

HISTOLOGICAL STUDY OF THE THYROIDS OF RATS TREATED WITH PROPYL THYOURACIL, PAROTIDECTOMYZED AND PAROTIDECTOMYZED TREATED WITH PROPYL THYOURACIL

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ABSTRACT: A histological study of rat thyroid gland was done in four experimental groups: control rats (group I), rats submitted to surgical parotid gland removal (group II), rats treated with 25 mg of 6-propyl-2-thyouracil a day (group III) and paratidectomized rats treated with 25 mg of 6-propyl-2-thyouracil a day (group IV). Twenty-six days after consecutive administration of 6-propyl-2-thyouracil, all the animals were sacrificed. The histological thyroid aspect of group III is compatible with thyroid hypofunction. In the parotidectomized rats (group II) the histological feature is one of thyroid hyperfunction. In group IV the histological thyroid aspect is an intermediate balance between groups II and III. Such results suggest that parotidectomy can attenuate the hypofunction caused by 6-propyl-2-thyouracil and emphasize the hypothesis of existence of a functional relationship between salivary glands and thyroid gland.

KEY-WORDS: Histological study; thyroid gland; parotidectomy; propyl thyouracil; rats.

INTRODUCTION

The relationship between thyroid and salivary glands has been studied in several laboratory animals by authors as BURGEN & SEEMAN⁴, MASON *et alii*¹⁷ and MYANT²¹. This relationship were studied particularly in rats, and in this way HAMMET¹⁰ reported that the thyroid hypofunction causes a decrease on salivary gland growth. GRAD & LEBLOND⁸ point out that the complete absence of thyroid hormone due to its glandular extirpation, develops a salivary gland atrophy. RAYNAUD²⁴ states that the injection of thyroxine causes salivary gland hypertrophy.

Anti-thyroid drugs, such as 6-propyl-2-thyouracil, used to produce experimental

hypothyroidism^{2, 3, 6, 7, 8, 9, 12, 19, 20, 23}, are also active against salivary glands. The structural changes induced by these drugs are similar to that of thyroidectomy. They are seen as atrophic process but its normal structure is brought back when thyroxine is injected.

On the other hand, salivary gland extirpation is also reflected in thyroid through morphological and functional changes²⁷. The removal of both parotid and submandibular glands induces an increase in the number of follicular cells, changes in the staining pattern of colloid and an increase on the diameter of thyroid follicles. These changes, although less intense, also happen when only the parotid is removed. Such results can be interpreted as a thyroid hyperfunction^{22, 29}.

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Based on the reports showing the possible relationship between salivary glands and thyroid, the purpose of this study is to analyze the histological thyroid aspects of rats treated with propyl thyouracil, parotidectomized and parotidectomized treated with propyl thyouracil.

MATERIAL AND METHODS

Forty-eight female albino rat 120 days old were divided into 4 experimental groups with 12 animals each: control rats (group I), rats submitted to surgical parotid gland removal (group II), rats treated with propyl thyouracil (group III), and parotidectomized rats treated with propyl thyouracil (group IV).

Under general anesthesia by sulfuric ether the animals of groups II and IV had their thyroid glands removed according to the surgical technique proposed by MATHEUS¹⁸. The animals of group I and III were submitted to a sham surgical procedure; the parotid glands were only handled by using an anatomic forceps and remained in their places.

At the same time just after the surgery all the animals were housed in individual cages.

For the surgical recover all the rats stayed in observation during seven days. Then, each animal from groups I and III was daily fed in 20g of a triturated ground ration ("Produtor: Anderson Clayton S/A"), and each animal from groups II and IV received 25 mg of 6-propyl-2-thyouracil ("Andromaco") stirred into their diet every day during the experimental period². All the animals received water "ad libitum".

Twenty-six days after the beginning of the administration of the ground ration with or without 6-propyl-2-thyouracil, under general anesthesia with sulfuric ether, the thyroid glands of all the animals were removed by dissection.

The thyroid glands were fixed in 10% buffered formalin at room temperature for 24 hours and embedded in paraffin.

serial sections 6 micrometers thick were performed and the slices were stained by hematoxylin eosin.

RESULTS

Group I — Control Animals

The thyroid follicles were covered by a cuboidal epithelium, whose cells showed round or ovoid nuclei with sparsely distributed chromatin and evident nucleolus. The cytoplasm showed some vacuolization and intense acidophilia. The thyroid follicles were filled with colloid showing a characteristic acidophilia. The mitoses in the epithelium were rare. The stroma showed some fibroblasts, few collagen fibers and a great number of blood vessels (Fig. 1).

Group II — Parotidectomized animals

The thyroid follicles showed a cuboidal epithelium whose cells had small round nuclei. The chromatin was hardly seen. Many nuclei were picnotic. The cytoplasm was extensively vacuolized and lightly basophilic. The number of follicles was increased and there was also an increase of the follicles diameter. The colloid showed and altered stain with a basophilic tendency. Mitotic figures were not seen in the epithelium. The stroma showed some structural pattern as seen in the control animals, but there was a decrease in the number of blood vessels (Fig. 2).

Group III — Animals treated with propyl thyouracil

Most of the follicles were covered by a columnar epithelium whose cells had round or elliptic nuclei. The chromatin was sparsely distributed and the nucleoli were evident. The cytoplasm was sometimes vacuolized and showed a slight acidophilia. The number of follicles was increased, showing an intensive hyperplasia of the epithelial lining. There was a decrease in the follicles diameter, and in some of them it was not possible to see their lumen. The colloid was absent or decreased but lightly basophilic when it was

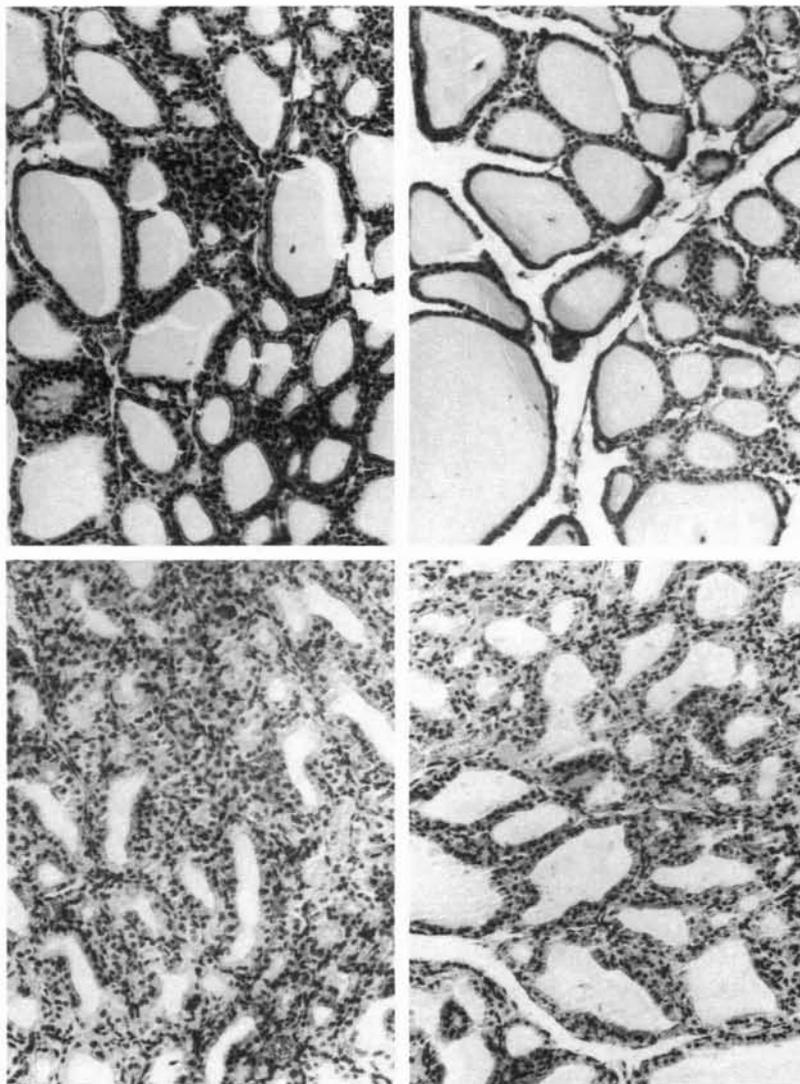


FIG. 1 — Control animal. Thyroid follicles showing a lining of cubic epithelium inside of whose the colloid with characteristic acidophilia can be seen. H.E. 160 X.

FIG. 2 — Parotidectomized animal. Thyroid with an increase on follicle number and the colloid stained differently from the normal one. Histologic feature compatible with hyperfunction. H.E. 160 X.

FIG. 3 — Animal treated with propyl thyouracil. Thyroid with a bigger amount of follicles showing hyperplasy of the lining epithelium. Both the lumen and the colloid are either absent or in a very small amount; there is an increase on the amount of the blood vessels. Histologic feature compatible with hipofunction. H.E. 160 X.

FIG. 4 — Parotidectomized animal treated with propyl thyouracil. Thyroid showing an increase of the follicle number and of the blood vessels when compared to the Fig. 1, and lesser hyperplasy of the vessels, but a higher amount of colloid, when compared to the Fig. 3. H.E. 160 X.

present. Mitotic figures were present in the epithelial lining of the follicles.

The stroma was reduced and few fibroblasts, together with a great number of congested blood vessels were seen (Fig. 3).

Group IV — Parotidectomized animals treated with propyl thyouracil

The follicles were lined by a cuboidal epithelium showing cells with round or ovoid nuclei. The chromatic was sparsely distributed and the nucleolus was evident.

The cytoplasm was lightly vacuolized and acidophilic.

There was a hyperplasia of the lining epithelium in the thyroid follicles, but less than that showed in group III.

The number of follicles was increased when compared to the control animals which showed normal characteristic and a perfect limit of its lumen.

The amount of colloid was increased similarly to that observed in group II. But it was decreased when compared to the control animals and was abundant when compared to group III. The staining of the colloid was acidophilic and specially in the borders of the gland showed a discret acidophilia. Mitotic activity in the lining epithelium was rare.

The stroma with a normal structural aspect was bigger than that showed by the control animals, with some fibroblasts and larger proportion of collagen fibers. The blood vessels were decreased when compared to group III and showed similar amount when compared to group II (Fig. 4).

DISCUSSION

The histologic pattern of the thyroid gland from control animals (group I) is identical to that reported by others^{2,3,16}.

The thyroid gland of the animals treated with 6-propyl-2-thyouracil (group III) presents similar histological aspect as that observed before^{3,9,11,14,23,26}, indicating an aspect compatible with thyroid hypofunction.

The histological aspect of the thyroid gland from the parotidectomized animals (group II) is in agreement with the findings of TAKIZAWA²⁹ and OGATA²², thus suggesting hyperfunction of this gland.

The histological characteristic of the thyroid gland of the parotidectomized animals treated with propyl thyouracil (group IV) presents results which are intermediary to those observed in the animals only treated with 6-propyl-2-thyouracil (group III) and the parotidectomized ones (group II), but not showing the normal characteristics of the thyroid gland of the control animals (group I).

These results suggest that previous parotidectomy develops organic conditions in these animals not permitting the 6-propyl-2-thyouracil production of the thyroid hypofunction as showed in group III, and that the 6-propyl-2-thyouracil was not able to neutralize the thyroid hyperfunction caused by parotidectomy as showed in group II.

The results concerning the thyroid gland of the parotidectomized animals (group II) and parotidectomized animals treated with propyl thyouracil (group IV) are in agreement with the report of SHAFER & MUHLER²⁷ who said that salivary glands extirpation produces thyroid morphological changes. These results are also in agreement with the findings of TAKIZAWA²⁹ and OGATA²² when they point out that parotidectomy induces an increase in the number of follicles cells, changes in staining pattern of colloid, and an increase on the diameter of thyroid follicles, indicating glandular hyperfunction.

Our results can be added to those that suggest a functional relationship between the salivary and thyroid gland^{1, 5, 8, 15, 19, 20, 22, 24, 25, 27, 28, 29}, and also corroborate to the statement of KRIKOS¹³ that the salivary glands actuate not only on the oral cavity but on the whole organism, maintaining a relationship with all the endocrine glands.

CONCLUSIONS

Under the experimental conditions of the present work and according to the histological findings we can state that: the thyroid histological aspect of the rats from group III is compatible with thyroid hypofunction. Parotidectomy produces significant morphological changes in the thyroids of the animals from group II, suggesting

glandular hyperfunction. The histological aspect showed in the thyroids of the animals from group IV suggests that the previous parotidectomy attenuates the anti-thyroid action of 6-propyl-2-thyouracil, and that the 6-propyl-2-thyouracil can not neutralize the glandular hyperfunction caused by the parotidectomy. Our results emphasize the hypothesis of the existence of a relationship between salivary glands and thyroid gland.

MATHEUS, G. & MORAES, N.P. — Estudo histológico de tireóides de ratos tratados com propil tiouracil, parotidectomizados e parotidectomizados tratados com propil tiouracil. *Rev. Odont. UNESP, São Paulo*, 12(1/2):47-52, 1983.

RESUMO: Os autores estudaram, histologicamente, as glândulas tireóides de quatro grupos experimentais de ratos: grupo controle (I), ratos submetidos à extirpação cirúrgica das glândulas parótidas (grupo II), ratos tratados com 25mg diários de 6-propil-2-tiouracil (grupo III) e ratos parotidectomizados e posteriormente tratados com 25mg diários de 6-propil-2-tiouracil (grupo IV). Após 26 dias consecutivos de administração de 6-propil-2-tiouracil, todos os animais foram sacrificados. O aspecto histológico da tireóide dos animais tratados com a droga antitireoideana (grupo III) foi compatível com o de hipofunção da glândula. Nos animais parotidectomizados (grupo II), o aspecto histológico foi o de hiperfunção glandular. Nos animais parotidectomizados e tratados com o 6-propil-2-tiouracil (grupo IV), o aspecto histológico mostrou características intermediárias entre o dos grupos II e III. Estes resultados sugerem que a parotidectomia atenua a hipofunção tireoideana causada pela administração do 6-propil-2-tiouracil, bem como vem enfatizar a hipótese da inter-relação funcional entre glândulas salivares e tireóide.

UNITERMOS: Estudo histológico; glândula tireóide; parotidectomia; propil tiouracil; ratos.

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