The Effectiveness of Gastric Bypass Over Gastric Partition in Morbid Obesity

Consequence of Distal Gastric and Duodenal Exclusion

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Eighty-seven morbidly obese patients were prospectively randomized to two operations: gastric bypass was performed on 42 and gastric partition on 45. Gastric bypass proved to be more effective; gastric bypass patients lost 15% more of their original weight at 12 months and 21% more at 18 months. There were no failures in the gastric bypass group; 28 of the 45 operations failed in the gastric partition group. An additional 60 patients underwent gastric bypass since the completion of the study. In the total series of 147 patients who underwent gastric bypass or gastric partition, there was no mortality, and the surgical complication rate was 12%. Because the gastric pouches and the anastomoses were similar in the two operations, the superiority of the gastric bypass may well be due to a heretofore unexplained effect of distal gastric and duodenal exclusion.

MORBID OBESITY is a serious disease. Generally defined as the degree of obesity that exceeds double the normal weight, it is associated with significantly higher mortality rates, in part due to higher incidences of diabetes, degenerative arthritis, gallbladder disease, heart disease, hypertension, stroke, and cancer of the breast, stomach, uterus, and probably the ovary.[1-4] Of even greater concern to patients are the inability to use public facilities and conveyances, the great difficulty in finding employment and the personal embarrassment and pain of social isolation and sexual victimization. The jolly fat lady facade usually hides a desperately unhappy woman praying to be thin.

Because diets are almost uniformly ineffective in the morbidly obese,[3-6] a variety of operations have been devised to induce weight loss. Wiring the teeth, although immediately effective, is almost always followed by a rapid gain that may overshoot the original weight by as much as 10–15%.[7-9] In addition, teeth wiring is often not applicable because many of the morbidly obese are edentulous and, addicted to eating, tolerate the procedure poorly. Intestinal bypass, initially developed by Payne[10] and Sherman,[11] and further refined by Scott,[12] produced weight loss by short-circuiting the small bowel, thereby interfering with absorption and digestion. Unfortunately, the operation was associated with an unacceptable complication rate.[2] Although many patients treated with intestinal bypass fared well, many developed liver failure, kidney stones, severe hypoproteinemia, and other problems after surgery. These complications became even more serious and frequent with long-term follow-up. In addition many patients regained their weight after two years because of intestinal adaptation.

Mason[13,14] pioneered the current surgical approach to obesity by developing the gastric bypass which interferes with the amount of food eaten by limiting the volume of the gastric pouch to 50 ml and by delaying emptying of the pouch with a small outflow tract. This operation yields far better results than intestinal bypass and has, therefore, been rapidly adopted.

Because gastric bypass is a difficult procedure and because it involves two intestinal anastomoses, various types of gastric partition[15,16] have been developed which also seem to meet the goal of developing a small gastric pouch with a small outlet and could, therefore, be expected to be as effective as the gastric bypass procedure of Mason. However, reports about this procedure have been mixed, and the optimal operation for morbid obesity is still not well established.

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FIG. 1. The gastric bypass. A channel is dissected gently behind the stomach from the left side of the esophagus to an opening 2–4 cm below the cardia on the lesser curvature. Neither the spleen nor the greater curvature need to be disturbed.

In an attempt to rigidly compare the effectiveness of the gastric bypass procedure with the gastric partition procedure, a randomized prospective study was performed at East Carolina University School of Medicine in which the patients were unaware of the procedure performed and in which severe restrictions were placed on the availability of information to doctors and allied personnel caring for the patients as to which procedure was performed. Objective measurements were used to gauge the effectiveness of the procedure. In all cases a uniform operative procedure was performed, a uniform size pouch was created, and a uniform sized gastric outlet stoma was created. Taves minimization technique[17] was used to eliminate or reduce dependent variables and to produce as uniform a study as possible. This paper reports the results of this study and also includes the subsequent larger series of gastric bypass procedures performed with discussion of the technique, preoperative and postoperative care, complications, results, and long-term follow-up.

Materials and Methods

A group of 87 morbidly obese patients, each weighing at least twice his or her normal weight and appropriately assessed for operative risk, was prospectively randomized into two groups to stratify for sex, age, weight, hypertension, and diabetes. Informed consent was obtained from each patient entered into the study, and the project was approved by the institutional review committee of this university. Each patient entered into this study during the period of February 1979 to February 1981 was randomized into one of two groups, gastric bypass or gastric partition, by a research associate using the Taves minimization technique. Four stratifications (sex, age, hypertension, and diabetes) were used to assign patients to the gastric bypass or gastric partition procedure by an associate who had no contact with the patients and who was not involved in patient follow-up. Every effort was made within ethical constraints to restrict the knowledge of the precise procedure performed to all persons involved in caring for these patients. In all cases, objective measurements of patient progress in the follow-up period were performed by persons unfamiliar with which procedure had been performed. These objective measurements included weight loss, percent weight loss, changes in blood pressure and diabetes, and other clinical parameters of follow-up performed on a regular basis. Follow-up has varied from a minimum of three months to a maximum of 18 months up to February 15, 1982. During this period, there were no patients who refused to participate in the study, and all patients who underwent operations for obesity during the period of this study are included in this report.

Gastric Bypass and Gastric Partition

The surgical procedures of gastric bypass and gastric partition were performed in the following manner. All patients were given 1 g of cefazolin intravenously one hour before operation at induction and q6h for 48 hours. This technique was associated with a very low incidence of infections when compared with a group not given this antibiotic as previously reported.[18] Ethrane served as the primary anesthetic.

The Gomez retractor, a self-retaining device that clamps to the operating table, was always used and was felt to be essential for the smooth performance of the procedure. A midline incision, starting at 1 cm above the xyphoid and giving a wide berth to the umbilicus (>2 in.) to minimize infection, provided access. The fat was divided by traction to minimize bleeding and to help find the linea alba. Thorough exploration was carried out with special emphasis to the gallbladder and

pelvic organs because of their high incidence of pathology.

Gastric bypass was performed by creating a 50 ml proximal gastric pouch and connecting it to a retrocolic Roux-en-Y loop with a 0.8 cm anastomosis. A tunnel was dissected bluntly behind the stomach from the cardia on the left to a point on the lesser curvature 2 cm below the cardia on the right (Fig. 1). Two TA-90 stapling instruments loaded with 4.8 mm staples were simultaneously guided through this channel to form the pouch with two separate and parallel rows of staggered staples (Fig. 2). A suture was placed at each end of the staple line to seal these ends securely. The ligament of Treitz was isolated and the proximal arm of the first loop identified and divided with a GIA autosuture instrument about 30 cm from the ligament of Treitz. Each end was oversewn with a running 3-0 synthetic absorbable suture. The distal jejunal loop was then brought up in a retrocolic fashion through the lesser sac and joined to the stomach with an "unstretchable" double-layered

FIG. 2. The pouch is created by two TA-90 autosuture instruments that are placed and fired simultaneously. A suture is required at each end for a complete seal.

FIG. 3. The distal limb of the divided jejunum is brought to the pouch behind the colon through the lesser sac.

anastomosis performed with continuous 3-0 monofilament polyproylene sutures (Figs. 3, 4, 5, 6). The stoma was created precisely 0.8 cm in diameter by suturing it snugly over a no. 18 double-lumen nasogastric tube. The jejunal limb coming from the stoma was fastened to the mesocolon with several nonabsorbable sutures to prevent an internal hernia. A jejunojejunostomy was then completed with the GIA and TA-55 autosuture stapling instruments (Fig. 7). The staple lines were then supported externally with four to six stitches of 3-0 nonabsorbable suture.

Gastric partition (Fig. 8) was carried out in the same manner as the gastric bypass procedure with the same incision, same exposure, same size gastric pouch, and same size gastric stoma. The gastric pouch was, however, anastomosed to the stomach immediately below the staple line (instead of the jejunum). The anastomosis was also made in exactly the same manner as that used for the gastric bypass with two continuous layers of 3-0 monofilament polypropylene sutures fitting snugly around a no. 18 nasogastric tube to create a 0.8 cm diameter stoma.

In both procedures, the abdominal cavity was then

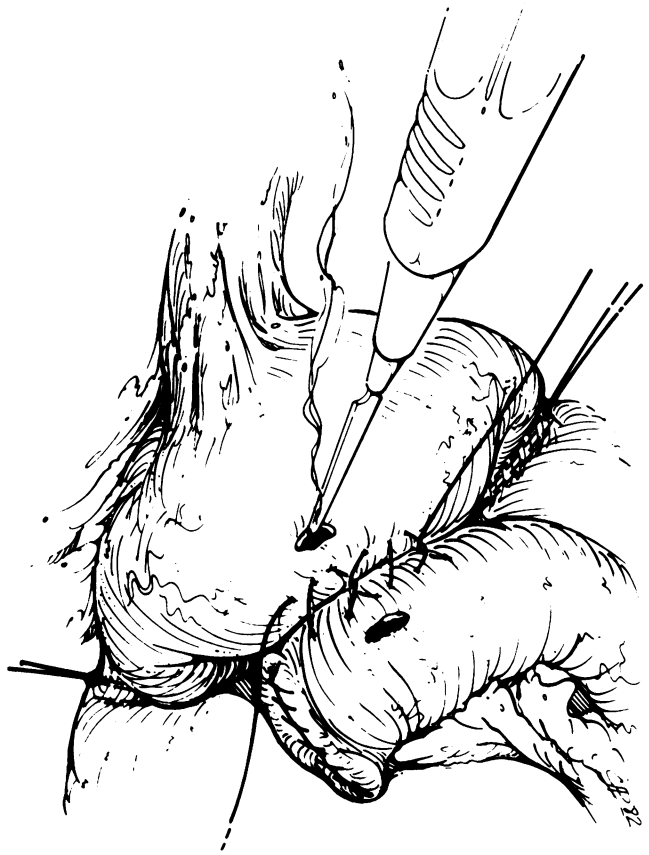

FIG. 4. The anastomosis is created with a double layer of continuous 3-0 monofilament suture. After the posterior layer is placed, two small opposing holes are made with the cautery and gently stretched with a clamp.

thoroughly irrigated with about 800–1000 ml of saline to float off the inevitable bits of fat, and the fascia was closed with two running double stranded loop 0-nylon sutures which were started at the ends of the wound and tied in the middle. The subcutaneous wound was washed with about 100 ml of saline, and the skin was approximated with skin staples.

The operation was usually completed in a little over an hour; the fastest time was 46 minutes and the longest two and a half hours.

Postoperative Care

Identical postoperative care was followed with both groups. The patients were generally extubated in the recovery room and kept in the intensive care unit for one day. They were supported with intravenous fluids until they passed flatus, usually on the third postoperative day. After a Gastrografin swallow demonstrated a satisfactory anastomosis, the nasogastric tube was removed and the patients were given 30 ml/hour of water orally for one day. This was supplemented with 60 ml tid of half-strength Ensure the next day and 60 ml tid of full strength Ensure the following day. At no time was any patient allowed more than 60 ml total volume per hour. Most patients were discharged on the sixth postoperative day. They were gradually advanced to an increasingly broad diet, measuring their food carefully so that the volume would not exceed two ounces at any one meal. They were further advised to chew each bite twenty times and initially to avoid those foods that are difficult to chew such as meat, apples, and oranges. Although a few patients followed these instructions religiously, most did not and tested their capacity often. The patients were also advised to walk four miles per day; perhaps a third actually did such exercise.

Most patients were seen two weeks after discharge, at monthly intervals for three months, three-month intervals for a year, and then at six month intervals. Considerable emotional support was often required. A well-trained, supportive, and sympathetic team is essential in this kind of surgery.

Two routines gradually developed with experience: (1) the persistence of a pulse exceeding 120 beats/minute or a fever over 102° led to the addition of chloroamphenicol, 1 qm q6h IV, for three days to the regimen. This routine seemed to avert potential infections of lungs, wounds, or urinary tracts, and (2) at about three

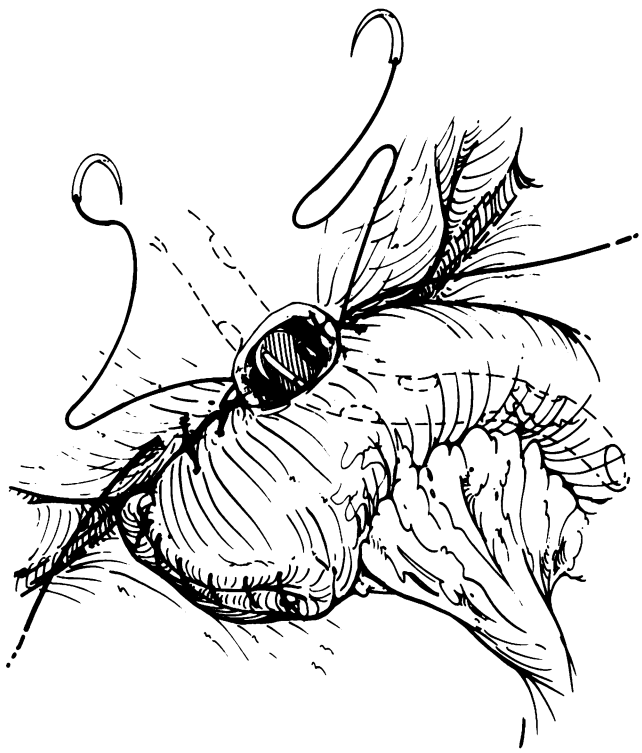

FIG. 5. The inner layer is sewn in a similar fashion. A no. 18 nasogastric tube is then pushed through and the anterior two layers are sewn snugly about the tube.

months, some patients, especially those who lost their weight rapidly, developed hypesthesias, paresthesias, dizziness, weakness, or other nonspecific symptoms. Initially such patients were studied intensively and were usually found to have normal laboratory studies except for various vitamin B deficiencies. With experience, the authors began to treat such symptoms pragmatically and found that children's chewable vitamins, 3 per day, and time took care of most of the problems.

Sixty Additional Gastric Bypasses

The authors stopped performing gastric partition procedure as soon as statistical review of the study demonstrated the marked superiority of the gastric bypass procedure. Since the completion of the study, another 60 gastric bypass procedures have been done as of February 15, 1982. These 60 plus the 42 cases carried out during the study thus offer 102 patients with gastric bypasses for review.

Results

At 15 months into the study, when statistically significant differences were clearly established at the 3-, 6-, 9-, and 12-month follow-ups, the code was broken, and it was determined that the gastric bypass group had a significantly greater weight loss at all times after operation (3–12 months) than the gastric partition group. Follow-up of both groups was continued to the present, but all morbid obesity procedures performed from that time to the present were gastric bypass procedures. In the second portion of this study, an additional 60 bypass procedures were done and followed by the same objective means, thus providing 102 patients with gastric bypasses for review.

Table 1 shows a comparison of weight loss after gastric partition and gastric bypass procedures. It is noted that the patients were well randomized in terms of their mean preoperative weight with a mean weight in the gastric partition group of 308.5 pounds and a range of 219 to 491 pounds and a mean weight in the gastric bypass group of 287.6 pounds with a range of 224 to 434 pounds. These differences were not statistically significant in the 45 patients entered into the gastric partition group and the 42 patients entered into the gastric bypass group. At a three-month follow-up, 44 patients in the gastric partition group had a mean weight of 257.4 pounds with a standard error of 0.6, whereas the 42 patients in the gastric bypass group had a mean weight of 232 with a standard error of 0.74. These differences are statistically significant at the 0.01 level. At the six-month period, the mean weight of 244.9 pounds in the gastric partition group and 203.8 pounds in the gastric bypass group were highly significant ($p < 0.001$). Similarly, at the nine-month, 12-month, and 18-month intervals, the gastric bypass group had statistically significant lowering of weight in excess of that in the gastric partition group (gastric partition 244 *vs.* gastric bypass 190.8 at nine months; gastric partition 240.2 *vs.* gastric

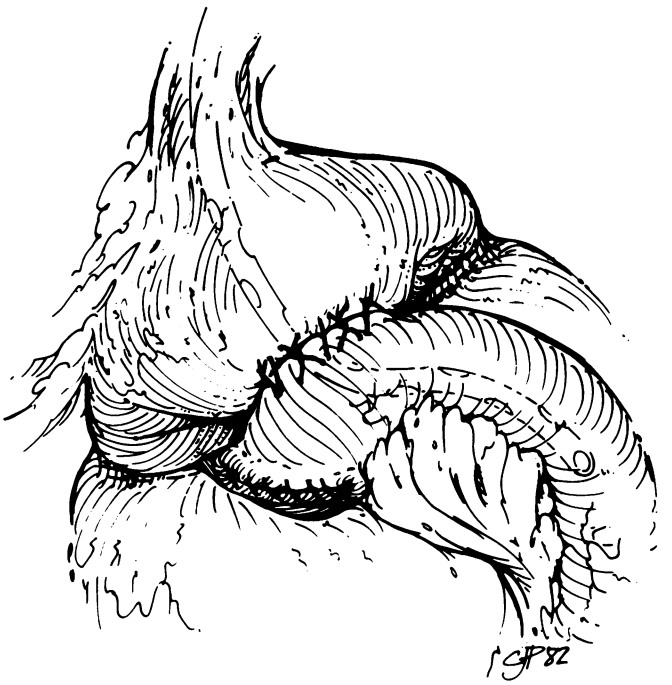

FIG. 6. The completed anastomosis.

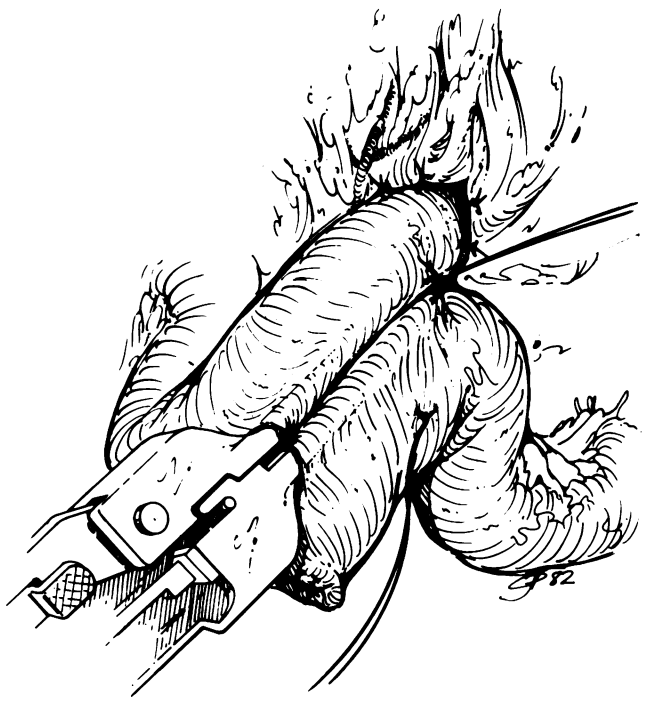

FIG. 7. A enteroenterostomy made with a GIA and a TA-55 and forming a Roux-en-Y loop completes the procedure.

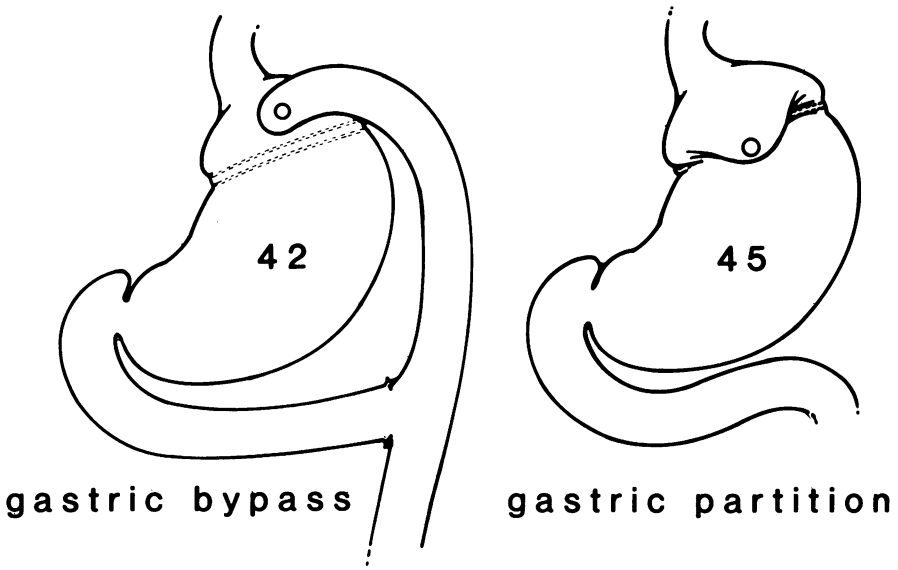

FIG. 8. The gastric bypass and gastric partition. The pouches and the anastomoses are identical in the two procedures.

bypass 179.1 at 12 months; and gastric partition 242.3 *vs.* gastric bypass 174.3 at 18 months).

Figure 9 shows this weight loss expressed as a percentage of the original weight with the standard error for each measurement shown. It is noted that the differences were statistically significant at all intervals from three months to 18 months in these patients according to the unpaired Student's t-test and a standard error of mean as the statistical procedure.

Table 2 demonstrates the effectiveness of randomization as performed by the Taves minimization technique. As noted, there was no statistically significant difference ($p > 0.05$) between the age and sex of the patients, the incidence of hypertension, diabetes or gynecologic pathology. These results support the findings of others who have had similar success in effective randomization using multiple variants with the Taves minimization technique.

The superiority of gastric bypass over gastric partition is also reflected by the number of failures, *i.e.*, those patients who failed to lose more than 25% of their weight. Table 3 shows that there were no failures among the 42 gastric bypass patients; all patients lost over 29% of their original weight. Among the 45 gastric partition patients, there were 28 failures. The authors have revised eight to date and have scheduled another 10 for the near future. Still another eight patients have lost less than 25%, and two have been lost to follow-up (the authors believe because of dissatisfaction with the procedure).

Both operations had a salutory effect on diabetes, and the benefits were evenly distributed in the two groups. Of the 12 patients with diabetes, all but one, the only patient with juvenile onset diabetes, reverted to normoglycemia following surgery. The patients with juvenile onset diabetes converted from an almost unmanageable brittle obese diabetic to a slim woman with constant insulin requirements.

Both operations were effective in alleviating hypertension. A total of 35 patients had hypertension; 19 in the gastric partition series and 16 among the patients with gastric bypass. After surgery only one of the patients with gastric partition and two patients with gastric bypass remained hypertensive during the first year of observation. It is of interest that the improvement of both hypertension and diabetes occurred even with relatively little weight loss after gastric partition. Only time will

TABLE 1. *A Comparison of Weight Loss After Gastric Partition and Gastric Bypass Procedures*

	Gastric Partition				Gastric Bypass				
	n	Mean Wt. Pounds	Range Pounds	Percent + SE	n	Mean Wt. Pounds	Range Pounds	Percent + SE	Significance
Initial	45	308.5	219–491	100%	42	287.6	224–434	100%	N.S.
3 Mo.	44	257.4	186–397	83.2 (SE = 0.69)	42	232.0	147–332	80.7 (SE = 0.61)	<0.01
6 Mo.	41	244.9	182–382	78.4 (SE = 0.90)	42	203.8	139–299	70.8 (SE = 0.94)	<0.001
9 Mo.	36	244.0	169–367	78.0 (SE = 1.11)	42	190.8	136–273	66.2 (SE = 0.87)	<0.001
12 Mo.	31	240.2	155–357	76.9 (SE = 1.36)	34	179.1	129–270	61.8 (SE = 1.04)	<0.001
18 Mo.	14	242.3	178–349	81.0 (SE = 2.64)	16	174.3	124–250	60.0 (SE = 2.02)	<0.001

tell if this effect will be maintained in those patients whose operations failed.

The complications were evenly distributed among the two study groups and in the group of 60 additional patients who underwent gastric bypass after termination of the study. Table 4 shows that there were no deaths in any of the groups and that 88% of the patients had no complications; these patients almost always went home on the sixth postoperative day.

There were five cases of stenosis of the anastomosis in the patients with gastric partition (11%), whereas none of the patients with the gastric bypass had this complication. No explanation is available for this difference which is not statistically significant within this series but could be of significant difference with addition of a larger group of patients.

Psychologic depression occurred in 6% of the gastric partition group, 10% of the gastric bypass group during the study, and overall in 6% of the gastric bypass patients done to date in this institution. There are clearly severe psychologic problems in some of these patients before and after surgery.

Overall the complication rates were equally distributed between the two groups, and, on the basis of surgical morbidity and mortality, there is no evidence to favor one procedure over the other. The superiority of the gastric bypass procedure stems from its capability to achieve greater weight loss.

Finally, although not a part of this prospective randomized study, it may be worthwhile to comment on

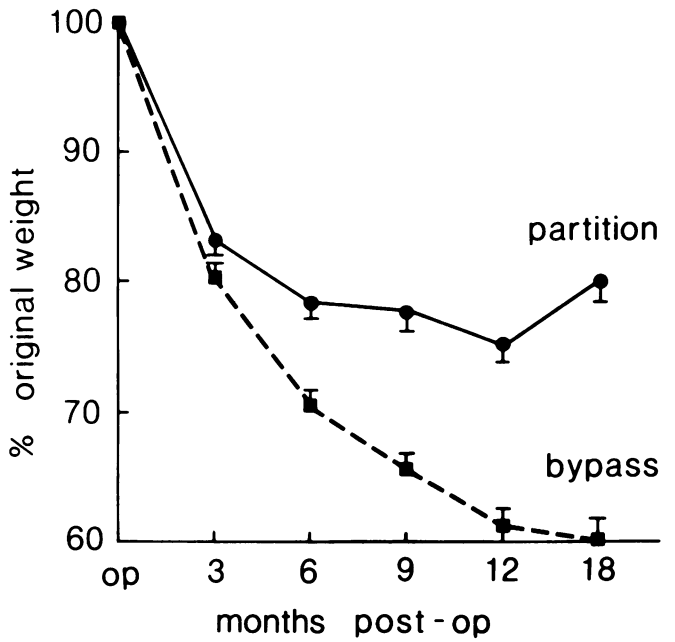

FIG. 9. Per cent of weight loss after gastric partition and gastric bypass procedures. Gastric bypass is far more effective in producing weight loss in the morbidly obese.

TABLE 2. *Effectiveness of Randomization*

	Gastric Partition	Gastric Bypass	
n	45	42	
Age	34 (22–54)	37 (20–56)	$p > 0.05$
Diabetes	7	5	$p > 0.05$
Female	35	34	$p > 0.05$
Gyn Pathology	11	14	$p > 0.05$
Hypertension	19	16	$p > 0.05$
Weight	308.5	287.6	$p > 0.05$

the authors' total experience with obesity procedures. Up to February 15, 1982, the authors performed a total of 221 operations for obesity of which the last 147 primary procedures are included in this report. Eighty-seven were in the control study, and another 60 subsequently underwent the successful gastric bypass procedure. The 74 remaining cases include the early cases done before the study and the revision of morbid obesity surgery failures from the authors' and other institutions. Among these the authors have had two operative deaths; one was caused by an irreversible cardiac arrhythmia in one of the very early cases perhaps because of premature endotracheal extubation, and the other followed a revision for a failed gastric partition and was caused by postoperative cholecystitis complicated by myocardial infarctions. There were three late complications among the early prestudy patients. One developed cancer of the larynx one year after prestudy gastric bypass and eventually died of the tumor; another, thought to be cured of melanoma, developed a recurrence and is still surviving. A third committed suicide.

Discussion

This study confirms that this version of the Mason type of gastric bypass is a successful operation that results in a significant loss of weight and that can be done with an acceptable morbidity and mortality rate. There were no deaths in any of the groups studied. All of the 102 patients who underwent the gastric bypass procedure lost at least 29% of their original weight with a mean weight loss of 38.2% at 12 months and 40% at 18 months. The crucial aspects of the operation appear to be (1) the small 50 ml gastric pouch, and (2) a tight anastomosis, 0.8 cm in diameter, which is hindered from stretching by two layers of continuous 3-0 monofilament

TABLE 3. *Failures After Gastric Partition and Gastric Bypass*

	Gastric Partition	Gastric Bypass
n	45	42
Revised	8	0
Revision scheduled	10	0
Failed <25% lost	8	0
Lost to follow-up	2	0
Total failures	28	0

TABLE 4. *Complications After Surgery for Morbid Obesity*

	Gastric Partition (Study)	Gastric Bypass (Study)	Gastric Bypass (All Cases)
n	45	42	102
Deaths	0	0	0
Wound infection	4 (9%)	5 (12%)	7 (7%)
Wound hematomas	2 (4%)	3 (7%)	3 (3%)
Subphrenic abscess	0	1 (2%)	1 (1%)
GI bleeding	0	0	1 (1%)
Stenosis of anastomosis	5 (11%)	0	0
Depression	3 (6%)	4 (10%)	6 (6%)

suture. The total surgical complication rate was 12% (infection 7%, bleeding 4%, and subphrenic abscess 1%), and there was an additional depression rate of 6%. All patients with complications recovered fully.

These results compare favorably with other published series, although it is difficult to compare results because of differences in reporting.

It is remarkable that such complex procedures can be done in the morbidly obese without a mortality, even though most weighed over 300 pounds, and that none of the complications were life threatening. Others have reported similarly good results. Poulos and associates[19] recently reported performing 302 cases without a death; Hardie et al.[20] operated on 102 patients without a mortality.

The gastric bypass proved to be far more effective in producing weight loss than the gastric partition even though both groups had the same size pouch and the same size and type of anastomosis. The differences were highly significant. In the gastric bypass group there were no failures (*i.e.*, a loss of less than 25% of original weight); in fact, all 42 patients lost over 29 percent of their weight. Among the 45 gastric partition patients there were 28 failures (62%). At one year patients with gastric bypass lost 15% more than those who had a gastric partition and by 18 months the difference between the two groups was 21%.

A number of studies of gastric bypass and gastric partition procedures have been performed with varying results. Some of these studies involve small groups of patients, and most are not prospectively randomized studies. Freeman and Burchett[1], in an uncontrolled study of 78 patients, found that gastric bypass patients lost 31.8% of their initial weight with a 40% failure rate; gastroplasty patients lost 26% and 35% failed. These authors suggested that there were no significant differences between the effectiveness of the two procedures. Eckhout and Prinzing[21] found no significant difference between the two procedures, but their follow-up was limited only to six months. Their gastric bypass patients suffered a 14% failure rate of the staple lines while their gastric partition patients had even more. Laws and Piantadosi[22] found that patients receiving the gastric partition procedure showed significantly poorer weight loss of 5% as early as three months and of 21% by 12 months. Lechner and Callender[23], following a prospective study of 100 patients, reported significantly better weight loss and less need for reoperation with gastric bypass than with gastric partition. Cohn and his associates,[24] in the discussion of their experience, state "whereas gastric bypass generally leads to a 35–45% weight loss, gastric stapling is customarily associated with a 20–25% weight loss."

Others have reported high failure rates following gastric partition procedures. Long and Collins[25] reported a 21% failure rate. Pace and his associates[26] had failure in 15–33% of their patients after a short follow-up depending on which procedure was used. MacLean and his coworkers,[27] in a refreshingly candid report, described four types of gastroplasty in which the first three variations failed, and the fourth had too brief a follow-up to allow assessment. Similarly, Gomez[28] described three variations of gastric partition in which the first two modes were not satisfactory and the newest had not yet had an adequate trial.

Although it is too early to determine whether the high mortality and illness rates associated with morbid obesity will be improved by surgery, there is already documented major improvement in diabetes and hypertension. According to Palombo and co-workers,[29] gastric bypass selectively reduced the excess fat while minimizing lean tissue loss. Rucker et al.[30] showed that gastric bypass produced lower cholesterol values (14%), lower total serum lipids (20%), lower SF 0-12 lipoproteins (21%) and SF 12-400 lipoproteins (48%).

The ability of these procedures to alter a state of diabetes to a normoglycemic state makes them unique. To our knowledge, the only operations available at present that will accomplish a reversion of diabetes to normal are the morbid obesity procedures and pancreatic transplantation. Whether the decrease in weight and metabolism consequent upon the gastric bypass produces this change in diabetic status or whether some intrinsic change in the pancreas occurs can only be speculated upon. Clearly this is an area that is in great need of detailed metabolic studies.

Furthermore, the morbidly obese often have severe emotional problems. Although most patients are normal, many demonstrate dependent, inadequate personalities, and depressions are common. During our routine preoperative evaluation by a psychiatrist, several psychotic depressions were discovered. After surgery strong emotional and medical support by an experienced multidisciplined team on a long-term basis is invaluable and greatly improves the chances for these patients' rehabilitation.

In spite of the authors' excellent results, this study and those of others must still be regarded only as interval reports. It still must be learned how well these patients will fare in the future. In addition, new approaches need to be pursued. The wrapping procedure of Wilkinson and Peloso[31] deserves further testing, although the early failure rate of 10% and the requirement for a large mass of foreign body are worrisome. It is, however, important, no matter what the approach, that uniform methods of reporting results be adopted and that the new operations are tested against the accepted procedures with prospective controlled blinded studies.

The reason for the superiority of the gastric bypass is probably due to the exclusion of the antrum and duodenum. Because the size of the gastric pouches and the characteristics of the anastomosis were the same in both operations, the difference should be due to interference with the neural, hormonal and enzymatic mechanism of the proximal gut. Little information on these matters is available at present. Both the fasting and postprandial levels of gastrin are reduced in patients after gastric bypass according to Shamos and associates,[32] but Huseman,[33] in contrast, found no significant changes. Villar and his associates[34] have shown striking alterations in the motility of the fundus after both gastric partition and bypass. Comparison of the two hormonal mileaus produced by these two operations should be a fruitful area of gastrointestinal endocrine research.

References

1. Freeman JB, Burchett HJ. A comparison of gastric bypass and gastroplasty for morbid obesity. Surgery 1980; 88:433–444.
2. Pories WJ. The surgery of morbid obesity. In: Sabiston DC, ed. Textbook of Surgery: The Biological Basis of Modern Surgical Practice. Philadelphia: WB Saunders, 1981; 1015–28.
3. Denbesten L, Kuchenbecker S. Metabolic surgery for obesity. Adv Surg 1980; 14:1–29.
4. Buchwald H. True informed consent in surgical treatment of morbid obesity: the current case for both jejunoileal and gastric bypass. Am J Clin Nutr 1980; 33(2 Suppl):482–494.
5. National Institute of Arthritis, Metabolism and Digestive Diseases. NIH conference on surgical treatment of morbid obesity. Ann Surg 1979; 189:455–7.
6. Bray GA. The Obese Patient. Philadelphia: WB Saunders, 1976; 317–318.
7. Bray GA. The surgical treatment of morbid obesity. Trans Assoc Life Ins Med Dir Am 1979; 62:106–17.
8. Kark AE. Jaw wiring. Am J Clin Nutr 1980; 33(2 Suppl):420–424.
9. Garrow JS. Combined medical–surgical approaches to treatment of obesity. Am J Clin Nutr 1980; 33(2 Suppl):425–430.
10. Payne JH, DeWind L, Schwab CE, et al. Surgical treatment of morbid obesity: 16 years of experience. Arch Surg 1973; 106:432–43.
11. Sherman CD Jr, May AB, Nye W, Waterhouse C. Clinical and metabolic studies following bowel bypassing for obesity. Ann NY Acad Sci 1965; 131:614–22.
12. Scott HW Jr, Dean R, Shull HJ, et al. New considerations in the use of jejunoileal bypass in patients with morbid obesity. Ann Surg 1973; 177:723–35.
13. Mason EE, Ito C. Gastric bypass in obesity. Surg Clin North Am 1967; 47:1345–51.
14. Mason EE. Gastric bypass and gastroplasty for morbid obesity. Milit Med 1981; 146(2):91–94.
15. Mason EE, Printen KJ, Blommers TJ, et al. Gastric bypass in morbid obesity. Am J Clin Nutr 1980; 33(2 Suppl):395–405.
16. Alden JF. Gastric and jejunoileal bypass. Arch Surg 1977; 112:799–806.
17. Taves DR. Minimization: a new method of assigning patients to treatment and control groups. Clin Pharmacol Ther 1974; 15(5)443–453.
18. Pories WJ, van Rij AM, Burlingham BT, et al. Prophylactic cefazolin in gastric bypass surgery. Surgery 1981; 90(2):426–32.
19. Poulos A, Peat K, Lorman JG, et al. Gastric operation for the morbidly obese. Am J Roentgenol 1981; 136:887.
20. Hardie GH, Stein G, CoBabe T. Gastric bypass: a safe, effective procedure? Wis Med J 1979; 78:34–38.
21. Eckhout GW, Prinzing JF. Surgery for morbid obesity. Colorado Med 1981; 78:117–122.
22. Laws HL, Piantadosi S. Superior gastric reduction procedure for morbid obesity. Ann Surg 1981; 193:34–40.
23. Lechner GW, Callendar AK. Subtotal gastric exclusion and gastric partitioning: a randomized prospective comparison of one hundred patients. Surgery 1981; 90(4):637–44.
24. Cohn R, Merrell RC, Koslow A. Gastric stapling for morbid obesity. Am J Surg 1981; 142:67–72.
25. Long H, Collins JP. The technique and early results of high gastric reduction for obesity. Aust NZ J Surg 1980; 50:146–149.
26. Pace WB, Martin EW Jr, Tetirick T, et al. Gastric partitioning for morbid obesity. Ann Surg 1979; 190:392–400.
27. MacLean LD, Rhode BM, Shizgal HM. Gastroplasty for obesity. Surg Gynecol Obstet 1981; 153:200–208.
28. Gomez CA. Gastroplasty in the surgical treatment of morbid obesity. Am J Clin Nutr 1980; 33(2 Suppl):406–415.
29. Palombo JD, Maletskos CJ, Rheinhold RV, et al. Composition of weight loss in morbidly obese patients after gastric bypass. J Surg Res 1981; 30:435–442.
30. Rucker RD Jr, Goldenberg F, Varco RL, Buchwald H. Lipid effects of obesity operations. J Surg Res 1981; 30:229–235.
31. Wilkinson LH, Peloso OA. Gastric (reservoir) reduction for morbid obesity. Arch Surg 1981; 116:602–605.
32. Shamos RF, Menguy RB. Effect of gastric bypass on serum gastrin. Surg Forum 1979; 30:350–351.
33. Huseman B. The gastric bypass procedure in the treatment of morbid obesity. Int Surg 1980; 65:107–110.
34. Villar HV, Wangensteen SL, Burks TF, Patton DD. Mechanisms of satiety and gastric emptying after gastric partitioning and bypass. Surgery 1981; 90:229–236.

Discussion

DR. EDWARD E. MASON (Iowa City, Iowa): This is a well-designed, double-blind, randomized, prospective study that shows that a gastroenterostomy is better than a gastrogastrostomy when an 8 mm stoma is created with two rows of running, locked 3.0 monofilament polypropylene sutures. A small gastrogastrostomy, so sutured, is predisposed to develop early obstruction, because of the edema and inflammatory reaction, and late dilatation because the sutures are then lost into the lumen. Some of the same loss of suture and dilatation of the stoma occurs with the Roux-en-Y gastric bypass, but it is less apparent because the Roux-en-Y gastric bypass provides other mechanisms for weight control besides the small pouch and a small stoma.

If we are to find a simpler operation than gastric bypass, what is needed is a nontraumatized, nonsutured, nonobstructed 11 mm diameter stoma that will not change in size, and is separated from the stapled partition by a well-healed divided stomach wall. (slide) You need to keep the stoma out of the zipper.