PROCEEDINGS
of the
BARIATRIC
SURGERY
COLLOQUIUM

June 1&2, 1981
Department
of Surgery
The University
of Iowa
PROCEEDINGS

OF THE

BARIATRIC SURGERY COLLOQUIUM

EDITED BY THOMAS J. BLOMMERS, PH.D.

Presented June 1-2, 1981

Iowa City, Iowa

Under the Auspices of

THE UNIVERSITY OF IOWA

Department of Surgery

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The morbidly obese require some kind of treatment, and now surgeons have demonstrated that they can treat it in a very effective manner. Because of that I welcome you and I applaud you for your work in this very challenging and difficult field. I hope you have a very successful meeting.
GALLBLADDER DISEASE IN THE MORBIDLY OBESE
Sheldon M. Soloczek, M.D.

Gallbladder disease is very common in the obese patient. We all remember the four watch words: fat, fertile, female and forty, but fat is the most important one. Madura, in 1977, reported a 43% incidence of gallstones among 121 patients with jejunoileal bypass. He saved the bile and found that among patients with no gallstones, 60% had lithogenic bile. He concluded that most of them would develop gallstones as they got older because the average age of his group was only 33 years. His figures indicate that approximately 76% of those patients would end up having gallstones if left long enough.

In my group of 370 patients operated on between January 1975 and May 1981, I witnessed a gallbladder disease incidence of 48.6%. Before coming to me, 21.1% of patients had had cholecystectomies. An additional 21.6% had their gallbladders removed at the time of operation.

Looking at the patients who had simultaneous cholecystectomy with their obesity operation, 26 had adhesions to the gallbladder. Adhesions are very important because they indicate an inflammation. Such gallbladders should be removed, even if the surgeon cannot feel stones and the patient is asymptomatic. The rest of the patients who had simultaneous cholecystectomies (46 or 12.4%) had positive x-ray studies or sonograms.

We all know that obesity influences the rate of development of gallbladder disease. But the extent of this influence has been brought out dramatically by several studies. Madura studied patients over 30% of their ideal weight and found that 56% had gallstones compared to 36% for the lesser weight groups.

Rimm studied 73,000 women in TOPS (Take Off Pounds Sensibly) and found that as obesity increases so does the incidence of gallstones. The same is true for age. In Rimm's study, over 40% of the heaviest patients beyond 50 years of age had gallstones.

In my group I have noticed a similar trend. For the 19 patients who were over 50 years old, the incidence of gallbladder disease was 73.7%. This drops to 48.1% for patients in the 30 to 39-year-old age group, and is even lower for the younger patients.

Dividing my patients by race, I found that the whites had a 53% incidence of gallstones while for blacks it was 28.5%. The national overall average for whites and blacks is 15% and 12.7% respectively.
THE EFFECT OF OPERATIVELY INDUCED WEIGHT LOSS ON HYPERTENSION

Richard M. Bell, M.D.

We started our study with several questions: Does surgically induced weight loss improve blood pressure, and, if so, to what extent? What trends can we see in our patient population? What is responsible for the failure of those patients who do not lose substantial weight? It is simply a failure to lose weight or some other factors at work? Does surgically induced weight loss adversely effect the management of hypertension?

Our criteria for review included those patients whom we define as morbidly obese, i.e., 100 lb above their calculated ideal body weight, and who had documented hypertension requiring medication for control. These were patients who had been screened by their family physicians or internists and not found to have some surgically correctable cause of hypertension. We calculate our ideal body weight with a very simple formula: Women should weigh 100 lb at 5 ft and 5 lb can be added for each inch above that; the men should be a little heavier, 110 lb for the first 5 ft and then 6 lb additional for each inch. Our obesity index is essentially quite simple. It is calculated by dividing their excess weight by their ideal body weight.

To measure our progress we have developed what we call, with tongue in cheek, our Cinderella index. This is the actual weight loss over the excess weight, and, the higher the number, the more effective we have been with the bypass operation.

Our obesity operation consists of a gastric partitioning with a Roux-en-Y reconstruction. We don't always measure our pouch size. Our gastrojejunostomy is about the size of a 18F nasogastric tube.

Our patient population comprises 50 patients (41 women, 9 men) that we evaluated from May 1977 through July 1981. Their obesity indices ranged from 1.07 for the males to 1.24 for the females, with the women being slightly heavier proportionally than the men.

We were able to divide the patients into two groups: those who presented with hypertension controlled by medication and those who were not controlled. Our definition of hypertension is a systolic pressure above 140 and a diastolic pressure above 90 mmHg.

Of those patients who had controlled blood pressure preoperatively, four lost control postoperatively. The majority, however, were able to reduce or stop taking medication altogether.
As of October 1980, I decided to remove all gallbladders that looked abnormal clinically or that had adhesions. Of 100 patients, 72 ended up having their gallbladders removed. Twenty-four had this done prior to the bypass; 48 had them removed at the time of their obesity operation. Among these latter patients, 34 had negative oral cholecystograms and sonograms and 26 had adhesions. The specimens were examined by numerous pathologists. According to the pathological criteria for gallbladder disease, which included calculi, cholesterolosis, inflammatory infiltrates, fibrosis, Rokitansky-Aschoff's sinuses, polyps, lymphoid nodules, etc., every patient had at least one indicating factor.

I believe the critical point is that more patients have diseases of the gallbladder than one might think. In my patients the incidence to date is 72%. Perhaps we should be removing most or all of the gallbladders on these morbidly obese patients. Although there would be 10 to 15% with normal gallbladders, it certainly would save the majority of people an operation and a lot of agonizing illnesses.

QUESTION: Do you routinely remove all gallbladders now?
ANSWER: As yet I just haven't had the courage of my convictions. I am still leaving those that appear absolutely normal by transillumination as well as by other preoperative tests.

QUESTION: Have you removed a gallbladder that you thought to be diseased that turned out not to be?
ANSWER: No. There hasn't been a normal one yet.

QUESTION: Are you suggesting that the bypass operation further develops or causes gallbladder disease?
ANSWER: I don't think the bypass has anything to do with it. If you look at the patients in my small series who are morbidly obese and over 50 years old, their incidence of gallbladder disease is 73.5%. I think as they get older they are going to develop stones irrespective of the obesity operation.
In summary of all patients, 22 (69%) improved, six (19%) remained stable, and three (9%) became worse. In regard to follow-up, the question arises as to whether they were made well by the operation or whether it was close weight. The husband of one of these patients was unable to lose weight. Consequently, we lost the chance of improving her hypertensive histories, which are divided into patients who achieved good control to failure to lose weight. For this reason, we must consider other factors at work.

We also had two patients who regressed during our follow-up period, but it is interesting to note that these are two particular individuals who did not lose an appropriate amount of weight. Specifically, the first patient had a failed gastroplasty; the second patient's staple line disrupted. Both of these patients have subsequently undergone reoperation and have been able to reduce the amount of medication required for control of their blood pressure.

We had four men and 14 women in the group of patients who were uncontrolled on admission. The obesity index in this group is really no different than that of our patient population altogether. Therefore, the size of these patients did not, at least in our series, clinically relate to the control of hypertension. In regard to results in this group, six patients remained unchanged. However, the other 12 patients gained control of their blood pressure, and, in addition, the majority of them were able to reduce the amount of medication that they were taking. For those patients whom we were unable to control, we found that most of them lost an appropriate amount of weight during the follow-up period. In reviewing their histories, some interesting points arose. All of these patients had longstanding hypertension which we defined as being greater than seven years duration. All of these patients had a history of difficulty in controlling their blood pressure preoperatively. All experienced improvement, i.e., reduction although without control, of their blood pressure postoperatively. All six had preoperative diastolic pressures greater than 100 mmHg. Postoperatively they fell between 90 and 100 mmHg, even though this improvement did not meet our criteria for absolute control of their blood pressure.

We reviewed the weight loss index of those patients who gained control of previously uncontrolled blood pressure or experienced a reduction in the dosage,
or number of medications needed for control. We found that at three months this mean index was 2.87, at six months, 4 and at 12 months it reached 5.35.

Eighteen patients had not improved by three months. Five had insufficient data. Two patients had failed gastric bypass procedures and their weight loss at three months equalled an index of only 0.28. After three months, only five additional patients improved by reducing or discontinuing medication.

In conclusion, I feel we can definitely say that surgically induced weight loss aids in the control of hypertension. Altogether 40 patients (80%) improved. Thirty-two of these patients were improved by the third postoperative month. This indicates that the majority of patients, should gain control or, in essence, gain their maximum benefit within the first few months of weight loss. Twenty-seven patients stopped medication altogether which I think may represent a significant savings in cost in subsequent medical care. Those few patients who have not benefited usually have failed to lose an appropriate amount of weight.

A word of caution is in order. Our numbers are small and our follow-up period is short. As we all know the management of hypertension is a somewhat complicated affair, and a longer follow-up period will be necessary in order to make substantial statistical correlations with these numbers.

QUESTION: How was blood pressure measured in these patients?

ANSWER: Blood pressure was measured with a thigh cuff by our nursing staff, and if the pressures were elevated they were re-measured on three separate occasions, generally in the sitting position.
GASTRIC BYPASS IN MORBIDLY OBESE INDIVIDUALS WITH SLEEP APNEA

Harvey Sugerman, M.D.

I appreciate the opportunity to be an uninvited guest speaker and discuss not just sleep apnea but respiratory insufficiency of obesity. Hippocrates confirmed Dr. Grundig's work that those naturally fat are more liable to sudden death than the thin, and Shakespeare also recognized the association between morbid obesity and difficulty in breathing. Joe, the fat and red-faced boy knocking at the door in a state of somnolence, and the 52-year-old gentleman in the classic paper by Burwell and Robbins who was found sleeping in a poker game while holding three aces and two kings are additional examples of a condition that certainly requires medical attention. Such patients have hypoxemia, hypercarbia, somnolence, right heart failure, periodic respirations with sleep apnea and a poor response to CO₂ rebreathing.

More recently it has become apparent that Pickwickian syndrome is probably a poor term and that in fact these patients show two different types of ventilatory insufficiency patterns. One is the obesity hypoventilation syndrome associated with hypoxemia, hypercarbia, right ventricular failure, somnolence, poor response to CO₂ rebreathing and restrictive lung functions measured as a decreased forced vital capacity, reduced functional residual capacity, impaired maximum voluntary ventilation and impaired expiratory reserve volume. In contrast, obstructive sleep apnea is associated with upper glottic airway obstruction and apneic episodes during sleep with somnolence which is documented by sleep apneography and polysomnography.

We reviewed the case of a 38-year-old gentleman who had severe sleep apnea as noted by the cessation of nasal and oral air flow for 25 to 40 seconds during polysomnographic study. He had several apneic episodes during the study, and chest pneumography and electromyographic study documented the presence of respiratory efforts. The apneic period subsided with an arousal pattern that was clearly seen on EEG and the return of air flow. Unfortunately, this patient had a respiratory arrest and died shortly after surgical evaluation. He had been followed up for over a year and tracheostomy had been recommended for him.

One of our first 80 gastroplasty patient presented with pure sleep apnea syndrome, and three others presented with obesity hypoventilation syndrome. These three patients weighed respectively 127, 140 and 140 kg prior to surgery. An additional patient weighing 264 kg, who underwent gastroplasty in January 1981, had a combination of both severe obesity hypoventilation and sleep apnea.
syndromes. Two of these patients had mild and one moderate bronchial asthma and one had chronic obstructive pulmonary disease. The majority of patients had no underlying pulmonary pathology.

The arterial PaO₂ levels were markedly depressed in three of the patients: 38, 44 and 43 torr on room air preoperatively, and in one patient it was close to 60 torr. The PaCO₂ levels were all elevated above 45 torr in all of these patients. A marked reduction in forced vital capacity, functional residual capacity and maximum voluntary ventilation was seen in all of the patients.

The patient with sleep apnea had a preoperative PaO₂ of 55 and PaCO₂ of 35. When visited in the hospital, this patient was frequently severely cyanotic and apneic and his snoring was legendary. He was no longer able to work, and he couldn't drive for fear of falling asleep at the wheel.

All patients were placed in the semirecumbent position postoperatively and treated with mechanical volume ventilation. The importance of an upright or partially upright position postoperatively in these patients is well appreciated. It markedly increases the expiratory reserve volume and the functional residual capacity so that closing of airways during expiration with resultant increased shunting does not occur. Therefore, it is extremely important that these patients be placed in the semirecumbent position after surgery.

Oxygen at 40% was given and all patients were extubated when they were able to maintain a PaO₂ level above 70 and a PaCO₂ below 40 without mechanical ventilation. All but two of the patients who did not have the respiratory insufficiency of obesity were able to be extubated in the recovery room within six hours. These two patients required 24 hours of mechanical ventilation. They weighed 200 and 225 kg. The patients with obesity hypoventilation syndrome required postoperative mechanical ventilation ranging from 18 hours to six days. We had one patient who was inadvertently extubated in the early postoperative period and had a marked fall in PaO₂ and a rise in PaCO₂ requiring emergency reintubation in the recovery room. This, however, did not prevent the patient from becoming more hypoxemic and it was necessary to institute the use of positive end-expiration pressure (PEEP). PEEP can be dangerous in these patients because it can impair flow to well ventilated areas of the lung. PEEP of up to 10 cm of water in this patient, however, was able to improve PaO₂ levels with a concomitant rise in PaCO₂. Then, over the following two days, the patient was weaned off of PEEP, placed on a T-piece and eventually extubated.
She was discharged on the eighth postoperative day. By that time she was breathing room air and her blood gas levels were comparable to what they had been prior to surgery.

Between two and ten months following gastroplasty and with a loss of between 16 and 73 kg, all patients experienced a significant rise in arterial oxygen tension. The average PaO₂ level rose from 51 torr preoperatively to 71 torr following weight reduction (significant at p < 0.05). The PaCO₂ levels fell in each of these patients following weight reduction. The average preoperative PaCO₂ level was 53 torr, and it fell to an average of 41 torr following weight reduction. This fall was also statistically significant.

The patient with sleep apnea syndrome had a marked improvement in vital capacity. We also noted a rise in functional residual capacity in the three patients in whom it was measured. The changes in maximum voluntary ventilation were equivocal; in some patients it rose, in one patient it fell, and in one patient it was not significantly changed.

A sleep apneograph in the patient with sleep apnea syndrome showed a gradual washout of CO₂ during the multiple apneic episodes which would last as much as 40 seconds prior to surgery. Following the loss of 50 kg, his sleep apneography study was completely within normal limits. The treatment for obstructive sleep apnea syndrome is tracheostomy. This patient's tracheostomy was able to be removed and closed uneventfully and he has been asymptomatic in the subsequent six months.

Following weight reduction, all but one of the patients are now gainfully employed. Our most obese patient was just operated upon in January 1980 and has lost over 120 lb. His sleep apnea syndrome is almost completely resolved but he is not yet employed.

In summary, we feel that obesity can produce both sleep apnea syndrome and hypoventilation syndrome. Patients with respiratory insufficiency can undergo gastric reduction procedures without undue risk provided that they are supported postoperatively by prolonged and careful mechanical ventilation. Postoperative weight loss is associated with an improved functional residual capacity and forced vital capacity, but not with an improved maximum voluntary ventilation although I would suspect that with more patients we will see a significant change in that also. Finally, we feel that respiratory insufficiency of obesity is an indication rather than a contraindication for the gastric reduction procedure.
DISCUSSION OF COMPLICATIONS OF OBESITY WITH EMPHASIS ON DIABETES

John D. Halverson, M.D., J. Patrick O'Leary, M.D., and Kenneth J. Printen, M.D.

PRINTEN: Morbid obesity is associated with a significant increase in diabetes as well as a variety of other conditions. It is reasonable to expect that a dramatic weight loss in a morbidly obese patient ought to produce some kind of physiologic changes. In fact, that does seem to occur. The diabetic patient who undergoes gastric reduction appears to lose more weight than the nondiabetic obese counterpart. If we look at the diabetic patients on whom we have operated, there is a change not only in their diabetic status, but also in the treatment requirements during the postoperative period. Of note is the fact that even though these patients achieve significant weight loss, not all patients who are insulin-dependent diabetics and morbidly obese become noninsulin-dependent diabetics after they have lost weight. Although 40% of these preoperatively insulin-dependent diabetics are able to be weaned from insulin after operation, the other 60% of patients continue to be insulin-dependent even though most are able to reduce the necessary dosage.

HALVERSON: Insulin is the primary anabolic hormone in the body and is responsible in a very primary way for glucose homeostasis. When people have deficiencies in how they utilize glucose, it may well revolve around insulin, the type of insulin they have, whether there are antibodies to the insulin and so forth.

Insulin may not be able to manifest its effect, because of a number of defects in the obese patient. The insulin may be no good, it may be bound, there may be an increased degradation rate, and more importantly from our standpoint, there are defects at the receptor cell. At the receptor itself there may be a problem in actual decrease in the concentration. This may take the form of a decrease in the number of receptors, or the receptors themselves may be for one reason or another less likely to lock onto the insulin. Hence the insulin is inhibited from manifesting its effects.

Insulin resistance does occur because of receptor involvement in a number of conditions. In contrast to Dr. Printen's experience with a fair number of diabetic patients, the information we have comes from our series of nondiabetic obese patients. In these patients it is possible to look at the various ramifications of the obesity as it pertains to glucose metabolism. Receptor involvement occurs in quite a list of known conditions.
When a person has abnormal receptor function, a number of effects can be seen on the target cells. As a person metabolizes their glucose in a fat cell, the insulin becomes antilipolytic. It tends to prevent breakdown of fat or lipolysis and, in addition, tends to promulgate the intracellular movement of glucose into fat cells for the creation of fatty acids and triglycerides. So insulin is anabolic by definition. In essence, it drives glucose into the cells and produces fat and, in addition, it inhibits breakdown. In contrast, insulin ordinarily suppresses protein catabolism and influences the movement of certain amino acids into muscle cells. In fact, in fasting obese patients this inhibition itself breaks down and protein catabolism is not impeded. This ultimately results in abnormal levels of amino acids in general and specifically, in serum alanine. Consequently, at the fat cell as well as at the muscle cell, insulin, which normally is anabolic, produces a breakdown of the inhibition of catabolism. The same thing occurs in the liver.

There are two areas of concern. The first is whether or not the insulin locks onto the receptor, and how effectively it accomplishes this. It is a function of receptor number and affinity, a decrease in either of which may influence obviously the effects of insulin. The second area of concern lies within the target cell itself, and has to do with whether or not there are post receptor defects. Most receptors are probably synthesized intracellularly. They move to the membrane where they tend to occur in clusters. There are probably five to eight insulin receptors in a cluster. An interesting phenomenon comes to light when a molecule of insulin is locked onto one or two of these receptors. The other receptors become less sensitive to the insulin. This is the so-called "negative cooperativity" effect. What happens to the insulin after it locks onto the receptor is very ill-defined. In fact, some evidence supports the idea that the receptor hormone complex, or a part of it, is internalized. The internalization, and ultimately, the metabolic effects of that fragment or complex are made manifest upon the bile synthesis of the various biochemical pathways. The insulin influences these intracellularly, and this, in turn, results in the production of various metabolic products that ultimately move extracellularly to make their effects manifest.

Monocyte receptor binding of insulin is very similar to what occurs in the fat cell. This justifies the appropriateness of the use of promonocytes to measure receptor function. One of the earliest observations made by Bar was
that the fasting serum insulin level is inversely proportional to the receptor concentration.

In our patients basal insulin levels decreased significantly after operation. The insulin receptor number and insulin-binding are greatly increased (about two- to threefold) in our postoperative patients. The early data suggest that this so-called "up regulation" of insulin receptor numbers occurs within the first one to two months postoperatively. In order to achieve a constant blood glucose level in these groups, it takes much more insulin than the obese people have.

If a person fasts over the short term, he will have an increase in insulin binding. Upon breaking the fast, insulin binding will return to the normal state. A person who chronically fasts will, again, "up regulate" or increase insulin binding. But the mechanisms are different. During an acute, fast the receptor affinity increases, but during a prolonged fast the actual receptor concentration increases. I believe this is what we see in the gastric bypass patients; first an immediate "up regulation." That is, the obese people within a month or two after gastric bypass increase their receptor concentration on the cell membrane in order to return to normal levels.

During oral glucose tolerance tests (75-gm loading dose) given to our postoperative group we observed an enormous peak. This was exactly the opposite of what we anticipated. Theoretically the need for insulin ought to be less. We think we have part of the explanation in that we have altered the anatomy of their GI tract. We known that any operative perturbation will produce altered gastric inhibitory polypeptide release and, in fact, after oral stimulation with glucose the levels increase greatly. Conversely, IV stimulation does not produce such a high insulin response. We don't have enough data yet to be certain whether this is the whole explanation or whether there are other aspects, such as the ability of the liver to clear the massive bolus of glucose that is presented initially to the GI tract and portal circulation. It is probably more complex. In any event, paradoxically, hyperinsulinemia occurs in our patients. We also see hyperglycemia which may indeed be a complex thing. It may well be caused by the short-circuiting of the glucose load directly into the jejunum. It may be related to an outpouring of gut glucagon. The important point is that the rate of decay is very different from the preoperative obese group. In fact, these levels decay so quickly that together with the hyperinsulinemia, they often cause the patient to become hypoglycemic.
It must be remembered that this is a contrived situation. The 75 gm of oral glucose is administered within two to three minutes. This is not comparable to the clinical situation of dumping which, fortunately, we see infrequently. This provocative test demonstrates the dramatic increase in the ability of the body to clear the glucose. It is partly due to the hyperinsulinemic peak that I mentioned above, as well as to the fact that the receptor function is more normal because of the increase in receptor number postoperatively.

In summary, there seems to be an up-regulation of receptor numbers in the immediate postoperative period. More time is needed, however, to fully evaluate the long-term effects of this occurrence.

O'LEARY: We are dealing with similar studies in different models. Dr. Halverson is observing peak levels of insulin that are much higher than those that we saw in patients with jejunoileal bypass. In gastric bypass patients glucose enters the gut at an uncontrolled emptying rate. Can we infer then that the key area of the gut that is sensitive to the release of insulin is really the distal jejunum and ileum instead of the duodenum or distal stomach?

HALVERSON: There are many other factors that come into the picture with jejunoileal bypass. I am not sure the two types of bypass are analogous or enough related to bear comparison in this situation. Therefore I am not sure that I could make the inference you suggest.

QUESTION (Wilkinson): I would like to ask a question about investigation of some of these patients. I am aware of one patient who had a jejunooileal bypass nine years ago and then five years later had a gastric wrap because the jejunoileal bypass was causing problems. Finally, two years after that, the patient underwent gastric bypass because of failure to lose weight. Now the patient is having severe episodes of hypoglycemia, and blood sugar levels sometimes go below 30 mg/dl. How would you investigate this?

HALVERSON: We would do an oral sucrose tolerance load test. I think we can probably explain such hypoglycemia with the data I discussed. Two months from now we will be starting a protocol looking at the blocking of sucrose which, after all, is probably a part of what is provoking the hypoglycemia. We will be studying a blocking agent that prevents the breakdown of sucrose and inhibits the absorption of glucose. Hopefully it would minimize, if not eliminate, the symptoms that this kind of person would have. To answer your question directly,
we are going to have this protocol running and tested before sucrose loading to see if we can correct the symptomatology with this drug.
COMMENT: For those who do not have a sucrose tolerance test or blocking enzyme, this particular patient presents a very difficult problem. I would suggest an IV glucose tolerance test first, followed by insulin and then an oral glucose tolerance test. I would do the oral glucose tolerance test in this patient in the hospital with an IV of normal saline running. Another thing that I think is important in this type of patient is to get some idea of what the rate of gastric emptying is. It may be that this patient is going to need some kind of revisional surgery because of dumping.
QUESTION: How frequently would you advise repetition of the glucose tolerance that for patients with the various types of procedures such as jejunoileal bypass, partitioning and gastric bypass?
PRINTEN: As a routine we stopped doing the test a long time ago unless the patient was diabetic or had symptoms to indicate the need for it.
O'LEARY: I don't think they need to be done routinely. The patient who takes insulin or an oral hypoglycemic agent should be evaluated three months after the obesity operation no matter which one it is. If there has been amelioration of symptoms during the early postoperative period, the patient should be checked again. Our data suggest that there may be a be reversal of the positive effects after three months. The most important determination is the clinical evaluation of the patient.
PRINTEN: I hope we have presented some reasons why we ought to operate on individuals who are morbidly obese. I think we also have given you enough evidence to show that diabetes in itself is definitely not a contraindication for operation, as long as the disease has not produced some irreversible sequela.
MANAGEMENT OF GASTRIC STOMAL STENOSIS
Dale C. Rank, M.D.

I am sure most of you have encountered the problem of how to manage a greater curvature gastric stomal stenosis. I call the basic procedure I do a discontinuity gastroplasty because I divide the stomach completely. It consists of a 50-ml pouch and 1-cm anastomosis handsewn with an absorbable suture. It is, in effect, a Gomez type gastroplasty except that it is done discontinuously. A tube gastrostomy is put in the distal segment.

A gastric partition stomal stenosis is characterized by pernicious vomiting. Regurgitation and reflux, however are less common. The pouch decompensates, and the patient becomes protein undernourished. Heat stroke is a danger in warm climates if the patient can't take water fast enough. There is a loss of solid food fullness. Patients often resort to high caloric liquid nutrition made up primarily of "empty calories," and they stay fat.

Diagnosis of a stomal obstruction is made clinically or by endoscopy. Roentgenograms can be helpful, but they can also be misleading.

Because the treatment of stomal insufficiency often requires a major operative revision, many surgeons are tempted to make the stoma larger initially. This temptation must be avoided.

In some cases stomal stenosis can be treated by dilatation. It does require a good endoscopist. We use a dilator with perforated dilating modules that can be passed over a wire. Because I do tube gastrostomies, I can make the incision directly under the costal margin. The stomach is always there and it can be brought up easily. Through a very short incision, at most 5 cm, one identifies the greater curve and does only that amount of dissection required to bring it up. With such good control I can pass a rigid proctoscope into the stoma and get a clear view of it without angulation. From below I thread a 2-0 silk string into the biopsy forceps. The endoscopist pulls it up to give us a through-and-through string. He passes the dilator guidewire down over the string, through the mouth and right up to me. Then he begins to pass the dilator modules sequentially down over the wire. I can actually watch the dilators come through the stoma. We always dilate up to at least 12 mm. Then the endoscopist removes the scope but leaves the string in place. The small abdominal wound can be closed very simply with imbricating sutures. A 24 tube gastrostomy is left in place. We leave the string in place until we are
absolutely certain the second dilatation will not be required. So far a second
dilatation has never required.

The patient usually goes home on the second day. After six or seven days
the wound heals. We discharge the patients with the tube left in so that
supplemental liquids can be given if necessary.

The small pediatric proctoscope can also be used for dilatation. It will
fit through a 24 Foley tube gastrostomy. I leave the tube gastrostomy in these
patients for three weeks, and should a second dilatation be required, I will not
have to open the patient's abdomen.

I have managed four cases of conventional greater curvature stenosis with
only one dilatation in each case. In addition, I have treated one anterior
gastrogastrostomy with one dilatation and one interesting patient with an
anterior gastrogastrostomy in whom retrograde dilatations were unsuccessful
twice. I did an electrosurgical anastomotic revision with this technique.

This is a technique that deals with a lateral stenosis without requiring a
major operative procedure. It should allow all of us to feel more secure in
making the stoma the proper size initially.

QUESTION: Have there been any late recurrent strictures?

ANSWER: No.

QUESTION: What is your average follow-up period in these patients?

ANSWER: All patients except one have been followed up for more than six months.

QUESTION: Were those stapled anastomoses done by removing staples from the gun
or by using something like the Gomez appliance?

ANSWER: They are similar to the Gomez procedure except that I staple the pouch,
and divide the stomach. I reapproximate the pouches from the lesser to the
greater curvature. At the greater curvature, I excise some of the staples and
make a direct, end-to-end, one row anastomosis.
MEASURES TO DECREASE MORBIDITY AND MORTALITY
William M. Headley, M.D.

In 1975 I was in the midst of doing intestinal bypasses and like anybody doing that operation, I was looking around for something better. Shortly after that I switched to the gastric bypass. It seemed to make more sense.

We had done 197 intestinal bypasses over the previous 12 years. We had no operative deaths but certainly had the usual problems and postoperative complications. In 1977 we began doing the gastric bypass. We now have a series of 212 cases. Of this group of gastric bypasses, 40 are simultaneous take downs of intestinal bypasses and conversions to gastric bypasses. We had one pulmonary embolus in our group of 212 which was not fatal. The patient had had an intestinal bypass take down. We try to get these people out of the recovery room and up walking almost at once. We move them around a lot the evening of surgery and do all the usual things to motivate them as soon as possible.

In our first group of about 20 patients we had separation of the staple line, wound infections, incisional hernias, a subphrenic abscess, an obstruction and a death. The procedure that we were using at this point was a gastric bypass with a 100-ml pouch and an antecolic loop gastrojejunostomy. It quickly became very evident that we were having a lot of trouble. For these reasons we switched from a single staple line to a double staple line. Then we started oversewing the staple line with a running 2-0 absorbable suture begun and ended on the lesser curvature side. We changed from an antecolic to a retrocolic gastrojejunostomy. It was obvious early that the 100-ml pouch was much too large. Now we make it around 30 ml or smaller so it is no more than a conduit between the esophagus and the jejunum.

In spite of all our modifications we still had several leaks. We quickly learned that whenever a patient has tachycardia with abdominal and shoulder pain, we should reoperate at once. Even a negative exploration is preferable to waiting and allowing a little complication to turn into a big one in these patients.

Another area of concern is the spleen. This is especially true when using the Poly-Track Retractor System (Pilling). The first thing I do upon entering the abdomen is to look over the spleen to see if there are any adhesions. Such adhesions must be freed before inserting and pulling on the retractor blades.

The nasogastric tube is another potential source of problems. After 30 patients, we started doing a tube jejunostomy. This became our standard
procedure. We cross the jejunum with the GIA ten inches past the ligament of Treitz. It is not necessary to divide the mesentery. We use 4-0 plain catgut which will dissolve in just one week so the tube can be removed. We use a Witzel tunnel, and the jejunum must be sutured to the anterior parietal peritoneum. In takedown of the intestinal bypass, we do not use a tube jejunostomy because of the small bowel that we see in intestinal bypass patients.

To prevent wound infections we take out the sutures on the ninth day at which time our patients go home. We close with a running whip stitch of 4-0 nylon and then a second suture of running 4-0 chromic catgut. We take out the nylon before they go home and spray the wound. This gives the patients a good cosmetic result. The tube jejunostomy is taken out in seven days and a #8 catheter is put in its place. The patients soak this area for four or five days after they go home. When serous drainage reduces to a minimum the patients can pop the catheter right out. We have not had a wound infection in the 80 patients with tube jejunostomies.

We also routinely use subclavian catheters in all patients. Our standard procedure in the last 80 patients has included the subclavian catheter, a double application of the TA90, abosrbable suture seromuscular oversewing of the staple line, a 60-cm long Roux-en-Y gastrojejunostomy, and tube jejunostomies on all routine gastric bypasses.
STOMACH CARCINOMA FOLLOWING GASTRIC BYPASS: A CASE REPORT
Samuel D. Porter, M.D.

In 1956 Helsington and Hillstead reported carcinomatous development in the gastric stump after partial gastrectomy for duodenal ulcer and gastric ulcer disease. Since that time there have been several conflicting reports, some noting an increased incidence and others, a decreased incidence, although the latest reports tend to support the former.

In 1975, Dominoff, Erickson and Genenger reported on attempts to answer the question of whether a Billroth I or a Billroth II anastomosis was more likely to predispose to carcinoma in the stomach pouch. They found no difference between these two operations. By doing multiple biopsies, they found a lower incidence of acute gastritis and a high incidence of chronic gastritis, intestinal metaplasia and some cystic dilatation of glandular tubules, the latter three of which have been felt to be precursors to carcinomatous change. In their studies they found a carcinoma incidence of 2.2% in the residual stump after gastric surgery for ulcer disease. This obviously is a much higher incidence than one would expect under normal circumstances. The time interval between the resection and the determination of carcinoma varied, but the authors concluded with statistical evidence that male patients resected for benign ulcer disease more than 11 years earlier were in an increased risk group for the development of stump carcinoma.

Popichristos, Magnanti and Fortner elucidated the matter more precisely in the American Journal of Surgery in February, 1980. Studying a larger number of cases, they reviewed patients previously treated either medically or surgically for ulcer disease who had gastric carcinoma. The authors also examined a control group of the same number of patients who were treated for other malignancies. Each group contained nearly 1500 patients. They found a significantly higher number of stump cancers in previously surgically treated ulcer patients than in patients with other malignancies. Patients with gastric ulcers showed no higher incidence of carcinoma than those with duodenal ulcers, and it made no difference whether the operation was a gastric resection or some form of gastrojejunostomy. There appeared to be no predisposition by sex. The interval between the ulcer operation and the diagnosis of gastric carcinoma indicated that the carcinoma appeared later in patients with gastrojejunostomies than patients with gastrectomies. The younger the patient at the time of the ulcer surgery, the longer it would take for the development of the gastric
carcinoma. The interval between ulcer treatment and cancer development average approximately 20 years, but some occurred in a shorter time of four years. All patients with carcinoma were diagnosed after the age of 50. In the course of the study, the authors evaluated mucosal changes and found results similar to those previously reported.

My experience with gastric bypass surgery goes back to the initial operation that Dr. Mason performed. After I left The University of Iowa in 1968, I did gastric bypass with gastrojejunostomies until August 1979. During that time I performed 89 of those operations. Since then I haven't done any of them. I now do gastric stapling with anterior gastrogastrostomies. The preceding information and the patient whose report follows are two of the primary reasons that I changed.

CASE REPORT:

In 1973 a 47-year-old lady presented with obesity, back pain, foot problems and increasing knee pain. Her weight at that time was 130 kg and she had fluctuated between 120 and 150 kg over the previous two to three years. Whenever her weight exceeded 138 kg, she would become hypertensive and require treatment. She continued to stay active, playing golf three or four times a week, even though she weighed 130 kg. She had previously had her gallbladder removed as well as her appendix.

After the usual preoperative protocol, in June 1973 she underwent a gastric bypass operation with a retrocolic gastrojejunostomy. Postoperatively she got along nicely. Her weight loss pattern was satisfactory. Six months later, she weighed 97 kg but tended to dip toward anemia and was placed on iron. A guaiac test of her stool was negative at that time. A month later her hemoglobin was 13.5 and she continued taking the iron. Her blood pressure remained normal during the follow-up visits. In the middle of the following year she stopped taking her iron, and in January 1976 her hemoglobin level again dropped although her stool's continued to be guaiac negative at that time. She was again placed on iron and it was recommended that she stay on it.

In October 1976 she came in with intermenstrual bleeding and some lower abdominal discomfort. Her weight was 80 kg. Her activity tolerance was excellent. Pelvic examination was normal. The abdominal examination was unremarkable and her primary complaint was mild occasional diarrhea and minimal urinary stress incontinence. An upper GI series at that time showed the bypass to be a normal small pouch and normal appearing stoma. There was not any
significant reflux at that time. Barium enema and sigmoidoscopy were unremarkable.

In January 1978 her hemoglobin level was 14.5 g/dl, and her chemistry panel was entirely normal except for a very slightly elevated uric acid. Because of some intermenstrual spotting in April of that year, I performed a sigmoidoscopy and a D&C; both were negative. Her menstrual periods were irregular but she did not have heavy bleeding. She did have some gas discomfort and a repeat upper GI examination showed some esophageal reflux. Her weight at this time was 68.1 kg. She was having no difficulty swallowing and although the reflux bothered her, it was quite minimal. Approximately six months later she developed dysphagia, loss of appetite for meat and the feeling that things weren't quite right. A repeat upper GI series showed marked inflammation and a ragged looking esophagus. An esophagoscopy was performed and several biopsies were taken. Only inflammation was seen with no evidence of tumor. I recommended another esophagoscopy. She had this and a diagnosis of adenocarcinoma of the gastric pouch was made. She underwent gastric resection with esophagogastrectomy. She had positive perigastric nodes but no evidence of distant metastases. She had resection of the segment of jejunum along with the proximal two-thirds of her stomach. Her postoperative course was essentially unremarkable and at the present time she is getting along satisfactorily.

This patient's history is presented as a case report with no specific conclusions to be drawn. However, I urge all physicians who treat gastric bypass patients to be cognizant of the lessons derived from the history of gastric surgery.
MANOMETRIC STUDIES OF THE LOWER ESOPHAGEAL SPHINCTER IN THE MORBIDLY OBESE PATIENT
Lars Backman, M.D.

Obesity is generally considered to be a contributing factor to gastroesophageal reflux symptoms in overweight persons. Extreme obesity results in abnormal concentrations of some gastrointestinal hormones that may influence the normal esophageal sphincter. Esophageal manometry was therefore performed in obese subjects, both before and after the surgical treatment of their obesity. It is possible that a thick layer of subcutaneous fat may influence intra-abdominal pressure, thus lower esophageal sphincter (LES) pressure and position.

We examined 40 obese subjects, 28 women and 12 men, with a mean body weight of 129 kg. The mean body weight index was 1.85, or about 90% overweight. Each subject underwent roentgenographic examination of the stomach and many also had gastroscopies. None of these tests revealed evidence of hiatal hernia. Ten subjects of normal weight and weight index with no signs of gastroesophageal reflux served as controls.

All subjects were examined in the supine position, and atmospheric pressure was used as the zero reference. The LES pressure was defined as the absolute sphincter pressure minus the intragastric pressure. We used a three lumen catheter system with a high pressure capillary perfusion inflow and a perfusion rate of 3 ml/hr. Three free flow catheters with an inner diameter of 0.75 mm were placed in a #14 duodenal tube at different levels, 5-cm apart. Each catheter had two readily oriented openings. This technique allowed compliance which increased the sensitivity. Both rapid pull-through and station pull-through techniques were used. No significant difference in the results was observed for the two techniques. All results presented here other than the LES length were obtained by the station pull-through technique. All pressures were scored at the end of expiration. We measured the length, pressure and position of the LES as well as the intragastric pressure.

The thickness of the subcutaneous fat was measured intraoperatively. We found normal LES pressure, length and position in the obese group both in comparison with our control group and with the results of other authors. The higher intragastric pressure in the obese group is perhaps caused by pressure from subcutaneous fat in the abdominal wall. However, there was no significant
relationship between the thickness of the subcutaneous fat and intragastric pressure.

Nine of the obese subjects underwent an operation to allow weight reduction. Two different operative techniques were used, gastric bypass and gastroplasty. A stapling instrument was used which reduce the amount of dissection at the proximal part of the stomach. Such a dissection may affect the angle of His and thus, according to some reports, influence LES function. For example, some authors have reported a higher incidence of gastroesophageal reflux symptoms after vagotomy.

Manometric study results before and after surgery for weight reduction showed no changes in LES pressure, length or position. The intragastric pressure, however, was significantly reduced after weight reduction. This supports the idea that intragastric pressure at least partly depends on the degree of obesity, with pressure from subcutaneous fat in the abdominal wall being an contributing factor.

In conclusion, extreme obesity, weight reduction and operation on the proximal part of the stomach do not influence LES function. The intragastric pressure is increased in the obese group, perhaps caused to some degree by pressure from subcutaneous fat in the abdominal wall. This study does not support the commonly accepted notion that obesity per se predisposes to dysfunction in the lower esophageal sphincter.

O'LEARY: We have tried placing a large blood pressure cuff around the patient's abdomen. We discovered a relationship between intragastric pressure and the pressure that we have applied around the abdomen, but there does not appear to be anymore than a marginal increase in LES pressure. This supports the premise that although the lower esophageal sphincter is an intra-abdominal sphincter, it is not totally dependent upon intra-abdominal pressure for its effect. I compliment Dr. Backman. I think that this is an excellent study and I suggest that there are other problems that should be addressed in a similar manner.
DISCUSSION OF RISKS OF GASTRIC REDUCTION FOR OBESITY

John D. Halverson, M.D.

We perform gastric bypass as Dr. Gomez used to do it, that is, a small stapled pouch with a loop gastroenterostomy. We have 70 patients in our series.

One of the commonest complications of any of these procedures, regardless of which variation one uses, is inadequate weight loss. I should point out that weight loss is presented in many different ways and very often unsatisfactorily. A standardized method should be adopted. We use percent of excess weight loss. If we group the patients by percent of excess weight loss the data produces a bell shaped curve frequency distribution. This bell shaped distribution shifts to the right showing progressive weight loss between the first and second years. Ninety percent of our patients have lost 50% or more of their excess weight. Unfortunately, that leaves us with 10% of patients who lose less than 50% of excess weight and therefore, must be considered as failures. Preoperatively it is important to describe more carefully to our patients what they can expect.

Many people say that weight loss ceases about the 12th postoperative month. In fact, in our series 42% of patients were still losing weight at that time. Twenty-seven percent did not lose in the six month interval between 12 and 18 months, and 3% gained a mean of 13 lb. Between 18 and 24 months, a quarter of the patients were still losing, half had stabilized, and slightly under a quarter gained a mean of 9 lb. There is no question that the patients are in a state of flux. Furthermore, it is obvious that weight loss can persist beyond the first postoperative year and into the third year if we design a situation that makes this kind of weight loss optimal. Such a situation must include careful follow-up examinations and very close adherence on the part of the patients to the dietary restraints that must be present in order to have successful weight loss. They must be followed up frequently postoperatively and, in my opinion, on a one-to-one basis. I have seen too many patients come in who were counselled only by dietitians. The surgeon was interpreted as being disinterested due to his conspicuous absence from the patient's bedside postoperatively and particularly in the office in terms of frequent counseling sessions.

In our study, which includes patients with up to two years of follow-up time, we have found that the heavier patients do not lose as well. These are all statistically significant correlations based on linear regression analysis. No matter how you express the preoperative weight --as raw weight, as amount of
excess weight or percent of ideal weight—the negative correlation remains. In other words, the heaviest patients do the poorest which is an unfortunate paradox. Another relationship that we have found to be statistically significant ($p < 0.01$) is that the bigger the postoperative pouch is the less percent excess weight the patients will lose. We have had no revisions for obstruction, and only one revision for dilation.

The complication of inadequate weight loss is related to pouch size, stomal size, speed of eating and amount of food ingested and the proper selection of patients. Patients must be selected who understand the basic notion that their calorie balance is still the bottom line with or without the operation. In that sense, the operation changes nothing.

We often see gastroesophageal reflux on our upper GI examinations in these patients after a loop gastric bypass. Nevertheless, only about 6% have any kind of reflux symptoms for which they take medication. We have not documented any significant esophagitis by endoscopic examination. With the way the operation is being done today, I think reflux is probably less of a problem than it was formerly.

We have had problems with stomal obstruction. Some patients will respond to positional treatment. We had one patient, for example, whom we rotated onto her side. Her symptoms abated after just two or three days of nasogastric suction and patience.

We have had two distal pouch blow outs. At the time of our first blow out I called Dr. Printen, and he felt that it was probably caused by obstruction at the stoma. Nevertheless, based on operative findings in one patient and at autopsy in the other, we felt the cause was pylorospasm. Both of these patients died. Subsequently, we began putting gastrostomies in the distal pouch in order to prevent this phenomenon. Later we had one patient who did indeed develop roentgenographically proved pylorospasm. With the aid of the gastrostomy tube we could vent the pouch for two or three days until the patient improved. We feel the gastrostomies help to avoid this kind of complication in which ischemic necrosis caused by dilation of the distal pouch will eventually occur.

In addition to the two distal pouch leaks, we have had two proximal pouch leaks in our series of 80 patients. These two patients both survived this complication. The first patient was a woman who, about a week after gastric bypass, developed a lot of air under the diaphragm and showed extravasation of dye on x-ray films. We reoperated on this woman and performed a jejunal patch
which promptly fell off. She continued to leak but fortunately the sump catheters and Penrose drains got rid of her draining material. Over the course of the ensuing three or four weeks and with the help of hyperalimentation and total parenteral nutrition, she ultimately healed. She currently weighs about 130 lb and is very happy which gives credence to the old adage, better lucky than good.

The second patient was a woman in whom we discovered a coincidental leak. We brought her back about a week after discharge because she was febrile, had pelvic pain, and had endometritis from an IUD. We found this leak on x-ray studies. We treated it with nasogastric decompression and total parenteral nutrition over about two weeks and it healed. We succeeded in getting it to heal because it fortunately drained right back into the proximal pouch.

There have been a lot of problems with staple dehiscence lately. Because of this many surgeons are beginning to staple twice, and some are even stapling three and four times. With the extra stapling have come some liabilities, including necrosis. This seems to be a particular problem if the staple lines are placed about 1-cm apart. It is perhaps better to place the staples directly on top of each other, but even then a little "out pouching" can occur particularly on the posterior side which may lead to a blind pouch. I have been in that jam a couple of times. Largely because of these problems I have not gone to a double staple line. One single application is all I use and as a result we have about a 6% incidence of staple line disruption. Fortunately up till now only one of these has been significant in terms of weight loss.

We had one very interesting patient who came to us after having had several procedures done elsewhere. Her stoma was stenotic and eventually we reversed the operation. In addition to her stenosis, to my knowledge she is the first patient with total cutaneous anergy and immunosuppression after this kind of operation. She had total anergy to all the standard skin tests, and immunologically she was totally deficient. She also had totally suppressed marrow. She was badly anemic, had iron deficient and a reticulocyte count of zero. That was based upon her folate deficiency. Since having her operation reversed, she has been gaining weight rapidly needless to say.

We had other patient who also had stenosis of the outlet. Originally she had a 7-mm anastomosis that was perfectly adequate. Unfortunately, she had no self-control and when she went home, she over indulged and vomited causing
irritation and eventually stenosis. She returned to us in such poor condition that we finally reversed her operation.

In our series we have revised two (3.5%) of 80 gastric bypass patients. In one of the patients we had to make the stoma larger and in the other I had to restaple the partition.

Our overall reoperation rate excluding cholecystectomy, is only 5.8%, and that includes adhesiolysis for obstruction, leak and two revisions. We believe this to be a very low rate. We attribute it to experience and the fact that we have stuck to the original gastric bypass. I feel we should look at the data and reevaluate the rush to perform all of the new gastric procedures in the light of more solid data now coming out about the old gastric bypass. One caveat is the metabolic complication rate. I believe that if one looks for hypovitaminosis after gastric bypass and presumably after gastroplasty as well, one will find vitamin A deficiency in about 18% of patients. Vitamin B12 deficiency will occur in 26%, folate deficiency in 9% and abnormal prothrombin time in 20% of patients. These were the figures from our series. In addition there may be a little hypokalemia, almost always related to concomitant diuretic administration by the local doctor and a little hypomagnesemia, never significant in terms of symptomatology. Anemia occurred in 18% of our patients for various reasons, but never was related to the folate or B12 deficiencies. The occasional low serum iron that we saw we attributed to the diverting of food around the duodenum which is the primary site of iron absorption. This occurred in about 20% and of patients and, contrary to what I have heard, was not always totally repletable by oral iron.

I urge caution and I think we all must begin to look for deficiencies in these categories. Fortunately, these deficiencies have never been severe enough in our series to have caused significant problems. We have picked them up early before they became clinically manifest and they have been treatable by conventional means. Still, I must caution that metabolic complications will occur, primarily due to low intake despite therapeutic vitamin supplementation on a routine basis. The only thing about the gastric bypass that is not related to the low intake per se is the fact that we do see iron deficiency based upon diversion of the food stream around the duodenum where iron is ordinarily absorbed.

ELLISON: Our leak rate at the Ohio State University is 5%, and it is most often seen in patients in whom a double row application of staples has been used. I
would like to confirm Dr. Mason's observation that the diagnosis is based on clinical findings of tachypnea and tachycardia. Positive roentgenographic findings using gastrografin or dilute barium were only present in about one-third of our patients who had leaks. More commonly we find a right subphrenic abscess or free extraluminal air under the left diaphragm. In addition laboratory data can sometimes be helpful. In two of our patients we have had large rises in serum amylase. I think that leak is probably the most dangerous complication. The average hospital stay following a leak is 40 days. They usually require reoperation although in some cases you can get by with nasogastric suction and antibiotics.

QUESTION: Do you drain the left upper quadrant routinely at the primary operation?

ELLISON: No. If we do that we are guaranteed a leak.

RANK: It should be pointed out that zinc is an extremely important substance that all patients should have. In addition, all the patients at Arlington, Texas, have received supplemental B12. I know that people have had difficulties with that. We simply give self-administered B12 once monthly to all patients. They learn to give it themselves and they get a vitamin supplement that include 10,000 units of vitamin A.

In response to this business of leaks, a few years ago I described a technique that I used. I have had no leaks in 300 patients. That is to say, do have leaks but I pick them up intraoperatively with a very simple maneuver. Upon finding the procedure, I introduce methylene blue into the pouch and I squeeze it. If I see a leak I repair it immediately.

HALVERSON: Most of us agree though that the leaks we see the most are the ones that become clinically manifest late and probably occur after operation. The second lady I on whom commented had a gastroplasty and became obstructed.

SCHWARTZ: I would like to comment on bile reflux after gastric bypass. The numbers presented showed fairly low statistics. We randomly performed endoscopy in 20 patients six months to one year after gastric bypass. Seventy-eight percent of those patients had endoscopic evidence of gastritis.

HALVERSON: Did these patients have loop gastroenterostomies?

SCHWARTZ: Yes. In addition, 38% of these patients also had evidence of esophagitis. We found a mean bile acid concentration in those patients of approximately 5,000 mcg/l. We also found positive correlations between the degree of dysplasia of the gastric mucosa and bile acid levels. In light of Dr
Porter's presentation, I would like to ask the panel whether that dysplasia represents potential problems in the future.

PORTER: I don't know the answer to that. The best we can do is to look at the work that has been done previously, the histologic changes that have been seen in post gastrectomy patients. Such patients seem to have a statistically significant trend toward the development of carcinoma. I can't answer your question, however.

SCHWARTZ: Would any of the panel suggest a Roux-en-Y instead of a standard loop to obviate this problem?

HEADLEY: In my series, 16 of 32 patients had loop gastroenterostomies. The others had Roux-en-Y gastroenterostomies owing to the fact that they were intestinal bypass takedowns. We had a number of that group with loops who complained of reflux esophagitis. I performed endoscopy in several of these patients and found bile in their pouches and in the distal esophagus. We converted a number of those operations to Roux-en-Y gastroenterostomies.

COMMENT: I am personally convinced that the Roux-en-Y is a lot better.

HALVERSON: I worry about the Roux-en-Y being a more complicated operation. We performed endoscopy in our first two dozen patients, and we saw no changes. It is very interesting that your changes would be so striking. I have attributed such changes to the fact that bile reflux was apparently more prevalent in the past because of the much larger anastomoses and pouches created by the original operation. I thought the smaller stomata that we now make are protective. That may well not be the fact.

RANK: We have been aware of the problems created by bile ever since peptic ulcer surgery began. In fact, everything that we do for peptic ulcer surgery involves trying to keep bile out of the stomach. It washes away and breaks down the mucous barrier which allows the acid to damage the walls of the stomach. This leads to such things as metaplasia. In regard to the patient with gastric bypass, bile can ruin the pouch. It leaves a chronic gastritis that changes the wall of the stomach. Patients experience big, floppy-eared dilatation of the pouch that is not seen with gastroplasty or Roux-en-Y. I believe that with time we will see that the Roux-en-Y will not produce a late failure rate from pouch dilatation simply because the bile is not up in the stomach.

HALVERSON: Could you give us some hard numbers to support this?

RANK: Our series comprises about 200 patients with loops, the earliest ones have been followed up now for six years. The revision rate among these patients
is continuing to increase. I think that more than half of those patients need revision, which I feel is caused by bile-produced gastric dilation.  

HEADLEY: For a number of years I did all of the endoscopies at our hospital, nearly 900. The worst looking stomachs that I saw were caused by reflux alkaline gastritis; they were Billroths I and II. Four or five years ago when I revised a Billroth I or II, I added a Roux-en-Y to that revision. I think those patients did a lot better with the Roux-en-Y. 

SOLOCHEK: Of 370 loop gastric bypasses, I have had to revise only six patients because of bile reflux.  

QUESTION: Dr. Halverson, what is your opinion on decompressing the distal stomach in gastric bypass?  

HALVERSON: I think it ought to be an automatic part of the operation.  

QUESTION: How can we classify failure?  

HALVERSON: I don't know what a failure or success is. If the patient dies, that's obviously a failure. In regard to revision rates I can not say what is acceptable. Certainly, the rate of 5 to 10% experienced with gastric bypass is better than the 20 to 25% with gastroplasty.
STAPLED GASTRIC PARTITION: SINGLE VS DOUBLE ROW
E. Christopher Ellison, M.D.

We have been doing gastric partitioning for morbid obesity at the Ohio State University for approximately four years. The operation consists of removing the fourth and fifth staple from the center of the cartridge. This fashions a stoma that has staples on both sides and is different from the standard gastroplasty. We have not reinforced these stomata. Over the four years we have gone through a progressive evolution, beginning with a single row of TA55\textsuperscript{®} staples and going to a single row of TA90\textsuperscript{®} staples. After a failure with single row of TA90 staples, we placed our patients on pureed diets for eight weeks. Later we tried doing gastrogastrotomies. Then we used a double application of the TA90 stapling instrument which led to the design of a stapler that would fire two cartridges of staples simultaneously.

This presentation reviews the results of the single vs the double application of the TA90 in terms of efficacy and weight loss at one year after operation. We have chosen to use the percent of preoperative weight lost at that time period to indicate the success of the operation.

We have operated on 415 patients, 89 with the TA55 single application, 129 with a single application of the TA90, and 197 patients with a double-row application. With the TA55 the mean weight loss at 12 months was approximately 20%. Only 12 patients had weight loss of greater than 20% at one year and were considered successful. That is very poor.

Using the single application of the TA90, again the mean weight loss at one year was roughly 20%. Fifty of 129 patients lost in excess of 20%. That represents a success rate of a little over one-third.

Finally, mean weight loss at one year for the group of patients having had a double application of the TA90 is also about 20%. This is really no different than the results from the single application of the TA9. However, at six months, a little over 50% of patients had lost greater than 20% of their preoperative weight using the double application of the TA90. Between six and 12 months, there was a considerable fall off.

Recently we tabulated 18 months follow-up data for 34 patients with a double row application of staples. The mean weight loss is again about 20%. There is no difference in the weight loss at six and 18 months after operation. Thus, the operation seems to stop being effective at six months although the patients do maintain the early loss.
Forty-seven percent of patients lost greater than 20% of their preoperative weight at 18 months. Interestingly enough, about one in ten patients has had a reoperation by 18 months and it is even more interesting that between 12 and 18 months 62% gained weight. The average weight gain is about 15 lb between 12 and 18 months.

We were not satisfied with the double application of the TA90 staples as the results have indicated. Therefore, we pursued the double row cartridge instrument designed in coordination with our Department of Engineering as a modification of a commercially available stapler that applies two staple cartridges simultaneously. Mean weight loss for patients in whom this instrument was used is a little over 20% at six months. Unfortunately, this does not represent an improvement over the previous group.

Over the entire series of patients, we have about 134 that have been followed up for three months or more. When evaluating the success of one of these operations one must consider the overall risk as well as weight loss. The morbidity of the entire series is approximately 10% including a variety of complications such as leak, hernia, wound infection, atelectasis, pneumonia, etc. We have had only five deaths in 415 patients. Morbidity is much higher with the double row application of staples compared with the single row. The single row application carries a morbidity of less than 10%. It is nearly three times that with the double row.

The major complication following any type of gastric reduction operation is leak. With the single row there were no leaks in 129 patients. With the double row application of the TA90 stapler there were four leaks among 135 patients. With the double row gun we had a 10% leak rate, clearly an undesirable result.

In summary, we find that the single row application of the TA90 was successful in a little over 30% of the patients in regard to weight loss. The double row application of the TA90 was successful in about 40% of patients. This difference, however, is not statistically significant by chi square analysis. The morbidity in patients that had a single application is extremely low. In contrast among patients that had the double row application, the morbidity was extremely high. The double row gun, as we designed it, is surely not safe and should not be applied clinically.

Our final recommendations include the following: The TA90 rather than the gun should be used. The double row application has a greater risk and the benefits seem not to be justified, therefore, the single row application is
preferred. However, the effectiveness of the procedure must be improved and perhaps stomal reinforcement is a way to improve the operation. Currently, we are no longer doing a gastric partitioning operation. We have adopted a procedure that uses a silastic collar to reinforce a lesser curvature stoma.
GASTRIC WRAP REDUCTION
Lawrence H. Wilkinson, M.D.

As I began to think about the problem of morbid obesity back in 1974, I had some fanciful thoughts. I thought of putting some type of a rock in the stomach, but that would require an operation to put it in and then an operation to get it out. I was searching for some sort of procedure that would be nonoperative.

In my fancy, one of the ideas I came up with was to put a balloon in the stomach that would go through the mouth. Once swallowed it could be inflated to achieve satiety. I gave up this idea because, having dealt with pseudocysts of the pancreas and various other problems that cause distortion of the stomach, I was pretty well convinced that it just wouldn't work.

About a month ago a patient came with epigastric distress caused precisely by a balloon in the stomach. Despite the fact that the balloon almost filled the stomach completely, the patient was able to maintain normal nutrition. When we operated on the patient and took out this balloon, it turned out to be a trichobezoar so huge that it filled the entire abdomen.

Perhaps there is a lesson to be learned from this experience. Considering the propensity of the stomach to adapt to various situations, I am concerned about what is going to happen in the next ten years to all of the small pouches that we are making today.

The procedure I do today is a wrapping of the stomach with a nonabsorbable material. I keep the left, right and epiploic gastric arteries connected to the stomach to avoid necrosis due to inadequate blood supply.

For the first 57 patients in whom I used this procedure, I tried hard to wrap the rectangular gauze around the esophagus and the stomach in a way that was acceptable. With the first patient I was fearful of injuring the esophagus. Apparently I didn't get the wrap tight enough. After losing 60 lb in six months, the patient began to regain weight and finally had a gastric bypass. Later I began using a yoke to wrap the lower esophagus, and then extended the wrap over a Nissen fundoplication.

I measured 25 stomachs with Nissen fundoplications and found the circumference of the lower esophagus varied between 7.5 and 8 cm regardless of the size or fatness of the patient. The circumference of the stomach which wrapped around the esophagus was 16 to 18 cm. At the prepyloric end, the circumference decreased to 9 to 10 cm. I now construct a polypropylene mesh
pouch that I prepare at home the night before operation. It has darts that enabled me to make the proper form.

After hearing one of my colleagues proclaim the dangers of putting this gauze in the stomach, I became determined to try to find some sort of material that would not permit ingrowth of the body tissue once it was in place. I went to the Howard Schulte Corporation with my problems and they made a device of dacron mesh impregnated with silicone, dacron being the only nonabsorbable material that would bond with silicone. We made a design error in not applying a strap around the silicone collar making it possible to fix it properly around the esophagus. I realized this at the time of surgery in the first patient. Seven months later after losing 70 lb, the patient suddenly developed dysphagia and upper gastric discomfort. She had so many symptoms that I knew I had to remove the wrap. At operation I found that the fundus of the stomach had herniated out through the esophageal collar.

The second generation silicone wrap is somewhat like an Angel Chick® device only it fits more snugly around the esophagus. The inside circumference of the opening is 8 cm. Straps are united, the excess is cut off and the wrap then fits around the esophagus with a 36F bougie in place. The remainder of the suturing is done along the lesser curvature overlapping the wrap about 1 cm.

During the operation I place the patient in a steep Trendelenburg position for 30 seconds every 30 minutes. I do not use minidose heparin or any sort of elastic supports. I must emphasize that this method is better than any sort of stimulation, wrap, minidose heparin or anything else.

In the recovery room, as soon as the patient is awake enough, we ask them to elevate their legs one at a time. We think this has many benefits including keeping the patient occupied.

The average hospital stay is only six days. We have had to administer one transfusion, and there have been no splenectomies, wound infections, or wound dehiscences. We had one death before we starting elevating the legs. We did not perform an autopsy, but clinically we felt the cause of death was a pulmonary embolus.

As of this report I have operated on 160 patients. One patient returned to the hospital four days after discharge with a complaint of bright red blood from the rectum. It was evacuated in small 60 cc spurts that contained bright red clots. We treated the patient conservatively with Tagamet. The nasogastric tube did not show any blood. The GI x-ray films were normal. Two angiograms
were normal. The patient seemed to improve somewhat on pitressin. I had just about decided to operate on her when she suddenly died.

Another patient did not reveal preoperatively that she was an alcoholic. Her daughter-in-law told me two days after operation. A week after discharge she returned with tachycardia. She was afebrile and able to eat. Four days later she literally erupted right through the upper part of her wound. She didn't have a dehiscence, but leaked fluid caused by her pancreatitis. A couple of days later she died from erosion of the hepatic artery.

Another young girl went home on the sixth postoperative day doing fine. One week after being home she developed pain, fever, diarrhea and tachycardia. She returned and, like the previous patient, she had a perforation of her stomach. It occurred near the upper end, and did not appear to be caused by ischemia. I reoperated to remove the wrap. After this she did well and now wants to be wrapped again.

Late complications have included one wound hernia, one Pickwickian patient who failed to maintain weight loss, and one patient that developed a perforation two years after surgery. I treated this last patient by removing the wrap and closing the perforation. I do not know what caused it.

Among the first 57 that I did I had six who developed a tightness at the gastroesophageal junction that prevented comfortable swallowing. This occurred sometimes as long as two years after the initial operation. I treated this by splitting the wrap and putting in what the seamstress calls a gusset. Four of the patients had complete relief without further complications. The other two manifested a perforation within the first week or two after reoperation. I have a suspicion that they had perforated onto the wrap before we did the gusset but we could not recognize it at the time of the procedure.

All of the patients, with the exception of the Pickwickian, mentioned above, have lost weight satisfactorily. We are now using only silicone wraps which prevent ingrowth and are very easy to remove. Patient acceptance is high and they describe a sense of well-being.
EVALUATION OF EXPERIMENTAL GASTRIC PARTITIONING CLIP
Cesar A. Gomez, M.D.

Looking at the program and exhibits, we realize a lot of changes have been made. I believe changes are important because it is the only way we can someday arrive at an ideal operation. We all have been responsible for the changes and I am no exception. I have been toying with the idea of a gastric partitioning clip for some time and thanks to the help of the Experimental Research Laboratory at Jewish Hospital in St. Louis, I have been able to conduct developmental and preliminary tests for the past several months.

We must all agree that as of now there are structural failures of gastric partitioning procedures. If we leave a large pouch initially, for example, the operation is going to fail. However, we know how to fashion the proper sized pouch. The same is true for the channel. If it is large initially, it will lead to failure. Fortunately, having careful intraoperative measurements and calibration we know how to fashion the proper sized channel. There are areas, however, that we have not yet learned to control. Staple line disruption, for example, has been a constant problem. We have done several things to try to decrease the incidence of staple line disruption—the double application of the TA90, and so on—but although we have decreased the problem, we have not yet eliminated it. The same is true for channel enlargement. We have done all sorts of things to try to prevent it, and although we are perhaps close to solving the problem, we have not mastered it yet.

A gastric partitioning clip should satisfy three requirements: 1) it should be nonreactive, 2) it must be an effective barrier to both liquid and solids, and 3) it must not interfere with blood supply to that portion of stomach enclosed in the clip. Because there are a variety of substances that can be used that are totally nonreactive, the first requirement is easily satisfied. I have used Teflon®, ultrahigh molecular weight polyethylene, Mylar® and also stainless steel. Whatever the substance, it should be radiopaque so that its image would be clearly visible on postoperative roentgenograms should they need to be taken. The last two requirements are interrelated and form the essence of my work.

The objective of the research work in the dog is to arrive at a proper clip pressure. To accomplish this it was important to design a pressure sensor probe. Such an instrument was not available. Therefore, I contracted Dr. Jorgenson of the Bioengineering Department of the University of Utah in Salt
Lake City who was able to fashion for me a small probe. He also helped me in finding a way to fix the clip to the stomach so it will not migrate.

The adult clip probably should be about 9 to 10 cm in length and should have a ring at one end which measures anywhere from 10 to 12 mm in diameter. The probe has two gold electrodes that, when touching, establish an electrical circuit that sets off an alarm. This, in turn, tell us that we have arrived at the precise desired pressure. Pressure is measured in millimeters of mercury. There is about a 2 mmHg error due to displacement.

I began a series of experiments in dogs. I inserted a stainless steel clip, secured with very fine screws in the first dog. I placed that clip at 18 mmHg pressure knowing that this was perhaps excessive. Within 48 hours the stomach perforated and the dog died.

We placed the clip at 40 mmHg pressure in the second dog. This clip was metal. The dog dropped from 28 to 22 lb during the first two postoperative weeks. At this point we sacrificed the dog. The stomach on the outside did not look particularly damaged except that it had serosal injury which I felt was caused by the thread on the screws that held the clip together. Looking inside of the stomach before removing the clip, I could see that the approximation of the mucosa was quite good and there did not appear to be any unusual reaction. The only reaction was at the point where the screw went through the mucosa. There was a little granulation tissue in the submucosa. However, the mucosa appeared to be intact. Microscopic examination indicated that the changes were not uniform, and there was significant serosal reaction. Other slides showed definite evidence of atrophy of the smooth muscle layer. It can be concluded that, even though gross changes were not apparent, in the dog a pressure of 40 mmHg does indeed cause microscopically confirmed changes.

In the next two dogs I decided to use a Teflon clip at a pressure of 30 mmHg in one, and a high molecular weight polyethylene clip at 20 mmHg pressure in the other. The Teflon clip placed the channel at the lesser curvature, and was held in a position like a button by going through posteriorly and coming out and tying it in the front. The polyethylene clip allowed for a channel at the greater curvature.

These dogs seemed to tolerate the operation very well, and there was no indication initially that anything was happening to them. I want to keep them as long as possible in order to study the long-term effects of this clip on
the stomach. At this point studies are incomplete and it is premature to make any predictions about the possible use of this method in humans.
PROXIMAL GASTRIC EXCLUSION
George K. Alexander, M.D.

The operation that I use is basically a proximal gastric exclusion (PGE). Approximately 8% of the proximal stomach is excluded from the remaining segment by application of two double rows of staples which I apply 1.5-cm apart. I don't believe the staples are strong enough to prevent failures. For this reason I apply a strip of Mersilene® mesh anteriorly and posteriorly and then I reestablish continuity of the GI tract by a side-to-side anterior gastrogastrostomy 1.3 cm in diameter.

I always use a Felling retractor which gives me better exposure. I believe that to make a small pouch it is necessary to mobilize the greater curvature. I merely ligate the short gastric vessels all the way to the gastroesophageal junction, being careful to preserve the ascending branch of the left gastric artery. The opening in the gastrohepatic omentum should be done next to the stomach preserving the nerves of Latarjet. This ensures the blood supply to the proximal gastric segment.

I do not apply Babcocks or any other clamps on the greater curvature. I place the mesh anteriorly and posteriorly and, as I mentioned, I hold it in place with through-and-through nonabsorbable sutures.

This procedure provides protection of the staple line and a handmade anterior gastrogastrostomy anastomosis of a constant size that involves all the layers of the gastric wall. It is performed with a nonabsorbable suture. It requires no bougies and no dilators. This procedure is safe. There have been no deaths in approximately 450 cases to date. It is effective in producing weight loss and the failure rate is extremely low.

I am currently following four groups of patients. Group 1 consists of gastric bypass patients and group 2 is made up of patients with gastroplasties. PEG patients without protection of the staple line, from group 3 and group 4 patients have anterior and posterior reinforcement. I have also done gastric bypasses and gastroplasties.

Because gastric bypass is a more difficult procedure, I had two deaths in that group, one from peritonitis which was not recognized and the other from a pulmonary embolism. My gastric bypass patients had an 18.8% failure rate. With time gastric bypasses tend to fail because the gastrojejunostomy increases in size from the 1.2-cm original diameter to 4.5, 5.0 or even 5.5 cm. The patients still eat a small amount of food at any given time, but they become hungry very
quickly due to rapid emptying. One of my gastroplasty patients died from acute hemorrhagic pancreatitis following a simultaneous gallbladder operation. The most distressing statistic emanating from my gastroplasty patients is their 38.4% failure rate. It was because of this that I changed to the PGE procedure. There have been no deaths in groups 3 and 4. There was one perforation which I repaired. It was possibly caused by a stress ulcer or an injury. Group 3, without reinforcement of the staple line, has a failure rate of 15.1%. To date, with follow-up time ranging from eight to 24 months, the failure rate for group 4 is 0.0%. The one year average weight loss has been approximately 125 lb.
GASTRIC VERTICAL STAPLING
Daniel C. Fabito, M.D.

Gastric procedures have virtually replaced the small bowel shunts for the surgical treatment of morbid obesity. Since the introduction of Dr. Edward Mason's gastric bypass procedure in the mid 1960s, an abundance of significant contributions improving the technique and general surgical care of the morbidly obese patient have come to light. We have the new modifications which are known already and the new instruments, particularly the overhead Poly-Tract Retractor System and the Gomez C-clamp.

As surgeons gained more experience with the different bariatric procedures, it became evident that a greater rate of success could be obtained with adherence to three technical details. Pouch volume must be ≥ 50 ml, the staple line must be secure and the channel must not dilate.

From January 1976 through December 1980 I operated on 590 morbidly obese patients. I used gastric bypass in 115 patients, horizontally stapled gastroplasty (Gomez) in 167 patients and vertical gastric stapling in 310 patients.

Technical problems, complications and revision rates in my experience with the use of the gastric bypass and gastroplasty procedures prompted me to devise an alternative but simple and effective method of gastric stapling. In addition, I have used a modified AutoSuture TA90 stapling instrument making it easier and quicker to staple the stomach without removing staples from the end of the cartridge.

One common denominator unites all previous gastric reduction procedures. The mobilization of the upper fundus and the taking down of the short gastric vessels. I believe that many perforations are caused by distention and lack of blood supply. If you remove the short gastric vessels, the patient relies on blood supply coming from the lesser curvature side. If the pouch distends and the blood cannot reach that area, there will be a perforation from necrosis.

At this meeting in 1979 I briefly introduced my technique of gastric vertical stapling that I call a "Fabito gastroplasty." Basically I adopted Dr. Mason's idea of putting a chromic ring around the outlet. I supported it with 2-0 polypropylene suture. Upon completion this procedure creates a pseudopyloric ring.

I use the C-clamp and also a retractor which is another modification of the bar. The ideal gastric bariatric operation should be technically easy and
simple. It should have few intraoperative and postoperative complications. It should be effective. The procedure should be complimented with good nutritional education and behavioral modification. Without this I think many patients will fail to lose and maintain weight loss.

By December 1979 I had revised 26 of my gastric bypass patients. This gave me a 22.6% revision rate. With the Gomez gastroplasty, I had a 14.4% revision rate. I found that my gastric bypass patients who eventually had revisions did not begin to fail at weight loss until after one year. The corresponding patients with gastroplasty begin to fail after six months. Other complications included one gastric pouch volvulus. This was caused by an adhesion. I had four perforations with the gastroplasty.

By the end of December 1979 I had a series of 189 patients with vertical gastric stapling. At that time I reviewed my experience and found no perforations, no splenectomies, a 2.7% occurrence of hernias and a revision rate of 1.6%. Mean one year weight loss was 82.5 lb.

To compare gastroplasty with gastric bypass, I combined the gastric stapling and the horizontal stapling and came out with a 7.3% revision rate. I believe that gastroplasty is clearly better than gastric bypass, and vertical stapling is clearly superior to horizontal stapling.

I adhere closely to my protocol for gastric bariatric surgery. I consider the first office visit to be very important. A history of weight loss and a thorough physical examination are completed and the candidates checked to ensure that they meet the criteria. I show the patients films on exercises for overweight patients and proper nutrition. I give them an information booklet on gastric vertical stapling. During the hospitalization phase the patient attends preoperative diet classes. I remove the nasogastric tube on the second postoperative day. The patients receive miniheparin for the first five postoperative days.

The procedure consists of making an incision over the gastrohepatic omentum and the caudate lobe of the liver. Because of my bad experience with horizontal stapling even with a double application of the stapler, I support my staple line with 2-0 polypropylene suture from front to back. To avoid making holes in the glove, a sterile thimble can be used.

I support the outlet channel with a Silastic® ring that was suggested to me by Dr. Henry Laws. Using a Keith needle I pass 2-0 polypropylene suture twice
puncturing the stomach at the staple line to secure the ring in position and prevent its erosion.

By December 1980 I had accumulated 310 patients with my new technique. There were no intraoperative splenectomies, postoperative pouch perforations or staple line disruptions. The six-month postoperative mean weight loss was 71 lb or 39.7% of excess weight. By 12 months the patients had lost an average of 44.8% of excess weight. There were ten revisions. Since I began using the Silastic ring, I accumulated 48 more patients. I reviewed them on April 30, 1981, and at that time patients had an average six-month weight loss of 78.9 lb.

In summary, gastric vertical stapling is technically easy and simple to perform without mobilizing the upper greater curvature. It has less intraoperative and postoperative complications. It has a low revision rate with no incidence of gastric staple line disruption. It is effective with acceptable weight loss. It is easy to perform endoscopy should the need arise. It is also technically easier to revise should that become necessary.
LESSER CURVATURE GASTROPLASTY
Norman Halpern, M.D.

Gastric reduction surgery has been evolving for several years, the evolutionary process continues. Although at the University of Alabama our operation is technically similar to that of most other bariatric surgeons, we do have some variations and preferences.

We believe that positioning and retraction are very important for the safety of the operation. We use an extreme headup position for the patient. We also use the Poly-Tract Retractor System over a midline incision.

We attempt to limit our dissection to the area between the esophagus and the upper short gastric vessels to avoid interrupting the blood supply. We initially mobilize the attachment of the stomach to the retroperitoneal area, and, of course, open up the lesser omentum creating a retrogastric soft tissue tunnel.

The first stage is to lay the staple line. We have not used a modification of the stapling instrument. We simply cut off a portion of the cartridge. Using a cast saw I cut through the fourth staple hole. This method seems to work adequately. Rarely has it left a channel that was too large. Occasionally I have had to remove a staple when it became apparent that the outlet size would be insufficient.

We use only one application of the stapler and reinforce the staple line with a double armed polypropylene suture extending from the upper part of the fundus to the channel.

Stomal reinforcement consists of passing a polypropylene suture from the front to the back of the stomach and then threading a small, 42-mm long Silastic catheter over the needle. The needle is then passed again through the stomach so that we have a double encircling, polypropylene that passes through a Silastic catheter. It is snugged down over a 32F dilator which gives a stomal diameter of about 11 mm. After ascertaining that hemostasis is adequate, we sew one layer of interrupted sutures to bury the ring.

We estimate pouch volume, but we do not actually measure it. Upon completion, it looks like the barrel of a 50-mm syringe.

Over the past year we have performed this operation on 69 patients. About a dozen additional patients had simultaneous procedures, such as revision of a previous gastric operation or takedown of a small bowel bypass, but they are not
included here. The majority of our patients, as is the case in most studies, are women. The weight ranged from 205 to over 500 lb with a mean of 294 lb.

Fortunately, there were no deaths, pulmonary emboli or gastric leaks. Although we encountered four instances of a clear fluid collection within the wound, none were frank wound infections. There was one wound infection, however.

One patient probably has a staple line disruption, although it is difficult to tell from a recent upper GI series. We have seen one case of documented ring erosion. This patient presented with symptoms of a stomal ulcer. She had pain and a small degree of hematemesis. On endoscopy, we could clearly see the channel with the Silastic ring protruding through an eroded, stomal ulcer-like area. The endoscopist was able to use his suture cutting instrument to divide the polypropylene and retract it. In the past six weeks she has done quite satisfactorily, but I cannot predict her final outcome.

Weight loss averages about 30% of original weight by 14 months. This is comparable to other procedures. Certainly more time and more patients are needed to determine the long-term effect of this procedure.

QUESTION: How do you do an endoscopic dilatation of a stenotic stoma?

HALPERN: If the stoma is on the lesser curvature it is easier to visualize. We instructed one patient to swallow a string. This allowed the passage of dilators. We have only three patients that have required dilatation.

COMMENT: We use Puestow dilators.

O'LEARY: We had a patient who had stenosis of a gastrogastrostomy. The patient developed outlet obstruction, nausea and vomiting. We performed endoscopy on the patient using a #7 inhalation catheter attached to the endoscope. We were able to manipulate the end of the catheter through the orifice, blow it up and pull it back. We repeated this step eight or nine times. During a second endoscopy we again repeated the step another six or seven times. Since then the patient has been able to eat and has done reasonably well. One should at least try to dilate such outlets before submitting the patient to another procedure.

MUSTANI (Charleston, West Virginia): I have used a simpler technique to dilate a stenotic stoma. We use catheters that are similar to embolectomy catheters but with very firm lumens. Catheters are now appearing on the market that will pass through the gastroscope. The largest one is 15 mm. It can be passed into the lumen and inflated with fluid. It dilates very nicely and can be calibrated from 10 to 15 mm.
PRINTEN: We have heard about several different kinds of operations today, each one presented by a prophet who states that his procedure is perhaps the best thing since sliced bread. This may or may not be true. I believe that if you are doing an operation on the stomach that produces 50% weight loss at one year and about 60% at two years, if you aren't killing more than 1% of your patients, and if they don't have metabolic complications, then you should not change. Maybe there really is more than one way to skin a cat. I think we would be mistaken to jump off and do something different.

LAWS: Has anyone used an Angel Chick prosthesis around the outlet?

WILKINSON: I do not know of anyone that has. In 1978 I was interested in vertical gastroplasty and it would appear from what has been presented today that it does have a great deal of merit. I did several vertical gastoplasties then, using a 36F bougie. We stapled the entire lesser curvature. In order to empty the blind pouch of the stomach we brought up the ligament of Treitz. We did what amounts to a Nissen fundoplication over the staple line with the idea of preventing leaks. On the fourth postoperative day one patient treated this way ate a large quantity of food and developed a subphrenic abscess. At reoperation we discovered that apparently a staple had pulled out near the upper end. We just put an irrigation sump in the subphrenic space. After a few weeks of irrigation she recovered. I talked with her on the phone last week. She has lost from 235 lb, down to 175 lb and she eats very slowly. I thought the gastroenterostomy was probably closed by now. It has been three years but apparently it hasn't because there is no reported huge cyst in the left upper quadrant.

DIXON (Charleston, South Carolina): I assisted a colleague of mine who did a gastric bypass procedure. The patient had a hiatal hernia with esophageal reflux and at the time that we did the gastric bypass we placed an Angel Chick prosthesis. At a visit four months after operation the patient was found to be getting along very well and losing weight quite satisfactorily. There have been no complications.

COMMENT: I have put several of the Angel Chicks in patients with gastric bypass. One of these patients unfortunately passed the Angel Chick through the rectum about two months later. Eventually the patient recovered. The other patients had no problems. Nevertheless, I am no long using them.

COMMENT: I have been doing vertical stapling for three or four years and have three patients with marked reflux and incompetent lower esophageal sphincters.
The vertical stapling with a traditional single plication is adequate. The placement of other foreign bodies is an improper approach to the treatment of reflux esophagitis.

COMMENT: I am distressed that the feeling is coming across that the pouch should be made as small as possible or that it couldn't be any smaller. I think that we should be very careful with this. I am extremely concerned that if you feed someone out of a shot glass, for instance, that we might really create a malnutrition problem. We are going from one extreme to the other. If the stoma is made so small that the patient has to be fed liquids, we may be creating a behavior modification that would tend to support obesity; that is the patients might just consume vast quantities of liquids. Perhaps we should establish guidelines.

LAWS: It appears to me that our major problem at this point is inconsistent weight loss or unpredictable weight loss. Every surgeon has a patient or patients who fail to lose weight. This may very well be due to patient selection. There are people who are just not going to comply with any sort of regimen and expect the operation to do everything. Poor patient compliance is part of failure. Technical inadequacy is certainly a factor and we have had surgeons here today tell us that their operations were probably inadequate and I think that is very commendable. On the other hand, I do believe that we see some operations that work and work fairly well.
GASTRIC STAPLING IN A SUBURBAN HOSPITAL
S. Ross Fox, M.D.

This is not a scientific presentation but rather the experience of one surgeon with the three gastric partitioning procedures that have been discussed today: gastric bypass with loop gastrojejunostomy, gastroplasty with a greater curvature stoma (Gomez), and vertical gastroplasty (Fabito), which is the procedure we are currently using.

Our procedure is similar to that of Dr. Fabito. We place one hand behind the stomach and bring a finger out through the esophagealgastric (EG) junction to create a window. Using Dr. Mason's technique we thread a catheter through the window and attach it to the anvil of the TA55 rather than the TA90. We ligate the right gastric artery and vein at approximately 7 to 9 cm from the EG junction and then we pass the TA55 across, beginning at the lesser curvature side. We leave four staples out of the heel of the instrument to allow for the stoma. It is very easy using the TA55 to make the staple line. We apply the stapler twice and then, using an aluminum finger splint instead of a thimble on the index finger, we completely reinforce the staple line with a locking 2-0 polypropylene full thickness suture. Finally, using a 30F bougie passed through the esophagus, we create a pseudopylorus by applying two layers of seromuscular sutures around this stent. Rarely do we make a pouch size larger than 20 ml; in a lot of patients the pouch volume is 15 ml. One advantage of this technique is that you can make the pouch size very tiny.

Our main reason for shifting to this procedure as opposed to the horizontal gastroplasty is that it is a lot easier to perform. In an effort to tangibly demonstrate this, we compared the blood loss of the three procedures. This includes about 173 patients. The average blood loss in our patients with gastric bypass was in excess of 400 ml, with horizontal gastroplasty it was 270 ml but only 170 ml with the vertical gastroplasty. We feel this is perhaps one measure of the simplicity of the procedure, although other possible contributing factors such as the surgeon's familiarity with the technique cannot be completely discounted.

The average hospital stay is 5.2 days. We have performed nearly 100 vertical gastroplasties. We have had no pouch perforations nor have we ever had a staple line disruption.

I feel that the failure rate is related primarily to the number of follow-up visits that the patient has. Without establishing a good follow-up
program, you are destined to failure regardless of how well you do the procedure. I think a commitment from the patient is extremely important, so much so that I have them sign a contract with me. They write it in their own handwriting stipulating that if I do the surgery, they will eat only three meals a day and all of those meals will come out of shot glass-sized containers. On their second preoperative office visit I spend an hour and one-half talking with them. I give them a one ounce shot glass and they make a commitment to me that they will live out of that shot glass until they get down to a reasonable size.

They also make a commitment to come into the office regularly, as often as once a month. They are to exercise daily for 30 minutes and I require vigorous exercise such as jogging, swimming, jumping rope or something that stresses their cardiovascular system. I also get them to promise that if their psyche resists their weight loss and they encounter mental problems, they will see a psychiatrist; about 10% of our patients need psychotherapy. Finally I get a commitment from them to go see a personal grooming counsellor if there is something about their personal attributes that can be enhanced. We are, among other things, changing their self-image, and I want them to know about this in advance. If they fail for any reason to lose weight, I remind them of their contract and make them feel a little guilty. How effective this method is, I don't know, but it is a behavior modification technique and I think it is working.

We also make a weight graph. Each patient gets a chance to see his or her graph every time they come into the office. They can tell instantly by looking at the graph how effective the procedure has been and whether they are losing weight.
The surgical procedures for morbid obesity carry a higher morbidity, mortality and failure rate than most elective operations. Therefore, proper selection of patients should yield an improvement in these factors. We have tried to achieve this through a vigorous preoperative workup that includes a team consisting of a surgeon, an internist specializing in gastroenterology and a psychiatric social worker. In this fashion, the patient is exposed to the facts of the procedure three different times and from different sources. The case being presented today will illustrate our suggested preoperative workup.

At the initial visit the patient receives literature similar to that distributed by The University of Iowa. We insist that the patient's spouse or next of kin be present during the interview.

The subject of our case report is a 40-year-old female patient who weighed 265 lb, and measures 5 foot 3 inches in height. This patient underwent our suggested preoperative workup. During the history and physical examination we tried to document the degree and duration of obesity, the methods and amounts of attempted weight loss and any possible amphetamine addiction, history of peptic ulcer disease, liver disease, endocrine abnormalities, nephrolithiasis or cholelithiasis.

In our laboratory we performed a complete blood count with differential, an SMA 12, electrolyte studies, a urinalysis, T3, T4 and T7 determinations, a lipid profile and a five hour glucose tolerance test. We carried out a chest roentgenogram, an oral cholecystogram, an upper GI and small bowel series, a barium enema and an intravenous pyelogram. Our cardiopulmonary evaluation consisted of an electrocardiogram, a treadmill stress test designed for hypertensive patients or those over 40 years of age, a valium stress test for patients with equivocal or positive treadmill stress test results and pulmonary function tests.

Our psychological workup includes an interview with a psychiatric social worker and completion of the Minnesota Multiphasic Personality Inventory test. During a second interview, the social worker reviews the results of the test with the patient. We use our psychological workup to assess the patient's understanding of the operation and complications, to evaluate the ability of the patient to cope with thinness, to educate the patient and reinforce the pre- and postoperative regimens such as the use of thigh high Ace bandages and Foley
catheter the morning of the operation. The patients must also have postoperative nasogastric suction for 72 hours. In the immediate postoperative period all patients are admitted to a respiratory care unit where they are monitored. They receive postoperative respiratory therapy every two hours around the clock. We stress early ambulation, a progressive post gastric bypass diet from day four on, life-long dietary discipline and a monthly follow-up visit until weight stabilization occurs.

The subject of our case report underwent this preoperative workup and was found to have negative results on all of the tests with exception of the barium enema which showed a polyp in the rectosigmoid and sigmoid descending junction and a constricting lesion in the rectosigmoid area. She underwent colonoscopy, polypectomy and biopsy of the lesion which proved to be an infiltrating adenocarcinoma. After the colonoscopy and positive biopsy, the patient underwent total colectomy with ileoproctostomy. She returned 11 months later with a recurrence of the carcinoma at the anastomotic site. At that time we performed proctectomy with ileostomy. Radiation and chemotherapy were instituted. Eleven months later, the patient again returned, this time with a small bowel obstruction. She expired two years after the initial discovery.

In other patients, the physical findings have shown varicose veins, multiple sclerosis by history and degenerative joint disease. Our laboratory tests have uncovered abnormal liver function tests, nontoxic goiters, type IV hyperlipidemias and cases of diabetes mellitus previously unknown to the patients. Our x-ray studies have diagnosed cholelithiasis, hiatal hernia and reflux esophagitis, erosive duodenitis, pelvic masses from uterine leiomyomas, periovarian cysts, ovarian cysts and kidney stones. Our pulmonary findings have demonstrated small airway obstruction, premature ventricular contractions and hypertensive response to treadmill exercise. During our psychological examination we have found depression, amphetamine abusers, psychopaths and intellectually restricted patients.

After the patients are approved and are deemed candidates for operation, they undergo gastric bypass with a 50-ml pouch capacity, a 1-cm gastrojejunostomy with a 60-cm Roux-en-Y limb. We use a double row application of staples. We also use the foot rest, the Swiss retractor (AutoMated Medical Products, Corp.) and the table tilt.

In conclusion, our vigorous preoperative workup is of value for the following reasons: We identify patients with absolute contraindications for the
surgery such as the one presented here. We try to identify and control major medical conditions to optimize postoperative results. We identify other significant medical conditions that may be significantly improved by weight loss. In addition to these obvious benefits to the patient, we minimize the medicolegal risk for all the physicians involved.
CONTINUOUS THORACIC EPIDURAL ANALGESIA IN THE OPERATIVE MANAGEMENT OF MORBID OBESITY

Peter Buckley, M.D.

The morbidly obese patient undergoing anesthesia and surgery on the upper abdomen poses certain problems for the anesthesiologist. Such a patient requires an increased dose of volatile agents and relaxants, and the reversal of the relaxants at the end of the procedure may be difficult. Morbidly obese patients also metabolize the volatile agents to a greater extent than normal patients, and this at times may cause toxicity. Moreover, intra- and postoperative hypoxemia is a fairly common finding. It can put the patient at greater risk and is associated with altered lung volumes, particularly in regard to functional residual capacity. Many papers claim that morbidly obese patients have a high incidence of postoperative respiratory complications, but looking through the literature this can not be well documented.

It has been suggested that a somewhat different anesthetic regimen to that which is normally practiced may benefit morbidly obese patients. This regimen consists of a thoracic epidural block accompanied intraoperatively by a light general anesthetic. The thoracic epidural block is continued postoperatively for analgesia. Many benefits may arise from such a regimen including the reduction of the volatile anesthetic dosage, which in turn leads to earlier awakening, early mobilization and possibly the preservation of a better respiratory status in the postoperative period. Obviously, the metabolism of the volatile anesthetic agents will also be reduced. Moreover, the regimen may eliminate the need for neuromuscular relaxants and, providing good postoperative analgesia, may thus avoid the need for narcotics. Reduced dependence on narcotics during the postoperative period provides the patient with better respiratory status. Furthermore, because the analgesia is excellent, the patient can better comply with the respiratory therapy maneuvers.

Our goal was to examine these ideas in a retrospective study. Our two major purposes were to look at the incidence of serious postoperative respiratory complications and to see if these were affected by using thoracic epidural analgesia.

We tested the extent of the block. The ideal blocks would extend from T4 to L1. Following this the patients underwent an awake intubation or rapid sequence induction intubation. We maintained anesthesia with nitrous oxide, oxygen, volatile agents and, in a small group, with relaxants. At the end of
the procedure, the relaxants were reversed. We insured that the patients met extubation criteria and they were taken to the recovery room. In the recovery room patients having had a general anesthetic (GA) received narcotic analgesia whereas the epidural block group received epidural analgesia for a mean period of six hours. This period varied from two to 24 hours.

Twenty-eight patients received a GA either because of patient preference, anesthesiologist preference, contraindications for blocks or because we failed to produce epidural block (11 cases). Forty-two patients received the epidural block.

Patient age was similar in both groups. There were greater proportions of men in the GA group than in the thoracic epidural block group. Height, weight and body mass index were all similar.

Preoperative findings amongst these patients can be broke down into two particular aspects. The major risk factors were preexisting cardiovascular disease and preexisting pulmonary disease. Both of these were more prevalent among the group receiving the thoracic epidural block. The thoracic epidural block group also had a greater incidence of pulmonary symptoms, smoking history, abnormal pulmonary function tests and so on. However, again, the differences were significant.

We considered adult respiratory distress syndrome, aspiration pneumonitis, bronchospasm, pneumothorax, pneumonia, respiratory insufficiency, and combination of these as serious postoperative respiratory complications. Twenty percent of patients in both groups had some serious postoperative respiratory complication. I must stress that we made no effort to exclude patients with preexisting disease. As an example we had one patient who was having a gastric bypass in order to lose weight prior to having a mitral valve replacement. Patients with preexisting cardiopulmonary disease had a 38% incidence of serious postoperative respiratory complication.

Upon looking at the two groups individually, we found that nine of 28 patients (32%) in the GA group had a serious postoperative respiratory complication. In the epidural block group only 12 of 42 patients (28.5%) had a serious postoperative respiratory complication. This difference was found to be significant (p <0.5). When we compared the two groups according to type of complications, we found few differences. A higher proportion of patients in the GA group had pneumonia but the difference was not statistically significant. However, a significantly higher proportion of patients in the GA group had
respiratory insufficiency or the occurrence of multiple events. The total number of patients having pulmonary complications also produced a statistically significant difference with the GA group having the greatest incidence.

I stress that this is a retrospective study. Nevertheless, it has produced some very bold figures. We do not know why the epidural block appears to be more beneficial to the patients. It may be because they are getting less interference with pulmonary gas exchange intraoperatively, that their lung volumes are altered postoperatively, or that they get improved analgesia and therefore can comply better with respiratory therapy. Much is left to be studied before we can draw definite conclusions. The effect of epidural block on lung volumes and pulmonary gas exchange should be examined carefully. In the meantime, epidural block promises to improve perioperative patient care in the treatment of morbid obesity.

TERRY: Does the analgesic keep the patient in bed? Are they able to sit up on the side of the bed or are they stationary in bed?

BUCKLEY: The patients aren't strictly stationary in bed. Of course a short paper like this one can't present everything we found. We did find that the overall volatile anesthetic dose was reduced. In general the epidural block patients awake sooner. They are able to sit up immediately and leave the recovery room sooner. They can move around in bed. They can cough and deep breathe. We do not routinely come up and walk them in the recovery room. It may not be possible to do that with all of these patients because of systemic hypertension. Nevertheless, we nearly always have them sit up 45 degrees in the recovery room. They do move their legs. One of the things we have noticed with this group of patients so far is that, regardless of what type of anesthesia they receive, there have been no clinical deep vein thromboses or clinical pulmonary emboli.

TERRY: What is the relative risk that you might possibly paralyze respirations? Has this not occurred with your technique?

BUCKLEY: Certainly you can paralyze respirations if you give a big enough dose, but the purpose of using a thoracic block as opposed to a lumbar block is precisely that you can reduce your dosage making it more predictable. For example, the dose we would use to produce a T4 to L1 block in a morbidly obese patient would be about 7 to 8 cc of 2% Lidocaine. I personally have never seen a patient with respiratory paralysis following a thoracic epidural block, either obese or nonobese.
QUESTION: What were your general anesthetic agents?
BUCKLEY: We used halothane and enflurane as the general anesthetic agents.
PHYSICIAN CONSENSUS ON DIETARY CARE
Ellen F. Schaaf, R.D.

We all have expectations regarding how we want this surgery to result. We want a safe, effective weight loss but our definitions of success are varied. The patient wants it fast. The dietitian wants it nutritious and the surgeon wants it without any complications. We all have difficulty communicating and suggesting to one another how to meet each other's goals.

Ascertaining the surgeon's expectations of the patient and the dietitian was the objective of a questionnaire sent to all physicians who came to this conference in 1980. Thirty-two percent of these surgeons perform gastric bypass, 45% perform the Gomez-type gastroplasty and 39% use some other form of gastric partitioning. Some surgeons use more than one procedure and almost all surgeons claim to have used a different form of the procedure at some time during their experience in the past ten years. All combined, the surgeons had operated on more than 12,000 patients. This gave each surgeon an average of approximately 210 patients.

The questionnaire asked what diet orders were given and what kind of follow-up program was being used. Seventy percent of surgeons recommended a liquid blenderized diet sometime during the postoperative course. Approximately 75% utilized the liquid diet for four to eight weeks; 22% said less than four weeks; and only one surgeon recommended it for greater than 12 weeks. Other recommendations for dietary put emphasis on behavior modification. For example, many surgeons recommended the use of small plates and stopping eating with the sensation of fullness. The liquid diet is recommended not only because it is easier to tolerate, but because we believe that it prevents disruption of the staple line during that initial period of postoperative healing. It is a means to achieve a nutritious diet.

About 75% of surgeons answering the questionnaire claimed to have from five to ten follow-up visits with each patient. Most of these visits became progressively less frequent with time.

The assessment of nutritional status was the primary function of these follow-up visits. Nutritional assessment included laboratory data, dietary intake data, the patient's sense of physical well-being, and anthropometric measurements. Almost all of the surgeons utilized height and weight information. Laboratory examinations were carried out either routinely or only
if necessary by 84% of surgeons. These tests included primarily complete blood counts and albumin and electrolyte levels.

The majority of surgeons deemed dietary history and food records as necessary. Approximately 82% either used the dietary history or the food records, but only half of the surgeons actually evaluated these measurement tools themselves. The other half relied on the services of a dietitian. The surgeons were most interested in measuring the effect of the operation on diet, caloric intake and portion control. To a lesser degree they wanted the dietitian to teach about the basic four food groups and safe weight loss. A far distant third was their interest in food records and caloric counts. This is interesting because follow-up visits are necessary in order to do food records and caloric counts. Patients cannot be relied on to do this accurately. As Dr. Halverson so clearly stated said yesterday, the bottom line is calories. The patients can be on a liquid diet or a solid diet. They can have the most beautiful stoma and staple line. But unless they are restricting the caloric intake, none of them will lose weight. Calories are very important. Just 500 calories a day can make a difference of 1 lb a week or 50 lb a year. It is surprisingly easy to make an error of 500 calories during the dietary intake assessment.

All surgeons answering the questionnaire believe that during the hospital stay instruction by the dietitian is essential. Seventy-one percent answered that the dietitian was necessary postoperatively. However, only 32% of surgeons actually do utilize the dietitian in their postoperative care. I believe dietary care is very important. These patients are morbidly obese or they have extra fat, but they do not have extra protein or mineral and vitamin sources. Although responses in the patient may be clinically difficult to evaluate initially, over a long period these patients may be at serious risk from nutritional deficiencies.

The benefit of the dietary history is that it gives the surgeon necessary information to evaluate the patient's diet. Food records benefit the patient in that they provide feedback and thus become a behavior modification technique. Dietitians can be very helpful in detecting early the symptoms or food eating patterns that will ultimately lead either to weight loss failure or nutritional complications. They can also be most helpful in assisting the patient education and behavior modification process. I encourage the utilization of the dietitian who can save the surgeon time and help the patient to achieve success.
THE #40 SCOOP DIET
Linda Colwell Smith, R.D.

Our surgeons started performing gastric bypasses and gastroplasties a little over two years ago at Sycamore Hospital. The diets given to patients have gone through evolutionary changes to accommodate the changes the physicians have made in their preferences. Different physicians ordering different dietary regimens caused a certain amount of frustration for our staff and often the physician's orders were not appropriately interpreted. A multidisciplinary committee was formed to advise about the care of patients having gastric reductions. This committee consisted of physicians, dietitians, nurses and other health professionals. One of the byproducts of this committee is the #40 scoop diet. Admittedly the #40 scoop is a gimic, like the shot glass or the egg shell, but it has proven to be an effective means of measuring the caloric intake and food volume of gastric reduction patients.

The #40 scoop is a very small scoop used for ice cream. One level measure from this scoop is equal to 1.6 tablespoons or about 24 ml. The #40 scoop is used to measure the amounts of foods that the patients receive.

Patients are given a diet guideline which lists foods according to the number of calories per #40 scoop serving. Grams of protein per serving are also listed. Patients are instructed to take tiny bites, chew very well and eat slowly. A walk around the nursing units aids digestion after eating. After dietary instruction by the nutritionist, the patient is able to plan a daily intake that complies with the total calories and food volume prescribed by the physician. Usually no more than 300 calories are allowed. Patients are encouraged to emphasize intake of those foods that are high in protein. In addition the physicians prescribe a multiple vitamin and mineral tablet. In this fashion, the patient is able to make intelligent food choices in order not to exceed the limits prescribed by the physician for optimum weight loss while at the same time consuming as much protein as possible.

Included in the dietary guideline is a list of very low calorie beverages. We encourage the patient to drink freely of these between meals. Patients are not permitted to drink with their meals. They are instructed to stop fluid intake 30 minutes before meal time and to wait at least 30 to 60 minutes after eating before they begin drinking again. This prevents the fluids from washing solid foods out of the pouch too quickly.
Our patients are not placed on a pureed regimen. After about three days of liquids, the patients progress to small amounts of soft solid foods. Our surgeons feel that the solid foods of a high protein content provide a higher satiety level than pureed foods. Although we recommend water between meals, artificially sweetened, sugar-free, soft drinks are permitted for variety as well as other beverages such as artificially sweetened Kool-Aid® and lemonade. Diet popsicles can be made from these beverages.

We discovered that many patients experience early intolerance to meat, especially beef and pork. Because high quality protein is of premium importance in this extremely low calorie regime, high protein vegetarian entrees are offered as an option. Soft cooked egg, custards, low fat cottage cheese and some of the softer textured vegetable proteins have proved to be satisfactory alternatives. A significant number of our patients, however, experience no problem with meats if they are thoroughly chewed.

All gastric reduction patients are given a packet of materials entitled Meals Minus Meat that includes The Restaurant Guide to Creative Cuisine prepared by the Miami Valley Chapter of the American Heart Association. Although designed to be used primarily by cardiac patients, persons who have had gastric stapling procedures find the information in this booklet helpful in choosing restaurants in the Dayton area that offer low fat dairy products, diet salad dressing, half portions and children's portions.

The #40 scoop diet is not perfect. It is not the answer to all of the dietary problems encountered by these patients, but for us it has proved to be an effective means of satisfying the dietary requirements prescribed by the physicians using our hospital facilities at this time. It is also very adaptable.

TERRY: Are there data to prove that liquids do not provoke satiety.

SCHAAF: Satiety is a very difficult thing to measure and as we all know it is based on a variety of input factors. There are certain important psychological factors. For example, if the patient sees a small amount of food, he/she is not likely to be satisfied, especially when they are used to eating large plates full of food, whether liquid or solid. The length of satiety depends on how long food remains in the stomach and on blood sugar levels.

TERRY: How do you tell the patient how much food to consume?

SCHAAF: I instruct them according to the number of cups of food per day. I recommend four ounces of meat per day.
TERRY: What is the basis for four ounces of meat? What would your total protein allowance per day be for these people?
SCHAAF: I base the protein allowance on the patient's height and ideal body weight. Four ounces of meat and two cups of milk contain approximately 45 gm of protein. This amount meets the recognized standards.
TERRY: Doesn't the optimum amount of protein vary according to ideal weight? Does each patient need a tailored diet?
SCHAAF: To a certain extent yes, I do recommend more protein for patients with higher ideal weights.
TERRY: Do you think the patients are fulfilling their daily protein requirements?
SCHAAF: No, our patients are not meeting their protein requirements.
BUKOFF (Iowa City): I think when a diet is selected you really have to be very realistic about the patient whom you are treating. It is nice to look at formulas on paper but we have to realize that patients just don't often follow dietary instructions at home. I encourage you all to analyze the methods you use and to think about the patients with whom we are dealing. Less restrictions may sometimes be better. You have to consider all of these things that the people have presented today. After operation the patients have a lot of adjustments to make and they will have to stay on some kind of diet for the rest of their lives.
TERRY: There should be an optimum stomach pouch size. We must be very careful that we don't make the pouches smaller and smaller to the point that nothing is left.
STEVEIS (Tulsa): I wonder how many surgeons actually see serious protein malnutrition in their patients. I have not seen it in my patients.
TERRY: Do you know how to tell a patient how much to eat?
ANSWER: I don't know how to tell them how much to eat. They are not going to follow instructions anyway. The patient population with which we are dealing has a very hard time understanding food groups and egg shells and the shot glass. They go home and do what they want anyway.
QUESTION: Have we definitely created a situation in which special diets are necessary, or are the patients able to feel their way by themselves after losing weight?
TERRY: I believe very few of us are be able to answer that question.
There seems to be two different trends of thought developing here. Some believe the patients will come around to the right way of eating and be successful on their own. Others believe we should play a more active role in structuring the patients' behavior regarding food intake. Each of these conflicting ideas must stand the test of time before we will know which is best.

SCHAAF: I believe that the operation alone will produce an immediate weight loss in these patients. However, to maintain long-term weight loss, the patients need to change their lifelong eating behavior patterns. They must be instructed in the principles of good nutrition.
NONOPERATIVE FACTORS INFLUENCING WEIGHT LOSS
Cathy Mojzisik, R.N.

One of my patients described to his wife all the positive aspects associated with being obese. He said to her, "Honey, I can give you two things that no other man can give you, warmth in the winter and shade in the summer." Since the advent of electric blankets and awnings, there is no longer any real need to be obese and we at the Ohio State University feel the same way. Through our observations we have identified factors that may influence the outcome of the operation.

We studied 50 patients at one year after the double row gastric partitioning procedure. These patients were divided into groups according to mean percent weight loss. We defined success as having lost 25% or more by the end of the year, and failure as 15% or less. Because we were interested only in identifying factors that influence success and failure, the patients with weight loss falling between these two groups were excluded. We studied physical, social and psychological variables.

Sixty percent of patients that failed had been obese since childhood. It has been reported that such a patient may be more resistant to weight reduction therapy. We found this to be true in spite of the surgical procedure. Furthermore, patients that were successful tended to be younger.

Patient expectations regarding the operation should be determined to identify their goals. Both realistic and unrealistic goals can influence the outcome. The expectations mentioned most often by the patients consisted of improving health, losing weight, and changing the physical appearance. Sixty percent of the patients that were successful had identified a health benefit and wished to prolong life. A simple discontinuation of antihypertensive medications or an increased tolerance to exertion can be an early recognized benefit of weight loss. This awareness of improving one's own health can be an everlasting weapon in the battle of the bulge.

Unsuccessful patients never identified a health benefit. Their primary goal seemed to be to change their physical appearance. For some patients this may be an unrealistic expectation; for others, such change may go unrecognized because of their own inability to perceive it after weight loss. If the change is not recognized or does not occur, then it loses its motivational potential.

Sixty percent of the people that were successful had an associated metabolic disorder at the time of operation. Such a patient may be more likely
to succeed if he/she can recognize the potential risk of the metabolic disorder and the benefits of weight loss.

We found that certain complications such as a perforation or prolonged daily emesis could also influence the outcome. Seventy-three percent of our patients had at least one complication, most commonly prolonged daily emesis. This negative experience left such an impression on these patients that it strengthened them in their resolve to accept nothing short of success.

We believe that a follow-up program influences the outcome. We discovered that 80% of our patients live within a 100-mile radius of Columbus. These patients come back to the clinic more often, an average of seven times per year. Patients who fail only come back an average of four times per year.

Eating habits must also change. We found that 100% of patients that fail continue to eat the so-called junk foods. By contrast, 53% of the successful group are now making daily food records and maintaining a per diem intake of approximately 1,000 calories or less. They also participate in a daily exercise program.

In summary, the ideal patient should be responsible for his/her own actions, and should be enthusiastic enough to participate in a continuous follow-up program. The patient should reside close enough to permit easy access to the follow-up program. Patients should also be willing to leave the components of obesity behind.

TERRY: In spite of quite a bit of experience, I still regard myself as unable to objectively select patients. I have been proven wrong many times. Often the patient that I think is perhaps not the best candidate will do very well, whereas others do just the opposite. It behooves us to be able to predict the response to whatever operation we do so that our impressions are not muddled by the complications or aberrant results and so we do not pass all blame onto the patient in the event of failure.
STAFF MOTIVATION
Peggy Ketron, R.N.

Our normal bariatric patient census at Sycamore Hospital is approximately 14 on any given day. With this many patients we began to notice a lack of cooperation, not only on the part of the nursing staff but on the part of all ancillary departments as well. Patient care was becoming fragmented and inconsistent. Our patients often felt lost in chaos. Nobody knew what the other person was doing.

We felt it would be helpful to involve the staff in the decision-making process so that they would feel more directly responsible for patient care. We could not expect the staff to become involved in motivating a patient if they did not share certain goals. Therefore, we established such goals. It is also important to reduce prejudice towards obesity so that the staff can deal with the patient as a person on a social, physical and psychological basis.

Our first step was to appoint a multidisciplinary committee. This committee was made up of admission clerks and employees from the outpatient scheduling office, the continuing education and instructional media office, the nursing administration, and the chaplain services, as well as physicians, our nurses, our home care coordinators, our patient relations personnel, dietitians, and members of the radiology department. The committee's first duty was to set ones. We identified four major goals. The first was to reduce resistance among the staff to the operation. The second goal was to reduce ignorance among the staff regarding the operation itself and how it works. The third goal was to reduce staff frustration. Finally, the last goal was to insure continuing education for the staff and patients.

To reduce resistance we set up meetings with all the ancillary departments. During these meetings we solicited the feelings of the participants about the operation. In this way we involved the staff members in the problem solving process, making them responsible for any negative feelings and prompting them to produce positive feedback not only to the patient but to the staff and to the physicians.

To reduce ignorance we asked our patients to come back and visit us after they had reached their goal weight or were well on their way. Being able to see and visit with successful patients greatly increased staff morale.

Our third goal, to reduce frustration, is of key importance. We believe basic needs have to be met before higher goals can be entertained. We found,
for example, that the nursing staff did not have the proper equipment to care for the obese patient. We installed overhead frames with double trapezes on all beds so the patients could more easily position themselves without putting undue strain on the nurses' back. Such an aid cuts down on the physical demand placed on the nurse and it also makes the patient independent. We also provided chairs and other furniture that was comfortable and adequately large for the patients. Daily weight graphs served as a convenience for the physicians staff. They also provided another motivational factor. Special wheel chairs, gowns and a scale for large patients were also purchased.

To insure continuing staff and patient education we developed an extensive orientation program for the new staff. They, in turn, could then teach and motivate the patient. We developed a patient booklet to be distributed at the physicians' offices and also on admission to the hospital. It deals with every aspect of patient care from admission to discharge.

We are currently planning our first local bariatric surgery workshop. We are inviting physicians, residents, and office and hospital nurses to update not only the nursing staff but all of the medical community regarding bariatric surgery.

The advantages of an organized motivational program include patient and staff constructive problem solving, improved awareness of patient need and rights and, finally, a motivated nursing staff. The physician can greatly facilitate the motivation of the nurse by taking a few simple steps. First of all, he should take time to really listen to her needs. The surgeon should keep the staff informed of his desires and goals. Being sympathetic and aware of the nurses' load can greatly encourage morale. Nurses are eager for knowledge. Any instructions that the physician can provide will be helpful and will assist the nurse in meeting the patient's needs.
ANTICHOLINERGICS IN THE RAPID EMMPTIER AFTER GASTRIC REDUCTION
Samuel D. Porter, M.D.

Those of us engaged in performing operations for morbid obesity are periodically confronted with patients who do not meet our weight loss goals for no apparent reason. Some patients fall into the failure category for quite obvious reasons. Most often they are unable to accept responsibility for their eating habits which results in either continual snacking or excessive intake of high calorie liquids. Such patients are, unfortunately, common in our experience. But it is the occasional patient who seems to fail for no apparent reason that is of interest. This is the patient who frequently loses weight initially, often more rapidly than one might expect, but who, at three to five months after operation, stops losing. It is not particularly uncommon to experience a weight loss plateau at this point, but usually it is a short lived. Minor adjustments in eating and exercise patterns prompt renewed weight loss.

The patients that concern me reach a plateau because they have had a change in their ability to eat. The change is quite specific in that they can eat more and are able to eat more rapidly. Very often these people can relate it to a particular meal, such as Thanksgiving dinner, or a specific date. One's initial suspicion is that the staple line has come apart. Nevertheless, to the best of my knowledge we have not had a single staple line dehiscence in 211 gastric operations for morbid obesity. We have examined by upper GI series or gastroscopy the patients who have not had a satisfactory weight loss and in all cases we have found that the staple line is intact.

In August 1979 we changed from gastric bypass to gastroplasty with anterior gastrogastrostomy. To avoid stomal stretching we use a three layer closure with an outer layer of 3-0 polypropylene, running suture, a second layer of 3-0 interrupted Surgilon® and an inner layer of 3-0 chromic. After we place the anterior polypropylene layer, we tie it to the posterior row at each end as the stoma is measured. Hemoclips are placed on the polypropylene knots to keep them from coming untied.

Our preoperative goal for patients undergoing gastric reduction surgery is the loss of 80% of estimated excess weight over a two year period. I consider any patient who does not lose at least 60% in that period of time to have a poor result. Most lose their weight in approximately one year.

We reviewed 112 patients who had gastric stapling with anterior gastrogastrostomy and found nine who failed to loss weight as described above.
They were all women and in all instances, an upper GI series showed the staple line to be intact with a normal postoperative pouch of 40 to 50 ml and a stoma approximately 10 mm in diameter.

We interviewed these patients and determined that they had not changed their eating patterns and were following our postoperative instructions. They continued to avoid fluid with meals, eating between meals and high calorie liquids, and they were still varying foods during the meal in order to have a balanced diet of solids as well as liquids. It seemed likely that emptying time had decreased even though we were not able to demonstrate that with the upper GI series.

We thought it would be worthwhile to try the use of an anticholinergic drug to see if we might slow the emptying of the stomach pouch. We used propantheline bromide which reduces the gastrointestinal motility by inhibiting the action of acetylcholine at the postganglionic nerve endings of the parasympathetic nervous system. We gave each patient 15 mg on rising, followed by 30 mg at 10:30 a.m. and 4:30 p.m. The peak plasma concentration of propantheline bromide after oral administration takes place in six hours, and excretion is completed in ten hours. These women did not experience any urinary retention. Only one patient complained of tachycardia or palpitations. Initially I started with a lower dosage, giving 15 mg three times a day on essentially the same time schedule, but this was ineffective.

Our arbitrary goal was to produce an additional 10 kg of further weight loss after beginning the medication. Five patients lost over 10 kg and had a successful result. Three patients lost not weight and failed completely. One patient lost 8.5 kg in approximately three and one-half months so I did not classify her as a total failure. Of the five patients who showed further weight loss, none reached our original goal for success (80% excess weight loss). Their results are listed in Table 1.
Table 1. Weight loss before and after treatment with anticholinergic drugs

<table>
<thead>
<tr>
<th>Patient</th>
<th>Loss Goal</th>
<th>Loss Before Treatment</th>
<th>Loss After Treatment</th>
<th>% Goal Weight Lost After Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>72</td>
<td>43.5</td>
<td>16.5</td>
<td>22.8</td>
</tr>
<tr>
<td>2</td>
<td>81</td>
<td>54.3</td>
<td>13.0</td>
<td>16.0</td>
</tr>
<tr>
<td>3</td>
<td>52</td>
<td>28.4</td>
<td>12.0</td>
<td>23.1</td>
</tr>
<tr>
<td>4</td>
<td>58</td>
<td>33.4</td>
<td>15.5</td>
<td>27.0</td>
</tr>
<tr>
<td>5</td>
<td>64</td>
<td>37.6</td>
<td>18.8</td>
<td>29.2</td>
</tr>
</tbody>
</table>

During treatment the patients complained of dryness and a bad taste in their mouths. They experienced some loss of taste for food. The bad taste or loss of taste are the most likely factors leading to the desired results of the medication. Our study cannot confirm that the stomach emptying time is delayed by using propantheline bromide. However, the patients stated that they felt their stomach stayed full longer, that they were unable to eat as much, and that they had to eat more slowly. Because of our results, I feel treatment with anticholinergic drugs is worth trying in that group of patients who seem to be rapid emptiers and have either reached a weight loss plateau prematurely or have started to regain their lost weight. Such patients must be reliable in following the eating patterns that we have outlined for them, and they should not have symptoms of reflux.

**QUESTION:** Did you keep your patients on the drug after they had lost weight?  
**PORTER:** No. They won't stay on it that long.

**QUESTION:** How long do you keep them on it?  
**PORTER:** As long as I can, usually about five months.

**QUESTION:** Have you used these drugs in patients with gastric bypass?  
**PORTER:** I have not.
DISCUSSION OF PERIOPERATIVE MANAGEMENT
Boyd E. Terry, M.D.

Candidate selection. The weight criterion is now fairly standard. In
general, the patient should be twice normal weight for height or 100 lb over
ideal weight. The patient should be well motivated and agree to serial
follow-up visits.

Other criteria are also very important, especially whether or not the
patient must have complications of obesity to be a candidate. This a battle
that is still being fought with third party payers. Many insurance companies
refuse to cover a patient who meets the weight criteria but has no complications
from obesity that can be easily demonstrated except for the threat of future
increased morbidity. The complications of obesity need to be documented. To
back up our claims that surgical treatment is important we also need to document
the fact that weight loss produces an improvement in morbidity and mortality.

Endometrial carcinoma is a problem. The hormonal balance in women places
them at much greater risk of having endometrial carcinoma. It is difficult to
palpate the uterus in many patients preoperatively. If there is a preoperative
diagnosis of endometrial carcinoma, I would not want to do the gastric
procedure. There could be some argument about that. I would tend to do
whatever was needed for the carcinoma and then at a later date do a gastric
procedure. Colon carcinoma would present similar problems.

Whether or not patients over 50 years of age are good candidates still
requires more documentation. At this point the decision to operate on such a
patient must be made individually by the involved surgeon. The data so far
indicate that these people do poorly and have a much greater morbidity.

Whether or not to operate on the pediatric age patient is a similar
dilemma. We must define when growth has been accomplished and not interfere
with the growth and development and the rounding out of the skeletal
structures.

Patients with advanced arthritis post another problem to the selection
process. We do not know how successful will be the individual who cannot
exercise and is not likely to be able to exercise. Such patients form a special
group. I have had some success in treating patients with rheumatoid and
osteoarthritis.

Having adequate teeth or dentures is another criterion that can be very
important. I think we must insist on adequate dentition before we operate. But
how many surgeons look in the mouth carefully and scrutinize the molars to
determine how healthy they are. If patients don't have teeth, they may have to
get dentures. This may take a while and may delay their preparation for the
procedure even though they meet the other criterion.

A history of pulmonary embolism may be a reason for trying to get control
of weight. But should such a patient be heparinized at the time of operation?
Should the surgeon order venography? Such questions often produce debate and
disagreement.

The presence of alcoholism is another important factor when choosing
candidates for bariatric operations. It is unusual in this patient group to find
blatant alcoholism. Their vice is more often food rather than alcohol, but if
it is present I would rate it as a very significant deterrent to considering an
operation. Cirrhosis is also something that requires further study. I have
always thought that bariatric procedures would not be contraindicated in the
cirrhotic severely obese patient. However, such conditions present special
nutritional problems that must be addressed.

There is a tendency to not use any kind of wrap around procedure or
anything that would effect the upper pouch. The few cases that I am aware of
have been fraught with problems.

Patient education and exercise. The use of a descriptive patient brochure
is very helpful. A check list can be given to the patient explaining precisely
what is going to happen. When the patients are discharged the check list can be
used to ensure uniformity of treatment. Close contact between the patient and
the surgeon is also important so that they will understand each other. I
believe that preoperative dietary training can be most useful. I place the
patient on a quarter portion diet on admission. I feel it is worthwhile to
train them on this diet. I have had a few who don't like it. Nevertheless I
believe it is necessary. Such training should be done outside the hospital if
circumstances allow it.

The dietitian should teach the patient to select a balanced diet, to take
small meals, and to chew adequately solid foods. At least some of satiety comes
from satisfying the impulse to chew.

The patient must also understand that an anaerobic exercise is important.
Breathing exercises can be taught easily without problems. Obviously, smoking
should be curtailed.
Preoperative studies In order to cut down the hospital stay many tests can either be dispensed with or done on an outpatient basis. Echo cardiograms in the particularly obese patients may yield significant information regarding cardiac function and valvular problems. I believe that pulmonary function tests are necessary to understand the patients blood gases and pulmonary function. Many surgeons prefer not to order an upper GI series and oral cholecystograms. I think this is a decision that can be made introperatively. The glucose tolerance test can be valuable in finding complications of obesity. Understanding the glucose metabolism in these people is important. Pelvic examination should be mandatory although it is rarely diagnostic. Endocrine evaluation should be kept to a minimum. Psychological testing can be undertaken and, of course, certain laboratory tests are essential.

Operative qualification The patient should be free of skin infections. Pulmonary function should be adequate. It is important to be aware of the patient's pulmonary function. I have the anesthesiologists assist in evaluating it so that they will be prepared for any eventuality. I believe hypertension must be controlled before considering an operation. Minidose heparin can be used, but I am not sure of its value. I prepare the bowel with castor oil; some people believe a more thorough prepartion is necessary. I give antibiotics just before the operation and discontinue them soon after. This is done mainly as a preventive measure. Some patients require awake intubation. The IV access must be well established. Sometimes a subclavian line is necessary. Very little blood loss should be expected. An arterial cannula is sometimes necessary to monitor blood gases in selected patients.

The incision can be made either vertically or horizontally. I use a horizontal incision in patients who have significant respiratory problems. It gives excellent exposure, but requires a little more time to close and may have an adverse effect if there is going to be a later panniculectomy.

Often other procedures are performed simultaneously. These include cholecystectomy, hernial repair, reversal of jejunoileal bypass and other pelvic procedures such as removal of an ovary or a cyst. Depending on the patient and the problem, it might be necessary to delay a secondary procedure to another time. Simultaneous panniculectomy is rarely necessary and should be avoided because of the increased risk of infection and pulmonary embolism.

Intraoperative management Good retraction and exposure are essential. My assistant and I find it possible to get adequate exposure using the octopus-like
Swiss made retractor. I am sure that the Pilling retractor and several others also provide excellent exposure. There is much debate and difference of opinion over whether to use or how long to use such things as nasogastric tubes, gastrostomies or feedings through a jejunal cannula. I would hope that every surgeon would be selective in their use of these tools. They can be very valuable at times.

Whatever procedure one uses, it is very important to carefully measure the pouch volume and the stomal size. The pressure of the volume measurement is also fundamental.

Postoperative management: I think patients should be extubated within 30 minutes unless they require a ventilator. I frequently remove the nasogastric tube after 36 hours. The patients then begin drinking water and progress to solid foods the next day.

I usually order an upper GI exam after two weeks. At that point I go over the discharge check list with the patient. We send questionnaires to the patients and prompt them to keep a dietary diary. They return these to use before coming for a follow-up visit with the dietitian. The questionnaire and diary aid us in determining which laboratory studies to perform. They also tell us much about patient eating habits and compliance. In this way we can keep expenses down and concentrate on individual problems.
COMPARISON OF JEJUNOILEAL AND GASTRIC BYPASS
Richard Rucker, M.D.

During the last ten years Dr. Henry Buchwald at the University of Minnesota has done more than 700 jejunooileal bypasses and over 300 gastric bypasses. This paper presents the results obtained on patients who underwent procedures between 1975 and 1979. During this period there were 205 jejunooileal and 106 gastric bypass patients.

Our jejunooileal bypass consists of anastomosing the proximal 40 cm of jejunum end-to-end to the distal 4 cm of ileum. Our gastric bypass procedure incorporates a 50-ml stapled pouch with a 1-cm antecolic gastrojejuncstomy.

We perform between 40 and 70 cases every six months. The number of jejunooileal bypasses that we do has greatly decreased. Currently, we rarely do them. Conversely, the number of gastric bypasses has increased and it is now the main operation that we perform for the treatment of obesity. We also have had an increase in takedowns of the long-term jejunooileal bypasses.

We follow up our patients quite regularly. About 80% of our jejunooileal and 60% of our gastric bypass patients return for follow-up visits during the first postoperative year. After the first year the follow-up visits are continued with the patient's own private physician.

We use a preoperative mechanical antibiotic bowel preparation. We initiate prophylactic antibiotics the night before operation. We use central venous lines, and a Foley catheter is placed before surgery. We use subcutaneous wound drains postoperatively. The nurses ambulate the patients the first postoperative day and the nasogastric tube is removed as soon as they have a bowel movement.

The operative mortality rate among our jejunooileal bypass patients was 0.5%. There were no deaths in the gastric group. Early postoperative morbidity in both groups was fairly low. The urinary tract infection rates were 12% in the jejunooileal bypass group and about 5% in the gastric group. The wound infection rate was 6 and 1% respectively for the jejunooileal and gastric bypass groups. We did have some problems with leaks among our gastric bypass patients. One occurred late after pancreatitis, another was due to afferent loop distention. After decompression we could no longer demonstrate the leak with methylene blue.

The long-term morbidity is distinctly different between the gastric and the jejunooileal bypass group. In the gastric group 10% of patients experienced
nausea and vomiting for several months after the procedure. Some patients required rehospitalization for dehydration. We have an approximate 2% rate of reflux esophagitis documented, either by upper GI series or endoscopy.

Long-term problems of the jejunoileal bypass are well known. In our total jejunoileal bypass experience (546 patients), there was a 37% of patients encountered problems with arthralgia at one time or another. Seven percent of patients developed kidney stones, 5.5 had incisional hernias, and less than 2% had liver failure and take-down of the bypass.

Weight loss is about the same between both groups over the first 12 months. Mean weight loss at one year among the gastric bypass patients was 41 kg. Our jejunoileal bypass patients had an average preoperative weight of 214% of ideal, while the gastric bypass patients were 196%. At the end of one year, the jejunoileal bypass group lost 65% of their excess body weight, and the gastric bypass group lost 63%. By 36 months, the gastric group was still maintaining a 62% loss, but the jejunoileal bypass group had increased their average excess weight loss to 76%. Obviously both procedures produce adequate weight loss.

We looked at many metabolic parameters. We found a marked increase in SGOT levels immediately after the jejunoileal bypass. These levels return to normal within two years. In contrast, the gastric bypass patients have no change in SGOT. The same is true for alkaline phosphatase levels. Triglyceride levels decrease about 35% after both the gastric and jejunoileal bypasses. Cholesterol values also drop significantly (P = .001) following both procedures, but the drop with gastric bypass is less (14%) than with jejunoileal bypass (42%).

We also performed serial liver biopsies beginning at the time of operation. These were rated on a five point scale: 1) normal histology, 2) < 25% fatty metamorphosis, 3) 25 to 50% fatty metamorphosis, 4) > 50% fatty metamorphosis, and 5) fibrosis.

The jejunoileal bypass patients in our series had a higher incidence of grade 4 fatty change while patients with gastric bypass had a higher incidence of grade 5 change. This difference, however, is not significant.

About 30% of patients had no significant histological changes on their one-year postoperative biopsy. However, among the rest of the patients there is an impressive difference. Forty-nine percent of jejunoileal bypass patients have histological deterioration of the liver at one year after operation, while at the same time 58% of the gastric bypass patients have improvement. This is not to say that all gastric bypass patients have improved liver morphology.
following operation. We have found that about 12% actually have worsening; some had an increase of fatty changes and others actually developed fibrosis. What this represents is hard to predict. These patients deny alcoholism. We have looked at the liver functions and tried to correlate them with the histological examinations, but this has been inconclusive. Alkaline phosphatase and SGOT levels were significantly higher at one year following operation for patients whose livers became worse. The reason for this is not known and further investigation needs to be done.

In summary, comparable therapeutic weight reduction occurred following the two procedures. Gastric bypass was associated with far fewer long-term complications. However, the jejunileal bypass does have a far greater cholesterol lowering effect. Most importantly, a small percentage of gastric bypass patients showed worsening of the liver fatty metamorphosis or fibrosis at one year after operation. Today we feel gastric bypass to be the preferred surgical form of intervention for morbid obesity. Jejunileal bypass should be considered for patients with morbid obesity and hyperlipidemia. Finally, liver status among patients having either procedure should be followed closely.
WEIGHT LOSS AND COMPLICATIONS WITH FOUR DIFFERENT GASTRIC PROCEDURES
Charles A. Herbst, M.D.

Our experience with bariatric surgery at the University of North Carolina Memorial Hospital began in April 1975 and includes four gastric operations. The patients presented in this report have been followed up for an average of 15.6 months (range 6-60 months). We have lost track of only four of 292 patients. Ninety-two percent of patients are female. The average age at operation is 34 years.

The four operations that we have done include gastric bypass with Roux-en-Y gastroenterostomies (105 patients), acstric bypass with loop gastroenterostomy (69 patients), Gomez-type gastroplasty (40 patients) and gastrogastrostomy (78 patients). The preoperative real weight and ideal weight in all four groups was similar. The average excess weight ranged from 147 lb in the gastroplasty group to 160 lb in the gastric bypass with Roux-en-Y group.

Our Roux-en-Y gastric bypass group can be subdivided into three additional groups. In our early experience we performed gastric bypass by transecting the stomach. We used this procedure in 12 patients. Mean weight loss at one and two years for those patients is excellent (56% of excess weight). We had three patients (25%) who developed complications.

After Alden publicized his use of the stapling instruments, we adopted the TA90, single application method. We performed this in 31 patients. Unfortunately, we discovered, as did many other surgeons, a fairly high number of staple line disruptions, six (20%) of the 31 patients. This gave us a total incidence of complications of 35% in this subgroup. Nevertheless, weight loss continued to be good, 51% and 53% at one and two years.

Because of the staple line dehiscence problem we subsequently began to use either a double application of the stapling instrument or a single application with nonabsorbable suture reinforcement. Again we had excellent weight loss, 60% and 62% at one and two years. Our complication rate (23%) was slightly less than in the other subgroups. Averaging the three gastric bypass subgroups together, we had an overall weight loss rate of 57% at one year which subsequently stabilized and a complication rate of 27%.

Another operation that we performed during our early experience was gastric bypass with a loop gastroenterostomy. Again, our loop gastric bypasses can be subdivided according to the method of creating the partition. We had nine patients in whom we performed transections. Weight loss was good, but the
complication rate (78%) was excessive. With the double row application of the TA90, the complication rate dropped to 28%, and weight loss continued to be good at around 60% of excess. For the total group of 69 patients, we had a weight loss of 59% and 62% at one and two years with a complication rate of 35%.

During 1978 and part of 1979 we performed the greater curvature gastroplasty using the technique of Gomez. Weight loss among these patients averaged 65% at one year, and in the few patients that we followed for two years it stabilized at that amount. Eleven of 40 patients had complications. We abandoned this procedure because we had several patients who developed stomal obstruction. We felt this was secondary to ischemia from taking down the short gastric vessels and also to bruising and edema from the crushing caused by the TA90 instrument.

We then switched to gastrogastrostomy which we have performed in 78 patients. Weight loss has been less than in the other three groups (46% of excess). We have not followed up enough patients at two years to make a reliable estimate of what weight loss will be at that time. These patients had a complication rate of 17% which is much lower than was experienced by the other three groups.

We had one death related to the operation. The cause of death was a pulmonary embolus. We have performed four splenectomies. These were in our earlier experience with the gastric bypass procedures. We have not had to perform splenectomy in the last two groups. This no doubt relates to our gaining technical expertise in doing these operations. We also had a higher incidence of abscesses in the first two groups. This was probably related to the fact that we performed splenectomy in several patients. In addition the opening of the small bowel in those operations adds to the risk of contamination.

We have seen leaks in all groups. Seven patients in the gastroplasty group had stomal obstruction. This is one of the reasons why we abandoned that operation. The six staple line separations occurred in the group of 31 patients who had a single application of the TA90. We have had no separations with the double application of the TA90 or with nonabsorbable suture reinforcement. Afferent loop problems occurred in the loop gastric bypass group and led us to abandon the procedure.

Two patients from the Roux-en-Y group had marginal ulcers. Both were probably caused by too large a pouch.
Bezoars have occurred frequently in our gastrogastrostomy group. In an effort to obtain better weight loss we have been making the stomas 8 mm in diameter. A dietary indiscretion in such a patient often results in a bezoar. Because these bezoars can be treated easily with meat tenderizer, we consider these to be a minor problem. We have had to remove several by outpatient endoscopy, but none of the patients have had to be rehospitalized. We hope that the smaller stoma and pouch that we have constructed will allow us to get a better weight loss in these patients.

In summary, we have used four different gastric operations in 292 morbidly obese patients since 1975. The excess weight loss at one year with either Roux-en-Y or loop gastric bypass and gastroplasty is excellent, but at the cost of significant complications and additional surgical procedures. In contrast, excess weight loss at one year with gastrogastrostomy is acceptable although slightly less than with the other three operations. However, there is a significant reduction in the number of complications and reoperations which makes gastrogastrostomy the operation of choice in our hands.
COMPARISON OF GASTRIC BYPASS AND GASTROGASTROPLASTY

Charles E. Yale, M.D.

We started doing gastric surgery for obesity in 1977, and we now have about 350 patients. We have used Roux-en-Y gastric bypass procedures and gastrogastromies. Our criteria for patient selection is fairly standard. The patients must be morbidly obese (at least 100 lb over normal weight) and have failed to lose weight under medical treatment. They must be adequately informed about the procedure and its risks as well as benefits. They cannot have serious psychiatric or medical contraindications.

All patients in this report have been followed up for at least three months. They all had primary operations, none are reversals or revisions of other procedures.

Our gastric bypass pouch has a 30-ml volume. We use a side-to-side gastrojejunostomy with a single layer of interrupted silk 1.2 cm in diameter, and one or two applications of the TA90 stapler. Our greater curvature gastrogastrostomy consists of stapling completely across the upper portion of the stomach to create a 30-ml pouch, and making a side-to-side 1.2-cm diameter anastomosis, again with interrupted silk sutures. This technique is the same as that used for the gastric bypass procedures. We were very pleased with the weight loss after gastric bypass. We reasoned that although the unsupported gastric stomes of gastroplasty showed poor weight loss, the scar that would form from a gastrogastrostomy would hopefully keep the stoma from stretching. We adopted this procedure because it is easier than gastric bypass.

We also have a smaller subgroup of about 50 patients who had lesser curvature gastrogastrostomies. As in the other procedures, we stapled completely across the stomach leaving a 30-ml pouch. In this particular series of patients, the single application of staples was oversewn with interrupted silk or polypropylene. The side-to-side gastrogastrostomy was made of interrupted 3-0 silk. The anastomoses were 1 to 1.5 cm away from the staple line.

We emphasize lung care and leg exercises after gastric surgery for obesity. We remove the nasogastric tube arbitrarily on the third postoperative day. We never place the nasogastric tubes through the stomas. Patients are given clear liquids after the nasogastric tube is removed. We advance the diet to full liquids on the fifth postoperative day, to soft food on the seventh day and regular food on the eighth day. We discharge the patients on the ninth
postoperative day. I think it is important to get the patients eating, ableit in very small amounts, before discharge. We follow up our patients at six weeks and three, six, nine, 12, 18, 24 and 36 months.

We began performing gastric bypass in 1977. We now have 135 patients with a 1:10 ratio of men to women. Combining both greater and lesser curvature gastrogastrostomy procedures, we now have 186 patients. The sex ratio is about the same. Age ranges from 16 to 60 years.

In our gastrogastrostomy group 137 patient had greater curvature and 49 had lesser curvature outlets. There were no significant differences in average ages, heights and weights. The mean original weight lost by nine months was 21% for the greater curvature procedure and 25% for the lesser curvature procedure. This latter procedure seems to be holding a little better than the greater curvature gastrogastrostomy. Nevertheless, weight loss for both these procedures is significantly less than with gastric bypass.

Two of our patients died within the first six months after operation; one was an operative death and the other was a suicide. Two gastric bypass and four gastrogastrostomy patients had splenectomies. There were only three subphrenic abscesses in over 300 patients. Our wound infection rate has been very low, 15 of 186 patients. It would be even lower had we not included several patients with tiny stitch abscesses. Other immediate postoperative complications included atelectasis in a few patients and, very rarely, thrombophlebitis. We emphasize leg exercises. These patients by and large did not have wraps or low dose heparin. One gastric bypass and three gastrogastrostomy patients had perforations of the proximal pouch. They were pistol shot perforations located approximately 1 cm above the anastomosis. We found one nasogastric tube sticking out through the pouch at the time of reoperation. There were no distal pouch perforations.

Our biggest problem was stenosis of the gastric outlet; 12 of 14 patients in the gastrogastrostomy series had to have reoperations. The main reason that we changed to the lesser curvature gastrogastrostomy was to make it easier for our endoscopist to help us with stenotic patients.

We have had one late postoperative death in each group. The one in the gastric bypass group was unrelated to the surgical procedure; the one in the gastrogastrostomy group was related to the operation.

Weight loss among the gastric bypass group averaged 62% of original weight by the end of the first year. Weight loss in the gastrogastrostomy group was
poor, only 20% of original weight at one year after the operation. A
significant number of these patients have had an enlarged gastric outlet,
greater than 2 cm in diameter. Very few have experienced staple line
disruptions, approximately 4% in each of the two groups. Nausea and vomiting
during the first year is infrequent. Alopecia was noted in both groups.

In summary, both the gastric bypass and gastrogastrostomy can be done with
an acceptable mortality of less than 1% and a very low morbidity rate. Gastric
bypass with a Roux-en-Y gastrojejunostomy provides satisfactory weight control
in our hands with the average patient losing one-third of their original weight.
Less than 10% of these patients lose under 20% of their original weight. In
contrast, the gastrogastrostomy as we have done it without external stomal
support, is an unsatisfactory weight control procedure. The average patient
loses only about 20% of their original weight and a significant number of
patients do not lose at all. Most gastroplasty failures are due to stomal
enlargement. The formation of gastrogastrostomy scar does not appear to be
strong enough to prevent stretching in the majority of these patients. Either a
gastrogastrostomy stoma is more likely than a gastrojejunostomy stoma to enlarge or
its size is more critical. I believe the latter is true. Despite its
theoretical advantages, I do not believe that gastrogastrostomy should be done
until a safe and reliable method is found to control stomal size and until it
can be shown that weight loss 12 to 18 months after operation is comparable to
that after gastric bypass.
GASTRIC BYPASS VS GASTROPLASTY
Alan Y. Newhoff, M.D.

My experience includes 103 patients with Roux-en-Y gastric bypasses. Half of them had gastrojejunostomies made with the GIA and the other half had sutured anastomoses with continuous polypropylene suture. I also performed 36 greater curvature Gomez-type gastroplasties, 53 lesser curvature gastroplasties and 14 vertical gastroplasties.

In assessing loss in percent of initial weight, I found that at six months after operation the gastroplasty patients were doing a little better than the gastric bypass patients. Weight loss averaged about 65%. By 18 months the gastric bypass patients reach a stable plateau having lost about two-thirds of their excess weight or about one-third of the initial weight.

I believe we need to develop standardized criteria for failure as well as success. I think that patients should be counted as failures if they lose less than a quarter of their excess weight at six months or less than half at one year. Essentially everybody lost 25% of their overweight by six months. But by the end of one year, three of 35 gastric bypass patients (9%) had not lost half of their excess weight. I was appalled to find that despite coming close, nine of 23 (39%) gastroplasty patients had not lost half of their overweight. I consider this to be the major complication.

As far as other complications are concerned, we had four deaths. One was caused by an anastomotic leak in a woman who had a cardiopulmonary arrest before we could reoperate. The second one was an error in judgment. The patient should never have undergone an operation. She had rheumatoid arthritis. She could not get out of bed or do anything to help herself after operation.

The third death was absolutely bizarre. The patient, a women, had gone home and apparently was doing well. She had had a hemoglobin drop in the postoperative period. I thought correctly that this was probably due to a clip coming off the greater curvature, however, we decided against reoperation. We gave her some blood. She developed a fever and backache, and went to her family doctor. He diagnosed her as having pyelonephritis. Several nights later she came into the emergency room complaining of feeling much worse. We discovered a tremendous air fluid level seen in the left upper quadrant on x-ray films. I felt this to be an infected subphrenic hematoma and thought that if we could get her blood pressure and volume up, and she would be fine by the next morning. Instead she went into shock during the night. We did get her resuscitated with
very vigorous volume expansion. I opened her abdomen to find that she had bled from a duodenal ulcer into the stomach, plugged the whole Roux-en-Y with clot, and ruptured the stomach. The whole peritoneum was full of old blood. I have never heard anybody describe such a complication before. It was really a shaking experience. We got her off the table and I hoped for the best. Nevertheless, she developed some serious metabolic problems including a blood sugar of 12 at three or four hours after reoperation.

The fourth patient was a woman who had persistent, frequent vomiting. We suspected and looked for stomal ulcer. However, an upper GI series and an endoscopic examination were both negative. The patient decided the problem was between her ears and I started to think that she was right. She didn't come back for a few months. Then one morning while I was in surgery she went to another hospital emptying her splenic artery through a stomal ulcer. Another surgeon who was not familiar with gastric reduction operations, gave the patient 32 units of blood in a futile attempt to gain control. He didn't realize the problem was the splenic artery and the patient died.

In regard to other complications, there have been a few leaks and subphrenic abscesses. Initially I had to do several splenectomies, but after I began using the Poly-track Retractor System, splenic injury was no longer a problem.

The stomal ulcers have been more of a problem than I anticipated. They are not all caused by big pouches. Just two weeks ago I converted a lady to a gastrogastrostomy who had a pouch that was no more than 20 ml in volume. The problem of dilating stomas has been minimal. It has only happened in one gastroplasty and two gastric bypass patients. The two bypass patients both had anastomoses made with the GIA. I am not sure what happened with the gastroplasty patient.

Psychiatric problems that I have seen don't have anything to do with the gastric bypass procedure. I am a little more selective now in choosing preoperative candidates.

I left here last year impressed with the importance of getting anterior and posterior gastric walls to heal and the importance of fracturing the mucosa to accomplish that. Unfortunately we had to reoperate on 20% of the first 36 patients. The endoscopist usually couldn't find the stoma such as it was. When we adopted the lesser curvature outlet we only had to reoperate on 10% of patients, but this is still a wretched number. Finally I began using one of the
C-clamp developed by Dr. Gomez'. We used it in several patients who had lesser curvature horizontal gastroplasty as well as in patients having vertical gastroplasty. I adopted the latter procedure in an attempt to obtain a smaller pouch with a good blood supply. Since changing to this procedure only one of my patients has had stomal stenosis.

Some have referred to the gastric bypass as the "Cadillac of gastric surgery for obesity." In my hands I would liken it more to a Jaguar, that is, a wonderful car when it is running right, but one that needs great precision and fine tuning. The gastroplasty may be safer, but I am worried about the long-term weight loss.

In closing I would like to make another sports car analogy. Colin Chapman, the builder of the Lotus race cars, was asked some years ago whether there was a key to success in the designing of a successful race car. He answered that it was very easy. You merely simplify and add lightness. I think that if we can simplify our procedures, we are more likely to be able to add some lightness to the patients.
GASTRIC BYPASS PROGRAM IN A COMMUNITY HOSPITAL
Paul W. Moen, M.D.

Since the beginning of our program we have used the standard gastric bypass with the anterior loop gastrojejunostomy. Our series now comprises about 230 patients. We mobilize up to the gastroesophageal junction and the greater curvature. The double staple lines are placed as close together as possible. We make an anastomosis that leaves a 1-cm internal lumen. Hemostasis of the cut anastomotic line is obtained with cautery. The Levine tube is passed down through the stoma into the efferent limb. Using a TA30\textsuperscript{®} snugged down against the tube, we close the stab wounds made for the GIA\textsuperscript{®}. We routinely use a distal gastrostomy that is brought out through a stab wound in the left upper quadrant. We close the wound with continuous absorbable suture in the peritoneum and linea alba reinforced with interrupted #2 Ethibond\textsuperscript{®}. We use clips on the skin.

In our series we have the usual 7:1 ratio (85% women, 14% men). Our youngest patient was 11 years old at the time of surgery. She weighed 220 lb then and is now down to 150 lb. The other patients fall mostly in the 20 to 50 year range; we have 18 patients over ten years of age.

During the initial office visit I explain the operative procedure in detail to each patient. They usually already know what the procedure is because they have talked with other patients. I explain the operative risks and the preoperative workup. I also emphasize that they are going to have to change their eating habits. I explain that this is a fifty-fifty partnership. I do the surgery but they must make the necessary changes in their eating habits. I give them the motivational materials that Dr. Rank uses.

Also in our area we have the National Gastric Bypass Club. I insist that our patients attend at least one Club meeting to talk with patients who have already had the operation and to exchange ideas. I also write the insurance carrier requesting that they inform me in writing whether or not they will cover the procedure. This can save me and the patient a lot of problems later.

Finally, I have the patients wait for one month so that they can carefully consider the operation. If they still want it after a month, and if the insurance will cover it, we proceed. I also tell them that if they are smokers they must stop. I will not operate on a patient who continues to smoke.

We use a team approach to our preoperative workup. We bring the patients into the hospital two days before operation. We perform the usual laboratory studies including an electrocardiogram and pulmonary function tests, which I
consider as mandatory. If there is any question of a pulmonary problem, we give the patient IPPB therapy preoperatively. The patients have consultations with the dietitian, the bypass nurse, the internist, the hospital chaplain, the pulmonary therapist, and the anesthesiologist. They also visit the intensive care unit to familiarize themselves with it. We always obtain IVP and gallbladder series, chest films and occasionally upper GI and colon series.

Twenty-four to 48 hours preoperatively I give our patients a neomycin-erythromycin base. I also give them antiflatulent four times preoperatively to try to cut down on the amount of gas in the small intestine during operation. I encourage the patient to drink an extra two liters of fluid between 3:00 p.m. and bedtime the night before operation to correct any lack of fluid balance that may have been encountered due to the radiological preparation. They are given a soap suds enema. We do not use CVP and/or arterial lines routinely, but in some of the heaviest patients they can be very worthwhile. We insert a Foley catheter and do the abdominal preparation in the operating room.

Preoperatively we found that a great majority of our patients suffer from hypertension and musculoskeletal disorders. Forty had previous cholecystectomies. Sixteen were diabetics. Six had previous gastric bypasses. Four had had gastroplasties that failed, and two had previous intestinal bypasses. Of the six patients whose gastric bypasses had failed, four had overly large pouches and two had staple line disruptions. Without the Poly-Tract Retractor System and the stapling instruments I would probably not be doing these operations. We use cautery, hemoclips, Gelfoam® and Avitene® to control bleeding and any relatively minor splenic injuries. Our operating time averages two and one-half to three hours.

The most commonly performed concomitant procedure in our series is gastrostomy (170 cases). We have also performed concomitant omentectomies, cholecystectomies, splenectomies, ventral hernial repairs, appendectomies, tubal ligations, salpingo-oophorectomies and one left colon resection. We have also done a few panniculectomies, vasectomies, and liver biopsies (16). One patient could not be intubated and required a tracheostomy.

Postoperatively we use low dose heparin and Kefzol®. We leave the Levine tube in place for 48 hours. On the third postoperative day the patients begin to drink about 30 ml/hr. On the fourth day we increase the amount of fluid to between 45 and 60 ml/hr, and on the fifth day they begin taking a semiliquid
bypass diet. We administer postoperative IPPB therapy. We remove the
gastrostomy tubes in ten days to three weeks after operation. We maintain the
patient's urinary output at 50 ml/hr with IV fluids for three or four days. We
use pressure stockings and abdominal binders, and keep the patients in the
intensive care unit for 48 hours.

Overall our complications have been minimal. The ventral hernia rate is
3.6%. Eight of our patients have had pneumonia. We are proud of our low wound
infection rate (1.8%). We have had three staple line disruptions, one early and
two late. Two of our patients had anastomotic bleeding. Another patient
developed a perforated ulcer in the gastric pouch, and it was after this case
that we decided to place a gastrostomy in all patients. Two weeks ago we had
our first perforation of the proximal pouch. A little over half of our patients
leave the hospital in five to seven days, one-third in eight to ten days, and
only a few stay longer than ten days.

In our first 29 cases we did a 90% gastric bypass; in the last 212 we did a
95% bypass. Also in the last 63 cases we used a double application of the
stapling instrument.

Postoperatively, we see our patients at ten days to two weeks, at which
time we remove the staples and the NG tube. We see them again about three weeks
later and then monthly for two to four months. After that we see them bimonthly
for the rest of the first year. They are given iron and vitamins daily and they
start a regular bypass diet at six weeks.

Only one patient has lost less than 25 lb. The majority of patients lost
50 lb or more. Most patients lose over 20%, and ten lost over 50% of their
original weight. We had five patients go through uncomplicated pregnancies
following bypass. We have had three deaths. Our total number of patients have
lost over 20,000 lb and the average hospital bill has been in the neighborhood
of $4,800.
DISCUSSION OF RESULTS
J. Patrick O'Leary, M.D.

We seem to be getting too caught up in eponyms. Rather than calling a
t procedure Alden's technique or Dr. Fabito's technique or a Gomez operation, I
think we should be more precise. The Fabito procedure is not the Fabito
procedure, it is a vertical stapled gastric partition. The Gomez procedure is a
horizontal gastric partitioning with a greater curvature opening. The gastric
bypass is just that, a gastric bypass and the decompression is either a
Roux-en-Y limb or a loop; and a gastrogastrostomy is a gastrogastrostomy. It is
not necessary for us to use eponyms. In order to make accurate comparisons we
need to know exactly what is being done.

LECKNER: I have done a randomized prospective study in 226 patients comparing
the horizontal greater curvature gastroplasty (suture reinforced stoma) with
loop gastric bypass. Pouch volumes for both procedures were set at about 15 mL.
A double application of the stapling instrument was used to divide the stomachs.
At all time periods after operation patients with gastric bypass averaged a
higher weight loss. The differences were all statistically significant, some at
the $p = 0.001$ level.

O'LEARY: Do you have any hypotheses as to the reason for this increased weight
loss or increased effect with the gastric bypass?

LECKNER: I think it may be due to metabolic effects. The gastroplasty patients
lost 50 to 55% of their excess weight, whereas the gastric bypass patients lost
60 to 65%.

O'LEARY: There seems to be an increase in the deprivation of fat soluble
vitamins with bypass, and increased steatorrhea. I don't know how that compares
with gastroplasty.

COMMENT: Most speakers have stated that the main problem with gastroplasty
seems to be stenosis and, therefore, surgeons are giving up the operation. I
was also having similar problems. I began to cut the cartridge off which
eliminated the crush effect of the stapling instrument. Now, instead of having
to reoperate on six of 75 patients, we have only had to reoperate one of the
last 75.

O'LEARY: Does anybody have any experimental data to suggest that the stapling
instruments do indeed crush the tissue?

LARRY: The data that I have is negative.
HALVERSON: I think one thing apparent at this colloquium is that we are now seeing consistency in results, at least for gastric bypass. The 60 to 65% excess weight loss at one year to 18 months after gastric bypass has been reported by Drs. Yale, Newhoff, Herbst and Leckner. I think this kind of consistency is encouraging and I, in turn, would encourage everybody here who has sufficiently carefully collected data to send them to The University of Iowa Bariatric Surgery Registry so that they can be analyzed en masse. That project has not been plugged enough and it is up and running and needs some support from all of us.

O'LEARY: I would reinforce your statement.
GENERAL PRINCIPLES OF GASTRIC POUCH CONSTRUCTION

Otto L. Willbanks, M.D.

During the last two days we have heard about multiple techniques for constructing the small proximal gastric pouches. I don't believe this is too surprising because as we all know by now these are difficult patients and only the adventurous doctors take on this sort of challenge. Bariatric surgeons are by nature precise, innovative, individualistic and bold. I have been astonished at times by the vast numbers of different technical complications of the same procedure that have been presented. It seems there are as many modifications and variations as there are surgeons. There are greater curvature and lesser curvature pouches, gastric bypasses with Roux-en-Y and with loop, gastroplasties and gastric partitions and stomach incontinencies, divided and sutured techniques, stapled techniques, banding with mesh and suture and the list goes on and on. All of the techniques that I heard of have some value, some merit; all have a success and a failure rate, each has its own list of advantages and disadvantages.

In an attempt to arrive at some type of order I began looking for common threads that seemed to weave together towards a successful operation. I arrived at six general characteristics of an ideal or successful gastric pouch procedure. First the pouch volume must be less than 50 ml, preferably about 30 ml. The stoma or outlet from the pouch must be 12 mm or less, and dilatation of the stoma should be prevented. Dehiscence or disruption of the staple line should be prevented. Stretching or dilatation of the pouch should be minimized or prevented. Finally, some mechanism should be found that prevents or discourages the intake of high calorie liquids or snacks that defeat these operations.

Almost everyone agrees the pouch should be less than 50 ml. It seems that the pouches get smaller every year. Some surgeons are now recommending that it be as small as 15 or 20 ml. Measuring the pouch volume is important. The pouch can be measured intraoperatively with a manometer attached to a nasogastric tube. Using this technique it is easy to adjust the pouch volume between 30 and 50 ml at 25 to 30 cm of water pressure. I cannot overly stress the importance of volume and pressure measurement.

The stoma must be small and also measured. I believe everyone agrees that the stomal size should be less than 12 mm or 38F and I would suggest also that it be large enough to accommodate the pediatric fiberoptic endoscope which is
28F. I use a 30F dilator which is about 9.5 mm. This size admits the pediatric scope snugly. Many techniques stop at this point being satisfied with a small pouch and a small outlet. I can assure you that if you stop here you will be in for a rude and unpleasant long-term result.

Several techniques are currently being used to prevent stomal dilatation. Last year Dr. Mason suggested ringing the stoma with a chromic catgut suture tied securely over a dilator, hopefully causing a ring of scar tissue about the size of the dilator. Dr. Gomez uses a continuous 2-O polypropylene suture to imbricate stomach over the dilator and make a valve-like structure similar to a pylorus. Others prefer using these two techniques in combination. It is important that we use something to keep the stoma from dilating, be it a sleeve of mesh or a length of Silastic tubing as described by Dr. Laws. It is clear that if the stoma is not reinforced, it will dilate and eventually cause weight loss failure.

With only one row of unreinforced staples, the incidence of staple line disruption is high (30% in one series). It is not clear whether or not two rows of staples are better than one. I have used two rows of staples and have added oversewing of the entire length with continuous 2-O polypropylene suture. Dr. Eckout has used interrupted sutures with some success. Some method of reinforcement is very important.

Preventing pouch dilatation presents a greater challenge. Moving the pouch to the lesser curvature where the stomach is somewhat thicker has seemed to help. Continuous counselling of the patient not to exceed the volume limitation of the stomach is also essential. Dr. Wilkinson and others are even wrapping the stomach pouch with mesh and have presented impressive results.

Preventing dietary indiscretion is perhaps the hardest job of all. I simply do not know of any way to absolutely prevent a determined patient from defeating the operation with candy or high calorie liquids. Because of the slightly higher incidence of dumping with gastric bypass it might be the better operation for such a patient. Still, some patients are going to beat their operation regardless of all the counselling and efforts to the contrary.

Over time I have accumulated about 500 patients in whom I have used a variety of obesity operations. As I have progressed, fortunately, my complication rate has declined. More importantly the major or life-threatening complications have diminished greatly as I began to adopt the general principles outlined above. The weight loss failure rate in my series has also decreased.
I would encourage bariatric surgeons to continue to be innovative and inventive, and to keep in mind the general goals and principles that have reduced the failure and complication rates.
ROENTGENOLOGICAL STUDIES OF POUCH CAPACITY AND EMPTYING TIME

Lars Backman, M.D.

The experience from various places here in the United States has obviously shown that the results of gastric surgery for the treatment of obesity are to a great extent dependent on the surgical technique. The two principal factors seem to be volume of the gastric pouch and the size of the draining channel from the upper pouch. The aim of these operations has been to create a proximal pouch with a volume of about 30 ml and an outlet diameter of 8 to 9 mm. The crucial factor is that the gastric wall is distensible and this makes it difficult to measure accurately these two parameters.

We are aware of the many pitfalls in the technique. We have used a very unsophisticated system for measuring the volume of the gastric pouch during surgery as well as during postoperative roentgenological examinations. The system consists simply of filling intraoperatively a very thin latex rubber balloon, such as a condom knitted over the end of a #14 nasogastric tube. We then measure the amount needed to fill the balloon. The length of the gastric tube inside the balloon is 5 cm. We have tried to standardize the intragastric pressure to 70 cm of water both during surgery and during postoperative x-ray examinations. Partly in order to maximally dilate the gastric segment and perhaps because of that the results have been remarkably reproducible.

During surgery it is fairly simple to obtain a gastric pouch of a suitable size by placing the stapler in the exact position. We get help from the anesthesiologist in measuring the volume. After the stapler has been fired twice, a new measurement of the gastric pouch capacity is made in which case the intragastric pressure usually is about 10 cm less than at the first measurement. There should be no holes in the tube above the suture, of course.

The same technique is used for postoperative roentgenological examinations in which case the balloon is filled with gastrografin. We have found it possible to see the outlet and it has been our experience that if the outlet is too wide, the balloon will slide down more or less totally into the distal pouch. During the postoperative x-ray examination, the emptying time of volume contrast material is also measured. If you fill up the pouch too much, you can see a lot of retained contrast in the distal esophagus which is very broad indeed. I think this fact makes it difficult to measure the pouch volume without the balloon system.
I have made the assumption that a good technical results include a gastric pouch of less than 100 ml, a passage time of barium through the outlet of more than 30 seconds and an intact staple line. A good clinical result of course depends on weight loss. Over the last three years we have done studies on some of our patients who have undergone either gastric bypass or gastroplasty. We have two groups of patients, those with good and those with bad technical results. Eight patients had good technical results. All but two of the patients lost weight adequately. When we compared these two patients with those who had technical failures, we noticed a strong correlation. In general, in 25% of the cases, there is a discrepancy between technical and clinical results. I speculate that the cause of this may perhaps be some kind of psychological phenomenon.

With this method it is possible to measure the postoperative increase in pouch volume over time. During the first two or three months, the volume seems to remain constant, but after that time the volume increases by about 150%. Some patients increase their volume much more rapidly than others and in these cases we have found stenosis at the outlet. These patients, of course, have a good clinical result.

We tried to measure the total volume in the stomach before surgery in obese patients. Again, using the balloon method, I filled the stomach with almost two liters of water. When we compared these volumes with others measured in normal weight patients, we found that the obese patient could tolerate almost double the volume of water in the balloon before experiencing pain and discomfort. Furthermore, the average intragastric pressure was higher in the obese patients than in the controls. I believe that this indicates that we should in some way tailor our operation according to the needs of each individual patient.
OBSTRUCTION AND REOPERATIONS
Luigi M. DeLucia, M.D.

My study consists of two parts. The first part is the analysis of the relationship between late obstruction and weight loss. The second part deals with the problem of second operations after gastric procedures for obesity. The study is based on 89 cases representing all patients who had been followed up for an adequate period of time. All had gastroplasties performed between January 1978 and March 1980. The minimum follow-up period was one year, the longest was three years and four months.

Of the original 89 patients, four had to be reoperated and are not included in the first part of the study. Of the remaining 85 patients, 14 developed postoperative outlet obstructions that eventually resolved without surgical intervention or endoscopic manipulation. The mean duration of the obstruction was 115 days (range, 35 to 203 days). All 14 of these patients had satisfactory weight loss. Of the 71 patients who had no clinical or radiological evidence of postoperative obstruction, however, only 33 had a satisfactory weight loss. The remaining 38 (54%) patients were considered to be failures.

For the purpose of this study a satisfactory weight loss was arbitrarily defined as a stable loss of 60% or more of excess weight. This definition represents a compromise between my cosmetic goals and the scientific and perhaps more realistic criteria of Dr. Drennick (Wadsworth VA Hospital, Los Angeles, California). The mean loss of excess weight among the 14 patients who developed postoperative obstruction was 78% (range, 60 to 104%). The 33 successful patients among the group of 71 who did not develop postoperative outlet obstruction had a mean excess weight loss of 80% (range, 66 to 114%). The 38 patients who failed had a mean excess weight loss of 34% (range, -10 to 57%). One of these patients actually gained weight.

The entire group of 89 patients was analyzed in the second part of the study. A 20% rate of obstruction occurred among these patients (18 of 89). As mentioned above, 14 of these patients had limited obstruction that eventually resolved without surgery or endoscopy. Only four of the 18 patients required reoperation because of intractable obstruction. On the other hand, of the 38 patients who had an inadequate weight loss, 19 sought revision and were found to be justified in their request, not only on clinical grounds, but also by radiological and endoscopic evaluations.
We reached the following conclusions based on the first part of the study:
1) Patients with obstructions more than double their chances for satisfactory weight loss. 2) Most obstructions (78%) eventually subside with conservative management, although it may require several months. 3) Patients who experience no significant problems in taking liquids and small amounts of semisolid food in the immediate postoperative period stand a 54% chance of eventually failing to lose adequate weight.

The second part of the study led to several observations. Half of the patients failed to achieve an adequate weight loss and eventually sought revision. The reoperation rate for inadequate weight loss was more than double the reoperation rate for intractable outlet obstruction.

The following considerations are a corollary of the information obtained from the statistical studies: 1) Postoperative outlet obstruction should not be regarded as a true complication until it becomes clearly intractable by conservative means. I believe an outlet should be declared hopelessly obstructed only when the following treatment criteria are fulfilled: a) a waiting period of six months or more; b) radiological evidence of obstruction; and c) endoscopic failure to enter and/or dilate the outlet of the fundic pouch. 2) Second operations for persistence or recurrence of morbid obesity are technically more difficult than second operations for obstruction.

Reoperation for obstruction sometimes can consist only of correcting an angulation of the channel or dilating the stenotic outlet. At the most it requires creating a new outlet by anastomosing the proximal pouch to the distal GI tract, or, in the case of the gastroplasty, a gastrostomy. The partition is left undisturbed. An operation prompted by weight loss failure, however, is much more complicated and usually involves doing a whole new bypass. Finally second operations for persistence of morbid obesity carry a greater mortality and morbidity risk than second operations for obstruction. Not only are second operations for obstruction technically easier but the patients themselves are better surgical risks having lost most if not all of their excess weight.

As a closing comment I would like to say that ideally a gastric operation for morbid obesity should lead to a satisfactory and permanent weight loss without producing obstruction. However, the myriad problems encountered with the various surgical techniques during the past decade attest to the difficulty that we as surgeons are experiencing in achieving this goal. Dr. Mason predicted these difficulties some years ago when he stated, "There may be a very
narrow margin between an adequate operation that results in a desirable weight loss and an operation that results in a complete inability to eat." I believe in the extreme importance of evaluating the various surgical techniques on a long-term basis. Dr. Drennick feels this evaluation should last at least five years. Those techniques that do not produce postoperative obstruction should probably come under close scrutiny. Unless such evaluations are carried out, a great number of inadequate procedures may be performed which will eventually require reoperation.
LATE WEIGHT GAIN AFTER GASTRIC BYPASS

Martin E. Felder, M.D.

I have been present at several meetings dealing with the surgical treatment of obesity, and one fact that stands out is that everyone with whom I talk is no longer doing the same procedure that he/she was doing at the previous meeting. Everybody is constantly changing. Of course, that is the problem.

The principles of whatever procedure one chooses are the same. Basically we want to have a small pouch and a small stoma. As has been stated earlier, the pouch volumes have decreased in the past four years from about 120 to 30 ml or less.

Why do we continue to have failures, particularly among patients who for years seemed to be doing well? Staple line dehiscence is one obvious reason. Pouch and stomal enlargement are equally obvious. Stomal ulcer, bile gastritis and patient adaptation are less apparent causes of weight gain. With staple line dehiscence the patient usually experiences an abrupt increase in the amount of food able to be taken. This is accompanied by an equally abrupt increase in weight. The patient's sense of satiety is gone. The diagnosis is easily made with the help of an upper GI series and the treatment required is fairly obvious.

Pouch enlargement is a more difficult problem. The patient experiences a gradual increase in meal size, a gradual increase in weight and a gradual loss of prolonged satiety. The diagnosis is often difficult. An increase in pouch size frequently goes undetected on upper GI series. Once the diagnosis is made the treatment includes surgical reduction of the pouch volume.

Recently one colleague showed that pouches measured intraoperatively at 100 ml had enlarged to 300 ml by the time of discharge and to 600 ml or more by the sixth postoperative month. We are making a great mistake if we think that our pouches are going to stay the same size. Upper GI series do not always indicate the true size of the pouch. We are very often fooled by what the pouch looks like if it is unobstructed. It can expand greatly allowing the patient to eat meals far in excess of the size shown by the barium meal.

Stomal enlargement is also a serious problem. Again patients may have a rapid increase in weight and the ability to eat. With gastric bypass dumping may be a symptom. Some patients notice a sudden ability to eat beef or other meats that they had been unable to eat previously. On upper GI series the stoma, much the same as the unobstructed pouch, may look perfectly normal.
Endoscopy is a much more reliable method of diagnosing this problem. Stomal enlargement is possible even that has been reinforced with a stapled anastomosis with a continuous stitch. Very often that continuous polypropylene suture will cut through to the lumen.

Stomal ulcer and bile gastritis are more subtle reasons for weight gain. The patients eat precisely because they have symptoms, and the weight gain is much more gradual. Endoscopy is the primary method of diagnosis. An upper GI series will occasionally show the stomal ulcer. Fortunately, the treatment of stomal ulcers with cimetidine is usually successful. If cimetidine fails, however, vagotomy or other operative procedures may become necessary. Bile gastritis can best be treated by either Roux-en-Y or gastroplasty.

The biggest problem we have, of course, is patient adaptation. If you take a careful history patients will often tell you that they have increased the number of meals, and changed the consistency of their food. They gradually increase their weight, usually after achieving an initially suboptimal weight loss. Unfortunately, such patients are difficult to treat. All possible technical causes must be ruled out and counselling should be undertaken.
DISCUSSION OF OPERATIVE FACTORS INFLUENCING RESULTS
Edward E. Mason, M.D.

Different modifications have different patterns of weight loss. We did our first gastric bypass with an antecolic loop gastroenterostomy in 1966. This procedure featured a small unmeasured pouch with a relatively large outlet. We used this technique through 1970, and some of our patients have now been followed up for more than ten years. In 1971, we introduced the unmeasured and unsupported greater curvature channel gastroplasty. Because of poor weight loss with this procedure we returned to gastric bypass in 1972. We decided to try to make the operation a little bit simpler by making a larger pouch and a smaller outlet. Weight loss was somewhat less satisfactory than it had been with the earlier gastric bypass procedure. Beginning 1975 the loop gastric bypasses were actually measured according to Terry's recommendation and suggestion as to how to do this. With measurement, we began to see a real improvement in weight loss. We eventually reduced the pouch volume to 50 ml or less. We have not yet had to revise any of these 50 ml or smaller pouches.

Unfortunately, patients often seem to follow a set pattern. First they lose weight, then they plateau, we revise the operation, and, finally, they lose weight again. We can summarize this by comparing pouch volume at the time of revision. It becomes obvious that a reduction in pouch volume will produce an increase in weight loss.

The 1971 gastroplasty failed because the pouches were too big and because the unsupported channel stretched. We created gastrogastrostomies in some of those patients on the thesis that the resultant scarring would prevent stretching, but this proved not to be the case. It is interesting and perhaps a bit tragic to see some of these lessons being relearned today.

Presenting statistical information on a series with many failures can be problematic. Weight loss curves that include patients with technical failure will not accurately predict anticipated weight loss. At the same time it is not fair to throw such patients out of the group. Some other types of statistic is needed. We have calculated the survivorship of the original operation on an actuarial method that allows you to use all data that you have available and takes account of those patients who have died or been lost to follow-up. Based on these figures we can then determine the individual failure rate for each technique or operative type. I would like to see such a method used for reporting cases in the future.
Using this method we find that by ten years about 50% of our first group of patients had required revisions due to failure to lose or maintain weight loss. In other words, the revision rate for that operation is 5% per year and it continues for at least ten years. Our second group of gastric bypass patients (1972 to 1974) had a revision rate of about 8% per year. Our third group of gastric bypass patients with measured pouch volumes have a revision rate of about 3% per year.

Obviously if you have a new operation that you have only been doing for one year, it will have a very low percentage of failures. However, using the actuarial method based on survivorship of the operation, you can calculate the yearly failure rate, and begin to see whether or not the operation will ultimately succeed. Our goal, of course, is to have an operation that does not require any revisions. To achieve that goal, we have to recognize and adhere to the requirements of an ideal operation which have been set out by previous speakers. Pouch volume measurement and outlet reinforcement are perhaps the most important of these criteria. Supporting the outlet is especially important in gastroplasty.

Gastroplasty relies only on the principles of a reduced volume and retarded emptying. Gastric bypass adds a third factor which is the bypassing of the lower stomach and part of the small bowel. The satisfactory prevention of dilatation of the outlet should not be peculiar to gastroplasty alone. It is more important in gastroplasty because it is a two factor operation. However, I would predict that even with Roux-en-Y gastric bypass eventually there will be dilatation in some patients, and consequently a need to revise and narrow the stoma.

The method of preventing dilatation should require some nontraumatic procedure. One advantage of dividing the stomach is that it allows the placement of reinforcing material around the outlet without having to put any sutures in the wall of the stomach. We need to try to keep the reinforcing material out of the wall of the stomach to prevents its migration into the stomach lumen. Dividing the stomach is a complicated way. Perhaps in gastroplasty this could be simplified by merely creating a window adjacent to the channel to allow external placement of the reinforcing material. It could then be sutured to itself and no sutures would have to be placed in the wall of the stomach.
Two problems arise from the ties, sutures and manipulation of the stomal area. One is early obstruction caused by swelling and the other is late dilatation caused by eventual erosion of the reinforcing material. I have had patients in the hospital for six weeks because of obstruction and yet after a year or two they come back in need of a revision because they have regained their weight.

Fortunately, we don't all have to learn the same lessons through direct experience. We can learn from the experiences of others. I learned from Drs. Tretbar, Eckhout, Fabitc, and Laws at this meeting last year that it is easier to perform the operation leaving the channel on the lesser curvature. It is also easier to look at the stoma postoperatively if problems arise. Consequently, in November 1980 I began doing vertical, banded, lesser curvature gastroplasties. The area just above the crow's foot is marked and serves as a reference point. A very convenient way to do this is to have the 32F Ewald tube in position along the lesser curvature, and then place the anvil of the EEA stapler on the stomach and mark the site. Then the anvil can be repositioned on the back side of the stomach. A trochar attached to the rest of the stapler can then be passed through the marked area into the center of the anvil. This maneuver allows easy placement of the EEA stapler and creation of a window through which the TA90 stapler can be positioned. With the TA90 in place and with a Penrose drain around the esophagus and another through the window, pouch volume can be accurately measured. When the pouch is the right size, the TA90 is screwed down and discharged. A second set of staples is placed just to the greater curvature side of the first set. This can be accomplished by using three stick sponges and simply having the assistant press down towards the floor, dragging the stomach over the foot plate or anvil of the stapler until the first set of staples are lined up in an adjacent position. The two lines of staples should be parallel and within 1 or 2 mm of each other.

I reinforce the channel with a 7 x 1.5-cm Marlex® mesh band which I overlap by 2 cm so that the outside diameter is actually 5 cm. By overlapping I can suture the mesh to itself and thereby avoid putting sutures in the channel wall. In view of the experience of Dr. Gomez, I have been very concerned about the possibility that this material might cause stricturing that would lead to obstruction. I now believe that the obstructions encountered by Gomez were not due to stricture formation, but to the stomach adhering to the diaphragmatic area causing kinking.
QUESTIONNAIRE RESULTS
Edward E. Mason, M.D.

At the beginning of the meeting we distributed a questionnaire which was answered by 126 surgeons. These surgeons had a combined series numbering more than 22,000 patients, and they are adding to this series approximately 11,000 new patients each year. About 1,000 of these patients receive gastrostomies, 4,000 have gastric bypasses and the remainder undergo gastroplasties.

In the combined series we found that about 2,000 of the patient have gastrogastrostomy. The average number of patients per surgeon is 143. There are around 9,400 gastric bypass patients, and the average individual series size numbers 264 patients per surgeon. Ten thousand gastroplasties were reported, with each surgeon having about 135 patients.

Of the 13 surgeons currently performing gastrogastrostomy, all but one prefer stapling in continuity. The stomach is rarely divided anymore, and probably it is not necessary. Unfortunately, only three of the 13 surgeons measure pouch volume. This is disappointing and I hope it will change. We are not in the age of the art of surgery. We are supposed to be scientific. We must start using some objectivity and quality control. We should not only measure the volume for the sake of getting it as near as possible to what we think it is correct, but we also need to have a good record so that if the patient doesn't do well we can look back to see with what volume we began. Otherwise, we will not know why the patient failed.

Eight of the surgeons who use gastrogastrostomy calibrate the outlet. Of these most use polypropylene suture as the reinforcing material.

Thirty-five of the surgeons answering the questionnaire use gastric bypass, and 21 of them prefer a Roux-en-Y anastomosis as opposed to a loop. Most staple in continuity, about half using a single row, and very few reinforce the staple line. Although more than half of these gastric bypass surgeons measure volume, only three measure the pressure. Volume measurement without pressure measurement is extremely variable and inaccurate. Most of the surgeons (22) calibrate the outlet.

Turning to gastroplasty, we find that 76 of the 126 surgeons who answered the questionnaire prefer this procedure. The majority (52) use a horizontal rather than a vertical method. Thirty-four of the surgeons using horizontal gastroplasty place the stoma on the greater curvature. The rest place it in the middle (16) or the lesser curvature (2).
All but 2 of the surgeons who perform gastroplasties staple the stomach in continuity. Sixty-three surgeons use two rows of staples and many reinforce the staple line with suture.

In summary, most surgeons now seem to prefer some sort of gastroplasty or gastrogastrostomy over the original gastric bypass. My general recommendation is that we should proceed with caution and pay close attention to technical details. We must also keep careful follow-up records especially when using less tested procedures.