

# Continued Excellent Results with the Mini-Gastric Bypass: Six-Year Study in 2,410 Patients

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**Background:** There is a growing body of evidence showing that the Mini-Gastric Bypass (MGB) is a safe and effective alternative to other bariatric surgical operations. This study reports on the results of a consecutive cohort of patients undergoing the MGB.

**Methods:** A prospective database was used to continuously assess the results in 2,410 MGB patients treated from September 1997 to February 2004.

**Results:** The average operative time was 37.5 minutes, and the median length of stay was 1 day. The 30-day mortality and complication rates were 0.08% and 5.9% respectively. The leak rate was 1.08%. Average weight loss at 1 year was 59 kg (80% of excess body weight). The most frequent long-term complications were dyspepsia and ulcers (5.6%) and iron deficiency anemia (4.9 %.) Excessive weight loss with malnutrition occurred in 1.1%. Weight loss was well maintained over 5 years, with <5% patients regaining more than 10 kg.

**Conclusions:** Overall, the MGB is very safe initially and in the long-term. It has reliable weight loss and complications similar to other forms of gastric bypass.

*Key words:* Morbid obesity, bariatric surgery, mini-gastric bypass, laparoscopy, weight loss, complications

## Introduction

Weight-loss surgery is a rapidly developing area of medicine. The fact that there are so many different types of surgical procedures for morbid obesity suggests in part, that none of them is an “ideal” choice.

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Each bariatric operation has its own advantages as well as its own attendant problems and complications, although it is well-known that patient selection, education, compliance, and surveillance also influence the results.

The mini-gastric bypass (MGB) was developed to try to deal with limitations in the present forms of weight-loss surgery.<sup>1</sup> Previous reports have documented excellent outcomes in the MGB with low rates of perioperative complications,<sup>2-4</sup> especially as compared to Roux-en-Y gastric bypass (RYGBP). The purpose of this study is to report on the medium and long-term results and safety of the MGB.

## Methods

Patients were selected for MGB, performed laparoscopically and using the criteria for bariatric surgery proposed by the NIH Consensus Development Panel of 1991 as a general guide.<sup>5</sup> Initially, patients were excluded if there was a history of prior major abdominal surgery, coagulopathy, age >55, or body mass index (BMI) >50. As experience was achieved, these exclusionary criteria were liberalized.

An extensive preoperative evaluation, including history and physical examination, psychiatric evaluation, and directed specialty consultations, was performed on all patients. In addition, patients were required to have extensive interaction with prior MGB patients and the written support of their family and primary care physician (PCP). Laboratory evaluation was directed rather than routine. We also maintain a nurse and an assistant specifically assigned to

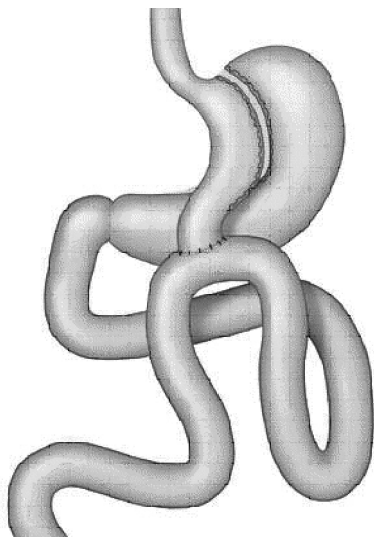
contacting patients and trying to ensure follow-up.

The study group included prospective data collection on consecutive patients (n=2,410) that underwent MGB between September 1997 and February 2004 (Figure 1). Data were collected prospectively and verified retrospectively. Data sources included office charts, hospital charts, follow-up notes, patient interview, physician reports, and telephone and email contacts. The data were entered into a computer database. Complete follow-up was available in 68% of the patients. Weight loss was expressed as percent of excess weight lost (%EWL) or BMI. Ideal body weight was determined according to the Metropolitan Life Insurance 1983 height/weight tables; for a given height, the middle weight for medium frame was chosen as the ideal body weight.<sup>6</sup> Outcomes related to changes in co-morbidities, quality of life, and patient satisfaction were assessed for patients with  $\geq 1$  year follow-up.

## Results

### Overview and Demographics

From September 1997 to February 2004, 2,410 patients underwent the MGB, with a mean follow-up of 38.7 months (range 1.0-74.4). The most common



**Figure 1.** The mini-gastric bypass. Stomach at lesser curvature divided *below* crow's foot, and then divided vertically against a 28-Fr bougie. Gastrojejunostomy performed 180 cm distal to Treitz' ligament.

co-morbidities included degenerative joint disease (68%), hypercholesterolemia (66%), gastroesophageal reflux disease (66%), hypertension (54%), depression (41%), urinary incontinence (33%), sleep apnea (29%), and type II diabetes (24%). The mean operating time was 37.5 minutes. The mean operative blood loss was 25-50 mL (estimated at each case). Mean age was 39 years (range 14-78). The female to male ratio was 2049/361 (85% female). The mean preoperative BMI was  $46 \pm 7$  kg/m<sup>2</sup> (range 34-74). Postoperative monitoring or treatment in an intensive care unit was required in only 4 patients (0.17%). The conversion rate to open MGB was 0.17%.

### Complications

Within 30 days of the MGB, 142 patients had complications (5.9%). Two of these patients died – one from a myocardial infarction 24 days after MGB and one from a perforated colon, giving a death-rate of 0.08%. Leaks occurred in 1.08%. When a leak was suspected early after surgery, patients were returned to the operating-room for laparoscopic reexploration and repair. The wound hernia rate was 0.08%, and wound infections occurred in 0.12% of patients.

### Patient Satisfaction

As part of the MGB Quality Assurance - Case Management System, continuous performance analysis was done by surveying the patient's opinions about the surgeons. Each quality was rated as Very High = 5, High = 4, Average = 3, Low = 2, Very Low = 1. Results are shown in Table 1.

**Table 1. Patient's opinion of the surgeons**

	Surgeons' Rating $\pm$ SD
Professional knowledge and technical capabilities	4.9 $\pm$ 0.3 Very High
Ability to explain things understandably	4.8 $\pm$ 0.43 Very High
Responsiveness to my concerns	4.4 $\pm$ 0.83 High
Amount of time spent with me	3.9 $\pm$ 1.05 High
Friendly and caring approach (bedside manner)	4.6 $\pm$ 0.69 Very High
Capacity for gentleness	4.6 $\pm$ 0.67 Very High

## Weight Loss, Changes in Co-morbidities, and Quality of Life

Weight loss was determined as mean %EWL and change in BMI. After 1 year, mean weight loss was 59 kg, mean %EWL was 80%, and mean BMI was 29. Weight loss was maintained within 10 kg of the maximum in >95% of patients up to 5-year follow-up.

In Figure 2, the plot of absolute weight loss and its relation to starting weight and postoperative time-period is shown. Weight loss followed a logarithmic decline with the majority of weight loss occurring in the first few months following surgery. Weight loss then stabilized for the following 2-5 years (Figure 3).

### Health Status Improvement

Health status improvement was excellent, with resolution or improvement in all major associated medical illnesses that were measured (Table 2).

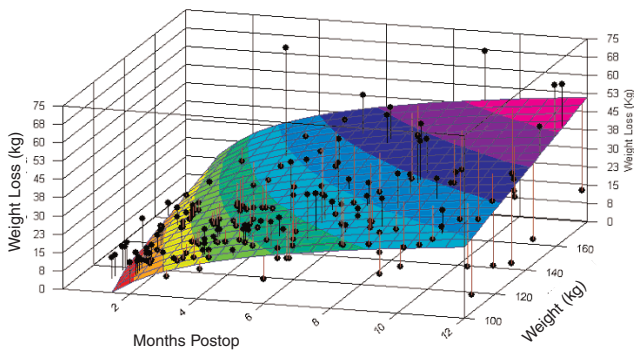


Figure 2. Postoperative weight loss (kg) after 1 year.

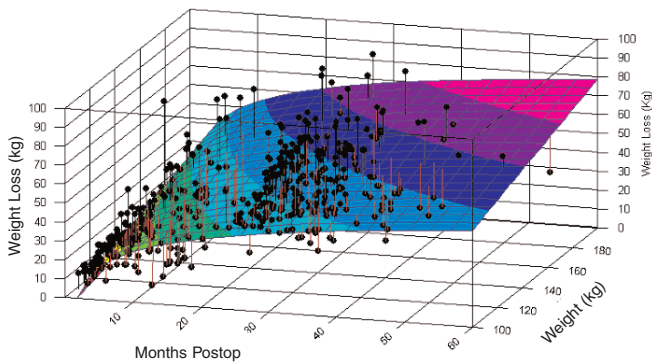


Figure 3. Postoperative weight loss (kg) over 5 years.

Table 2. Improvement in co-morbidities in patients who suffered these

	% Improved
Gastro-esophageal reflux	85%
Shortness of breath	96%
Diabetes	83%
Sleep apnea	87%
Hypertension	80%
Hypercholesterolemia	89%
Urinary incontinence	82%

### Long-term Complications

There were four late deaths following surgery (0.17%), related to narcotic overdose (1), alcoholic liver disease (2) and uncertain (2). Long-term complications were those seen in other forms of gastric bypass and manageable: dyspepsia and ulcers (5.6%) and iron deficiency anemia (4.9 %). Excessive weight loss with malnutrition occurred in 1.1%. Dyspepsia in MGB patients responded routinely to anti-acid regimens, often in combination with antibiotics for treatment of *Helicobacter pylori* gastritis. Ulcers occurred in 97 patients (4%) and were treated with anti-acid regimens and antibiotics. Three patients with ulcers failed medical therapy and underwent revision of their MGB.

Iron deficiency anemia was the most common nutritional deficiency syndrome and occurred in 110 patients (5%). Twelve patients required iron infusions to successfully reverse the anemia. Thirty-one patients (1%) developed excessive weight loss and required revision to a gastroplasty (division of the gastrojejunostomy, and gastro-gastrostomy).

### Discussion

Associated with the growing obesity epidemic are increasing rates of diabetes, hypertension, and other co-morbid conditions, with a rising cost of caring for the general population. Studies have shown that a successful bariatric operation is the best option for curing these co-morbid conditions.<sup>7-13</sup> Compared to classic treatment paradigms including diet and exercise, bariatric surgical procedures are superior to other treatment options on many health measures, including survival.<sup>14,15</sup> The challenge to general acceptance has

been the complication rates and late failure rates of some forms of weight-loss surgery.<sup>14,16</sup>

### Features of an “Ideal” Bariatric Operation

An ideal weight-loss operation should be effective, easy to perform and safe. It should have a simple and effective “exit strategy”, i.e., it should be easy to modify or revise for inadequate weight loss, weight regain, excessive weight loss or other complications. The ideal operation should leave little in the way of adhesions and rarely cause hernias. The operation should be relatively inexpensive, and long-term complications should be rare and manageable. The surgical procedure should be a part of a program that includes careful preoperative and postoperative follow-up, so that results can be continuously evaluated. In an ideal situation, patients should be available to outsiders to allow an objective assessment of the results of the operation.

While the weight of each of these factors may vary for different individuals, these elements define “ideal” weight-loss surgery. We believe that all these features are present in the present system used by our group offering the MGB.

The variety of surgical procedures offered for the treatment of morbid obesity and the disagreement between practitioners over the selection of the surgical technique suggests in part that there may be opportunities for improvement of the presently available surgical options.<sup>7-10,14,15,17</sup>

The results of this series compare favorably with other forms of weight loss surgery. In a recent study by DeMaria et al,<sup>18</sup> the results and risks with the RYGBP were reported. In 281 consecutive patients undergoing RYGBP, there were no deaths, but there were 14 anastomotic leaks (5.1%). The average operative time was 162 min in their most recent subset of patients. The average postoperative length of stay (LOS) was 4 days (range 2-91). Another recent review found that, on average, RYGBP has a 9.6% complication rate, with many patients staying in the hospital as long as 7 days.<sup>19</sup> “High volume” RYGBP programs, as determined by Nguyen et al,<sup>20</sup> have a 3.8 day LOS, 10.2% complication rate, and 0.6% mortality rate. As reviewed in this series, the MGB, when performed by the surgeons associated with our group, has a 5.9% complication rate, an average LOS of 1.4 days, and an 0.08% mortality rate.

The MGB allows rapid recovery. This is particularly important in the morbidly obese patient, who is often limited in activities of daily living before the operation. The important outcomes of a bariatric operation such as weight loss and improvement in co-morbidities and quality of life appear to compare favorably with RYGBP.

Initial studies of the MGB demonstrated these good results,<sup>1</sup> and this study confirms previous work. In addition, this new study provides the first reports of long-term follow-up and confirms that the MGB is equally effective over the longer term.

The MGB has the attraction of short operating time and easy revisability. Advanced laparoscopic skills, including two-handed technique and laparoscopic stapling and suturing, are required. Fundamentals of bariatric surgery and advanced laparoscopic surgery should both be mastered before performing laparoscopic gastric bypass.

### Conclusion

The MGB is being increasingly performed in the USA and abroad. It is a relatively low-risk bariatric operation in skilled hands, which results in good weight loss and improvement in co-morbidities. The operation is relatively simple, and has a short operating time and a shortened hospital stay when compared to RYGBP. The MGB is easily revised laparoscopically (<60 min), has a low failure rate, and a short recovery time. If needed, the MGB can be revised with morbidity comparable to the original MGB. Patients return to work quickly, show durable weight loss and have no implanted foreign body.

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