

Vertical Banded Gastroplasty: A Simple, Effective and Safe Surgery for Morbid Obesity

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Background: The purpose of this study was to analyze the data of 92 patients who were treated with vertical banded gastroplasty (VBGP) for morbid obesity. We wanted to show that VBGP is a simple, effective and safe surgery for an experienced gastrointestinal surgeon.

Methods: From January 1994 through June 2000, 92 patients with morbid obesity who were treated with VBGP were enrolled into this study. All associated data were corrected and analyzed. The gastric pouch was created with end-to-end anastomosis instrument (EEA-31) and two applications of thoracic anastomosis instrument (TA)90-4.8 or TA90-B. The outlet of the gastric pouch was 10 to 12 mm in diameter. The results were classified as excellent, good, fair, poor, and bad.

Results: Staple disruption occurred in four patients with two applications of TA90-4.8 at the beginning of the series. No surgical deaths occurred. Fifteen patients had excellent results. Thirty-eight patients had good results. Twenty-three patients had fair results. Only 16 patients had poor or bad results.

Conclusion: VBGP is a simple, effective and safe surgery for an experienced gastrointestinal surgeon in management of morbid obesity. The associated morbidity and mortality rates are low and the results are good.
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Key words: morbid obesity, vertical banded gastroplasty.

No dietary management for morbid obesity has achieved uniform long-term success. Surgical management should be considered for patients who weigh 100 pounds above their ideal body weight and for patients whose body mass index (BMI) exceed 40 kg/m² or between 35 and 40 kg/m² but with high risk comorbid conditions.⁽¹⁾ There are more than 30 surgical procedures that have been developed for the management of morbid obesity⁽²⁾ and two of them have stood the test of time and are commonly performed via celiotomy at present. These two proce-

dures are vertical banded gastroplasty (VBGP; Fig. 1) and the Roux-en-Y gastric bypass (RYGB; Fig. 2). Both of them have established records for their safety and effectiveness.⁽³⁾ Although the mean weight loss after RYGB is approximately 10 % more than after VBGP,⁽⁴⁾ VBGP is more easily performed and can avoid many of the complications seen after gastric bypass. Patients retain their normal anatomy after VBGP except the new formation of a small pouch over the proximal stomach.^(4,5) VBGP also avoids the complications of blind bypassed digestive

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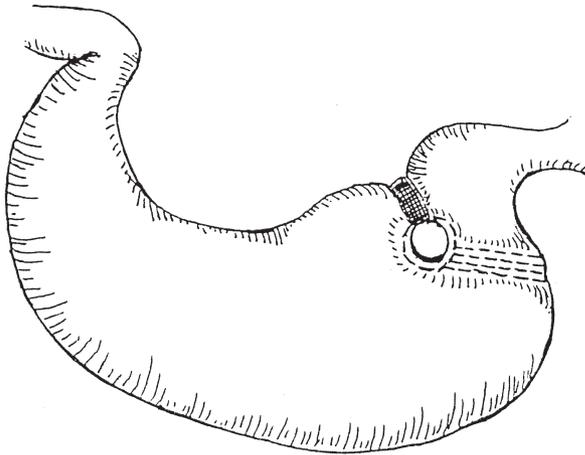


Fig. 1 Vertical banded gastroplasty. The gastric pouch was less than 25 ml and the diameter of its outlet was 10 to 12 mm.

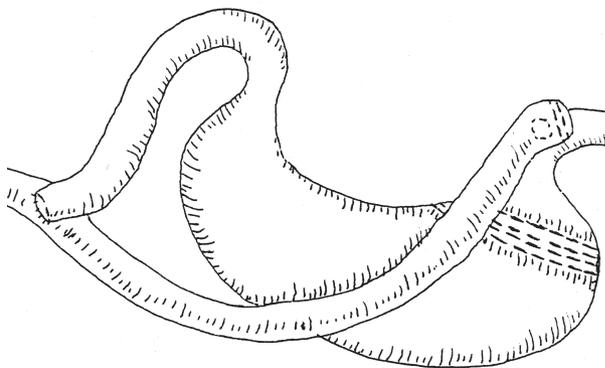


Fig. 2 Roux-en Y gastric bypass.

tract, ulceration, dumping, calcium deficiency bone disease, and protein malnutrition. Compared with RYGB, only a few patients have needed minimal vitamin and mineral supplementation after VBGP.⁽⁶⁾ Patients with peptic ulcers, gastric polyps, antral gastritis or significant iron or vitamin B12 deficiencies are also good candidates for VBGP⁽²⁾. VBGP is also the choice for reoperation for correcting the complications after RYGB, as it provides weight control while eliminating the problems of gastric bypass.⁽⁷⁾ Because of the positive results of patients with morbid obesity after VBGP in the quality of life gained and lower costs, this surgery is also recommended from a societal point of view.⁽⁸⁾ We chose VBGP for

the treatment of 92 patients with morbid obesity and analyzed our results retrospectively.

METHODS

From January 1994 through June 2000, 92 patients with morbid obesity who had undergone VBGP in two hospitals by two experienced gastrointestinal surgeons were enrolled into this study. The indications for surgery were mainly according to patients' BMI. Body weight in kilograms divided by body surface in square meters defined the BMI. The patients with BMI over 40 kg/m² were good candidates for surgery. Ten patients whose BMI were over 50 kg/m² were defined as superobese. The preoperative work-up included liver function test, endocrinological study, and abdominal ultrasound to exclude patients with hepatobiliary or endocrinological disease. The patients who had severe cardiopulmonary disease or were at high risk for surgery or anesthesia were not good candidates for this procedure. However, 24 patients with mild hyperglycemia, phlebitis, or dermatitis were accepted for surgery.

The patients' age, gender, preoperative body weight and excessive body weight (EBW) which means the excessive weight over the ideal body weight in percentage, operative time, blood loss during operation and the length of hospital stay were recorded (Table 1). The ideal body weight in kilograms was calculated using the following formula: (body height (cm) - 80) × 0.7 for men and (body height (cm) - 70) × 0.6 for women.⁽⁹⁾ Preoperative and postoperative body weight, BMI, and EBW were also recorded (Table 2). According the Reinhold's criteria, patients with 0 to 25% postoperative EBW were expressed as excellent results, with 26 to 50% postoperative EBW were good results, with 51 to 75% postoperative EBW were fair results, with 76 to 100% postoperative EBW were poor results, and

Table 1. Patients' Demographic Characteristics and Data Related to Operation.

Age (years)	29 ± 8.85 (16-53)
Gender (men to women)	42 : 50
Operative time (min)	157 ± 37 (90-310)
Surgical blood loss (ml)	123 ± 65 (20-300)
Length of hospital stay (day)	10.5 ± 3.3 (5- 30)

Table 2. Comparisons of Body weight, BMI and EBW before and after VBGP.

	preoperative	postoperative	<i>p</i>
Body weight (kg)	123.9±17 (84 -163)	89.8±15.9 (59 -133)	< 0.001
BMI (kg/m ²)	44 ± 4.3 (34.2- 54.8)	33.2± 7.9 (23.4- 51.9)	< 0.001
EBW (%)	107.4±22.8 (63.2-163.8)	50.4±24.6 (2.9-137.5)	< 0.001

Abbreviations: *BMI: body mass index; EBW: excessive body weight

over 100% as bad results. Any patient who needed secondary surgery for morbid obesity was also defined as poor results.

The surgery was undertaken with general anesthesia and an upper abdominal midline incision. The angle of His was looped. A 32 French Ewald tube was inserted from the mouth into the stomach on the lesser curvature side. A window was created against the Ewald tube using an end-to-end anastomosis stapler (EEA-31) 7 cm distal to the esophagocardiac junction. The thoracic anastomosis stapler, TA90-4.8 (two-row staples) or TA90-B (four-row staples), was applied from the lesser curvature side of the window to the angle of His, leaving a tiny pouch less than 25 ml. Two applications of TA90-4.8 stapler were performed for the first 20 patients. A Marlex mesh band, 5.5 cm in circumference and 1.5 cm in width, was secured to itself with two rows of polypropylene to restrict the outlet of the pouch and to prevent perforation of the stomach. The inner diameter of the pouch's outlet was 10 to 12 mm. The Ewald tube was then removed.

All data were analyzed using SPSS statistic software (Chicago, Ill, 1994) and described as mean ± standard deviation. Paired-t tests were used for comparison between preoperative and postoperative body weight, BMI and EBW. A *p*-value less than or equal to 0.05 was considered statistically significant.

RESULTS

There were 42 men and 50 women (Table 1). The mean preoperative BMI was 44±4.3 kg/m². The BMI of 83 patients were over 40 kg/m². The BMI of the other nine patients were between 35 to 40 kg/m² but they all had mild hyperglycemia. The patients with hyperglycemia returned to normal after surgery without medical treatment. The mean surgical time was 157±37 minutes and most procedures were finished within 3 hours. The mean blood loss during operation was 123±65 ml and the maximal

surgical blood loss was 300 ml. Blood transfusion was not needed for our patients. The mean hospital stay was 10.5±3.3 days and most patients were discharged smoothly within 2 weeks.

Patients were followed up every 6 months after discharge for 2 years. The average follow-up period was 19.2±8.7 months (range, 6 to 50 months). The mean body weight reduced from 123.9±17 kg to 89.8±15.9 kg one year after operation. The mean EBW and BMI also reduced significantly during the follow-up period (Table 2). Fifteen patients had excellent results, 38 patients had good results and 23 patients had fair results. Only 13 patients had poor results and three patients were noted to have bad results. The causes of the poor or bad results included staple disruption in four patients who all had two applications of TA90-4.8, revision because of outlet stenosis in two patients, bezoar formation in one patient, and massive sweet eating in the other patient's. We also found that the results were fair in superobese patients. The reduction of BMI after surgery was significant (Fig. 3). The BMI before surgery was 44±4.3 kg/m² and was reduced to 33.2±7.9 kg/m² at 6 months after surgery. The mean BMI was 27.2±11.9 kg/m² 1 year after surgery and 22.4±15 kg/m² 2 years after surgery. Three patients regained some body weight, but not as much as the weight prior to surgery (mean BMI 30.37±5.71 kg/m² 5 years after surgery). No more surgical intervention for their obesity was performed.

No surgical deaths occurred in our patients. One patient died during the long-term follow-up period, but the death was not related to the operation. The most common complication after surgery was wound infection (Table 3). Mild wound infection occurred at 11 patients and all of them recovered without surgical debridement. Splenic injury occurred in one patient without splenectomy. Two patients needed revision of their pouch outlets because of outlet stenosis. Postoperative pulmonary infection occurred in one patient who recovered after

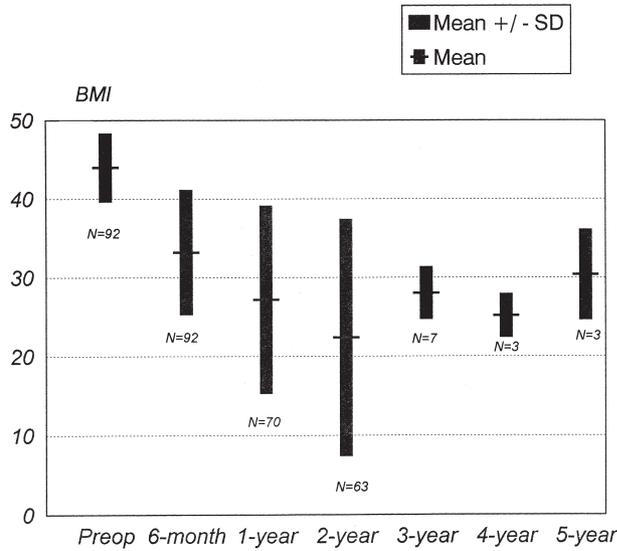


Fig. 3 Reduction of body mass index after vertical banded gastroplasty. BMI"body mass index.

Table 3. Surgical Morbidity and Mortality Rates of 92 patients with Morbid Obesity

Mortality	surgical mortality	0 (0 %)
	late mortality	1 (1.1%)
Morbidity	wound infection	11 (12 %)
	splenic injury	1 (1.1%)
	revision of gastroplasty	2 (2.2%)
	pulmonary infection	1 (1.1%)
	respiratory failure	1 (1.1%)
	esophagitis	1 (1.1%)
	postprandial vomiting	1 (1.1%)
	cholecystitis	1 (1.1%)
	staple disruption	4 (4.3%)

antibiotic treatment. Respiratory failure was noted on one male patient and he recovered after ventilator support. Esophagitis was noted on one patient who recovered after conservative treatment. One patient experienced postprandial vomiting during the follow-up period, which was controlled with medical treatment. Cholecystitis was found on one patient. Staple disruption occurred in four patients and all of them had two applications of TA90-4.8.

DISCUSSION

The use of non-surgical methods to maintain

significant weight loss more than 5 years has failed clinically in severely obese patients.^(1,10) Patients whose BMI exceed 40 kg/m² or between 35 to 40 kg/m² but with high risk comorbidities such as life threatening cardiopulmonary complications, sleep apnea or hypertension are considered for surgical treatment.^(1,11) Individual patient characteristics, eating habits and medical conditions, as well as surgeons' capabilities and preferences all contribute to the selection of surgical procedures.⁽³⁾ In this study, the main indication for surgery was the patient's BMI. Patients with severe medical diseases who were at high risk for surgery and anesthesia were not treated by surgery in our series.

Comparison with RYGB, VBGP is less effective in achieving weight loss, especially for those who eat food with high sugar content.^(10,12) In our results, only 16 patients had poor or bad results. The other patients had acceptable weight loss. Patients with no family history of obesity, without dietary misbehavior after surgery, without extremely high preoperative BMI and with regular physical activity presented more favorable BMI evolution after VBGP.⁽¹³⁾ Weight reduction did not depend on the type of food eaten but on the ingestion of food with high sugar content.⁽¹²⁾ In our patients, eating sweet food was the main cause of poor results. During the long-term follow-up, slightly more than 60% of the obese patients achieved permanent excellent or good results according to the Reinhold's criteria.⁽¹⁴⁾ Although the superobese patient may not be good candidates for VBGP because they remained obese after surgery in high incidences and had higher remaining comorbidities than other morbidly obese patients,⁽¹⁵⁾ we found in our series that 10 patients with superobesity before surgery had fair responses to VBGP during the follow-up period. Postoperative follow-up is extremely important after bariatric surgery. Postoperative dietary consultation and psychological support are helpful to increase the patient's compliance and success rates.^(16,17)

Morbidity and mortality rates associated with VBGP were low with morbidity rates less than 10% and mortality rates less than 1% in other studies.^(17,18) No death directly related to surgery occurred in our patients. The most common complications in our series were mild wound infections, but surgical debridement was not needed for them. The incidence of major wound infection was remarkably low

with the incidence from 1 to 3%,⁽¹⁷⁾ and this complication did not occur in our patients. Minor seroma formations were common in patients after surgery. Anastomatic leak is a surgical emergent situation and can induce fatal conditions such as adult respiratory distress syndrome or acute renal failure.⁽⁴⁾ Fortunately, no anastomatic leaks have been found in any of our patients. Staple disruption was noted at four patients. After changing two applications of TA 90-4.8 to TA90-B for the creation of gastric pouch, no more staple disruptions were noted.⁽¹⁹⁾ Staple disruption that occurred in patients with TA90-4.8 might have been due to the difficulty of continuing two perfect applications of TA 90-4.8 which led to a weaker new pouch. Some surgeons removed gall bladders because of the increased incidence of gallstone associated with rapid weight loss after VBGP.⁽²⁰⁾ Most surgeons who performed a prophylactic cholecystectomy because of the additional effect of bile stasis due to the lack of stimulation from the cholecystokinin after VBGP.⁽²⁰⁾ We removed gall bladder only when stone was detected using ultrasound before surgery or was palpable during operation. Only one patient suffered from cholecystitis during the follow-up period and was treated with cholecystectomy. We recommended routine preoperative biliary surveys using ultrasound instead of routine prophylactic cholecystectomy. Severe complications seem to be more common among older, heavier male patients with android fat distribution. The type of bariatric surgery did not significantly influence the complication rate.⁽²¹⁾ No severe surgical morbidity or mortality occurred in our patients. In addition, no excessive surgical time, massive surgical blood loss, or prolonged hospital stays occurred in our series. An increased experience at gastrointestinal surgery has resulted in the reduction in complication rates to very reasonable levels. Even results of VBGP from a low-volume community hospital general surgical practice were similar to those reported from a specialized series.⁽²²⁾

Minimal invasive laparoscopic technique has been developed for VBGP. The early results of satiety and weight loss parallel those in successful open gastroplasty.⁽²³⁾ Laparoscopic VBGP also reduced the incidence of incisional hernia to less than 1%.⁽⁶⁾ Although with limited experience, we will continue performing VBGP using the laparotomy or laparoscope.

We recommend from our limited experience that VBGP is an effective and safe modality for treating morbid obesity with relatively low surgical mortality and morbidity rates. It is also a safe and simple procedure for an experienced gastrointestinal surgeon to perform.

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垂直帶結成形術，一種簡單、有效且安全之 治療病態肥胖症的手術

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背景： 本研究的目的，在於分析92位病人接受垂直帶結成形術治療病態肥胖症之資料，以期證明垂直帶結成形術對一有經驗之胃腸外科醫師而言，是一簡單、有效且安全治療病態肥胖症之手術式。

方法： 從1994年1月至2000年6月，共計92位病態肥胖症病人接受垂直帶結成形術。所有相關資料均予以分析。胃囊袋以EEA-31及TA90-4.8或TA90-B造成，其開口內徑為10至12公厘。術後結果分為極優、優、普通、差、極差等。

結果： 胃囊袋自動縫合處脫落發生於4名病人，其均使用TA90-4.8。所有病人均未因手術致死。手術結果極優者有15名，優者38名，結果普通者有23名，結果為差或極差者有16名。

結論： 垂直帶結胃成形術對一有經驗之胃腸外科醫師而言，是一簡單、有效且安全的治療病態肥胖症的術式，其相關的併發症及死亡率均低且效果良好。
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關鍵字： 病態肥胖症，垂直帶結胃成形術。

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