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Laparoscopic Gastric Bypass, Roux-en-Y: Preliminary Report of Five Cases

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The technique of laparoscopic gastric bypass, Roux-en-Y, has been developed, and performed in five patients. The detailed technique and instrumentation is described. Early case results show comparable weight loss, and reduced morbidity and disability. Laparoscopic gastric bypass is a feasible alternative to the open operative procedure.

Key words: Gastric bypass, laparoscopy, morbid obesity

Introduction

Laparoscopic, minimally-invasive surgery has surged to the forefront of modern surgical development. The advantages of minimal morbidity, reduced scarring, shorter hospital stay, and early return to full activity have enhanced acceptance by both patients and referring physicians.

Advances in laparoscopic techniques and instrumentation have broadened the repertoire of procedures available to experienced laparoscopic surgeons. The authors, with experience of several hundred bariatric procedures and broad advanced laparoscopic experience, sought to bring the techniques of minimally invasive surgery to the field of bariatric surgery.

Laparoscopic gastric banding has been previously described.[1] As a first principle, the procedure performed laparoscopically should be equivalent to the open procedure in expected therapeutic value – treatment should not be sacrificed for access. We consider the gastric bypass, Roux-en-Y, as our procedure of choice, and sought to perform this procedure laparoscopically. We began our development in the laboratory model, performing each phase of the procedure on animals, before it was applied to the human patient. The key piece to the puzzle was the development of the ENDOPATH* Stealth endoscopic/conventional circular stapler, 21 mm, by Ethicon Endo-Surgery.

Material and Methods

From 27 October 1993 through January 1994 we performed five procedures. Before performing the operation, each patient was given full informed consent regarding the risks and sequelae of gastric bypass and reflecting the change in access for the laparoscopic technique.

Preparation

Patients have been selected in a weight class of 41–55 kg (90–120 lb) over ideal body weight and BMI 35–40. Larger patients await the development of longer cannulas and instruments to make the procedure technically feasible. Preoperative mechanical bowel cleansing is performed. Peri-operative antibiotics and sub-cutaneous heparin are used.

Operative Technique

The patient is placed in an extended dorsal lithotomy position on the operating table, the legs being separated to permit the surgeon or scrub technician to stand between them. Pneumoperitoneum is induced and the initial operating cannula is inserted at the umbilicus, subsequent cannulas being introduced under direct vision. The initial cannulas are ENDOPATH Tristar* trocars, 10/12 mm; the lower left and right trocars are later exchanged for an ENDOPATH Ultraport 33 mm trocar kit and an ENDOPATH trocar

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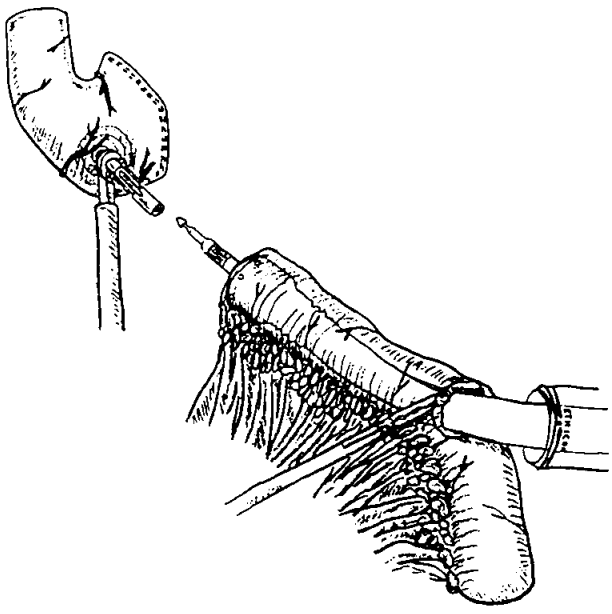

Figure 3. The Stealth is inserted through a counter-incision in the Roux-limb, and the penetrator is extended and is united with the stem of the anvil.

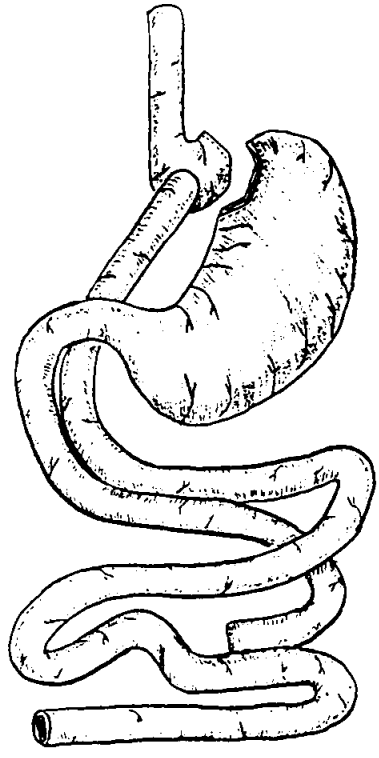

Figure 4. Completed anatomy is entirely similar to usual Roux-en-Y gastric bypass. Pouch is approximately 30 cc, and diameter of gastroenterostomy stoma approximately 12 mm.

the proximal end is immediately marked with clips, for identification.

The colon is again drawn anterior and cephalad, and a peritoneal incision is made just anterior to, and to the patient's right of, the ligament of Treitz. Dissection at this location will lead to ready penetration of the mesocolon into the lesser peritoneal sac. A blunt grasping forceps, or roticulating forceps, is then passed behind the colon and stomach, and is brought out of the lesser sac at its upper reaches, through either the lesser omentum or the opening adjacent to the transected stomach (Figure 2). A 15 cm (6") length of penrose drain is then drawn back to the lower abdominal field, and is sutured to the proximal end of the distal small bowel limb. The drain is then used to pass the bowel through the mesocolic aperture and lesser sac, to a relationship with the proximal gastric pouch.

Sufficient length of bowel, approximately 10 cm, is drawn into the upper abdomen, and a longitudinal incision is made in its antimesenteric aspect, 8–10 cm from the stapled end. The Stealth is then inserted through the lower left lateral port, which has now been converted to a 33 mm port, and is introduced into the lumen of the small bowel through the enterotomy. The stem of the anvil is grasped, using the anvil grasping forceps, through the upper right lateral port. The penetrator of the Stealth is then extended, and united with the anvil stem (Figure 3). The orientation of the bowel is observed and maintained as the Stealth is closed and discharged. The endoscopist can also observe the closure from the intragastric viewpoint, if desired.

The Stealth is withdrawn, and the enterotomy is closed with an application of the ELC60. The small bowel is then returned below the mesocolon, without excess tension. A secondary anastomosis of the duodenal limb to the enteral limb is then constructed, approximately 75 cm distal to the gastroenterostomy. This is accomplished with two applications of the ENDOPATH ELC35 endoscopic linear cutter, 35 mm, and closure of the stapler defect with a final application of the ELC60 (Figure 4).

The gastroenterostomy and enteroenterostomies can be tested by submerging them in irrigation fluid, while air is introduced into the lumen by the endoscopist.

Post-Operative Care

No nasogastric suction is employed post-operatively. Patients are permitted ice chips when alert, and a gastrograffin swallow is performed on the second post-operative morning. Figure 5 A and B shows a typical appearance of the gastric pouch and the stapled gastroenterostomy. Most patients are ready for discharge, on a diet of broth and jello, on the second post-operative day.

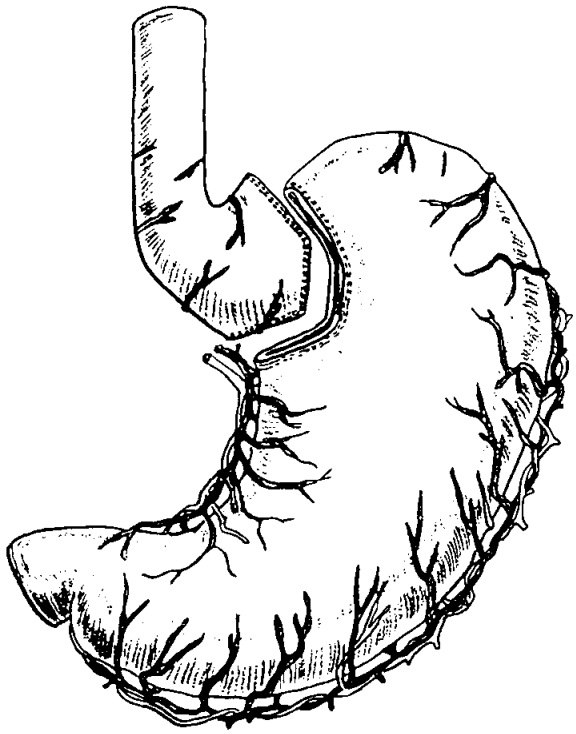

Figure 1. The stomach is transected with a series of applications of the endoscopic linear cutter, forming a curvilinear staple line.

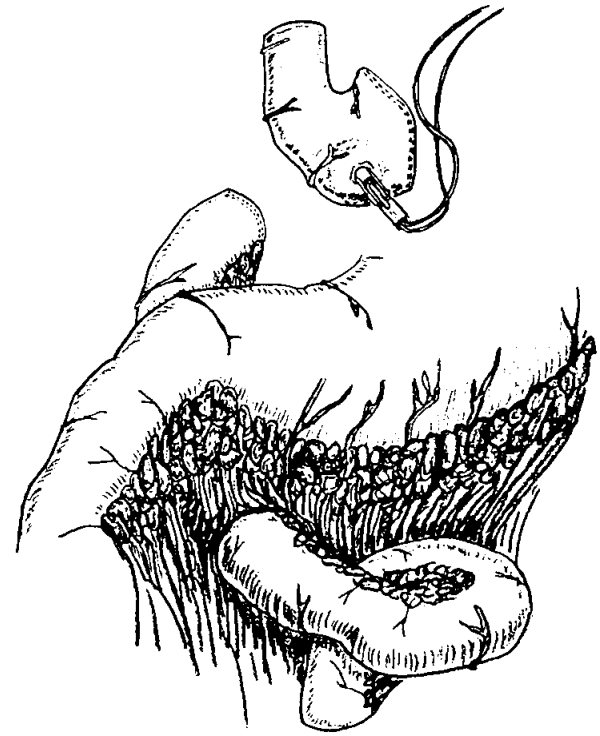

Figure 2. After insertion of the Stealth anvil per-orally, the proximal end of the Roux-limb is passed behind colon and stomach, to emerge from the upper recess of the lesser sac or through the gastrohepatic omentum.

sleeve, 18 mm, respectively. Due to the thickness of the abdominal panniculus, care must be taken to avoid tunneling obliquely between the skin and the abdominal fascia, or cannula length will be insufficient to maintain access.

The liver is retracted by a fan retractor, placed through an upper midline port. The esophagus is exposed and the cardio-esophageal junction and angle of His are identified. This localization can be aided by inflation of a balloon catheter, such as a Baker jejunostomy tube, in the gastric lumen, and drawing it up to the cardia.

The dissection is begun approximately 5 cm below the cardia at the lesser curvature. The stomach is elevated, and an aperture is created adjacent to the gastric wall, around the lesser curvature, along the posterior gastric wall. An initial application of the ENDOPATH ELC60 endoscopic linear cutter, 60 mm, is then made in a horizontal direction. The dissection is then continued, and the direction of the transection line is turned vertically, aiming for the angle of His. The pouch should be vertically oriented and just sufficient in size to admit the anvil of the Stealth 21 mm circular stapler. Prior to each discharge of the stapler, the location of the esophageal cardia is re-confirmed by per-oral introduction of a dilator. Three or four applications of the ELC60 linear cutter are required to completely divide the stomach (Figure 1).

The endoscopist then performs flexible endoscopy of the gastric pouch, and a percutaneous venous cannula is used to introduce a wire loop into the lumen, where it is grasped by the endoscopist and retrieved through the mouth. The wire loop is easily passed through the stem of the STEALTH anvil, and is then used to draw the anvil, stem-first, through the oropharyx and esophagus into the stomach. Momentary deflation of the balloon of the endotracheal tube is usually necessary to admit the anvil to the distal esophagus. The anvil is placed under tension, and gentle electrocautery is applied to create an opening large enough to bring the stem through the wall of the pouch. This serves to elevate the gastric pouch and retract it anteriorly during the next portion of the procedure.

The operating table is placed in Trendelenberg position, and the transverse colon and greater omentum are paddled toward the upper abdomen. The small bowel is examined, and the proximal jejunum identified at the ligament of Treitz. The peritoneal reflection must be clearly demonstrated, to avoid misidentification.

The small bowel is followed distally for approximately 10–12 cm, to reach a comfortable length of mesentery. It is then transected with the ELC60, and

A

Results

All patients underwent uncomplicated procedures, with duration of 7.5 – 3 h, as experience accumulated. All recovered uneventfully and were discharged by the second post-operative day. Gastrografin studies in the immediate post-operative period demonstrated the proximal gastric pouch to be of acceptable size, 15–25 cc estimated volume.

Two patients developed an acute viral syndrome during late convalescence. In one case (Patient 1), local treating physicians subjected her to open exploratory laparotomy, with negative findings. One of the authors (ACW) attended the procedure, and observed the anastomoses and measurements to be correct and adhesion formation to be minimal.

Patient 4 developed a similar viral syndrome (epidemic in this region at the time), and required readmission for diagnosis and rehydration. Both patients subsequently recovered uneventfully.

Table 1 shows pre-operative height, weight and BMI, and short-term post-operative values.

Figure 5 A and B. GI series after laparoscopic Roux-en-Y gastric bypass. Gastric pouch and stapled gastrojejunostomy are demonstrated.

B

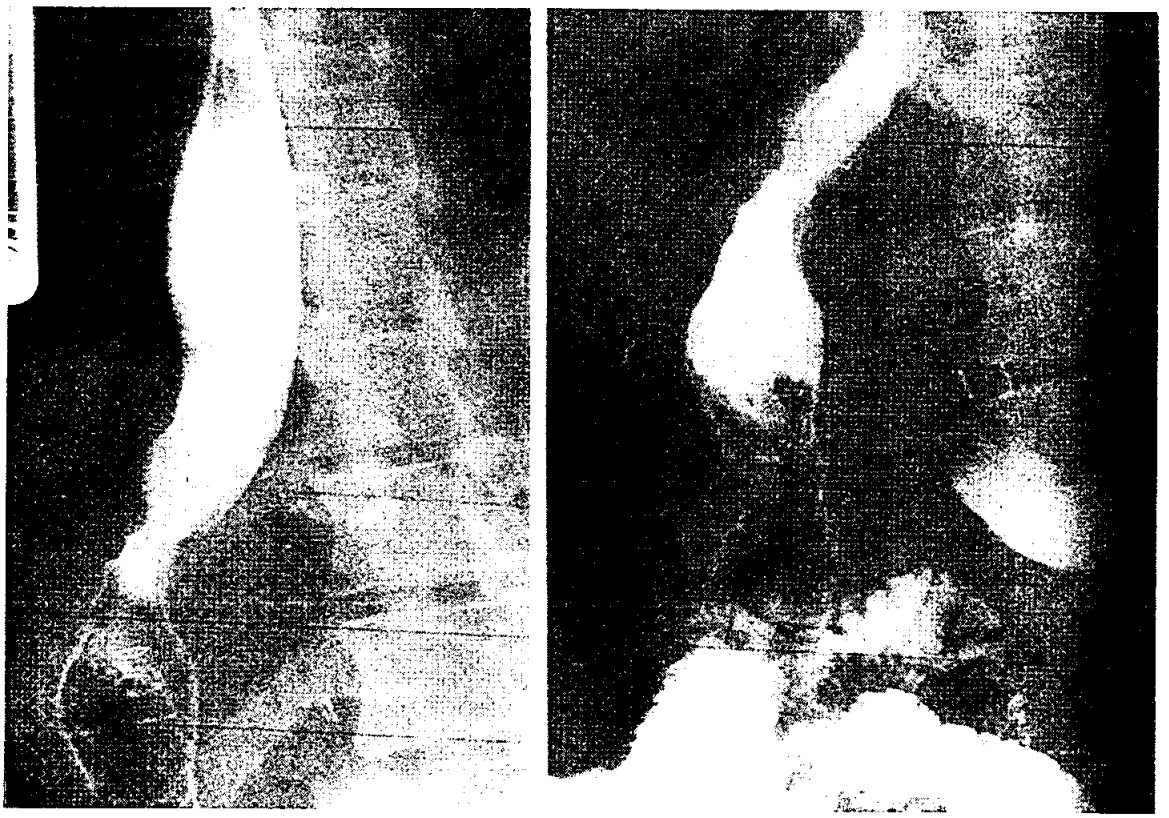

Table 1. Pre-operative and three months post-operative results: laparoscopic gastric bypass

Patient	Pre-operative Height	Pre-operative Weight	BMI (kg m^{-2})	Post-operative Weight 1 month	Post-operative Weight 3 months	Percentage excess weight Lost @ 3 months	Lab* at 3 months
1. JT	157.48	90.9	36.6	77.3	63.2	67	Normal
2. MR	157.48	100.0	40.0	86.8	75.9	50	Normal
3. LD	160.02	99.5	38.8	86.4	79.5	42	Normal
4. SA	165.10	109.5	40.2	97.7	80.9	54	Normal
5. KG	157.48	97.7	39.4	76.8	NA	NA	NA

* Three month post-operative laboratory studies include CBC and SMA-20.

Discussion

The costs of health maintenance and care are a pressing issue, and morbid obesity is associated with several chronic and very costly co-morbidities, such as diabetes mellitus, hypertension, and esophageal reflux disease. Major therapeutic benefits from effective bariatric surgery have been substantiated by the Consensus Development Panel of the National Institutes of Health.[2]

Fobi asserts that gastric bypass is a more desirable operation for control of obesity than the vertical gastroplasty, and is the 'gold standard' of obesity surgery.[3] Efforts to adapt minimally invasive techniques to lesser procedures, such as gastric banding, sacrifice the therapeutic objective to the achievement of the technique.

Pories has described the benefits of gastric bypass in normalization of diabetes mellitus.[4] We have confirmed his observations in our own unpublished series. Tight control of blood glucose is associated with much-reduced risk of the complications of diabetes[5] – a value to be realized in savings of both lives and expense.

Application of the minimally invasive technique of laparoscopic gastric bypass offers the afflicted patient a new option to achieve highly beneficial therapy, with optimally reduced morbidity and disability. Its potential for increased acceptance will allow improved management for an expanded set of suffering patients. Minimally invasive bariatric procedures should be performed only by bariatric surgeons who are experienced in laparoscopic techniques.

Acknowledgement

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* Trademark, Ethicon Endo-Surgery

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