

found most advantageous is the following: the quantity of opium to be used is immaterial; if sufficient is at hand, 1,000 grains, as recommended by O'Shaughnessy, is a convenient quantity. The opium is broken up into pieces as small as possible, and digested in five times its weight of rectified spirit in a stoppered bottle with occasional agitation for a couple of days. The tincture is strained through calico and pressed, and the marc transferred to a flask, which is to be closed with a stopper or glass plate. The calico is washed with half as much spirit as that first used, which is then digested with the opium for 24 hours more, after which the flask is placed in a water bath, the cork having been removed, until the spirit begins to boil. It is then removed from the bath, and when cool the liquid is strained through calico and thoroughly pressed out, being washed at last with a few drachms of spirit. In this way a complete exhaustion is effected, any remnants of narcotine being brought into solution at the boiling temperature. The liquid, if turbid, is filtered through paper, poured into a retort placed in a water bath, and solution of ammonia, in quantity sufficient to destroy completely the acid reaction, is added. Two drachms will be ample for this purpose; the use of so much as one ounce, formerly recommended, is quite unnecessary. If the spirit is very strong a few drachms of water may be added, and the distillation proceeded with. When four-fifths of the spirit have been distilled off, the retort is removed,* its contents poured into a porcelain capsule, and the retort washed with a small quantity of rectified spirit which is added to the rest. The capsule is covered and left for 24 hours. During the distillation most of the alcohol is driven over, and a weak spirit, much under proof strength remains, in which, when cold, narcotine is scarcely at all soluble. The mass is squeezed through linen, which is better than calico in this case, the crystals of narcotine washed several times with a little rectified spirit, and again pressed.

* It is essential that all the ammonia be driven off, otherwise on the subsequent dilution of the liquid with water some of the morphia will be precipitated with the resin and lost. The last portions of spirit should therefore be tested, and if found alkaline, an additional quantity of pure spirit should be poured into the retort, and the distillation renewed until no more ammonia appears in the distillate.

The liquors are united, and mixed with water equal to four times the weight of the opium employed. After 24 hours the clear liquid is strained off from the deposited resin, gently evaporated to one-fourth of its bulk, the remainder brought nearly to boiling, and mixed in a beaked tumbler with half its bulk of rectified spirit; solution of ammonia is then added until, after blowing away the air in the vessel, the smell of ammonia remains permanently perceptible, or until the air retains an alkaline reaction. In a few minutes flaky crystals of morphia make their appearance, and rapidly increase as the liquid cools. They adhere but little, and sometimes not at all to the walls of the vessel. It is well, at the expiration of 12 hours to stir the liquid smartly, which expedites the complete precipitation of the morphia. After 24 hours the crystals are filtered off, washed, and dried. If they should be very much coloured, which is not often the case, they may be dissolved by warming with a little caustic soda or potash, the liquid diluted, filtered, heated, mixed with alcohol, slightly supersaturated with acid, and precipitated as before by ammonia.

The crystals of narcotine are treated with cold caustic soda or potash of the usual strength; this dissolves the adhering resin, but leaves the narcotine unaffected. After some hours, if the crystals are not quite colourless, the liquid may be heated to 180° for a short time, poured off from the crystals, and the operation repeated with fresh solution of soda, the liquid is then diluted with much water, and the narcotine allowed thoroughly to subside; the clear liquid is then poured off, water added, and the narcotine collected upon a paper filter, washed and dried. The strong alkaline liquid clogs the paper too much to render immediate filtration practicable, hence the necessity of separating it in the first place by the subsidence of the narcotine. The crystals are thus obtained at once and without the trouble and loss of recrystallization, snow-white, notwithstanding the dark colour of the liquid in which they are formed, for the colouring matter is merely superficially adherent; they are also perfectly pure, every trace of morphia being removed by the alkali. The decolorization of morphia is much more difficult, the colouring matter being incorporated with the substance of the crystals; it can only be removed entirely by the use of animal charcoal.

The process, it will be observed, differs from that employed by Sir W. O'Shaughnessy and by Dr. Giraud in the following points:—The extraction of the opium is effected in two macerations instead of one, the last time at a boiling temperature. The quantity of ammonia used is only a third or a fourth of that originally employed. The narcotine is washed with spirit instead of water, the immediate effect of the latter being to throw down quantities of resin upon the crystals in an insoluble form. The narcotine is not dissolved in acid, and reprecipitated by ammonia, which in reality, does very little towards purifying it. I have repeatedly obtained the narcotine by O'Shaughnessy's process as an almost black resinous mass, adherent to the paper and totally devoid of crystallization; it is evident therefore that the results are not fully to be depended on. By the present method the trouble is less, and the result, as may be seen by the specimens on the table, very satisfactory. As to the morphia, the syrupy liquid which contains it is diluted with less water, but I find that the quantity I have mentioned is more than sufficient. Instead of adding the ammonia at once to the cold clear liquid, by which a highly impure and resinous morphia is thrown down, the solution is concentrated, mixed with alcohol, and precipitated hot with ammonia. The spirit keeps the resin in solution, and aided by the effect of heat, retards the separation of the morphia, so that it has time to form distinct crystals. This has been previously pointed out by M. Fordos. The loss of morphia by solution in the spirit is perfectly inappreciable, and is more than compensated by the reduction in the bulk of the liquid by previous evaporation. It is, I believe, an essential step in all precipitations of morphia.

All the processes hitherto recommended had in view merely the estimation of morphia. In addition to the method of Couerbe,¹ commonly known as Mohr's,—and the manufacturing process of Gregory,² adopted, but not advantageously, as an analytical one by Berthemot,³—may be mentioned that of

¹ Pereira's *Mat. Medica*, 3rd ed. Vol. II. p. 2107.

² Geiger und Lisöig's *Handbuch der Pharmacie*, Band I. s. 1191.

³ Pereira's *Mat. Med.* *loc. cit.*

Guillermont,¹ who precipitates a spirituous solution at once and without concentration by ammonia, and separates the morphia and narcotine mechanically; or the modification of Riegel,² who separates the narcotine from the morphia by treatment with ether; the original one of Robiquet,³ who precipitates the aqueous solution by boiling with magnesia, dissolves the precipitate in boiling alcohol, and treats the crystals which form on cooling with ether to dissolve narcotine; that of Thiboméry,⁴ who precipitates hot with ammonia; that of Fordos,⁵ who mixes an aqueous infusion, without previous evaporation, with spirit, and precipitates cold with ammonia, separating the narcotine by washing with ether and chloroform. Lastly, that of Merck,⁶ a most trustworthy and practical experimenter, who evaporates the watery infusion to a small bulk, adds an excess of carbonate of soda, continues the evaporation to dryness, washes with water, then with spirit, and treats the residue with very weak acetic acid as long as it is neutralized, which dissolves morphia only and not narcotine; filters through pure animal charcoal, and precipitates with ammonia.

But whatever method is adopted, hurry is to be avoided. The thorough extraction of the opium requires time, and too much time also can hardly be allowed for the crystallization of the morphia; filtrations too are tedious operations, if effectually performed. The use of spirit as the extracting agent is on the small scale much preferable to that of water for all purposes of analysis. It brings into solution all the crystalline principles, including the narcotine, and by leaving undissolved much of the gummy matters, it renders the crystallization and purification more

¹ Journal de Pharmacie, 3me sie. tome XVI. p. 17. Pharmaceutical Journal, Vol. IX. p. 236. Liebig and Kopp's Annual Report for 1849, English edition, p. 422.

² Pharm. Jour. Vol. XI. p. 418.

³ Ann. Ch. Phys. 2me. sie. tome V. p. 279.

⁴ Pereira's Mat. Med. *loco cit.*

⁵ Comptes Rendus, Vol. XXIV. June 15th 1857.—Pharm. Journ. Vol. XVII. p. 239.

⁶ Geiger und Liebig's Handbuch der Pharmacie, Band I. s. 1189.

easy and complete. By the process above described, I have repeatedly obtained crystals of morphia half an inch and upwards in length, even when operating upon as little as 300 grains of opium. The morphia is separated by this method with fully as much ease and accuracy as by any other, and certainly by no other means can the entire quantity of narcotine be so readily extracted,—a matter of some interest now that the antiperiodic properties of this base are so fully established.

Subjoined are the results obtained by the application of this process to some little known varieties of opium.

No.	Name of Source.	Per Cent.				Remarks.
		Moisture, dried at 230°.	Smokeable Extract.	Narco- tine.	Morphia.	
1	Shiraz	(about) 5·0	62	5·74	5·69	In muller-shaped cakes. Ditto.
2	Sheerel (from Ispahan)	(do.) 6·0	80	6·00	7·67	
3	Pooreh (ditto) ..	(do.) 7·0	84	4·56	4·46	
4	Kerman	5·46	65	6·58	10·33	
5	Kazeroon (from Shiraz)	7·33	78	6·13	6·89	In thin sticks, wrapped in co- loured paper. Chick consistence, mouldy.
6	Istehbanat (ditto) ..	8·00	73	4·58	6·58	
7	Yezd, in sticks	5·30	82	5·89	9·46	
8	Do. in lump	10·81	50	5·76	5·18	
9	Benares, 1850	6·33	46	5·32	3·34	
10	Patna, 1850	3·33	53	4·90	4·53	
11	Malwa, 1850	6·00	58	4·08	5·00	
12	Punjab, No. 1.	8·73	} dry.	3·17	4·44	
13	Do. No. 2.	8·67		2·73	9·26	{ Consistence of treacle.
14	Opium from Canton.	(about) 7·0		7·15	4·63	
15	Smokeable Extract, first quality, from Canton. (Qy. In- dian opium ?)	19·09	{ Nearly all so- luble in water.	1·30	11·57	

REPLIES TO CERTAIN INQUIRIES FROM THE ROYAL COMMISSION ON THE SANITARY STATE OF THE INDIAN ARMY.

Presented by the Principal Inspector General, Medical Department.

No. 1.—A list of all the Stations in the Bombay Presidency arranged according to their order of salubrity, with notes on the general Sanitary condition of each.

The following are the principal Stations for European troops in the Bombay Presidency :—

1. Bombay, and Colaba.
2. In the Deccan.—Poona, Kirkee, Ahmednuggur, Sattara, and Sholapore.
3. In the Northern Division.—Deesa, Ahmedabad, Surat, and Baroda.
4. In the Southern Division.—Belgaum.
5. In Sindh.—Kurrachee, and Hyderabad.
6. In Malwa and Rajpootana.—Mhow, Neemuch, and Nusseerabad.
7. Aden.

It is only since the mutinies that European troops of the Bombay Army have occupied the stations of Mhow, Neemuch, Sattara,

Table A. Surat, Baroda, and Ahmedabad, and from the two latter places they have been now withdrawn. The statistics of all these new stations, therefore, only extend over three years, whilst at the other places they embrace the period from 1850 to 1860 as will be seen from the accompanying table marked A in the series of tables at the end.

Arranged according to their comparative salubrity, as judged of by a minimum of deaths, the several stations stand as follows:—

Stations.	Proportion of Deaths per 1000.	Proportion of treated to strength per cent.	No. of years referred to.
Asseerghur	13·5	152·7	3 Years .. 1858 to 1861
Kirkee	13·7	166·3	10 „ .. 1850 to 1860
Aden	16·7	138·6	„ „ .. ditto.
Poona	17·3	184·2	„ „ .. ditto.
Belgaum	17·8	144·3	„ „ .. ditto.
Sattara	18·9	180·8	3 „ .. 1857 to 1860
Deesa	19·5	185·4	10 „ .. 1850 to 1860
Ahmedabad	20·8	208·8	3 „ .. 1857 to 1860
Sholapore	20·9	245·4	10 „ .. 1850 to 1860
Ahmednuggur	27·2	237·7	„ „ .. ditto.
Kurrachee	27·4	185·6	„ „ .. ditto.
Mhow	28·4	233·3	3 „ .. 1857 to 1860
Hyderabad	28·7	230·6	10 „ .. 1850 to 1860
Neemuch	30·3	279·0	3 „ .. 1857 to 1860
Colaba	32·0	177·5	10 „ .. 1850 to 1860
Nusseerabad	37·8	215·8	„ „ .. ditto.
Baroda	42·3	260·7	3 „ .. 1857 to 1860
Surat	51·7	403·4	„ „ .. 1857 to 1860

European troops were temporarily stationed at, for a short time after the mutinies but have since been withdrawn from, Dharwar, Rutnagherry, Kolapore, Kulludgee, Vingorla, and Malligaum.

No. 1.—ASSEERGHUR.

This is a well-known Hill Fort on the borders of Candeish and Rajpootana. It was formerly garrisoned only by Native troops, but since the mutinies, one or more companies of Europeans have been stationed at Asseerghur. The statistics in the

* No. 1. accompanying table* extend over three years from 1858 to 1861, and show that the average annual strength has been 74, of which 112 have been treated in Hospital, being in the proportion of 152·7 per

cent. The number of deaths has been only one a year, giving a death-rate of 13·5 per thousand. There can be no doubt that it is a very healthy locality for European troops, although the barrack accommodation has been hitherto indifferent. Two new barracks have however been lately erected and occupied. The climate is excellent, moderately dry and not very variable. Fuller details will be found in the separate sanitary report already transmitted.

No. 2.—KIRKEE.

Kirkee has been for upwards of a quarter of a century the chief European Cavalry station in the Bombay Presidency. It is now occupied by the Head Quarters of Artillery.

The annual average strength for the last ten years has been 802. The average number of sick 1,335, being in the ratio of 166·3 per cent. of treated to strength; the average number of deaths 11 per annum, being a death-rate of only 13·7, the lowest rate, with the exception of Asseerghur, of any station in the Presidency. The chief diseases, with their classes and numbers,

* No. 2. will be seen in the accompanying table.* Cholera it will be observed has

visited the station in 1853 and 1855 and last year. The barracks and accommodation for troops are every thing that could be desired. The details with respect to climate and meteorology will be found in the separate sanitary report already transmitted.

No. 3.—ADEN.

This station has been occupied by both European and Native troops of the Madras and Bombay Presidencies, since its capture in 1840. The statistics of European troops for the last ten years furnish the following results. The average annual strength, consisting of a wing of one of the line or local Regiments with a company of Artillery, has been 479, the average number of sick treated has been 664, and the average number of deaths 8. This gives, therefore, an amount of sickness of only 138·6 per cent. being one of the lowest of any station in the

Presidency, and a death-rate of only 16·7 per mille. The principal classes of disease will be seen in the accompanying table.* Cholera, it will be observed, was altogether absent from Aden. The barrack accommodation for the troops is on the whole good, and additional barracks are about to be erected.

No. 4.—POONA.

Is a well-known station for European troops in the Deccan, within a few hours' reach of Bombay and of the sea coast by rail.

The average annual strength of European troops, consisting of Horse Artillery and Infantry, has been 2,191, of which number the admissions into hospital average 4,037, being at the rate of 184·2 per cent. The average yearly number of deaths has been 38, giving a death-rate of 17·3 per thousand. The chief classes

of disease will be seen in the accompanying table.* Cholera, it will be observed, has been epidemic last year, and in some former years. Weak and delicate Soldiers and invalids are sent to the neighbouring Sanatorium of Poorundhur, which is easily accessible, and those requiring the air of the sea coast, to the Colaba Sanatorium. The new barracks, hospitals, and appliances for troops at this station, are of a superior description. The barracks have been made as comfortable and salubrious as possible, and are a great contrast to the old ones.

No. 5.—BELGAUM.

This has always been a favourite station for European troops in the Southern Division. During the last ten years, the average yearly strength of European troops has been 1,286, consisting of Artillery and Infantry;—the average number of sick yearly treated has been 1,856, being in the proportion of 144·3 per cent. The number of deaths has been annually 23 on an average of ten years, making the death-rate 17·8 per mille.

The principal classes of disease will be seen from the accompanying table;* and it will be observed

* No. 5. that with the exception of last year, epidemic cholera has been almost entirely absent from the station for the past ten years. The barracks and accommodation for troops are of a superior description, and the camp is well drained. This station is 2,500 feet above the level of the sea, the climate partaking in some degree of both the N.E. and S.W. monsoons, and very agreeable to the European Soldier.

No. 6.—SATTARA.

Sattara has only been occupied by European troops since the mutinies, and the accommodation has been of the most temporary nature. A site for permanent barracks has been chosen contrary to the recorded opinion of the present Deputy Inspector General of Hospitals of the Poona Division.

The statistics only extend therefore from the year 1857 to 1860. The average strength of Artillery and infantry has been 369, whilst the admissions into hospital

Table No. 6.

have been 667, or about 180·8 per cent., the average annual number of deaths has been seven, showing a low death-rate of only about 19 per mille (18·9).

No. 7.—DEESA.

At Deesa, European troops have been long stationed, usually one troop of Horse Artillery and a wing, or an entire European Regiment. During the last ten years the average annual strength has been 769, and the treated in hospital 1,426, being in the proportion of 185·4 per cent. to strength. The annual average number of deaths has been 15, giving a death-rate of 19·5 per mille. The chief diseases are fevers, peculiar to Gujarat, from which the mortality is high, but has been reduced somewhat by the severe cases, which would admit of it, being

* No. 7. sent to the neighbouring Sanatorium at Mount Aboo. The accompanying

table* will show the chief diseases from which the troops suffer.

No. 8.—AHMEDABAD.

This station was only occupied by European troops since the mutinies in 1858, 1859, and 1860, and they are now withdrawn with the exception of a company of Artillery.

The barracks were only of a temporary nature, but there is good and sufficient accommodation for the Artillery. During the three years under report the average annual strength was 670, the average sick treated, per annum was 1,399, being in the proportion of 208·8 per cent. The annual number of deaths was 14, in the ratio of 20·8 per mille.

Table No. 8.

No. 9.—SHOLAPORE.

A company of European Artillery has been stationed at Sholapore as a portion of its regular garrison during the last ten years, but between the years 1857 and 1860, detachments of Infantry were located there, which have however now been withdrawn. The average annual strength has been 143, the number of sick treated has been 351 per annum, being in the proportion of 245·4 per cent. The average yearly number of deaths has been 3, making the mortality rate 20·9 per mille.

The chief classes of disease will be seen by the accompanying table.* Even if it were desirable to locate a larger body of European Troops at Sholapore than at present, there would not be sufficient accommodation, although the facility of easy access by rail makes it otherwise a convenient position.

* No. 9

No. 10—AHMEDNUGGUR.

This, although a favourite station and for many years the Head Quarters of the Bombay Artillery, has been far from a healthy location for troops, as must be evident from it being placed *tenth* on the present List. The average annual strength has been 440, whilst the admissions and treated in hospital have amounted to 1,046 per annum, in the proportion of 237·7 per cent.

The number of deaths has averaged 12 per annum, making the death-rate 27·2 per mille. At Ahmednuggur the high rate of sickness is due chiefly to the arrival of recruits from England and to their being located there during the period of acclimatization. The barracks, hospital, and accommodation, are all of a comparatively old date.

No. 11.—KURRACHEE.

During the last ten years the average annual number of troops at Kurrachee has been 1,566, consisting generally of one troop of Horse Artillery, a company or more of Foot Artillery, and a full Regiment of Infantry. The number, however, has been augmented by troops proceeding to, or arriving from, the Upper Provinces of India, and halting at Kurrachee, until their arrangements were completed. There were 2,907 patients treated annually in hospital, being in the proportion of 185·6 per cent. The annual average mortality was 43, showing a death-rate of

27·4 per mille. The number of deaths from the chief classes of disease is shown in the accompanying table.* Cholera, it will be observed, prevailed in 1853, 1854, and last year, to a very considerable extent. The new barracks at Kurrachee are superior to any other except at Hyderabad in Scind.

No. 12.—MHOW.

The station has for some years previous to the mutinies been occupied by Bengal troops. It is only since 1857 that a portion of the Bombay Army has garrisoned it, and hence the statistics embrace only the three last years. The troops quartered at Mhow have consisted at different times of Horse and Foot Artillery, of Cavalry, and of Infantry. The annual average strength of all arms has been 983. The number treated in

hospital 2,295 per annum, being in the proportion of 233·3 per cent. The average annual number of deaths was 28 giving a death-rate of 28·4 per mille.

The barracks and accommodation for European troops have hitherto not sufficed, and were of a temporary nature; but new permanent barracks of a superior description are now ready.

NO. 13.—HYDRABAD IN SIND.

Portions of different arms of the service have occupied Hyderabad during the last ten years, but the strength has varied greatly from 905 in 1856, to 52 in 1857. In the former year the whole of the 2nd European Regiment was stationed at Hyderabad previous to the Persian campaign. The average yearly strength has been 418, and the average yearly number of patients treated in hospital 964, being in the proportion 230·6

* No. 13.

per cent., chiefly, as it will be observed from the accompanying table,* from fevers. But the number of deaths was only 12 per annum, making the annual death-rate about 28·7 per mille. During the decade under notice, not a single instance of admission or of death from cholera took place. The barracks for European troops at Hyderabad surpass any other, upon this side of India, for loftiness and airiness.

NO. 14.—NEEMUCH.

This Station has been occupied by Native troops of the Bombay Army for a long time, but only since 1857 have European troops formed a portion of its garrison. These have consisted of Artillery, Infantry, and few squadrons of Cavalry. The barracks occupied by European troops were the best that could be restored and re-constructed out of the hospitals and other buildings formerly appropriated for Natives.

The mean annual strength of the last 3 years was 658, of these 1,836 were treated in hospital, being in the proportion of 279·0 per cent. The average annual deaths were 20, giving a death-rate of 30·3 per mille.

Table No. 14.

No 15.—BOMBAY AND COLABA.

The average annual strength of European troops at Colaba and in Bombay, appears by the tables to be 818 per annum, but this is fallacious, as the garrison merely consists of a wing of a European Regiment and a company of Artillery. The additional numbers are made up by the arrival of troops, chiefly invalids, for embarkation to England, and by drafts proceeding up country. In this way invalids arrive very often only to increase the sick list, and to swell the high death-rate of Bombay which, for the decade 1850 to 1860, reached

Table No. 15.

as high as 32 per mille. This state of things will not probably again happen, as the establishment of the Khandalla Depôt relieves Bombay of invalids; whilst the railroad to Poona permits invalids from that large station being kept in their own hospitals until the eve of embarkation still, there is no doubt but that Bombay is a very unhealthy station, both for European and Native troops. Very severe epidemics of fever prevailed in 1858 and in the present year, owing to the bad structure of barracks and hospitals, insufficient drainage, and unwholesome effluvia from the neighbouring beach.

No. 16.—NUSSEERABAD.

Between the years 1850 and 1857 only one company of European Artillery belonging to the Bombay Presidency was stationed at Nusseerabad, and even this company was withdrawn in the early part of 1857. But since that period, in addition to a troop of Horse Artillery, some portion of a Dragoon Regiment and a wing or more of Infantry have occupied Nusseerabad. During the first seven years of the decade, the average annual strength was about 60, but for the whole period of ten years the average yearly strength amounts to 449, and the treated in hospital to 969 or 215·8 per cent. The number of deaths was 17, which, in proportion to the strength,

Table No. 16.

makes the death rate 37·8 per mille.

The accompanying tables show the chief forms of disease met with at Nusseerabad.

No. 17.—BARODA.

This Station was temporarily occupied by European Troops from 1857 to 1860, but it has since been given up. A Battery of Royal Artillery with a few companies of an Infantry Regiment, formed its garrison, the annual average strength of which was about 354. Of this number the treated in Hospital amounted to 923, being in the proportion of 260·7 per cent. The annual mean mortality was 15, being at the rate of 42·3 per mille. This large mortality was

Table No. 17.

due to a peculiar form of "*sun-stroke*" which with "*apoplexy*" carried off 21 individuals out of the total number of deaths (45).

The barracks and accommodation were merely temporary.

No. 18.—SURAT.

A few European troops have been quartered in the Fort at Surat since the mutinies, and continue to be so located, although the sickness and mortality have been greater than at any other station in the Bombay Presidency as the following table will show. The strength of the detach-

Table No. 18.

ment was annually 58, the number of admissions and treated in hospital 234, being more than 400 per cent., whilst the deaths averaged 3 per annum, in the proportion of 51·7 per mille. Out of the total number of deaths, viz., nine in the (3) three years, six occurred from diseases of the stomach and bowels, diarrhœa or dysentery. The Castle at Surat has been always considered unhealthy and the room used as a guard-room unfit to be occupied by European Soldiers; whilst the drain is occasionally very offensive.

No. 2.—*A list of all existing Sanatoria in the Bombay Presidency, with an account of the advantages or disadvantages of each.*

- (1) *As places of residence for preserving health.*
- (2) *As places of recovery from sickness, with diseases for which they are adapted, or not adapted.*

EXISTING SANATORIA.

The existing Sanatoria are,—

1. Mahableshwur.
2. Poorundhur.
3. Mount Aboo.
4. Ghizree.
5. Taraghur.
6. Sulabat Khan's Tomb, near Ahmednuggur.

1. **MAHABLESHWUR** is situated on the western slope of the table land of the Ghâts $17^{\circ} 56'$ N. lat. $73^{\circ} 30'$ E. long. and is 4,500 feet in height at its highest point. The climate is very pleasant, the annual mean temperature being 66° Fah., the mean range $9^{\circ} 7'$. The air is moist from the influence of the sea breeze which reaches the hill in full force, and preserves it from the aridity so common on the hills further eastward from the coast.

Mahableshwur is not made use of as a Sanatorium for troops in the Deccan, as it is unsuitable during the monsoon from the amount of rain which falls, the average being upwards of 250 inches. Invalids would have to descend to the plains in the hottest period of the year, and at a season when cholera generally prevails; so that this hill is not calculated either as a place of recovery for the sick, or as a permanent residence for persons in health.

In the year 1829, a party of invalid soldiers was sent to this Sanatorium, but the results did not warrant the experiment being repeated. Since that period it has been resorted to chiefly in the hot months of October and November, April and May, as a hill station to escape the heats of the plains. Since the introduction of the New Furlough Regulations few Officers are sent to Mahableshwur for any continued period, or for any serious

chronic disease, as a change to England has a more beneficial and enduring effect, than a resort to any hill station in the Tropics.

A full account of the medical topography and meteorology of the Mahableshwur Hills will be found in the 1st, 2nd, and 7th Nos. of the Transactions of the Medical and Physical Society of Bombay (copies of which are obtainable at the India House), and in Dr. Morehead's published reports on the Sanatoria of Western India (*see Morehead's Researches on Disease in India, new edition, page 728*).

II. POORUNDHUR has for the last eight or nine years been used as a Sanatorium for troops in the Deccan. During that time about 2,000 invalids have been treated on the hill, 1,500 have been cured and returned to duty, 29 only have died, and the remainder were either returned to the plains—the climate being unsuited to their complaints—or are now occupants of the Sanatorium.

Its height is about 4,200 feet above the level of the sea, its climate is cool and invigorating, it is within the influence of the sea breeze, and the fall of rain, about 70 inches, is not so heavy as to render it uninhabitable the whole year.

Poorundhur, like all the hills arising from the plain on this side of India, is not useful in cases of organic disease, but those from debility, fever, dyspepsia, derive great benefit. There is not space at Poorundhur for a cantonment for troops in health, but it is most useful as a Sanatorium.

A full description of Poorundhur will be found in a memorandum published by Dr. Morehead at page 747 of the 2nd edition of his Researches, and a later Bombay account in the appendix to the sixth volume of the Bombay Medical and Physical Society's Transactions.

Annual Returns of Mortality and Sickness are herewith appended.

III. MOUNT ABOO is situated in the territories of the Rao of Sarowy in Rajpootana, 50 miles N.E. from Deesa, the principal station for European troops in Guzerat. It is in 72° 50'

E. long. and $24^{\circ} 37'$ N. lat. and is about 4,500 feet in height. Aboo has been resorted to for the last twenty years, as an agreeable retreat in the hot weather, and since 1851, European invalids have been located there; the climate is cool and favourable for Europeans, the scenery is picturesque and the sites for building are very eligible. Troops remain on the hill the entire year, and Mount Aboo is therefore not only fitted as a Sanatorium for Invalids suffering from the debility of fever, induced on the plains of Guzerat, but from the ample space and excellent climate it is well adapted for a permanent station for European soldiers. The barracks have been placed in a disadvantageous position which, however, is about to be changed.

A general topographical and medical report by Assistant Surgeon Ogilvy up to the latest date, will be found in the sixth Volume of the Bombay Medical and Physical Society's Transactions, page 192.

The annual return of sickness and mortality for the last ten years accompanies this paper.

IV. GHIZREE is not a hill, but a coast Sanatorium, and as such has been for some years occupied by the troops in Sindh. It is elevated scarcely 60 feet above the level of the sea, but the plateau rises abruptly from the shore and enjoys in an eminent degree the full force of the sea breeze, pure and uncontaminated, from the Indian ocean. It is in the purity of the air, the strength of the breeze, and consequently slightly lower temperature than the camp of Kurrachee, that the value of Ghizree as a sanatorium consists, and a residence there is calculated to give a healthy tone to the weakened system, whether arising from fever or from chronic visceral disease.

Ghizree is not at all fitted for a permanent encampment for a large body of troops, owing to the want of water of which it is entirely destitute, as all required at the sanatorium is brought from the cantonment of Kurrachee.

A further account of Ghizree will be found at pages 15 and 16 of the published report on the extent and nature of the Sanitary Establishments, in the selections from the records of the

Government of India (Military Department) Calcutta, March 1861.

Tables of Sickness and Mortality are herewith appended.

V. **TARAGHUR** is a hill fort about 14 miles from Nusseerabad, close to Ajmere, which has been made use of as a hill Sanatarium and with great success; the ascent is easy, but the space on the plateau is not sufficient for more than 40 or 50 invalids. The hill is 2,800 feet above the sea, and about 1,000 above the plain: water is collected in tanks and supplies are abundant.

The statistics do not extend beyond the present year. From April 1860 to March 1861, 178 invalids have been sent to the hill for change of air, of these only 14 were returned without having derived any benefit; no death occurred, the cases were however well selected and the experiment has proved that men suffering from debility, the result of sickness and long confinement in hospital, recover rapidly at Taraghur.

VI. **SALABAT KHAN'S TOMB**, near Ahmednuggur, has lately been resorted to as a Sanatarium for weekly and delicate Soldiers from Ahmednuggur during the hot months of April and May. It is a small hill about 6 miles from Ahmednuggur, about 2,000 feet above the level of the sea, and 6 or 700 feet above the level of the camp of Ahmednuggur. The temperature is about 2 or 3 degrees cooler than Ahmednuggur. It is freely exposed to the high winds which prevail during the hot months in the Deccan, but on the hill these are cool, whilst in cantonment a furious hot wind may be blowing.

The tomb has received certain additions and improvements since it was first occupied in 1859, and the buildings are now well adapted for the reception of invalid Europeans, about 50 or 60 men have been sent there during the hot season with advantage and improvement to their general health. The site from its elevation is cool and healthy, and recent experience proves that a temporary residence is very beneficial to Soldiers in a debilitated condition. There is ample space for the erection of other buildings, but the access is not good and water is not obtainable on the hill, but from a distance.

No. 3.—A list of all places within the Bombay Presidency where Hill stations might be advantageously fixed for the health of the Troops, or where Sanatoria might be established, with particulars as to the elevation, topography, climate, means of access, distance from Stations, &c.

There are many hills met with in the Ghâts and spurs leading from them, well calculated for Sanatoria, and where hill stations might be advantageously fixed, if they were accessible. These hills are generally about 4,000 feet above the level of the sea, and enjoy the same climate as Mahableshwur, but are for the most part inaccessible, deficient of supplies, and out of the line of the railroad. In the Satpoora range in Kandeish there are also hills varying from 4,000 to 6,000 feet in height, and one of these would probably be found very useful to the troops serving in Malwa who have as yet no nearer resort for Invalids than Poorundhur which entails a long and wearisome march of 350 miles.

The general height of the most elevated hills in this Presidency seldom exceeds 4,000 feet, in one instance alone in Kandeish is there a mountain of 6,000 feet, but the plain surrounding it is said to be very unhealthy.

Between Sattara and Mahableshwur the hill of Euteshwur possesses great advantages, and is likely to prove a good locality for preserving the health of troops. Its height is 3,600 feet with good water, soil, and plenty of space as well as easy of ascent.

As places of residence for preserving the health of European Troops, there is no want in the Bombay Presidency.

One of these, Paunchgunny, 12 miles to the eastward of Mahableshwur, is sheltered from the monsoon. The fall of rain is so slight as to be of no inconvenience, the average being about 50 inches per annum. Troops might reside at Paunchgunny the whole year, the soil is laterite and water does not remain on the surface. The sea breeze, although late in arrival, blows regularly for many hours in the day. There is ample space for drill, and the climate is favourable for horticultural

pursuits. Its mean maximum temperature is 77° and mean minimum 62° , whilst the extremes are from 56° to 86° . It is perfectly accessible.

An account of Paunchgunny will be found in Dr. Morehead's Note on Deccan Hill Climates before referred to.

The Sanatoria in this Presidency are generally free from malarious fever; neither does the climate produce abdominal complaints as noticed at the Hill stations of Bengal.

There are two coast Sanatoria for such diseases as hill climates do not suit,—one at Colaba, the other at Rairee, on the Southern Mahratta Coast, near Belgaum.

Colaba, although a convenient locality, is unhealthy, and it is to be hoped that some more pure and salutiferous site will be ere long selected on the coast of the Concan.

Rairee is only now being tried and as yet the results are not known.

T A B L E S

OF THE

**HEALTH STATISTICS OF THE STATIONS FOR
EUROPEAN TROOPS IN THE BOMBAY
PRESIDENCY.**

TABLE A.

GENERAL RETURN of the Health Statistics of the Stations for European Troops in the Bombay Presidency.

Period.	Number of years.	Stations.	Strength	Fevers.		Epidemic Cholera.		Diseases of the						All other Diseases.	Total.		Ratio per 1,000 to average Strength.	
				Treated.	Died.	Bruplative Revers.	Lungs.	Liver.	Stomach and Bowels.	Brain.	Treated.	Died.	Treated.		Died.			
From 1855 to 61	8	Asserghur	923	106	20	...	...	...	...	...	...	...	...	...	...	...	158.7	
" 1850 to 60	10	Kirtce	8,048	3,919	32	70	13	839	0	1,923	40	983	94	11	18,352	113	166.3	
" ditto	10	Aden	4,794	1,470	17	394	13	330	13	1,134	11	300	11	3,055	6,643	80	138.3	
" ditto	10	Poon	21,911	12,508	34	1,271	61	1,984	48	4,970	100	902	18	18,084	54	40,376	379	17.3
" ditto	10	Beigam	12,968	3,268	18	1,104	19	835	24	2,400	91	556	20	10,323	36	18,569	235	146.0
" 1857 to 60	3	Battara	1,103	84	1	46	1	31	12	200	4	56	2	787	2	9,000	30	180.8
" 1850 to 60	10	Deesa	7,686	4,773	38	741	15	615	12	1,580	38	201	26	0,314	19	14,393	101	185.3
" 1857 to 60	3	Ahmedabad	3,012	2,504	19	169	4	78	4	468	4	41	0	1,301	1	4,199	45	306.0
" 1850 to 60	10	Sholapur	1,437	1,063	8	101	1	60	3	313	11	32	1	604	9	3,568	31	244.1
" ditto	10	Ahmednugur	4,360	3,493	11	84	10	179	8	1,715	40	349	3	4,680	9	10,460	129	337.9
" ditto	10	Kurrachee	15,665	10,367	90	5	...	...	...	...	...	...	...	...	...	...	37.2	
" 1857 to 60	3	Mhow	2,950	3,100	18	4	...	...	...	...	...	...	...	...	...	...	37.4	
" ditto	10	Hydrabad	4,181	4,706	56	...	...	...	...	...	...	...	...	...	...	...	38.7	
" 1850 to 60	10	Nernuch	1,974	3,990	31	8	...	...	...	...	...	...	...	...	...	...	39.4	
" 1857 to 60	3	Bombay & Colaba	6,183	4,300	24	11	...	...	...	...	...	...	...	...	...	...	37.8	
" ditto	10	Nu-seerabad	4,493	2,344	51	38	...	...	...	...	...	...	...	...	...	...	30.3	
" 1857 to 60	3	Baroda	1,003	1,733	10	...	...	...	...	...	...	...	...	...	...	...	315.7	
" ditto	3	Barat	176	446	2	...	...	...	...	...	...	...	...	...	...	...	43.3	
" ditto	3	Barat	176	446	2	...	...	...	...	...	...	...	...	...	...	...	51.7	

No. 1.—ASSEERGHUR.

YEARS.	CORPS.	Strength.	Fevers.		Eruptive Fevers.		Diseases of the								Epidemic Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.		
			Treated.	Died.	Treated.	Died.	Lungs.	Liver.		Stomach and Bowels.		Brain.		Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.		
								Treated.	Died.	Treated.	Died.	Treated.	Died.									Treated.	Died.
{ 1858-59. }	<i>Queen's Troops.</i> Detacht. H. M.'s 18th Ryl. Irish.. " " 57th Regt..... " " 18th Ryl. Irish.. " " 28th Regt..... " " 28th Ditto " " 95th Ditto	{ 80 }	55	...	...	18	..	2	..	3	..	...	...	...	...	80	..	158	..	197.5	..		
			40	...	...	8	..	4	..	8	..	2	..	1	1	65	..	128	1	143.8	1.1		
			11	...	...	..	..	2	1	5	..	3	1	..	..	34	..	55	2	74.3	2.7		
			223	106	...	...	26	..	8	1	16	..	5	1	1	1	179	..	341	3	152.9	1.3	
	Total....																						

No. 2.—KIRKEE.

YEARS.	CORPS.	Strength.	Fevers.		Eruptive Fevers.		Diseases of the						All other Diseases.		Total.		Ratio per cent. to Strength.								
			Treated.	Died.	Treated.	Died.	Lungs.		Liver.		Stomach and Bowels.		Brain.		Treated.	Died.									
							Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.											
<i>Queen's Troops.</i>																									
1850-51 ..	H. M.'s 8th Hussars	680	286	2 ..	..	..	128	3	72	1	309	17	9	1 ..	..	755	1	1,559	25	229	2	3	6		
1851-52 ..	" ditto	702	436	6 ..	..	..	103	3	35 ..	300	4	3	1 ..	..	657	1	1,534	15	218	5	2	1	0	5	
1852-53 ..	" ditto	705	664	1 3 ..	..	..	68	1	33 ..	254	1	3 ..	..	..	668	1	1,693	4	240	1	0	5			
1853-54 ..	" ditto	691	681	4 ..	..	..	57 ..	19 ..	19 ..	195 ..	4	6 ..	10	7	630 ..	..	1,598	11	231	3	1	5			
1854-55 ..	" ditto	662	395	1 1 ..	..	..	31	1	24 ..	165	4	9	1 ..	..	422	2	1,047	11	158	1	1	6			
1855-56 ..	14th Light Dragoons, ditto	720	275	2 1 ..	..	..	23	1	33 ..	64	1	17 ..	6	1	606	1	1,025	6	142	3	0	8			
1856-57 ..	"	686	137	1 1 ..	..	..	16	1	25 ..	60	1	24	1	1 ..	429 ..	..	693	4	101	0	0	9			
1857-58. {	3rd Dragoons	967	120 ..	1 ..	..	..	66 ..	27	3	71 ..	6 ..	..	..	..	353 ..	..	644	3	66	5	0	3			
1858-59. {	14th Light Dragoons, 17th Lancers		533	5	3 ..	..	86 ..	24	1	216	5	155	2 ..	..	..	750	2	1,767	15	174	2	1	4		
1859-60. {	6th ditto		392	1	3 ..	..	123	3	47	2	289	7	51	1	7	3	880	1	1,792	18	149	4	1	5	
	17th Lancers	1,199	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
	6th Dragoons		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
	14th Light ditto		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
	Total	8,026	3,919	23	13 ..	701	13	339	9	1,923	40	283	7	24	11	6,150	9	13,352	112	166	3	1	3		

No. 3.—DEN.

YEARS.	CORPS.	Strength.	Fevers.		Diseases of the								All other Diseases.		Total.		Ratio per cent. to Strength.			
			Eruptive Fevers.		Lungs.		Liver.		Stomach and Bowels.		Brain.		Epidemic Cholera.		Total.		Ratio per cent. to Strength.			
			Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.		
<i>Queen's Troops.</i>																				
1850-51	H. M.'s 78th Highlanders	501	184	4	...	7	3	81	4	67	1	7	3	...	263	1	609	16	121.5	3.1
1851-52	" ditto	483	89	1	...	14	2	22	...	147	1	10	...	...	103	2	475	6	98.3	1.3
1852-53	" ditto	400	87	2	...	43	...	29	1	123	1	6	...	...	229	3	517	7	129.2	1.7
1853-54	Wing 86th Regiment	438	174	1	...	53	2	32	1	157	...	13	1	...	270	1	609	6	152.6	1.3
1856-57	" ditto	450	58	1	...	106	...	25	...	101	...	13	...	...	244	...	547	1	119.9	0.2
1857-58	" 57th ditto	286	53	...	...	14	1	3	...	35	...	2	...	...	91	...	198	1	69.2	0.3
	" 86th ditto	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1858-59	2-11 Royal Artillery.	311	261	2	...	19	2	10	1	53	2	3	1	...	141	1	487	9	156.6	2.9
	Wing H. M.'s 57th Regt.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1859-60	5-13 Royal Artillery.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	R. W. H. M.'s 4th K. O. Regt.	322	67	1	...	12	...	10	...	54	...	9	...	...	203	...	355	1	110.2	0.3
	Wing H. M.'s 57th Regt.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
<i>European Troops of the Indian Army.</i>																				
1859-53	Hd. Qrs. 1st Eur. Regt. Fus.	182	46	...	...	10	...	9	...	23	...	19	...	...	177	...	254	...	215.1	...
1853-54	" 1st ditto	513	218	1	...	34	...	47	1	131	8	75	8	...	450	...	655	8	189.1	1.5
1854-55	" 2nd Co. 1st Battalion Artillery	516	133	2	...	38	3	49	2	122	...	72	2	...	527	4	941	13	182.3	2.5
1855-56	" Hd. Qrs. 1st Eur. Regt. Fus.	178	64	1	...	12	...	7	2	65	3	17	1	...	127	1	202	8	164.0	4.5
1856-57	" 2nd Co. 1st Battalion Artillery	102	23	...	...	30	...	1	...	44	...	5	...	...	63	1	166	1	169.7	0.9
1857-58	" 2nd Co. 1st Battalion Artillery	94	10	1	...	2	...	...	...	11	...	5	...	...	46	2	74	3	78.7	3.2
1858-59	" Ditto	42	3	...	...	...	...	1	...	5	...	4	...	...	31	...	44	...	104.7	...
	Total....	4,794	1,470	17	...	394	13	326	12	1,138	11	260	11	...	3,055	16	6,643	80	138.5	1.6

No. 4.—POONA.

YEA RS.	CORPS.	Strength.	Fevers.		Diseases of the						All other Diseases.		Total.		Ratio per cent. to Strength.	
			Treated	Died.	Frustive	Lungs.	Liver.	Stomach and Bowels.	Brain.	Epidemic Cholera.						
						Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	
<i>Queen's Troops.</i>																
1850-51 .. {	H. M.'s 88th Regiment	11,117	340	2	1..	90	1	39	..	392	21	21	..	151-4	2-3	
1851-52	" 80th ditto	1,089	450	1	1	79	..	73	..	312	5	29	2	164-4	1-0	
1852-53 .. {	" 78th Highlanders	1,952	401	..	1..	98	2	83	4	368	2	31	..	142-9	0-7	
1853-54 .. {	" 80th Regiment	1,831	1,514	3	5	182	2	203	6	499	4	54	1	202-4	1-3	
1854-55	" 78th Highlanders	921	754	112	2	64	4	107	3	169	1	26	2	179-8	2-1	
1855-56	" ditto	878	463	2	4	42	3	52	..	115	..	26	..	138-5	0-7	
1856-57	" ditto	768	173	..	1..	37	..	56	2	117	3	27	3	110-3	1-8	
	D. Troop Royal Artillery															
	8 14 ditto															
1857-58	H. M.'s 18th Royal Irish	1,076	404	3	6..	81	4	17	2	126	1	22	..	116-3	1-1	
	" 33rd Regiment															
	Depot H. M.'s 78th Highlanders															
	" 80th Regt.															
	D. Troop Royal Artillery															
	Detach. 8 13 ditto															
	Y. F. B. ditto															
1858-59	H. M.'s 18th Royal Irish	3,040	1,480	3	6..	222	4	53	4	370	7	43	2	132-6	0-6	
	" 31st Regiment															
	Depot H. M.'s 78th Highlanders															
	" 80th Regt.															
	German Legion															

1850-50 ..	1,757	1,175	3	1	1	78	4	65	4	260	19	31	1	40	20	1,325	2	3,014	60	171-5	3-4
<i>European Troops of the Indian Army.</i>																					
1850-51 ..	1,380	1,440	9	3	..	97	4	106	5	261	10	120	3	14	4	1,505	2	3,612	37	200-6	2-6
1851-52 ..	1,305	612	..	5	1	104	5	110	3	210	8	139	1	1	1	1,351	4	2,582	23	194-0	1-7
1852-53 ..	1,020	704	..	..	..	125	3	79	..	170	5	196	..	..	..	1,276	4	2,550	12	250-0	1-1
1853-54 ..	560	162	..	..	..	38	2	16	1	115	1	17	1	2	2	423	1	773	8	138-0	1-4
1854-55 ..	840	651	3	3	..	161	2	40	2	411	6	12	..	7	7	939	5	2,224	25	204-7	2-9
1855-56 ..	1,051	830	2	2	..	72	3	45	1	448	3	34	1	..	..	1,425	1	2,856	11	271-7	1-0
1856-57 ..	1,035	521	4	2	..	80	..	59	4	266	..	28	..	8	3	1,254	3	2,188	14	211-4	1-3
1857-58 ..	505	226	1	..	..	51	2	36	4	177	3	15	1	..	..	912	2	1,417	13	280-5	2-5
1858-59 ..	177	120	1	5	..	26	1	17	1	71	4	6	..	..	..	247	2	501	9	283-0	5-0
1859-60 ..	294	167	..	..	..	44	5	23	2	128	3	19	..	30	11	289	2	700	23	238-0	7-8
Total	24,911	12,596	38	58	6	1,771	51	1,284	48	4,970	106	902	18	111	58	18,684	54	40,376	379	184-2	1-7

No. 5.—BELGAUM.

YEARS.	CORPS.	Strength.	Diseases of the										All other Diseases.	Total.		Ratio per cent. to Strength.
			Fevers.		Ruptive Fevers.		Lungs.		Liver.		Stomach and Bowels.			Brain.		
			Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.		Treated.	Died.	
<i>Queen's Troops.</i>																
1853-54	H. M.'s 64th Regiment	332	247 ..	4 ..	34 ..	22 ..	58 ..	2 ..	20 ..	383 1	768 5	231.3	1.9			
1854-55	" ditto	992	231 ..	1 ..	128 ..	88 1	223 11	46 1		947 ..	1,064 14	107.7	1.4			
1855-56	" ditto	1,093	192 1	2 ..	69 ..	81 2	244 9	37 ..		870 4	1,405 18	130.7	1.6			
1856-57	" ditto	604	107 ..	..	63 ..	83 1	170 10	54 3		610 2	1,087 16	163.7	2.4			
{ 81 14th Royal Artillery																
{ Detach. H. M.'s 3rd Dragoons																
1857-58	H. M.'s " 33rd Regiment	806	95 1	3 1	46 ..	29 1	119 2	15 1		397 1	704 7	81.3	0.8			
{ H. M.'s " 56th ditto																
{ Depot H. M.'s 64th ditto																
{ H. M.'s 80th ditto																
1858-59	" 56th ditto	684	174 2	..	101 1	52 2	210 3	21 ..		755 1	1,313 9	197.0	1.3			
{ Depot H. M.'s 64th ditto																
1859-60	H. M.'s 56th ditto	1,090	171 1	..	85 ..	59 2	230 9	19 3	16 14	851 3	1,431 32	131.3	2.9			
{ " 83rd ditto																
<i>European Troops of the Indian Army.</i>																
1850-51	{ 2nd Regiment European L. I.	1,059	268 4	..	118 3	77 4	240 8	31 2	1 ..	1,113 3	1,873 24	176.8	2.2			
{ Garrison Details																
1851-52	{ 3rd Co. 1st Battalion Artillery	1,249	287 3	..	125 5	79 ..	216 6	72 2	1 1	1,105 4	1,885 21	150.8	1.6			
{ 2nd Regiment European L. I.																
{ Garrison Details																

1852-53 .. {	2nd Co. 1st Battalion Artillery	1,103	208	1	5	1	127	3	90	3	900	13	35	4	..	..	916	9	1,780	24	156-9	9-9
	{ 2nd Regiment European L. I.																					
	{ Garrison Details																					
1853-54 .. {	2nd Co. 1st Battalion Artillery	763	166	2	3	..	64	..	67	1	134	6	53	3	..	..	537	4	1,030	16	137-6	2-1
	{ 2nd Regiment European L. I.																					
	{ Garrison Details																					
1854-55 .. {	2nd Co. 1st Battalion Artillery	125	35	..	3	1	9	..	11	..	20	1	2	..	..	..	80	..	180	2	144-0	1-6
	{ Garrison Details																					
1855-56 .. {	2nd Co. 1st Battalion Artillery	124	17	..	..	..	2	..	13	1	24	1	2	..	..	..	61	..	119	2	95-9	1-6
	{ Garrison Details																					
1856-57 .. {	2nd Co. 1st Battalion Artillery	126	19	..	..	..	9	1	5	..	15	1	7	..	..	..	88	..	143	2	113-4	1-5
	{ Garrison Details																					
1857-58 .. {	2nd Co. 1st Battalion Artillery	353	471	2	4	..	19	..	11	1	76	2	24	1	..	..	274	1	879	7	249-0	1-9
	{ 2nd Regiment European L. I.																					
	{ Garrison Details																					
1858-59 .. {	2nd Co. 1st Battalion Artillery	602	217	..	..	..	33	1	20	4	111	5	24	..	..	..	623	..	1,028	10	155-2	1-5
	{ 2nd Regiment European L. I.																					
	{ Garrison Details																					
1859-60 .. {	2nd Co. 1st Battalion Artillery	1,541	141	1	..	..	42	2	42	1	180	2	39	..	13	7	713	3	1,170	16	75-9	1-0
	{ 1st European Regt. Fusiliers																					
	{ 2nd Regiment European L. I.																					
	{ Garrison Details																					
Total....		12,860	8,208	18	22	5	1,104	19	835	24	2,490	91	550	20	31	22	10,323	36	18,546	235	140-6	1-8

No. 6.—SATARA.

YEARS.	CORPS.	Strength.	Fever.		Eruptive Fevers.		Diseases of the						Epidemic Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.		
			Treated.	Died.	Treated.	Died.	Lungs.		Liver.		Stomach and Bowels.		Brain.		Treated.	Died.	Treated.	Died.	Treated.	Died.	
							Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.							Treated.
<i>Queen's Troops.</i>																					
1857-58 ..	{ Detcht. H. M.'s 14th L. Dragoons.	132	33	..	3	1	7	..	7	..	14	1	3	..	81	..	148	3	112.1	1.5	
	" " 3rd Dragoons																				
	" " 33rd Regiment																				
	" " 3rd Dragoons																				
1858-59 ..	{ " " 6th ditto	346	208	1	1	16	..	10	..	48	2	16	2	..	230	..	539	5	152.8	1.4	
	" " 18th Rl. Irish.																				
	" " 33rd Regiment																				
	" " 56th ditto																				
1859-60 ..	{ " " 6th Dragoons.	301	319	..	..	14	1	5	..	84	..	24	..	18.10	270	..	734	11	243.8	3.6	
	" " 31st Regiment.																				
	" " 57th ditto																				
	" German Legion																				
<i>European Troops of the Indian Army.</i>																					
1857-58 ..	{ 4th Troop Horse Brigade	156	38	..	1	..	4	..	6	..	22	..	5	..	86	..	161	..	103.2	..	
	" 2nd Co. 2nd Bat. Artillery																				
	" Detcht. 2nd European Regt.																				
	" 2nd Co. 2nd Bat. Artillery																				
1858-59 ..	{ " " 2nd Co. 2nd Bat. Artillery	89	90	..	1	6	..	3	..	24	..	17	1	4	..	87	..	214	3	210.4	..
1859-60 ..	{ " " Ditto																				
	Total	1,106	844	1	6	1	48	1	31	..	209	4	56	2	19.11	787	..	2,000	20	180.8	1.8

YEARS.	CORPS.	Strength.	Diseases of the								Epidemic.		All other Diseases.		Total.		Ratio per cent. to Strength.			
			Fevers.		Eruptive Fevers.		Lungs.		Liver.		Stomach and Bowels.		Prain.		Cholera.					
			Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.
<i>Queen's Troops.</i>																				
1850-51 ..	{ H. M.'s 8th Hussars.....	908	522	4 ..	..	..	81	2	84	1	258	8	706	5	1,070	23	167.3	23	167.3	
1851-52 ..	" 80th Regiment.....	1,001	498	4 ..	..	..	82	3	144	2	232	3	721	4	1,702	17	170.0	17	170.0	
1852-53 ..	" 8th Hussars.....	984	487	7 1 ..	..	..	93	1	103	2	160	6	632	3	1,505	21	152.9	21	152.9	
1853-54 ..	" 89th Regiment.....	33	16 ..	6 ..	..	..	9	1 ..	1 ..	..	6 ..	..	..	..	69	1	209.0	30	300.0	
1854-55 ..	" ditto	340	185 ..	1 ..	..	..	116	1	36 ..	..	84 ..	..	355 ..	..	800	3	235.2	08	235.2	
1855-56 ..	" ditto	475	291	1 3 ..	..	..	42 ..	..	18 ..	..	31	2	282	2	695	7	146.3	14	146.3	
1856-57 ..	" ditto	822	400 ..	..	..	..	50	3	40	1	63	3	624	3	1,203	16	153.6	19	153.6	
<i>11th Co. Royal Engineers</i>																				
1857-58 ..	{ H. M.'s 83rd Regiment	686	252	1 1	1	48	2	13 ..	..	..	116	1	438	1	882	8	128.5	11	128.5	
	" 89th ditto																			
	" 95th ditto																			
1858-59 ..	{ " 33rd ditto	619	474	3 3 ..	..	70	1	19	1	90	2	..	461	..	1,138	12	183.8	19	183.8	
	" 89th ditto																			
1859-60 ..	{ Depot H. M.'s 83rd ditto	878	945	14	1 ..	70	..	95	4	252	4	..	684	..	2,090	31	238.0	35	238.0	
	" H. M.'s 33rd ditto																			
<i>European Troops of the Indian Army.</i>																				
1850-51 ..	{ 1st Troop Horse Brigade.....	108	45	1 ..	..	12	..	4 ..	..	..	25	1	139	..	231	5	213.8	46	213.8	
	" 4th ditto																			
1851-52 ..	" ditto	109	57	2 ..	..	5 ..	..	6 ..	..	..	22	1	151	..	254	3	233.0	27	233.0	
1852-53 ..	" ditto	109	179	1 ..	..	7	1	3 ..	..	..	28	2	116	1	341	5	312.8	45	312.8	
1853-54 ..	" ditto	101	64 ..	2 1 ..	..	6 ..	..	8 ..	..	..	21	..	129	..	237	2	234.6	20	234.6	
1854-55 ..	{ 2nd ditto	107	80 ..	1 ..	..	14 ..	..	11 ..	..	..	71	4	142	..	320	4	307.4	37	307.4	
	" 4th ditto																			
1855-56 ..	" ditto	99	43 ..	..	..	9 ..	..	5 ..	..	..	47	..	149	..	262	..	264.6	..	264.6	
1856-57 ..	" ditto	91	54 ..	..	..	2 ..	..	5 1	..	17	1	5	91	..	173	2	190.1	21	190.1	
1857-58 ..	{ 1st Co. 2nd Battalion Artillery	17	18 ..	..	..	..	..	..	..	..	6 ..	..	25	..	55	..	311.7	..	311.7	
	" ditto																			
1859-60 ..	{ 1st Troop Horse Brigade	121	103 ..	..	..	25 ..	..	17 ..	..	..	60	..	351	..	569	1	470.2	08	470.2	
	" ditto																			
Total....		7,698	4,773	38	19	2	741	15	615	12	1,589	38	6,214	19	14,203	161	185.2	21	185.2	

No. 8.—AHMEDABAD.

YEARS.	CORPS.	Strength.	Fevers.		Eruptive Fevers.		Diseases of the						Epidemic Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.		
			Treated.	Died.	Treated.	Died.	Lungs.	Liver.	Stomach and Bowels.		Brain.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.		
									Treated.	Died.											
1857-58.	<i>Queen's Troops.</i>																				
	{	Detacht. H. M.'s 72nd Hldrs.	717	445	3	..	92	2	3	..	70	2	5	..	..	236	..	851	7	118.6	0.9
		" " 83rd Regt. ..																			
1858-59.	{	" " 86th ditto ..																			
		" " 89th ditto ..																			
	H. M.'s 4th K. O. Regiment.	542	834	6	..	46	..	23	2	223	118	4	..	..	433	..	1,577	13	290.9	2.3	
1859-60. ...	Detacht. H. M.'s 51st ditto..																				
	" " 89th ditto ..	525	670	7	..	29	2	42	2	114	110	4	3	2	336	1	1,204	19	229.3	3.6	
	H. M.'s 4th K. O. Regiment.																				
	<i>European Troops of the Indian Army.</i>																				
1857-58. ...	1st Co. 1st Bat. Artillery	50	85	2	..	6	..	1	..	19	..	2	..	..	33	..	146	2	292.0	4.0	
1858-59. ...	Ditto ditto	78	72	..	..	11	..	2	..	96	..	2	..	..	86	..	209	..	267.9	..	
1859-60. ...	Ditto ditto	100	98	1	..	5	..	7	..	21	..	4	1	..	77	..	212	2	212.0	2.0	
	Total....	2,012	2,204	19	..	189	4	78	4	483	441	9	3	2	1,201	1	4,199	43	204.6	2.1	

No. 9.—SHOLAPOOR.

YEARS.	CORPS.	Strength.	Diseases of the												All other Diseases.		Total.		Ratio per cent. to Strength.	
			Fevers.		Eruptive Fevers.		Lungs.		Liver.		Stomach and Bowels.		Brain.		Treated.	Died.	Treated.	Died.	Treated.	Died.
			Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.						
1857-58	Detcht. H. M.'s 50th Regiment	61	10	...	...	...	5	...	...	4	...	1	...	...	...	...	...	...	...	...
1858-59	" 3rd Dragoons	201	153	2	...	...	9	...	12	...	33	1	3	...	...	...	...	...	...	...
	" 17th Lancers																			
	" 18th Royal Irish																			
	" 33rd Regt.																			
	" 56th ditto																			
1859-60	" 3rd Dragoons	314	978	3	2	...	37	...	25	2	115	7	9	1	20	9	235	...	1,421	22
	" 18th Royal Irish																			
	" German Legion																			
	" European Troops of the Indian Army.																			
	1st Co. 1st Bat. Artillery																			
1850-51	1st Co. 1st Bat. Artillery	105	23	...	...	3	...	1	...	4	...	...	...	...	...	...	24	...	55	...
1851-52	" Ditto	105	127	1	...	3	...	1	...	13	...	4	...	...	...	...	75	...	223	1
1852-53	" Ditto	111	171	1	...	11	...	3	...	14	1	3	...	...	...	...	67	...	269	2
1853-54	" Ditto	105	114	1	2	...	10	...	6	...	32	...	1	...	...	...	86	...	251	1
1854-55	1st Co. 2nd ditto	33	31	...	...	2	...	2	...	19	1	...	...	...	...	...	32	1	86	2
1855-56	" Ditto	95	104	...	...	5	...	18	...	25	...	1	...	...	...	...	105	...	258	...
1856-57	" Ditto	58	30	...	...	1	...	6	...	6	...	...	...	...	...	...	55	...	98	...
1857-58	Detcht. 4th Troop H. Brigade	67	26	...	...	...	2	...	2	...	11	...	3	...	...	...	54	...	98	...
	2nd Co. 2nd Bat. Artillery																			
	3rd Co. 2nd ditto																			
	" Ditto																			
1858-59	" Ditto	98	22	...	...	7	...	2	...	20	...	6	...	...	...	65	...	122	...	
1859-60	" Ditto	84	174	...	...	6	...	2	...	17	1	1	...	1	...	42	...	243	2	
	Total...	1,437	1,963	8	4	...	101	...	80	2	313	11	32	1	21	10	994	2	3,508	34

No. 10.—AHMEDNUGGER.

YEARS.	CORPS.	Strength.	Diseases of the																Other Diseases.	Total.	Ratio per cent. to Strength.			
			Fever.			Eruptive Fevers.			Lungs.		Liver.		Stomach and Bowels.		Breast.		Died.	Treated.						
			Treated.	Died.	Treated.	Treated.	Died.	Treated.	Treated.	Died.	Treated.	Treated.	Died.	Treated.	Treated.	Died.				Treated.	Treated.	Died.		
1857-58	Queen's Troops.	19	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
1858-59	Detachment, H. M.'s 33rd Regiment ..	19	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
	" " 3rd Dragoons ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
	" " 18th Royal Irish ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
	" " 33rd Regiment ..	334	175	1	1	46	..	12	..	80	1	18	..	393	..	..	..	..	..	..	..	..	..	
	" " 57th ditto ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
1859-60	" " 3rd Dragoons ..	709	1,550	7	4	96	2	18	1	294	15	9	..	383	3	2,364	30	0.9	..	..	..	..	..	
	" " 28th Regiment ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
	" " 56th ditto ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
	" " 57th ditto ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
	European Troops of the Indian Army.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
1850-51	1st Battalion Artillery ..	381	352	..	..	29	..	18	..	220	4	51	..	309	1	1,040	6	272.9	..	..	..	..	..	
1851-52	..	505	311	1	..	40	1	12	1	178	1	49	..	445	1	1,038	5	205.5	0.6	..	..	..	..	
1852-53	..	463	235	..	..	48	1	17	..	145	4	34	..	388	..	867	5	187.2	1.0	..	..	..	..	
1853-54	1st Battalion Artillery ..	435	115	..	..	46	1	18	3	90	2	20	..	352	..	673	8	154.7	1.8	..	..	..	..	
1854-55	..	311	117	..	..	25	1	18	1	195	10	24	..	30	19	654	30	223.1	9.6	..	..	..	..	
1855-56	..	268	156	1	2	21	..	21	..	76	..	18	..	251	2	516	5	192.5	1.8	..	..	..	..	
1856-57	..	196	81	1	..	24	..	10	..	57	..	11	..	192	..	377	..	102.3	..	..	..	..	..	
1857-58	..	155	96	1	..	20	..	10	..	40	..	9	..	154	..	290	..	107.7	..	..	..	..	..	
1858-59	1st Battalion Artillery ..	276	113	1	2	30	2	3	..	109	1	44	..	484	..	854	4	309.4	1.4	..	..	..	..	
	Depot 3rd European Regiment ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
1859-60	1st Battalion Artillery ..	344	251	2	10	86	2	22	2	231	8	60	2	366	1	1,040	26	302.3	7.5	..	..	..	..	
	Depot 3rd European Regiment ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
	Total ..	4,306	3,482	11	24	581	10	170	6	1,715	46	349	3	4,080	9	10,400	122	237.9	2.7	..	..	..	..	..

YEARS.	CORPS.	Strength.	Fevers.		Eruptive Fevers		Diseases of the						Epidemic Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.		
			Treated.	Died.	Treated.	Died.	Lungs.	Liver.	Stomach and Bowels.		Brain.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.		
									Treated.	Died.											
1857-58 ..	<i>Queen's Troops.</i> { Detacht. H. M.'s 14th L. Dragoons. " 86th Regiment.... 7 11 Royal Artillery	148	59	..	..	16	..	14	1	42	..	2	..	8	94	1	248	10	107.5	6.7	
1858-59 ..	{ Detachment H. M.'s 17th Lancers. H. M.'s 71st Highlanders	900	826	2	2	76	5	46	5	281	10	16	2	1	808	1	2,056	22	928.4	2.4	
1859-60 ..	{ " 92nd ditto	1,364	1,456	14	2	137	2	76	6	330	5	31	6	8	1,069	5	3,114	46	229.0	3.3	
1857-58 ..	<i>European Troops of the Indian Army.</i> { 1st Troops Horse Brigade	38	9	..	3	..	1	..	16	..	1	..	..	38	..	68	..	178.9	..		
1859-60 ..	{ 4th Co. 2nd Battalion Artillery Detachment 3rd European Regt. ... 4th Co. 2nd Battalion Artillery Detachment 3rd European Regt. Staff and Details	500	750	2	..	20	..	21	..	186	1	18	1	..	403	2	1,399	6	279.8	1.2	
Total		2,950	3,100	18	4	252	4	158	12	855	16	68	9	36	16	2,412	9	6,885	84	233.3	2.8

No. 10.—AHMEDNUGGUR.

YEARS.	CORPS.	Strength.	Diseases of the								All other Diseases.		Total.		Ratio per cent. to Strength.	
			Fevers.		Lungs.		Liver.		Stomach and Bowels.		Brain.		Epidemic.	Cholera.	Treated.	Died.
			Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.
1857-58	Queen's Troops.	19	..	..	..	..	..	..	..	..	2	..	..	..	121-0	..
	Detachment H. M.'s 33rd Regiment ..															
	3rd Dragoons ..															
	18th Royal Irish ..	334	175	1	46	..	12	..	80	1	18	..	..	..	217-0	0-8
1858-59	33rd Regiment ..															
	57th ditto ..															
	3rd Dragoons ..															
1859-60	28th Regiment ..	709	1,550	7	96	2	18	1	204	15	9	1	..	..	332-0	4-2
	56th ditto ..															
	57th ditto ..															
	European Troops of the Indian Army.															
1850-51	1st Battalion Artillery ..	381	852	..	29	..	18	..	220	4	51	..	1	1	1,040	6
1851-52	..	505	311	..	40	1	12	..	178	1	49	..	2	1	1,038	5
1852-53	..	403	235	..	48	1	17	..	145	4	34	..	..	..	867	5
1853-54	..	435	115	..	46	1	18	3	90	2	20	..	..	..	673	8
1854-55	1st Battalion Artillery ..	311	112	..	35	..	18	1	105	10	24	..	30	19	684	30
1855-56	..	208	156	1	21	..	21	..	76	..	18	..	..	..	516	5
1856-57	..	196	81	..	24	..	10	..	57	..	11	..	1	..	377	..
1857-58	..	135	26	1	20	..	10	..	40	..	9	..	..	..	200	..
	1st Battalion Artillery ..	276	113	1	90	2	3	..	109	1	44	..	..	..	884	4
1858-59	Depot 3rd European Regiment ..	344	251	2	80	2	22	2	231	8	60	2	14	9	1,040	26
1859-60	1st Battalion Artillery ..															
	Depot 3rd European Regiment ..															
	Total ..	4,306	3,482	11	24	3	81	10	179	8	1,715	46	349	3	50	32
															4,080	9
															10,400	122
															327-9	2-7

No. 12.—MHOW.

YEARS.	CORPS.	Strength.	Fever.		Eruptive Fevers		Diseases of the						Epidemic Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.			
			Treated.	Died.	Treated.	Died.	Lungs.	Liver.		Stomach and Bowels.		Brain.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.		
								Treated.	Died.	Treated.	Died.										Treated.	Died.
1857-58 ..	<i>Queen's Troops.</i>	{ Detach. H. M.'s 14th L. Dragoons. " " 86th Regiment.... 7111 Royal Artillery	59	...	...	16	..	14	1	42	..	2	..	21	8	94	1	248	10	167.5	6.7	
1858-59 ..	{ Detachment H. M.'s 17th Lancers. H. M.'s 71st Highlanders	900	826	2	2	76	2	46	5	281	10	16	2	1	..	808	1	2,056	22	228.4	2.4	
1859-60 ..	{ H. M.'s Depot..... D. Troop Royal Artillery..... H. M.'s 3rd Dragoon Guards..... " 72nd Highlanders	1,304	1,456	14	2	137	2	76	6	330	5	31	6	13	8	1,069	5	3,114	46	229.0	3.3	
1857-58 ..	<i>European Troops of the Indian Army.</i>	{ 1st Troops Horse Brigade	9	...	...	3	..	1	..	16	..	1	..	..	..	38	..	68	..	178.9	..	
1859-60 ..	{ 4th Co. 2nd Battalion Artillery.... Detachment 3rd European Regt. 4th Co. 2nd Battalion Artillery Detachment 3rd European Regt. Staff and Details	500	750	2	..	20	..	21	..	186	1	18	1	..	403	2	1,399	6	279.8	1.2		
Total		2,950	3,100	18	4	..	252	4	158	12	855	16	68	9	86	16	2,412	9	6,885	84	233.3	2.8

No. 11.—KURRACHEE.

YEARS.	CORPS.	Strength.	Diseases of the												Epidemic Cholera.	All other Diseases.		Total.		Ratio per cent. to Strength.	
			Fever.		Eruptive Fevers.		Lungs.		Liver.		Stomach and Bowels.		Brain.			Treated.	Died.	Treated.	Died.	Treated.	Died.
			Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.							
<i>Queen's Troops.</i>																					
1850-51 ..	H. M.'s 8th Regiment	1,721	491	5	...	139	8	141	8	446	11	47	4	...	1,081	4	2,345	35	136'0	2'0	
	" 83rd ditto																				
1851-52 ..	" 64th ditto	1,029	610	11	...	169	7	67	1	666	49	78	7	19	942	5	2,551	92	156'5	5'6	
	" 83rd ditto																				
1852-53 ..	" 64th ditto	1,681	2,798	37	1...	193	10	69	4	418	10	110	12	1...	866	8	4,456	81	265'0	4'8	
	" 83rd ditto																				
	" 64th ditto																				
1853-54 ..	" 83rd ditto	1,313	2,053	4	2...	174	4	97	2	306	4	70	2	16	1,004	8	3,722	27	283'4	2'0	
	" 86th ditto																				
1854-55 ..	R. W. 83rd ditto	1,187	519	1	...	132	4	82	5	300	10	32	1	...	840	2	1,905	23	105'5	1'9	
	" 86th ditto																				
1855-56 ..	" 86th ditto	297	97	3	...	43	1	52	2	148	2	8	...	...	248	...	506	8	200'6	2'7	
	" 4th (K O.) do.																				
1857-58 ..	" 51st ditto	661	196	2	...	5	...	5	1	40	2	...	...	...	144	...	384	5	58'8	0'7	
	" 46th ditto																				
1858-59 ..	" 51st ditto	656	238	9	...	23	1	24	1	93	1	3	...	1	358	...	740	13	112'8	1'9	
	" 51st ditto																				
1859-60	" 64th ditto	958	294	1	1...	76	3	33	1	247	3	62	1	...	752	2	1,405	11	152'9	1'1	
<i>European Troops of the Indian Army.</i>																					
1850-51	1st Troop Horse Brigade,	42	23	...	...	6	...	0	...	26	2	7	...	...	71	...	142	2	338'0	4'7	
	" ditto	120	32	...	...	13	...	10	1	66	2	7	...	...	148	...	282	3	235'0	2'5	
	" ditto	144	95	3	...	13	...	12	...	42	...	10	...	...	127	...	209	3	207'6	2'0	

No. 13.—HYDRABAD.

YEARS.	CORPS.	Strength.	Fever.		Eruptive Fevers.		Diseases of the						Epidemic (Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.
			Treated.	Died.	Treated.	Died.	Lungs.	Liver.		Stomach and Bowels.		Brain.		Treated.	Died.	Treated.	Died.		
								Treated.	Died.	Treated.	Died.	Treated.	Died.					Treated.	
1850-51 ..	<i>Queen's Troops.</i>	523	303	1 ..	..	..	13 ..	51 ..	90 ..	13 ..	..	..	367 ..	837 ..	1 100.0	0.1			
1851-52 ..	L. W. H. M.'s 8th Regiment	440	392	10 ..	..	..	23 ..	49 ..	144 5	15 1	..	..	379 1	932 17	208.9	8.8			
1852-53 ..	" " 64th ditto	443	1,542	28 ..	..	..	15 ..	17 ..	79 1	21 3	..	..	198 1	1,872 33	422.5	7.4			
1853-54 ..	" " 83rd ditto	370	316		..	..	18 3	6 ..	50 1	11 2	..	..	185 ..	586 6	158.3	1.6			
1854-55 ..	" " 80th ditto	219	143		..	..	17 ..	29 1	185 1	9 1	..	..	226 1	559 4	224.4	1.6			
1855-56 ..	" " 86th ditto	125	50		..	..	21 ..	6 ..	45 1	3 ..	..	..	122 ..	947 1	107.6	0.8			
1856-57 ..	" " 46th ditto	139	28		..	..	7 ..	12 2	20 1	9 ..	..	..	101 ..	177 3	127.3	2.1			
1857-58 ..	" " 64th ditto	23	3		..	..		1 ..	6 ..	4 ..	..	..	25 ..	39 ..	109.5	..			
1858-59 ..	<i>European Troops of the Indian Army.</i>	170	32		..	..	8 1	14 1	23 ..	12 ..	..	..	109 ..	198 2	116.4	1.1			
1859-60 ..	1st Troop Horse Brigade	905	530	5 ..	..	..	61 3	50 2	218 4	115 5	..	..	693 3	1,607 22	184.1	2.4			
1860-61 ..	2nd Troop Horse Brigade	520	1,207	11 ..	..	..	51 2	14 ..	127 9	68 7	..	..	419 ..	1,946 29	374.2	5.5			
1861-62 ..	4th Co. 1st Battalion Artillery	52	76		..	..	5 1	4 1	12 2	2 ..	..	..	54 ..	153 4	204.2	7.6			
1862-63 ..	3rd Co. 1st ditto	85	52		..	..	3 ..	8 ..	17 1	6 ..	..	..	87 ..	173 1	203.5	1.1			
1863-64 ..	4th Co. 1st ditto	131	42	1 ..	..	..	14 1	13 ..	34 ..	0 ..	..	..	147 1	926 3	105.4	2.2			
1864-65 ..	Detachment 1st E. R. (Fusiliers)	4,181	4,706	56 ..	..	..	256 11	274 7	1,000 26	294 19	..	..	3,112 7	9,042 126	230.6	3.0			
	Total.....																		

No. 14 —NEEMUCH.

YEARS.	CORPS.	Strength.	Diseases of the						Fever.		Eruptive Fevers.		Lungs, Liver, Stomach and Bowels, Brain.				Epidemic Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.	
			Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.
1857-58 ..	<i>Queen's Troops.</i> Detacht. H. M.'s 83rd Regt. " " 72nd Hlders. " " 89th Regt. .. " " 95th ditto. ... 11th Co. Royal Engineers... 6th 13th Royal Artillery. Detacht. H. M.'s 8th Hussars. " " 89th Regt. ... " H. M.'s 95th Regiment	100	146	1	..	6	..	2	..	17	..	3	..	..	..	..	..	43	..	217	1	217	0	1.0
1858-59. {		751	835	11	..	99	3	26	1	154	8	17	4	..	..	..	..	421	2	1,552	29	206	6	3.8
1859-60. {		984	2,203	7	8	1	59	..	102	9	216	3	21	1	..	..	..	870	5	3,479	26	353	5	2.6
1858-59 {	<i>European Troops of the Indian Army.</i> 1st Co. 2nd Bat. Artillery... 3rd Co. 4th ditto .. 1st Co. 2nd ditto ..	66	29	1	..	2	..	2	1	11	..	1	..	..	..	..	..	50	..	95	2	143	9	3.0
1859-60 ..		73	86	1	..	9	..	4	..	14	1	1	..	..	..	..	..	51	..	165	2	226	0	2.7
		1,974	3,299	21	8	1	175	3	136	11	412	12	43	5	..	..	..	1,435	7	5,508	60	279	0	3.0
	Total...																							

No. 15.—BOMBAY.

YEARS.	CORPS.	Strength.	Fever.		Eruptive Fevers.		Diseases of the								Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.	
			Fever.		Eruptive Fevers.		Lungs.		Liver.		Stomach and Bowels.		Brain.		Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.	
			Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.
<i>Queen's Troops.</i>																						
1850-51	L. W. H. M.'s 78th Highlanders	519	183	4	...	...	18	1	56	4	293	8	7	...	42	15	82	...	956	32	184-2	0-1
1851-52	" ditto	535	66	2	1	1	13	2	123	3	481	8	5	1	1	1	339	3	1,029	21	192-3	3-9
1852-53	" ditto	393	276	1	...	...	14	...	49	6	361	7	8	...	...	...	288	1	960	15	253-4	3-8
1854-55	R. W. 83rd Regiment	45	17	...	...	...	5	...	1	...	7	1	1	...	...	...	35	...	63	1	140-0	2-2
1855-56	" ditto	561	349	...	...	...	55	3	33	...	137	2	50	6	5	4	546	2	1,175	17	209-4	3-0
1856-57	" 86th ditto	447	473	2	...	...	73	3	57	3	141	3	23	1	...	...	356	3	1,123	15	251-2	3-3
<i>H. M.'s 8th Hussars.</i>																						
1857-58	" 33rd Regiment	2,119	87	1	6	...	79	...	13	1	79	1	13	2	...	...	440	1	717	6	33-8	0-2
	" 51st ditto																					
	" 71st Highlanders																					
	" 72nd ditto																					
	Wing 80th Regiment																					
	" 92nd Highlanders																					
	" 95th Regiment																					
1858-59	" 28th ditto	912	1,517	1	1	1	31	...	12	1	76	3	22	...	...	...	634	...	2,243	6	245-9	0-6
	" 57th ditto																					
	" 86th ditto																					
	" 92nd Highlanders																					
1859-60	" 28th Regiment	934	376	6	1	...	37	4	15	...	124	10	8	...	...	...	511	...	1,072	24	169-0	3-7
	" 86th ditto																					

No. 16.—NUSSEERABAD.

YEARS.	CORPS.	Strength.	Fever.		Eruptive Fevers.	Diseases of the				Epidemic Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.			
			Treated.	Died.		Lungs.	Liver.	Stomach and Bowels.	Brain.	Treated.	Died.	Treated.	Died.	Treated.	Died.				
<i>Queen's Troops.</i>																			
{ 1857-58 ..	{ 3 14 Royal Artillery	{ 453	435	413	2	32	2	17	1	68	2	14	2	3	5	203	..	845	15
	H. M.'s 83rd Regiment																		
	" 95th ditto																		
	" 8th Hussars																		
{ 1858-59 ..	{ " 83rd Regiment	{ 1,301	1,193	329	..	81	3	83	4	361	20	71	22	..	..	1,397	6	3,200	78
	" 8th Hussars																		
{ 1859-60 ..	{ " 83rd Regiment	{ 1,658	1,179	12	4	114	4	67	7	333	12	49	4	4	..	1,553	2	3,303	41
	" 83rd Regiment																		
<i>European Troops of the Indian Army.</i>																			
{ 1850-51	{ 3rd Co. 2nd Bat. Artillery	{ 104	58	3	...	6	..	2	..	56	4	10	..	3	..	142	1	277	8
	Ditto																		
	Ditto																		
	Ditto																		
	Ditto																		
	Ditto																		
	Ditto																		
	Ditto																		
	Ditto																		
	Ditto																		
	Ditto																		
	Ditto																		
{ 1851-52	{ 2nd Co. 2nd ditto	{ 116	50	1	..	2	..	5	..	22	..	8	..	..	..	122	..	210	1
	3rd Co. 2nd ditto																		
	4th Co. 2nd ditto																		
	Ditto																		
	Ditto																		
	Ditto																		
	Ditto																		
	Ditto																		
	Ditto																		
	Ditto																		
	Ditto																		
	Ditto																		
{ 1852-53	{ 2nd Troop Horse Brigade	{ 115	90	3	...	1	..	3	...	12	..	8	..	..	..	85	1	292	8
	2nd ditto																		
	3rd ditto																		
	4th ditto																		
	5th ditto																		
	6th ditto																		
	7th ditto																		
	8th ditto																		
	9th ditto																		
	10th ditto																		
	11th ditto																		
	12th ditto																		
{ 1853-54	{ 2nd Troop Horse Brigade	{ 141	133	2	...	6	..	2	1	48	3	10	..	..	..	145	1	357	7
	2nd ditto																		
	3rd ditto																		
	4th ditto																		
	5th ditto																		
	6th ditto																		
	7th ditto																		
	8th ditto																		
	9th ditto																		
	10th ditto																		
	11th ditto																		
	12th ditto																		
{ 1854-55	{ 2nd Troop Horse Brigade	{ 122	54	1	...	10	..	11	..	25	1	..	..	2	1	182	..	285	3
	2nd ditto																		
	3rd ditto																		
	4th ditto																		
	5th ditto																		
	6th ditto																		
	7th ditto																		
	8th ditto																		
	9th ditto																		
	10th ditto																		
	11th ditto																		
	12th ditto																		
{ 1855-56	{ 2nd Troop Horse Brigade	{ 141	133	2	...	6	..	2	1	48	3	10	..	..	..	145	1	357	7
	2nd ditto																		
	3rd ditto																		
	4th ditto																		
	5th ditto																		
	6th ditto																		
	7th ditto																		
	8th ditto																		
	9th ditto																		
	10th ditto																		
	11th ditto																		
	12th ditto																		
{ 1856-57	{ 2nd Troop Horse Brigade	{ 141	133	2	...	6	..	2	1	48	3	10	..	..	..	145	1	357	7
	2nd ditto																		
	3rd ditto																		
	4th ditto																		
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	6th ditto																		
	7th ditto																		
	8th ditto																		
	9th ditto																		
	10th ditto																		
	11th ditto																		
	12th ditto																		
{ 1857-58	{ 2nd Troop Horse Brigade	{ 141	133	2	...	6	..	2	1	48	3	10	..	..	..	145	1	357	7
	2nd ditto																		
	3rd ditto																		
	4th ditto																		
	5th ditto																		
	6th ditto																		
	7th ditto																		
	8th ditto																		
	9th ditto																		
	10th ditto																		
	11th ditto																		
	12th ditto																		
{ 1858-59	{ 2nd Troop Horse Brigade	{ 141	133	2	...	6	..	2	1	48	3	10	..	..	..	145	1	357	7
	2nd ditto																		
	3rd ditto																		
	4th ditto																		
	5th ditto																		
	6th ditto																		
	7th ditto																		
	8th ditto																		
	9th ditto																		
	10th ditto																		
	11th ditto																		
	12th ditto																		
{ 1859-60	{ 2nd Troop Horse Brigade	{ 141	133	2	...	6	..	2	1	48	3	10	..	..	..	145	1	357	7
	2nd ditto																		
	3rd ditto																		
	4th ditto																		
	5th ditto																		
	6th ditto																		
	7th ditto																		
	8th ditto																		
	9th ditto																		
	10th ditto																		
	11th ditto																		
	12th ditto																		
{ 1860-61	{ 2nd Troop Horse Brigade	{ 141	133	2	...	6	..	2	1	48	3	10	..	..	..	145	1	357	7
	2nd ditto																		
	3rd ditto																		
	4th ditto																		
	5th ditto																		
	6th ditto																		
	7th ditto																		
	8th ditto																		
	9th ditto																		
	10th ditto																		
	11th ditto																		
	12th ditto																		
{ 1861-62	{ 2nd Troop Horse Brigade	{ 141	133	2	...	6	..	2	1	48	3	10	..	..	..	145	1	357	7
	2nd ditto																		
	3rd ditto																		
	4th ditto																		
	5th ditto																		
	6th ditto																		
	7th ditto																		
	8th ditto																		
	9th ditto																		
	10th ditto																		
	11th ditto																		
	12th ditto																		
{ 1862-63	{ 2nd Troop Horse Brigade	{ 141	133	2	...	6	..	2	1	48	3	10	..	..	..	145	1	357	7
	2nd ditto																		
	3rd ditto																		
	4th ditto																		
	5th ditto																		
	6th ditto																		
	7th ditto																		
	8th ditto																		
	9th ditto																		
	10th ditto																		
	11th ditto																		
	12th ditto																		
{ 1863-64	{ 2nd Troop Horse Brigade	{ 141	133	2	...	6	..	2	1	48	3	10	..	..	..	145	1	357	7
	2nd ditto																		
	3rd ditto																		
	4th ditto																		
	5th ditto																		
	6th ditto																		
	7th ditto																		
	8th ditto																		
	9th ditto																		
	10th ditto																		
	11th ditto																		
	12th ditto																		
{ 1864-65	{ 2nd Troop Horse Brigade	{ 141	133	2	...	6	..	2	1	48	3	10	..	..	..	145	1	357	7
	2nd ditto																		
	3rd ditto																		
	4th ditto																		
	5th ditto																		
	6th ditto																		
	7th ditto																		
	8th ditto																		
	9th ditto																		
	10th ditto																		
	11th ditto																		
	12th ditto																		
{ 1865-66	{ 2nd Troop Horse Brigade	{ 141	133	2	...	6	..	2	1	48	3	10	..	..	..	145	1	357	7
	2nd ditto																		
	3rd ditto																		
	4th ditto																		
	5th ditto																		
	6th ditto																		
	7th ditto																		
	8th ditto																		
	9th ditto																		
	10th ditto																		
	11th ditto																		
	12th ditto																		
{ 1866-67	{ 2nd Troop Horse Brigade	{ 141	133	2	...	6	..	2	1	48	3	10	..	..	..	145	1	357	7
	2nd ditto																		
	3rd ditto																		
	4th ditto																		
	5th ditto																		
	6th ditto																		
	7th ditto																		
	8th ditto																		
	9th ditto																		
	10th ditto																		
	11th ditto																		
	12th ditto																		
{ 1867-68	{ 2nd Troop Horse Brigade	{ 141	133	2	...	6	..	2	1	48	3	10	..	..	..	145	1	357	7
	2nd ditto																		
	3rd ditto																		
	4th ditto																		
	5th ditto																		
	6th ditto																		
	7th ditto																		
	8th ditto																		
	9th ditto																		
	10th ditto																		
	11th ditto																		
	12th ditto																		
{ 1868-69	{ 2nd Troop Horse Brigade	{ 141	133	2	...	6	..	2	1	48	3	10	..	..	..	145	1	357	7
	2nd ditto																		
	3rd ditto																		
	4th ditto																		
	5th ditto																		
	6th ditto																		
	7th ditto																		
	8th ditto																		
	9th ditto																		
	10th ditto																		
	11th ditto																		
	12th ditto																		
{ 1869-70	{ 2nd Troop Horse Brigade	{ 141	133	2	...	6	..	2	1	48	3	10	..	..	..	145	1	357	7
	2nd ditto																		
	3rd ditto																		
	4th ditto																		
	5th ditto																		
	6th ditto																		
	7th ditto																		
	8th ditto																		
	9th ditto																		
	10th ditto																		
	11th ditto																		
	12th ditto																		
{ 1870-71	{ 2nd Troop Horse Brigade	{ 141	133	2	...	6	..	2	1	48	3	10	..	..	..	145	1	357	7
	2nd ditto																		
	3rd ditto																		
	4th ditto																		
	5th ditto																		
	6th ditto																		
	7th ditto																		
	8th ditto																		
	9th ditto																		
	10th ditto																		
	11th ditto																		
	12th ditto																		
{ 1871-72	{ 2nd Troop Horse Brigade	{ 141	133	2	...	6	..	2	1	48	3	10	..	..	..	145	1	357	7
	2nd ditto																		
	3rd ditto																		
	4th ditto																		
	5th ditto																		
	6th ditto																		
	7th ditto																		
	8th ditto																		
	9th ditto																		
	10th ditto																		
	11th ditto																		
	12th ditto																		
{ 1872-73	{ 2nd Troop Horse Brigade	{ 141	133	2	...	6	..	2	1	48	3	10	..	..	..	145	1	357	7
	2nd ditto																		
	3rd ditto																		
	4th ditto																		
	5th ditto																		
	6th ditto																		
	7th ditto																		
	8th ditto																		
	9th ditto																		
	10th ditto																		
	11th ditto																		
	12th ditto																		
{ 1873-74	{ 2nd Troop Horse Brigade	{ 141	133	2	...	6	..	2	1	48	3	10	..	..	..	145	1	357	7
	2nd ditto																		
	3rd ditto																		
	4th ditto																		
	5th ditto																		
	6th ditto																		
	7th ditto																		
	8th ditto																		
	9th ditto																		
	10th ditto																		
	11th ditto																		
	12th ditto																		
{ 1874-75	{ 2nd Troop Horse Brigade	{ 141	133	2	...	6	..	2	1	48	3	10	..	..	..	145	1	357	7
	2nd ditto																		
	3rd ditto																		
	4th ditto																		
	5th ditto																		
	6th ditto																		
	7th ditto																		
	8th ditto																		
	9th ditto																		
	10th ditto																		
	11th ditto																		
	12th ditto																		
{ 1875-76	{ 2nd Troop Horse Brigade	{ 141	133	2	...	6	..	2	1	48	3	10	..	..	..	145	1	357	7
	2nd ditto																		
	3rd ditto																		
	4th ditto																		
	5th ditto																		
	6th ditto																		
	7th ditto																		
	8th ditto																		
	9th ditto																		
	10th ditto																		
	11th ditto																		
	12th ditto																		
{ 1876-77	{ 2nd Troop Horse Brigade	{ 141	133	2	...	6	..	2	1	48	3	10	..	..	..	145	1	357	7
	2nd ditto																		
	3rd ditto																		
	4th ditto																		
	5th ditto																		
	6th ditto																		
	7th ditto																		
	8th ditto																		
	9th ditto																		
	10th ditto																		
	11th ditto																		
	12th ditto																		
{ 1877-78	{ 2nd Troop Horse Brigade	{ 141	133	2	...	6	..	2	1	48	3	10	..	..	..	145	1	357	7
	2nd ditto																		
	3rd ditto																		
	4th ditto																		
	5th ditto																		
	6th ditto																		
	7th ditto																		
	8th ditto																		
	9th ditto																		
	10th ditto																		
	11th ditto																		
	12th ditto																		
{ 1878-79	{ 2nd Troop Horse Brigade	{ 141	133	2	...	6	..	2	1	48	3	10	..	..	..	145	1	357	7
	2nd ditto																		
	3rd ditto																		
	4th ditto																		
	5th ditto																		
	6th ditto																		
	7th ditto																		
	8th ditto																		
	9th ditto																		
	10th ditto																		
	11th ditto																		
	12th ditto																		
{ 1879-80	{ 2nd Troop Horse Brigade	{ 141	133	2	...	6	..	2	1	48	3	10	..	..	..	145	1	357	7
	2nd ditto																		
	3rd ditto																		
	4th ditto																		
	5th ditto																		
	6th ditto																		
	7th ditto																		
	8th ditto																		
	9th ditto																		
	10th ditto																		
	11th ditto ..																		

No. 17.—BARODA.

YEARS.	CORPS.	Strength.	Fevers.		Eruptive Fevers		Diseases of the						Epidemic Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.			
			Treated.	Died.	Treated.	Died.	Lungs.		Liver.		Stomach and Bowels.		Brain.		Treated.	Died.	Treated.	Died.	Treated.	Died.		
							Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.							Treated.	Died.
1857-58 ..	<i>Queen's Troops.</i>																					
	{ X. Battery Royal Artillery.																					
	{ Detach. H. M.'s 4th K. O. Regt.																					
	{ " " 72nd Hldrs.																					
1858-59 ..	{ " " 86th Regt.																					
	{ X. Battery Royal Artillery.																					
	{ K. ditto																					
	{ Detach. H. M.'s 33rd Regt.																					
1859-60 ..	{ " " 51st ditto																					
	{ 1113 Royal Artillery.																					
	{ Detach. H. M.'s 4th K. O. Regt.																					
	{ " " 33rd Regt.																					
Total		1,002	1,733	10	..	..	106	4	35	2	210	1	61	21	7	5	617	2	2,708	45	260.7	4.2

No. 18.—SURAT.

YEARS.	CORPS.	Sirength.	Fevers.		Kruptive Fevers.		Diseases of the						Epidemic Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.		
			Treated.	Died.	Treated.	Died.	Lungs.		Liver.		Stomach and Bowels.		Brain.		Treated.	Died.	Treated.	Died.	Treated.	Died.	
							Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.							Treated.
1857-58...	Detacht. H. M.'s 86th Regt.	55	63	...	...	6	...	2	...	25	...	5	...	2	...	29	...	132	...	240	...
1858-59.	2 11 Royal Artillery	55	112	1	1	...	8	...	8	...	37	4	4	1	...	37	...	208	6	378	10
	Detacht. H. M.'s 83rd Regt.																				
1859-60...	" " 92nd Hhldrs.	66	271	1	1	...	1	...	7	...	26	2	7	...	...	52	...	364	3	551	4
	Detach. H. M.'s 4th K. O. Regt.																				
	Total....	176	446	2	2	...	15	...	17	...	88	6	16	1	119	...	704	9	400	0	5

No. 19.—POORUNDUR SANATARIUM.

YEARS.	CORPS.	Strength.	Fevers.		Diseases of the								All other Diseases.		Total.		Ratio per cent. to Strength.	
			Treated.	Died.	Ruptive Fevers.	Lungs.	Liver.	Stomach and Bowels.	Brain.	Epidemic Cholera.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.
1852-53 ..	} Sanatorium.....	43	91	...	...	1	0	1	26	..	4	..	54	1	182	2	423.2	4.6
1853-54 ..		78	152	1	...	0	5	2	35	1	3	..	37	..	238	4	305.1	5.1
1854-55 ..		85	137	...	...	9	7	..	42	2	3	..	64	..	265	3	309.4	3.5
1855-56 ..		68	115	...	...	4	0	..	28	..	9	..	60	..	222	..	336.4	..
1856-57 ..		51	72	...	...	4	5	1	35	..	6	..	99	..	221	2	433.3	3.9
1857-58 ..		62	56	...	...	11	20	1	35	2	8	..	85	1	212	4	307.2	5.7
1858-59 ..	} Total.....	84	100	1	...	29	25	4	100	..	8	1	156	1	419	6	498.8	7.1
1859-60 ..		83	163	...	...	21	25	1	58	..	12	..	159	1	482	6	520.4	7.2
		561	885	1	1	85	99	10	359	5	50	1	707	4	2,169	37	390.1	4.8

No. 18.—SURAT.

YEARS.	CORPS.	Strength.	Fevers.		Eruptive Fevers.		Diseases of the						All other Diseases.		Total.		Ratio per cent. to Strength.	
			Treated.	Died.	Treated.	Died.	Lungs.	Liver.	Stomach and Bowels.	Brain.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.
1857-58. ...	Queen's Troops. Detacht. H. M.'s 86th Regt.	55	63	...	...	...	6	2	25	5	...	...	29	...	132	...	240.0	..
1858-59. ...	{ 2 11 Royal Artillery	55	112	1	1	...	8	8	37	4	4	1	...	37	208	6	378.1	10.9
	Detacht. H. M.'s 83rd Regt.																	
1859-60. ...	" " 92nd Hldra.	66	271	1	1	...	1	7	26	2	7	...	52	...	364	3	551.5	4.5
	Detach. H. M.'s 4th K.O. Regt.																	
	Total....	176	446	2	2	...	15	17	88	616	1	2	119	...	704	9	400.0	5.1

No. 19.—POORUNDUR SANATARIUM.

SANITARY STATE OF THE INDIAN ARMY.

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YEARS.	CORPS.	Strength.	Fever.		Disruptive Revers.		Diseases of the						Epidemic Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.	
			Treated.	Died.	Treated.	Died.	Lungs.	Liver.	Stomach and Bowels.	Brain.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.
1852-53 ..	POORUNDUR Sanatorium.....	45	91	...	...	...	1	6	26	4	...	...	...	...	54	1	182	2	423.2	4.6
1853-54 ..		76	152	1	...	...	6	5	35	3	...	...	...	...	37	...	238	4	305.1	5.1
1854-55 ..		85	137	...	...	...	9	7	42	3	...	1	...	...	64	...	263	3	300.4	3.5
1855-56 ..		68	115	...	...	...	4	0	28	9	...	...	...	...	60	...	222	...	326.4	...
1856-57 ..		51	72	...	...	...	4	5	35	0	...	...	...	...	99	...	321	2	433.3	8.9
1857-58 ..		62	56	...	...	...	11	20	35	6	...	...	...	...	85	1	212	4	307.2	5.7
1858-59 ..	POORUNDUR Sanatorium.....	84	100	...	1	...	29	25	100	8	1	...	...	...	156	1	419	6	498.8	7.1
1859-60 ..		83	162	...	...	...	21	25	58	12	...	2	...	...	153	1	432	6	520.4	7.3
Total....		561	885	1	1	...	85	99	359	50	1	3	...	...	707	4	2,189	27	390.1	4.8

No. 20.—ABOO SANATARIUM.

YEARS.	CORPS.	Strength.	Fever.		Eruptive Fevers.		Diseases of the						All other Diseases.		Total.		Ratio per cent. to Strength.			
			Fever.		Eruptive Fevers.		Lungs.		Liver.		Stomach and Bowels.		Brain.		All other Diseases.		Total.		Ratio per cent. to Strength.	
			Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.
1850-51 ..		5	0	..	..	..	1	2	7	..	..	..	15	..	31	..	7.7	..		
1851-52 ..		47	21	..	..	..	4	22	27	2	..	..	50	1	128	8	208.6	10.7		
1852-53 ..		48	10	..	..	..	8	16	16	..	..	..	42	1	94	2	194.4	4.1		
1853-54 ..		90	70	1	..	..	10	7	40	3	10	1	47	2	184	7	204.4	7.7		
1854-55 ..	Sanatorium	30	137	..	..	..	2	3	8	..	3	..	38	..	191	..	636.6	..		
1855-56 ..		74	142	..	..	..	10	3	36	..	10	..	58	..	259	..	350.0	..		
1856-57 ..		87	115	1	..	..	5	8	39	1	8	..	70	..	245	1	281.6	1.1		
1857-58 ..		91	98	..	3	1	9	8	16	..	5	..	110	1	249	3	273.6	3.2		
1858-59 ..		135	237	..	3	..	14	9	31	..	6	..	77	..	397	1	294.0	0.7		
1859-60 ..		160	153	1	..	..	7	18	30	2	3	1	69	2	286	7	178.8	4.3		
Total.....		767	1,008	5	6	1	70	98	265	8	61	9	576	7	2,014	99	269.1	8.7		

No. 21.—GHIZREE SANATARIUM.

YEARS.	CORPS.	Strength.	Fever.		Eruptive Fevers.		Diseases of the								Epidemic Cholera.		All other Diseases.		Total.		Ratio per cent. to Strength.					
			Died.		Treated.		Died.		Treated.		Lungs.		Liver.		Stomach and Bowels.		Brain.		Died.		Treated.		Died.		Treated.	
			Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.	Treated.	Died.
1855-56..	Sanatorium.	{	59	...	31	143	1	76	118	1	...	...	...	...	144	1	371	5	508.2	6.8						
1856-57..			200	1	20	222	..	48	113	...	...	...	...	136	1	439	5	744.0	8.4							
1857-58..			116	...	8	118	1	30	..	3	...	...	...	134	1	309	3	671.7	6.5							
1858-59..			48	...	6	..	5	17	..	5	...	...	...	102	1	183	1	508.3	2.7							
1859-60..			58	...	8	114	..	31	..	9	...	...	...	119	..	239	1	569.0	2.3							
Total.....		256	481	1	73	5102	2	202	848	1	...	...	...	635	4	1,541	15	601.9	5.8							

REPORT ON THE HEALTH OF EUROPEAN AND NATIVE TROOPS IN THE BOMBAY PRESIDENCY FOR 1860.

Presented by the Principal Inspector General, Medical Department. .

THE accompanying returns show the sickness and mortality in Her Majesty's Home and Indian Troops (European and Native) in the Bombay Presidency, during the year ending 31st December 1860. The columns regarding men "Invalided" are left blank.

The year 1860 was on the whole an average healthy year for European Troops in this Presidency, and the sickness and mortality did not vary much from the preceeding year. The strength of the Home Regiments was diminished about 5,000 men during the year, thus in 1859 it was upwards of 17,000 (viz. 17,328), whilst in 1860, it was little over 12,000 (viz. 12,071). The strength of the local European Regiments differed but slightly from that of 1859, being in the former year 4,417, and in the latter 4,321. The number of Native Troops was reduced from upwards of 40,000 in 1859, to about 37,500 in 1860. The health of the Native Army continued much the same as in previous years, and calls for no special remark. The causes of mortality amongst the European Troops of both Services are classified in the Tables under "deaths from ordinary causes," and "deaths from cholera," but the admissions into Hospitals are not separately shown as "general" and "special" and refer to both causes combined. The admissions into Hospitals during 1860 were, when compared with 1859, proportionately fewer; thus amongst the Home Troops they were in 1859 nearly 37,000 out of a strength of about 17,000 being about 212 per cent., whilst

in 1860, they were only about 23,817 out of a strength of 12,000 *i. e.* about 197 per cent., and in the Local Regiments the average proportion was reduced from nearly 212 per cent. to about 202 per cent.

Mortality.—The total number of deaths in the Line Regiments was 360, in proportion to strength about 2·9, which is the same as last year. Deaths from cholera numbered 102, being a per centage of 0·8 to strength, whilst in 1859 it was only 0·4. The total number of deaths in the Local Force was 113, being in proportion to strength 2·6, whereas in 1859 the percentage was 3·4. There were only 17 deaths from cholera in this Force in 1860, opposed to 33 in the former year. In contrasting the two Services it may be said, that on the whole there was a proportionate larger amount of sickness amongst the Local than amongst the Line Troops, that is as 202 per cent. admissions into Hospitals, represents the former, and 197 per cent. the latter, but that the mortality was greater amongst the Line than amongst the Local Troops as 2·9 per cent is greater than 2·6 per cent. The reason of the increased mortality in the Line Troops is to be traced to epidemic cholera, attacking the Troops stationed in Gujarat, thus from it H. M.'s 33rd Regiment lost 42 men at Deesa, Baroda, and Ahmedabad, and in the 4th K. O., 13 fatal cases of cholera occurred, also stationed at Ahmedabad, Surat, &c. the only Europeans belonging to the Local Force in Gujarat were the Battery of Artillery at Ahmedabad, but no case of cholera happened amongst it. The diseases which were most fatal in the Line Regiments stood in the following order:—Cholera 102, Fever 64, Dysentery 43, Hepatitis 36, Diseases of the Brain 31, Phthisis 21. In the local Regiments, Dysentery 24, Hepatitis 18, Cholera 17, Diseases of the Brain 9, Fever 8, Phthisis 5. The most striking circumstances is the number of deaths from Phthisis in both services, viz. 21 in the Line, and 5 in the Local Troops. The Stations of the Line Regiments in which the heaviest mortality occurred were, as before observed, in Gujarat, then in Rajpootana, in Bombay, Poona, and Belgaum, as will be seen by reference to Table B. In Table C the Stations of the Local service are shown, and opposite to Bombay, Kurrachee, and Ahmednuggur, are the largest number of deaths

recorded. It will be observed, that at the several sanitaria. stations but few deaths happened, and those chiefly from diseases which had baffled remedial means at other places, or were of such uncertain nature as to be classed under "other Diseases."

A.

RETURN showing the Sickness, Mortality, and Invaliding in Her Majesty's European and Native Troops in the Bombay Presidency for the year ending 31st December 1860.

YEARS.	Presidency.	Military Europeans and Natives.	Average Strength.		Admission into Hospital during the year.		Deaths from Ordinary causes.		Deaths from Cholera.		Invalided.	Ratio per cent. of Ordinary deaths to Strength.		Ratio per cent. of deaths by Cholera to Strength.		Ratio per cent. of deaths generally to Strength.		Ratio per cent. of number Invalided.	REMARKS.
			1860	1859	1860	1859	1860	1859	1860	1859		1860	1859	1860	1859	1860	1859		
1860	Bombay	H. M.'s British Troops ..	12,071	17,332	23,817	36,868	258	438	102	79		2.1	2.5	0.8	0.4	3.9	3.9		
		(Europeans	4,321	4,417	8,765	9,357	96	121	17	33		2.2	2.7	0.4	0.7	3.8	3.4		
		H. M.'s Indian Troops																	
		(Natives ..	37,642	40,818	44,371	51,931	263	375	88	111		0.7	0.9	0.2	0.3	0.9	1.2		

B.

TABLE showing the Mortality among Her Majesty's British Troops with Classes of Diseases during the year 1860.

CORPS.	STATIONS.	Strength.	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XII.	XVI.	Total.
			Fevers.	Eruptive Fevers.	Diseases of the Lungs.	Diseases of the Liver.	Diseases of the Stomach and Bowels.	Epidemic Cholera.	Diseases of the Brain.	Dropsies.	Rheumatic Affection.	General Affections & Diseases of the Genital Organs.	Wounds and Injuries.	Other Diseases.	
H. M.'s 33rd Regiment ..	Deesa, Dwarka, Baroda, Aboo and Ahmedabad..	903	5	..	1	3	7	42	3	..	..	1	..	..	62
" 4th K. O. do. ..	Ahmedabad, Surat, Baroda and Aden ..	900	11	..	1	4	4	13	13	..	..	..	1	..	47
" 95th do. ..	Neemuch, Sehor, and Poona ..	855	8	1	..	5	6	16	1	..	..	..	..	..	37
" 56th do. ..	Belgaum, Poona, Ahmednuggur, Kolapoor, Sattara, and Bombay.	903	10	..	2	..	2	14	6	..	..	..	..	1	35
" 28th do. ..	Poona, Ahmednuggur, Nusseerabad and Mhow..	901	14	2	..	7	7	..	..	..	..	..	..	..	24
" 8th Hussars ..	Nusseerabad, and Neemuch ..	638	5	..	5	2	4	1	1	..	1	..	..	..	20
" 57th Regiment ..	Aden, Poona, and Sattara..	774	2	..	4	..	3	4	..	1	..	..	1	..	15
" 72nd Highlanders ..	Mhow, Augur, and Sehor ..	817	1	..	1	5	4	..	2	..	..	..	..	1	14
" 83rd Regiment ..	Nusseerabad, Belgaum, and Kolapoor ..	935	..	..	1	2	1	5	1	1	..	..	..	1	13
" 3rd Drag. Guards ..	Mhow, Kirkee, Poona, and Ahmednuggur ..	604	2	..	1	1	5	..	..	..	..	..	1	..	10
" 64th Regiment ..	Kurrachee and Hyderabad ..	969	2	..	3	3	1	1	..	..	..	..	..	..	9
" 13 Royal Artillery ..	Baroda and Poona..	192	1	..	..	..	3	..	1	..	..	..	..	..	5
H. M.'s 6th Drag. Guards ..	Kirkee, Sattara, and Ahmednuggur..	689	1	..	..	1	..	..	..	..	..	..	1	..	3
D. Troop Royal Artillery ..	Mhow ..	216	..	..	..	..	..	..	..	..	..	..	..	1	3
6th Royal Artillery ..	Neemuch ..	132	1	..	..	1	..	..	..	..	..	..	..	..	3
7th ditto ..	Poona ..	198	..	..	..	1	1	..	1	..	..	..	..	..	3
5th ditto ..	Aden ..	118	..	..	..	..	..	..	..	..	..	..	..	1	1
Hd. Qrs. ditto ..	Poona ..	45	..	..	..	2	1	..	..	..	..	..	..	1	3
Details H. M.'s Regiments ..	Poona ..	126	..	..	..	1	2	1	..	..	..	..	..	..	4
H. M.'s Depôt ..	Kurrachee ..	361	..	..	5	1	4	3	1	1	..	..	..	1	15
Sanatorium ..	Colaba ..	275	..	..	5	4	7	2	1	..	..	..	..	1	21
Ditto ..	Poorundhur..	91	..	..	..	..	..	..	..	..	..	1	..	2	3
Ditto ..	Aboo ..	85	..	..	3	1	..	..	..	..	..	1	..	3	3
Ditto ..	Gizree ..	20	..	..	..	1	..	..	..	..	..	..	..	2	7
Ditto ..	Tarraghr ..	16	..	..	..	..	..	..	..	..	..	..	..	1	2
Ditto ..	Poona and Khandalla ..	161	1	..	..	..	3	..	..	1	..	..	..	..	..
General Depôt ..	Total ..	12,071	64	3	82	37	65	102	31	4	1	4	5	12	300

TABLE showing the Mortality among Her Majesty's Indian European Troops with Classes of Diseases for the year 1860.

CORPS.	STATIONS.	Strength.	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XVI.	Total.
			Fevers.	Eruptive Fevers.	Diseases of the Lungs.	Diseases of the Liver.	Diseases of the Stomach and Bowels.	Epidemic Cholera.	Diseases of the Brain.	Dropsies.	Rheumatic Affections.	Veneral affections and Diseases of the Genital Organs.	Wounds and Injuries.	Other Diseases.	
2nd Eur. Regiment L. I.	Bombay and Kolapoor	627	1	2	2	2	13	11	1	..	..	...	1	..	32
3rd European Regiment	Kurrachee and Hyderabad	895	..	..	..	..	6	2	1	..	..	...	..	2	17
1st & 3rd Battalion Artillery	Ahmednuggur and Kurrachee	461	..	1	1	3	6	..	3	..	..	...	..	..	16
4th Troop H. B. & Hd. Qrs.	Poona	177	..	..	4	..	..	2	..	..	1	...	..	..	9
2nd ditto	Kurrachee	139	..	..	1	1	..	..	..	..	..	...	..	..	6
1st Eur. Regt. (Fusiliers)	Belgaum, Dharwar, Kolapoor, and Poona	561	1	..	2	1	1	..	..	..	..	...	..	1	6
4th Co. 1st Bat. Artillery	Bombay	80	..	..	..	1	2	..	..	..	..	...	..	..	3
1st Troop Horse Brigade	Mhow	135	..	..	1	1	..	..	..	..	..	...	..	..	2
3rd ditto	Nusserabad	136	..	..	..	1	..	..	..	..	..	...	..	..	2
1st Co. 2nd Bat. Artillery	Xecmuchi, Indore, and Schore	92	..	..	..	1	..	..	..	1	..	...	..	1	2
3rd Co. 2nd ditto	Sholapoor.	81	..	..	..	..	1	..	1	..	..	...	..	..	2
4th Co. 2nd ditto	Mhow and Schore	90	..	..	1	1	..	..	1	..	..	...	..	..	2
1st Co. 3rd ditto	Kurrachee	82	..	..	..	..	..	1	..	..	..	...	..	..	2
2nd Battalion ditto	Bombay	24	..	..	..	..	..	..	..	..	..	...	..	..	1
2nd Co. 3rd Bat. Artillery	Ahmednuggur	17	..	..	..	..	..	1	..	..	..	...	..	..	1
4th Co. 3rd ditto	Bhooj and Kurrachee	84	..	..	1	..	..	..	..	..	..	...	..	..	1
1st Co. 1st ditto	Ahmedabad and Kurrachee	93	..	..	..	..	..	..	..	..	..	...	..	..	..
2nd Co. 1st ditto	Belgaum	90	..	..	..	..	..	..	..	..	..	...	..	..	..
3rd Co. 1st ditto	Hydrabad	77	..	..	..	..	..	..	..	..	..	...	..	..	..
2nd Co. 2nd ditto	Sattara	81	..	..	..	..	..	..	..	..	..	...	..	..	..
3rd Co. 3rd ditto	Kolapoor and Ahmedabad	102	..	..	2	3	..	1	1	..	1	...	..	..	7
European Depot	Bombay	61	..	..	..	..	..	..	1	..	..	...	..	..	1
Staff Hospital	Poona	28	..	..	..	..	..	..	1	..	..	...	..	..	..
ditto	Belgaum	40	..	..	..	..	..	..	..	..	..	...	..	..	..
ditto	Mhow	28	..	..	..	..	..	..	..	..	..	...	..	..	..
ditto	Ahmednuggur	34	1	..	..	..	..	..	..	..	..	...	..	..	1
	Total..	4,321	8	1	16	18	31	17	9	1	2	1	1	8	113

TABLE of Cases of Lithotomy performed by Dr. Asher at the Civil Hos-

No.	NAMES.	Age.	Caste.	Sex.	Occupation.	Duration of Disease.	Date of	
							Admission.	Operation.
1	Dadoo	34	Mussulman.	Male.	Labourer	Impossible to ascertain with any degree of accuracy.	1860 26th Dec.	1861 1st Jan.
2	Khallunnoo, Khutiana.	35	"	"	"		1861 31st Jan.	2nd Feb.
3	Oobhaya, Chachia	38	"	"	"		9th Feb.	11th Feb.
4	Sadick, Magrind	6	"	"	"		"	"
5	Ahmed Memoon, Meer- pore	35	"	"	"		16th "	18th "
6	Ramjan Pown, Degree.	38	"	"	"		17th "	"
7	Soomur, Soomer	9	"	"	Fuckeer's son.		5th Mar.	18th Mar.
8	Kumall, Nubte	3	"	"	Weaver's son.		6th "	"
9	Ramjan, Hyderabad	5	"	"	"		16th "	"
10	Butchul Saha, Kheyr- pore	36	"	"	Labourer		29th "	1st Apr.
11	Moolla	4	Hindoo....	"	"		31st "	8th "
12	Saha, Gunib's Gate ..	13	Mussulman.	"	"		2nd Apr.	"
13	Kaddoo, Meerpore	36	"	"	"		6th "	"
14	Munnoo, Halla-potia ..	8	Hindoo....	"	Cobbler's son.		13th "	15th "
15	Suchris, Soomer	7	Mussulman.	"	Labourer		17th "	22nd "
16	Sazee Ruchio, Bagool's- Gate	6	"	"	"		18th "	"
17	Alahabad, Jhoonda....	28	"	"	"		25th May	30th May
18	Goolam Hyder, Gulma- homed's Gate	65	"	"	"		16th June	24th June
19	Methoo, Hyderabad	8	Hindoo....	"	"		24th "	"
20	Achur, Dora Tanda ..	22	Mussulman.	"	"		1st July	2nd July
21	Ahmed, Mahomed Khan's Tanda	32	"	"	"		14th "	15th "
22	Goolm, Mea Khan's Tanda	26	"	"	"		17th "	23rd "
23	Butchul, Mahomed Khan's Tanda	3	"	"	"		25th "	29th "
24	Zara, Matla	30	"	"	"		31st "	5th Aug.
25	Hanoo, Giddoo Bunder.	9	Hindoo....	"	Bunya's son..		2nd Aug.	"
26	Peroze, Adamjee's Tanda	6	Mussulman.	"	Labourer		"	"
27	Noor Mahomed, Shaha- bunder	10	"	"	"		6th "	12th "
28	Khoshal, Meer Vuha..	5	Hindoo....	"	Bunya's son..		11th "	3rd Sept.
29	Thawoo, Habrund Kul- lee	10	"	"	"		13th "	20th Aug.
30	Khubben,	7	"	"			9th Sept.	10th Sept.

The subjects of the disease were not afforded by any one locality, but seemed to be The exact ages of the patients could not be ascertained ; more than the half were under to be noted that the Hindoo was not exempted, and that the agricultural population in Only one case of calculus in a female presented itself (an otherwise very unhealthy The proportion of deaths is 13·3 per cent.

The average weight of calculi is 1 oz. 2 drs. 19 grs.

* As estimated from the appearance on section : for the indications of these

pital, Hyderabad (Scind), between 1st January and 10th September 1861.

Discharge or death.	Number of days under treatment after operation.	Result.	No. of Calculi.	Probable Composition of Calculi.*	Weight of Calculi.	REMARKS.
1861					oz. dr. gr.	
18th Jan.	17 days	Cured ..	2	{ C c { B or F }	2 0 30	
13th Feb.	11 "		1	C	0 1 6	
8th Mar.	25 "		1	C i	1 4 10	
7th "	24 "	"	1	B h	1 3 40	
22nd "	32 "	"	1	A	1 4 0	
26th Feb.	2 "	Died....	1	C a	2 2 2	Suppression of Urine.
6th Apr.	19 "	Cured ..	1	B b	0 5 10	
20th Mar.	2 "	Died....	1	C b	0 0 30	Peritonitis.
18th Apr.	31 "	Cured ..	1	B b	0 1 48	Fragments.
22nd "	21 "	"	1	C d	3 3 3	
23rd "	15 "	"	1	B h	0 6 0	
24th "	16 "	"	1	C c	0 0 30	Fragments.
"	"	"	1	C a	0 0 30	
5th May.	19 "	"	1	C	2 0 0	
15th "	23 "	"	1	B b	0 0 50	Fragments.
23rd Apr.	1 "	Died....	1	C b	0 1 38	Peritonitis.
12th June.	13 "	Cured ..	1	C a	2 1 10	Fragments.
7th July.	"	"	1	B e	3 3 10	
5th "	11 "	"	1	B i	0 1 18	
19th "	17 "	"	1	C d	2 2 2	
4th Aug.	20 "	"	1	C d	2 5 0	
16th "	24 "	"	1	A	0 3 34	
30th "	1 "	Died....	1	B h	0 1 0	
19th "	14 "	Cured ..	1	C a	3 0 15	
"	"	"	1	B b	0 0 30	
"	"	"	1	C h	0 4 10	
....		"	2	C i	0 4 6	Fragments.
....			2	B ?		
1st Sept.	12 days		3		0 2 10	
....			1		0 0 36	Fragments.

derived from Central Scind generally.

12 years. By far the greater proportion of sufferers was of the Mussulman caste, but it is which the disease mostly prevails, is almost wholly Mussulman.

young girl), whose friends would not entertain the idea of an operation.

letters, see the volume of the Transactions for 1859, p 143 (H. V. C).

APPENDIX.

APPENDIX.

No. 1.

Notes on the Possibility of the Embryos of the Guinea-Worm and so-called "Fungus-Disease" of India, respectively, entering the Human Body through the Sudorific Ducts.—By H. J. CARTER, F.R.S.

Presented October 1861.

In my "Observations on *Dracunculus*," published in the IVth No. of the "Transactions" of the Society (New Series), I have stated, at page 217, that the young *Filaridæ* of the free species, which abound in the Island of Bombay during the "Rains," and throughout the year in most of the Tanks, "might pass into the human body through the skin direct, or indirectly through the ducts of the sudorific glands, the latter being much larger in calibre (viz. 1-1200th of an inch), than these young *Filaridæ*"; assuming that *Dracunculus*, when fully developed in the human body, is a monster-growth of a worm, whose natural habitat is out of the body; that the young ones which it then brings forth are too delicate to maintain an independent existence and thus unable to propagate the species; and that, therefore, the Guinea-worm is introduced.

No case, however, has yet occurred where a young *Filaria* of the free species has been found entering, or in, one of the sudorific ducts, so this is still an assumption; but having met with an instance in which young *Filaridæ* were found entering a fungus by analogous apertures on the surface, even smaller than those of the sudorific ducts, it seems desirable that the facts should be recorded to show that at least, in the vegetable kingdom, this kind of entrance takes place.

I have formerly stated that, the free microscopic *Filaridæ* chiefly frequent the gelatinous algæ for breeding, and also for food, and now I can add that myriads also accompany almost every species of large fungus for the same purpose. The number of microscopic worms, together with the larvæ of insects, to which the fungi give nourishment,

is incredible, and it was on the surface of a large species of *Sphæria* that I observed the fact to which I have above alluded, and of which the following is a description :—

While examining some specimens of the large digitiform *Xylaria* which grows on the decaying trunks of Tamarind trees, &c., some delicate, glistening, thread-like bodies were seen to project from the summits of the conceptacles (one from each), and to be waving with such an animal motion, that I thought it desirable to ascertain their real nature, so, having collected two or three on the point of a needle for this purpose, they were transferred to a little water on a glass-slide, and placed under a microscope, when they were found to be young *Filaridæ*,—but too undeveloped for their species to be determined.

The conceptacles are little globe-shaped sacks, imbedded in, and scattered over, the surface of the fungus, upon which they open by minute mouths or ostioles, respectively, which, when measured, were found not to exceed the 1-1880th part of an inch in diameter, so that they are smaller than the orifices of the sudorific ducts of the human body ; and from each of these ostioles was projecting a single *Filaria*,—the head in the conceptacle.

If, then, it be possible for these little embryo-worms to enter such small apertures for food in one organic being, it may fairly be inferred that others may do so in another ; and hence the possibility, if not probability, of the Guinea-worm in the human subject, being a monstrous development of a particular species of one of the free *Filaridæ*, which also enters the human body in an embryonal form for food, through the sudorific ducts ; assuming as before stated (that indeed, which is almost a certainty) viz. that the young of *Dracunculus* are too delicate to maintain an independent existence, and therefore cannot propagate the species, which must thus obtain its perpetuity and come, from some other source.

(Turning to another subject.—To those who are interested in seeing how the fungi follow in their propagation the law of all other organised beings, the species of *Xylaria*, to which I have above alluded, may form a beautiful example, for it presents on its surface conceptacles of two kinds, viz., one (the female,) bearing thecæ filled with sporidia, and the other (the male), bearing a bunch of filaments surmounted by spermatia or conidia. It is necessary, however, not to confound this *Xylaria* with another species of *Sphæria* which often accompanies it, viz., an *Hypoxylon*. The former is brown when fresh, dentiform, digitiform or clavate, with no definite internal structure ; the latter

blackish-brown, globose, convex, and sessile, presenting a concentric, laminated structure internally, and throwing off a dark-black, indigo-blue powder when mature, which consists of the sporidia. Both may exceed in size, the fingers and the fist respectively.)

“*Fungus-Disease.*”—Again, the black fungus described by my namesake (Dr. H. V. Carter), in the last number of the “Transactions” (No. VI.) which commits such devastation in the bones and soft parts of the feet and ankles, almost exclusively, and ultimately attains in spheroidal masses, the diameter of half-an-inch, may also, in an embryo-state, that is, in the form of a zoospore, like an *Amœba*, enter the body through one of the sudorific ducts; for microscopic examination of fresh, young, and favourable specimens of this undoubted fungus has led me to infer that, it is most nearly allied to the Mucorideæ, *ex. gr.* *Mucor stolonifera*, Ehr. (the black-headed, pin-shaped fungus, that grows over paste), which we shall presently see is most probably propagated in this way. This *Mucor* is closely allied to *Achlya*, which has been viewed by some as merely an aquatic form of it, so much are the two alike (*ex. gr.* the fungus which grows out from dead grass-hoppers and insects generally when undergoing decomposition in water). Closely allied to *Achlya*, again, are the “water-fungi” which grow in and out through the cells of all *Algæ*, to which I have long called attention in the Characææ, &c. (Ann. and Mag. Nat. History, 1856), and which lately have been named by Pringsheim “Python” (Ann. des Sc. Nat. t. xi. p. 370, Bot. 1859. *Ex. gr.* *Python entophytum*, which breeds in and about the cells of *Spirogyra* after the latter has been removed from its habitat, and kept in a basin of water until it begins to perish). • Lastly, all these are allied to the great fungus family of Myxogastres, for which now, the name of “Myxozoa” has been proposed by M. Antoine de Bary (Ann. des Sc. Nat. t. xi. p. 150, Bot. 1859); partly on account of their embryos or propagative germen being locomotive,—that is, polymorphic cells (minute *Amœbæ*), provided with one or two cilia, so that they can swim with the latter when in water, or creep about by means of their polymorphic moto-plastic cell when on wet surfaces (under the form of *Amœbæ*). Now *Mucor*, *Achlya*, *Python*, and the Myxogastres, all being allied to each other by this mode of propagation (that is, by minute amœbous or moto-plastic cells), we are not wanting in fungi which produce embryonal forms, that if any of them chose to enter the human body, they have the power, under the condition and circumstances above mentioned, to do so as easily through the sudorific ducts (or even directly, through the skin

itself, for they have wonderful penetrating power),—as an embryonal *Filaria*.

I would also add my opinion that the black fungus of the human body is a monster-form,—from its sporangia, or large cells apparently identical with sporangia, never to my knowledge, containing anything but an amorphous, albuminous mass—(abortive state of sporidia, which is chiefly the seat of the black colouring matter, and ultimately becomes resinous or fatty ?)—and thus that, this fungus is no more capable of putting forth a true embryo which can propagate the species from one human body to another or even out of the body, than the Guinea-worm; and that the natural habitat of the species is therefore, like that of the Guinea-worm, out of the body.*

It may perhaps be asked how I come to place *Mucor stolonifera* among the fungi which are propagated by polymorphic zoospores? My reply is, that I have met with a case in which many of the heads of *M. stolonifera* were composed of a mass of minute polymorphic cells (*Amœbæ*), which, after having been placed in water on a slide, soon separated from their globular aggregation, and crept away from each other under moto-plastic forms, which forms, under other circumstances, I assume, would have respectively been surrounded by firm, sporidious capsules, and on the latter bursting in development, would have come forth as propagative, amœbous germs or embryos, like those which come from the sporidia of the Myxogastres, with which family Corda has already placed the Mucoridæ, though not probably from the

- * I take from my "Note-book" the following short description of this fungus which on one occasion (28th September 1861), I examined half an hour after the amputation of the foot in which it was situated, with my namesake, who has the merit of having first pointed out its real nature in the "Article" to which I have above alluded, and to which I would direct attention for a more elaborate account of the disease, &c :—

Foot.—Greatly enlarged, presenting several small cloacal orifices connected with branched sinuses originating around globular, black or dark-brown masses, ranging in size, from microscopic minuteness to upwards of half an inch in diameter, situated in the bones and deep soft parts of the foot and ankle.

Black masses.—Globular, presenting a cauliflower surface and breaking up with a like structure radiating from the centre; composed of short, irregular filaments of concatenated, unequal sized cells, bearing on their sides and ends larger ones, (abortive spores ?) which at first are pear-shaped, but afterwards become globular, filled with a homogenous (albuminous ?) substance colored brown, which, swelling out the cell, appears to burst it, and thus becoming free, affords the principal part of the coloring matter and substance of the mass.

Iodine gives a deep claret color to the contents of the large cells (spores ?) indicative of their amylaceous nature, and a deep sherry or amber-color to the rest of the structure, among which I observed starch-grains that appeared to me to belong to the fungus.

The best portions for illustrating this structure, are the smallest and least colored, not those which come from the large dark masses, for they seldom present much beyond homogeneity and color.

circumstance just mentioned, but from their general resemblance.—(Corda, “*Icones Fungarum*,” p. 19; and *Mucor stolonifera seu Rhizopus nigricans*, p. 20, tab. xij, fig. 83*).

No. 2.

On Hill Sanitaria and Climates in India, being a letter addressed to the Right Honourable the Secretary of State for India.—By C. MOREHEAD, M.D., Honorary Surgeon to the Queen.

Presented September 1861.

SIR,—I have been favoured with a copy of a “Report on the extent and nature of the Sanitary Establishments for European Troops in the Bengal, Madras, and Bombay Presidencies,” published by the Government of India, and forwarded to me through the India Office by desire of the Honourable Sir Bartle Frere, K.C.B.

2. At page 21 of the Report I observe that Sir Hugh Rose, in transmitting to the Government of Bombay my official Report on the Sanitaria in the Poona Division of the Bombay Army, makes comments which show that he did not rightly apprehend the principles which it was my object to inculcate, or the scheme by which I proposed to apply them.

3. As the right use of the hill climates of India is of the utmost importance to the welfare of the British soldier, it is very desirable that the question should not be rendered needlessly complex by diversity of opinion. I therefore take the liberty of addressing you with the view of re-stating in a succinct form the principles which I endeavoured to apply in my Report, and of showing that in truth there is no real difference of opinion between Sir Hugh Rose and myself.

* Familiar examples of these Fungi are given that the reader may the more easily procure them for examination. Abundance of the *Myxogastres* may be found on the dead wood in the building-timber and fire-wood yards during the Monsoon; among which is the *Æthelium* or “creeping-fungus,” which, under the microscope, by transmitted light, affords one of the most wonderful objects in the world. To obtain this, look among the chips and saw-dust of the astringent woods during the “Rains,” and having found a yellow or brown colored slime, take a piece of it, about half the size of a pea, and place it in a watch-glass with a little water; afterwards put the glass in a shaded or dark place for a few hours, when the *Æthelium* will, if young and fresh, have passed into an arborescent form fit for observation.

4. The following' are the principles included in my Report :—

1. The cold season—from the middle of November to the end of February—throughout India is, speaking generally, not adverse to the European constitution.

2. The hot season—from the beginning of March to the middle of June, and the month of October—may be said in general terms to be more or less injurious to the European constitution throughout India below an elevation of about 4,000 feet.

3. The rainy season of the south-west monsoon—from the middle of June to the end of September—is from humidity, heat, malaria, or cold more or less injurious to the European constitution in most parts of India at all elevations. There are, however, some remarkable exceptions, the chief of which is, that part of the Deccan table-land situated between 20° and 15° N. latitude within 60 miles of the eastern side of the Western Ghauts, and with an elevation of from 1,700 to 2,300 feet.

4. The cold season—from the middle of November to the end of February—being throughout India suitable to the European constitution, is that to which the movement to and from Hill Sanitaria should, as far as practicable, be restricted.

5. The hot season—from March to the middle of June and the month of October—throughout India in all localities below about 4,000 feet (that is, within the influence of inland hot winds or the relaxing heat of the Coast) should, as far as practicable, be avoided.

6. Localities in which the rainy season—from the middle of June to the end of September—is unfavourable should, as far as practicable, be avoided.

7. The cold season of hill climates in India is unsuitable in forms and stages of disease, for which a change to the sea-coast is often very beneficial.

8. Two great defects have hitherto existed in the application of Indian Sanitaria—

(a) The exposure to the cold and rainy seasons of hill climates of convalescents from forms of disease for which these seasons of these climates are unsuited.

(b) The neglect of sea-coast sanatoria for convalescents in the cold season for whom the cold season of hills and of inland table-lands is unsuited.

9. If from among the convalescents at stations with unfavourable hot and rainy seasons a judicious selection be made of those appropriate to a hill climate, and their arrival at the hills station be timed so as to

occur early in March, then a residence of one hot season (including October) on the hills, and one rainy season in a suitable locality, will in general be sufficient to fit such convalescents for return to duty in the succeeding cold season.

10. The hill climates are not merely to be regarded as conducing to the recovery of suitably selected convalescents, but also as, when taken in connection with a suitable monsoon climate, materially assisting in maintaining, at a higher standard, the general health of European soldiers and their families. This object may be effected by transmitting, towards the end of February of each year, such percentage of the men and families of every regiment as the contingencies of service may permit to a hill and suitable rainy season climate, and returning them to their stations in the succeeding cold season. Thus every soldier in India with his family would periodically, and in rotation, more or less frequently, according to the available percentage, be saved from the deteriorating influence of the injurious seasons of India.

11. In order to provide for the wants of the sick and convalescent, from those forms and stages of disease for which the cold season of the hills and inland table-lands is unsuited, sanatoria, on carefully selected positions on the sea-coast, should be established.

12. These principles admit of easy application in the Presidency of Bombay, as is shown in my official Report, and also, though in less degree, in that of Madras. But in Bengal and the Punjaub they are beset with difficulties which doubtless further inquiry and observation may most materially abate; and it is most desirable that no effort with this view should be spared, for it may be safely affirmed that they are the only sound principles deducible from past experience and proved physiological data.

13. On the question of acclimatation there can be no doubt that the longer and more continuous the exposure of the European to the adverse action of high temperature, excessive humidity, and malaria, the greater will be the deterioration of his constitution. Therefore, as respects *these* influences, there is no such thing as beneficial acclimatation. But when the change is made from Europe to India, that is from a temperate to a tropical climate, then the constitution of the European undergoes a modification, in order that the various functions may be brought into harmony with the influence on them of continued high temperature. There are few facts in physiology more satisfactorily

proved than this. It is a true acclimatation. It is perfected in a short space of time in one cycle of the seasons. If the arrival in India has taken place in the cold season, then with ordinary care as regards diet, dress, exposure, exercise, &c., this modification of the constitution, this acclimatation will be insensibly effected, and the European, at the commencement of the second cold season, that is after a year's residence in India, will have become acclimatised. But if arrival should take place in the hot season, or if there should be excesses in food, intemperance, undue exposure or fatigue, then forms of febrile disease or biliary derangement are readily excited, and these, in common language, are correctly enough termed *seasoning diseases*. But this rude process of acclimatising Europeans to an Indian climate not only for the time fills the hospitals with sick, but leaves the men shattered in constitution, and predisposed to the serious forms of tropical disease. With a good sanitary system it ought to be of very rare occurrence.

14. In organising a sanitary system for the British soldier in India, the truly practical aim is not to give him that state of constitution which he would have in his native country, for that is incompatible with the contingencies of military service in India. The object ought to be to maintain him in that condition which best fits him for the maximum of efficient service with the minimum sacrifice of health and life, by as far as practicable protecting him from continuous high temperature, malaria, and the other various agencies which deteriorate health. This is to be effected by a careful selection of sites for cantonments, good construction of barracks, a systematised use of hill, coast, and healthy monsoon climates, with assiduous attention to the other various conditions which are now so well known to conduce to the maintenance of health. Therefore, to place permanently at such elevations as Ootacamund, on the Neilgherry Hills, all the British troops in India, even if politically practicable, would not prove, in my judgment, the best method of fitting the European soldier for the maximum of efficient service with the minimum sacrifice of health and life. Doubtless Europeans permanently residing in a hill climate such as Ootacamund would retain much of their native vigour, but they would not be efficient for the contingencies of military service in India. If suddenly called to the plains for service in the hot season, there would be a heavy sick list from seasoning fevers and biliary derangements, and a rapid loss of vigour and stamina would result. Then, the service over, and the men exhausted by heat, fatigue, and sickness, moved back to their hill cantonments, would be subjected to much mortality and invaliding from these forms

of disease, for which the cold and rainy seasons of hill climates are unsuitable. Were it possible to transport *in a few hours* troops from the camp at Aldershott to the plain of the Ganges any time between March and November, use them for active service, and return them broken in health *in a few hours* from India to Aldershott any time between October and May, the result need not be told. It would be analogous in kind to that which may be anticipated from the permanent location of troops in such positions as Ootacamund and the interior Himalayas, and their rapid transfer any time between March and November, in the one instance to Malabar, the Concan, or Carnatic, and in the other to the plains of the Punjab or of the Ganges, with their return to their hill cantonments between September and April. In both these instances I have assumed the hill position to be *above* the force of the south-west monsoon, as at Ootacamund, or *beyond* it as in the interior Himalayas; but should it be open to the force of the south-west monsoon, as at Mahableshwur, or on the sub-Himalayan hill ranges, then the unfavourable period for return to the hill stations would be between November and March, and again between the middle of June and the end of September.

15. In consequence it would seem of my report, dwelling on the injurious action of the cold season hill climate in certain forms and stages of disease, appropriating the cold season—suitable in all parts of India—to the transfer to and from the hills, and limiting the soldier's absence from duty to one hot and one rainy season, Sir Hugh Rose has erroneously assumed that I am not familiar with the fact that the cold season at Mahableshwur is invigorating and useful to Europeans without organic weakness, more especially if not long resident in India. His Excellency has further overlooked that the period of his personal experience, viz. from 20th October to the middle of November, is included in the time recommended by me for the European soldiers, as may be seen by reference to the 26th and 31st paragraphs of my report. Moreover, it does not appear from Sir Hugh Rose's letter, dated Mahableshwur, 30th April 1859, that at that time he had any personal experience of what in my report is termed the "cold season," viz. from the middle of November to the end of February, and which it need hardly be remarked differs materially in many characteristics from the season between 20th October and middle of November. I regret a seeming difference of opinion with a high military authority on a matter of so much importance as the health of the British soldier in India; the more so in this instance because it might easily have been avoided. On

the 30th April 1859, the date of Sir Hugh Rose's letter, I was either on the Mahableshwur Hills, or within an easy march of them, and a few minutes' conversation, or a note of reference from His Excellency, would have enabled me to remove the misapprehension under which he laboured.

16. It may be well that I should explain more fully why I have not included the cold season in the period of residence recommended for the European soldier at Deccan hill stations—

1. The cold season throughout India is suitable for the European, and is the only season appropriate for the return of men from hill sanatoria to stations in the low country.
2. If only cases suitable for a hill climate be selected, and the use of hill climates be systematised and judiciously practised, absence from stations in the plains for one hot and one rainy season periodically repeated will be sufficient.
3. As the cold season of hill climates is injurious in some states of constitution, there would always be a risk of a proportion being retained during that season to their injury rather than their benefit.
4. Without a system of employment and amusement far more perfect than any yet thought of, a two years' residence at a hill station most generally proves tedious and depressing to the soldier.

17. But doubtless exceptional cases will occasionally present themselves for which a continuance on the Mahableshwur Hills during the cold season may be useful. If so, there is nothing in my proposed scheme incompatible with their detention,—it being, however, remembered that on no account should they be returned to their station and to duty in the low country before the opening of the succeeding cold season, and that therefore it will involve an absence of two years from duty instead of one. It should be further borne in mind that this exceptional proceeding, if largely practised, will necessarily have the effect of lengthening the interval of the soldier's return to the healthy climates, and of increasing the continuity of his residence in the unhealthy ones, and therefore operate disadvantageously on the army at large.

18. In conclusion it may be confidently anticipated that the regular and systematic use of hill, coast, and healthy monsoon climates in accordance with principles similar to those suggested in my report, and re-stated in this letter, in connection with a never-failing attention to the position and construction of barracks, to the dress, rations, duties,

amusements, and the other various matters of detail which relate to the health and comfort of the soldier, must in a few years have a marked effect in reducing the proportion of sick, of mortality, and invaliding in the British army serving in India.

I have the honour to be, &c.

C. MOREHEAD, M.D.,
Surgeon Major, Bombay Establishment.

12 Vernon Place, Scarborough, 17th September 1861.

No. 3.

Selection of Cases from the Records of the Kurrachee Charitable Dispensary.—By Sub-Assistant Surgeon BAZUNJEE RUSTOMJEE.

Presented December 1861.

CASE NO. I.—*Fungus disease of the left foot, white variety.*

Kullian, age 40, caste Hindoo, native of Jurodhur, 32 miles from Bhooj. Duration of disease three years. Occupation partly agricultural and partly begging. Admitted 24th June 1861.

The left foot is four times larger than the right; its dorsal surface is irregularly swollen, rendering the whole outline of the tarsus and metatarsus obscure. The toes only remain distinct. The skin is congested, and bears three or four prominent soft elevations on the surface. The sole and sides of the foot are beset with numerous sinuses which discharge purulent or sanious matter, containing at times white granules. A probe can be passed to some extent through one of these sinuous openings till it is interrupted by hard osseous structure in the interior. The skin is preternaturally soft, and has an unhealthy whitish look; over the metatarsus and phalanges it is healthy; a portion of integuments over the heel is also healthy.

The disease commenced as a hard, painless tumour on the plantar surface of the foot just above the healthy skin of the phalanges without any wound or injury of the part some three years since, and gradually invaded the other parts of the limb. He further states that there was no pain or discharge for the first two years, and it progressed rapidly to its present condition on the application of medicines.

The patient seemed to be perfectly familiar with the white granular masses which had already come on the surface, as he picked up a couple of them from two different parts of the dorsum of the foot. The nature of these peculiar yellow pulpy bodies has been recently satisfactorily demonstrated by Professor H. V. Carter, according to whom the white particles are composed of a collection of fungi with crystalline matter of a fatty nature, a single granule containing dozens of fungi which have a beaded cellular filamentous appearance under the microscope. Each granule is composite, being made up of the aggregation of many, sometimes a dozen, separate particles. The fungi and crystalline matter which has, according to Professor Ballingall, who first described it, a fringed coat under the microscope with oil globules are the chief characteristics of the disease. The instance now described belongs to the second or white variety of Dr. Carter, whose masterly researches have acquainted us with the pathology of the disease.

The patient, an opium-eater, as it is generally the habit with the Charon tribe and others in Kutch, was willing to submit to operation, but he was at the same time eagerly desirous of proceeding to his native place, as it was the closing of the fair season, and consequently he could not be persuaded to stay in Kurrachee, although I promised to pay the expenses of his passage to Kutch.

He was in an emaciated condition, but in fair good health; had never any venereal disease, and no symptoms of scrofula.

CASE NO. II.—*Fungus disease of the left foot, white variety.*

Mathoora, age 57, occupation confectioner, caste Hindoo, Pokerna Brahmin. Duration of disease six years. Native of Kurrachee. Re-admitted 26th September 1861.

From a little above the ankle down to the line of Hey's operation, the left foot is globularly enlarged. The skin is beset with large fungoid granulations or sinuous openings which discharge purulent matter, containing from two to four granular bodies every day. The foot measures $19\frac{1}{4}$ inches in circumference. The fungoid granulations are in greater numbers on the heel and on both sides of the foot immediately below it. The skin on the dorsum from the toes to five inches upwards is healthy; that on the plantar aspect is normal to its extent, except a small portion in the centre of the internal and external borders of the foot. The ankle-joint is embedded in the globular mass, and its integuments participate in the lividity of the tarsus.

The disease commenced as a painless tumour on the inner side of the foot below the malleolus six years ago. At intervals of every four or six months severe pain was felt in the part; two years afterwards the granular discharge began to appear, and the disease invaded the outer side of the limb within the last twelve months. Says he had applied at the Dispensary three and a half years ago, when topical applications were used. Was salivated by a Bhatia Vuyd seventeen months ago, and about two years since an incision was made in the diseased part by a barber. Has never had syphilis or gonorrhœa. Has never been out of Kurrachee except once to Narainsir and Bhooj for a period of one month some thirty years ago. Has no recollection of the hereditary existence of the disease in his family, whose male members follow the occupation of confectioner through a long pedigree. Is an emaciated old man, with a pale dejected countenance caused by long suffering from the disease. No symptoms of scrofula and consumption. Gets febrile attacks occasionally. Had applied for relief in the early part of August last, and has again, but with a too timid resolve to submit to amputation.

In my notes on cases of "Diseased Foot," submitted two years ago, the prevalence of the disease among farmers who, more than any other class of men, are predisposed to the disease was apparent. Dr. Carter alludes to the opinion entertained by Professor Ballingall and Dr. Colbrook about the liability of cotton-field labourers to suffer from the fungus disease. My belief is that not only do the cotton-field labourers but farmers and others engaged in the growth of vegetables and the cerealia also suffer from the disease. Moreover, the case now described with others I have seen conclusively provided that spores of the fungi might find entrance into the foot without the sufferer exposing himself to any sort of field labour.

CASE NO. III.—*Fungus disease in the early stage. Diagnosis doubtful.*

Khaitbaee, age 13, female, caste Hindoo Loharra, native of Nuro, 40 miles off Bhooj in Kutch. Duration of disease six months. Admitted 7th July 1861.

Has a small nearly circular ulcer on the outer side of the sole of the right foot about an inch from its external margin. The ulcer, or rather opening, discharges thin sero-sanguineous matter, which apparently comes from the deep interior of the sole. The skin surrounding

the opening, which is about the size of a quarter of a rupee is inclined to dark-grey colour. Above the opening and just at the inner margin of the sole is a hard lump of thickened integuments and areolar tissue. Says the disease commenced six months since with a thickening of the skin on or near the seat of the present ulcer. That on her way to Kurrachee *vid* Mandvee, while embarking on board a kotia (Kutch vessel), she was injured on the spot with a sea-shell which caused the present ulcer that has never healed since. The discharge is either purulent or sanious. Her father, an old man of nearly sixty, says he never sent her to labour in the fields, and is himself a grocer on a small scale. She is in excellent health. The rest of the foot is sound and normal in appearance. No scrofula; walks on her heel with the toes raised from the ground.

9th July.—A portion of the integuments near the ulcer has given way, and a small ulcer covered with thick pus is observed on the spot; from the lower side of the ulcer thick foetid purulent matter oozes out. The thickening of the skin and areolar tissue extends to two inches from the inner margin of the ulcer, and is continuous with the lumpy hardness on the inner edge of the sole of the foot. She absented herself the next day.

The question is, is it a case of commencing fungus disease? I am inclined to view it as such, though I have expressed my doubt as to the correctness of my diagnosis. There is evidence of the way in which the fungus disease often begins, and there was the presence of the characteristic indurated lump, and deep sinuous opening. If these are the signs of the early stage of the fungus disease (and such they were; but with others more characteristic in the only case of early foot-disease, detailed by me in my previous notes), then no doubt could be entertained as to its nature; but in the almost entire absence of recorded instances of the early stage of the disease, the absence of a microscopic examination of the tissues involved, and the absence of any visible granular particles in the discharge, the diagnosis cannot be stated with certainty.

CASE NO. IV.—*Stone in bladder. Lithotomy. Tube not used.*

Recovery.

Noor Mahomed, age 33, caste Mussulman Puttan, native of Candahar, occupation shoemaker. Duration of illness two years. Admitted 28th October 1861.

13th November.—Was prepared for the operation up to yesterday. This evening chloroform was administered at 3 o'clock, and the lateral operation of lithotomy performed. The stone easily extracted weighed 90 grains, and was of the mulberry variety. The sound striking against the irregular prominences of the stone gave the fallacious impression of the existence of more than one calculus. The bleeding was pretty free, but the perinæum being deep, it was not easy to make out whence it came; consequently the wound was injected with cold water which checked the bleeding in a few minutes; in the absence of a properly constructed tube, the wound was left alone.

From the date of the operation nothing unusual occurred. The urine passed freely by the wound, and on the third day part of it came by the urethra, since which it continued to appear by both the channels, and on the ninth day almost the whole of the secretion took its exit by the natural passage, and the wound was healing fast. By the end of November scarcely any urine escaped by the wound which had healed, and he was discharged well twenty-one days after the operation.

CASE NO. V.—*Stone in bladder. Lithotomy. Non-insertion of Tube. Recovery.*

Name Peerdad, age 18, occupation labourer, native of the Khelat Puthan. Duration of disease eight years. Admitted 24th May 1861.

12th July.—As he was a spare man, and the presence of stone was attended with great irritability of the bladder, preparatory treatment was used up to yesterday. This evening an attempt was made to bring him under the influence of chloroform, which he took badly. The administration of the anæsthetic was attended with difficulties, the bladder contracted thrice, and it was necessary to inject tepid water as many times; more than $11\frac{1}{2}$ fluid drachms of chloroform were consumed, although it was administered by the practised hand of Dr. John Bean, the Civil Surgeon, without whose very valuable and able assistance I could not have finished the operation. The internal incision having been made, the patient struggled, and so the internal incision was very nearly being made in a wrong direction; but at length the groove was regained, and a short incision made in the prostate, the stone grasped and extracted without trouble. It was a mulberry calculus, and weighed 5 drachms. No tube was inserted in the wound.

6 P.M.—Vomited the opiate given him after he recovered from the effects of the chloroform. Is restless. To have another opiate at bed-time.

13th.—Slept indifferently. The urine passes by the wound. No bleeding; vomited first early in the morning; has febrile heat of body. Ordered mist. diaphoret. ʒ iss every 4 hours, thrice, and linseed tea. *Vesp.*—Some urine by the urethra; the wound covered with a little lymph. Has much febrile heat. Complains of pain in the belly, particularly in the hypogastrium. The opiate to be repeated at bed-time.

14th.—Did not sleep much. Has less fever than last evening. Bowels not opened. Urine through both passages. Coating of lymph on the wound. Continue the morphia. *Vesp.*—Fever more than in the evening. Does not like the linseed tea. Repeat the opiate.

15th.—Had some sleep in the night. Bowels not moved. Pain in the region of the bladder less, but there is some hardness and tumefaction around it. Urine passed twice in the night through both passages. The mixture to be continued; the belly to be fomented, after applying turpentine and tinct. opii twice daily.

16th.—More urine passes by the urethra than by the wound. Slept well. Order castor oil ʒ iv.

17th.—Feels better. To take chiretta and acid thrice daily. Wine ʒ ii.

18th.—Makes no complaint. Cont.

19th.—Sleeps well. The whole of the urine passes by the urethra. Wound granulating, but not opened. Small bed-sore on the sacrum. Castor oil ʒ iv.

2nd August.—The wound entirely healed. Attends at the dispensary and picks up strength.

These cases are introduced to show the difference of time in the appearance of the urine by the urethra in lithotomy operations, when a tube is inserted or not in the wound. In these two cases the urine first appeared by the urinary channel before the expiration of 48 and 24 hours respectively, and continued to flow partly by the urethra and partly by the wound till the eighth and ninth day, when the whole of the urine took its exit by the natural passage. In ordinary cases when a tube is inserted in the wound, the urine appears by the urethra on the second day when the sides of the tube are clogged with lymph, but it flows again by the wound when the tube is withdrawn and appears by the urethra in part on the ninth day, and the whole of the fluid does not generally find its way by the urethra till the middle or end of the third week. I make this latter statement on the faith of what I have seen of Professor Ballingall's practice during my attendance in the Surgical Wards of the J. J. Hospital. In his notes on Lithotomy, published in the Medical Transactions for 1852-53, Mr. Bhawoo Dajee, who, I believe, has

the largest experience of Lithotomy among the Graduates of the Grant College, states that the urine appeared in part by the urethra on the ninth and eleventh day in his first and third case. The urine took the same course in five operations for stone in the bladder which I had to perform before the two narrated above, and where a tube was introduced into the wound. Professor Fergusson makes the following statement in the 3rd edition of his *Practical Surgery* :—" Usually from the swelling of the parts in the track of the incision the urine passes freely by the urethra on the second and third day, but it soon again all escapes by the wound, then on the eighth or ninth or tenth it flows in part by the natural course, and in a few days more is entirely evacuated through this channel." But as above stated, the urine follows a different course when the tube is dispensed with. The reason of the earlier appearance of the urine by the urinary channel in the latter case is evident enough. The wound is not irritated by any foreign body, and its sides are in better apposition, and consequently in a state favourable for the contraction of the wound. Whereas when a tube is introduced, the sides of the wound are dilated and put upon the stretch for two days, and so the closing in the wound proceeds comparatively slowly. Thus it is advantageous not to use a tube when lithotomy is properly performed, the prostate cut to a limited extent, and when there is no danger of hæmorrhage or extravasation of urine. But in instances when the operation is clumsily performed and the danger of hæmorrhage and extravasation are impending, it is better not to dispense with the tube. In children I should think the use of the tube indispensable. The experience of two cases is limited and requires confirmation.

CASE NO. VI.—*Extensive contused and lacerated wound with compound comminuted fracture of the forearm and arm. Amputation. Death.*

Hajee Abbos, age 34, beggar, Puthan, native of Cabool. Duration of injury nine hours. Admitted 12th May 1861 at 3 P.M.

Bitten by an alligator at Muggur-Peer at the morning-prayer time, while he was engaged in offering his prayers. The left forearm is extensively lacerated; the muscles, blood-vessels, and nerves fearfully torn asunder; the elbow-joint is exposed, and the head of the radius separated from its joint. The ulna is also splintered about an inch below the joint. Higher up and on the same side about two inches and a half below the shoulder-joint the humerus is fractured into splinters.

Another inch further down, the bone is comminuted into pieces, and the muscular substance greatly smashed. The accident happened early in the morning, and much blood was lost before he was brought to the Dispensary. He is of robust body, but in a state of profound shock. There was hardly room enough to obtain good large flaps, and in consequence circular amputation of the arm was performed after administering of wine 6 ozs. and chloroform. He died at 4 A.M. on the 13th May 1861.

As a rule, amputation must not be performed while the patient is in a state of shock. But here the injury was so extensive, and the quantity of blood lost so great, that there was no prospect of the patient rallying soon, and the operation itself was not calculated to add to the shock already present. Professor Erichsen states that "in some cases, however, the presence of a crushed limb appears to prolong the shock, and thus prevent the patient rallying, notwithstanding the administration of stimulants. Under these circumstances the Surgeon would be justified in operating before reaction came on."

NOTE.—Muggur-Peer is situated about 10 miles from Kurrachee, and contains hot springs and reservoirs, where alligators abound in numbers and are fed on animal food by Hindoo and Mussulman votaries, who regard the place and the horrid creatures with religious reverence.

CASE NO. VII.—*Extensive contused and lacerated wound of the right forearm. Death from traumatic spreading Gangrene.*

Soomar, aged 13, caste Mussulman, no occupation, resident of Kurrachee. Duration of injury three hours. Admitted 13th September 1860.

Brought to Dispensary at 5 P.M. by Foujdar's men with a severe and very extensive contused and lacerated wound of the right forearm. The whole of the skin, as well as the muscular substance from an inch and a-half above the wrist up to the elbow-joint was laid bare, and the blood-vessels, nerves, and subjacent muscular parts were exposed. There was bleeding from the small vessels, but no large artery was injured. He had also a contused wound on the head just behind the left ear. The wound on the forearm is more than four inches long, and its greatest breadth is about an inch and a-half. No fracture or any other injury of the limbs. Is quite sensible. The injury happened by the sharp edge of a cart coming against the part. Chloroform was given, the particles of sand and dust removed, and the wounds stitched, and straps and water dressing applied,

Fever came on the next day, and on the third day gangrene commenced in the form of bullæ, and in three days more it spread below as far as the fingers and upwards above the elbow-joint; stimulants, tonics, and wine were administered, but he died of prostration from the effects of the spreading gangrene on the morning of the 19th, *i. e.* on the fifth day after the receipt of the injury.

The question of amputation in spreading gangrene presented itself in the case. The injury was not sufficient to account for the disease, which was undoubtedly due to a constitutional defect. The line of demarcation had not formed, death ensuing previous to its formation. Professor Erichsen advises the performance of the operation notwithstanding the liability of stump to turn gangrenous. But acting on the advice of Professor Ballingall that in India the knife is viewed with suspicion, and death unreasonably ascribed to its use, I did not perform the amputation. Dr. Bean, the Civil Surgeon, who was consulted when the gangrene set in, did not advise the use of the knife.

CASE NO. VIII.—*Worms in the Nose, or "Punosh."*

Mahomed Ally, aged 28, petty trader, Mussulman, native of Sheewan in Sind. Admitted 9th April 1861.

Is of spare habit of body, with pale, blanched features. Says the disease existed for three days before admission, when he complained of pain in the nose, eyes, and face. He had discharged blood from the nostrils the day before admission, and passed about 20 or 25 worms from them. The worms according to the patient's account were small and like thread. The nose is flattened and snubbed a little at its tip and nostrils, but more prominent and larger than in health. Feels pain on pressure. There is ulceration in both nostrils. No ulceration in the mouth or palate. Tongue preternaturally clean. Breathes with difficulty. Has some febrile heat. Pulse small and quick. Ordered turpentine and water injection in the nostrils. Mist. diaphoret. ʒiss every 4 hours, 3 times daily.

10th.—The next day no worms were reported to have been discharged, but the discharge of blood continued, and the nose, eyes, and face were more swollen, and pain in the teeth was complained of. Has some fever. Diaphoretic mixture to be continued. The nostrils to be syringed with alum lotion. Pulv. Doveri. gr. x. h.s.s.

11th.—Passed about 15 worms yesterday; bleeding from the nose less; the pain more severe, particularly in the mouth. Swelling of the nose

much the same. No sleep; fever slight; tongue clean, with slight furr; bowels not moved. R mixt. diaphoret. quinae ā ā ʒiii. tinct. opii ʒ ss ft. mixt. ʒii ter. in die.; continue syringing the nostrils. He ceased attending after the 12th April.

The patient brought to me some of the worms expelled last time. They were small, from $\frac{1}{3}$ to $\frac{1}{2}$ inch in length, with knots and intervening rings which numbered from 10 to 12 in each worm, and there were dark points at the head and tail of each worm. They were similar to worms observed by me in a case admitted in the dispensary last year and detailed by me in the selection of cases for that year. The worms were kept in spirit and forwarded to Professor H. V. Carter of the Grant College Museum.

CASE No. IX.—*Hypertrophy of certain bones of the upper and lower extremities at particular points.*

Looper, a Mussulman boy, aged 13, and native of Meckran, was admitted on the 12th September 1859 as an out-patient of the Charitable Dispensary when the following note was made:—

“The right humerus is thickened above the elbow-joint to the extent of an inch. There is small swelling of the ulna a little above its middle. The tibia of the same side is considerably thickened at its middle; also a slight swelling below the knee-joint. On the left side the humerus is curved and thickened from below its middle to the elbow-joint and the tibia is thickened below its tuberosity. The left clavicle is thicker than the right.”

On inquiring into the history no important information was elicited, but the boy said the state of the bones existed for the last three years.

The hypertrophy of the bones at various points is, I believe, due to a local determination of blood during the growth of the epiphyses, and the thickened state of the clavicle is also due to the same cause, coupled, perhaps, with a greater exercise of the arm, causing greater development of the collar-bone. Whatever may have been the cause, the state of the bones was as above noted.

CASE No. X.—*Disease of the left foot (cancerous).*

Name Soomar, aged 25, caste Mussulman, native of Sheewan in Sind. Admitted as an in-patient on the 26th September 1859.

On the outer side of the left foot immediately above the pointed projection of the fifth metatarsal bone is an enlargement about $1\frac{1}{2}$ inch, raised above the general level of the foot, and four inches in circumference.

The skin on the top of it is ulcerated and congested, and livid over the rest of its surface. In the midst of the ulcerated spot are two small elevated granulations: the whole surface discharging a foetid semi-sanguineous fluid. The swelling is apparently immovable from the deeper parts, and the skin is well adherent to the body of the tumour which is hard to the feel. No pulsation observable. Feels great pain in the swelling. The rest of the foot is apparently healthy.

Says that about five years ago he received an injury of the foot by a hatchet having struck it. Since then a small tumour appeared in the site of the present swelling and has been gradually increasing ever since. He is in tolerably good health. Charcoal poultice to the tumour; opiate at bed-time.

27th.—No fœtor from the surface of the tumour, which continues to discharge the bloody liquid. Complains of pain in the limb. Turpentine dressing and bandage.

Vesp. Seen with Dr. J. Bean, the Civil Surgeon. On my placing a finger on one of the prominent granulations on the surface a piece of bone was easily removed from it. To have his opiate. The extraction of the piece of bone left no doubt as to the seat of the disease. It was clearly a case of diseased foot, probably confined to the os calcis and astragalus. But a doubt hangs over its nature—whether cancerous or otherwise. The history of the disease beginning after an injury, the fungous appearance on the top, the congested and adherent skin around it, and the presence of great pain with bloody discharge led me to believe it was one of the cases of the so-called Osteo-encephaloma. It had no resemblance to the fungous disease of the foot I have observed.

The patient was willing to submit simply to the removal of the tumour, but knowing the disease to be deeper seated, Dr. Bean and myself persuaded him to submit to Syme's operation, but he did not like to lose his foot for what he thought to be a circumscribed affection, and he left the dispensary at night-time.

No. 4.

Case of Hydatids of the Liver evacuated through the Lungs.—

By W. HANBURY, Esq., Surgeon, 33rd (Duke of Wellington's) Regiment.

Presented September 1861.

Dr. Watson in the third edition of his *Lectures on the Practice of Physic*, vol. 2, pages 538 and 539, relates the history of a case of Hydatids of the Liver, which were discharged by the lungs and bowels, and so full of interest does he consider the case, that he concludes his account of it with the remark that it “deserved to be recorded in more complete detail.”

That hydatid cysts are seen most generally in the liver is of course well known, as also the fact that they sometimes lead to the formation of abscess, and are thus discharged through the walls of the abdomen. I have not yet, however, during my experience of ten years among British troops in India met with more than one instance in which these cysts were evacuated by the lungs, and as this case forms almost an exact parallel to that recorded by Dr. Watson, it is unnecessary, while supported by his example, to offer any apology for its publication.

G. G. proceeded to Aboo with his company on duty in October 1860. On the 9th May 1861 was attacked with what were considered symptoms of colic, but subsequently admitted under the head of hepatitis. On return to Deesa from the hills early in June, a report was received from the Medical Officer in charge of the Sanitarium at Mount Aboo, stating that he was “admitted with colic caused by the passing of gall-stones, and constipated bowels, pain occurring at intervals in the epigastrium extending to the right hypochondrium and the back, which terminated in inflammation of the liver.” After his arrival on the 14th June at Deesa he was detained three weeks in the regimental hospital, during which period he suffered from paroxysms of pain for several hours on different occasions, was pale, weak, and emaciated, affected with irregular bowels and bleeding hæmorrhoids, but examination of the dejections frequently repeated, failed to detect gall-stones.

On the 3rd of July he was discharged from hospital and placed on the convalescent list, but on the 14th of the same month was again admitted as he did not appear to regain strength. From this time he

continued under treatment till the 13th of the following month, complaining frequently of attacks of pain in the right side of a severe writhing character, and lasting for a few hours, short and embarrassed breathing, fatigue on slight exertion, diarrhœa, &c. ; but on the evening of that day he called my attention to some fluid which he had expectorated during the day, and on examination five or six broken cysts were observed from which the fluid was derived, and which it seemed more than probable were detached from the liver and evacuated through the lungs.

The report continues—

August 15th.—Has expectorated more of the fluid matter with a few cysts, the latter like grape or gooseberry skins, and tinged with bile. No additional constitutional derangement.

August 16th.—Vespere. This evening expectorated rapidly about a quart of fluid, floating innumerable cysts, more or less tinged with bile, from which this fluid matter had escaped. A few of these hydatids (though none of the larger ones) were found unbroken, about the size of a small grape, and filled with a liquid of an opaque colour somewhat resembling that occasionally seen in an addled egg, though not so dark, and of less consistence. In the efforts to evacuate these cysts he was much prostrated, and I found him sitting up, breathing with distress, and covered with profuse perspiration. On examining the chest rhonchi were heard over the base of right lung posteriorly, while over the left respiratory sounds presented nothing abnormal. About an ounce of dark grumous purulent-like discharge, derived from the right lung, was expectorated with the contents of the hydatid cysts. Wine was now administered to the extent of a few ounces, and a bandage was applied to support the abdomen.

August 17th.—During the night expectorated more than a pint of the same sort of fluid, though containing fewer cyst walls, but a much larger admixture of bile, which renders the matter of a green colour ; has recovered from the exhaustion of last evening. The pulse is now of some volume, and he expects to be able to eat something for breakfast.

August 18th.—Improvement is noticed, and he is able to sit up ; has expectorated about a pint of thin bilious fluid without cysts and free from purulency.

Vespere. Progresses favourably, and got off during the day about half a pint of dark-green bilious-looking fluid.

August 19th.—Little change is observed in general appearance, but he is yet weak and much reduced. Expectorated since yesterday about 4 ounces of tenacious mucus sputa with some degree of purulency.

August 20th.—Continues in the same state generally, and has expectorated about 5 ounces of muco-purulent fluid of a bitter taste.

August 21st.—Last evening the sputum was still muco-purulent and tenacious, but during the night this ceased to be coughed up, and he expectorated in its place about a pint or more of dark-green bile; pulse is soft and equable, and skin moist, spirits good, and appetite moderate. Yesterday auscultation elicited posteriorly a strong tubular sound in the act of coughing. From this date the improvement was steady and progressive, and the reports henceforward were less frequent.

August 23rd.—Expectoration continues copious; a tenacious mucus with slight trace of pus; once since last report half a pint of bilious-looking bitter fluid was coughed up; pulse is soft, and strength holds up.

August 29th.—General health has steadily improved, and his appetite is tolerably good, while there is no febrile excitement; has expectorated from half a pint to one pint daily of mucus with slight admixture of pus and a tinge of bile, and occasionally thin fluid bile.

September 6th.—No new features have been presented; health improves, and expectoration is somewhat less, and quite free from purulency, but still contains bile in more or less quantity; this is so bitter that violent coughing comes on, and breathing is almost suspended when a little of it finds its way into the œsophagus, while it is speedily ejected thence by vomiting.

September 14th.—Continues to improve, but he still expectorates a tenacious mucus mixed with bile to the extent of half a pint daily.

September 20th.—Expectoration decreases daily in amount, and now seldom contains a trace of bile; has gained seven pounds in weight since the 7th of the month.

September 27th.—No new symptoms are presented. He gains both weight and strength, but still expectorates mucus, which is occasionally tinged with bile.

October 6th.—There is now scarcely any expectoration of mucus or bile; general health is excellent, and he has gained six pounds in weight since the 20th September; but without following the case into further detail here, I may observe in conclusion that it is intended to recommend him to the Annual Invaliding Committee for change of

climate to England, as there is considerable deficiency of respiratory murmur with some condensation at the base of right lung, and he is not likely to be fit for the performance of active or laborious duty for some time to come.

It will be noticed that the subject of this case was admitted in the first instance under the head of colic, and that he suffered before the hydatids were dislodged, periodically from paroxysms of pain suggestive of the passage of gall-stones, though none were discovered in the evacuations by the medical officer who was first concerned with the case or by myself.

These paroxysms were, it appears, also a very prominent feature in the case recorded by Dr. Watson. "For eight or ten years (he observes), at intervals varying from ten to fourteen months, he (the patient) suffered a series of attacks precisely resembling such as are commonly produced by the passage of a biliary concretion through the excretory ducts of the liver. In May 1847, just after one of these attacks, while searching for a gall-stone, he discovered among the excretions from the bowels two or three small hydatids." The question therefore arises—is the occurrence of these writhing pains at intervals to be considered a symptom always common to the passage of gall-stones and the presence of hydatids in the liver; are we in practice, when such pains are complained of, to look to one or other of these causes for explanation; and if no gall-stones be found in the dejections, is it safe to assert the presence of hydatids? Such a conclusion would indeed add little to the comfort of the patient, but if justified by the result would undoubtedly increase the reputation of his physician. It remains only to add that in this case, as in that published by Dr. Watson, the urine was high-coloured, very scanty, and sometimes voided with a severe scalding sensation amounting to strangury; it is also desirable to state that the patient had not been at any former period affected with tape-worm.

No. 5.

*Case of Anæsthetic Leprosy, with post-mortem examination
and remarks.*—By H. V. CARTER, M.D.

Presented February, 1862.

A Mussulman, *ætat* 30, native of Dacca, but resident in Bombay, was admitted into the J. J. Hospital 8th December 1861, having for seven months (?) been affected with leprosy; is emaciated and weak. There is no abnormal appearance about the head beyond slight sinking of the nose; no anæsthesia in any part; the trunk also is free from disease. Both hands are affected; the fingers atrophied and superficially ulcerated; and there is complete anæsthesia extending some distance up the fore-arm. The feet and legs are similarly affected, and the great toe of the right foot is lost. Here the disease began, attacking the hands afterwards, and quite recently the face. Urine copious, pale; specific gravity 1003; free from albumen, slightly alkaline. The patient died of dysentery on January 7th.

Post-mortem examination.—No disease of the brain or spinal cord; the arachnoid of the latter, however, was studded with small ossific points, some placed near the posterior roots of the spinal nerves, but not calculated to affect them; this appearance may be regarded as a mere coincidence, and has not been again seen. No disease of the thoracic viscera; in the abdomen the kidneys were found small and mottled; sympathetic system normal; several Pacinian corpuscles of considerable size were seen at the root of the mesentery. The dysenteric appearances need not be here described, as there was nothing peculiar in them.

Upper extremity.—The nerves supplying the benumbed parts were diseased, viz. the lower part of the radial, the median above the wrist, and the ulnar at the elbow.

Lower extremity.—The external popliteal and its two main divisions, the external saphenous, the posterior tibial below, and to a less extent the internal saphenous, &c. were all diseased.

These nerves were enlarged, cord-like, firm, of a brownish semi-transparent hue, or mottled; the terminal branches were generally much atrophied. Measurements were taken and compared with those of corresponding healthy nerves. Further examination showed that the neurilemma was unaffected; the funiculi or nerve-cords were themselves the seat of these changes, which are owing to the deposit of a nucle-

ated fibrinous or albuminous material between the individual nerve-tubules, compressing and destroying them: this new formation has striking and peculiar characters, which however are not quite the same in recent and in chronic cases. A similar material has been found in the parts affected with tubercular leprosy.

Remarks.—This case completely demonstrates that the anæsthesia—the characteristic feature of all varieties of leprosy—is owing to a diseased condition which is confined to the nerves supplying the benumbed parts. The nerve-centres are not necessarily affected. These conclusions have been abundantly confirmed by the examination and dissection of six other cases of Leprosy, mostly of the anæsthetic form. The enlargement of the Pacinian corpuscles above referred to has never before been noticed, but it is by no means uncommon, being only a part of the general affection of the nervous system; a dissected hand, with notes, was laid before the Medical and Physical Society in September 1860, and the preparation, showing very numerous large Pacinian corpuscles, is now in the Pathological Museum of the Medical College. The preceding case, with full description and illustrations was also presented to the Society more recently, and it is believed that the minute morbid anatomy of Leprosy was then described for the first time, as the only other observers (Messrs. Danielssen and Boeck, in Norway) who have given any details concerning this subject, do not seem to have made use of the microscope. When the whole subject of leprosy shall be more fully inquired into than is yet possible, these changes and others equally characteristic affecting the bones, &c. will be described in detail; already it appears that leprosy in India differs in many respects from the same disease in Europe, and also from various syphilitic affections with which it may be compared. The principal data upon which my investigations have been founded are derived from the patients in the Dhurmsala, in Bombay, where nearly 100 lepers are resident, and also from the patients of the J. J. Hospital and Male Dispensary; information is yet much needed on the premonitory symptoms and early stages of the disease, which those favourably placed might perhaps be induced to furnish, so that this wide-spread and fearful malady shall no longer remain an ignored subject. Its pathological interest is considerable, as it is probably the only disease known which is confined (if we may except the renal organs) to the nerves and the sentient skin; and physiologically it claims attention as illustrating, often very forcibly, the effects of suspended nervous influence upon the tissues, such as are witnessed in the distortion and destruction of the extremities which render lepers such pitiable objects.

Note on Distoma hepaticum.—By H. V. CARTER, M.D.

Presented August, 1861.

ON account of the great rarity of this species of Entozoon in the human subject, it may be worth while to briefly notice the following instance of its occurrence. Last July four specimens were brought to the College by Mr. Atmaram Pandoorung, which had just been ejected from the stomach of a patient of his. She was a young Hindoo in an advanced state of pregnancy; there were no accompanying symptoms, and on no other occasion, before or since, have other distomata been voided. On inquiring as to the nature of the diet and drink, nothing was elicited that could throw light on the subject, and no other member of the household was similarly effected; the interest of the case is therefore purely one of natural history.

It is stated that the entozoa were of a reddish colour, like raw meat, when first seen, and that they then exhibited active movements. All four were much alike, the average size $1\frac{1}{2}$ inch by $\frac{2}{3}$ inch, shape elongated and lanceolate at the anterior extremity, the opposite being somewhat rounded; flattened. Present colour reddish-yellow, or light-brown; surface minutely wrinkled, margins corrugated, thin and wavy; the mouth, placed on a small papilla measuring $\frac{1}{40}$ in. in diameter, surrounded by a sheath-like groove and looking forwards, is very minute, and slightly oval; about $\frac{1}{20}$ in. behind it is the sucker, the oval aperture of which measured $\frac{1}{25}$ in. and is surrounded by a slightly-raised lip; its depth is considerable. The genital pore is a very minute transverse slit-like aperture, containing a curved body (the intro-mittent organ), and is placed somewhat nearer the sucker than the mouth. A simple dissections by means of needles shows the ventral sucker to be of comparatively large size and almost bell-shaped, being at first globular and then quickly becoming more pointed at the cæcal extremity. Connected with the genital pore is a long delicate tube which leads to a convoluted expansion (oviduct?), and near this is a separate irregularly-shaped sac, which seems to communicate with the tube, and may perhaps be regarded as belonging to the male organs of the hemaphiodite creature. The mouth opens into a globular muscular pharynx, from which the alimentary canals pass off: the opening belonging to

the so-called water-vascular system was not seen. In the parenchyma of the body *ova* were readily found: one is figured above, its length was $\frac{1}{150}$ inch, at one end the outer, transparent, elastic, and delicate coat is wanting, and the nucleated yellowish yolk was perfectly visible within. I have appended two simple but tolerably accurate figures in illustration of the above remarks, and comparing these and others in my possession, with those of Dr. Budd, &c. some differences are to be noticed. Dr. S. Cobbold (Intellectual Observer, No. 2, p. 117) gives a plate copied from Blanchard, which shows a very different external form; and Owen's the same (Lectures on the Invertebrata, ed. 2nd, p. 80); Owen states that the anterior extremity is broader and rounder, the posterior attenuated, but the specimens in my possession present rather an opposite configuration. Dr. Cobbold states that the outer coat or chorion of the ovum is of a yellow brown colour, on the contrary I find it very delicate and transparent: his figure, too, of the hooklets which are imbedded in the skin by no means corresponds with what I observe. I find these little bodies have very much the shape of a lancet, convex from side to side and also in the antero-posterior direction, so that the dorsum is everywhere rounded; about half (the pointed end) is free, the rest is imbedded in the nucleated integument and terminated by a wavy basal line: the entire length is about $\frac{1}{400}$ in. average breadth $\frac{1}{1500}$: one edge appears thicker than the other. They are confined to the ventral surface; are obliquely placed, and very numerous. One cannot help being reminded by this singular apparatus of the hooklets found around the head of Cystoid and Cystic entozoa, nor can we doubt their office is the same, namely that of enabling the parasite to advance. The above-mentioned points of difference are worthy of notice, if others should hereafter be found, a question of the identity of my specimens with *D. hepaticum* might be raised. I find, too, similar discrepancies, or nearly so, between the Indian distome and that described by authors in Europe, have been previously pointed by Medical Officers in this country; thus for instance, in an elaborate Topographic account of the district of Dacca by surgeon J. Taylor, a species of *Distoma*, which is very prevalent (more so than *Tænia* the native doctors say), and gives rise to several serious complaints, as epilepsy, colic, and dropsy, is referred to as differing from *D. hepaticum* in the more closely approximated position of the pores, the larger size and more obtuse shape of the anterior (?) extremity of the body, which latter is also thinner and firmer. The author proposes the name *Distoma Intestinale* for this entozoon, its habitat

being the small intestines; but this circumstance is of too slight importance to furnish a specific character: the features previously noticed, however, confirm the impression that our species is not identical with the common liver fluke of Europe. *Vide* Plate 3, fig. 5.

The following additional remarks may be interesting: as to mode of propagation, the ova give birth to ciliated animals (like infusoria) in which is developed a cyst; these cysts are called sporo-cysts or nurses, and in them are formed the young distomata or cercaria; these latter are furnished with a tail and sometimes resemble in form, &c. a tadpole. The sporo-cysts are parasitic; the cercaria are generally free, and though commonly swallowed by molluses (fresh-water snails, &c.) do not develop themselves in their interior, but become encysted and afterward pass with the mollusc into the body of some vertebrate animal, where they lose the tail and acquire a generative apparatus and so becoming distomas, produce other ova, which being expelled pass through the same metamorphoses. The cercaria of distoma hepaticum is probably introduced into the body in the water drunk; various mammalia are infested, chiefly ruminants, and most frequently the sheep. (*Zoologie Medicale, Vol. II, by Gendrin and Van Beneden.*)

A list of other animals which are the occasional seat of this entozoon is given by Dr. Cobbold (*loc. cit.*); as regards man himself, see Budd on the Liver, ed. 2: Dr. Cobbold also refers to cases where the parasite was found elsewhere than in the liver, for instance, in the sole of the foot, and beneath the scalp; with reference to these latter cases, he says "there is every reason to believe that all these entozoa are referable to the species under consideration" (which he calls *Fasciola hepatica*, the 'old original' name): Owen however states that it is peculiar to the biliary ducts and gall-bladder, passing thence into the intestine, and Budd's statements are to the same effect.

In conclusion, there appears to be reason for regarding common salt as a preventative, when mixed with the food, at least sheep and cattle feeding in salt-water marshes are rarely affected with the *rot*, and salt is a useful remedy; the deficiency of it may have been the cause of the occurrence of Distoma in the case above related, and also of its prevalence at Dacca.

No. 7.

Notes on the Medical Topography of Sind, being portions of the Annual Medical Report on the Sind Division of the Army.—By Deputy Inspector General of Hospitals C. F. COLLIER, Esq.

Presented by the Principal Inspector General Medical Department.

KURRACHEE.

Situated at the extreme north end of the Indian Ocean, the Gulf of Persia on its west, that of Cutch on the east, the Delta of the Indus in close proximity, the maritime cantonment of Kurrachee is destined ere long to become very important by its commerce, especially if its harbour is improved. It is less on that account, however, than that it is likely to form a large Military Station, that the present medical topography has been sketched. The railway will shortly facilitate the rapid movement of troops; the Indus affords a ready transport for stores and ammunitions, not only throughout Sind, but to the north-west and the Punjab.

Kurrachee may be deemed a healthy station, but the province of Sind is decidedly very unhealthy. While pointing out the causes, I cannot enough dwell on the fact that by sanitary measures a locality may be rendered comparatively healthy even in unhealthy districts. The average temperature of Sind is higher than any part of India, and there are no periodical rains to mitigate it. It has but two seasons, the hot and cold, and these rapidly merge in each other, lasting respectively six months. The long-continued heat is not only a direct source of disease, but by producing debility renders individuals very susceptible to the annual fevers which follow the hot season upon the fall of the Indus. Swelled by the melting snows of the Afghanistan mountains and its tributaries from the Punjab, &c. the river overflows a vast tract of country on each side. Subsiding in September it leaves to the soil all the conditions essential for the rapid evolution of malaria, and fevers with their sequels ensue. From November to April the climate is far more healthy. There are diseases resulting from long intense heat, less prevalent indeed than fevers, but far more formidable. The march of Europeans during the heat of May and June in Sind, and away from the revigorating sea breeze, is simply murderous. They die of insolation, congestion of the brain, or of a remittent fever, ending in apoplexy or assuming a typhoid malignant type, even if marching at a

later period; whilst immediately preceding the season of fevers, the men's constitution, are badly prepared to resist malaria. It is clear that whatever may be done to diminish the danger and prevalence of disease yet the causes originating in extreme heat and inundations cannot be removed, and hence sanitary cares cannot be relaxed for a moment. Under such circumstances a locality must be sought for troops where the fierce heat is tempered by a sea breeze, and where the soil is most free from malaria. Unfortunately the sea-board of Sind is of no great extent.

Kurrachee fulfils the first condition, and may be made to accomplish the other. It should be, as it is, the Head Quarters of the Force, and if it be deemed essential to locate European Troops at Hyderabad, or other stations, they should be limited in number, frequently relieved, whilst their quarters claim the incessant vigilance of Military and Medical Officers.

The military cantonment of Kurrachee is on a gently sloping plain, surrounded like an amphitheatre on the north by hills of considerable elevation, which dwindle into mere hilly ridges towards the east, terminating in the rocky range called Clifton. The site of Kurrachee faces the sea and harbour on the south.

Of the geological formation of the mountains and ridges around, it need only be said that they are composed of coralline, nummulitic, and fossil shell, bearing lime, resting in some places on sandstone. The detritus of these rocks, their decomposition into pebbles, gravel, sand, and clay, form the soil of the plain. Such a soil is favourable to the absorption of surface water, while the gentle slope of the plain towards the sea speedily turns into the latter any sudden accumulation from the rains.

Wells dug in such geological strata will contain only brackish water, holding lime in solution, and having a purgative quality. It is certain that wells containing tolerable water are all dug in the proximity of the river Siaree, which rises in the hills of the north, passes by the Government garden, the jail, town, and empties itself in the harbour. The Siaree is a considerable stream during heavy rains, but is dry by far the greatest portion of the year, still water percolates beneath its bed, and may be reached a few feet below the surface. The boring for Artesian wells would meet with but doubtful success, and has been very partially tried. Three plans have been suggested:—one, to make a navigable canal to Jerruck, which would bring the water of the Indus to Kurrachee, and

promote commercial enterprize ; another is, to obtain the water from the Muller river north of the cantonment, and at an elevation of some 150 feet from the foot of the church ; and finally, the one suggested by Colonel Turner, which would secure an unlimited supply of very pure fluid from the Hubb river. Among the hills, some six miles north of Kurrathee at Muggurpeer, are hot springs said to be salutary in certain diseases, and in one of which the water reaches a temperature of 120°.

The collection of these springs form a tank, the domicile of many alligators, fed by the voluntary contribution of goats. It is one of the rights of the neighbourhood, and curiosity is indulged at the expense of sundry limbs torn from poor men by the rapacious brutes, as the records of the Civil Hospital will show.

To the favourable description of the site of the Kurrachee cantonment there is a drawback. Between it and the sea there is an extensive swamp, some five or six square miles in extent ; the tides come over this within less than a mile from Camp, and at each ebb leave an accumulation of animal and vegetable remains to decompose beneath the rays of the sun ; some water courses loaded with filth empty themselves in it, and its oozy mud is at times fœtid in the extreme. The entrance of the sea into this swamp is by a creek between Clifton and the harbour, of no great depth or breadth, and it would be well to ascertain the best means (if practicable) to fill up or dry this unhealthy marsh. The property of trees to decompose mephitic exhalations might in the meanwhile be made useful. A belt of trees on the camp side of the swamp might correct in a degree its baneful influence.

The cold season comprises a period from the end of October to the middle of March, with an average minimum temperature of 61° and maximum of 72°. The hot season shows an average minimum of 80° and maximum of 88°. The heat is much mitigated by the clouded sky and south west breeze which usher the Indian monsoon, although without periodical rains heavy showers not unfrequently fall at Kurrachee about that period. The hygrometer betrays great humidity of the atmosphere which, in the months of September and October, shows itself in morning fogs and night dews, November being the driest month of the year. The temperate and cold seasons ensue, which are chiefly remarkable for occasional dust storms ; and, in January, for heavy showers.

This general description of meteorological changes must not be taken as a constant rule for Kurrachee, or as one applicable 20 miles inland

from the sea coast. The climate of this locality is extremely changeable. During the prevalence of a land wind the dew drop on the hygrometer can scarcely be obtained, and this is accounted for by the saline nature of the soil which rapidly absorbs humidity. A sea breeze arises and saturates the atmosphere rapidly.

The sudden changes of the thermometer are at times very singular, and the rise and fall of the barometer equally so. The maximum pressure on the latter is 30·138 in December, and 29·602 in July. A long observation induces me to think the climate liable to rapid changes of temperature from a turbulent atmosphere, depending on the peculiar locality of Kurrachee and geographical surroundings.

Medical men will readily understand what influence such a climate may have in originating disease, and also on the progress of maladies it did not cause. The functions of the skin are liable to be suddenly checked while perspiration is profuse, and congestion follows in predisposed organs. Hence diarrhœa, dysentery, catarrh, &c. which somewhat prevail. The cure of rheumatism from the same cause is greatly protracted or fails, and as a sequence valvular disease of the heart is induced. Phthisis, too, is not unfrequent, and becomes rapidly fatal.

I dwell on these results of climate to urge the best means of obviating them. Substantial, lofty, and well-ventilated barracks will secure a pure atmosphere and more equal temperature ; the drainage and cleanliness of camp its salubrity. On these latter conditions every facility and assistance have, to the honour of the military authorities, been given in cantonment ; but in the town and harbour there is much to improve.

Epidemic cholera during the hot weather was of frequent occurrence at Kurrachee long before, and in the early years, of our conquest. In 1846 its visitation in Her Majesty's 86th Regiment was very disastrous ; it was preceded by a dust-storm blowing from the town, and observed by many as extremely fœtid. Cholera appeared a few months ago epidemical in the surrounding villages and the town, but only sporadic cases occurred in the cantonment, and it was remarkable of these cases that the individuals (Europeans) came mostly from the harbour. Every precaution was taken in camp, but the municipal regulations were but little enforced, or scavengers encouraged, and at the very time putrid fish and meat were sold in the bazars, circumstances which I brought to the notice of the Civil authorities. As a fact, however, it may be taken that cholera is of rare occurrence at Kurrachee.

During the hot season there are occasional cases of insolation, of apoplexy, of congestion of the brain, and the fevers at that time are remarkable for cerebral and hepatic complications.

The subsidence of the Indus, the drying up of swamps, and decomposition of vast accumulations of vegetable matter in the end of September, although occurring at a distance from Kurrachee, have a remote influence on health there, and bring on intermittent and remittent fevers, and their sequels of enlarged spleens, morbid hepatic functions, and relapses, inducing permanent debility.

The cold weather supervenes the hot almost suddenly, and those exhausted by fever become liable to diarrhœa, dysentery, and other diseases of the mucous membranes, as catarrh, &c., &c. But I have observed a form of subacute bronchitis among sepoys who have long suffered from fever, which is very suddenly and frequently fatal among them. Rheumatism is also prevalent at this time. To the mass, however, the cold season proves reinvigorating, and secures to many immunity from disease; but my remarks have been of little value, if they have not pointed out the urgency of judicious clothing for the troops in so variable a climate.

HYDRABAD.

The distance of Hyderabad from the sea, its immediate proximity to the Indus, must subject it to a greater and more prolonged heat, and also to the endemic fever usual on the fall of the great river. I was stationed in the entrenched camp on the river shore in 1844 and 1845, and in my regiment officers and men were prostrate with fever during the autumnal months of each year. The large force in the cantonment around suffered also very severely, though, as compared to the proportion of sick, there were but few deaths. Both years had been remarkable for heavy falls of rain, and to such falls have been traced an increase of sickness in the province. The intermittent and remittent fevers of Sind rarely run into the typhoid type, or are so severe as in Gujarat. Prevailing strong winds, sand-storms, and other atmospheric changes, probably tend to dilute miasma and reduce its baneful effects on man. Again, it must be considered that the two years to which I allude above, were those of the conquest of the country, and that many unavoidable circumstances tended to deteriorate the atmosphere. Since then some seasons have been worse than others, yet the climate of Hyderabad cannot, in my humble opinion, be deemed an irreclaimable one.

It is a most pernicious, no less than an unfounded but prevailing notion, that because a district is unhealthy we may not render a locality in it better. Much remains to be known of the laws of a mephitic atmosphere, but this at least is certain, that in this country its deleterious effects do not extend much beyond 800 feet in circumference from its source. The reasonable deduction is, therefore, that a locality may in a great measure be saved from deleterious exhalations. It has also been well observed that the intensity of miasma from any swamp is in proportion to the speed with which foul water dries; *2nd*, to the want of free ventilation to disperse it; *3rd*, to the concentration it acquires from a check to the ventilation; and *4th*, to the want of large trees to decompose it. If these results of experience are well borne in mind means may be taken to modify the effects of malaria, surface water must be allowed no where to accumulate. If tanks are essential they must be deepened that they may subside slowly, wells must be frequently drawn, and a parapet to prevent dirt, leaves, or any other source of animal or vegetable decay to accumulate in them. Large trees decompose mephitic gases effectually. The latter are seen to stick to them like shrouds, and gradually disappear, and they should be encouraged between Hyderabad and the Indus, but the lower branches intercept the circulation of air: what so reasonable as to lop them off? It is the lower shrubs and rank vegetation which rapidly decay. It is these which must be constantly removed where they appear. But Hyderabad and its cantonment are principally built on a low range of table-lands of lime, which appear as if they had been upheaved from the alluvium of the Indus. There, when the wind blows from the direction of the river, mephitic vapours accumulate at their base. In such situations I have known regiments decimated, while in fancied security from the malaria of the lower marshes. The baneful exhalations checked but to concentrate, soon prove their existence by spreading disease where it was imagined the height of the table-land conferred immunity; every means in such a case must be tried to create draughts of air, to burn fires at the base of the hills, and above all to prevent dwellings being built on the verge of the table-lands, immediately over the direction of the river.

In the fort of Hyderabad, in the town, in the cantonments, cleanliness, the removal of surface water by drains (so easy from their raised position), wide streets, should be obtained at any price; and to insure free ventilation the peremptory removal of dirty huts, of crumbling walls, of ruined little inclosures, all mere receptacles of filth, should be insisted on.

In fact, stringent sanitary regulations to insure the welfare of the many, all this may be obtained by energy on the part of the authorities concerned. In the lower plains at the base, there are great but not insurmountable difficulties. Here and there a little morass resulting from rain, or the overflowing of the Fullallee. The very slight inclination of the plain towards the Indus is indeed a great obstacle, but from all I have observed not such as our intelligent engineers cannot remove. I have no doubt that by proper measures Hyderabad and its cantonment may be made comparatively healthy, but the care must be unrestricted and unremitted.

In the hot season there are results from exposure to the sun which must be guarded against. The long exposure of European, or even native soldiers, to a brass sky, and vertical rays of the sun, cannot be met with impunity.

A frightful mortality among the soldiers of Her Majesty's 86th Regiment took place at Hyderabad from insolation. An illustrious and in every respect a well-intentioned General, Sir Charles Napier, sent for me and attributed the death of many soldiers to bad treatment in hospital. An explanation proved to him that it was the result of exposure to the sun of a guard of honour intended for the reception of the Chiefs in Sind. Immediate were the orders, and immediate was the stop of the calamity. The men were struck down as if by a sledge hammer. The pouring of cold water on their heads by a Bheestie from a mussuck, seemed the only cause of recovery in the few that were restored to life. Need I say that Commanding Officers cannot be too careful in exposing troops to the deadly influence of the sun in the hot season.

Heavy dews prevail, and are very pernicious to persons sleeping exposed to them. I have seen the sheets of a bed placed unscreened on a high terrace completely saturated by the dew, and careless as the soldier is in general of such matters, it behoves Medical officers to point out the risk and its prevention.

I have seen certain affections of the bronchia which appeared to me distinctly traceable to inhaling the impalpable dust of continual dust-storms. Many individuals have a chronic state of irritation of the mucous membranes lining the air tubes, and to such an atmosphere loaded with fine sand must prove injurious; observations are much needed on this subject, and I believe if the attention of Medical officers was called to it the result might prove interesting.

One last point I would notice respecting the evil of too long a residence at Hyderabad by European soldiers; some may escape fevers

or active diseases, but none will risk with impunity the prolonged high temperature of the climate : a premature debility of the system is sure to result. With greater means a Civil or Military officer may struggle by artificial appliances against it more or less, but the soldier has no such resources, and European corps should be frequently relieved.

SUKKUR.

A portion of the Halla range is prolonged to this place, rising abruptly from the alluvium on the west side of the Indus, dividing the river in two streams by a line of rocks, the largest of which forms the fort of Bukkur, and then extends to the town of Roree upon the eastern bank. The navigable channel is between Bukkur and Roree, that between Sukkur and the fort is very narrow, the current rapid, and, I believe, rarely used. The late Sir Charles Napier considered Sukkur a most important locality as a point of strategy. If possibly some political contingency may compel its re-occupation by British troops, it may not be irrelevant that I should give some details of its sanitary condition. As a permanent residence for soldiers former arrangements were very ill calculated, and this is the more singular that Sukkur appears to offer considerable advantages for the improvement of its unhealthy climate. The fearful results of disease among Her Majesty's 78th Highlanders in 1845 gave Sukkur a very bad reputation, but I think it is merely subject to the usual fevers and the trying hot seasons experienced at the other stations of Sind. The 78th regiment had been marched from Kurrachee to Sukkur at an unfavourable season, and arrived predisposed to the attacks of the October fevers. Their barracks were low and confined, and void of every appurtenance of comfort or ventilation. They had been built, it was said, upon old cemeteries, which had been used for generations by the inhabitants of Sukkur to bury their dead. The walls were of sun-dried bricks, and the mud for the building taken from the spot. Certainly such a site, and such materials used for barracks, might account for any amount of pestilence. Even if this last circumstance be an exaggeration, there remains quite enough mismanagement in the construction of the barracks and their appliances to explain the mortality of the unfortunate soldiers from malignant fevers which such a state of things was likely to foster. From the number of Officers who, being better lodged, and having better means of reducing temperature and ventilation, not one died, and very few were sick at all. This would appear very conclusive.

I have already pointed out in this report the means of checking miasma, and moderating the evil results of climate. These will not be obtained without expense, but the argument resolves itself to this, that if Sukkur, as indeed all Sind, is to be occupied by European troops too many precautions cannot be taken to preserve their healths. In the cantonment of Sukkur, the drainage is almost natural from the hills in the river. The superficial soil of the site of new barracks should be removed to the rock, and the buildings should be of stone or terraces, high, broad, well ventilated, and with wide verandahs to mitigate the heat and glaring light, &c., &c., &c.

SHIKARPOOR.

This cantonment is now almost deserted. There are but few European inhabitants, consisting of the Assistant Judge, Medical Officer, Engineer, and Lieutenant of Police.

JACOBABAD.

This station once called Khanghur, a desolate desert with three wells of salt water as the only salient points, and with scarcely a vestige of vegetation, is now a fine cantonment for four regiments of cavalry, two of infantry, and a mountain train. A fine canal brings water to this once sterile locality, and in the wells which have been dug the water has risen lately some two feet from its former level. Umbrageous trees have sprung up; fine houses have been built; wide bazars and good lines and hospital, &c. for the troops. The advent of this military colony, the excellent regulations adopted for its police and sanitary condition, have drawn a large increase of population, and I understand that agriculture is flourishing around. The whole locality is very clean; the buildings reared of dried mudbricks, with terraced roofs, are in good repair; and will remain so while carefully looked after, but once abandoned such buildings have no permanency.

The great drawback of Jacobabad is its climate, which is very trying. In the north-west a high range of hills surrounds it like a distant amphitheatre. On these hills (the Murree) I saw snow at the period of my inspection (in January), and the wind blowing from that quarter was very cold, but again such a position must in the hot season make the temperature very exhausting.

The mountain range must check the wind from the only quarter where it could be cool, and the tornados of dust and hot blasts from the alluvial plains of the south-east must be felt to be understood. The

truth is that the extremes of temperature are unhealthy. In the sickly season the malaria of the Indus is blown in the direction of this cantonment, and the proportion of admissions for fever is very large at the time, but one fact I must note, the number of deaths is much smaller, and the typhoid type of fevers more rare. Under the best view we can take of it, the climate is very exhausting, and induces a premature constitutional debility after a long residence.

I trust these rough general observations on the climates of military stations, the result of a long residence in Sind, will not be deemed tedious. I have sought to make them as short as I could consistently with their importance.

No. 8.

Case of Compression of the Brain. Communicated by ASSISTANT
SURGEON C. JOYNT, M.D.

Presented by the Principal Inspector General.

A healthy recruit, of the 2nd Regiment Light Cavalry, age about 21 years, was admitted into the Hospital at Rajcote at $\frac{1}{2}$ past 7 on the morning of the 8th January 1861, having been thrown from his horse whilst upon parade about half an hour before. The scalp on the left side of the occipital protuberance was contused, and cut in two places, but neither fracture nor depression could be detected. Symptoms of concussion were present, and he appeared in a state of great depression. When roused, he was capable of answering questions only to a very slight extent, and manifested considerable irritation when he was interfered with. He could not swallow. At 9 A.M. he was more insensible; pulse very weak. No reaction. At 11 A.M. the pupils were dilated and insensible to light; pulse still feeble, breathing stertorous and coma profound. In consultation with Dr. Pirie, the seat of injury was carefully examined, but neither fissure nor depression of bone could be found; the incisions made into the scalp bled freely: a strong purgative enema was administered. He was cupped to 9 oz. at the back of neck, and a blister applied. At $\frac{1}{2}$ past 4 P.M. reaction was apparently setting in, pulse had become distinct, the surface warm, but there was stertor; no action from the enema, which was repeated, and immediately afterwards, whilst being raised to have the blister dressed, the stertor ceased, the breathing suddenly became quicker, and then ceased altogether.

Post-mortem appearances 14 hours after death.—Rigor mortis well marked. Body well formed and muscular. On dissecting off the scalp it was found much contused for a space about as large as a crown piece a little to left of occipital protuberance. The pericranium was not denuded. A thin layer of fat existed beneath the scalp. On removing the calvarium, which was carefully done with a saw, not the smallest trace of injury to the cranium was found. The dura-mater was also uninjured, but bulged out, and was dark-coloured. On incising it, large coagula existed over the whole surface of the cerebrum, but slightly on left side. The right anterior lobe of the cerebrum was extensively lacerated and its structure broken down. The cerebral surface was elsewhere uninjured, the cerebral lesion having occurred precisely opposite the seat of injury.

No. 9.

Deaths reported to have occurred from the bites of Scorpions.

In the diaries of the Superintendent of Police, Rutnagherry, three deaths were reported to have taken place from the effect of Scorpion bites.

1. *20th May* 1861. In Kelondey, Talooka Unjunwell, it was reported that a Maratha male, age about 30 years, was stung on the foot by a Scorpion, became insensible, and died within an hour of infliction of the bite.

2. *15th June* 1861. In Boregaum, Talooka Unjunwell, Gunno, a Coonbee Boy, 15 years old, was bitten on the right foot by a scorpion whilst ploughing; he was affected with great difficulty of breathing, and died within two hours.

3. *13th July* 1861. In Doughler, Talooka Sevendroog, a Maratha man, 25 years old, and after becoming insensible died in an hour and a half.

No treatment was adopted in either case, but on each instance the Scorpion was killed.

ABSTRACT PROCEEDINGS
OF THE
MEETINGS OF THE MEDICAL AND PHYSICAL
SOCIETY,
FOR THE YEAR 1861.

No. 1.

MONTHLY MEETING HELD 2ND FEBRUARY 1861.

Present :

H. J. Carter, Esq., F.R.S., *Vice-President*, in the Chair.

Members.—T. B. Johnstone, M.D. ; C. C. Mead, Esq. ; R. Haines, M.B. ; G. C. M. Birdwood, M.D. ; and W. C. Coles, M.D., *Secretary*.

The proceedings of the last meeting, held on the 1st December 1860, were read and confirmed.

A letter was read from Assistant Surgeon W. A. Shepherd, applying to become a member of the Society under Regulation V., agreeably to which he was declared to be admitted. From Assistant Surgeon H. R. McDougall, requesting to be allowed to withdraw from the Society. From the Superintendent Government Observatory, forwarding the "Meteorological Observations for 1859."

The first paper brought before the meeting was the "Annual Report of the Mount Aboo Sanitarium, ending 31st December 1860," by Assistant Surgeon Moore, M.D.

A report of a case of *Hydrophobia*, with a novel method of treatment by Dr. Moore, was then read (see Vol. VI. p. xxx. Appendix).

Notes of a few Medical and Surgical cases by Assistant Surgeon J. M. Barnett, whilst on field service, Kattywar, were then communicated.

Dr. Birdwood showed a specimen of *Gentian*, forwarded by Dr. Broughton from Mahableshwar, which was considered undescribed until the appearance of Dr. Gibson's and Mr. Dalzell's work on Botany, published a few days since, and named by the latter "*Ophilia Multiflora*" (see Vol. VI. p. lviii. Appendix).

After the best thanks of the Society and been accorded to the contributors of Papers, the meeting was adjourned to Saturday the 2nd March.

No. 2.

MONTHLY MEETING HELD 2ND MARCH 1861.

Present :

A. H. Leith, M.D., *President*, in the Chair.

J. Peet, M.D., F.R.C.P., *Vice-President*.

Members.—W. Arbuckle, M.D.; H. D. Glasse, Esq.; C. C. Mead, Esq.; G. C. M. Birdwood, M.D.; G. C. Bell, M.D.; and W. C. Coles, M.D., *Secretary*.

The proceedings of the last meeting held on the 2nd February 1861 were read and confirmed.

A letter was read from Dr. Waring, Trevandrum, intimating the despatch of several publications as presents to the Society, which have not however yet come to hand.

The third Number of the "Madras Quarterly Journal," four numbers of the "British Medical Journal," and two copies of the "Indian Lancet" were laid on the table, having been received since the last meeting.

A letter was read from J. St. C. Woollorton, Esq., President of the Managing Committee of the Byculia Library, applying for copies of the Transactions (New Series). The request was referred to the Committee for disposal.

Dr. Birdwood read a highly valuable and interesting paper "on the introduction of the Cinchona plant into India," presented by Clement R. Markham, Esq., F.R.G.S.* In this paper an account is given of the nature of those forests in South America, of which the Cinchona trees are natives, and the conclusions at which Mr. Markham has arrived, after examining some of the hill districts of the India Peninsula, regarding the localities which are likely to be most suitable for the culture of plants in this country. Details are entered into respecting

* See p. 333, vol. 6, new series.

the causes which have made this measure so important, a review is taken of former attempts to introduce the Cinchona, and the measures adopted by Mr. Markham for the conduct of this important experiment described with the present prospect of final success.

The Secretary then read some extracts from reports on the use of large doses of arsenic in the treatment of uncomplicated intermittent fever, which will, with other reports, now due, be hereafter analysed and arranged.

After the best thanks of the meeting had been voted to Mr. Markham, for kindly forwarding his paper to the Society, the President announced that the usual recess of three months was about to take place, and that the next meeting would be held on Saturday, 6th July 1861.

No. 3.

MONTHLY MEETING HELD 6TH JULY 1861.

Present :

A. H. Leith, M.D., *President*, in the Chair.

H. J. Carter, Esq., F.R.S., and J. Peet, M.D., F.R.C.P., *Vice-Presidents*.

Members.—W. Campbell, M.D.; W. G. Hunter, Esq.; G. C. M. Birdwood, M.D.; H. V. Carter, M.D.; and W. C. Coles, M.D., *Secretary*.

The proceedings of the last meeting, held on the 2nd March, were read and confirmed.

Letters were read from the Librarians of the undermentioned Institutions, acknowledging the receipt of the 5th Volume of the Transactions for 1859: the "University of Aberdeen;" "King's College, London;" "London Hospital;" "Royal Medical and Chirurgical Society, London;" "Trinity College, Dublin;" "Royal Society, London." From the President Managing Committee of the Byculla Library, acknowledging the receipt of a set of the Transactions. From the Principal, Grant Medical College, acknowledging having received the 6th Volume of the Transactions, viz. that for the year 1860.

A letter was read from E. Impey, Esq., dated 6th March, requesting, on account of his continued and prolonged absence from Bombay, to be allowed to withdraw from the Society.

The presents laid upon the Table were the several numbers of the "Indian Lancet," the "London Medical Journal," and the "Dublin

Quarterly Journal" received since the last meeting. From Dr. Waring, Trevandrum, a work on the use of indigenous or bazar medicines as substitutes for articles of the *Materia Medica* derived from Europe, and a pamphlet on "Indigenous Anthelmintics." From the Principal Inspector General, Medical Department, Report on Vaccination for 1858 and 1859. A Report on the extent and nature of the sanitary establishments for European troops, in the Bengal, Madras, and Bombay Presidencies. Publications of the General Board of Health, London, and a list of the Fellows, Members, Licentiates, and Extra Licentiates of the Royal College of Physicians, London.

The Secretary stated that the 6th Volume of the Transactions was issued on the 1st June, and that copies had been furnished to all subscribers in this country. About 75 presentation copies had been forwarded to England, to be distributed to retired Members—Honorary Members—and to the numerous Societies and Institutions in Great Britain; and that a complete set of both the old and new series had been presented to the Army Medical School, Chatham.

A paper, presented by the Principal Inspector General Medical Department, entitled "Special considerations on the health of European Troops," by Dr. Grierson, M.D., Staff Surgeon, Kurrachee, was then read (see p. 1 ante).

An interesting case was then read, forwarded by Assistant Surgeon Joynt, Scinde Horse, of the death of a recruit of the 2nd Cavalry following a blow on the head in which no external injury could be perceived, or fracture detected, but in which after death laceration of the brain was discovered (see p. xlii. ante).

After the best thanks of the meeting had been accorded to the contributors, it was adjourned to Saturday, 3rd August 1861.

No. 4.

MONTHLY MEETING HELD 3RD AUGUST 1861.

Present :

A. H. Leith, M.D., *President*, in the Chair.

H. J. Carter, Esq., F.R.S., and J. Peet, M.D., F.R.C.P., *Vice-Presidents*.

Members.—W. Arbuckle, M.D.; W. Campbell, M.D.; T. Crawford, M.D., 18th Royal Irish Regiment; R. Haines, M.B.; G. R. Ballingall, M.D.; J. Welsh, Esq.; T. Diver, M.D.; Ponsomby Adair, Esq.; and W. C. Coles, M.D., *Secretary*.

The proceedings of the last meeting, held on the 6th July, were read and confirmed. Letters were read from the Registrar of the Royal College of Physicians, London, acknowledging the receipt of the 5th Volume of the Transactions of the Society. From the Secretary to the Bombay Mechanics' Institution; from the Principal Grant Medical College; from Assistant Surgeons J. M. Barnett, and H. C. Kingstone, M.D.

The presents laid upon the table were four numbers of the "British Medical Journal" received since last meeting, one number of the "Chemist and Druggist," "the Annual Report of the Grant Medical College," "Transactions of the Epidemiological Society of London," Vol. I. Part I., and the July No. of the "Madras Quarterly Journal of Medical Science."

Assistant Surgeon Kingstone was duly proposed and elected a Member of the Society under Regulation No. 5. Assistant Surgeons P. S. Turnbull, M. D., and H. A. Lewis, were elected Members for two years, on admission into the service under Regulation No. 6.

The first paper presented to the notice of the meeting was the Annual Report of the Sanitarium, Poorundhur, ending December 1860 (see p. 45 ante), by Assistant Surgeon W. A. Shepherd, in medical charge, and forwarded by the Principal Inspector General. This is a very elaborate and comprehensive Report, consisting 1st, of an Historical Sketch of Poorundhur; 2nd, a description of the present Hill Sanitarium, as respects barracks, accommodation, &c.; 3rd, on the climate and productions of Poorundhur; 4th, the medical history of the year 1860; and lastly, the changes which have taken place during the year, with observations thereon. From the report, it appears that since 1852, Poorundhur has been under six different Commandants, and nine Medical Officers. That from 1856 to the end of 1860, nearly 2,000 European soldiers have been treated on the Hill as patients, about 1,500 of whom were returned to duty as cured, 29 died, and about 330 sent away as cases unsuited to the climate. On the 1st January 1861 there were 97 convalescents at Poorundhur.

A paper by Dr. W. J. Moore, in medical charge of Mount Aboo, was then read, in which he treated separately, and fully, of three affections incident to tropical countries, viz. of a masked form of malarious fever; of congestion of the spleen; and of local cachexia. After fully discussing the question of *malaria*, the author gives a description of the symptoms of, and effects produced by, malarious fever in a masked form. To the statement, that the circulation was not excited in this

form of fever, some exception was taken by the meeting, as it was contended that there could be no fever without some such excitement. In the accurate and graphic description of the symptoms and effects of splenic engorgement and local cachexia, the meeting fully agreed, and felt indebted to Dr. Moore for bringing before them a paper possessing so much interest and originality (see p. 94 ante).

After some discussion on the several points noticed in the above paper, specimens of *Distoma hepaticum* from the human subject, and a beautiful drawing of the same by Dr. H. V. Carter, were placed on the table, and his notes thereon read.

The meeting separated after the usual vote of thanks to the contributors of papers, and was adjourned to Saturday, the 6th September 1861.

No. 5.

MONTHLY MEETING HELD 7TH SEPTEMBER 1861.

Present :

A. H. Leith, M.D., *President*, in the Chair.

H. J. Carter, Esq., F.R.S. ; and J. Peet, M.D., F.R.C.P.,
Vice-Presidents.

Members.—W. Arbuckle, M.D. ; W. Campbell, M.D. ; T. B. Johnstone, M.D. ; T. Diver, M.D. ; R. Haines, M.D. ; W. G. Hunter, Esq. ; G. C. M. Birdwood, M.D. ; Ponsomby Adair, Esq. ; and W. C. Coles, M.D., *Secretary.*

The proceedings of the last meeting were read and confirmed. Letters were read from several members on the ordinary business of the Society, and acknowledging the receipt of the last volume of the *Transactions*.

Four numbers of the "British Medical Journal," and three numbers of the "Indian Lancet," received since the last meeting were laid upon the table.

The first paper presented to the notice of the meeting was the Annual Return and Report of the 1st Battalion 4th (King's Own) Regiment, by Surgeon Gorringe, presented by the Principal Inspector General (see p. 105 ante).

Portion of some general and medical notes on Larkhana, by Mr. Assistant Apothecary Vincent DeSouza, were then read, which being drawn up with great care, possess considerable interest, and are highly creditable to Mr. DeSouza's industry and ability.

Mr. Carter then brought forward an interesting and rare case of "Melanosis of the Eye," and exhibited a portion of the melanotic tumour which had been removed. This led to a discussion amongst the members as to the true nature of Melanosis, and in which it differed from the varieties of cancer.

Three instances of reputed deaths from scorpion bites in the Rutnagherry Zilla were then related to the meeting, having been kindly forwarded by the Revenue Commissioner, Southern Division, through Dr. Arbuckle. They are alleged to have occurred in May, June, and July last; two in the Unjenwel, and one in Sevendroog Talookas. One individual died, it is said, within an hour, another within one hour and a half, and the third lived two hours, after having been bitten by the common Scorpion, each in the foot, whilst the men were ploughing in the fields.

The President remarked that he knew of a well-authenticated case of death following upon a Scorpion bite.

An instance of death from "Snake bite" at the Gogo Dispensary, which occurred in June, was then read, as also an account of some wounds inflicted upon children by a dog supposed to be rabid, in which Mr. Anding, the Apothecary in charge, was making use of a supposed specific, or a prophylactic against hydrophobia.

After the best thanks of the meeting had been accorded to the contributors, it was adjourned to Saturday, 5th October 1861.

No. 6.

MONTHLY MEETING HELD 5TH OCTOBER 1861.

Present :

A. H. Leith, M.D., *President*, in the Chair.

H. J. Carter, Esq., F.R.S., and J. Peet, M.D., F.R.C.P., *Vice-Presidents*.

Members.—W. Arbuckle, M.D. ; W. Campbell, M.D. ; R. Haines, M.B. ; J. Welsh, Esq. ; T. Diver, M.D. ; G. C. M. Birdwood, M.D. ; G. C. Bell, M.D. ; and W. C. Coles, M.D., *Secretary*.

The proceedings of the last meeting were read and confirmed. A letter from the Secretary to the Geographical Society, dated 23rd September, acknowledging the receipt of the last volume of the *Transactions*, was read, and four numbers of the "British Medical Journal" were laid upon the table, received since the last meeting.

The first paper read was on "Hyptalgia," or "Neuralgia" of the Liver, by Assistant Surgeon W. J. Moore, M.D., Aboo Sanitarium (see p. 84 ante).

The writer, after remarking upon the almost entire absence of any recorded opinions on the subject, and the silence of nearly all authors (with the exception of Dr. Copland) on Medicine or on Indian diseases regarding Neuralgia of the Liver, proceeds to consider the affection under the symptoms by which it is characterised, the diseases for which it may be mistaken, and those with which it may be associated, entering fully into a consideration of each with a view to a correct diagnosis. The causes of neuralgia or nervous pain in the liver, are then enumerated, and the appropriate treatment of the disease described.

Several points in the paper were the subject of discussion by the meeting, and the experience of most Members went to show that the solar plexies of nerves, and particularly the hepatic plexies, were sometimes affected with Neuralgia. The President remarked that he had observed aquatidian form of neuralgia of the liver, evidently due to malarious origin.

Tables of the Health Statistics of the European Troops at the different stations of the Bombay Army for ten years, presented by the Principal Inspector General Medical Department, were laid before the meeting, and examined by Members (see p. 251 ante).

Mr. Carter then read a note "On the possibility of the Guinea Worm entering the human body in an embryo state through one of the sudorific ducts," which will be published in detail in the next volume of the Transactions. Mr. Carter stated that he had lately discovered "*Filarida*" entering into a fungus (a species of "*Xylaria*") which grows on the decaying trunks of Tamarind trees, for the purpose of nutriment, through apertures not exceeding the $\frac{1}{880}$ of an inch in diameter, and considered it a fair inference that the young of the Guinea Worm might enter the human body through the sudorific ducts, which are considerably larger than those just described, as he considers it almost fully established that the dracunculus cannot maintain an independent existence, but must be derived from some extraneous source. The specimens of "*Xylaria*" and drawings of the "*Filarida*" were placed on the table (see p. iii. Appendix ante).

A case of extensive sword cuts on a native female, by which the left arm and the right thumb were cut off, the scalp in several places laid bare, and the head almost severed from the neck, under the care of

Assistant Surgeon McDowall, was read. The patient slowly, but satisfactorily recovered, under the judicious treatment adopted.

An instance of the assumed good effect of Belladonna in poisoning by opium, which occurred at the Bhooj Dispensary, was read.

The President placed upon the table an interesting pathological specimen of disease of the spleen, and showed a portion of a stomach, on the anterior surface of which a needle was adhering to the omentum. The needle, however, had given rise to no symptoms during life to indicate its presence.

After the best thanks of the meeting had been accorded to the contributors, it was adjourned to Saturday, the 2nd November 1861.

No. 7.

MONTHLY MEETING HELD 9TH NOVEMBER 1861.

Present :

A. H. Leith, M.D., *President*, in the Chair.

H. J. Carter Esq., F.R.S., *Vice-President*.

Members.—W. Arbuckle, M.D. ; W. Campbell, M.D. ; T. B. Johnstone, M.D. ; T. Diver M.D. ; C. C. Mead, Esq. ; R. Haines, M.D. ; G. R. Ballingall, M.D. ; J. Welsh Esq. ; G. C. M. Birdwood, M.D. ; H. V. Carter, M.D. ; and W. C. Coles, M.D., *Secretary*.

The proceedings of the last meeting were read and confirmed.

The presents to the Library were laid on the table, viz. : the last number of the "Indian Annals of Medicine ;" Number VI. of the "Madras Quarterly Journal ;" four numbers of the "British Medical Journal ;" and "Deaths in Madras during 1859."

A letter was read from Surgeon W. Hanbury, H. M.'s 33rd Foot, dated 7th October, which was directed to be acknowledged with thanks for the communication which accompanied it.

Dr. Haines read a paper "On the extraction and estimation of some of the Crystalline principles of Opium" (see p. 222 ante).

In this paper were detailed the proceedings which had been adopted to extract and prepare *Hydrochlorate of Morphia* from a large quantity (360 lbs.) of damaged opium, which had long been in the Medical Stores. The quantity of morphia salt obtained varied from a minimum of 4½ to a maximum of 5½ per cent. of the opium used. The method by which the other crystalline principles, viz. *Narcotine*, *Codeia*, *Thebáia*, or *Paramorphia*, *Narceine*, and *Meconia*, were subsequently extracted

from the residue, was described, and the specimens of these principles in a pure state, exhibited. The paper concluded with a summary of the various methods recommended at different times for the estimation of the proportion of morphia in opium, and a description was given of certain modifications and improvements which had been introduced by the author into the process of O'Shaughnessy,—a process by which the proportion of the *Narcotine*, as well as of the *Morphia*, are both shown. By the improved method, these principles were obtained at once in a crystalline form. The *Narcotine* in a state of perfect purity and whiteness, and the *Morphia*, but slightly-coloured specimens of the results of the method were shown.

A letter, addressed by Surgeon Major C. Morehead, M.D., to the Right Honorable the Secretary of State for India, dated 17th September, was read (see p. vii. Appendix ante).

The Secretary then read a case of "Hydatids of the Liver evacuated through the Lungs," by Surgeon W. Hanbury, which was considered almost unique, and worthy of publication in the next volume of the Transactions.

After the President had exhibited some interesting pathological specimens, the thanks of the meeting were given to the contributors of papers, and it was adjourned to Saturday, the 7th December 1861.

No. 8.

MONTHLY MEETING HELD 7TH DECEMBER 1861.

Present :

A. H. Leith, M.D., *President*, in the Chair.

H. J. Carter, Esq, F.R.S., and J. Peet, M.D., *Vice-Presidents*.

Members.—W. Campbell, M.D. ; T. Diver, M.D. ; R. Haines, M.D. ; J. Welsh, Esq. ; A. M. Rogers, M.D. ; G. C. M. Birdwood, M.D. ; H. V. Carter, M.D. ; and W. C. Coles, M.D., *Secretary*.

An abstract of the Proceedings of the last meeting having been read, the proceedings were confirmed.

The presents to the Library since the last meeting were four numbers of the "British Medical Journal," and the October number of the "Chemist and Druggist." From the Principal Inspector General of the Medical Department, "Deaths in Bombay during 1860," "Cholera in the Delhi Division," and "Dr. Husband's Treatise on preserving Vaccine Lymph."

Surgeon W. Hanbury, H. M.'s 33rd Foot, was duly elected a member of the Society under Regulation V., and Assistant Surgeon F.R.O. Kearny on entering the Bombay Medical Service and for a period of two years.

Dr. H. V. Carter read a paper entitled Pathological observations, No. V. He stated that the present communication is the second on a subject already brought before the Society, a year since; viz. the peculiar condition of the urinary excretion termed "Chylous;" the true pathology of which is yet obscure. On that occasion the view was proposed, and sustained by various cases from the Jamsetjee Jejeebhoy Hospital, and by inferences upon them, that the affection in question is owing to direct admixture of the two fluids,—chyle and urine. In these cases a dilated hypertrophied or varicose condition of the lymphatic system is present, followed probably by rupture of some of the smaller vessels, and free discharge of their contents on any mucous surface implicated, in this case, the urinary. Evidence of the actual occurrence of such a state of the lymphatic system was brought forward in drawings, and notes of cases; in one of the latter chylous urine coexisted with, and was connected with, the local affection.

Since that time the subject having been further studied by the author, the correctness of the above view has become more apparent. The opinions of contemporary writers were stated, and with regard to those of Dr. Prout, the following circumstances were named as not satisfactorily accounted for,—the sudden appearance, cessation, and renewal of the symptoms, the normal state of the blood, absence of organic renal disease, and of such constitutional disturbance as would necessarily follow prolonged derangement of the assimilative process, and renal function. The endemic nature of the disease and its frequent association with hæmaturia were mentioned as incompatible with mere functional derangement. The view now proposed would satisfactorily explain these peculiar characters; *ex. gr.* when the lymphatic vessels from any cause are over distended rupture occurring, or a former aperture re-opening, instant flow of chyle would take place, and the distension subsiding, this would as speedily cease. Organic changes, in the blood and kidneys are no necessary concomitants; the connection with hæmaturia would indicate that the capillaries also are equally disposed to congestion and rupture, both being the result of the lax idiosyncrasy of structure common in hot climates; other features of the disease were pointed out and made clear on the adoption of these views; the very different states of the urine were shown to be entirely explicable on the

supposition that chyle of various degree of maturation had been intermixed; such admixture accounts for the physical appearances, as Rayer long since proved by experiment. The following facts were then referred to as decisive in confirming the author's opinion:—*First*, that the chemical composition of chyle and of chylous urine shows the proportion of albumen and fat to be the same in each, and such as could not occur from mere coincidence; three examples were drawn up. *Second*, by means of the microscope the author had some time since been able to unmistakably detect the presence of chyle corpuscles in chylous urine, this had not yet been done in Europe, but the fact is indubitable, and also that they present the varieties, in size, form, &c. of healthy chyle according to the degree of elaboration it has undergone. *Lastly*, a physiological arrangement of the instances of this peculiar affection, according to the locality of occurrence, and consequent appearance and composition, was suggested, three classes being proposed in which all the known published cases had been arranged by the author; a fourth class was proposed under the term "Lymph urine," examples of which were also offered. Although adding nothing directly in aid of treatment, yet these views will, on consideration, furnish suggestions that may lead to better success than has yet been attained,—regulation of diet, and mineral tonics, and astringents amongst others, may be mentioned.

The Secretary then read portions of a Report on Cholera which occurred during the months of April, May, and June, in Sind, by Dr. Grierson, of which the following is a brief abstract. Before commencing to trace the epidemic of the last few months, Dr. Grierson alludes to the ravages of Cholera in former years, thus:—

"Cholera became known to our army in Sind in the year 1839, when in the month of March it attacked the 22nd Regiment N. I. then encamped near the town of Tatta. It presented itself at times, subsequently mostly at Kurrachee, and was most severe and fatal in the year 1846, when 915 persons died amongst the Regiments stationed at Kurrachee. It continued to show itself pretty regularly every year at Kurrachee, till the year 1853, after which it was scarcely seen till last year. It appeared on that occasion to enter the Province from the east-side, and gradually approached Kurrachee. In September, Manora, the town, and the cantonment were invaded, and the disease exhibited an activity which occasioned great alarm and carried off many victims, but its prevalence was not long continued. At the same time it visited other places in lower Sind principally, namely, Jerruck, Shahbunder, Khetty, Sehwan, and Hyderabad slightly, and also Mehur and Shikarpore, in

Upper Sind. The deaths reported to the Civil authorities by this outbreak were 1,777. The disease, which, it was hoped, had passed away not to return, after the short interval of a few months, reappeared in April 1861. On the former occasion Lower Sind was, with two exceptions, the theatre of action of the pestilence. The difference was most marked on this second invasion of this perplexing and tremendous disease. It has seemed to pervade a great part of the whole province, so that out of the deplorable number 8,523 deaths reported by the Police and Civil Officers, there were on the frontier of Upper Sind 167, in the Shikarpore Collectorate 4,192, in that of Hyderabad 1,160, and in that of Kurrachee 3,004. In these two epidemics together, which fall within twelve months considerably, though happening in different years, the sum of reported deaths is 9,700, and if we take the population at 3,000,000, there died on the occasions of cholera 1 in 309 of the population, or 003 per cent. Wide as is the extent over which the disease prevailed from the Frontier of Upper Sind to Shahbunder, and to Thur, and Parkur, from Roree to Manora, it is worthy of remark that the commencement of the outbreak was reported by the Medical observers to have occurred in seventeen places in April, in three in May, in three also in June, and in two in March. It ceased generally in June, but a few cases were reported at a later date."

During the months of April, May, and June 1861, the number of cases reported was 1,673 of which 249 proved fatal or 14.8 per cent. In the Military Hospitals the number of cases was 17, and deaths 9. In the Civil and Police Hospitals, and Dispensaries at the principal stations, the number of cases was 331, and deaths 96. In the superior Civil Stations under Apothecaries and Assistant Apothecaries the number of cases was 253 and deaths 34, whilst in the inferior Civil Stations under Hospital Assistants, the number of cases was 1,072, and deaths 110. The trustworthiness of the returns from some of the dispensaries is doubted, as many of the patients were not seen after their first application for relief. The epidemic it is stated prevailed severely in the districts and villages, and but slightly in the larger and chief stations of the province. The disease differed in extent in the different Collectorates. It prevailed most in that of Shikarpore, next in the Kurrachee, and least in the central Collectorate of Hyderabad. The chief peculiarity about the Sind epidemic of cholera appears to be the absence of spasms or cramps, or at least that they were never very prominent, and sometimes did not appear to attract notice. No one description would apply to every case, whilst yet all cases had something

in common. The treatment consisted chiefly of calomel and opium, internal and external stimulants, chloroform, dilute sulphuric acid, &c. Dr. Grierson says "in the treatment of cholera in a very marked manner is shown the fact that the most contradictory methods have been proposed for its cure. Some think they have divined or discovered the nature of the diseased processes from first to last, and their views of the pathology of the disease suggest to them the treatment they think best fitted to subdue it. Others struck by the urgency of the symptoms are guided to the selection of remedies by the impulse of the desire to afford immediate relief. Of all remedies, however, for the disease, calomel has maintained its place most steadily." With regard to the causes of the Epidemic it is remarked. "In Sind the habitations of the people, especially in the districts, are small and mean, cattle and other live stock are often in closest proximity, and the refuse and waste of organized life lies almost undisturbed amidst and around them. Hence they breathe constantly an impure air. This year was preceded by several years of little rain, it was a year of famine, food was scarce and bad, and many thousands of cattle died. Instead of health and occupation in the fields men pined in their miserable habitations, in hunger and sorrow, with bad water for drink and breathing constantly an impure and deleterious air. These were the conditions in which the epidemic air found the people, favoured in its transport perhaps by the dryness of the atmosphere; and cholera was the result. In the great stations where the disease was less severe, the conditions of life were different. The regularly paid, well fed, troops suffered but very little. The other inhabitants comparatively little. For in these stations and others to some extent, *hygiene* has not been unknown. It is due to Sir Bartle Frere, K.C.B. to state, that in Kurrachee first, and afterwards elsewhere, he originated changes and improvements in this direction which only require extension, improvement, and diligent supervision to give Sind a character of excellence in this respect, and to protect in a great measure its inhabitants from the ill effects of epidemic states of the air. Not simply the removal of refuse, offal, waste, filth of all descriptions, is insisted on; but the disposal of all noxious matters, by inhumation, and incrimation in furnaces, constitute the peculiar features of the hygienic measures adopted in the Province. In the large towns likewise the dwellings are better, occupation is more steady, and the means of subsistence better, and these facts no doubt contributed to the greater immunity of the people from the effects of the epidemic invasion.

A selection of cases from the records of the Kurrachee Charitable Dispensary, by Sub-Assistant Surgeon Bazunjee Rustomjee, were then read (see p. XIII ante), and after the examination of a pathological specimen of aneurism of the arch of the aorta forwarded by Dr. Niven, the President in the name of the Society accorded thanks to the contributors of papers, and adjourned the meeting until Saturday the 4th January 1862.

No. 9.

ANNUAL MEETING HELD 4TH JANUARY 1862.

Present :

A. H. Leith, M.D. ; H. J. Carter, Esq., F.R.S. ; W. Campbell, M.D. ; T. B. Johnstone, M.D. ; W. C. Coles, M.D. ; G. C. M. Birdwood, M.D. ; and H. V. Carter, M.D.

The Secretary read the following Report :—

Annual Report.

During the year 1861 eight Monthly Meetings of the Society have been held, and the average attendance of Members on each occasion has been ten. The chief contributors of Papers have been Dr. Moore ; Dr. H. V. Carter ; Mr. Carter ; Dr. Grierson (through the Principal Inspector General) ; Dr. Haines ; Dr. Hanbury ; and Dr. Gorringe. Numerous minor contributions have been made to the Society through the kindness of the Head of the Medical Department.

2. Five new paying Members have joined the Society, and two have gone off. Three Members have been admitted upon first entering the Service. There are 85 subscribing Members in India, and 17 in Europe, besides Members under two years.

3. The sixth number of the New Series of the Transactions was published in June last, and distributed as usual. It was rather a larger and more costly volume than was desirable. It is proposed that the 7th Number, now in the press, should be somewhat reduced in size and expense, and it is intended to issue it as early as possible.

4. There have been several presents made to the Library by Government, and by the Principal Inspector General ; whilst periodicals, marginally named,* in exchange for our Transactions have been regularly received. The Library has now considerably out-grown the proportions originally contemplated, and requires some re-arrangement and getting rid of old documents and books.

* The "*Dublin Quarterly Review*," the "*British Medical Journal*," and the "*Indian Lancet*."

5. The Finances of the Society, as shown by the accompanying accounts, are much as before, the balance in the Bombay Bank being only about Rs. 200 less than last year.

Annual Statement of Receipts and Disbursements of the Medical and Physical Society from 1st January to 31st December 1861.

RECEIPTS.		DISBURSEMENTS.	
	Rs. a. p.		Rs. a. p.
By Balance of last account closed on the 31st December 1860.	1,690 5 5	By Amount paid for printing Circulars, &c.	44 8 0
By Subscriptions received from 1st January to 31st December 1861 ..	988 0 0	By Amount of Office Establishment and Petty Charges, &c.	291 12 1
By Amount received from Government, being the value of 100 copies of No. 6 of the New Series of the Society's Transactions.	500 0 0	By Amount paid for printing charges of No. 6 of the New Series of the Transactions	1,341 4 0
		By Balance in the Bombay Bank	1,500 13 4
Total Rupees....	3,178 5 5	Total Rupees....	3,178 5 5

6. The accounts with the Agents have been now squared, and Messrs. Chesson and Woodhall have 85 volumes of the Transactions on their hands for sale. As the annual subscriptions with the Government grant are likely to cover each year's expenses of management, the Committee are about to take into consideration the propriety of investing the sum of Rs. 1,500 in the Bank in 5 per cent. paper, the interest of which might be profitably employed.

7. The Committee of Management and the Secretary now retire from office, but they offer themselves for re-election.

Upon the examination of the votes recorded, the following gentlemen were found to be elected :—A. H. Leith, M.D. (withdrawn, on being about to leave Bombay) ; W. Arbuckle, M.D. ; H. J. Carter, Esq. ; W. Campbell, M.D. ; J. Peet, M.D. ; H. Giraud, M.D. ; W. C. Coles, M.D. ; R. Haines, M.D. ; G. R. Ballingall, M.D.

The election of office-bearers then took place, when Mr. Carter, F.R.S., was elected President ; Dr. Peet, and Dr. Haines, Vice-Presidents, and Dr. Coles, Secretary.

REGULATIONS
OF THE
MEDICAL AND PHYSICAL SOCIETY OF BOMBAY.

ESTABLISHED 1835.

Objects.

I. The encouragement of the cultivation of Medical Science and its collateral branches, by discussion at periodical meetings, and by the publication of original communications.

Constitution.

II. The Society is composed of Ordinary, Corresponding, and Honorary Members.

Ordinary Members.

III. Under the head of Ordinary Members are to be classed all who contribute to the funds of the Society, and all who are admitted in accordance with Regulation VII.

IV. All Medical men residing in India, who can produce certificates of a regular medical education, are eligible as Ordinary Members.

V. Medical Officers of Her Majesty's Indian or British Services are elected Ordinary Members of the Society, on application by letter addressed to the Secretary.

VI. Qualified Medical Practitioners, not belonging to Her Majesty's Indian or British Services, are elected by ballot at the ordinary meetings of the Society, and a majority of three-fourths of the Members present is necessary to secure the election.

VII. Assistant Surgeons, on first entering the Bombay Medical Service, are considered Ordinary Members of the Society, free of the payment of admission fee and annual subscription, and continue so for a period of two years, after which, should they not intimate their wish to be considered Ordinary Members by payment of the regulated admission fee and annual subscription, they are considered to have withdrawn from the Society.

Payments.

VIII. Ordinary Members pay an admission fee of Rs. 5, and annual subscription of Rs. 12, payable in advance in the month of January of each year.

IX. Ordinary Members, absent from India, are not chargeable with subscriptions for the period of their absence.

X. Ordinary Members neglecting to pay their annual subscription for two successive years, are considered to have withdrawn from the Society, and are liable to have their names erased from the list of Members, under a resolution passed to that effect at an ordinary meeting of the Society.

Corresponding Members.

XI. Ordinary Members, on retiring from service in India, on being proposed and seconded at an ordinary meeting of the Society, are eligible, by ballot, as corresponding Members. A majority of four-fifths of the Members present is necessary to secure their election.

Honorary Members.

XII. Medical men of celebrity, not residing in India, are eligible as Honorary Members. On being proposed and seconded at an ordinary meeting of the Society, they may be elected at the next meeting by the unanimous consent of the Members present.

Election of Office-bearers.

XIII. The Committee of Management of the Society consists of eight Members, elected annually from among the Ordinary Members resident in Bombay, by the general vote of the Ordinary Members residing under the Government of Bombay.

XIV. The Voting Lists are circulated in the first week of November of each year, and the result of the election is declared at the annual meeting of the Society.

XV. In the event of vacancies occurring in the Committee between the periods of election, such vacancies to be filled up in rotation by the individuals who commanded the number of votes next to those of the Members returned at the last election.

XVI. A President and two Vice-Presidents of the Society are elected annually from among the Members of the Committee of Management by the Members of the Society present at the meeting at which the annual election of the Committee is declared.

XVII. The Secretary of the Society is elected biennially from among the Ordinary Members resident in Bombay at the annual meeting held in the month of January of alternate years, or, on the occurrence of a vacancy, at any other ordinary meeting of the Society.

Committee of Management.

XVIII. The Committee of Management have the general direction of the affairs of the Society, and decide on what communications are to be published in the Transactions of the Society. They keep minutes of all their proceedings,

which are entered into the Minute-book of the Society, and read at the following ordinary meeting.

XIX. When questions of importance to the stability and interests of the Society arise, they shall be submitted by the Committee for decision to the Ordinary Members residing *under the Government of Bombay*. The majority of votes necessary to decide any question, to be determined according to its importance, and fixed at the time by the Committee.

XX. It shall form part of the duty of the Committee to give due consideration to all suggestions offered by Members of the Society. Should it be represented to the Committee that the conduct of a Member of the Society is disgraceful, in a professional or social capacity, the Committee may, if they deem it necessary, bring the question, of his expulsion before a Special Meeting of the Society, at which the votes of three-fourths of the Members present are necessary to decide it affirmatively.

President and Vice-Presidents.

XXI. The President shall take the Chair and conduct the business at all meetings of the Society.

XXII. In the absence of the President, one of the Vice-Presidents shall take the Chair, and conduct the business of the meeting; and in case neither be present, the senior Member at the meeting shall preside.

Secretary.

XXIII. The Secretary is a Member of the Committee of Management *ex officio*.

XXIV. It shall be his duty to enter into the Minute-book of the Society minutes of the proceedings of all meetings and transactions of the Society, and, in communication with the Committee of Management, to conduct the details of business, and carry on the correspondence of the Society.

XXV. The Secretary shall prepare an annual statement of the receipts and disbursements of the Society, to be laid before the annual meeting in the month of January of each year.

XXVI. To enable the Secretary to perform these duties a suitable establishment is entertained, under sanction of the Committee of Management, confirmed at an ordinary meeting of the Society.

Meetings.

XXVII. Ordinary meetings of the Society are held in Bombay on the first Saturday of every month, except in April, May, and June.

XXVIII. The chair being taken, the order of business shall be as follows:—

1. The minutes of the last meeting, and those of subsequent Committee meetings to be read and confirmed.
2. The announcement and election of new Members in accordance with Regulations V., VI., and VII.
3. The election of Corresponding and Honorary Members.
4. The reading of letters, and the discussion of any ordinary business of the Society which may be before the meeting.
5. The announcement of presents and donations.
6. That of papers and dissertations received since the last meeting.

XXIX. After the announcement of the papers and dissertations, the President shall call upon the Secretary to read one or more of them, and shall subsequently

invite the Members to discuss any particular part of them which they may consider deserving of remark.

XXX. No new business shall be introduced until that which is before the meeting has been concluded.

Papers and Dissertations.

XXXI. All papers and dissertations presented to the Society to be considered the property of the Society.

XXXII. The Transactions of the Society are published by the Secretary, in communication with the Committee, as often as circumstances will admit.

XXXIII. A copy of each publication is presented to the Honorary and Corresponding Members of the Society, and to every Ordinary Member who, at the time of publication, is a contributor to the funds of the Society.

N. B.—All communications addressed to the Secretary or Treasurers must be prepaid.

Members are requested to pay the amount of their subscriptions to the Bank of Bombay, Treasurers to the Society.

 The Publications of the Society are for sale by Messrs. CHESSON and WOODHALL, Booksellers, Bombay, the Society's Agents.

The First Series of the Transactions of the Society consist of—

No. 1, 1838	Pp. 370	Rs. 5
„ 2, 1839	„ 209	„ 5
„ 3, 1840	„ 225	„ 3
„ 4, 1841	„ 158	„ 3
„ 5, 1842	„ 196	„ 3
„ 6, 1843	„ 250	„ 3
„ 7, 1844	„ 206	„ 3
„ 8, 1845-46.....	„ 122	„ 3
„ 9, 1847-48.....	„ 264	„ 5
„ 10, 1849-50.....	„ 338	„ 5

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The Second Series of the Transactions consist of—

No. 1, 1851-52.....	Pp. 356	Rs. 5
„ 2, 1853-54.....	„ 362	„ 5
„ 3, 1855-56.....	„ 389	„ 5
„ 4, 1857-58.....	„ 389	„ 5
„ 5, 1859	„ 349	„ 5
„ 6, 1860	„ 484	„ 5
„ 7, 1861	„ 354	„ 5

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TRANSACTIONS
OF THE
MEDICAL AND PHYSICAL SOCIETY
OF
BOMBAY.

NO. VIII. NEW SERIES.

FOR THE YEAR 1862.

Bombay:
PRINTED AT THE
EDUCATION SOCIETY'S PRESS, BYCULLA.

1863.

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ON THE SYMPTOMS AND MORBID ANATOMY OF LEPROSY; WITH REMARKS.

By H. V. CARTER, M.D. (Londin.)

THIS terrible scourge of the indigenous population of India, though widely prevalent and pitiaibly destructive in its effects, has attracted but slight attention on the part either of the ruling powers or our own profession. When the same or a similar disease devastated Europe during the middle ages, public asylums for lepers were raised and endowed, and the medical literature of the time teems with notices of leprosy; in modern days too, with the aid of an enlightened government (that of Norway, where leprosy still prevails), most valuable and interesting information, adequately illustrated, has been given to the world by M. M. Danielssen and Boeck.

That leprosy is not an attractive subject for investigation, that it attacks mostly the lower orders, and is but little amenable to treatment, are probably the reasons why it has been comparatively neglected by medical observers in India; something, however, must be attributed to the incidental difficulties of pursuing the inquiry.

In articles by Ainslie, Robinson, recently Day and Van Someren, and notices in a few general works, as D. Johnson's (which I have not seen), Brett's, and lately that of Morehead, is included nearly the whole of our information on this subject; the last named distinguished writer, who well observes "the morbid anatomy of leprosy has been altogether neglected in India," is the only one who gives any *post-mortem* observations. Of these, however, it must be said that they do not reveal the essential anatomical features of the disease. Being favourably situated for the task, and knowing something of the striking results of Messrs. Danielssen and Boeck's researches, I have for some time past turned my attention in this direction, and not without being repaid, for it may be considered as demonstrated that the

morbid changes in leprosy are peculiar, if not unique, in their nature and seat ; also, that taken in connection with the symptoms, they are of considerable interest in a physiological point of view.

Another common but slightly regarded feature of leprosy (the eruption) is worthy of notice.

It should be added that even in the general (or cosmic) literature of this disease, excepting the work of the Norwegian authors above-named, but very scanty information on the anatomical characters of leprosy is to be found ; and as regards this exception, the results I have arrived at do not, in some very essential particulars, agree with those of M. M. Danielssen and Boeck.

Judging from experience afforded in this presidency and from published sources, leprosy is a frequent disease in India. Numerous opportunities of seeing it occur in Bombay at the Native Hospital and Male Dispensary ; and at the Dhurumsala (an asylum for the homeless, under the control of the local District Benevolent Society) ; to these sources I am principally indebted for the facts upon which the following account is based. In the Jamsetjee Jejeebhoy Hospital from 60 to 70 lepers are annually admitted ; a larger number probably attend the Dispensary in my charge ; and at the Dhurumsala about 100 lepers are lodged and partly fed ; it also furnishes a certain proportion of the more severe and fatal cases found in the hospital ; the number of deaths in the latter averages 12 annually, and post mortem inspections are generally to be obtained.

A large majority of the cases seen in the presidency town consists of residents of the numerous fishing villages and small towns situated on the sea coast,* but in the Deccan and

* "The frequency of the disease in the class concerned in the catching and selling of fish is very remarkable, especially as this class contributes but in a trifling proportion to the general mortality. This serves strongly to confirm the opinion long entertained that an inordinate use of fish tends to produce the disease ; for the other classes which suffer the most are also those which use fish very largely, not always in the freshest condition ; and it is interesting in connection with the fact of the prevalence of a very similar disease, notwithstanding the great difference of climate in those countries of Europe where the poorer population feed the most largely upon fish, viz. Norway and the Shetland Isles, the Faroe Isles and Iceland."—*Deaths in Bombay during 1860, page xii.*

Dr. Haines, the Registrar of Deaths, also shows that in the last twelve years 543 deaths from leprosy have been recorded, of which 400 were males, 134 females ;

Northern Provinces Leprosy is by no means unfrequent, and patients from the eastern parts of India are occasionally seen, so that it is probable examples of all the chief forms of the disease have at one time or other come under notice. Systematic notes of about 200 cases and 16 mortisections have been collected; the latter include the ordinary inspection of viscera, dissection of the nerves of one side of the body, and subsequent microscopic examination of the diseased structures; these materials being the results of personal effort, may, if deemed adequate, be also considered as trustworthy.

A simple method of viewing Leprosy would be to consider the chief groups of symptoms (or features, as they may be called) it presents; these are three in number:—

1. An eruption on the skin, probably related to *Lepra* (*Græcorum*), and accompanied by anæsthesia.

2. Anæsthesia of the skin of the face, ears, and extremities, owing to an affection of superficially-placed nerve-trunks, and cutaneous nerve-branches; the Pacinian and Tactile corpuscles (appendages of the sensory nerves) are frequently also implicated.

3. A tumefaction or tubercular thickening of the skin, and the mucous membrane of the palate, tongue, &c.

These primary symptoms seldom occur quite alone, but in all cases one or other will be found to predominate, and so the variety or form of the disease be determined; the second is the more constant and perhaps characteristic; it is generally preceded or accompanied by the first, the duration of which is sometimes temporary; the third feature is almost always accompanied by the second, and occasionally by the first.

The inevitable consecutive phenomena, as atrophy, distortion, and destructive ulceration of affected parts, which appear in

“proportionally to the total deaths, leprosy is most prevalent among the Native Christians, next among the Marathas and low-caste Hindoos, particularly the latter; then follow the Mussulmans, the Parsees, the vegetable-feeding Hindoos; one case is recorded in an Indo-Briton and two in Negro-Africans. Jews and Europeans have been exempt from the disease.” The mortality seems to reach its maximum about 30 years of age.

cases of prolonged duration, at present require only to be mentioned.

In thus giving prominence to the eruption of leprosy, I have been led by observation alone. This striking feature, unnoticed by the later Western authors, was correctly discriminated by the Arabs and some Greek writers, and I may add is almost solely referred to in the Mosaic and Hindoo descriptions of leprosy; it is the *Baras* or *Leuce*, by either of which names it might now be distinguished. The second of the above forms of the disease is that known as *Anæsthetic Leprosy*—a distinction first made by Robinson; it is also the “articular” Leprosy of medical authors residing in the West Indies and Africa. The third variety is the *Tubercular*—the “leprosy of the middle ages,” and the form best known in the West; it is still, as compared with the Anæsthetic, the commonest in Europe, &c., but not in India, and here a contrast might be noticed similar to what obtains as regards the relative frequency of the two chief forms of Ague in Europe and in India.

As already implied, I am inclined to view all these three varieties as so many features of one disease: the relation the eruption holds to the others is matter of observation and not, perhaps, strictly explicable, although its peculiar anæsthetic character is wanting, so far as I know, in other skin-diseases; but that the cutaneous nerve-affection and tubercular thickening of the skin are essentially connected is admissible, from the fact of the latter being commonly associated with the first in the same patient, and both being the result of a deposit having similar characters in each, in the two structures implicated. I shall now proceed to consider these features of Leprosy *seriatim*.

1. THE ERUPTION.

As seen at the present day, the eruption presents characters sufficiently varying to warrant some such simple arrangement as the following, which will generally hold good:—

(1.) A characteristic, if not typical form, consisting of moderate-sized, isolated, circular, and serpiginous patches scattered over the body.

(2.) In another, a very large extent of skin has become implicated, possibly by indefinite extension of patches like the above.

(3.) Again, extensive, defined, and characteristic discolourations of the surface of the skin.

(4.) Or, numerous and more indistinct pale blotches, also widely scattered.

In this summary are not included those alterations in the appearance of the skin which are clearly referrible to the local deprivation of nervous influence; such are not uncommon in Anæsthetic Leprosy. It should be remarked, however, that there is sometimes a difficulty in assigning the anæsthesia to either of these causes separately; some phenomena (occurring in the hands and feet) have induced me to conclude that the patches of eruption have a tendency to appear on a surface previously anæsthetic, though they may be exceptional; it has occasionally seemed, too, that the anæsthesia has extended along the skin, and along the sub-jacent cutaneous nerves (to a larger extent) at the same time; but the exact chronology of symptoms it is almost impossible to precisely ascertain in most native patients.

(1.) The eruption first named has the following characters:— patches or spots of a circular or annular form, size $\frac{1}{4}$ in. to 3 in. or more in diameter; edges raised, of a pinkish hue, free from scales, slightly cracked or wrinkled, centre depressed, pale, dry, glistening; a tendency to spread and join so as to cover larger spaces. The centre of the patches is insensible, often completely so, and always in the older ones. Their appearance is not preceded or accompanied by any general symptoms, or even local signs of irritation; there is nothing like hyperæsthesia at the commencement. The patches commonly occur about the shoulders (front) and hips (back), behind the elbows, and in front of the knees; on the face the temple and cheeks are frequent positions, sometimes where the branches of the fifth cranial nerve emerge; the trunk and limbs are often affected in a perfectly symmetrical manner, and there is always a strong tendency to such an arrangement. The eruption begins as a small reddish, flattened elevation of the whole skin, giving the impres-

sion of a tubercular character to it. Squamæ, discharge, and scabs are absent; even a furfuraceous desquamation of the cuticle is by no means common. The hairs on the patches are few and atrophied, but seldom blanched; the function of the glands of the skin is suspended or diminished; blood readily flows on puncture of the surface. In less marked cases the distinction of margin and centre is apt to be obscure, but anæsthesia is always present in the latter.

Cases in illustration of the above.

1. Mhowjee, a Mussulman, ætat 50, a woodman; comes from near Rajcote (sea coast). Numbness of the feet was accidentally discovered about 12 months since, and spots appeared near the elbows, &c. Is strong and in fair health. There is doubtful redness and numbness of the cheeks; the lobules of the ears are benumbed. On the trunk, front, and back are to be seen numerous small spots or patches, varying in size from 2 lines to 2 inches in diameter, and mostly of a round or oval form; the smaller consisting of mere light-red-dish elevations of the skin; the larger of distinct circles, the centre of which is depressed and of a pale-yellowish colour; the margin broad, raised, light-red; at a glance they have something the appearance of "wheals;" the surface is rather rough and dry; the hairs grow scantily, but when present are by no means invariably white. On the shoulders, outer side, and back of the arm, especially about the elbow, also on the outer side and back of the fore arm, may be seen similar spots; on the nates a few are present; none on the thigh, but some on the front of the leg; there is also an undefined light tint about the knees. The spots are numerous; they are all benumbed, especially the centre of the older ones. There is slight but evident anæsthesia of the dorsum of the hands and feet, without any distortion of the latter. No kind of uneasiness accompanies the eruption of the spots; he never has fever; denies an hereditary or syphilitic taint. (Dispensary patient, No. 55.)

2. Tah Mahomed, Mussulman, ætat 53, a pensioner, comes from near Nas-sick (Deccan); 2 years sick. On the body is an eruption of circular patches, the centre of which is pale and comparatively depressed (sometimes really below the level of the skin); the margin broad, raised, defined, of a purplish hue; the cuticle is entire over both, wrinkled and dry. On close examination the hair follicles are found to be distended, the hairs frequently absent or atrophied, not blanched. The diameter of these patches varies from $\frac{1}{4}$ in. to 3-4 inches; they are present on the nose, temples, cheek (right side of face), helix of both ears, neck, shoulders, arms, and forearms; on both mammæ; there is one exactly on the middle line behind, others on the nates, right thigh, leg, and foot, and also on the opposite a few; they first appeared

on the right thigh close to the knee, on the inner side, and the patch there is still the largest; one spot is just below the attachment of the *ligamentum patellæ*; the most recent (15 days ?) is on the opposite thigh; its diameter is about 6 lines, colour reddish-purple; it is raised, with a mere trace of a central pale part; no tenderness, but loss of sensation. At a short distance these patches have a whitish glistening aspect, which is attributable to very thin, dry flakes of cuticle, or to a similar state of the general surface, without distinct scales being apparent; their number is about 20, and they are all without exception quite benumbed in the centre; being sharply pricked blood exudes.

About the time the patches first appeared (2 years since), he accidentally discovered that the right hand was weak and benumbed, the two inner fingers are slightly atrophied, and remain a little flexed when at rest, their palmar surfaces, especially of the first phalanx, wrinkled, shrivelled, and of a purplish tint; also the whole length of the inner third of the palm of the hand is shrivelled slightly and livid, the difference being perfectly clear to the eye; these parts are benumbed except close to the wrist, and also the dorsum of the two fingers beyond the first phalanx; their temperature is notably diminished. The whole hand is weak; and the *interossei* are atrophied, particularly of the first space. The *ulnar nerve* of the same side, about an inch above the elbow, forms a firm and tender swelling running upwards for about two inches, which, when pressed, causes pain in the forearm and starting of the two inner fingers; this swelling was first noticed about the time of the numbness; it cannot be confounded with enlarged lymphatic glands. General health fair; never has fever; is married, and has a grown-up family and grandchildren, who are all well; knows of no taint of leprosy in his family; has had syphilis on more than one occasion, many years since. (Dispensary patient, No. 48.)

3. Rajal, Mussulman, ætat 30, a weaver. Six months since "wheals" began to appear on the body passing into light-coloured raised patches, with reddened edges and depressed centres; they are present in the abdomen, back, shoulders, back of arm and forearm, and also on some of the fingers; within the last 12 days fresh spots have appeared on the forehead and face, exactly where the three branches of the fifth cranial nerve emerge. Ears unaffected. There are indications of slight facial paralysis (r. side). The old spots are perfectly anæsthetic; the new ones less so; none are particularly tender; their appearance gives the impression of a gelatinous-like effusion; at first red and shining, afterwards lighter than the sound skin, becoming depressed in the centre. General health fair; a short time since had fever; manner heavy; no hereditary taint known. (Dispensary patient, No. 33.)

I had selected three other cases as illustrations of this form of eruption, but it will not be necessary to detail them; two are of long standing and accompanied with anæsthetic leprosy.

(2). The transition from isolated to blended patches is a natural one, and in some cases, at least, it is only a question of time; but I doubt if in all or in most; evidence of it will, however, be found in the following case :—

4. Chinapa, a Hindoo, *ætat* 50, comes from near Mangalore (coast). The disease is of upwards of 30 years standing; it commenced with anæsthesia of the left foot; the eruption followed, and a few years since the hands became affected. Health tolerable; is intelligent; denies syphilis. The face is not affected in any way, nor is anything to be seen on the front of the trunk; on the back, including nearly the whole of the left shoulder, and encroaching on the right side, extending as high as the nape of the neck, and reaching downwards to the level of the last rib is a discoloured patch, the surface of which is uniformly lighter and redder than the sound skin, and appears dull and dry; the edges are wide, defined, broad, and lighter coloured towards the patch; on the opposite margin at the juncture with the skin, numerous isolated, flattened, red, or purplish tubercles are seen covered by the thinnest cuticle (only in the smaller patches amounting to anything like a scale); isolated tubercles may also be seen at a little distance from the edge, and others in the middle of the large patch, where probably sound skin has become inclosed. There is clear evidence of a primary circular or annular arrangement, especially in the new spots. One is present below the large patch described above, about the size of a rupee, and oval in form; already the centre is depressed; the edges irregularly tuberculated. Quite recent spots may be seen on the right forearm, as commencing by a cluster of flattened, light-red tubercles, a line or two in diameter; then spreading the centre subsides, acquires a darker reddish tint, while the lighter raised margin extends. Perspiration is deficient on the affected surfaces, and the hairs stunted, sometimes white. Sensation is more or less deficient in the patches, except the most recent of all. The hands are benumbed and distended, particularly on the left side; the left lower extremity is benumbed below the knee, and the foot is nearly destroyed. No general or local symptoms precede or accompany the appearance of new spots. He states that his mother's brother had leprosy; other relations and children unaffected. (Dhurumsala, No. 62.)

5. Deojee, Hindoo, *ætat* 45, comes from near Herni (coast); has been 18 years sick. There was first a patch on the nates; the hands and feet only recently affected. On the face are light-coloured patches; there is numbness also, and the ears are benumbed; the eruption on the trunk (back) consists of large, irregular, but often rounded patches, measuring five or six inches across and more or less blended; their colour is a uniform light red, and the surface is slightly raised, but after attaining a certain size, the central part acquires a dark colour, like the sound skin, but the supple smooth appearance of the latter is wanting. In these patches the raised margin is not apparent, as the

whole surface is equally affected, except in the oldest ones ; no tubercles are to be seen along the edges ; the older ones are benumbed, that on the nates completely so ; the more recent but slightly. There is anæsthesia of the upper extremities, and slight distortion of the hands, also below the knees, and the great toe of the left foot is destroyed. He never suffered from syphilis ; leprosy is said to be in his family, but he is the only one now affected. (Dhurumsala patient, No. 84.)

6. Murya, Hindoo, *ætat* 30 ; a ryot, from Ooran (coast) ; duration of disease 4 years. It began with numbness of the legs, and an eruption which spread upwards, and soon after the right hand became affected. Face—slight tumefaction and coarseness of skin of brows, cheeks, with diminished sensation ; hair scanty or small ; lobules of both ears benumbed, and rim of the right also reddish and swollen. Something like thickening of the mucous membrane along middle line of hard palate. Trunk marked with numerous pale, red, raised, level patches of irregular form ; the smaller rounded, others are large, and surround the waist like a girdle ; on the back and chest are seen discolourations similar to those included under the next head ; perhaps remains of old patches. Extremities, upper—similar patches on the shoulders, arm, and forearm, with, on the right side, partial destruction of the hand, on which bullæ appear, leaving white scars ; the ulnar nerve is evidently affected. Lower—on the nates, thighs, and legs are other broad, light-coloured, raised, and connected patches, presenting a characteristic appearance ; the feet are benumbed, and the toes of one partly destroyed. The centre of the large patches is depressed and pale ; rather lighter, drier, and more finely wrinkled than the sound skin ; it is benumbed, and the patient himself describes how the patches spreading leave this benumbed surface ; but inclosed pieces of sound (?) skin also seem to have lost their sensation in some places, so that, as is very probable, the cutaneous nerves are also diseased beneath the patches. This case is of considerable interest, as exhibiting a form of skin-disease which appears to me altogether characteristic of leprosy. (Hospital patient, No. 72.)

7. Rosa, a Portuguese woman, of about 30 years of age, comes from near Bassein (coast). Four months since the eruption appeared on the face, and has since spread downwards to the trunk and extremities ; there were no premonitory or general symptoms. She is in good health and intelligent : never had syphilis. The eruption consists of raised, rounded spots of a livid-red colour, and in size varying from four lines to as many inches across ; they are very numerous, and blending, nearly cover the face, forehead, and ears ; but few on the trunk, and those small and isolated : *mammæ* normal. On the outer and back part of the arm and forearm, and on the dorsum of the hand, others are seen ; in the thighs are larger patches, at the back, and about the knee, also on the front of the legs. The spots blend, producing broad irre-

gular markings, and some are in the form of complete rings; the margin broad and raised, the centre small, depressed, and almost resembling sound skin; they impart a peculiar expression to the face, looking at first sight like tubercular thickening. All the spots are unmistakably benumbed, and that to a considerable degree, the skin in the neighbourhood being normally sensitive. There is, however, evidence of nerve-disease in the benumbed condition of the skin of the forehead at the lower part, and of the dorsum of the hands and feet, which are also much bronzed and generally wasted, but no destruction of parts has yet taken place, only the fingers, &c. are thinned and rather stiff; the palms of the hands are yet partly sensitive, but deterioration of structure has evidently commenced. There is a broad, red, thickened line along the middle of the hard palate. The disease is increasing. She knows of no hereditary taint; her husband is dead; no children. (Dhurumsala patient, No. 108.)

This case resembles the last, and it also shows how the eruption may approach, in some of its characters, to ordinary tubercular thickening of the skin, indicating, as I shall have further occasion to point out, the evident connection there is between *baras* and tubercular leprosy.

(3.) A more frequent appearance than either of the foregoing, is a light discoloured state of the skin in the form of large patches, the surface of which may present hardly any other changes beyond those of colour and sensation; but the often rounded form (particularly when small), defined and slightly raised, reddish margin, and dry, shrunken, anæsthetic centre—characters sometimes common from the very first and imparting an aspect which to an experienced eye at once reveals the nature of the disease—clearly connect this form of eruption with the preceding; it seems, too, highly probable that the cutaneous affection in leprosy is of a specific character, although this may not be very evident in all its modifications.

8. Harri Sangla, a Hindoo, ætat 30, native of Chiploon (coast.) Twelve months ago he found the left foot to be benumbed and soon after spots began to appear on the body. Never had syphilis, and is in good bodily condition. The entire expanse of the forehead, the whole of the left cheek and a part of the right, are of a light colour, although the skin is otherwise unchanged in appearance, except in the left cheek where it seems rather flushed and puffy; here sensation is particularly diminished, but also lessened in the other parts, and lobule of right ear. On the nucha is a reddish patch; in

front of the trunk are two large, circular, almost white patches with defined edges, level, slightly spotted, and supple surface; a much larger single patch of less regular form and definition, but otherwise identical, is found on the opposite side to these, and scattered about are a few white spots; numbness exists in these places, particularly in the larger one. On the shoulders, arms, back of elbows, and outer side of forearms are numerous, often large, patches, of somewhat irregular form, but frequently rounded, of light reddish tint, dry and roughened surface, edges not perceptibly raised; in some round spots the centre is darker than the defined broadish margin; they are not quite symmetrical; some of them (*e.g.* on the shoulder) have an appearance not unlike (1), are slightly raised at margin, depressed and pale in centre. There are patches on the dorsum of both feet, where the skin is thin and shiny and coarsely wrinkled, an appearance different to that of other spots: over all these places sensation is deficient, and sometimes absent altogether, while the intervening skin of sound aspect is sensitive as usual. The fore-finger of the left hand is benumbed, dry, and shrunken. On both nates are large coarse patches, having a light reddish margin and darker centre; also in front of both thighs, knees, and legs are similar ones extending, on the left side, to the dorsum of the foot, which is partly destroyed; there is anæsthesia of the patches, and of the skin supplied by the musculo-cutaneous nerve. No hereditary taint. (Dispensary patient, No. 65.)

9. Rama, a Hindoo, ætat 55, from near Poona (Deccan),*7 years a leper: first were present anæsthesia and blisters on the toes, afterwards the hands were attacked, subsequently the eruption appeared. He never contracted syphilis and denies an hereditary taint. There is numbness of the ears: on the trunk are large light-coloured patches, those on the front are not raised, those on the back are, and show a tendency to form circles, or rings; here sensation is diminished, it is absent in the flattened (and older?) patches, where, too, the surface is dry and harsh: the hairs grow nearly as usual. Upper extremities—small patches of both kinds may be seen, benumbed and of circular form: the hands are much deformed, especially the left: the lower extremities are similarly affected with patches, numbness, and distortion. The new spots appear to arise by isolated round small marks. (Dhurumsala patient, No. 82.)

10. Elia, a Jew, ætat 26, from Cochin; duration of disease 5 months. On the back (left side), in the loins is a large irregular patch of a light red colour, defined edge, doubtfully raised in parts darker in the centre, and quite benumbed; other small patches of a rounded form and light red colour, all more or less benumbed, are also present: on the arm and forearm are two or three such, and a similar number on the leg and thigh. Their size at first is not $\frac{1}{4}$ inch, and they spread in a serpiginous manner. No other signs of leprosy: he probably never had syphilis, and denies an hereditary taint: looks strong and well. (Dispensary patient, No. 76.)

11. A boy (Hindoo), *ætat* 10 years, from near Ooran (coast), states that about 5 years since the disease began. There are numerous light patches on the trunk where the skin is dry, harsh, and glistening; others on the face. The eruption is mostly a simple discolouration; the smaller spots do not show either pimples or tubercles, but are frequently rounded: the larger have, on the extremities, a distinct raised edge: tubercular thickening is present in all the large patches, to a small extent, giving in some places the idea of a cicatrix from a burn, or cheloid bands. On the face however are distinct raised reddish configurations, placed on a uniform light discolouration of the skin, which invades almost the whole mark, leaving some places, *e. g.*, one half of the upper lip, free; hairs little affected. Sensation is wanting in all these discoloured places, and also in the limbs, except the palms and soles. The father of this boy died in the Dhurumsala of leprosy 5 years ago. (Dhurumsala patient, No. 103.)

I have notes of other cases which, like the first and last of these, seem to indicate a close connection between the several forms of eruption, and also with tubercular thickening of the skin; and of many others presenting the kind of eruption now under notice; two, in old women, are very much alike; but those above given may perhaps afford an adequate conception of the appearances.

(4.) In not a few instances, however, the character of the eruption remains obscure, even from the first: it is evidently something more than a mere change of colour, for there is a 'method' in its commencement and extension, and yet it cannot be said to be either tubercular or papular. Perhaps the occurrence of this form is quite peculiar to leprosy, and it may indicate an extreme degree of modification of those previously described. Numbness more or less marked is usually present, but I have noticed its absence in spots on the face, occasionally. A few illustrative cases will give the best idea of this form of eruption.

12. Changi, a Hindoo female, *ætat* 25, comes from Bancote (coast). There have been spots in the body for 12 years; they first appeared on the left forearm: at present a few, rather indistinct and the size of a rupee, may be detected on the face: all over the shoulders, front and back, on the chest, abdomen, and loins, and extending onwards to the extremities where they become fainter, are light discolourations perfectly distinct to the eye, even on her pale skin: they are generally large, and defined at the spreading borders,

but towards the extremities pass insensibly into a colour resembling that of sound skin, portions of which probably yet remain within the circumference of the patches : the free edge often shows a circular disposition. The more recent spots are decidedly circular in form, or occasionally oval ; on the back, they show the faintest red edge, slightly raised, then a broad light surface, and finally, in the centre the colour may be almost white : the surface presents rather a coarse appearance, the clogged hair-follicles being visible, as elongated dots : most of the hairs are white, thin, and short, as seen with a lens. There is marked anæsthesia in all the patches. The hands are benumbed and partly distorted, and the cuticle is apt to peel off the numbed surface. Otherwise well-formed and in good health : her paternal uncle had leprosy and was in the Dhurumsala : is married and has children, but her husband has driven her from home on account of this disease. (Dhurumsala patient, No. 7.)

13. Tulsi, a Hindoo female, ætat 20, from Shapoor (Concan), like the last patient, a shoemaker by occupation, has for 8 years been the subject of leprosy. It appeared by two spots on the cheeks which spread over the face : then others came on the trunk. No general or local premonitory symptoms : general condition good. There is no distortion of the face but numbness of the cheeks, chin, forehead, and ears : hairs intact : on the front of the body, on the back, shoulders and hips are large patches of a light colour, irregular form, and not raised above the sound skin : they are defined, but have no raised edge ; there is sometimes a narrow red margin but no trace of tubercles or pimples : they probably begin as small white points ; the newer ones are round with a reddish edge, and a little raised : their surface looks rough and dry, perspiration being deficient. In these patches sensation is impaired, and sometimes absent. The discolouration has invaded the upper extremities which are everywhere benumbed, and the two inner fingers bent, with atrophy of the *interossei* : the lower extremities are similarly affected : numbness everywhere, but no distortion of the feet. There is no hereditary taint, but her father married another woman before her mother, who had leprosy and died of it : a girl was born of this marriage a year before the appearance of leprosy in the woman, and is now living and well : her own sister, a few years younger than herself, is affected in a precisely similar manner, and there is a younger one yet well : has no brothers. (Dhurumsala patient, No. 13.)

The similarity of these cases is too striking to be accidental : it is probable that they are fair examples of a well-defined form of eruption : I might add several others by no means dissimilar, and also mostly females.

In connection with these, rather than in the first set of cases, should perhaps be placed certain examples of scanty, small, isolated white spots occurring in leprous patients, which may be one mode of commencement of the larger patches, or else modifications of those described under (1). The two instances I have seen were remarkably alike in *all* particulars: one may be detailed.

14. Chinaya, a Hindoo, ætat 20, from Mangalore; a tailor by trade. About seven years since a small white patch appeared at the right elbow, and spread around; its extent is now visible but not entirely defined, its character serpiginous: a similar spot came on the chest, near the left mamma, and recently another on the right side: on examining the two last, they are found to be composed of small white tubercles clustered in a circle, the centre of which is slightly depressed and rather darker, though less so than the sound skin (which is unusually fair for a native, and fine and supple): the diameter is nearly an inch. It would also appear from his account that another recently appeared on the right hand, where now the anæsthesia exists, but traces are barely visible: the older patches are quite insensible. The right hand has lately shown all the appearances indicative of disease of the ulnar nerve, and there is some tenderness with probable enlargement of the latter, near the elbow-joint: the hand is so weak that he cannot feed himself. The disease is in the family, his maternal aunt being affected: he is a fine strong-looking young man. (Dispensary patient, No. 50.)

Diagnosis.—Such are the various appearances of the skin which are seen in cases of leprosy, there may be others, similar or not; and there are skin-diseases of an ordinary character not unlike one or other of them. Although arranged under separate heads, I do not intend to assert that those I have distinguished are all separate species, the question will rather arise, are *any* characteristic of leprosy? This I am very strongly disposed to answer in the affirmative, and only regret some of the drawings of the more characteristic in my possession cannot be reproduced, so that a clearer impression of the appearances might be afforded than may perhaps be gained from the notes only. But while maintaining their pathognomic character, I admit that there are several points in which they agree with well-known skin-diseases, such as lepra, &c., these points of agreement, indeed, will form

the ground on which the subsequent historical remarks are founded.

At present it need only be observed that the raised, flattened, smooth, livid swelling described by some authors (I believe, amongst others, by Messrs. Danielssen and Boeck) is not to be confounded with any of the above forms of eruption; it belongs to the tubercular variety of leprosy. In this country, some apparently similar affections may be seen which require a brief notice: first, there is a rare eruption consisting of rounded, raised, flattened spots of a pale tint, covered with a thin cuticle which readily desquamates, and is very tender and vascular: the colour is like veal's flesh; there is a tendency to form excoriations, but most seem to subside, leaving small level (slightly depressed?) smooth, livid, shining marks, not unlike the cicatrice of small-pox in natives, only less uniform in size and not so puckered. I quote from a well-marked instance which left some doubts in my mind as to its real nature; in the only other similar case seen, patches of "Baras" occurred at the same time, so that its co-existence with leprosy, if nothing more, was clearly possible. Next, a much more frequent skin disease called variously "gachkaram" (properly "gajacharma") "dadur," "dinah," maighum,* occurs, which much resembles ordinary lepra; large, rounded, scaly patches, accompanied with local irritation and often thin discharge, are seen particularly around the lower part of the waist and groins, also in other parts: this is certainly not connected with leprosy, though mentioned as such by the Hindoo authors, who like their successors in Europe, included many skin-diseases under that head. Again, very often in natives we see palish spots on the skin, often clustered, and common about the neck, &c., which are also innocuous: an intelligent patient told me they are known as "sibbla." I have once seen this appearance in a leper who, however, himself spoke of it as "kuchh nahin"—not worthy of notice. Ordinary skin-diseases as herpes, eczema, scabies, &c., are common enough, but

* Popular names for the patches in leprosy, &c, are "Nitah," "Chattar," a red and white kind being distinguished.

except "gachkaram" (lepra?), the scaly eruptions are not so: perhaps, the habits of the people, and the climate, have some influence in this respect. Syphilitic eruptions of various kinds are often seen, papular, scaly, tubercular, but I have not found any difficulty of diagnosis to arise hence. Some remarks on that singular bleaching of the skin, so striking in natives, I shall reserve till the end of this summary; also a notice of a black discolouration.

Morbid changes in the Skin.—These have not been thoroughly ascertained: no doubt a deposit in and below the cutis is the cause of the elevation of the surface of the skin, impairment of sensation, and (partly) change of colour, when these are present: on one occasion a pale discoloured patch (3), which was much less evident after death, was minutely examined, and it was noted, after comparison with a similar section of sound skin taken from the neighbourhood, that the pigment in the cuticle was less abundant, and it and the cutis atrophied: sweat-ducts smaller than natural ($\frac{1}{800}$ – $\frac{1}{600}$ in. diam. to $\frac{1}{44}$ in. normal) much less clear and surrounded by a deposit marked with clear small nuclei: the same kind of deposit was also scantily seen about the hair-follicles, and occasionally in the meshes of connective tissue near to the cutis, sometimes branching as if enveloping a blood vessel: nerves (?) were seen in meshes, and then, approaching the surface, suddenly becoming taper-like, but free from deposit around them: hairs small and few, and sebaceous glands very scanty. These alterations of structure would, to a great extent, account for the symptoms.

Historical notices and Identification of the eruption in Leprosy.—A very cursory inquiry into the history of leprosy (particularly as it shows itself in the east and the tropics) will elicit the fact that a cutaneous affection was early recognised as connected with this disease; thus the *Leuce* of the Greeks (Vitiligo, 3rd species, of Celsus) was a light-coloured spot, having a depressed surface, on which the hairs were white, and which when pricked exuded a colourless liquid: it was considered incurable and very

destructive in its course. Hippocrates and Galen state that it sometimes passed into Elephantiasis (Græc.) Under the term *Baras* the Arabs also recognised a similar eruption, and further, the spots are noticed as insensible: "the disease is seated not only in the skin, but in the flesh and bones, and often terminates in leprosy." Bateman, Good, Adams, and others have endeavoured to identify this skin-affection, but with no great success, because the eruption of leprosy was barely known to them. Bateman, indeed, who seems to me the most acute and accurate of our modern authors, thought he recognised in the description of Anæsthetic Leprosy by Robinson this Leuce or Baras, but, as I think, the data were inadequate for satisfactory comparison. Both he, and Willan previously, expressed the want of a full description of the eruption accompanying leprosy, as well as others occurring in the tropics; for the present, as it is the first attempt to supply this information, some indulgence may be claimed, and I trust accorded. The difficulties are not so much in what we now observe, as in what the ancient authors described; and it is not imputing to those belonging to our profession a special blame that they confounded things which differ, for, according to modern critics, few if any are to be wholly relied upon. Names of diseases have been employed in a very inexact manner, losing their value both by having their application extended from perhaps a single affection to a whole group (of which a better example could not be afforded than the word *lepra*), or by being transferred to a different disease (and no better illustration could be given than the use of the same word by certain translators). The following table expresses the result of my inquiries: finding it impossible to satisfactorily identify the terms used, I have placed them in such a manner as to indicate where the confusion exists, the brackets serving to show the two affections undiscriminated by the terms enclosed.

TABLE OF SYNONYMES.

Names. MODERN.	Lepra, and other diseases.	Leprosy.			Elephan- tiasis.
		Eruption. Anæsthesia. Tubercles.			
GREEK.		Alphos, Melas.	Leuke.	Elephantiasis. Leontiasis, &c.	Unknown to them.
TRANSLA- TORS OF ARABS.*		Morphœa alba, nigra.	Baras.	Lepra.	Not mention- ed.
		Albaras nigra.	Albaras alba.		
ARABS.		Bohek, white & black. Beres, black.	Beres (white). (Berek.)	Jezam. Da-al-Asad (Lion-disease).	Da-al-fil (Elephant dis- ease).
MOSAIC.		Roak, Berat Cecha.	Berat Icbena (?)		
HINDOO (Marathas).		Shvet-kusta.	Guleet-kusta Sunbahiree.	Ructa-kusta Ructa-pittia Maha-viadhi.	Ras, Godh, (H. H. Wilson)

The various kinds of eruptions seen in leprosy are, in my opinion, intimately related; so much so that they may be regarded as modifications of one specific form, or at least generic group. It is freely admitted that they present several points of affinity to some other skin-diseases, but even supposing them to be specifically the same as one or other of these, the modifications they have undergone in that great constitutional malady are yet characteristic or pathognomic. It will be afterwards seen that it is with lepra (after Willan's limitation of the term) most salient

* Stephanus Antiochenensis, the translator of Haly Abbas, is an exception, he more correctly terms Beres, *Lepra*; and Jezam, *Elephantia*; this was an approximation to a right precision.

characters agree, such as the absence of local irritation, circular form, raised tubercular edge, serpiginous tendency, and especially the disposition to appear around certain joints, as the elbow, knee, &c.; and this striking fact seems to afford an explanation of the discrepancies formerly attending the use of the term *Lepra*, as well as of its first application to signify Elephantiasis (Græc.) or Leprosy.

There are several curious, almost anomalous, skin-affections yet noticed in Europe, which are probably also connected with this group, and the same impression has occurred to one of our best authorities—Erasmus Wilson: his synonymes I believe to be often erroneous, but there are, I think, sufficient grounds for separating *lepra* from other “*squamæ*,” and even for classifying it with *kelis*, *lupus*, elephantiasis (Græc.) as he has done, if not for ranging the whole as “diseases arising from special internal causes.” My own observations tend to show that *lepra* and the eruptions noticed in leprosy (in the east, its birth-place) are essentially related to each other, the former being possibly a modification of the latter, attributable to decay of type, climate, or constitutional peculiarities, and it is not improbable that *lupus*, *vitiligo*, *kelis*, *morphœa*, are similarly related. As to the *scrophuloderma*, I give no opinion; they are certainly uncommon in India: nor do I pretend to criticise Wilson’s view of the identity of any of these diseases with syphilis: that leprosy and syphilis are identical, I have not seen or read anything to really prove.

On comparing leprosy as it now appears in the east and some parts of the tropics, and the west (in recent as well as former times), the most striking differences will, I think, be found in the frequent presence of a peculiar eruption and the comparative rarity of those tubercles in the skin which are the cause of the huge mis-shapen distortion of the face, ears, &c., so generally associated with the idea of that disease. I refrain from speculation on this interesting topic, but we may suppose that the former of these differences partly explains why the translators of the Arabian authors were led to make use of the term *Lepra*,

already employed to designate a (badly defined) class of skin-diseases, in interpreting the *Baras* and *Jezam* of the Arabs (both varieties of true leprosy and commonly accompanied by a lepra-like eruption), and thus to introduce much confusion in the meaning of this term: the mistake (if wholly a mistake it were) was not unnatural, more particularly as in their days leuce was probably classed along with lepra; besides, an elephant-like distortion of size is not frequent in eastern leprosy, and therefore the Greek word for leprosy would be generally inapplicable; not to mention the fact that the Arabs had already their *Da-ul-fil*, or elephant disease, meaning thereby a totally distinct affection from leprosy. Admitting the force of these remarks, we ought not so severely to blame these translators as has been done: they endeavoured to express, too forcibly indeed, the common features of leprosy as known to the Arabs, but unfortunately they adopted a word already employed in a different and too indefinite sense.* It is singular to notice, however, that this term lepra held its ground, so that subsequently elephantiasis, leontiasis, &c., came to be regarded as species of lepra; and in quite modern days it was similarly understood by both Heberden and Cullen, who pronounced lepra (leprosy) to be very uncommon or unknown to them.

I now proceed to make a few remarks on the similarity of some modifications of lepra commonly so called, and the eruption in leprosy, more especially the two first varieties described above; these chiefly refer to the absence of 'squamæ' or scales in the former; a peculiarity so striking as to considerably diminish the precision of Willan's definition. Rayer, and Cazenave, and Schedel have noticed this, in Paris: the former

* "The only description of leprosy known in El Hejaz (Arabia) is that called 'Baras;' it appears in white patches; seldom attacks any but the poorer classes, and is considered incurable."—'El Medinah and Mecca,' by Lieut. Burton, vol. II. p. 182, published a few years since. Unless the disease has changed, which there are no grounds for assuming, it may be readily conceived how these Latin translators would be led to adapt the term lepra, and not elephantiasis, to a complaint essentially marked by a skin-disease, such too as I have shown to really present some of the characters of the lepra of the Greeks.

states, "I have moreover observed lepra under another form, that, namely, of arcs of circles a few lines in diameter, red, prominent, devoid of scales and bounding surfaces of various extent, occasionally as much as five or six inches across, the skin of which had either a yellowish cast, or appeared perfectly healthy," it generally occurred on the trunk, but also on the fore arm and hand. Cazenave and Schedel say, "It (lepra) sometimes appears with very different and very remarkable symptoms. Thus, for example, the eruption deviating from its ordinary course appears in the form of small red circular points, which unite at their edges, and by their eccentric arrangement acquire an enormous size: the patches are not covered with scales, or if they happen to be so, and these fall off, they are not renewed:" instances are mentioned which seem to me very similar to those described under (2). It is true neither of these observers notices any diminution of sensation in the patches, so characteristic of the true leprosy-spot, nor anæsthesia of other parts, as commonly accompanies it here, and I admit this omission is important, but the force of the observation remains that lepra is not always a scaly but sometimes rather a modified tubercular skin disease; and this feature alone will serve to partly assimilate the characters of Baras as described above, and of Lepra. Finally: the question may again be asked, are not these two skin-diseases allied? it is not, perhaps, susceptible of satisfactory reply, but there are, in my opinion, grounds for answering it in the affirmative: the peculiar feature of anæsthesia would lead to the view of the eruptions in leprosy being a form of lepra occurring in a leprous subject rather than the lepra of Europe being a remnant of leprous taint, though this view is as tenable as Wilson's, that it is connected with the syphilitic diathesis.

The Leprosy of the Jews.—Whether this were really a variety of the disease known as leprosy at the present day or not, is difficult to determine: in the Mosaic account it is described as a series of affections of the skin, which would lead us to suppose it was similar to leuce or baras, and the diagnosis was made to

depend upon appearances not unlike those of leuce; the white glossy aspect, depressed surface, and blanching of the hairs being the most striking. The probability of the Jews becoming tainted with leprosy during their residence in Egypt, where the disease is known to have prevailed, and the general belief of antiquity, are also in favour of this view: and it may be further urged we are not to look for a scientific description in the Mosaic records. After making every allowance, however, the proofs of identity are not satisfactory; putting aside the fact that more than one skin-disease is certainly included in the account in Leviticus, ch. xiii., and the otherwise inexact application of the term leprosy to inanimate objects, we find no reference to loss of feeling in the spots, or in the hands and feet, or to distortion and destruction of these parts, or to any of the symptoms of tubercular leprosy. The mode of distinguishing leprosy spots is also peculiar, depending upon changes they may undergo in the course of one, two, or three weeks; this would hardly assist in the detection of the eruption of leprosy as we now see it, for its progress is so slow that months elapse before any change occurs. Such are the chief grounds on which it might be argued that the disease was really not leprosy at all, but a collection of inveterate cutaneous eruptions, most arising from neglect of personal cleanliness, and to be remedied accordingly; while others, perhaps, scaly and tubercular, were rather constitutional. I should, myself, have come to this conclusion, if I had not found in other ancient accounts of leprosy the same confusion and omissions, making it almost impossible to arrive at satisfactory results. It is worth notice that the Jews are now seldom affected with leprosy; I have seen only four cases, and, as stated in a previous note, no deaths from this cause have happened among the Jews during the last 12 years in Bombay.

“Kushta, or Leprosy, as known to the Hindus.”—This is the title of a valuable article by H. H. Wilson (Vol. I. of Trans. Med. Phys. Society, Calcutta, 1825), briefly referred to here as showing that the manner in which the subject was treated by Hindoo authors is similar to, but more precise than, that of

Moses. Eighteen varieties are distinguished, seven chief, eleven of less importance, the distinction being founded on the "appearance and discolouration of the skin, and other incidental modifications." Some of the former are no doubt identical with the eruptions now seen, and described above; and amongst the latter it is easy to recognise others now known by the same name although not of a leprous type. Of these last or secondary forms, the species first mentioned is "ekakustham," also called "gajacharma," or "elephant-skin." This I conclude to be the scaly disease before referred to as popularly named "gaj-karam": thus the Hindoos, like the Arabs and Greeks, had an "elephant" disease; amongst all three nations, however, the idea to be conveyed was different, and consequently the diseases indicated of a perfectly different nature. In all these eighteen varieties I find no reference to anæsthesia either of the spots, or the extremities, &c., nor any marks, beyond the attendant eruption, of either anæsthetic or tubercular leprosy. This seems strange, for we cannot suppose this wide-spread disease to have quite changed its characters in the course of a few centuries; how is this total absence of allusion even to the most striking and peculiar feature of leprosy to be explained? Slowly indeed has plain observation been liberated from the trammels of traditional methods and inveterate preconceptions! The Hindoo is an improvement on the Mosaic, the Arab upon the Hindoo, and yet perhaps the best and most precise: it is reserved for the moderns to make the next step, aided by means of investigation till now unemployed, though not yet perfected.

Albinism.—There is a very striking and well-known blanching of the skin which in the dark native produces a curious and rather repulsive appearance; I mention it here, having heard the suggestion that it is the kind of leprosy of old sometimes called "snow white," and the force of the simile cannot be denied, for the albinism is so complete, though of a somewhat chalky whiteness, as to equal the tint of the fairest European. The hairs of the head, &c. and the eyes are unchanged, and the functions of the skin uninterfered with. Cases are not uncommon; I have

before me notes of 10, of which 4 are females (3 Parsees) of adult age, the age of the men is generally less : in two cases the affection has existed for about 25 years without any impairment of health, in others for 10 years, and in one since infancy ; I have seen very young children marked with it. The most frequent position at commencement is the hand, next the foot, and face ; the spots are often perfectly symmetrical ; they begin by minute white points, and spread so as to invade the entire surface ; constitutional and, usually, local irritation are absent. In two cases it seemed hereditary, and in two or three connected with leprosy which is worthy of notice : a syphilitic taint is generally not observed. One instance may be related as presenting some unusual features.

15. A Mussulman, *ætat.* 28, from Mandavie ; a wood-seller. The following parts are affected,—lips, within the nose, inner canthi : front of sternum ; both elbows, front of forearm near the wrist, palm of hands, dorsum, knuckles, and fingers : whole length of shins, soles, and dorsum of feet : scrotum and inner part of the thighs. The spots are level, and white, irregular in form and size ; the hairs on them white, and surface rather dry though otherwise healthy ; they are quite symmetrical, except the one in the sternum, and largest on the hands and feet ; they are still spreading. It is ten years since the first appeared : some recent spots are reddish in colour, raised, the seat of itching sensations, and when scratched blood exudes : the glands in the axilla are inflamed. He is in good health and condition, but complains of the heat, and burning in the eyes. No spots are to be seen in the mouth. He states that his elder brother is affected to a much greater extent than he, and his paternal great grandfather had spots on his feet : there is no taint on the mother's side : he has no children.

Black discolouration of the Skin.—This is worthy of brief notice and is not very unfrequent : the colour may be compared with that of plumbago, or it may be bronze-like. I have short notes of seven cases, in which it has only occurred on the face, usually on the forehead or the cheek just below the orbit, sometimes in the course of the branches of the fifth pair. The functions of the skin are not affected. This curious disfigurement is not connected with a syphilitic taint ; once it appeared in a patient tainted with leprosy, and I should remark that a bronzing of the hands and feet, face, &c. is common in lepers, where anæsthesia and

tubercles exist; this fact may have given rise to the term "black leprosy," the worst form of the disease; the Hindoos have besides a white leprosy, which is probably Baras. In the Mosaic, Arabic, and Greek authors, we also find the terms white and black in constant use.

2. ANÆSTHETIC LEPROSY.

Impairment or loss of the tactile sense is the prominent character of this phase of leprosy, and, in the earlier stages, the first symptom noticed: it is moreover a very common attendant on the two other phases, as in one has already been shown, and as subsequently will appear in tubercular leprosy; it is therefore the most constant feature of the disease, at least in India, and the most significant. Inability to appreciate differences of temperature and other kinds of irritation, forms part of this symptom; but the muscular sense is impaired, if at all, only when paralysis (acinesis) comes on, and that is neither invariable nor marked even in advanced cases.* The explanation of this fact indicates the special seat of disease, viz., the cutaneous nerves proper in their course above the deep fascia; or else the nerve-trunks of compound function where they approach nearest the surface, and then probably only the sensitive or cutaneous element, as will appear further on. Conjoining to this striking peculiarity the circumstance of the two other phases of leprosy being skin-affections, it might be inferred that the proper seat of the disease is the cutaneous system, and to this conclusion my own observations seem to point, but there-in they differ materially from M. M. Danielssen and Boeck's. Viewed as the evidence and result of a diathetic condition

* I have been fortunate enough to meet with a most interesting account of a "case of anæsthesia" by the well-known Physician, Dr. J. Yelloly; it is published in the *Medico-Chirurgical Transactions of London*, vol. III., p. 80, and is really an example of anæsthetic leprosy, although not recognised as such. The observant author clearly points out the peculiarity I now refer to, but being unacquainted with the morbid anatomy of leprosy, he was naturally at some loss to explain the symptoms. Dr. Yelloly's paper is worthy of close perusal by those interested in this subject, and I am glad to refer to it as confirming in so many ways my independent observations.

(which undoubtedly is present in leprosy), anæsthesia of this kind, so far as I know, occurs in no other disease to which the human frame is liable: but it is not my intention to enter upon the subject of the pathology of leprosy, which must yet be a matter of speculation; I have only to record, as accurately as possible, the results of direct observation of its symptoms and morbid anatomical characters.

It will be convenient to introduce here some statistical facts connected with the biology, &c. of the disease in general, and so to avoid needless repetition.

GENERAL REMARKS ON LEPROSY.

1. *Comparative frequency of its different varieties.*—The following table contains a brief summary of the cases I have noted: in distinguishing the various forms it should be recollected that they all belong to one disease and consequently often blend:—

	Dispensary patients.	Dhurumsala patients.	Hospital fatal cases.	Total.
Anæsthetic Leprosy	29	29	9	67
Mixed Leprosy (anæsthetic & tubercular) ..	5	28	7	40
Tubercular Leprosy	2	14	1	17
Baras	5	9	0	14
Anæsthetic Leprosy and Baras	22	26	0	48
Total..	63	106	17	186*

Such according to an arbitrary arrangement was the condition of the patients at the time of being first seen; sometimes the disease was advanced, sometimes only commencing, and on the more predominant symptoms alone were these distinctions made. Each of the varieties above distinguished might claim separate

* Notes of 17 other cases now before me were unfortunately mislaid before this table was drawn up; they would only serve however to confirm the results it points to. One was fatal, the patient being a Portuguese female suffering from anæsthetic leprosy and finally anasarca, &c.

notice, and would repay it, did space permit. I may mention that no evidence has come before me indicating that Leprosy is less frequent than formerly.

2. *Age at which the disease commenced.*—Of 65 cases of anæsthetic leprosy the symptoms first appeared under 30 years, in just over half the number; in many under 20 years, two cases being under 10 years: in comparatively few after 40 years. The eruption made its appearance rather more frequently under the age of 20, and so the combined form of it and anæsthetic leprosy: the same seems to hold good of the tubercular variety.

3. *Sex.*—Males suffer much more frequently than females from the first form; the same is the case with the tubercular; not so with baras, as it would appear, but the data are limited.

4. With regard to *occupation*, many patients are fishermen, many ryots, or field-labourers; amongst the Dispensary patients were men engaged in very various trades. All live more or less on rice and dried, or salt, fish.* I may here mention that Elephantiasis is also popularly attributed to a fish diet, and is commonest along the sea-board, in this Presidency: I have never seen a union of the two diseases.

5. The *localities* where lepers have resided or been born, are usually Bombay and the neighbouring fishing towns and hamlets, the names of these are in my notes, but need not be introduced here. As before mentioned, the disease is common in inland parts; for instance in the Huttee Sing and Premabhai hospital at Ahmedabad, there were admitted in 1861, 72 cases of leprosy, 50 being marked as anæsthetic and 22 as tubercular; but, as Surgeon Wyllie, in charge, observes, "in some the distinction was ill-defined, and in several both conditions appeared co-existent:" he also states that the disease is not so common as might seem near Ahmedabad, for "in most instances the patients have come from distant provinces, notably Rajpootana and Katiawar": several were re-admissions: three deaths

* See the note at page 2.

occurred during the year. I hope that the present imperfect account of leprosy will be the means of eliciting useful if not important information concerning this sad scourge, by drawing attention to some of the points now referred to.

6. The *duration* of the disease may, when not extensive, be prolonged to upwards of 30 years, the patient retaining a fair amount of health and vigour; it is generally much less, 5, 10, or 15 years being, perhaps, the usual periods, but there is not, to my knowledge, either a uniform termination, or limited course: much will depend upon the outward circumstances of the patient.

7. *Cause of death.*—I am not able to point out any special cause of death in leprosy, attendant or accidental complications having generally carried off the patient: thus in 17 cases, four died of cholera, a larger number of debility induced by chronic diarrhœa or dysentery, and this is probably the most frequent mode of termination. Two patients, however, died from albuminuria: fever and anasarca were present in one of these, the leprosy being of the anæsthetic kind and of three years' duration (see M.L. TABLE (1) no. 2); the other was complicated with acute jaundice, the leprosy was mixed, and of only one year's standing (see M.L. TABLE (1) no. 3): both were Portuguese.* As in six other cases at least, the kidneys were found more or less diseased after death, it may be presumed that interference with the functions of these organs assists in hastening a fatal issue. It should be stated that in one of the above Portuguese patients inflammation and suppuration of the absorbents in the axilla were present, and in two other cases, unmistakeable phlebitis was found in connection with sloughing and ulceration of the extremities, the kidneys being also diseased: in one of these two abscess of the liver and dysentery had occurred, but the second patient complained only of fever and debility, and it is possible death may have been owing to pyæmia: such a conclusion would

* A third case is that of the Portuguese woman mentioned in a previous note, she died of anasarca, &c., having been affected with anæsthetic leprosy for seven years.

not be warranted in the other cases, yet the presence of pus in the absorbent and venous systems is a fact which should not be overlooked.

Further remarks will be made under the head of Morbid Anatomy.

An acute form of tubercular leprosy has been distinguished by the Norwegian authors; I am not acquainted with it.

8. *Hereditary predisposition*.—This is undoubted: amongst the Dhurumsala patients it was frequently noted, 41 times out of 107, a few of the latter being uncertain; in 24 instances it seemed to arise on the male side, in 17 on the female, and transmission of the taint did not always occur in a direct manner, but sometimes by alternate generations: often its presence was indicated by disease in the brother or sister of either of the parents. Out of 24 cases of anæsthetic leprosy, 9 acknowledged the existence of a taint; and in a similar number of the same combined with baras, not fewer than 14. Amongst the Dispensary patients this predisposing cause was less evident, or rather less frequently acknowledged, for there is natural unwillingness to admit that such a terrible and loathsome malady has ever occurred in a family. The subject is worthy of fuller inquiry than I can now attempt, although my notes are sufficiently copious.* It has been already stated that a *syphilitic* taint does not appear to be essentially connected with leprosy, but, as is well known, this is a subject of debate amongst physicians in Europe, especially in Germany.

9. *Contagion*.—The disease is not communicated by contact, or through the air; whether it be inoculable, may be questioned

* The following illustration of the general belief in hereditary tendency was mentioned to me by my friend H. J. Carter, Esq., F.R.S., as happening in his experience. A Sheik on the Arabian coast owed something of his distinction to the circumstance of his being affected with anæsthetic leprosy, for his tribe pretended to recognize the rightful successor to power by the appearance, after a certain age, in his person, of the peculiar distortion of the hands; in saluting him they were in the habit of kissing the elbow instead of the hands, as usual.

At the Dhurumsala in Bombay, we might expect to find some evidence of contagion, if anywhere, for the lepers mix freely with the people in the immediate neighbourhood; yet on inquiry no instance of propagation of the disease was ascertained. The following statements however are worth noticing: a late sepoy in charge of the Dhurumsala had two children affected with leprosy, both of whom died about the age of puberty; they were in the habit of running about amongst the inmates: neither of the parents was affected. Some years after marriage and birth of healthy children, a wife became a leper and afterwards her husband, the form of the disease being different in each; neither acknowledged an hereditary taint. Again, the wife showed symptoms of leprosy (tubercular) soon after marriage with a leper (similarly affected), the children are yet healthy, though grown up: and in a third case, the husband being a leper, the wife became so, and their son is affected. In all these three last instances the patients were natives of localities where the disease is common, hence no satisfactory inference can be made. Another supposed feature of leprosy may be here noticed—the *libido inexplibilis*—evidence of which was apparently presented in two or three cases of intermarriage, other inducement being at least hardly conceivable.

Anæsthetic Leprosy.

Its symptoms readily arrange themselves into three groups, answering to the early, established, and terminal stages, and in this order will be now referred to; each category being illustrated by cases taken from my notes.

Premonitory and early stages.—If there be any symptoms which are strictly premonitory, I have never seen them, but such are mentioned by experienced writers; their descriptions, however, have generally seemed to me to be based not so much on direct observation, as upon inference or a supposed analogy of leprosy to the eruptive skin-diseases: I cannot regard this view as correct. Some of the ancient Greeks remarked that the disease is not detected until it has already made its appearance by unmistakeable signs; and such is my own opinion, but it is

given with diffidence, being the result of a somewhat scanty experience.

Of the disease at an early stage, I have seen several instances. It has been stated by some that hyperæsthesia is a common attendant at this period, but my experience does not accord with theirs; in anæsthetic leprosy this symptom has certainly been absent if we may trust the assertions of the patients themselves, and in the earliest cases I have personally examined, it has been wanting. I have, however, seen considerable tenderness in parts of the face where a puffy, flushed appearance seemed to indicate the onset of tubercular thickening, and I have been informed of an instance where it was present in the lobules of the ears which are supplied by a nerve very often found diseased. Tenderness has also a few times been found in the hands, &c., when the cuticle overlying the digital nerves was much thinned, but these cases are rare and of some standing; and they strictly belong to the form of leprosy here termed 'baras.' Local sensations of pricking, shooting, burning pain are often present in the fingers, toes, &c.; sometimes there is a susceptibility to cold, and a feeling of heaviness and weakness, with tremor, in the part. Similar sensations running upwards in the course of the great nerve-trunks of the extremities as far as the elbow or knee are frequently felt, being either spontaneous or excited by slight pressure, &c.; if local tenderness co-exist it is greatest at certain points, as on the side of the neck (n. auricularis magnus) above the middle of the wrist or bend of elbow (median nerve); or behind and above the inner condyle, and at inner side of wrist (ulnar nerve); behind the inner ankle (posterior tibial n.) or along the inner side of the leg (long saphenous n.); sometimes a distinct enlargement of the nerve is perceptible to the touch in these places. These local symptoms are often increased at night. General aching wearing pains in the limbs, &c. are occasionally complained of, and I have also noticed an excited state of the system, with tremulous movements of the extremities, but this appeared to be rather the result of depressing emotions, &c. Fever is not a special attendant on leprosy, but will cause

exacerbation of the symptoms for the time; nothing like the so-called "elephantoid fever" has come before my notice in Bombay. Many patients have expressed themselves not so well in the cold season as at other periods of the year.

The following cases are intended to illustrate these remarks, in some the disease is first appearing, in others a fresh part is being attacked: as a matter of convenience the upper extremity has been selected for illustration.

CASE 1.—Anæsthesia of ten days' standing, dorsum of hands and feet affected. A Parsee, *ætat.* 30, a carpenter, living in Bombay. On the dorsal aspect of all the fingers and thumb, also on the back of the feet, near the ankle, is well-marked numbness of the skin (the first symptom noticed by the patient) with a coarse dry wrinkled appearance, but no change of colour beyond a slight reddening: over all these places the cuticle comes off in thin flakes; there is no kind of local irritation, or unusual sensation, and no impairment of muscular power. In the hands the numbness is greatest over the knuckles and does not extend so far as the ends of the fingers, a circumstance readily explained by the anatomical distribution of the radial and ulnar (dorsal branch) nerves on the back of the hand. There is no general disturbance of the system, or fever; no hereditary predisposition or any apparent cause for these symptoms: health good. (Dispensary patient, No. 44.)

CASE 2.—Anæsthesia of one month's standing—the median nerve affected. A Mussulman farmer, *ætat.* 42, from Broach. There is numbness without marked alteration in appearance of the tips of the thumb and two next fingers, on their palmar surface (right hand); when they are irritated, pain is felt along the middle of the forearm as far as the elbow, in the track of the median nerve, and the same effect follows jarring of the elbow or irritation of other parts supplied by the median nerve: there is no local tenderness in the course of the latter, but at night flexion of the forearm causes such uneasiness as to interfere with sleep. The tips of the fingers have not their temperature altered. For upwards of a year the middle cutaneous nerves of both thighs have been affected; the anæsthesia began near the knees. There is no hereditary taint, but he has had syphilis: health good. (Dispensary patient, No. 41.)

CASE 3.—Anæsthesia of the hands of a month's duration—both surfaces affected. A Hindoo, *ætat.* 26, a carpenter, native of Bombay. About a month ago when lifting a carpet bag he experienced a feeling of numbness in the hands, extending up the forearm, similar to that caused by pressure at the elbow (several other patients have used the same simile, some compare the feeling to the creeping of ants): since that time the numbness has increased

and extended to all the fingers. He positively asserts there was no previous exalted sensibility in the hands, and at present no tenderness in the course of the nerve-trunks can be detected. Left hand—outer part of palm (median nerve) and dorsum (radial nerve), including the thumb and corresponding fingers, are quite benumbed, and a slight though perceptible change of appearance is already visible, the palm and fingers having a purplish hue and looking smooth and dry, but not yet shrunk : muscular power intact. Right hand—is in a similar state, only sensation partly remains in the ball of the thumb, &c. : small blisters, accidentally caused, have appeared on the outer side of the fore finger. The legs and feet have long been benumbed (two years) : on the left side everywhere below the knee, the skin being shrunk and bronzed, and scars of sores are seen in the sole where pressure is greatest ; there are no bullæ : on the right side the extent of anæsthesia corresponds to the distribution of the external saphenous nerve, and the skin is here, too, dry, bronzed and shrivelled. He denies hereditary taint and syphilis : is in fair health. (Dispensary patient, No. 80.)

CASE 4.—Incipient anæsthetic leprosy. A Mussulman, ætat. 35, a drummer, native of Mahim, near Bombay. Symptoms of five weeks' standing. There is considerable numbness of both surfaces of the hands and fingers, limited above at the wrist : the skin of the palm is dry and shrunk and the cuticle is here desquamating in thin flakes ; temperature not perceptibly changed : the dorsum of the feet, including the lower and inner part of the leg, in front, and the soles especially, are also benumbed ; the skin is affected in a similar way to the hands. Muscular power and muscular sense (?) are so much implicated that he can hardly stand on his feet or feed himself : the movements are tremulous and slow. No tenderness of the nerve trunks, or other marks of leprosy : no premonitory symptoms, or local sensations except debility, twitching, and aching pains. Is in poor health and of intemperate habits : formerly suffered from syphilis : denies an hereditary taint. (Dispensary patient, No. 85.)

The local sensations are frequently so slight as to pass unnoticed by the patient, the numbness being then the first symptom observed, and this is often discovered by mere accident, *e.g.*, the fingers or toes are not uncommonly scorched unawares ; one man found he could not feel the bridle he was holding, &c.

There is no computing indeed how long absent or deficient sensibility may remain unobserved, for it is well known that persons who are deaf, or devoid of the sense of smell, may be unaware of the fact during the greater part of their lives.

It will be remarked that the pricking, creeping sensations and the attendant anæsthesia commence at the peripheral terminations of the affected nerves, extending *centrad*, and that the local tenderness and swelling of the latter, if present, are generally noticed simultaneously: the chronology of these symptoms is of some interest, but unfortunately the data are not always to be relied on. A case which I carefully examined, presented an apparent exception to one of the above statements, for while the palm of the hand (except the inner side) was benumbed, the tips of the thumb and three inner fingers were still sensitive to the prick of a pin: I could not be sure of any difference between them and the tips of the opposite fingers, which were benumbed, though otherwise hardly changed.

The foregoing instances will also serve to show the earliest changes the benumbed skin undergoes; these are briefly a dry, flushed, shrunken, mummified appearance, the cuticle being evidently atrophied, and smooth though shrivelled; it occasionally shows a tendency to desquamate. In dark skins a bronzed tint is very common. There is no evidence of elevation of temperature, but rather a tendency to the reverse. Perspiration is generally deficient or absent on the benumbed surface, and sometimes over a large extent around. Except the bronze tint which is less common there, the skin of the palm shows these changes best.

The following cases further illustrate these, and the next succeeding phenomena, one of which is the appearance of bullæ or vesicles. The hand is taken for example as before. Nos. 9 and 10 are of special interest as proving a close relation between local nerve-affection and the superjacent eruption (Baras), the specific character of the latter being thus again demonstrated.

CASE 5.—Symptoms of a month's duration, or longer—tenderness in nerve-trunks considerable—further local changes. A Hindoo, *ætat.* 45, a trader, native of Bombay. Anæsthesia appeared on the palmar aspect of fourth finger left hand, spread to dorsum and also to the little and middle fingers; a slight degree of numbness is present in the inner margin of the palm, which already is a little concave, indicating some degree of atrophy: the little finger has lost its flexibility and the fourth is swollen, stiff, and

superficially ulcerated. Since 15 or 20 days there have been pricking and shooting pains in the forearm and inner side of arm: there is also decided tenderness at the middle of the forearm above the wrist and the front of the elbow, but especially behind the inner condyle, also along the course of the median and ulnar nerves in the arm as far as the armpit, firm and tender cords are felt in the position of these nerves. The pain is so great when the arm is bent or compressed that he cannot sleep. There is no tenderness over the spinal column in the neck. He had syphilis many years since: no known hereditary tendency: no other part affected: there were no premonitory symptoms whatever. He has long suffered from dysentery, and is thin, but tolerably strong and very intelligent. Afterwards it is noted that perspiration is scanty in the left arm (this symptom has been found in other cases), and that the skin of the hand is becoming darkened and shrunk. (Dispensary patient, No. 47.)

CASE 6.—Disease of the ulnar nerve of 3 months' standing—marked diminution of temperature. A Mussulman, *ætat.* 25, from Hindoostan. Above the inner condyle of the left arm is an elongated swelling, visible even to the eye and tender to touch; pain and tenderness extend also as far as the axilla; pressure on the swelling causes shooting pain and spasms in the two inner fingers of the hand. Here is seen slight atrophy of the inner side of the palm, slight flexion of the two fingers, with some thickening of the ring finger; on the dorsal surface is a light-reddish patch, probably the result of a caustic application intended to remove the numbness there. The skin of the palm—inner half—presents a slight blushing tint and shrivelling, extending to the fingers, the innermost of which seems a little atrophied: these parts are of a decidedly lower temperature than the rest of the hand, judging by the feel only: they are completely benumbed. The whole hand is weak, the interosseous spaces collapsed, particularly the first one (the adductor pollicis muscle supplied by the ulnar nerve being paralysed), and the thumb is much weakened. There is decided atrophy of the inner side of the fore arm: the hand is displaced somewhat outwards as if the flexor carpi radialis muscle were acting without an antagonist. History—there was first a pricking sensation (as if asleep) in the little finger, followed by numbness in it and the next finger; soon afterwards the swelling at the elbow attracted attention, there being great pain and tenderness shooting along the forearm, which prevented his sleeping; increased numbness and weakness followed, but the symptoms now progress very slowly. Is in fair health and intelligent; denies syphilitic and hereditary taint. (Dispensary patient, No. 471.)

CASE 7.—Disease of the ulnar nerve. An adult Parsee, who for a year and a half has shown symptoms very similar to the last case: the skin at the inner side of the palm (right hand) is thinned, red, and shrunk, the change being very apparent indeed; there is twitching of the small muscles supplied

by the ulnar nerve : on the latter just above the elbow is an elongated tender swelling. The hand is very susceptible to cold, and the temperature, at the inner side, is slightly reduced, judging by the feel. This patient formerly attended the Dispensary, but the disease was not then detected, being mistaken probably for inflammation of the lymphatic glands at the elbow, but the hand was already implicated, for poultices, he states, were ordered : there is no clear evidence, however, of hyperæsthesia now, or in the history. (Dispensary patient, No. 70.)

CASE 8.—Anæsthesia of a year's standing : bullæ, or vesicles. A Mussulman, ætat. 45, from Baroda. There is numbness of the dorsum of both feet and both hands ; and slightly of the lobules of both ears, which are rather reddened. In the hands the tint seems darkened ; the anæsthesia is limited precisely to the dorsum, and does not extend to the ends of the fingers (this part being supplied by a branch from the palmar digital nerves.) The feet are much bronzed, particularly the left one where the disease began, and numerous small bullæ or vesicles appear on the sides and tips of the toes, he states, in a perfectly spontaneous manner : the size of some is almost minute. The anterior tibial nerve is probably less affected than the musculo-cutaneous : the sole of the left foot is benumbed, and there is tenderness behind the inner ankle. He never had syphilis and knows of no hereditary taint. (Dispensary patient, No. 77.)

The case of Tah Mohammed narrated at page 6, is also an excellent illustration of the early stage of anæsthetic leprosy : see as well that at page 14.

CASE 9.—Identity of seat of the eruption and the nerve affection. An adult Mussulman, from Rutnagherry (coast), complains of numbness of the right arm and forearm over the extent supplied by the two internal cutaneous nerves, also of the palm of the hand and little finger where supplied by the ulnar : this he first discovered by accident about a month since. Around the elbow and above, the skin has a pale appearance limited by an indistinct but defined margin, which is gradually spreading upward : here the anæsthesia also ends and pressure at this spot, over the ulnar nerve, alone causes shooting pain in the course of the latter. Other pale patches are found at the knees, of longer standing. (Dispensary patient, No. 82.)

CASE 10.—Baras attendant on the local anæsthesia and disease of ulnar nerve. Nowrojee, ætat. 15, a carpenter, living in Bombay, in good health, but unable to work on account of the left hand being weak or tremulous, and stiff. There is already atrophy of the palm, and the appearances so characteristic of leprosy have begun to show themselves : the skin near the wrist, on the inner side, is shrunk, dry, and dusky, and quite benumbed. On the inner, front, and outer surfaces of the forearm up to beyond the elbow are two large

patches of *baras* of a perfectly typical character and most striking to the eye: they are quite benumbed. The ulnar nerve at and above the elbow is greatly enlarged and very tender; pressure on it, as he observes, causes twitching and shooting pains running downwards to the inner fingers. The dorsum of the hand is not benumbed except over the little finger, and here there is the pale red tint generally indicating the eruption, indeed it is evident that the large patches of *baras* began at this spot upon the benumbed surface and they have spread upwards over the course of the internal and external cutaneous nerves. The history of the case shows that pricking pains and numbness were first noticed in the hand (and this only two months since), about the same time pain and tenderness at the elbow, and a short time afterwards (three or four weeks) the eruption made its appearance, at first on the dorsum of the inner finger. Great weakness and atrophy of the hand followed with quick spreading of the eruption upwards: no fever. (Dispensary patient, No. 83.)

These two cases, and I could mention others, offer conclusive evidence of the close but inexplicable relation of disease of superficial or cutaneous nerves with a characteristic form of skin disease. The last one is remarkable for the rapid progress of the local symptoms, depending upon extensive and acute nerve-disease.

Thus it will be seen that wasting of the deeper seated tissues and of the muscles supplied by the diseased nerves, with atrophy, flexion, and stiffness of the fingers and toes; frequently a marked diminution of temperature; vesicles and superficial ulceration, are the chief phenomena which succeed the anæsthesia. The distortion of the hands is peculiar, the palm being narrowed and concave, the first phalanges drawn backwards, the two next, flexed stiff and claw-like, are also much wasted. The ball of the thumb subsides, and a marked depression exists where the first interosseous muscle should be; and as might be anticipated, muscular power of the hand is diminished, but it is not lost until the muscles themselves have probably become wholly changed; in the forearm, paralysis seldom occurs, and then on the inner side where the two muscles supplied by the ulnar nerve are placed; I have also noticed a wasting here, indicated by a straight or concave outline. All these changes may occur in a few months, or they may be delayed

for two, three, or more years, depending, no doubt, upon the degree of nerve disease, and also the general condition of the patient. The bodily health is not yet necessarily affected; patients in favourable circumstances still retaining their vigour, with the exception of this curious blight in one or other of their limbs.

The disease has now reached a *confirmed stage*. The function of certain parts is seriously affected by impairment of their nutrition. As bullæ continue to appear they may be noticed first: their most frequent seat is the fingers and hand, toes and feet, but I have seen them on the thigh, nates, &c., never on the face: their size varies from a line to an inch in diameter; their number is small, one or two appearing at a time, generally in the night, and their form is irregular: they contain a turbid or reddish fluid, and sometimes are but little raised, as if the effusion were seated in the cutis itself: they usually subside in two or three days, but may burst, leaving a raw surface which, however, by no means invariably ulcerates; finally a white spot may remain if the cutis have been involved, otherwise no distinct mark may be left. I have once or twice seen a deep ulcer leading to bone (beneath the ball of the great toe) and around which the skin was benumbed, said by the patients to have begun by a vesicle. Difficult as it may be to explain the occurrence of these bullæ on benumbed surfaces, it cannot be denied that many times they appear to arise spontaneously, and hence they have been ranked as the peculiar feature of anæsthetic leprosy; but it is equally certain that they are often absent, and in my experience they have never appeared on a surface not previously anæsthetic, so that their diagnostic value can be but slight. And again, they may often be traced to an accidental cause, as the heat of a fire, or "biri," friction of the shoes, pressure, or some such slight irritation (unperceived by the individual), as it is probable would induce their formation on a surface the vitality of which is depressed, and cutis partially disorganised: they occur, too, on parts most exposed to such irritation, as the knuckles, sides and tips of fingers, sole of foot, &c., and finally in appearance there is nothing to distinguish them from other

accidental vesicles, only sometimes they seem deeper placed. Febrile symptoms neither precede nor accompany their appearance.

It may be observed that sub-cutaneous structures, *e. g.*, the bottom of a deep sore, will be sensitive when the cutaneous surface around is benumbed; this I have noticed more than once, and it seems to show that the anæsthesia is, sometimes at least, only superficial. Ulcers generally readily heal.

The frequency of an accompanying eruption (baras in one of its forms) has been fully pointed out and illustrated in previous cases; when present it was found to have preceded the anæsthesia rather oftener than follow it, the interval being generally a year or two. In many instances of long standing leprosy it had ceased to be visible, if the statements of patients are to be trusted, and as anæsthesia would probably remain, this may be the explanation of the extensive benumbed but otherwise unchanged surface sometimes noticed on the trunk: it must be acknowledged, however, that the cause of this wide-spread anæsthesia has not been adequately investigated, and it is probable that the cutaneous nerves are also sometimes implicated, as on the extremities, since the numbness may be wanting in defined regions; as for instance, along the median lines of the trunk, and here alone, or on the front of the abdomen, &c.: the intercosto-humeral nerve is not seldom diseased. Bronzing of the skin of the feet, hands, and face, is common in dark Hindoos and Indo-Europeans; it may be partly due to exposure, but is accompanied by atrophy and smoothness, as well as deficient sensation.

The progressive interstitial absorption, the most frequent and characteristic mode by which the hands and feet become distorted and partly destroyed, always commences at the ends of the fingers and toes (like the anæsthesia), and it would seem that the terminal phalangeal bone is very early affected. After its removal the altered nail and pulp are transferred by a kind of involution as it were, to the second segment of the digit, subsequently to the first, which also not unfrequently

disappears, and so destruction proceeds. Striking limitations of this process to one side or its greater progress there are sometimes seen, corresponding evidently to deeper implication of the median or ulnar nerves, or in the foot the inner and outer plantar: my notes refer to remarkable instances in the latter locality: this fact will be again referred to as proof of the real though obscure dependance of nutrition upon nerve influence. In spare subjects the fingers become very slender by absorption, but in the plethoric Mussalman or lymphatic Parsee this may be less evident; they are then shortened, and being thinnest opposite the intervals of the joints, the latter appear swollen, or become so from chronic inflammation. It is in these cases, I believe, that the Pacinian corpuscles will oftenest be found changed; they are seldom so in the dried and shrivelled hand. Necrosis of the phalanges is not uncommon; it begins at or near the joints which then become swollen, foul ulcers appear on their dorsal surface, and fragments of bone, or a whole phalanx, are extruded there: but this process, infinitely more unsightly though not more destructive than the first described, is not so prevalent as supposed; the two may co-exist. In either case the hand or foot is mutilated, nay, well nigh destroyed; in the worst examples it is doubtful if even the carpal bones remain, and a good part of the tarsus may be removed by the same interstitial absorption, accompanied with no pain, swelling, or sores. It is not then without reason that this variety of leprosy has been named "articular," or sometimes the "joint evil;" although the large joints are never attacked. I notice that the nails are less frequently deformed than in tubercular leprosy.

The occurrence of ulcers, sometimes large, deep, and foul, and of local gangrene, may be referred to a combination of accidental causes and deficient nervous influence, aided by exposure and want: that the second of these causes may alone lead to ulceration seems shown by its presence on the lobules of benumbed ears, parts little liable to direct irritation. Absorption of the nasal bones is often seen in advanced cases; it may possibly be

connected with disease of the nasal branch of the fifth cranial nerve. In accordance with its constitutional nature advancing leprosy generally attacks symmetrical parts, both hands and both feet, but less often, I think, both sides of the face: striking exceptions however occur, I have twice seen a unilateral affection of the extremities, of the right and left sides respectively. The comparative extent to which the two extremities are usually implicated—the lower the greater—is partly explicable on anatomical grounds: but it is worth notice that men engaged in manual labour are frequent subjects of numbness and distortion of the hands, particularly carpenters; and we may suppose that the exposure, &c. the feet are ordinarily subject to, certainly accelerates, may perhaps dispose to, the disease there.

That a cachectic condition of the system is likely to supervene under the circumstances in which most lepers are placed, might be presumed: it may even be concluded that a leprous taint naturally leads to such a condition, for there is certainly a deteriorating influence at work in the system, and if its effects may be somewhat hastened or deferred, this may be owing to the fact of the textures involved being here more than elsewhere exposed to sources of injury, or capable of adequate protection. General growth and development are not so stunted as in the tubercular form of the disease, but patients are seldom attacked before the age of puberty. I am inclined to attribute to a 'taint' of the latter form the occasional great distortion of the hands, &c., when evidence of nerve-disease seems slight, not that the symptom of mere numbness can be viewed as a perfect measure of the latter, although it is the readiest means of detecting its presence; there are however other components of nerves besides sensory and motor nerve-tubules, which preside over the vascular and calorific processes and are derived from the sympathetic system; it is not improbable that these elements may be most of all liable to leprous nerve-disease.

The cases that follow will supply deficiencies in these cursory remarks, and also give a more general view of the leprous state

by exhibiting its assembled characters : they have been selected for this purpose.

CASE 11.—Anæsthetic leprosy of 8 or 9 years' duration. A male Hindoo, *ætat.* 25, a ryot living near Panwell (coast). Of moderate habits : never had syphilis. Numbness was first noticed on the calf of the left leg, no premonitory symptoms, or fever, that he recollects : recently sores have appeared at this part and elsewhere. General condition fair ; not emaciated or stunted in growth : appetite good : bowels not costive : pulse 66, soft : is tolerably intelligent. No affection of the viscera of the chest or abdomen. On the face, the tip of the nose, the cheek, and the ear, are benumbed (for the last two or three years), the skin is but little changed, looking only a little coarser than usual : throat unaffected. On the trunk is nothing abnormal. Upper extremities—from the shoulder downwards is numbness everywhere, except on the front of the left forearm, and arm : the anterior and inner surface of the arms and forearms are of a rather lighter colour than the rest, but this is probably not unnatural : the hands are not much affected, but the interosseous spaces and fingers are atrophied, and the skin shrivelled : two fingers are bent and fixed in one hand. Lower extremities—from the hip downwards, anæsthesia is present everywhere without exception : little apparent change has occurred in appearance, &c., but within the last six months some of the toes of the right foot have disappeared ; others are swollen, smooth, but not shortened. There is no apparent complication. No hereditary taint that he knows of. (Dhurumsala patient, No. 10.)

CASE 12.—Leprosy of 16 years' duration. A Mussulman, *ætat.* 35, a porter, from Bancote (coast). Vesicles first appeared on the hands, and numbness was discovered at the same time and has spread up the arm : the feet then became affected with numbness and distortion, but no bullæ appeared on them : and there seems to have been some pale discolourations of the skin soon after the numbness. There is no distortion of the face, which is well covered with hair, but there is anæsthesia of the forehead, cheeks, and chin, but not on the lips. Nothing abnormal in the throat. There is numbness of the skin of the back and front of the body, except along the middle line and sides of the abdomen : no discolouration, &c. is at present visible, but pale patches formerly existed. The skin of the entire upper extremities is very considerably benumbed ; without any apparent change : the hands are greatly distorted, most of the fingers shortened and of some only the stumps remain, bent and stiff : some superficial sores are seen. The same is the case with the lower extremities, entire numbness from the hips downwards : the toes are very much distorted ; on the left foot the great toe is gone, and others atrophied, &c. : on the right foot, some of the smaller toes have almost disappeared, the great toe is much distorted. General bodily condition fair : is intelligent. His father's relations for four generations back have been

healthy, his mother is well, but her brother was affected with leprosy : his sister is well : has no children. (Dhurumsala patient, No. 58.)

CASE 13.—Distortion of the hands, with little loss of feeling. A Hindoo, *ætat.* 25, a ryot, from near Panwell ; the disease is of 7 or 8 years' standing. First of all there were pale discolourations of the skin which spread widely : at present, is some thickening of the skin of the face, nose, and ears, but sensation is little affected : the hairs remain ; on the body are the slightest possible traces of light-coloured patches. Upper extremities—there is atrophy of the hands, the fingers have become smooth, rounded, and whitish in colour ; their terminal phalanges have disappeared, the nails remaining as a misshapen mass : he declares he feels readily the prick of a pin in all parts. Lower extremities—from the middle of the legs downwards is perfect loss of sensation in every part, and yet beyond a slight bronze tint, there is nothing abnormal to be seen, the toes being hardly affected at all. Is in fair bodily condition. His father and mother are both living (the latter has since died in the Dhurumsala) ; both were affected with leprosy in precisely the same way as himself ; but a younger brother and sister are yet well : he is betrothed to a leper in the Dhurumsala. (No. 44.) No. 85 of my notes is a similar case to this ; with much distortion of the hands, and destruction of the fingers is hardly any impairment of sensation ; while the legs are affected in the usual way. In these cases we must suppose only the median and ulnar (main trunk) nerves are affected and not the cutaneous nerves, or dorsal branch of the latter : the large trunks in the lower extremities are differently situated with regard to the cutaneous supply of the feet. It is my impression, however, that they and like instances which appear at first sight exceptional, in the absence of marked or wide cutaneous numbness, belong to the group intermediate between the two chief forms of the disease, a 'tubercular' taint so to speak being present and serving to account for the disproportionate degree of local change. Such is also the following :—

CASE 14.—Great distortion of the hands and feet—anæsthesia incomplete—leprosy of 35 years' standing. A Hindoo clerk, *ætat.* 51, native of Bombay, and in comfortable circumstances. Below the wrists and middle of the legs, such a degree of numbness is present, that he does not feel firm pinching of the skin, or the presence of heat, but the sharp prick of a pin is felt. The fingers are shortened, a little thickened, bent, and stiff ; interstitial absorption began at the terminal phalanges : the deep-seated structures disappear, the skin and nails persist and follow in a retrograde direction the diminishing digit : no sores occur during this process. The feet are more affected than the hands, and there is a sore on the left sole. There seems to have been some thickening of the skin of the face and certain spots on the body, traces of which are not now apparent : bullæ appeared formerly on the fingers and toes. No perceptible enlargement of the ulnar nerves at the elbow. He

is intelligent and enjoys tolerable health, but there is a drooping of the lower eye-lid and a discoloured conjunctiva which would indicate persistent cachexia: he has been treated with mercury and thinks with benefit. His elder brother was affected in a very similar way to himself. (Dispensary patient, No, 58.) A young man was attending the Dispensary at the same time whose hands and feet were in a precisely like condition, but the anæsthesia was more extensive and all the changes had occurred in the course of three years—a great contrast to the above.

Advanced and terminal stages.—These by help of the fatal cases in Table (I) and some of the above, may be as readily conceived as described. Anæsthetic leprosy is less exhausting in its course than the tubercular: there is seldom the prolonged drain of suppurations, a less extent of the body is implicated, and the blighting influence upon growth and general nutrition has not been so marked.

It is unnecessary to again depict the poor crippled leper—an outcast, yet clinging to life—his sufferings susceptible of much amelioration, but exposure and want of mere necessities his too common lot—more than helpless, a very repulsive object, which charity almost loathes to approach. The mental faculties are not directly impaired, the organic functions might be fairly performed and appetite restored, but failing the means, a natural mode of relief does not long delay its appearance and its work.

3. TUBERCULAR LEPROSY *alone or combined with the Anæsthetic* (MIXED LEPROSY).

About 15 per cent. of the cases I have noted presented the combined characters of tubercular and anæsthetic leprosy; this may be called the “mixed” variety. Signs of the former were visible on the face, of the latter in the extremities, and in both localities of the characters usual in unmixed examples: it must be added, too, that almost all these cases are either accompanied by a distinct eruption, or began with such; so that the distinction of this variety, as of the others, is founded only upon the characters which predominate.

Mixed Leprosy.

Decided indications of the nerve affection accompany the manifest distortion of the features, and in about a fourth part of the whole are traces of an eruption on the trunk and limbs. The first-named symptoms co-exist with the usual distortion of the extremities : the nails, however, are sometimes converted into mere horny clumps, and the bronze tint is often deep. Tubercular thickening, usually well marked, sometimes seems, as it were, mitigated ; and numbness of the altered skin is invariably present on the face, &c., hence it may be presumed that disease of the branches of the fifth cranial nerve is more common than in simple tubercular leprosy. The eruption is present as pale discolourations, having roughened surfaces, frequently benumbed.

In one-third of the cases, the disease appeared under 20 years of age ; in nearly as many under 30, seldom as late as 40. When commencing early it greatly checks the growth of the body ; two or three patients were lamentable examples of ill-developed humanity. Its duration may extend to upwards of 25 years. The evidence of hereditary transmission is very decided, often on the mother's side. About one-third of the whole were females, a proportion above the average in leprosy generally. A syphilitic taint is uncommon. It so happens that one-half of the fatal cases I have seen were referrible to this variety of the disease, and to the summary of them in TABLE (I) I may refer for further illustration of the mixed form of leprosy.

Tubercular Leprosy.

This form of the disease was most marked in about only 8 per cent. of the cases noted by me, and although its separation from the mixed form is somewhat arbitrary, yet combined, the two make but a small proportion ; much less than seems to hold good in the West and extra-tropical countries. Some very striking cases may be seen in the Dhurumsala ; it has been rarer at the Hospital, and still more so at the Dispensary.

In all confirmed cases the face is most affected ; the eye-brows, nose, cheeks, lips and chin, and the ears, are more or less

swollen and livid, the surface being firm, smooth, bronzed, and shining; it is not so common to find distinct tubercles, the tumefaction being general over a certain space, or as a variety, the appearance may be rather like great thickening of the natural folds of skin, loose and pendulous, with less bronzing and oiliness of surface. The nose frequently becomes depressed, and along the margin of the lips a 'corona' of small tubercles may be seen; from subsequent ulceration and union the aperture of the mouth has been noticed nearly closed: the rim or lobule alone of the ear may be affected. The hairs of the face, ciliary and supra-ciliary, soon drop away: the opening of the eye-lids becomes round, and the eyes unshaded by the lashes acquire a staring look; this, their sallow colour, and the overhanging brows give an expression not inaptly termed "leonine," or "serpentine," and even "vulpine," to adopt the conceits of old authors. Sensation may persist in some parts of the face and high on the forehead, but it is generally wanting or lessened on the brows, nose, cheeks, and especially the lobules of the ears; and also elsewhere when the thickening is considerable: in the localities just named the anæsthesia may be owing to disease of the subjacent nerve trunks rather than of the small filaments in the skin itself, but it is always present, in some degree, wherever the tumefaction is great.

The mucous membrane of the hard palate sooner or later presents one or two broad pale lines, tubercular or flattened, down the middle; but the soft palate and fauces have been found free from thickening in all the cases examined. The dorsum of the tongue may be studded with distinct pale tubercles, and, as on the palate, superficial ulceration may co-exist: the sense of taste appears to be seldom impaired, but one patient complained of a feeling of heat in the mouth, while eating, and another declared he could not taste even pungent condiments. Ulceration of the skin or tubercles on the face, I have never seen; it occurs however within the nose, which becomes clogged with discharge, and may be present on the ears. Lepers are often "blear-eyed," but I have only once

seen thickening of the conjunctiva and opacity, &c. of the cornea, with blindness; yet this complication is particularly noticed by some writers. The voice being not only weak, but changed in tone, it may be presumed that the mucous membrane of the larynx is more or less thickened, &c.; this alteration of the voice does not occur in simple anæsthetic leprosy.

On the trunk small palish tubercles are seen in all advanced cases, widely disseminated in the skin, and often clustered into rounded groups or masses: their size when isolated is not larger than a pea or horse-bean. The intermediate skin is harsh, shrunk-en, and dry, and too often stained with dirt: traces of a pale eruption (baras) are occasionally present. The nipples are frequently affected in both sexes, in the advanced stage being converted into mere 'knobs,' sometimes of considerable size; and in male subjects the testes may be very small, but the reverse is sometimes the case. The hair on the pubes is apt to fall off.

The skin of the upper extremities is similarly affected, especially on the outer and posterior surfaces, the tubercles being sparse or clustered, and a few may be found on the dorsum of the hand and knuckles. In more than half the cases I have noted sensation was diminished or absent in the skin, often from the shoulder downward, but the palm of the hand may remain partly sensitive. On the lower extremities the same appearances are visible, the tubercles being rather smaller and less numerous than on the upper. Anæsthesia was never quite absent, the dorsum of the foot at least, sometimes the whole limb, being benumbed. Tubercles (like the eruption of baras) never occur in the palm of the hand or sole of the foot; on the contrary, the skin of these parts has been found thinned, and in consequence rather tender, even when tumefied elsewhere.

I do not pretend from experience to treat of the various stages the tubercles pass through; they may be preceded by a puffy state of the skin, but sometimes at least they appear, from the first, distinct and close-set; and they may certainly be wanting even in advanced cases, the integument being, as already mentioned, on the face, generally tumefied, or thrown into large folds.

On this smooth surface the openings of the sebaceous ducts and emptied hair-follicles are very distinct, and the oily aspect is here owing, partly at least, to increased effusion from the former : I have found the sebaceous glands enlarged after death, under these circumstances. There is often a special character about the tumefied skin, giving the impression of a 'gelatinous' deposit beneath, or in it ; and the colour will vary with that of the deposit itself, reddish or pale, as I have ascertained. It should be also observed that a sensation like that of tubercles may sometimes be felt in the skin when to the eye none are clearly visible ; but as this and the other varieties of appearance depend on the mere consistence, or limit, of the endo-cutaneous deposit, much stress need not be laid on them. An ulcerative stage of the tubercles has been distinguished, but it is certainly not very common in India : small superficial ulcerations may be seen on the extremities and the ears ; never on the face where the tubercles are largest, so far as I have seen, and they very rarely lead to those frightful sores, &c., some authors describe.

Of the destruction of the digits by caries and necrosis of the joints, I shall immediately treat, but this is not necessarily connected with the presence of tubercles in the skin.

Some sort of an eruption (baras in one of its forms) has in the majority of cases been present at the onset of the disease, according to the statements of the patients themselves, and traces occasionally remain even at the advanced stage : this fact confirms my opinion that with leprosy is essentially associated a definite skin-disease. I have already quoted cases which indicated this connection of tubercular leprosy and baras, and another is given below (No. 1), where simple anæsthesia was also present. Enlargement of the lymphatic glands in the groins and arm-pits is common ; in the former locality the swelling thus caused has been needlessly specified by the term 'femoral tumour.'

In more than one-half the cases the fingers and toes were affected, being swollen, especially at the joints ; the terminal phalanges of one or more are destroyed, and the skin is thinned, smooth, often pale, sometimes bronzed. The distor-

tion is not quite similar to that of anæsthetic leprosy, the swollen digits being spread out, and though stiff, not permanently flexed; the ends are clubbed, and the nails usually converted into horny masses, and scurf accumulates beneath them, or a thin discharge exudes. Fissures and ulcerations occur on the knuckles, at the heels, or on the soles; and loss of parts takes place by sloughing and necrosis, commencing at the joints, rather than by interstitial absorption, but both processes may go on simultaneously. Even when the distortion is considerable some sensation may persist, especially on the palmar aspect of the hands, &c.; hence it might be supposed that the former is not wholly referrible to loss of nervous influence, but also to a general impairment of the nutritive processes, such as undoubtedly attends this form of leprosy in all its modifications, and as compared with the anæsthetic, is one of its fundamental characteristics.

With regard to the *premonitory* symptoms which some authors have described in detail, few opportunities of observation have occurred to me; but as before intimated, I am somewhat sceptical concerning 'prodromi' which last for months or years, and I think leprosy should be compared with scrofula or syphilis rather than with the ordinary exanthemata. On this point, however, my information is deficient, and I am as little acquainted with the general symptoms, if such there be, which attend the onset of the disease. As to their *order* of appearance; an eruption in the mixed form is the first, then the face becomes tumefied, afterwards the trunk and extremities; anæsthesia and distortion of the latter usually appear at a latter period. As the face, including the ears, is the earliest seat of tubercles, so it remains the most affected. The *progress* of the disease is steady and uniform, the local changes become more marked, and the powers of the system decline; after a varying interval of some years, complications, as diarrhœa, &c. supervene, and the whole *duration* of the disease is less prolonged than in anæsthetic leprosy, for in only one of my cases had it extended beyond 12 years. As to the *cause of death*, this has been

already indicated in leprosy generally; a chronic bowel affection is often the immediate one, and it may be associated with fatty degeneration of the kidneys.—M.L. TABLE (II.) nos. 5 & 6. During life the urine is by no means frequently albuminous, nor the pulse very quick or slow. I have not found that the mental faculties are more debilitated or blunted in any form of Leprosy, than in other diseases accompanied by a similar depressed and miserable state of the system.

In Tubercular Leprosy the constitution is evidently deeply implicated, the disease is widely located, and exhaustion is accelerated by prolonged though limited ulcerations, &c. The state of the leper at the *advanced* stages is even more pitiable than in the other form, his appearance more repulsive, his sufferings greater, though not extreme; but it will not be necessary to again catalogue his miseries. See the annexed fatal case T.L. TABLE (I.) Case no. 3, and M.L. TABLE (I.)

Taking mixed and tubercular leprosy together, I find that over one-third of the cases were females: in 7 out of 40 the symptoms appeared under the age of 10 (in 3 females at the period of infancy); under 20 years in 12 cases; under 30 years in 11; in 9 cases under 40 years, and once above that age. In more than one-third of the whole was an hereditary taint, direct or indirect, acknowledged, and it occurred rather most often on the female side.

The second and third of the following cases are appended for the sake of illustration; the first as of general interest.

CASE 1.—Simultaneous occurrence of the three forms of leprosy—early stage. A Mussulman, ætat. 35, tin-smith by trade, native of Rajcote, two years sick. The disease began in the hands with loss of sensation in one finger, which spread upwards: after some months the feet were similarly affected, and a year since the face became swollen, &c.: a burning sensation in the extremities was at first very troublesome, but has now subsided. No fever: never had syphilis: is in good health and intelligent. Head,—the skin of the forehead is tumefied, bronzed, and roughened from the enlarged orifices of the gland-ducts; in parts shining and smooth, as on the eye-brows; the nose is bronzed and its alæ tumefied: the skin of the ears red, tumid, harsh: on the temple, cheek, and chin, are some small slightly raised patches

of a reddish-bronze tint, smooth shining surface, and tolerably defined: on the chin a few small tubercles. The patches are placed chiefly over the situation of the larger branches of the fifth cranial nerve: all are benumbed, the sound parts being normally sensitive. The ciliary and supra-ciliary hairs are scanty, the eyes rounded and staring, which with the bronze tint and swelling, impart a decided 'leonine' expression. Nothing visible in the throat. On the trunk are large discoloured patches of bars. The right nipple is evidently enlarged. On the upper extremities are some silvery patches, extensive anæsthesia, and commencing changes in the hands; the fingers are slightly clubbed, but there is thinning of the first row of the phalanges; muscular power is yet little impaired. The lower extremities are similarly affected; there is extensive anæsthesia; discoloured spots, fissures, or cracks at the heels, but no distortion of the toes or nails. The organs of generation appear unchanged, but there is anæsthesia here. He is married, no children: the venereal appetite is now diminished. No hereditary taint that he knows of: has been under active native treatment without benefit. (Dispensary patient, No. 48.)

CASE 2.—Incipient Tubercular Leprosy.—A Mussulman, ætat. over 30, a stoker, native of Mhar (where leprosy is frequent); affected about 12 months. The disease began on the face (eye-brows) and spread to the trunk: no premonitory symptoms. At present the skin is studded with small tubercles, most not larger than a pea, colour pale, especially on the trunk; on the face they are bronzed and the intervening skin is tumefied; they are present on the eye-brows, nose, cheeks, chin, the ears are much enlarged, their eminences and rim, including the anti-tragus. Also on the chest (most) and back: shoulders, outer side of arm and forearm as far as the wrist, and on the back of one hand; they are also present on the lower extremities, including the dorsum of the feet, but not to so great an extent. The face is much the most affected: the hairs on the eye-brows, and the eye-lashes are scanty, the beard and moustache little affected. There is doubtful thickening of the mucous membrane of the palate: voice is natural: mammæ not enlarged. Sensation is not perceptibly diminished in any part, except perhaps the lobules of the ears. He denies a syphilitic taint; formerly suffered from rheumatic pains, and has been actively treated without avail. The urine is healthy: sp. gr. 1009. (Hospital patient, No. 71.)

CASE 3.—Confirmed Tubercular Leprosy.—Dhundoo, ætat. 26, from near Rutnagherry (coast), 11 years sick. There were first light patches on the skin beginning at the nates, four years subsequently tubercles followed, first on the face, then the legs became benumbed. Was not subject to fever. There is well-marked tubercular thickening of the brows, nose (which is sunken), cheeks, lips, and ears: the hairs on the face are wanting: all these parts are deeply bronzed. The tongue is covered to the tip with tubercles, and two large rows or masses may be seen on the hard palate. The voice is very

hoarse. On the trunk no eruption is now to be seen, but the skin is studded with small tubercles the size of a pea. The same are present on the upper extremities, on the outer side of the arm and forearm, forming elevations of considerable extent: the hands and fingers are swollen, the latter expanded and marked with fissures; some of them are shortened. On the nates are light tubercles, a few on the back of the thigh and leg: the feet are swollen, and some of the toes destroyed, just as in the hands: a bronze tint is not marked, but the skin of the thighs and legs is darker, smooth, and shrunk or atrophied; this appearance indicates the extent of complete numbness, from the middle of the thighs downwards. There is no perceptible loss of sensation on the face, trunk, or upper extremities. The nipples are converted into small knobs. He never had syphilis. Both his father and mother were lepers; a sister younger than himself is healthy, no brother: it is also said that a (paternal) male cousin is a leper, being about his own age. Is married, but has no children. Is in poor condition, having just returned from Ahmednuggur, a long pedestrian excursion. Was formerly in the army. (Dhurumsala patient, No. 93.)

THE MORBID ANATOMY OF LEPROSY.

The following remarks are, like the preceding, entirely based on personal observation, and they will convey, I think, a satisfactory explanation of the symptoms noticed during life. The most striking results of my inquiries concern the peripheral nervous system, or the nerves, in which morbid changes are found probably peculiar to leprosy. With the assistance of the accompanying tables and plates, and notes of microscopic examinations, I propose to consider in order the state of the Viscera, Nerves, Bones, Skin, &c. in the two chief forms of this disease: the whole number of autopsies being small, I should have hesitated to lay much stress upon their revelations, were I not convinced, from the uniformity of results, and the precise correspondence to symptoms of the morbid alterations, as well as from the peculiarity of the latter, that the true pathological characters of leprosy, as seen in India, have been fairly made out, or at least sufficiently to indicate the direction of future research.

Of the changes the *Skin* undergoes in Baras, I have already offered one illustration ; see page 16.

According to the circumstances preceding or causing death, the *general condition* of the body varies ; being adequately nourished when decease has been rapid, or the disease not very prolonged ; emaciated under opposite circumstances, but to what extent the impairment of nutrition is referrible to the leprous cachexy and its direct results, alone, independent of concomitant diseases, is not yet ascertained.

1. The *Brain* and its *Membranes*.—A.L. (Anæsthætic Leprosy), 8 cases. In all the membranes were healthy ; the Pacchionian bodies presented only normal variations. Brain substance—generally rather soft, especially about the central parts, but not differently in manner or degree to what might be anticipated, considering the influence of climate and the length of time between death and autopsy : the pallor and wet condition may be explained by the fact of the bodies having been injected with a solution of arsenic soon after death ; this operation would not interfere, however, with any organic changes, if present. The vascular punctæ and minute extravasations noticed in case 1 did not strike me as very peculiar.—M.L. (Mixed Leprosy), 7 cases. The membranes healthy. Pacchionian bodies once large and scattered ; one at the base of the skull appeared to press upon the 3rd division of the fifth cranial nerve, but as the nerve was unchanged in appearance, it is probable no injurious consequences followed. Brain substance—either quite healthy or slightly altered as above, and the same remarks apply, for when examined early after death, the consistence was unaltered.—T.L. (Tubercular Leprosy). The single case presented, as a peculiarity, only a slightly irregular distribution of pigment in the pia-mater.

Conclusion.—That in ordinary leprosy the brain and its membranes are not diseased. And during life there is an absence of symptoms indicating any affection of the brain.

2. The *Spinal Cord* and its *Membranes*.—A.L. 8 cases. The membranes generally quite unchanged ; once (no. 1) several

small opaque-white osseous particles were seen in the arachnoid, chiefly on the posterior surface, and in the dorsal and lumbar regions, some being close to the posterior roots of the spinal nerves, but not in a position to press upon them; their size $\frac{1}{10}$ in. and smaller; form flattened, round, or stellate (very curiously so); they consisted of ossified connective tissue, the bone-cells being normal, and were hollow, containing fat-cells in their interior. These little deposits were clearly only incidental. Substance of cord—healthy or a little softened from natural causes; in two cases the softened parts in the dorsal and lumbar regions appearing reddish in colour, were examined microscopically and no disease was detected.—M.L. 7 cases. Membranes healthy, once stained with bile (case of jaundice, no. 3). Substance of cord: healthy or a little softened from natural causes; once rather firm in the lumbar region, but no other change apparent.—T.L. 1 case. Membranes healthy. Substance rather firm in the lumbar region, but not diseased.

Conclusion.—That in all the varieties of leprosy the spinal cord and its membranes have been found unaffected. During life no symptoms are observed but such as are satisfactorily explained by the condition of the nerves themselves, and none indicating a likely implication of the spinal cord.

The *Roots* of origin of both cranial and spinal nerves in no instance appeared abnormally changed, so as to call for special examination.

3. *Sympathetic Nervous system.*—In all cases the larger ganglia of the abdomen, sometimes of the neck, thorax, and pelvis, were examined, but in none was any evidence of disease. I noticed that the great splanchnic nerves once seemed large and opaque, and twice swollen at a point (symmetrical), also that the communicating branches of the superior cervical ganglion once seemed rather firmer and rounder than natural, but on closer examination did not find clear traces of deposit or degeneration.

The *Ganglia* on the posterior roots of the spinal nerves were a few times examined microscopically, but no clear evidence of

disease was in any instance detected ; and the same may be said of the Gasserian ganglion of the fifth cranial nerve, which once or twice was apparently rather small and softened, yet no morbid changes were visible under the microscope.

4. *The Heart*.—Was generally healthy ; once (A.L. no. 6) soft reddish fibrine was seen on the mitral valve, and this case is otherwise interesting as fibrinous deposits were also found in the left lung, spleen, and one kidney, probably the result of embolism ; the patient died of chronic dysentery. Once the aortic valves and lining membrane of the left auricle were slightly opaque (M.L. no. 5). The *Aorta* was always free from atheroma, and I may add, the *arterial system* generally, as far as examined. The Pericardium, usually clear, was twice spotted with opacities : in one of these cases the kidneys were diseased.

5. *The Lungs*.—Were not affected in any special way : in one half the cases the organs were healthy. Adhesions were not uncommon : twice congestion was marked : three times inflammatory condensation of the upper lobes was found (once with albuminuria, twice with chronic dysentery, and in one of these a few firm strumous tubercles were present, the only occasion on which they were detected) : once lobular condensation of one lung, especially towards the anterior margin, the intervening tissue being emphysematous, this was the case of fibrinous deposits in the spleen, kidney, &c. above referred to. On one occasion the right lung was found wasted, and the cavity of the pleura filled with bloody serum ; and on another, some emphysema at the margins and apex with no further change. The Pleura was never alone diseased.

6. *Intestinal Canal*.—Presented no uniform or marked disease. Three times ulcers were found in the rectum (dysenteric) and in a case of Cholera, small ulcers in both intestines with ecchymoses (M.L. no. 6). The Peritoneum had only once a slightly soddened appearance.

7. *The Liver*.—Was almost invariably healthy : some adhesions on the upper surface were once noticed, and once (M.L.

no. 5) two small abscesses were found ; this case was complicated with kidney-disease and pale ulcers in the rectum. In the instance of rapid and fatal jaundice (M.L. no. 3), this organ was of full size, and dark coloured, surface smooth, outer coat clear, edges sharp: the substance had a mottled appearance, owing to the presence of small light-yellow patches, chiefly surrounding the portal canals. In these spots the tissue seemed slightly shrunk, the lobules were distinct: the hepatic cells were loaded with fat, and rather smaller in size than in other parts, the nuclei were often indistinct and pale: in the redder parts the cells also contained some fatty particles, but the biliary matter was more abundant, and their size rather larger than in the light spots. In the fatal case of albuminuria and fever (A.L. no. 2) the liver was also diseased, being much enlarged, mottled, and puckered on the surface: on section the puckered appearance was seen to extend for half an inch into the interior, but there was no distinct deposit around; the substance of the organ was congested and looked coarse: peritoneal coat clear. Both these patients were Portuguese and probably of intemperate habits: as the above appearances of the liver are to be seen in individuals accustomed to drinking, and are not peculiar to leprosy.

8. *Pancreas*.—Always seemed healthy.

9. *Spleen*.—Occasionally soft, enlarged, and the capsule thickened: once fibrinous deposit.

10. *The Kidnies*.—In 15 cases were, one or both, six times noticed as large, as often small; thrice as natural in size. Seven times they were mottled, and in 3 cases with more distinct deposit; once also cysts. I will give the results of minute examination in seven instances, notes of which were kept.

1. (A.L. no. 2.) Organs large, pale, mottled, slightly granular, and cortical substance increased: the uriniferous tubes were sometimes much enlarged, and filled with opaque granular matter; the secreting cells also distended with granules (fat), though their nuclei could be seen. There was distinct fatty degeneration. For the state of the urine, see A.L. TABLE (1.)

2. (A.L. no. 3.) Kidnies large, pale, flabby, and smooth. Uriniferous tubes greatly distended with fat granules, or oil drops, sometimes free, sometimes within the secreting cells, in these the nuclei were still persistent and contained oil globules. The walls of the malpighian tufts had also undergone fatty degeneration. Urine not examined.

3. (A.L. no. 6.) There was considerable deposit of yellowish fibrine in one of the kidneys: no alteration in size of either: not examined microscopically. Similar fibrinous deposits were found in the spleen, &c.

4. (M.L. no. 2.) Patient died of cholera: urine not examined. The kidneys were not obtained till 36 hours after death, but then found so much softened that it may be questioned if some change had not occurred during life. The uriniferous tubes were hardly to be seen, but no fat globules were present: the apices of the pyramids had an opaque white tint, and the tubes were there filled with a homogeneous and refractile material; the secreting cells were barely visible, but it seemed as if this substance had been deposited primarily within them. These changes, if the result of disease, may possibly have been attendant on the cholera rather than leprosy.

5. (M.L. no. 3.) The kidneys, like the liver, were found to have undergone some fatty degeneration, one being particularly affected. The urine was not healthy, see M.L. TABLE (II.)

6. (M.L. no. 4.) The patient died of cholera. Some of the secreting cells seemed more granular than usual, especially towards their attached surface, but it was doubtful how far this change indicated disease.

7. (M.L. no. 5.) Decomposition of the body had proceeded rapidly. The kidneys were large, firm, mottled, and granular: some of the uriniferous tubes were filled with a granular material, their epithelium being also affected: there were no distinct oil globules. Malpighian tufts healthy. The urine was albuminous.

In these seven cases fatty degeneration was found four times, and in one other case at least the kidneys were decidedly diseased (A.L. no. 1); if we add to them the fatal case (not examined) of the Portuguese woman who was affected with anasarca, &c., the proportion becomes 6 in 16, which is large enough to warrant the assertion I made, that leprosy is not unfrequently accompanied by disease of the kidneys, such as may at least hasten its fatal termination. There is no apparent relation between this and either the duration or variety of the leprosy,

but the instances are too few to permit wide inference. In five cases where death was attributable to chronic dysentery, kidney-disease was certainly present in two, and in a third fibrinous deposit was found; in one of the two just referred to abscess of the liver was present, and opacity of the aortic valves, lining membrane of left auricle, and peritoneum; these and other facts are of interest, but belonging as they do to the general pathology of Bright's disease, need not be enlarged on here. I have, I believe, rather under-estimated the frequency of this complication, but the connection that exists between general cachexia of the system so common in the class to which lepers belong and degeneration of the renal organs, has yet to be definitely ascertained.

The *Supra-renal Capsules*.—Healthy in all cases when examined.

The *Testes*.—Have not been minutely examined: sometimes they were enlarged (from syphilis), and occasionally the reverse; in one youth affected with Mixed Leprosy they were much atrophied, being hardly larger than those of an infant, the seminal vesicles were very small indeed, and the *vas deferens* very narrow. The *thyroid body* was rather larger than usual. The autopsies having been all of males, the condition of the *Ovaries*, &c., has not been ascertained.

The *Blood* was in no uniform condition, nor did it ever strike me as peculiar in appearance.

The *Lymphatic vessels and glands* were not affected in any special way, as far as examined; the latter were noticed as enlarged in about half the cases, either in the loins where a deep red colour was also common, or mesentery where once they were very numerous, or in the groins, &c. A syphilitic taint was as often absent as present. In one case (complicated with syphilis) the opaque cortex of the enlarged inguinal glands contained large granular cells and masses (almost like myeloid cells) which bore a resemblance to those found in the thickened skin. Once (A.L. no. 2) inflammation and suppuration had

occurred in the axillary glands and vessels, the corresponding hand was distorted, &c. ; this patient died of albuminuria, but there was no reason, I think, to suspect pyæmia : the blood was generally fluid. The inguinal glands contained a yellowish firm material in the case where fibrinous deposits had occurred in the kidney and spleen : and they are not unfrequently enlarged when ulceration, &c. is present in the foot.

With regard to the condition of the *Blood Vessels* in the distorted hands, &c., on several occasions they were carefully examined, and to all appearance were unchanged, certainly not diminished in calibre : in an injected specimen the size had run freely into the capillaries of the skin and Pacinian corpuscles, nor have I ever seen any reason to infer that deficient arterial supply is the cause of the atrophy or ulceration.

The state of the small *Muscles* is what might be anticipated. I have found those of the little finger entirely converted into fibrous tissue ; no fatty degeneration of the fibres was observed. The flexor carpi ulnaris (supplied by a diseased ulnar branch) has been seen undergoing a similar conversion, but the muscles of the forearm generally, and those of the leg, are seldom much changed, nor during life is their action greatly interfered with ; the leper making use of his hands and feet, such as they become, to the last.

Morbid changes which the Nerves undergo in Leprosy.—It is here that interest chiefly centres. In order to render them intelligible, the normal structure, as well as anatomical distribution, of the nerves should be recalled to mind, and the more clearly they are recollected, the better will the connection between the symptoms of leprosy and the morbid alterations which accompany it, be understood.

A healthy nerve is uniform in diameter, of an opaque whitish or yellowish colour, and rather lustrous hue ; of moderate consistence, and more or less flattened ; and its branches retain the same general characters as far as they can be traced. When of

moderate size it will be found to consist of several funiculi (cords or strands), readily visible through its coat, which not only ran parallel to each other but frequently communicate, so that numerous plexuses are formed within the nerve-trunk itself; these are particularly evident in the larger nerves, and their significance has been rather overlooked, I think, by anatomists: such an interchange of nerve-tubules is hereby effected that it becomes impossible to trace far those of an individual funiculus, hence disease of the latter may lead to symptoms anywhere in the area supplied by the whole nerve.* Each funiculus is provided with a sheath (neurilemma), and is itself composed of clusters of nerve-tubules similarly isolated; one or more of these may be alone diseased in leprosy. The nerve-tubules are classed as large (motor?) and small (sensory?) according to their size, and there is no question that the latter may be affected to the exclusion of the former, so that disease of even a compound nerve may cause anæsthesia alone: the tubules I find to be in absolute (?) contact, their contents more or less clear and refractile, and semi-fluid or soft; in the mass the tubules have a yellowish tint, and by transmitted light they are opaque.

The diseased nerve is swollen, but not abruptly so, and of a dull reddish grey or semi-translucent aspect; rounded and firm. Its coat of connective tissue is little changed, the funiculi alone being the seat of disease. These, enlarged and grey in colour, impart a streaked or marbled appearance, and when the nerve is cut across they start up, separate and firm, almost as if previously under some degree of tension; in the healthy nerve they rather droop. On further examination, the clusters of nerve-

* With regard to this arrangement in the sciatic nerve, Bichat observes, "I once employed myself in tracing attentively and to some length all its filaments, and I found that those which above composed the exterior cords were below for the most part those of the centre;" he also remarks that this communication of the nerve-cords does not take place in the roots of the spinal nerves, but only outside the vertebral canal. *Anat. Gen. trans. by Coffyn*, p. 136. Dissection of a diseased nerve shows exceedingly well these intra-neural plexuses. See preparations in my possession.

tubules are found to have mostly disappeared, their place being taken by a clear gelatine-like deposit, which has separated and compressed them; this is provided with nuclei and fibres, the latter curiously arranged round each tubule, and thus 'mapping out,' as it were, the area into rounded or polygonal spaces, in each of which lie the remains of one or two altered nerve tubules. The following is from notes of the first case:—

(December 1861.) Generally the nerves are rounded and cord-like, semi-translucent and firm; the strands are not clearly seen from the outside, they are enlarged; the whole nerve seems shortened and tense; its smaller branches, and occasionally the trunk, appear atrophied and translucent. For minute examination it is not possible to make a transverse section of a healthy nerve that will maintain itself erect, the unconnected tubules which compose the funiculi fall aside under the least pressure, while in the diseased nerve each segment stands upright and will even bear considerable pressure without being displaced; the tubules imbedded in a firm material do not separate from each other the funiculi of a healthy nerve have an opaque white tint, derived from the refractive contents of their nerve-tubules, in disease they are grey, brownish, and translucent, owing to the partial destruction of the tubules by a yellowish deposit, partly clear, partly granular.

Thus it will be seen that enlargement and diminished opacity are the fundamental changes which the nerves exhibit. The general cellular investment, the ordinary seat of neuromatous swellings, inflammatory and other formations, is here but little altered: the amount of enlargement varies from just above the normal size (at the seat of disease, above or below it, the nerve may be smaller than natural) to more than twice that: the colour may be grey, reddish-grey, reddish-brown, or very rarely a dead opaque white: the consistence of all degrees from almost flabby to semi-cartilaginous, but generally firmer than natural; marked vascularity is uncommon; adhesions have been found, but only under exceptional circumstances.

The cutaneous nerves are altered in a similar manner, but are sometimes less rounded and firm.

These changes do not occur indiscriminately in the course of the nerves, but make their appearance at certain selected spots;

for the compound trunks where they are most superficially placed, for the cutaneous nerves immediately after they have perforated the deep fascia. As regards the former, the nerve-trunk above the 'locus morbi' may be unchanged, below it is usually atrophied, but occasionally almost normal in appearance and structure: the apparent extent of disease may be limited to two or three inches, but it is often considerably more; in both sets of nerves the terminal branches will be found atrophied and pearly in aspect, being, in well-marked cases, evidently incapable of performing their functions. A very interesting fact connected with the nerves of compound function is recorded in the TABLES (A.L. III. & IV., no. 2; M.L. IV., no. 4, &c.,) viz., that the sensory or cutaneous segment alone may be diseased, being traceable by the eye for some distance upwards in continuation of the altered cutaneous branch, after it has joined the main trunk: this fact, as well as others, also shows that the morbid changes proceed from the periphery towards the centre, as might have been anticipated.*

The following list, together with PLATE 2, figs. 1 to 6, and the TABLES which contain a brief description of the appearances in each case, comparative measurements, &c., will further serve to elucidate the general features of leprous nerve-disease; I shall afterwards add its microscopic characters.

* The following has recently been noticed in a subject brought for dissection to the Medical College. The left external popliteal nerve, and the musculo-cutaneous as far as the dorsum of the foot, were enormously but irregularly enlarged and of very firm consistence, all the funiculi being converted into tough fibrous tissue; but, in addition, the central part of each had undergone fatty degeneration, so that long white streaks were visible on the outside giving the appearance of Filaræ being imbedded in the nerve, and on section a soft opaque substance was seen in the axis. Even in this extreme stage of disease a few clusters of almost healthy tubules could be detected. The specimen was interesting as showing a further stage of nerve-disease, viz. that of *fatty degeneration*; it is possible that even *ossification* of the fibrous material may occur and the nerve-trunks be thus converted into bony rods. The corresponding nerves in the opposite leg and some others examined were not affected.

A list of the Nerves found diseased in Leprosy.

Name of Nerve.	Place of Disease.	Parts supplied.
Supra-orbital (cut.)	After emerging and on-wards.	Skin of brows, forehead, &c.
Infra-orbital (cut.)	After leaving its foramen.	Cheek, nose, lip, eyelid.
Mental (cutaneous.)	Ditto.	Lip, chin, &c.
Superficial cervical (cut.)	After piercing the fascia.	Side of neck.
Great auricular (cut.)	Ditto.	Lobule of ear, &c.
Small occipital (cut.)	Beyond its origin.	Skin behind the ear, &c.
Descending branches of cervical plexus (cut.)	After piercing the fascia.	Skin of chest, shoulder, &c.
Circumflex (compound) cutaneous branches.	Ditto.	Skin of shoulder, arm.
Internal cutaneous (cut.)	Ditto.	Inner part of arm and forearm.
Lesser ditto.	Ditto.	Inner part of arm.
Intercosto-humeral (cut.)	After piercing side of chest.	Ditto.
External cutaneous (cut.)	After piercing the fascia.	Outer part of forearm.
Musculo-spiral (comp.) its cutaneous branches.	Ditto.	Back and outer side of arm.
Radial (cutaneous.)	Ditto.	Back of hand, outer side.
Median (compound.)	Above elbow and above wrist.	3 outer fingers (palmar surface.)
Ulnar (compound.)	At elbow, above wrist, and in palm.	1½ inner fingers (palmar surface.)
Its dorsal branch (cut.)	After piercing the fascia.	Back of hand, inner side.
External cutaneous (cut.)	Ditto.	Outer side of thigh.
Middle cutaneous (cut.)	Ditto.	Front of thigh.
Internal cutaneous (cut.)	Ditto.	Inner side of thigh and knee.
Long saphenous (cut.)	Ditto.	Knee, inner side of leg and foot.
Popliteal (compound.)	In popliteal space.	
Peroneal (compound.)	Ditto.	
Short saphenous (cut.)	After piercing the fascia.	Back of leg, outer side of foot.
Musculo-cutaneous (compound), its cutaneous branches.	Ditto.	Front of leg, dorsum of foot, &c.
Posterior Tibial (comp.)	Above inner ankle.	Heel and sole of foot, &c.
Plantar (compound), their cutaneous branches.	In sole of foot.	Sole and toes, (plantar surface.)
Anterior Tibial (comp.)	Dorsum of foot.	Inner toes (dorsal surface.)

This enumeration, which is founded upon the tables, is so far imperfect that it does not include many other cutaneous nerves supplying the skin of the trunk and some parts of the head and extremities, but these I have seldom attempted to examine: very much is left for future research. The place of disease as above given is that where the changes were most advanced and probably first commenced, subsequently the 'locus morbi' becomes more diffused by extension. There is little to be said on the comparative liability of any nerve to disease, as in cases at all advanced (and such only have as yet been investigated) almost the whole of the nerves named in the above list were found implicated; it may be inferred, however, that the Ulnar and Radial nerves in the upper, and the Musculo-cutaneous in the lower extremities, are oftenest affected; they supply the dorsum and inner side of the hand, and the dorsum of the foot: and least often, the branches of the fifth cranial nerve on the face.

Microscopic Examination.—Taking the tissues of the nerve in succession, it is found that its coat or sheath (connective, adipose, and vascular) and the investment of the funiculi themselves (neurilemma of connective tissue) are either both unchanged, or the latter may be slightly thickened and marked by fusiform granular masses, or more distinct oval granular nuclei of full size; on its inner surface accumulations of granular matter or nuclei are apt to occur, and here the septa pass off which map out so curiously the area of the diseased funiculus. These are composed of a nucleated fibrous tissue, very distinct and clear; the nuclei, varying in size, are granular, they have occasionally appeared to be free, and when small, at first sight these resemble the ends of the wasted nerve-tubules, in a transverse section. The space inclosed by these septa is polygonal in shape, and from $\frac{1}{100}$ in. to $\frac{1}{300}$ in. in diameter; it is occupied by a clear homogeneous refractile substance, in which the altered nerve-tubules are imbedded. The latter are usually much changed, their medullary sheath corrugated, and contents granular, uniform (?), and firm; their diameter very irregular, according to the amount of compression they have undergone, and when this has been considerable, it occasionally seems as if the tubules were emptied, their collapsed and folded walls alone remaining: in still more diseased funiculi mere granular streaks or lines of minute nuclei, only are seen; lastly, all traces whatever of the tubules may be wanting, the whole being converted into fibrous tissue, and that without their undergoing fatty degeneration previous to complete absorption. Whether the axis-cylinder is especially affected or not, I cannot say. With regard to the origin and progress of the nerve-disease, it appears that first of all a clear

material (probably albuminous) is deposited between the nerve-tubules, and in this nuclei and subsequently fibres are developed, and the deposit itself may become fibrillated. The nuclei are often large ($\frac{1}{1000}$ — $\frac{1}{1000}$ in. long diameter), but I have also found them very small ($\frac{1}{2000}$ — $\frac{1}{4000}$ in.), clear, round, and very numerous; this is a variety worth notice as possibly indicating rapid progress of development. (See PLATE 2, Fig. 9.) The deposit might be regarded as having its beginning in the scanty inter-tubular matrix which it is probable always exists, at least in the larger nerves.

These observations unequivocally demonstrate the limited extent of the morbid process in the nerves themselves, so that some of their components may continue to perform their functions, while others certainly could not; it seldom happens in a compound nerve that some of the funiculi, or parts of them, are not in a sufficiently normal condition, but to the unaided eye all may seem equally diseased; and on the other hand a nerve may appear healthy enough, and yet a segment of it be decidedly ineffective. Histologists have not sufficiently determined the characters of motor, sensory, and sympathetic nerve-tubules to enable pathological inquirers to settle a question like the present, but it would appear from the symptoms and the special tendencies of leprous nerve-disease, that the last-named elements of a compound nerve are those peculiarly affected.

Hitherto I have not seen any traces of the fatty decomposition or degeneration of nerve-tubules along their tracts, centrad or peripherad, which is described by Waller and others as occurring after section of a nerve. I assume that disease begins not at the periphery of the nerves, but at certain elective points, below which, and sometimes above, they become atrophied; but it is quite possible as regards the cutaneous nerves that it may be otherwise, as the wasting below the seat of lesion is not always that of mere atrophy, but rather a conversion into tough fibrous tissue with no diminution of size, which would indicate previous effusion or deposit between the tubules. There is evidently a distinction to be made between leprous nerve-disease and such local injury as might equally interfere with the conduction of impressions, as both symptoms and consecutive local changes point out.

With regard to the nature of the disease, on first impression it would appear to be inflammatory, for the primary symptoms include local pain and tenderness of the nerves, and after death decided redness, if not vascularity, and adhesions to the subjacent tissues are sometimes noticed, as the tables show. The nearest approach, however, to unmistakeable inflammation was observed in a case where sloughing of the areolar tissue, &c., on the dorsum of the foot had occurred, near to which the nerves were decidedly inflamed (as well as the veins), at least in their coats, for the diseased funiculi appeared unaffected. (See A.L. TABLE IV., no. 3.) But the question cannot be thus summarily disposed of, for often there are no signs during life of local inflammation (especially in cases at all advanced) even in the large nerve-trunks, to which the above remarks apply, and they have never been unequivocally observed in the cutaneous nerves. Nor do I think that the microscopic appearances favour this view, pointing as they do rather to the gradual effusion of a very slowly organised deposit; and it is just possible some accidental local cause may have induced inflammation in those cases where it has seemed to be clearly indicated. Noteworthy redness or vascularity is generally absent, and adhesions were found only when the skin had become so shrivelled as to compress the subjacent nerves, or, as at the elbow, when from the position of the limb the nerve was necessarily brought into permanent contact with a firm surface beneath it. Again, as far as I can ascertain of what is known concerning "neuritis," the new formations are seated in the sheath and septa of the nerve, and the same is the case with neuromata, cancer, &c., whereas it is a special character of leprous nerve-disease that, as a rule, the sheath is wholly unaffected, as the microscope itself has many times revealed. My own opinion is that the change is rather one of fibrous conversion or degeneration, commencing either in the envelope or limiting membrane of the nerve-tubules (which is possible), or immediately on its exterior, with the effusion of an organizable material, the subsequent development of which has been already pointed out; not that this statement, however, throws much light upon the subject. Evidently there is no real hypertrophy of the

nerves, any more than in neuromatous swellings; on the contrary, with a far less amount of enlargement than in them, a much more considerable atrophy of the essential nerve-elements ensues; and it has been remarked that neuromata of even large size do not always either interrupt the functions, or cause marked deterioration of structure, of the tubules.

Pacinian corpuscles.—In the hand and the mesentery—the foot has not been examined—these little bodies have sometimes, but not invariably, been found to be enlarged, their pearly tint little changed, and their consistence firm. My notes contain the following examples:—

An elderly man affected with leprosy for 6 years, died in a state of great debility. The hands are much distorted, thumbs nearly gone, fingers shortened and bent, a deep sore over the cuneiform bone: the nerves are enlarged, grey, and tough; the Pacinian corpuscles appear very numerous, are larger than usual, some being $\frac{1}{2}$ in. in long diameter (or double the normal size), and closely aggregated on the shortened digital nerves; this is especially evident in the stump, which is all that remains of the thumb; it would seem that this clustering together is owing to their not having been removed like the other textures of the digits, but driven back as it were by the advancing process of absorption. Change of structure—it is not uniform, some corpuscles are simply hypertrophied, the number and size of the capsules being increased, but the central nerve fibre is either much atrophied or absent; in others a large deposit of granular matter with numerous nuclei, is seen in the central parts, and at the two ends; this imports a semi-opaque appearance, and sometimes a tortuous or spiral tube is present in the midst which has rather the aspect of the displaced and elongated nerve filament. PLATE II. Fig. 10. The blood vessels are very well seen in a specimen I have injected, they are probably more numerous and larger than natural (date Sept. 1860). 2.—A similar case, the hands less distorted. When compared with healthy specimens the corpuscles are found to be larger, their capsules coarser and less regular, and the central parts confused, the nerve filament not being seen: there is a granular deposit, furnished with nuclei or cells, sometimes large and granular, or smaller and more numerous, scattered between the capsules in the middle and at the ends. 3.—Hands little distorted. The corpuscles are not much enlarged, but the granular nucleated deposit and altered nerve are distinct. 4.—Disease in the hands and feet, and in the nerves much advanced. The corpuscles are quite distinct, but doubtfully changed in size or possibly smaller than usual.

From the above memoranda it may be concluded that these bodies undergo in leprosy similar alterations to the nerves, being first enlarged by the deposit of a granular material which subsequently acquires nuclei, and is finally converted into fibrous tissue, after which gradual wasting takes place: their functions must be interfered with from the first, but what particular symptoms would indicate this is not known, since the use of the corpuscles themselves is yet only matter of speculation.

Tactile corpuscles.—The papillæ of the smooth, atrophied, wrinkled skin of benumbed surfaces are either much diminished in size or wanting, indeed the smoothness and absence of cuticular markings (as at the tips of the fingers, palm, &c.) is evidently owing to their absorption. In one case I found the cuticle thin, soft, and dark, the cutis red and soft, its papillæ much fewer (on comparison with a corresponding healthy part), generally shorter, attenuated and inclined; every one contained capillary loops, none tactile corpuscles, so that it may be inferred that those papillæ especially administering to the sense of touch are particularly affected in anæsthetic leprosy. The preparation was from M.L. no. 7, and it offered a striking contrast to the healthy one it was compared with.

Changes in the Skin and Mucous Membranes.—These compound tissues are specifically affected only in the tubercular and mixed varieties of leprosy. On the hard palate and tongue, and in the larynx, the *mucous membrane* is frequently the seat of marked tumefaction, or more distinct tubercles, small and pale in colour; the latter I find to present the same characters as tubercles in the skin. In the larynx the deposit does not extend below the rima glottidis; and it has been found absent in the Schneiderian membrane as well as the pharynx, where if the tonsils be enlarged, it is not from tubercles; tumid glands may be seen in the soft palate, &c. My attention has not been directed to the other mucous surfaces, as they never presented to the eye sufficient evidence of morbid change to call for minute examination; but it seems to have been otherwise in Norway.

In the *Skin* disease is also limited to the dermoid and sub-jacent tissues, and it consists in the deposit of a plasma in which granules and nuclei subsequently appear: the nerves, vessels, and appendages of the skin being necessarily implicated, thence result many of the symptoms previously described. This deposit is obviously of the same character as that found in the nerves, and the similarity forms, in my opinion, clear proof of the unity of leprosy, for the pathological changes are also the same in the eruption. The following extracts from my notes will furnish their minute anatomical characters:—

M.L. Case 1.—A section of skin of left cheek, which was reddened, thickened, coarse in aspect, rather lighter in colour (it is often darker), and somewhat shining. The entire substance of the skin is occupied by a reddish deposit varying in thickness from $\frac{1}{4}$ to $\frac{1}{2}$ in. arranged in vertical patches, investing and compressing the sweat-glands and hair follicles: an isolated patch of the granular and yellowish deposit may sometimes be seen in the sub-cutaneous tissue on the outside of a sweat-gland. The sebaceous glands are distended and appear to the eye as opaque white dots (they subsequently become atrophied and destroyed): the hairs are thin and scanty (have been noticed as paler in colour). The cutis is slightly convex; papillæ not seen (but readily in sounder skin around): the cuticle is little changed (often thinned and loaded with pigment); apertures of follicles and gland ducts enlarged. The new formation consists of a homogeneous material, rendered almost transparent by acetic acid, and disposed in layers, as would appear from the disposition of its nuclei and masses; these are of a yellowish tint, granular aspect, size and form irregular (sometimes large pigment cells are seen). In some cases distinct cells are visible with an indication of a nucleus, but in most no distinction of parts can be seen in the granular masses: (the nuclei or cells sometimes appear to be branching out into fibres). In isolated places the deposit occupies the meshes of the areolar tissue, as if it had been effused there. Acetic acid renders these features more evident: æther only appears to make the presence of nuclei in the granular masses more apparent, but has otherwise little effect. See PLATE II. Figs. 13 and 14. Such are the ordinary microscopic features of leprous tubercles or tumefaction: the following is a variety corresponding to that noticed in the nerve deposit:—

M.L. Case 4.—Skin of forehead: the patient had a decided leonine expression without there being any large or distinct turbercles, and the brows were most affected. Hairs very scanty to the eye, but under microscope many small ones are seen, seldom furnished with sebaceous glands. The deposit is not very distinct, but there is a reddish-grey appearance beneath the cutis which

indicates its presence; arranged in the usual manner, but the masses less distinct or isolated: it follows the vessels and ducts, and surrounds the convoluted sweat-gland: its colour is not so decidedly brown as common:† acetic acid and glycerine, the matrix is seen to be clear, homogeneous, scanty; the nuclei very numerous, more or less oval, tolerably uniform in size ($\frac{1}{1000}$ – $\frac{1}{500}$ in.) and devoid of nucleoli and, generally, of granules, edge defined; they differ from the nuclei of the connective tissue, which they somewhat resemble, by their closer aggregation, irregular arrangement, colour, and more refractile appearance, and they do not seem to branch out into fibres.*

The lobule of the ears present the same characters as the skin elsewhere, an abundant reddish, firm deposit, furnished with numerous granular nuclei and oil-globules, &c. I need not however enter into further details, only remarking that this new formation must obviously interfere with the functions of the skin, both as a secreting and a sensory organ; its tendency to surround the vessels, glands and ducts is a feature worth special notice, and its microscopic structure is probably also characteristic.

* In case no. 1 Mixed Leprosy, TABLE (I), a scanty syphilitic (?) eruption was present on the trunk and limbs; and a tubercle the size of a split pea, taken from the back of the hand, presented different characters to any of the above; it was placed in the sub-cutaneous tissue, the unchanged skin moving freely over it; its form lobulated and structure of a firm yellowish material, vascular and tough, but readily torn, in which clear, delicate, oval, nuclei, $\frac{1}{100}$ in. diam., provided with minute nucleoli and sometimes dividing, were plentifully distributed. I concluded that the tubercular eruption on the hand, &c. was syphilitic and not leprous; but that there is a resemblance between the two forms, the following extract will shew: "Gummata or gummy tumours are scarcely ever met with except in syphilitic individuals; they are small, solid, pale tumours generally of the size of a pea, which may be found in the most various parts of the body, particularly in the skin and subjacent tissue, where they are usually larger, equal even to a nut; they are also frequently found under mucous membranes, and it is their ulceration which produces the often considerable destruction in the throat. Some of the affections of the bones are due to them. They are met with in the muscular and connective tissues, in the liver, testicles, lungs, and frequently in the brain. According to Lebert they consist of a rather solid, elastic tissue in which are found, in the finely granular intercellular substance, a number of roundish bodies neither distinctly cells nor cell-nuclei, but resembling tubercle-corpuscles without being identical with them; their similarity depending on this, their intercellular substance rapidly becomes tough and dense, so that the cellular elements can be no longer fully developed. They may pass into suppuration when distinct pus-corpuscles are found, &c." *Med. Chir. Rev.*, Oct. 1861. No. lvi., p. 285. Were it not my object to record facts rather than indulge speculation, nothing would prove more interesting than a comparative view of constitutional syphilis (as now understood) and leprosy. I can only say that as far as I am informed concerning the former, it presents some features by no means agreeing with the latter; yet that points of singular accordance exist, appears undeniable.

Changes in the Bones of the hands and feet.—If it be maintained that the local deteriorations of structure in leprosy are directly or indirectly the result of deficient innervation, there will here be found conclusive evidence of the nutritive dependence of even the osseous system upon nerve influence.* In accordance with what is observed during life, the digits of the extremities are most affected; the terminal phalangeal segments which support their pulps seem to become atrophied at the very commencement of the symptoms, and the other rows in succession, also the metacarpal and metatarsal bones; all in a similar manner. To these the more characteristic changes produced by interstitial absorption are limited; they are, briefly, atrophy of the shaft, part, or whole, disappearance of the head or distal end, with persistence of the bases or proximal ends of the bones. The carpal bones in the hand are more seldom altered, but I have noticed a rarified condition of the ossa cuneiforme and unciforme (particularly its process), and the os pisiforme has sometimes been enlarged or carious; these bones, it will be remembered, are placed at the inner or ulnar side of the wrist; and corresponding to the unciforme, the two inner metacarpals have been seen to be unusually slender when the others were unchanged. As the ulnar nerve is constantly and chiefly diseased in these cases, the explanation of the limited atrophy now referred to seems obvious. In the foot the distal articular surfaces of the three ossa cuneiforme and cuboid are sometimes found rarified or distorted, or the latter may be carious, corresponding to the two outer toes, supplied by that Plantar nerve answering to the ulnar in the hand. This unilateral absorption of the bones of the hand and foot—the inner or outer digits alone—strictly accords with what is observed during life; in one very striking example all the outer side of the foot, in front, was wanting. Occasionally a general diminution in size of the whole hand or foot is witnessed, and then the bones will be found thinned, porous, light in weight, grey in colour, and marked with large

* The bones are affected only when the nerve-trunks of compound function, or those supplying the deeper seated structures, are diseased.

apertures or depressions; such was the condition, to some extent, of the specimen represented in PLATE 3, Fig. 1. Anchylosis is not uncommon between the bases of the metatarsals, and them and the tarsus; or between the corresponding parts of the hand: roughening or outgrowths do not occur. The ossa sesamoidea have been noticed as small, and the bones of the forearm and leg are occasionally rarified in the shaft, especially the latter, and porous on the surface.

A reference to the accompanying illustration will afford some idea of the alterations in form and size which the small long bones of the extremities undergo, in consequence of this interstitial absorption; the curious pointed remnants of the phalangeals and metatarsals, and the very characteristic appearance of the remains of the great toe and thumb are well worthy of notice. I am not able to say why absorption should be most advanced at the distal end of these bones; the peculiarity cannot be connected with the direction of the nutritive canal, for this differs, while the progress of absorption is the same, in the two sets of bones; the cancellous tissue seems to suffer most, but in young subjects the epiphyses have not been found especially affected.

The second method by which destruction of the bones is caused is that of caries or necrosis, which generally occurs at the first or second joint of the digits, extrusion of the fragments taking place on the dorsal aspect: the usual consequences as swelling, &c. attend this process, which, as already stated, I am inclined to regard as incidental rather than otherwise, and as Figures 8 and 9 show, interstitial absorption may precede or accompany it. Marks of vascular excitement are seldom very evident even in this condition, and the periosteum is not red or thickened.

Microscopic appearances.—Four sections, horizontal and vertical, of two metatarsal bones altered by extensive interstitial absorption, when mounted in Canada balsam, exhibited the following appearances:—The compact osseous tissue forming the attenuated remains of the shaft was permeated by *channels* opening at the tip, or on the outer surface, and ending either in rounded

extremities or communicating with Haversian canals; the smallest were only $\frac{1}{125}$ in. in diameter, and frequently passing off from the latter in a radiated manner, pursued an irregular more or less longitudinal course, often inosculating with other channels or Haversian canals; they reminded me of the tracks of boring insects in wood and shell. The largest channels, sometimes not unlike irregular cancelli, may perhaps be best described as elongated and branching Haversian spaces; some were $\frac{1}{30}$ in. across, and enclosed several Haversian systems in their area; from them passed off smaller channels in various directions, which were not unlike dilated Haversian canals, but as with the larger, although bearing a general resemblance to normal structures, were too irregular in their disposition to allow of confusion, and yet sufficiently methodical not to be mistaken for mere cracks or fissures. The bone cells were but little changed, occasionally on comparison with those of healthy bone (of the same part) they seemed small; it did not appear that the minuter channels were connected with them in their origin. The canaliculi being generally invisible in the balsam, I cannot say if any morbid change had occurred in them, probably not. The cancellous tissue forming the base of the shortened metatarsal bones seemed only "rarified."

The appearances thus briefly described, if, as I believe them to be, accurately interpreted, are of considerable interest: I am not aware if such have been previously noticed, but they seem to me to show the way in which interstitial absorption occurs very clearly. Adopting the views of Messrs. Tomes and De Morgan, this process may be said to be a modification of the ordinary method by which bony tissue is removed for the purpose of being replaced, in the course of normal nutrition: it might be termed *molecular destruction*, the tissue absorbed not being restored as usual.

Such are the results of my enquiries into the structural pathology of Leprosy: but I am fully aware of many deficiencies in these observations. I would particularly point out as a subject requiring further investigation, the first commencement and progress of the nerve-disease, and an endeavour should be made to ascertain whether the vaso-motor nerves are primarily affected or not; the condition of the sensory nerve-trunks above the seat of lesion I have not sufficiently examined, and that of the small blood-vessels in the atrophied parts requires further notice. The chemical and vital pathology of Leprosy have not been even cursorily ascertained.

REMARKS ON THE RELATION OF INNERVATION TO NUTRITION.

Upon this subject the phenomena of leprosy are calculated to throw much light; and, as I should interpret them, their teaching is to the effect that the process of nutrition is greatly dependant upon, or under the immediate control of, some influence exercised by the nervous system.

The following considerations seem to me particularly emphatic:—first, there is no other apparent cause for the atrophy of the hands and feet, or the alterations in the skin, except disease of the nerves; and secondly, there is such a close correspondence between the extent of these changes and the area supplied by the affected nerves, as admits of but one inference: I may also add that the duration of the nerve-disease bears a decided relation to the amount of distortion, &c., and that both morbid changes commence simultaneously, thus agreeing in time, as well as local connection and degree. I have never found destruction of the hands, &c., without nerve-disease, nor does the latter exist without some degree of the former.

The nerve-centres themselves, as has been shown, are not affected, but on account of disease in the nerve-trunks, the force generated in them is conveyed not at all, or not readily, to the tissues; or it may possibly undergo some modification in transit, for the nerves are not mere conductors only of impressions or impulses.

Granting that no other series of morbid actions (possible cause) bears the same relation to the symptoms (effect), and that the above is an adequate cause, the only question that remains is as to the manner in which nerve-force influences nutrition—is it exercised immediately upon the vital properties of the tissues, or less directly through the blood-vessels, or

some other medium?* This question I shall not now discuss, but the points above-mentioned deserve further notice.

It has been already shown that in the case of the ulnar nerve the effects of deficient nutrition are strictly limited to the district it supplies, even to the bones of the carpus and metacarpus; that the outer side of the foot suffers in a precisely like manner to the extent supplied by the external plantar nerve; that the skin on the back of the foot supplied by the musculo-cutaneous nerve may be alone affected, &c. &c. As in these instances the amount of motor paralysis is by no means considerable, or in proportion to the anæsthesia—as the atrophy seems to be of a peculiar character—and since there are other elements in a compound nerve besides those belonging to sensation and motion, which it is possible are specially affected in leprosy; as well as for other reasons (amongst which is the liability of muscles to become atrophied without paralysis, or previous to it), I am led to infer that these morbid changes are not the result of simple inaction, as might be supposed.

* In considering this interesting topic, two sets of collateral influences would have to be regarded, either operating from without (as local exposure), or inherent (as a deteriorated condition of the blood), each of which might exert an injurious effect upon nutrition; and hence with respect to leprosy, it would be necessary to determine whether deficient or altered nerve-influence only favours their effects, or acts as a special morbid cause. My own conviction is towards the latter view.

No one imagines that the organic vital endowments of the tissues are wholly dependant upon nerve influence, any more than the contractility of muscular fibre, but it may be questioned if an animal possessing a nervous system and habitually enjoying its influence, being structurally and dynamically adapted thereto, could be deprived of it, even in part, without corresponding impairment of structure and function immediately ensuing.

Brown-Sequard indeed asserts "that all the phenomena of nutrition and secretion may remain normal when the action of the nervous system on the various tissues is missing" (*Lancet*, 1858. v. 2. p. 547), but I do not think that opinion is well founded. The case of plants and a-neurous animals, often advanced in illustration of this subject, is not, in my opinion, a parallel one; they never had a nervous system, and it may not be said how far the vital endowments of their tissues have been modified on that account; and the ingenious simile of a horse and his rider falls far short of illustrating the connection of the nervous system and the organic functions; it is really inappropriate, too, for it only shews how the nobler mind can rule a lower.

On the other hand, it may be gathered from my observations that the extent of local change does not always accord with the area supplied by the corresponding diseased nerve; also that the changes do not appear with equal certainty, and that their amount is not necessarily in proportion to the degree of nerve-disease.

To which it may be replied that seldom is a nerve diseased throughout, some of the funiculi, or parts of them, may be much less affected than the rest; hence it is probable these sounder portions have carried on their functions, and this partial action would account for the apparent anomalies: with regard to the last-named objection, it may be further remarked that during life it is impossible to measure precisely the degree of nerve-disease, that after death this oftenest appears rather in excess, and also that the degree of distortion is partly regulated by the state of the vital powers of the system, and the presence or absence of a 'tubercular' taint, as well as by the exposure and irritation the part may have been subject to; nor should the possible limitation of the nerve disease to the sympathetic element be overlooked, in considering this hypothetical demur.

The discrepancies between the results of experiments on animals, and of direct injury or leprous disease of corresponding nerves in man, form one of those points that will soon have to be considered by physiologists; it seems to me they are only, or best, explicable on the assumption that the connection of the nervous system with the organs and processes of organic life is not equally intimate in all members of the animal kingdom, and and in none so close as in man himself.* I cannot, however,

* That such an assumption is not untenable may be inferred from facts like the following. A strong young man was submitted to operation on account of a large fibro-cystic tumour of the neck, by Professors Busch and Weber of Berlin; the right vagus nerve, below the origin of its superior laryngeal branch, having been unavoidably divided, aphonia, urgent dyspnoea, and spasms quickly ensued, and with the greatest difficulty life was prolonged for a period of sixteen hours. It was observed by the distinguished operators that this lamentable occurrence showed that section

omit noticing some experiments of Dr. Waller on the refrigeration of the ulnar nerve, in man, by the application of ice to the elbow (see Proc. of Roy. Soc., Vol. XI., no. 46), as it might be anticipated that they would illustrate the early symptoms of Leprosy: but the phenomena are rather discordant, so far at least, as the latter are yet known. Waller found that hyperæsthesia temporarily preceded the anæsthesia, and that muscular irritability is increased, as well as temperature and vascularity, at the inner side of the hand; whereas in leprosy there has been no evidence of increase of heat or vascularity in the hand, but quite the reverse.* These phenomena, in the two cases, seem to correspond respectively to paralysis of the vaso-motor or sympathetic nerves (Waller), and to their irritation (Leprosy); and since excitation of the sympathetic produces

of one vagus will soon cause death in man, whereas in animals this result follows only when both vagi are divided. (Med. Times and Gaz., Aug. 17, 1861, p. 176).

Compare also the experience of Müller (Physiology, vol. 1. p. 394-7),—"I have only once among several cases in which I divided the ischiadic nerve in rabbits for the purpose of investigating the reproduction of nerves, observed that the skin of the heel of the paralysed limb gave way and ulcerated at the part upon which the animal rested": with the cases occurring in the human subject, quoted by Hilton (Lancet, 1861, vol. 1., pp. 155 & 201), and Swan (on Diseases and Injuries of the Nerves, p. 60); also one recorded in the Med. Chir. Trans. of London, vol. IV.

It may be observed, too, that amongst the lower animals, local deprivation of nerve influence is tolerated in different degrees.

* C. Bernard describes similar symptoms to those mentioned by Waller, as the result of division of the ischiadic nerve in dogs (loc. cit.); and I am rather surprised that no one has called attention to the similarity between them and neuralgia. It seems to me most evident, and well calculated to assist in forming correct views of that disease; judging by inference, too, the employment of galvanism in neuralgia might be expected to afford relief, at least in certain cases.

That disease of the great nervous centres (*e. g.* Paraplegia) is not followed by atrophy, &c. of the extremities, such as is observed in leprosy, is not difficult to explain, admitting that the sympathetic system is the source of those nerve elements especially concerned in nutrition; for the communication of the latter with the cerebro-spinal nerves does not take place until some distance beyond their origin; hence in disease of the centres the vaso-motor nerves are not, immediately at least, implicated. See some late experiments of C. Bernard. Med. Times and Gaz., Aug. 23, 1862.

spasm of the arteries, diminished supply of blood, and "decrease of vital properties," it might justly be advanced as the primary cause of the local atrophy, &c. of the hands and feet in leprosy; but while it is undoubtedly true that the flow of blood is lessened, and the nutritive energies of the parts reduced, in the benumbed and wasted limbs, there are some difficulties in the way of adopting this explanation; such are the circumstance that after death, at least, the blood vessels are not found contracted (see page 59), and that the evident tendency of the local nerve-affection is to destroy rather than simply irritate the nerve-tubules.

To each of the hypotheses I have now mentioned, viz.—that of direct influence of the nerves upon the tissues—that of spasm of the blood-vessels and consequent deficient supply of blood—and that of inaction and its necessary results—some objections may be advanced, in the attempt to explain the local symptoms of leprosy. I own myself in favour of the first-named, but see no reason why a conjunction of circumstances might not be fairly assumed to be in causative operation, rather than one influence alone.

How much alike, on the other hand, direct injury of the ulnar and median nerves, &c., is to leprous-disease, in its consequences, will be evident to any one comparing recorded examples of the one with the present account of the other. *

Lastly, with regard to the influence of external circumstances in aggravating the local changes, reference has more than once been made to this subject; and Brown-Segard long since illustrated it by numerous experiments on the lower animals, which showed when and why (in his opinion), swelling, ulceration, and gangrene of the hind feet followed section of the sciatic nerve; those individuals alone suffering which were allowed to run about on a hard, cold, paved floor, dragging upon it the

* See particularly a case lately described, *Med. Times and Gaz.*, Aug. 23, 1862, in which besides loss of sensation, &c. vesicles had appeared on the fingers, and the temperature (as measured) was notably reduced.

weakened and insensible limbs, whilst others better protected did not suffer. (Quoted in the Brit. and For. Med. Chir. Rev. 1850, p. 247.)

On some occasions, (A.L. TABLE (IV.) no 3. T.L. TABLE (II.), ulceration and sloughing of the skin and deep-seated parts were found in such close connection with marked nerve disease, that it seemed likely the relation was one of cause and effect.

In concluding these imperfect observations, I should not hesitate to admit that very many points regarding the symptoms and morbid anatomy of leprosy require further investigation, or elaboration; it has, indeed, been to me a matter of some difficulty to compress my remarks on this fresh and intricate subject within these few pages.

Although it was no part of my plan to depend upon others for facts, having studiously avoided recording any not based on direct observation, I must acknowledge the stimulus derived from the labours of M.M. Danielssen and Boeck, my acquaintance with which is limited to a careful review in the Brit. and For. Med. Chir. Rev. 1850, vol. V. It will be seen how far their results have surpassed mine, as regards particularly the condition of the great cerebro-spinal centres, but I can hardly help asking was all this necessary to explain the symptoms of leprosy? With such a condition of the spinal cord as these authors describe, what different and urgent symptoms might we not anticipate! Further information is doubtless needed; but while the leprosy of India must not be looked to for confirmation of the Norwegian disclosures, its anatomical characters do not fail to account for all and every symptom noticed during life. And I think it may be regarded as affording more copious illustration than has hitherto been advanced, of the fundamental physiological doctrine touching the connection of nerve-influence and nutrition, in man himself.

The PATHOLOGY of Leprosy in India is a subject of enquiry well deserving investigation. This disease is doubtless associated with well known hygienic conditions; but it has also a special diathesis, which, as it seems to me, most nearly approaches the syphilitic. Both result in the effusion of a low-organized deposit in the skin and nervous system; in constitutional syphilis, however, many of the internal organs of the body, as the Brain, Liver, &c. are affected; this is not the case in Leprosy, the advent of which, too, is not generally preceded by syphilitic infection.

Direct and methodical observations would alone afford data for profitable speculation; these have not been carried out, hence little or nothing of value can yet be advanced on this interesting topic.

As to the TREATMENT of Leprosy, few words can be needed, in the present state of therapeutics, to indicate its futility in confirmed cases. The question must rather be by what means can we arrest or prevent the effusion in the skin or amongst the nerve-tubules: for after a time, its re-absorption, even if possible, will be of little advantage—the nerve is destroyed. Alkalies and the Iodide of Potassium have certainly seemed beneficial in some of the many cases they have been tried in, but they usually failed. Mercury has never been fully pushed, so as to affect the mouth, for evident reasons. Arsenic has always been inefficacious in Baras. Local applications (of Iodine, Mercury, or Stimulants) have never done palpable good, though long continued. Indigenous remedies I have not tried, being sceptical on pathological grounds of their superior efficacy to the above. Galvanism would be worth testing where it can be efficiently applied; but as yet no attempt at cure has, in my hands, succeeded in effecting more than an apparent retardation of the symptoms, in the earliest and most favorable cases.

TABULATED NOTES OF THE HISTORY, SYMPTOMS, AND POST-MORTEM EXAMINATION OF 16 FATAL CASES OF LEPROSY; WITH THE DISSECTION OF THE NERVES OF THE TRUNK AND EXTREMITIES.

N.B.—In the Tables the diameter of the nerves, both healthy and diseased, is indicated by numbers which represent the *twentieth-parts of an inch* as marked on the dial of the Aphemetric compass; they have been allowed to stand un-reduced on account of better showing, at a glance, the relative size of the nerves.

FATAL CASES.]

ANÆSTHETIC

No.	Caste.	Age.	Duration of Disease.	Hereditary Influence and Remarks.	Commencement and Course.	Extent, &c. of Anæsthesia.
1	Muss.	30	7 months?	Not known. Died of Dysentery and exhaustion. Native of Dacca.	Began in right foot, spread to opposite foot, then hands and face.	None on the face : hands, and feet, extending up the forearm and leg : it is most complete in the former, both surfaces being affected.
2	Christ.	29	3 years.	No hereditary taint. Syphilis 4 years since. Treated with Iodine and Arsenic for some time before albuminuria and fever came on, then had Quinine, Diaphoretics, and Antimony : finally stimulants. Died comatose. Came from Tellicherry, where Leprosy is common.	Eruption first on body, then numbness of the feet, hands, and face; the fingers and toes became distorted and partly destroyed. At an early period, the skin of the face acquired a bronze tint, and became a little swollen on the nose, cheeks, and ears.	Doubtful if present in the spots, particularly on the cheeks and ears : back, lateral surfaces, and nates, &c. on the genital organs, but not their mucous membrane, probably. Upper extremities, — left hand completely benumbed, and also inner part of forearm. Right hand — anæsthesia very slight. Lower extremities — loss of sensation in right foot, and leg as high as knee. On left side confined to foot.
3	Hind.	35	7 to 8 yrs.	Not known. Is a labourer, from Hyderabad in the Deccan. Died exhausted? phlebitis.	Not known.	Hands and feet, it is impossible to ascertain the precise extent.
4	Muss.	50	10 years.	None. Is a sailor, had syphilis twelve years since and was treated with Mercury. Native of Bombay.	Began with swelling at the sole of the right foot, near the great toe.	Is present in the hands and feet, extending a short distance above the wrist and ankle.
5	Hind.	Adult.	Unknown.	A pilgrim. No history obtainable before death.*	Not known.	Not known.
6	Christ.	23	12 years.	Died of Dysentery. History unknown.	Not known.	Not known.
7	Hind.	Adult.	10 years ?	From Rutnagherry. No history known.	Not known.	Not known.
8		No account.		No history known.	Not known.	Not known.

* It is to be regretted this is so frequently the case, the patients being admitted in an almost dying state.

LEPROSY.—TABLE (I.)

[J. J. HOSPITAL.

Present State.

Very thin and weak. There is slight depression of the nose: hairs on eye-brows scanty. There are superficial ulcers on the shoulders, hips, scrotum, and the fingers and toes, with partial destruction of the latter, on the right foot the great toe having disappeared. All these parts look puffed and shining, as if from the application of oil. He complains of pains in the joints. Urine is pale, sp. gr. 1003, plentiful, slightly alkaline, and unaffected by heat and nitric acid. [Case referred to in last Volume of Transactions, &c. Appendix p. xxviii.]

Numerous light-coloured oval or circular spots, varying in size from an 8-anna piece to palm of hand, having a reddish slightly-raised edge; over this skin is roughened and on extremities looks scaly: they are present on the face, trunk, and limbs, and are occasionally symmetrical, as on the mammae (Bara^a). Is of spare habit. Muscular power of limbs somewhat impaired. Upper extremities—left hand, palm shrivelled, fingers atrophied and distorted, last phalanx of thumb gone. Right hand, middle and little fingers rather shrivelled, the former has lost a phalanx and half; ring finger also contracted. Lower extremities—right foot and leg: former contracted, great toe atrophied, skin shrivelled and dark: a small sore on the sole:—left foot, little toe only atrophied, skin is shrivelled: a sore on the sole. Nothing to be seen in the throat: voice unaffected: sense of smell deficient. Manner dull and heavy, answers questions carelessly. A month before his decease, there supervened depression, fever, and anasarca, with fullness of the abdomen; a sense of heat in the body and aching pains: then dyspnoea came on, and he finally died rather suddenly. The urine was then high coloured (blood?) sp. gr. 1009, contained much albumen, and a scanty brownish serculant deposit: he attributed the change to the medicine (Iodine) he had been taking. Afterwards it became of a lighter colour and was plentiful. Under the microscope were seen pale, clear casts, others slightly granular, nuclei: blood corpuscles, numerous delicate spherical cells with a distinct spherical nucleus, and sometimes yellowish granules; others like epithelial scales. No distinct oil globules were seen.

Very weak and reduced: suffers from fever. No affection of the face and trunk. Upper extremities—right hand, much distortion, anaesthesia at the front and back, at the outer side, including the thumb and two next fingers. Left hand—much distortion: numbness everywhere, except a flute at the outer side. Lower extremities—right foot, it and the leg are swollen and painful, cannot say where sensation is most deficient. Left foot, benumbed on the dorsum and sole only. Extensive sloughing and suppuration in the right foot: and phlebitis of the superficial veins in the leg, &c.

No marks on the face: very doubtful light spots on the trunk. Upper extremities—right hand, light spots and distortion: the phalanges of some of the fingers are gone, and the thumb is shortened: left hand, light spots, thickening, and distortion; small dark blisters on the sides of the fingers. Lower extremities—right foot, the second toe is gone and there is a large sore on the sole close by: retraction of the toes with shortening and distortion. Left foot, toes thickened, some shortening, and great toe contracted, and fourth toe almost gone: a recent sore on the sole.

Emaciation. Superficial excoriations on various parts of the trunk and limbs: great distortion of the hands and feet, with destruction of several fingers and toes.

Body in fair condition. Hands and feet alone affected: there being distortion and partial destruction of the fingers and toes.

Exceedingly reduced. Slight flattening of the nose; swelling of the ears: ulcers over the knees and ankles: atrophy and ulceration of the hands and feet.

Emaciated, particularly lower limbs; hands are atrophied, skin smooth, and glistening: toes are shortened and thickened, skin rough and shrunken: a "femoral tumour."

POST-MORTEM APPEARANCES.]

ANÆSTHETIC

No. of Case.	Brain.	Spinal Cord.	Sympathetic.	Heart.	Lungs.
1	Membranes injected, healthy. Substance soft and wet, marked by "punctæ": in floor of fourth ventricle and in corp. dentat. of crus cerebelli, both on left side, very small extravasation of blood: surrounding substance not softened.	In the arachnoid were several small white osseous formations, $\frac{1}{10}$ in. diam. or less, form starred. Chiefly on posterior surface, and in dorsal and lumbar regions: some were close to posterior roots of spinal nerves, but not in a position to press on them, other membranes and substance of cord quite healthy in appearance.	Appeared healthy in the abdomen: semilunar ganglia normal. At root of mesentery several enlarged Pacinian corpuscles were seen.	Healthy, firm clots in left cavities. Pericardium not opaque. Aorta free from atheroma.	Adherent. Healthy. Pleura not opaque.
2	Membranes pale, little sub-arachnoid fluid. Pacchionian glands not enlarged. Substance wet but not particularly soft, few "punctæ": little fluid in ventricles: choroid plexuses pale, arteries at base healthy.	Membranes healthy, pale, except pia-mater in lumbar region. Substance of normal consistence, but softened in middle of dorsal region, where it had a reddish hue. Microscope failed to detect abnormal elements, the nerve fibres, &c. being very clear. Roots of spinal nerves normal.	Nothing abnormal seen in abdomen.	Large, substance pale, but not diseased. Valves healthy, cavities dilated and filled with clots. Pericardium clear, it contained some serum. Aorta healthy.	Congested, and upper lobe of left lung solid & light coloured, but regaining scarlet hue on exposure to air. No adhesions, Pleura and bronchi healthy.
3	Membranes—dura-mater thin, arachnoid slightly opaque, many Pacchionian glands. Substance softish, ventricles a little reddish serum. Vessels healthy.	Membranes and substance had all appearances of healthy state, beyond a slight diminution of consistence (from decomposition?)	Left splanchnic nerve seemed enlarged and opaque; but on examination no disease was found. Ganglia healthy.	Healthy, cavities contained clots. Aorta free from deposit.	Congested and firm, but still crepitant.
4	Membranes—dura-mater pale, adherent to arachnoid along the vertex. Substance rather soft, especially about septum lucidum, some reddish fluid in the ventricles. Origins of cranial nerves healthy.	Membranes healthy, pia-mater vascular below. Substance softened places in lumbar region, and reddish tint of grey commissure, but there was no actual disease. Roots of spinal nerves looked quite healthy.	Healthy. Numerous Pacinian corpuscles at root of mesentery of usual appearance.	Healthy.	Healthy, adherent.
5	Membranes—arachnoid slightly opaque. Substance rather soft and wet, little serum anywhere.	Membranes healthy. Substance of uniform and tolerably firm consistence.	Healthy.	Small. Great vessels healthy.	Right lung indurated below and behind: slight puckering at apex. Left lung—adhesion at apex: some contraction and puckering of pleura, a few firm tubercles.
6	Membranes healthy. Substance slightly congested, but firm and seemingly healthy.	Membranes and substance; roots of spinal nerves, in all parts normal.	No memoranda.	Mitral valve covered with reddish fibrine. Aorta healthy.	Adhesions on left side. Lobular condensation in parts, specially towards anterior margin: intervening tissue emphysematous.
7	Both membranes and substance appeared healthy.	Membranes healthy. Substance healthy, but softened in process of extraction.	No other notes.		
8	Membranes healthy. Substance the same, but softened at the fornix and septum lucidum.	Membranes and substance had a normal appearance.	In the abdomen was healthy.	Healthy.	Adhesions on both sides, right lung vascular, bloody serum, pleura. No tubercles.

LEPROSY.—TABLE (II.)

[Viscera.]

Intestinal Canal.	Liver.	Spleen.	Pancreas.	Kidnies.	Lymphatics. Glands, Muscles, Blood.	REMARKS.
Healthy. Intestines collapsed. Peritoneum not opaque.	Rather small, adherent on convex surface.	Normal.	Normal.	Capsule not adherent. Small; outer surface smooth, mottled with large white patches, which extended through cortical substance and were defined.	Lymphatics and glands not diseased. Blood coagulated, muscles pale.	
Stomach contained lumbrici, semi-digested. Intestines filled with air. Peritoneum clear. Its cavity contained fluid.	Enlarged, surface mottled and puckered, substance congested and coarse, no deposit, serous coat clear. Gall-bladder small, contained viscid bile.	Rather large, coats thin, substance friable.	Healthy.	Capsule slightly adherent. Both considerably enlarged, surface pale, mottled and slightly granular. Cortical structure more abundant than usual, and encroaching on medullary, pale, coarse, striated, texture friable. Supra-renal capsules healthy.	On left side absorbents near axilla contained pus; glands near were inflamed. Blood mostly fluid. Muscles pale.	Body injected with arsenic solution before examination; much swollen from oedema. Urine albuminous.
Normal.	Somewhat congested, substance healthy.	Soft and pulpy.	Normal.	Capsule not adherent. Enlarged and pale; cortical substance of a light colour (fatty degeneration), traces of cysts.	Blood diffluent.	Examined 20 hours after death.
Not examined.	Healthy.	Soft.	Healthy.	Capsule normal. One was enlarged, and its colour mottled, as if from deposit. Surface of both smooth.	Muscles pale.	
Healthy. No opacity of Peritoneum.	Healthy.	Slightly enlarged, surface puckered.	Healthy.	Capsule not adherent. Small, surface smooth mottled, with pale spots as if from a scanty deposit. Supra-renal capsules healthy.	Glands healthy, muscles pale, blood clots small.	
No notes.	Healthy.	Enlarged, considerable deposit of yellow friable substance. No thickening of coats.	Normal.	One healthy. In the other was a considerable deposit of yellowish fibrine occupying both cortical and medullary substance: no alteration in size.	Yellowish firm deposit in inguinal glands.	
.....	Healthy.	Healthy.		Capsule easily separated. Small, surface pale and smooth.	Glands of a deep red colour in abdomen, enlarged in inguinal region.	

POST-MORTEM } APPEARANCES. } ANÆSTHETIC LEPROSY—TABLE (III.)

Cervical Plexus.

Case.	Auricularis Magnus.	Superficial Cervical.	Occipitalis Minor.	Descending branches.	REMARKS.
2	Soon after emerging for the space of an inch, enlarged and reddish-grey.	Lower branch atrophied at commencement, but where it lay over the Sternal-mastoid much enlarged and transparent. $\frac{1}{2}$ then $2\frac{1}{2}$, beyond this atrophied. Normal size=1.	Occipitalis Minor. Slightly thickened.	Not affected in appearance.	Left side of Neck. During life the ears were benumbed, but the upper part of the neck was not so: the lower part may have been. In case 7, the auricularis magnus was diseased in the usual manner, being large, soft, and reddish-grey, and streaked.

Brachial Plexus.

Case.	Plexus.	Internal cutaneous = 1 $\frac{1}{2}$.	External cutaneous = 1 $\frac{1}{2}$.	Median above = 2 below = $4\frac{1}{2}$.	Ulnar at elbow = $2\frac{1}{2}$.	Its dorsal branch = 1-1 $\frac{1}{2}$.	Musculo-Spiral.	Radial = 1 $\frac{1}{2}$.	REMARKS.
1	Not affected.	•	•	Above = $2\frac{1}{2}$ Below = $6\frac{1}{2}$ Broad and thick, collected much blood in appearance—this was at the wrist.	Above elbow = $2\frac{1}{2}$ opposite = $6\frac{1}{2}$ below = 3 Enlargement opposite elbow very marked; soft and reddish; below smaller than usual.	•	Cutaneous branches. •	•	• Were small and transparent, and very difficult to trace. Skin appeared thinned. In case No. 7 the ulnar nerve was diseased at the elbow.

Normal.	emerging for about an inch thickened, and transparent—below this rather atrophied.	very much thickened, &c., and for some distance.	In the arm—middle of fore-arm = 13 at wrist = 10 and diseased.	Above elbow = 9 red and marbled, below = 2½ reddish and transparent.	Rounder and trans-continuous than usual.	Outer part, the continuation of the disease, alone diseased.	At elbow = 1½ and atrophied; below = 2½ emerging near wrist = 3 and diseased.	Notice the relation of the cutaneous branches of the ulnar nerve spirally to the main trunk of the ulnar nerve itself, showing that part of a nerve may alone be diseased, while the entire trunk appears to be so; or one part may be more diseased than another.
Right side.	Diseased.	More transparent than usual.	Enlarged and whitish at elbow, but not transparent.	Considerably enlarged at elbow, but little changed in appearance, atrophied in forearm, looks normal below.	Much diseased, also the strands which join the main trunk for some distance, very striking.		Considerably diseased after emerging.	
Left side.	Right side.	Right side.	Right side.	Right side.	Right side.		Right side.	Two enlarged lymphatic glands at the right elbow which may have compressed the internal cutaneous.
No apparent change, and microscope reveals none decided.	Much diseased, near axilla = 1½ soon after = 3 swollen and red, below opaque in patches.	Evidently diseased, after emerging = 2½ some strands may be unaffected.	Near axilla = 3 looks streaked, in forearm = 2 almost normal, near wrist = 5 opaque & whitish.	Near axilla = 2½ at elbow = 4½ reddened, in forearm = 1½ being atrophied, near wrist = 2½ looks almost normal.	Just after emerging = 1½ round and transparent.		Soon after emerging = 1½ in forearm = 2½ red, swollen & semi-transparent.	
Right side.	On the arm it is diseased.	Diseased, cord-like and vascular.	Enlarged above, firm, round, streaked, smaller below.	Less affected, large as far as elbow, small afterwards.	Slightly enlarged, round and transparent.		Above = 1 turning backwards, below = 2 swollen & grey, afterwards pale and atrophied its strands could be traced along outer side of fingers, but not thinning, extent of lesion being less than might be anticipated.	Pacinian corpuscles were enlarged on some fingers, but distal nerves look atrophied and pale. Radial nerve most diseased. Distortion, and destruction of fingers, but not thinning, extent of lesion being less than might be anticipated.

POST-MORTEM } APPEARANCES. }

ANÆSTHETIC LEPROSY.—TABLE (IV.)

Lumbar Plexus.

No. Case.	Anterior Crural=§1.	Ext. Cutan.	Midd. Cut.	Obturator.	Long Saphenous.	REMARKS.
1	†	•	•	†	•	†† Did not notably differ in appearance when compared with corresponding nerves in a non-leprosy subject. ••• Were somewhat increased in size.
2	Small on both sides, right side = §1, and transparent, left side = §1.	Little changed. Ditto.	Little changed. Ditto.		Little changed. Slightly atrophied.	In case 4 the long saphenous was found atrophied in the leg; in case 5 the anterior crural was found slightly atrophied, none other examined.

Sacral Plexus.

No. Case.	Great Sciatic above.	Popliteal = 3	Peroneal = §4.	Posterior Tibial below = §4.	Plantar Internal = 3 External = 14	Musculo-cutaneous (cutaneous branch) = 14.	Anterior Tibial at ankle = 1.	Short Saphenous 1 below.	REMARKS.
1	Little changed. Firm, round grey, 5.		Near bifurcation 4	Above = 2½ and round, below = 5.	Internal = 3½ External = 2½	Before emerging semi-transparent muscles = 1, after emerging = 2½ colour, opaque white, firm, terminal branches small and atrophied.	Small above increasing below, at ankle = 3 and very large on dorsum of foot.	Above 2, below 1½.	• In case 5 the anterior tibial was found diminished in size and transparent; no other examined. In case 7 the posterior tibial at the inner ankle was diseased, being enlarged with streaked blood-vessels, but soft and grayish in colour.

2	Right side, Above of natural size, below $3\frac{1}{2}$ and $4\frac{1}{2}$.	Right side, Above $= 3$ afterwards increasing in size.	Right side, Near ankle $= 3\frac{1}{2}$ round and firm.	Right side, Atrophied above, and for some distance below, on leg and foot.	Right side, Disposed, 4	Diseased 3	In accordance with the comparative degree of numbness and distortion observed during life, the nerves of the two limbs were found changed to a different extent; the greater the disease in them the greater the distortion, &c.
3	Left side, Looked normal.	Left side, Above normal, except that part continuous with musculo-cutaneous, for some distance up the thigh.	Left side, Near ankle $3\frac{1}{2}$ diseased, but less changed in appearance.	Left side, Before emerging $= 1\frac{1}{2}$ to $2\frac{1}{2}$ and diseased.	Left side, Less in size than usual, but round and firm.		
4	Divided high up, inner part seemed large, outer diminished.	At first flattened $= 3\frac{1}{2}$ opposite head of fibula, thicker reddish, striated, $= 4\frac{1}{2}$ from this part Ext. Saph. arose.	Near ankle $= 4\frac{1}{2}$ very firm, round and of dead-white colour.	Near head of fibula transparent, grey, $= 7$ at emerging $= 1\frac{1}{2}$ and flattened, then larger, and reddish near ankle, afterwards again atrophied, the outer division most diseased.	Atrophied above, thin transparent and adherent, on dorsum of foot larger.	Decidedly enlarged and changed before perforating the fascia.	It would seem that the enlarged nerves lose some of their peculiar appearance towards the periphery, as if absorption took place of the diseased deposit, or its conversion into white fibrous tissue, producing a less striking appearance than the deposit at an early stage, though not less characteristic.

FATAL CASES.]

(I.) MIXED LEPROSY.—

No. of Case.	Caste.	Age.	Duration of Disease.	Hereditary Influence and other Remarks.	Commencement and course.	Extent &c. of Anæsthesia.
1	Hin.	25	6 months.	No taint, comes from Rutnagherry, had syphilis 4 yrs. ago; temperate habits; died of Cholera.	No specially premonitory symptoms, had ague. It began on face and spread.	More or less over all the patches: no other notes.
2	Hin.	15	?	Not known, lived on the coast: died of Cholera.	Not known.	Not ascertained with precision: states that all parts (five included) feel numb, arms and legs heavy.
3	Por.	40	1 year.	None known: had syphilis a year before the numbness came on; native of Goa; died of Albuminuria and Jaundice.	First anæsthesia of the hand, after thickening of the nose, face, and ears.	Two inner fingers and corresponding parts of thumb and palm of left hand, the latter is atrophied but temperature not lower to sense of touch.
4	Hin.	25	2 years.	None known: never had syphilis: a labourer from Hermit (coast): has lived mostly on salt fish and rice: died of Cholera.	Light spots on the skin which subsided, leaving dark (?) stains: numbness followed, hands affected within last year.	There is marked numbness of the entire mask and on both temples, limited below by the body of the lower jaw very precisely. Sensation persists in the scalp, behind the ears and in the neck. Back of right hand, except thumb; left hand, on front and back of 3 inner fingers & adjoining dorsum. No difference of temperature to touch.
5	Mus.	35	5 years.	No known taint: several attacks of syphilis: died of dysentery and exhaustion.	Fever; pale patches on the body, small and not benumbed: no traces of them now.	All parts of face slightly benumbed. Upper extremities, left side, anæsthesia in forearm and both surfaces of hand, right side slight numbness in forearm and hand. Lower extremities—numbness below middle of both legs, extending to dorsum of feet, not in sole, but when these are placed on the ground a cutting or pricking sensation is excited; no feeling of heat, the benumbed parts feel cold.
6	Hin.	20	6 years.	Father lately become a Leper (anæsthetic variety): he is eldest son, comes from Rutnagherry (coast): died of Cholera.	No premonitory symptoms: began with thickening of skin and numbness in nates.	Numbness in bronzed patches on face, doubtful elsewhere. In loins, not on patches there, entirely in upper extremities from shoulder downwards, completely from hips downwards, in scrotum and penis, not in throat.
7	Hin.	35	+10 years.	No taint, never had syphilis, comes from Deccan: died of exhaustion from chronic dysentery.	First, tubercles on face, then on body, afterwards hands benumbed, formerly suffered from fever.	Of most parts of mask and of ears, of upper extremities and entirely of hands, of lower extremities and entirely so in legs and feet, of many parts of trunk, including the back. It is not apparently altogether limited to the pale patches.

(Anæsthetic and Tubercular).

[J. J. HOSPITAL.]

Present Symptoms.

the face are reddish-brown, raised, shining patches, particularly on eye-brows and lower lip, imparting a leonine expression: the ears are but little changed, and eye-lashes remain. On the trunk is a scanty eruption, possibly syphilitic; no patches, but small tubercles scattered about, specially on nates. On the extremities, the same eruption; also distinct reddish tubercles: little distortion of hands or feet; but superficial excoriations on the latter.

Some emaciation; incipient leonine expression; is tolerably intelligent. The extremities are oedematous, skin rough and dry, marked with light patches, no distortion of fingers or toes, is subject to fever, when these appearances are aggravated (?), testes small, a chancre (?) on penis.

Weak but not much emaciated; intelligent. There is incipient leontiasis with bronzing of forehead, brows, nose, and cheeks, and ears; no tubercles on palate; voice natural; no eruption on trunk. There is enlargement at the elbow of left ulnar nerve, with flexion atrophy and deadening of the two inner fingers; little finger much shortened, skin of palm curiously drawn aside: probably paralysis of muscles of inner side of fore-arm; no other part affected though the feet look swollen, bronzed, and toes rather irregular. The patient died suddenly in a comatose state a short time after admission, death preceded by some fever and intense jaundice. Urine plentiful, light coloured, cloudy, a scanty white deposit sp. gr. 1012, albumen doubtful.

Weak, but in tolerable health, intelligent, a peculiar expression of face, almost "snake-like" owing to tumefaction and falling of the hairs, swollen parts bronzed not shining, ears much enlarged, no eruption, mucous membrane of palate pale and marked by an oval group of flattened tubercles, voice not clear, nothing to be seen on trunk, or lower extremities; no distortion or bronzing of latter. Right hand little finger shortened interstitially; tips of fingers clubbed, nails converted into small excrescences. Tips of fingers, excepting the thumb, benumbed, but not the palm. Dorsum of hand below the wrist, and of fingers, except the thumb, quite benumbed as far as the ends. Left hand, a similar but less degree of distortion of the fingers and nails; the three inner are affected, and their dorsal surface is quite benumbed, corresponding to dorsal br. of ulnar, on palmar surface these fingers are also benumbed. Muscular power of hands not impaired, nor muscular sense.

Weak and emaciated; feet oedematous, bowels relaxed, some tumefaction in parts of face, hairs on brows partly remain, nose depressed, ears tumid and red; pale, flattened tubercles on hard palate, voice feeble and hoarse. Upper extremities—blisters on hands, fingers swollen, pale and shortened; on left side, middle finger is gone, nails atrophied and distorted, on right side, considerable distortion, nails especially affected. Lower extremities—both legs oedematous, feet atrophied, skin harsh and cracked, toes swollen and smooth, sores on dorsum of left foot preceded by blisters: urine cloudy pale-coloured sp. gr. 1008, slightly alkaline, albumen plentiful; whitish, scanty deposit, composed of granular matter, crystals of phosphates, a few delicate granular cells, vibriones, &c.

Face, &c.—skin thickened, marked with diffused shining swellings of a bronze colour, best seen about middle of face, lobules of ears, nose slightly fallen, hairs on brows remain, voice rather hoarse. Trunk—a few, light spots in various parts; in loins, skin bronzed and tumefied. Upper extremities—a few, light patches in various parts, a few small tubercles in forearm, fingers thickened, shortened, swollen, bronzed, nails atrophied, occasionally a puriform discharge takes place from under them. Lower extremities—tubercles on thighs, a similar state of feet and toes, genitals imperfectly developed, specially testes; skin of scrotum thickened and wrinkled. Throat—white patches in fauces. Voice rather hoarse, tolerably intelligent, remarkably stunted in size and growth, thin and cachectic.

Tubercular thickening of face, particularly nose and ears, loss of hair, ulceration of rim and lobules of ears, marks of small-pox. A broad, pale, ulcerated line in middle of hard palate with tubercles. Voice hoarse and weak. Numerous light patches on skin of trunk; abdomen swollen. Upper extremities—light coloured patches, smooth; fingers fixed, distorted and partly destroyed. Lower extremities—similarly affected, except toes, which are not yet distorted or shortened. Mask, hands and feet have assumed a bronze tint. He is in a miserable condition, but sufficiently intelligent.

POST-MORTEM APPEARANCES.]

(II.) MIXED LEPROSY.—

No. of Case.	Brain.	Spinal Cord.	Sympathetic.	Heart.	Lungs.
1	Membranes and substance apparently quite healthy.	Membranes healthy. Substance rather firm below, also grey matter; no change in appearance. Roots of spinal nerves healthy.	In the abdomen appeared healthy; a swelling on left <i>splanchnic nerve</i> , it was probably ganglionic.	Healthy, loose dark clots in its cavities.	Healthy, little congestion, no opacity of pleura.
2	Membranes healthy. Substance, soft, but equally so all over the brain.	Membranes healthy. Substance, rather soft, but so in all parts equally.	In the neck and abdomen seemed hardly changed.	Flabby, fluid blood in all cavities, aorta healthy.	Healthy, no adhesions, &c.
3	Membranes pale and stained yellow. Substance of natural consistence and appearance; "punctate" yellowish and fluid in ventricles. Cranial nerves looked healthy.	Membranes stained yellow. Substance, also yellowish, particularly roots of nerves; to all appearance normal.	Not specially examined.	No disease; loose clots in right side.	Slightly emphysematous at margins and apex.
4	Membranes pale. Substance everywhere firm and pale; small cysts in choroid plexus. Cranial nerves healthy.	Membranes pale. Substance of a particularly healthy appearance throughout; also roots of spinal nerves.	In chest and abdomen, healthy in aspect.	Healthy.	Healthy.
5	Membranes pale. Substance soft and pale, especially in interior, about the optic thalamus, but not pathologically so. Origin of cranial nerves healthy.	Membranes pale. Substance pale and soft throughout, grey matter very distinct, roots of nerves looked a little thin.	In chest and abdomen, normal; also in the neck only some of brs. of <i>sup. cerv. gang.</i> seemed rather firmer and rounder than natural.	Slight opacity of aortic valves and lining membrane of left auricle; also of pericardium: otherwise healthy.	Considerably congested: no opacity of pleura.
6	Membranes healthy. Pachionian bottles large and scattered; one at base of skull seemed to press on 3rd div. of 5th, which nerve however was not changed in appearance. Substance quite healthy.	Membranes healthy. Substance firm and healthy, also roots of spinal nerves.	Healthy in aspect in cavity of pelvis; some ganglia seemed rather firm and enlarged.	Healthy.	Healthy.
7	Membranes pale. Substance softened about central parts; posterior cornua of lateral ventricles large; cranial nerves healthy.	Membranes healthy. Substance rather soft, compressed during extraction of cord; spinal nerves healthy.	Semilunar ganglion of one side seemed rather large, (no disease detected by microscope.)	Healthy: small opaque patches on pericardium.	Inflammation and adhesion, upper lobe of lung, mucus in trachea.

*(Anæsthetic and Tubercular.)**[Viscera.]*

Intestinal Canal.	Liver.	Pancreas.	Spleen.	Kidnies.	REMARKS, &c.
Quite healthy in appearance, no opacity of peritonæum.	Somewhat congested and coarse-looking, but no evident disease.	Healthy.	Small and healthy.	Capsule healthy, of usual size and colour, cysts in one: minute structure healthy.	P. M. E. 12 hours after death: urine copious, pale, alkaline, sp. gr. 1011, not affected by heat and nitric acid.
Healthy, mucous membrane pale.	Of natural size and appearance, substance rather soft and pale.	Red and rather soft.	Large, of purple colour, soft; capsule clear.	Capsule slightly adherent or thickened, organs rather large, mottled, and a little granular; substance very fleshy and soft, a. r. capsules healthy.	P. M. E. not until 36 hours after death.
Appeared healthy, lumbrici.	Of full size, dark coloured, smooth surface, sharp edges, serous coat clear and free of adhesions. Substance mottled, light yellow patches around portal canal, firm; the light patches were owing to fatty degeneration.	Healthy.	Very large, friable, free from adhesions.	Capsule transparent, slightly adherent, one considerably enlarged, outer surface smooth, pale; section, parasitic-like, evidence of a light deposit and fatty degeneration, stained with bile.	P. M. E. 5 hours after death. Nerves not dissected by accident. Urine unhealthy.
Healthy in aspect.	Of rather small size, but particularly healthy.	Healthy.	Enlarged, substance friable; no adhesions.	Capsule normal, small and firm; surface pale and smooth, cortical structure pallid and rather thick.	P. M. E. very soon after death, rigor mortis.
Peritonæum slightly solidified; it contained a little yellow serum, atonic ulcers in Rectum.	Large and firm; it contained two small abscesses filled with yellowish mucous-like pus, one superficial, one deep.	Healthy.	Enlarged, firmly adherent; capsule thick and spotted.	Capsule thin and adherent, organs large and firm, outer surface mottled and rough, cortical part thick & light coloured, spotted with cysts, a. r. capsules healthy.	P. M. E. made 8 hours after death: decomposition commenced soon. Urine contained albumen. Phlebitis in left arm.
Mucous membrane congested in intestines and marked with small ulcers, ecchymoses in stomach and intestines.	Of usual size, mottled; gall-bladder filled with yellowish green bile.	Healthy.	Healthy, not enlarged.	Of usual size, congested but otherwise in a particularly healthy state.	Body contained fat: died of cholera.
Mucous membrane vascular and ulcerated in Rectum.	Healthy, the distinction of brown and yellow substance very apparent.		Adherent capsule thickened; texture healthy.	Capsule not adherent, size small, outer surface smooth, on section no evident morbid change was seen.	P. M. E. 18 hours after death.

POST-MORTEM } MIXED LEPROSY.—(III.) APPEARANCES. }

Cranial Nerves.

No. of Case.	Origins.	5th Pair.				REMARKS.
		Gasser. Gangl.	Supra-Orbital.	Infra-Orbital.	Mental.	
1			Slightly rounded ?	Atrophied ?	Rounded ?	Numbness in patches on face, doubtful if elsewhere.
2		On left side grey matter and 3 divisions atrophied, 2nd and 3rd most.	Frontal n. reddish and slightly atrophied, after emerging on forehead, round grey and firm.	Looked small and reddish, brs. to nose and lip flattened and red, diseased.	Inferior maxill. not affected, on terminal brs. a slight adherent deposit.	Other cranial nerves healthy, except facial changed as skin on the face.
4	Nothing abnormal seen.	Normal, and main divisions.	After emerging large reddish and semi-transparent.	Unchanged in appearance.	Unchanged in appearance.	Right side only examined. Numbness of face during life, skin tumefied..
5	Pale and soft, not diseased.	Slightly soft and atrophied ?	On emerging = 2 (normal = 1) white and opaque, then red and characteristically enlarged, afterwards suddenly small and pale; nasal br. probably atrophied.	Appeared small, but white, though less firm than usual.	Perhaps a little reddened and rounded.	5th pair healthy. Skin of forehead slightly infiltrated and hairs scanty and small.
6			In several of branches	deep red stains were seen which may have indicated deficient nutrition.		Other cranial nerves healthy, except <i>Spinal access.</i> are stunted.
7	Healthy.	Healthy.	In orbit, round and firm, its brs. diseased, greatly enlarged.	Normal.	Normal.	Microscopic examination showed nucleated deposit in fibres of <i>Sup. orbit. n.</i>

POST-MORTEM } MIXED LEPROSY.—(III.) *continued.*
 APPEARANCES. }

Cervical Plexus.

No. of Cases.	Superf. Cervical = 1.	Auricularis Magnus = $1\frac{1}{2}$.	Occipitalis Minor =	Descending Branches.	REMARKS.
1	Atrophied.	Soon after emerging = $3\frac{1}{2}$, diseased.	Slightly rounded, diseased $1\frac{1}{2}$.	Their trunk of origin vascular.	Ears but slightly changed in appearance.
2	Left side, atrophied?	Left side, = $2\frac{1}{2}$ after emerging and red-dish-grey, before emerging = $\frac{3}{4}$ and white. Right side, much diseased.	Slightly changed.	Not notably changed.	Right ear more affected than left. Root of <i>auric. mag.</i> and corresponding spinal nerves and their ganglia, not apparently changed.
4	Some terminal branches looked red.	Just after emerging = 2, and changed in usual manner, terminal bra. less affected.	Probably slightly diseased after emerging.	Doubtfully affected, perhaps a little large but opaque.	Ears much enlarged and benumbed, no numbness of neck. Right side only examined.
5	Affected, but not much.	Soon after emerging = $2\frac{1}{2}$, red and round.	Perhaps a little less in size.	All probably affected, particularly the clavicular below the clavicle.	Ears much enlarged. C. plexus itself looked thin.
6	Healthy.	Semi-transparent, and strands indistinct = $1\frac{1}{2}$ largest just when reached ear.	Small.	Going to shoulder and pectoral region were decidedly enlarged and semi-transparent.	Phrenic and other muscular bra. not changed. Ears were swollen.
7	Decidedly enlarged after piercing the fascia.	Greatly enlarged = $5\frac{1}{2}$ flattened and grey, terminal bra. small.		All seemed to be healthy.	Lobules and rim of the ears superficially ulcerated, not greatly enlarged.

POST-MORTEM APPEARANCES.

MIXED

No. of Case.	Plexus.	Musculo-cutaneous in forearm = 1½	Internal cutaneous = 1½	Musculo-spiral.	Radial, near wrist = 1½
1	Normal	Much enlarged and red before emerging.	At first = 1, after = 2, and diseased, main brs. very large.	Appeared atrophied..	Before emerging = 2, afterwards = 3, thick, swollen and grey, terminal brs. much diseased.
2	Some cords looked tumid and red.	Above elbow = 1½; flat and thin after emerging = 2½; round and reddish grey, also terminal brs. which join Radial.	Near axilla = 1; atrophied, after emerging = 2; diseased and so terminal brs.	Just above elbow slightly grey in entire circumference.	At commencement = 4, marbled, grey, round; after emerging = 4, red, grey and much thickened, terminal brs. atrophied flattened and red.
4		Right side. After emerging = 2, and diseased.	Right side. In forearm, anterior br. was 2½ and diseased.		Right side. Healthy above; after emerging decidedly diseased = 4. Left side considerably changed but not red.
5	Left side only examined.	Diseased in forearm.	Both nerves of this name were much enlarged at their lower branches and so the <i>Intercosto-humeral</i> .		In forearm = 1½; below division at the wrist and branches of distribution also diseased, enlarged.
6	Not diseased, nor upper branches.	At commencement = 1 below its anterior branch = 2.	At origin almost transparent = ½, below middle of arm = 2, posterior br. = 2, anterior br. = 1½, <i>Intercosto-humeral</i> on emerging ½ at elbow before dividing 1½, and in arm of same size.	Somewhat enlarged, especially cutaneous brs. to back of arm and forearm.	At first small = 1, afterwards when the backwards, grey = 2½.
7	One of cords looked affected.	On emerging diseased = 2½, lower down, the two divisions increased in size the anterior = 3, and reddish.	At origin = 2, after emerging = 4, and semi-transparent; lower down, branches became pinkish, and terminal filaments were atrophied. <i>Intercosto-humeral</i> after passing on to the arm became much enlarged and of a reddish colour = 4.	Probably healthy.	At first = 2 and not just before emerging increased to 4, and terminal divisions became diseased.

LEPROSY.—(IV)

[*Brachial Plexus.*]

Ulnar at elbow = 2½.	Its Dorsal branch = 1 to 1½	Median, in forearm = 2, at wrist = 4.	REMARKS.
<p>Above elbow = 1½ opposite the joint = 0, swollen, red, and firm, very characteristically affected; lower down = 2½ atrophied; and on wrist = 3½ reddish.</p> <p>Near axilla atrophied and soft = 2½; about middle of arm swollen and grey; at elbow 6½, of a very characteristic appearance; at middle of forearm = 2½ rounded, afterwards again large streaked, red, above wrist = 4, and onwards. digital brs. reddish grey and soft.</p> <p>Right side.</p> <p>Near axilla, softish, at elbow flabby, diseased = 5½, in forearm 2½ a grey tint on inner side continuous with dorsal brs. difference very evident where later separated. In palm a little large and so digital brs. on tracing these to tip of fingers where pulp was shrunk and red, they were larger and reddish. Left side equally or more affected—reddish at elbow.</p> <p>Near axilla = 2, bend of elbow 6½ in forearm = 1½ near wrist = 3 after giving off dorsal branches: near elbow irregularly swollen and red, adherent and contracted opposite the joint.</p> <p>At origin 1½, below semi-transparent marbled and near elbow = 3, just below elbow = 1½, at the wrist = 2½.</p> <p>In axilla = 3, streaked with vessels, and flat below middle of arm 6-7, round, not very firm, reddish-grey, semi-transparent, on forearm above, 3, streaked and whitish, lower down, larger and still grey.</p>	<p>Diseased, rounded at first but spread out on dorsum of hand and also much diseased.</p> <p>Much diseased, terminal brs. of same appearance as digital nerves.</p> <p>Right side.</p> <p>Evidently much diseased; reddish flattened and flabby, = 3. Left side diseased and afterwards atrophied being different appearance to above.</p> <p>Considerably enlarged.</p> <p>Enlarged.</p> <p>Diseased, not much enlarged but grey, semi-transparent, and rounded in form.</p>	<p>Near axilla, marbled in appearance = 3, specially on outer side to which <i>musc. cutan. n.</i> was apposed. Left side in forearm = 2½, but an inch above wrist suddenly enlarged, = 8½ and broad, thick, grey, in the palm brs. looked little changed.</p> <p>Near axilla = 2½, being rather small, bend of elbow = 3½ and rounded, in forearm = 2½ grey and rounded. At wrist = 7, marbled and pale, digital and muscular brs. also diseased and <i>anter. inteross. nerve</i>.</p> <p>Right side.</p> <p>Near axilla = 3, at elbow slightly diseased = 4½ being marbled, in forearm = 3, looking almost normal at the wrist = 0, but not much changed otherwise: on left side, not so enlarged at wrist.</p> <p>In arm = 3, natural, in forearm = 2, same at wrist = 6, being also reddened, digital nerves were semi-transparent, but not small.</p> <p>In arm streaked with yellowish lines = 2½, middle of forearm = 2, and less altered, beneath annular ligament = 3½ muscular brs. healthy.</p> <p>Looked tolerably healthy in arm, in forearm = 3, and lower down streaked with grey lines, rounded and pale = 8, in palm branches a little large, but were semitransparent, could be traced to tips of fingers.</p>	<p>For the striking condition of <i>median n.</i> see Plate 2, fig. 3.</p> <p>On left side <i>ulnar n.</i> only exposed, found to be symmetrically affected with the opposite.</p> <p>All the nerves even when clearly diseased were of a palish colour and the texture relaxed, increase of bulk very apparent. It is evident considerable alteration may be present in the nerves, and yet beyond size, little change of appearance, Pacinian corpuscles not enlarged.</p> <p>Superficial ulcerations on fingers, cutaneous veins filled with adherent and purulent coagula.</p> <p><i>Circumflex n.</i> was diseased, particularly brs. to skin of back of shoulder and upper part of posterior surface of arm. Digital nerves had almost usual appearance. No <i>palmaris longus</i> muscle in his small hand.</p> <p>Several Pacinian bodies were seen and some of rather large size.</p>

**POST-MORTEM }
 APPEARANCES. }**
MIXED LEPROSY.—(V.)
Sacral Plexus.

No. of Case.	Plexus, Gr. Sciatic, &c.	Posterior Tibial at ankle = $3\frac{1}{2}$	Plantar.	External Saphenous = 1	Peroneal = $2\frac{1}{2}$	Anterior Tibial = 1.	Musculo-cutaneous = $1\frac{1}{2}$.
1	Gr. Sc. large flattened, not diseased; cutaneous branches of small sciatic not changed.	At ankle = 4, round and red, but not from inflammation probably.	Rounded and reddened, but not so much diseased as the cutaneous nerves of the foot.	The communicating brs. were healthy; the main trunk = $1\frac{1}{2}$, after emerging it became reddened and large = 4, on dorsum of foot, tough, grey and adherent.	At first = $2\frac{1}{2}$; afterwards rounded, red, streaked with vessels = $5\frac{1}{2}$ to 8, marbled and semi-transparent.	At first small, atrophied in leg, at ankle red = 2, and diseased also its brs. on the foot.	At commencement = 1 and white, on emerging = $2\frac{1}{2}$, red and irregularly thick, at ankle $4\frac{1}{2}$, thick and adherent, atrophied at intervals, digital brs. atrophied.
2		Diseased at ankle					Diseased in leg and foot.
4		Enlarged, red, and soft.					Very large, red, flat, and soft.
5	Gr. Sc. not changed.	Little changed, rounded? but diseased.	Reddish, slightly enlarged.		Little changed; probably large and round.	The same.	Diseased, but not much altered, round and transparent.
6	Small Sciatic, cutaneous filaments on thigh decidedly affected.	At first = $4\frac{1}{2}$ then = $3\frac{1}{2}$ in middle of leg = 6 and diseased, at the ankle = 7 and reddened.		Peroneal br. = 3, popliteal br. = 1, trunk very red and firm like a cord.	Near head of fibula = 5.	Firm, round = $2\frac{1}{2}$.	At first $1\frac{1}{2}$, after it became larger, flattened, and red.
7	Gr. Sciatic largish, not diseased.	In middle of leg = 4 rather firm, at ankle = $9\frac{1}{2}$, it would be difficult to exaggerate this striking change.		Of reddish grey colour, much diseased in whole length.	Enlarged near head of fibula, and its cutaneous branches.	Large, red, semi-transparent on dorsum of foot, where are ulcers, sloughing of skin, &c.	Much enlarged at its very origin, and on emerging more so; atrophied on dorsum of foot.

POST-MORTEM
APPEARANCES. }

MIXED LEPROSY.—(V.) *continued.*

Lumbar Plexus.

No. of Cases.	Plexus, &c.	Anter-Crural.—4.	Exter.Cutan. =1	Middle Cutan. =1½.	Internal Cutan.	Obturator.	Long Saphenous =1½
1		Strands broad and thin =5½.	Atrophied?	Same.	Same.	Main healthy.	Atrophied in leg, below reddish and transparent.
6	Healthy also <i>Semio-crural</i> n.	Normal.	On emerging atrophied below =2; thickened, yellowish, and semi-transparent.	Before emerging, atrophied, lower down = 2½ and affected in same way.	At first small, below very much enlarged =2 thickened and transparent.	Healthy.	At origin 1½ and normal, behind the knee-joint, before emerging=3½ and more vascular.
7	Healthy and bra. in the pelvis.		All these branches are much enlarged, of a reddish-grey colour and semi-transparent, the increase of size is most striking and extends from perforation of <i>fascia lata</i> onwards.				Enormously enlarged from knee downwards, and bra. over patella.

FATAL CASE.] TUBERCULAR LEPROSY.—TABLE (I.) J. J. HOSPITAL.

Case.	Age.	Duration of Disease.	Commencement.	Present State.	Other Remarks.
Blad.	30	4 years.	By pale spots, especially on face, not now visible.	<p>Much emaciated, and stunted in growth. Well-marked tubercular thickening of eye-brows, cheeks, lips, and chin, and particularly of ears, with loss of hair on the first and face generally, the expression is very characteristic (Serpentina), nose depressed, eyes round and staring, &c.; the skin is smooth, shining, and rather pale in these parts, giving the impression of there being some soft effusion beneath. Voice feeble. Is intelligent enough. No eruption on, or tubercular thickening of skin of trunk, but this is dry and harsh. No distortion of the extremities, which however are rather oedematous, and there are large sloughing sores at the ankles close by the Tendo Achillis, also a large circular slough over the right knee-pan. Nipples very small: testes not so. Palate sensation is diminished on brows and cheeks, more so on ears; also back of left forearm and left hand, hardly so on right upper extremity. Lower extremities not examined on account of his great debility. Suffers little pain, and has chronic Dysentery.</p>	Is not aware of hereditary taint, but knows very little about his family. Denies syphilis. Died of Chronic Dysentery.

POST-MORTEM APPEARANCES.] *Viscera.*

Brain, &c.	Spinal Cord, &c.	Sympathetic.	Heart, Lungs.	Intestinal Canal.	Liver.	Pancreas, Spleen.	Kidnies.	L. Glands, Blood, Muscles, &c.
Membranes, pale but clear; pia mater marked with grey patches of pigment. Substances, pale and rather soft, particularly in central parts, but no morbid appearances. Cerebral nerves at origin pale but healthy.	Membranes healthy. Substance tolerably firm, particularly at lumbar swelling, softened by accident in dorsal region; grey matter seemed healthy, and so roots of spinal nerves.	Both splanchnic nerves near the Diaphragm presented a firm swelling, apparently angiotonic. Semi-lunar ganglia well seen, healthy.	Heart healthy, aorta free from adhesion. Lungs slightly adherent but healthy, apices opacity of pleurae.	Mucous membrane pale but healthy, except in rectum where numerous small ulcers were seen and patches of inflammation of peritoneum.	Healthy in appearance, left lobe rather larger than usual. Gall-bladder contracted, healthy bile.	Pancreas healthy; Spleen large and soft.	Capsule slightly adherent; size of organs full; surface smooth and pale; cortical substance pale, but normal in amount. Sup. Ren. Capsules healthy.	Glands large and red in loins, very numerous soft, and pale in Mesentery as if from deposit. Blood coagulated; Muscles pale, P. M. E. made 23 hours after death.

POST-MORTEM } TUBERCULAR LEPROSY.—TABLE (II.) APPEARANCES.

Cranial, Cervical, and Brachial Nerves.

Cranial Nerves.	Cervical Plexus.	Brachial Plexus.	REMARKS.
5th only examined, outside the skull, <i>supra orbital</i> —trunk rather firm, branches apparently healthy. <i>Infra-orbital</i> and <i>mental</i> —healthy in appearance.	Superficial branches only examined. <i>Auricularis magnus</i> just after emerging acquired a broad flattened appearance and was of a reddish-grey colour being decidedly diseased =2, (normal =1½). The other branches as far as traced appeared healthy.	Left side.— <i>Internal cutaneous</i> main branches healthy in arm, but the posterior branches soon became enlarged, reddish and evidently diseased. <i>Lesser internal cutaneous</i> was also diseased soon after emerging from beneath the fascia, and onwards. <i>Ulnar</i> affected in the usual way about the elbow, and again near the wrist; here the <i>dorsal branch</i> was similarly diseased, and equal in size to the main trunk. <i>Median</i> seemed rather large and round just above the elbow, but near the wrist was flattened considerably and diseased. Right side.— <i>Internal cutaneous</i> was considerably less affected than on opposite side, <i>Ulnar</i> and <i>Median</i> diseased to a considerable extent, but not of firm consistence as usual.	When compared with the alterations of sensibility these changes in the Nerves afford satisfactory explanation. There was generally a want of roundness and firmness in the affected nerves, indicating a slighter degree of disease than usual.

Lumbar and Sacral Plexuses.

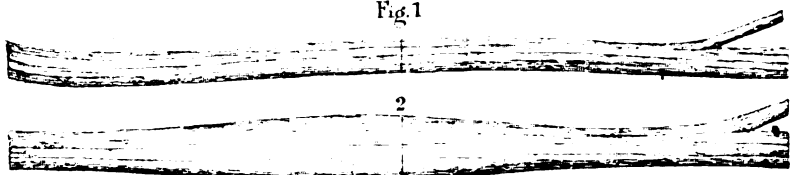
Lumbar Plexus.	Sacral Plexus.	REMARKS.
<i>Middle cutaneous</i> affected in a characteristic manner just after perforating the <i>fascia lata</i> , and the branches going to the knee, where, on the right side, was a large sloughing ulcer of round form. <i>Internal saphenous</i> also diseased below the knee, and its branch to the skin in front of the joint.	<i>Musculo-cutaneous</i> , decidedly but not greatly diseased. <i>Posterior Tibial</i> much diseased on both sides at the lower part of the leg and near the sloughing ulcers on the feet.	It may be asked, is there not a causal relation of the diseased nerve-branches to the local destruction of the integument, or at least a predisposition to exhaustion of vitality from any ordinary irritating influence, as the result of nerve-disease?

THE ERUPTION IN LEPROSY.

CASE OF TAH MUHAMMED, P. 6.



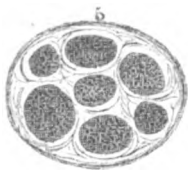
Fig. 1



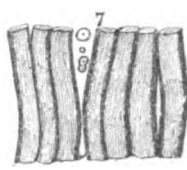
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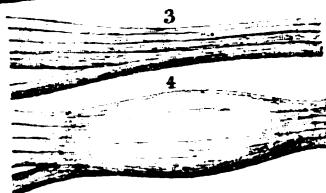
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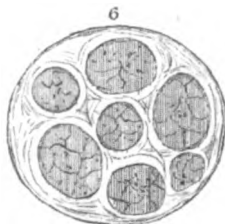


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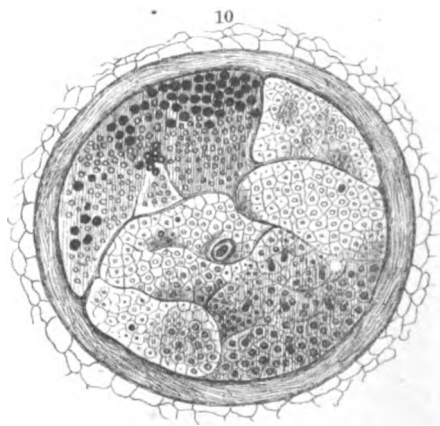
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Fig. 12.



10



11



Fig. 13.

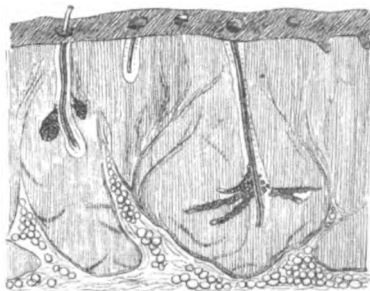


Fig. 14.



DESCRIPTION OF PLATE 2.

- Figure 1. A portion of a healthy Ulnar nerve, natural size, $\frac{1}{4}$ in. in diameter.
2. A part of a diseased Ulnar nerve, natural size $\frac{3}{10}$ in. in diameter.
3. Part of a healthy Median nerve, at the wrist, natural size.
4. A diseased Median nerve, natural size : this figure shows an unusually abrupt form of swelling.
5. Transverse section of the healthy Ulnar, made where the line is seen in figure 1. Magnified.
6. Transverse section of the diseased Ulnar, made where the line is seen in figure 2. Equally magnified. The character of the enlargement is here seen, the funiculi alone being affected and not the nerve sheath.
7. Nerve-tubules from a healthy nerve; they are of uniform diameter, and in close apposition, no matrix being apparent in this specimen.
8. Vertical section of a diseased nerve-funiculus, showing the tubules widely separated, compressed and atrophied : their diameter reduced and irregular ; their surface much corrugated. The morbid inter-tubular deposit is fibrillated, and contains elongated, granular nuclei. +acetic dil.
9. A portion of a diseased Supra-orbital nerve showing almost similar appearances, also a collection of small nuclei separating the fibres, round and slightly granular. This is a variety of the ordinary deposit. +ac.
10. Transverse section of a single funiculus from a much diseased Median nerve + acetic +Glycerine—1 in. object glass. The entire diameter is about $\frac{1}{10}$ in. This figure is intended to show that disease of a nerve may be limited to certain nerve-tubules only ; in it the darker parts are the sound or least affected, and the black points indicate the extremities of nerve-tubules as yet but little changed ; the lighter parts are the most diseased, and here the naturally opaque tubules, the remains of which the dots indicate, are replaced by a clear refractile material : there is also well seen the defined unaltered fibrous neurilemma or sheath of the funiculus, with the septa passing from it which divide the area into limited segments, each composed of a fasciculus of nerve-tubules ; near the centre is the aperture of a blood-vessel, and outside the neurilemma, the connective tissue (acted upon by the acetic acid) which envelopes and binds the funiculi together, this contains fat-cells and vessels which are not here shown. Indistinctly marked in this view is the mapping out of the diseased area by nucleated fibres, as displayed in figure 11. So completely is the new deposit limited to the funiculi that these, after the action of spirit, readily drop out of their sheath, on manipulation, being firm and translucent, while the latter is comparatively unchanged.

11. A portion of a diseased funiculus more highly magnified, from a similar specimen to the last. Here several nerve-tubules are seen, compressed and otherwise changed, as imbedded in the clear morbid deposit around them; the nucleated fibres developed in the latter, are shown surrounding one or more tubules, and connected externally with the neurilemma, a part of which is also seen: the area of the spaces thus mapped out varies exceedingly; finally the nerve-tubules altogether disappear, and the clear deposit is probably wholly converted into fibrous tissue.

12. An enlarged Pacinian corpuscle, from the hand. The opaque granular and nucleated deposit in the interior is clearly seen, the tortuous tube in the midst is probably a blood-vessel, although in some instances it rather resembled a nerve-tubule.

13. A vertical section of the skin of the cheek, slightly magnified. It was made over a smooth shining livid swelling, and it displays the position of the morbid deposit to which this is due. The surface of the skin is smooth, free from papillæ, and slightly convex; the apertures of some hair-follicles are seen; the cuticle is thin, the cutis and subjacent tissue are the seat of a firm, reddish, semi-translucent deposit, disposed in lobular masses and enveloping the glands, hair-follicles, &c. of the skin; beneath connective and adipose tissues are seen. The sebaceous glands belonging to the hair-follicles were in this specimen atrophied and compressed: I have seen them also distended; and the hairs are slender.

14. Minute structure of the deposit in the skin and mucous membranes. A coarse, obscurely striated matrix in which are imbedded numerous irregular granular masses and nuclei: the former are of considerable size (sometimes $\frac{1}{150}$ in. in length) and of irregular branching or stellate form; the latter round or oval and measuring from $\frac{1}{1000}$ to $\frac{1}{500}$ in. in diameter. Many varieties in appearance are to be seen which it is needless to figure, but the general characters of the deposit are as here shown.

THE BONES IN LEPROSY.

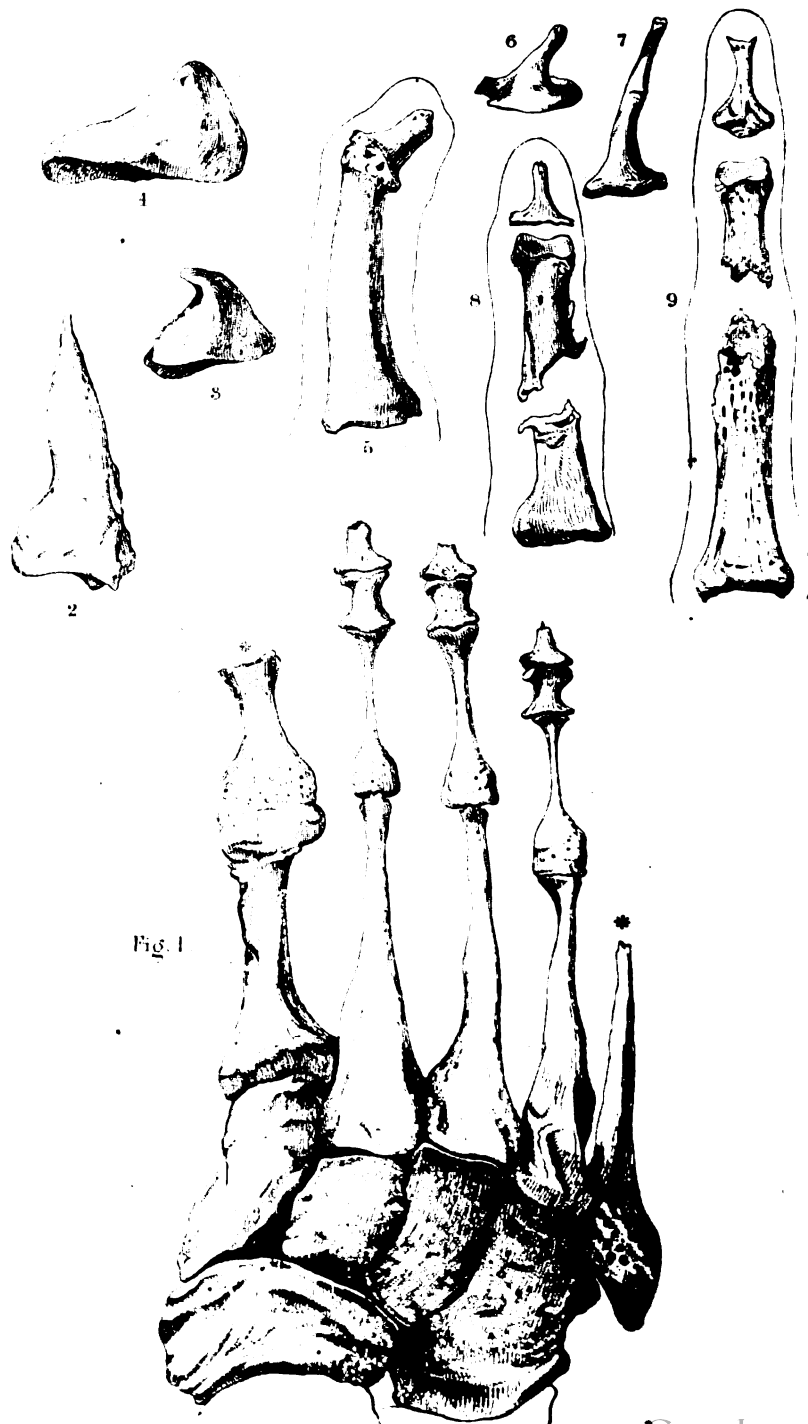


Fig. 1

DESCRIPTION OF PLATE 3.

Figure 1. A view of the bones of the right foot taken from a specimen in the Grant College Museum (A. 102). The segments of the *tarsus* are light and delicate in texture. The *metatarsal* row is greatly affected, each piece being attenuated towards the anterior extremity, so as to become more or less pointed; the head is wanting; the base is unchanged. The *first phalangeal* row is also characteristically altered, the shafts being converted into slender columns upon which the heads are seated like small expanded capitals; at * * these and the following segments are absent, probably by accident. The *second* row of phalanges are much less changed, but there is a perceptible thinning of the shaft: in the *terminal* row the expanded horse-shoe shaped ends of the little bones are wanting; the bases little changed. This and the following figures are of natural size.

2. A separate metatarsal bone from another foot, seen from above; it shows the tapering pointed form of the partly absorbed shaft, the anterior part and the head being deficient; the base unaffected.

3. The metatarsal bone of the great toe, seen from above; here the base alone remains like a conical stump, of which the apex is everted.

4. A side view of another first metatarsal showing the same malformation. Another specimen is mislaid which had a still more regular conical shape, exactly resembling a limpet-shell.

5. The bones of a shortened and bent middle finger: the remains of the wasted 2nd phalanx is ankylosed to the altered head of the 1st.

6. The remains of a segment of the 2nd phalangeal row: here absorption has proceeded to an extreme degree.

7. A similar specimen in which the shaft still remains as a slender, slightly incurved column.

8. The three segments of a shortened finger: the changes are characteristic in the terminal phalanx where absorption has proceeded to the greatest extent; destruction of the joint between the 1st and 2nd row of phalanges had occurred, as the result of inflammation, &c. and the adjoining portions of bone were separated in small necrosed fragments.

9. Another finger less distorted, but affected in a similar way to the last. These two specimens show the simultaneous occurrence of the two methods of destruction, viz. interstitial absorption and necrosis, the latter occurring at the articulations, being accompanied by swelling, &c. and leading to sinuses on the dorsal surface where the fragments are extruded.

DELIRIUM TREMENS IN THE EUROPEAN GENERAL HOSPITAL, BOMBAY, DURING THE FIVE YEARS 1857—1861.

By A. H. LEITH, M.D., Deputy Inspector General of Hospitals.

Presented October 1862.

Having arranged the copious notes that I took in the cases of Delirium Tremens admitted during the time I had charge of the European General Hospital, I offer the results to the Society as an addition to the annals of this disease which it already possesses in its Transactions, derived from the same field of observation.

The period during which the cases now analyzed were admitted extended from 1st January 1857 to the 9th January 1862, or a few days beyond five years. It is here necessary to explain that my definition of the disease is more restricted than that of Blake, which has been adopted by many writers, and which has been previously followed in the Hospital, and according to which many had Delirium tremens who did not advance beyond the first of his three stages, and who consequently never manifested any delirium. As stated in a former communication, I class under Delirium tremens only such as evince waking illusions or hallucinations; and those who, from the effects of drinking are merely tremulous and sleepless, or if trying to sleep, are startled by fearful dreams, I put under the heading "Ebrietas."

It was only in the wards under my own immediate care, that at the beginning of the period this distinction was made, and in consequence there was a considerable number of cases registered under Delirium tremens, as had been usual, in which but the indications of its approach were seen. When, however, my atten-

tion was more particularly given to the diaries of this disease through references from Dr. Morehead, I discovered the discrepancy in the classification; and as my colleague then most readily entered into my views and adopted the same diagnostic signs as myself, the entries in the Register became more uniform, and, I may add, the treatment became assimilated.

The following table is made after careful examination of all the diaries of the cases that could be found. Those in whose diaries illusions or hallucinations, or delusions are not recorded, are transferred to Ebrietas: they are thirty in number. Two cases of Mania wrongly entered are removed from this table. On the other hand, there are added to the admissions for Delirium tremens, two, who, from the hasty diagnosis required in rendering periodical Returns, were entered under Ebrietas, but in whom delirium was subsequently manifest; and seven cases in which the patients, although admitted for other ailments, were also treated for Delirium tremens, but were not transferred to that heading in the Hospital Register. Cases registered as Delirium tremens of which the diaries are missing, are retained as such—they are ten in number.

Differences in the definition of a disease are a bar to profitable comparisons in medical statistics; and it seems to me that it would be an advantage as regards the statistics of this disease, were the name given only when, what is commonly called its 2nd stage, has begun, as the diagnosis of this stage can always be more exact than that of the premonitory stage. As, however, the nosological definitions of Blake have hitherto been largely prevalent, it is advisable I should show the admissions for Ebrietas along with those for Delirium tremens, as has been done by Dr. J. Macpherson in his statistics of this disease in the Indian Annals of Medical Science, and the desirableness of which has been forcibly shown by Dr. Stovell in his elaborate and comprehensive paper on the statistics of the European General Hospital for the decennium, 1846-56, printed in No. 3 of the Society's Transactions.

Admissions and Deaths, corrected from the Diaries of Cases.

	Delirium tremens.										Ephrietas.										Delirium tremens and Ephrietas.									
	1857					1858					1859					1860					1861					Five years.				
	Admitted.	Died.	Admitted.	Died.	Admitted.	Admitted.	Died.	Admitted.	Died.	Admitted.	Admitted.	Died.	Admitted.	Died.	Admitted.	Admitted.	Died.	Admitted.	Died.	Admitted.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
January.....	7	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
February.....	2	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
March.....	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
April.....	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
May.....	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
June.....	5	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
July.....	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
August.....	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
September.....	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
October.....	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
November.....	8	1	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
December.....	4	1	3	7	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
1st Week 1862.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Admitted.....	49	38	44	40	39	210	192	149	88	106	87	502	181	197	132	140	126	772	..	..	..	..	..	..	..	..	..	..	..	..
Died.....	5	2	2	1	1	11	11	2	..	2	2	..	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

NOTE.—Two admissions in January 1862 are added to the sum of 1861. The deaths under Delirium tremens are here entered according to the dates of admission.

From this table it is calculated that the ratio of mortality on the admissions in the five years was, from Delirium tremens 5·24 per cent.; from Ebrietas 1·07 per cent.; and from Delirium tremens and Ebrietas, together, 2·20 per cent.

In the first year, that is 1857, the mortality from Delirium tremens was twice as high as it was in any subsequent year, amounting to 10·2; the mortality of the other four years, taken together, was 3·7, and in the last two, that is, 1860 and 1861, it was 2·5 on the admissions.

The uncorrected table which I have before me, but with which I do not encumber this paper, shows for the five years, of Delirium tremens 233 admissions and 12 deaths, or 5·15 per cent.; of Ebrietas 534 admissions and five deaths, or 0·94 per cent.; and of both together, 767 admissions and 17 deaths, or 2·23 per cent.

I endeavoured to arrange all the cases in two classes, according to the definitions of the two recognised species, but I had to relinquish the attempt owing to the large number that were on the border line, and from there being a considerable number that, in running their course, passed from one form to the other. There were many, however, that were illustrative of the two species of the disease, and the majority of the deaths were of the first species or that which follows a debauch, more or less prolonged, and is attended with vascular excitement. The result of a tentative classification of 117 cases was, that 97 could be referred to the second species, 11 to the first species, and 9 were too doubtful to allow of their being referred to either category.

From the table, the influence of *season* on the admissions is not apparent, but the bad effects of Christmas festivities is seen in the numerous admissions in January.

The sufferers were of the following *occupations* :—

Seamen.....	67
Ship Masters' mates, Pilots, Preventive Officers, Mail Agent.	17
Military Pensioners.....	23
Warrant and Non-Commissioned Officers and Soldiers	17

Steam-ship Engineers and Boiler-makers, Plate layers	19
Engine-drivers, Fire-men, and Railway Guards	10
Civil Engineers	2
Press-readers, Compositors, Reporters, &c.	6
Schoolmasters	3
Groom, Jockey, Farrier, Circus Clown	7
Coach-builder, Carpenter, Painter, Saddler	6
Railway Sub-Contractor, Overseers	4
Merchants	2
Turn Cock, Warder of Prison	2
Tavern-keeper	1
Telegraph Signaller, Station-master	2
Clerks	10
Women	12

The large preponderance of Seamen is owing to the circumstance that the majority of the patients treated in the Hospital were of that class. The female admissions for this disease were in nearly the same proportion to the male, that they were from all causes, the number of women received into the Hospital being small.

The mean age for the five years was 36·2 years, while that of the patients generally as I ascertained for the year 1857-8, was but 28·7. Arranged in periods, the ages of 209 were as follows,—the age of one is not at hand.

18 years in cases	1	41 to 45 years in cases	28
22 to 25 " "	7	46 " 50 " "	21
26 " 30 " "	56	51 " 52 " "	5
31 " 35 " "	45	59 " "	1
36 " 40 " "	44	61 " "	1

Of the fatal cases four occurred between the ages 26 and 30, five between 31 and 35, and two between 36 and 40 years.

The *liquors* which the patients had been drinking were noted in 84 instances, with a view to discover whether the character of the disease was in any way modified or affected by the kind of liquor taken, but neither in the severity nor the duration,

nor in the character of the delirium, nor in the tendency to convulsions, was there anything assignable to any particular kind. It was the alcohol that was the pernicious agent, and to the quantity of it taken, was to be attributed the disease in all its phases: there were no grounds for the idea often cherished by those who have a sympathy with the drunkard, that it is the bad, the drugged liquor that does one harm.

The kind of Liquor drunk.

Brandy alone	by	36	Brandy and Country Liquor	by	1
Gin or Old Tom	"	4	Gin and Rum	"	1
Country Liquor	"	10	Wine and Beer	"	1
Brandy and Gin	"	8	Brandy, Gin, and Arrack	"	2
Brandy and Beer	"	8	Brandy, Gin, and Whisky	"	1
Brandy and Arrack	"	2	Brandy, Wine, and Beer	"	1
Brandy and Wine	"	2	" Mixed," " All kinds "	"	7

The *accession* of delirium with reference to the lapse of time since the last taking of liquor was noted in 189 instances. In 113 cases delirium began while still drinking, and in the other 76 the mean interval between potation and delirium was 45 hours, it was—

24	hours in	24	cases.
25 to 48	" "	24	"
49 to 72	" "	18	"
73 to 96	" "	10	"

From time to time it occurred that after the hallucinations had lessened or apparently passed off, and perhaps after having had an hour or two of broken sleep, the patient suddenly had a return or exacerbation of delirium. Such relapse having attracted my attention, I was more careful to note future cases; these, along with what were already recorded, form a list of twenty-three, and the list would doubtless have been more copious had the daily entries in the diaries been as full at the beginning of the years, as they subsequently were: the following is an example of the *secondary* or *relapse* cases:—

CASE of ———, Railway Plate-layer, aged 29 years. In India 2 years, admitted 6½ A.M. 17th Sept. 1861. Says he has been drinking hard and for four or five days has eaten nothing, but has still been drinking: latterly he has had irritability of stomach. Says he has not slept for four nights. Has hallucinations of persons being present and speaking to him. Surface is warm and moist: pulse in recumbent posture, 90; tongue foul; bowels regular; has no headache: has no inordinate heat of head. Smells of alcohol and he says he drank some spirits this morning before admission. Is tremulous: diameter of the pupil between ¼th and ⅓th of the diameter of the clear cornea.

Besides his usual meals with meat at dinner, to have broth every 4 hours.

Vespere. Vomited after midday. Is very tremulous: has some heat of head; bowels have acted twice.

Cold affusion to the head.

18th. Has not slept; has dizziness on shutting his eyes; still has hallucinations of vision. Pulse in recumbent posture 84, soft. Surface moist; no inordinate heat of head; no vomiting. On standing is very tremulous and unsteady; pupil ⅓th.

Vespere. Had some heat of head about 1 P.M. and cold affusion was used; says he does not feel so well since then and has some occipital headache. Still has fancies of people talking to him. Converses rationally.

19th. Slept a little last evening, but at 10 P.M. started up screaming and crying "Murder." He was violent and noisy in the night, but since day-light he has been less so. Is occupied with delusions, and fancies animals are about him: he points to them on the floor. Pulse in the recumbent posture is 120. Surface is warm and moist. Is very tremulous. Bowels were open yesterday. Pupil between ⅓th and ½th.

Vespere. After the morning visit he tried to destroy himself by dashing his head against his iron cot, he has severe contusions on his face. He said, on being questioned, that he thought that all were dead and that he wished to die also. Since then, an attendant has been in the room with him, inducing him to keep lying down, and he has been tractable. Delirium continues, and he is under delusions as to all things around him, and has hallucinations of vision and hearing. Surface moist and of moderate warmth. Pulse in recumbent posture 96, soft.

Cold wet cloths to the head.

20th. No sleep. Is fully occupied with his delusions and hallucinations. Is tractable and does what he is told to do. Surface of moderate heat; has had thirst; takes food; pulse 90; pupil ⅓th.

Continue.

Vespere. Delusions fully occupy him. Pulse 110.

21st. Last night became violent, there was increased heat of surface. Cold affusion was used to the head. Has not slept; pulse 110; surface of moderate warmth and moist; delusions fully occupy his mind; is tremulous; takes his food. Bowels have not acted for 3 days.

Continue.

Vespere (4 P.M.). Fell asleep at 1 P.M. and slept until now, when he has taken broth; seems still drowsy. Bowels acted naturally to-day.

22nd. Fell asleep at 7 P.M. and slept until 7 A.M., merely waking to take broth. Is now free from delirium. Pulse in recumbent posture 66; surface natural; pupil $\frac{3}{4}$ th.

23rd. Slept some hours yesterday, and in the night three or four hours. Has had some headache since last evening. No return of delirium. Pulse in recumbent posture 60. Pupil between $\frac{1}{4}$ th and $\frac{3}{4}$ th. *To have mutton diet.*
September 28th.—*Discharged.*

There were five instances of *secondary delirium* among the fatal cases, and in these it was of a violent character and ended shortly in convulsions. Violence, however, was not in the majority of all the cases a characteristic. I find that Jackson had noticed this phenomenon, and that he mentions it as the supervention of, what he calls, the true Delirium tremens (the 2nd species of others) on what he considers a totally different disease,—the *delirium a potu continuo*. My observations include cases of secondary delirium which may, without hesitation, be referred to the 1st species, and others which are equally well marked instances of the 2nd species; the greater number, however, were of the latter. Among the twenty-three observed cases there were three in which the primary delirium did not begin until after cessation from drinking for a mean interval of twenty-two hours, while in twenty it began while still drinking. The secondary delirium began after having left off drinking for a mean of 63 hours.

The state of the *Stomach* during delirium was noted in 179 cases, as to the presence or absence of vomiting. Of these, 112 had no vomiting, while 35 were admitted delirious with irritability of stomach, having been still drinking up to the time of admission. Out of 31 who were admitted not yet delirious but having irritability of stomach, two continued to vomit for a short time after delirium had begun: one of the two had *pneumonia*.

In one case admitted drunk, vomiting began on her becoming sober, and was still present for a short time after delirium had begun. In none was the vomiting persistent through the delirium. A case in which vomiting was produced by the *Mistura Antimonii cum opio*, and others in which it was caused by the medicines for concurrent disease, are not included in the above.

Out of 127 cases, the *Tongue* was clean and moist in 32; it was "furred," "dry," "white" in 67; it was "foul," "coated," or "brown" in 26, and in two instances it was "red" and "dry;" in one of these two last there was concurrent acute dysentery; in the other, the patient had been under opiate treatment for the delirium before admission. No particular state of the tongue exclusively pertained either to those cases that might clearly be referred to the 1st, or to those belonging to the 2nd, species.

The *Bowels* were mentioned as constipated in 24, but few of these required aperient medicine, as spontaneous action soon took place. There were 33 in which the bowels were noted as loose; this number includes those suffering from dysentery: some who had diarrhœa got medicine to check it, but in others the looseness ceased spontaneously.

The state of the *Skin* was recorded in 144; and among these it was of natural temperature, or cool, and more or less moist in 118; in some of these the perspiration was profuse. In 6 the surface was chilly, while in 20 it was hot; and in the last number were six of the fatal cases.

Of 121 cases there were 45 who had disproportionate *heat of head*, and 76 who were free from it. It was observed that some in whom there was no disproportionate heat at the beginning of the attack; it became observable when the sleeplessness and delirium were much prolonged.

Particular inquiry was in most cases made as to the presence or absence of *Headache*, but the result was not satisfactory, as during delirium the patients' answers are not to be depended on, and a leading question is too likely to bring an affirmative answer. In but two was severe headache spontaneously complained

of, and in both it was so after convulsions at the beginning of an attack of the 1st species: in one of these there was the secondary delirium or relapse, and during this headache seemed to be absent. Of the 30 in which headache was said to be present, it was referred to the forehead in 20; to the temples in 4; to the occiput in 5; to the vertex in 1; and in 4 its seat was undescribed.

Redness of the Conjunctiva was present in some whose other symptoms indicated the 1st species; and in many, who might be included under the 2nd species, it became manifest after several days and nights of sleeplessness, and might reasonably be ascribed to the unusually long exposure of the eye to the air, through wakefulness.

In observing the *Pulse* in any disease, it is of importance to take into account whether the observation is made while the patient is standing, sitting, or lying; and in this disease which is so often attended with debility, it is particularly needful to guard against error from inattention to the position of the patient. Another possible source of error is the effect that mental perturbation may have on the circulation; and a third is the recent muscular exertion that may have just been made: this has been noticed by Dr. Morehead. The observations recorded here were mostly made when the patients were recumbent; some of them however were in the sitting posture. Observations made while the patients were standing are considered as exceptional, and are not included in the following table.

Pulse, as noted in 150 Cases.

Under 70 in a minute	in	5 Cases
70 to 79	"	25 "
80 " 89	"	40 "
90 " 99	"	45 "
100 " 109	"	14 "
110 " 119	"	9 "
120 " 129	"	10 "
130 and over	"	2 "

Of the two at 130 and upwards, one had chronic heart disease and recovered, the other died. In another fatal case the pulse was 120. In the rest of the fatal cases in which a satisfactory record of the pulse is preserved, it was, before the fatal convulsions began, from 92 to 98 in six, and in one who had convulsions from the hour of admission, the pulse did not rise above 72 in the intermissions of the convulsions.

Tremor was generally present, and in some it was so severe that the patient could not walk unsupported, and his pulse at the wrist could not be counted; in many, however, it was very slight, and in a few it was not observable.

Convulsions indicate very great imminent danger; and with the exception of one, whose primary disease was dysentery, and who sank exhausted under its severity, all the fatal cases, that is, ten out of eleven, ended in convulsions, or convulsions succeeded by coma. The attack was often without premonition; at other times it was ushered in by muscular twitchings; and some complained of an indescribable sensation in the head before the fit. Among the recovered cases there were ten who had convulsions.

Sleeplessness was a constant concomitant of the disease and it usually preceded it, and the only cases in which it was not clear that it did so, were those in which the persons continued to get drunk until admission; and among these a patient told me that it was many nights since he had slept, excepting in the insensibility of drunkenness. Sleeplessness is not strictly a diagnostic sign of delirium tremens, because it is often present in mania, but where it is absent or when after sound sleep, delusions and hallucinations continue, there is strong reason to conclude that the disease is mania, or that it is passing into it, as after repeated attacks delirium tremens is not unlikely to do.

The *Delirium* varied much in character and degree. Its precursors, in those cases that came early under observation, were vivid dreams. The mental representations which were

as yet repressed in broad day-light, and corrected by the realities of perception, recurred with startling effect in the night, or when the eyes were closed in approaching sleep. They soon came in twilight to be mixed up with surrounding indistinctly visible objects, and the disease still advancing, the pictures of the mind became so vivid that even in day-light they combined with objects of sense to form *illusions*. If still progressing, purely subjective pictures of the mind or *hallucinations* rose up uncorrected by the perceptions; in some, especially the experienced drunkard, the judgment still disallowed their reality. Yet further advancing, these visions became more life-like, while erroneous fancies or *delusions* came to possess the mind, and the judgment no longer refused to accept them as realities. The patient was now more influenced by his hallucinations than by the words of his attendants; and at a still more advanced stage of the delirium, the power of attention was in abeyance, and the mental visions and memories passed unarrested and in such rapid succession, that his articulation could not keep pace with them, and although the chain of the ideas that passed through his mind may have been perfect, his utterances were altogether disjointed and incoherent: or the ideas flowed in rapid succession with no exercise of the attention to arrest them; and the only indication of volition was an incoherent muttering now and then. Thus attention and volition ceased to be exercised to the same degree that they have ceased where in sleep the dreamer mutters, yet here sleep was absent. Sleep indeed was what would have restored the deranged mind. We have still to ask the Psychologist the question—What is sleep? for sleep may be present when imagination is active, as in dreaming, and sleep may be absent when volition and attention are in abeyance.

The *delusions* were usually of a distressing nature, such as conspiracies to defame, ruin or murder, and the hallucinations, which were most frequently those of sight, were generally of a hideous or frightful kind, but not always so. The most common of these were wild beasts and persons with deadly

weapons and Satanic figures lying in wait, or in pursuit, or reptiles crawling about the room: sometimes the delusions and hallucinations were of a different character, as for instance, a patient fancying himself in the company of his drinking companions, put out his hand to snatch the glass which he saw one of them offer, and on its still eluding his grasp after several attempts to take it, he became enraged at being thus mocked by him. This was no mere illusion, but a pure hallucination, as he was in bright day-light, sitting with his eyes directed to the clean, whitewashed wall of his room, when he pointed to his fancied tormentor. Visions of blood were not uncommon: two men fancied blood was dropping from the points of their fingers, and one saw it dropping from an imaginary knife. The phantom figures were by some seen in their natural colours, by others as black, by others white, and by a few as red. Their size was often diminutive; and one man who saw flights of small white angels, said, as he continued to look at them, that they became larger. Next to sight, hearing was the perception most subject to illusion and hallucination, ordinary noises being perceived as articulate sounds, and the voices of unseen persons being heard when no real sounds were perceptible. A combination of the hallucinations of sight and hearing was rare, but sometimes a patient talked as if receiving answers from one with whom he fancied he was in conversation, and at whom he was gazing. One of the few whose delusions were hilarious and whose hallucinations were amusing, after seeing Lilliputian figures moving about the room, saw a cock stand in the middle of the floor and heard it repeat the multiplication table.

Hallucinations of smell were not observed, and those of taste but rarely so. Hallucinations of touch were not uncommon, and with these may be included the searching in the mouth with the tongue, for something fancied to be in it, which it was wished to spit out. A man was noticed going through the movements of smoking with his lips and cheeks, while with his hand he held the imaginary pipe to his mouth. Another, for a long time opposite the smooth wall of his room worked with his hands