Current status of Laparoscopic Adjustable Gastric Banding In the United States

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Laparoscopic adjustable gastric banding (LAGB) was introduced into clinical practice in the United States in 2001. The catalysts for its introduction were two prospective multicenter Food and Drug Administration (FDA) monitored clinical trials. The Lap-Band trial A recruited patients from 1995-1998 in 8 centers with 259 out of 292 patients having the band implanted laparoscopically by way of a perigastric dissection. The average percentage excess weight loss (%EWL) was 26.5% at 6 months, 34.5% at 12 months, 37.8% at 24 months, and 36.2% at 36 months. A high incidence of gastric prolapse and slippage was observed which was attributed to multiple factors. These include the learning curve of the procedure, utilization of the perigastric dissection and lack of frequent adjustments, with the majority of patients followed every 3-6 months and adjusted by a radiologist based merely on a contrast swallow evaluation. The Lap-Band obtained approval by the FDA in June 2001. The Swedish Band clinical study recruited 276 patients in 12 centers in 2003. All these gastric bands were implanted laparoscopically by way of the pars flaccida technique. This trial included centers with both large and no experience with gastric band management. The mean %EWL at 3 years was 41.1%. The Swedish Band, later rebranded as the Realize Band, was approved for use by the FDA in September 2007. In February 2011, the FDA also expanded criteria for use of the Lap-Band in patients with a body mass index (BMI) as low as 30 kg/m² with at least one associated comorbidity,
based on a study documenting 64% EWL at one-year in 143 patients with a very low complication rate.\textsuperscript{3,4} The LAGB procedure increased in popularity after appropriate insurance coding was implemented in 2006 and was recognized by Medicare as one of the approved procedures for reimbursement in Bariatric Surgery Centers of Excellence (BSCOE). From 2007-2009 there were approximately 90,000-100,000 LAGB procedures performed per year in the U.S., approaching close to 50% of the total annual bariatric procedures. In the BOLD (Bariatric Outcomes Longitudinal Database) data from the BSCOE, the band accounted for close to 40% of the cases and this data did not include a significant number of cases performed in outpatient surgery centers.\textsuperscript{5} Factors influencing patients and surgeons choosing this procedure were its’ safety and the lower level of invasiveness compared to gastric bypass or sleeve gastrectomy.\textsuperscript{6}

Early proponents of the gastric band in the U.S. included both academic and private community centers reporting good weight loss in the short- and mid-term follow-up with low rates and degrees of complications. The team at New York University demonstrated in a group of 2,909 patients a %EWL of 37.6% at 1 year, 53% at 3 years and maintained over time with 47% at 6 years of follow-up.\textsuperscript{7} Data from University hospitals in the U.S. documented a significantly low rate of band explantation (0.87%) and band revisions (0.76%) out of a total of 10,151 LAGB procedures.\textsuperscript{8} At the community level, several authors have reported weight loss between 40-64% at 1-5 years of follow-up.\textsuperscript{9,10} This data created early enthusiasm for many other programs, but significant issues became evident, including the need for intensive after-care and maintenance, frequent follow-up with recommendations for the need of monthly follow-up during the first year, the presence of intractable reflux, the need for crural repair in most patients and tremendous variability in outcomes between centers and patients.\textsuperscript{11,12} In one recent study comparing outcomes in 7 different U.S. centers using the same gastric band but an individualized approach for follow-up and band adjustments, the weight loss achieved in each center was significantly different ranging from 22% to 52% EWL at one year.\textsuperscript{13} All these factors combined with the growing acceptance of the sleeve gastrectomy have led some surgeons to abandon the LAGB. In 2011, approximately 60,000 cases were performed in the U.S. representing a smaller percentage of total annual bariatric cases and the majority being done in centers with a high volume of band cases.

Roux-en-Y gastric bypass (RYGB) has been performed in the U.S. longer than the LAGB. In RYGB patients, there has been a documented 5-15% rate of significant weight regain.\textsuperscript{14} The LAGB has gained popularity in high volume band centers as a revisional procedure for gastric bypass patients that have experienced weight regain. In two small series from U.S. academic centers, the % EWL has been an additional 21-47% from what was regained after the RYGB in 1-5 years of follow-up.\textsuperscript{14,15} Also, in the US it is important to acknowledge the influence on patients from celebrities undergoing bariatric surgery. Recently, Carnie Wilson, a pop music singer who had a laparoscopic RYGB in 1999 and lost 150 pounds, developed a significant weight regain of more than 50% of the initial weight loss. In January 2012 she had a LAGB placed around her gastric pouch and has subsequently experienced significant weight loss.\textsuperscript{16} All of these factors are playing a role in the utilization of the LAGB as a bariatric surgery revisional modality in the U.S.

As of 2012, the use of LAGB in the U.S. continues to decline, but still remains an accepted option (Figure 1). There is a trend to offer it to lower BMI patients (BMI<50 kg/m\textsuperscript{2}) that do not have Type 2 diabetes, usually in centers with dedicated physician extenders that can assist with the intensive
follow-up required. We are still only operating on less than 1% of the eligible candidates for bariatric surgery, and some patients only want the band. I predict that in the future the band will be offered mainly in high-volume centers that have a dedicated team for band management including comprehensive long-term follow. 

![Gastric Banding Cases in the United States](image)

**Figure 1** - Trend in the Volume of Laparoscopic Adjustable Gastric Bands being performed in the United States

References

Laparoscopic Greater Curvature Plication: An Evolving Surgical Technique for the Treatment of Obesity: Results and Lessons Learnt from 499 Consecutive Cases

Ariel Ortiz Lagardere, MD, FACS
Arturo Martínez Gamboa, MD

Introduction

The concept of plicating the stomach in order to reduce gastric volume is not a new one. Indeed Talebpour et al published their experience of the laparoscopic gastric plication procedure in 2007 with the main advantages of it being a relatively cheap bariatric operation (through its’ avoidance of expensive laparoscopic staplers) and the theoretical reduction in leak rate due to the lack of a staple line as exists in gastric bypass or sleeve gastrectomy. This article will describe our experience of the now increasingly practiced laparoscopic greater curvature plication (LGCP).

In August 2010, following approval by our national Ethics and Scientific Committee we started performing LGCP. All LGCP procedures were performed by the same surgical team based at the Obesity Control Center, a leading tertiary referral bariatric surgery unit based in Tijuana, Mexico.

Surgical Technique

The patient is positioned in the Trendelenburg position. Five ports are utilized (four 5 mm and one 10 mm port) in an ergonomic placement (similar to that of sleeve gastrectomy). After dissection and full mobilization of the greater curvature, greater curvature plication is performed with 2 layers of non-absorbable sutures. The first plication layer consists of interrupted 2-0 braided polyester sutures and the second layer with continuous 2-0 polypropylene sutures. In both plication layers seromuscular bites are taken commencing 1 cm from the Angle of His and terminating 3-5 cms from the pylorus. Care is taken to ensure a symmetrical greater curvature plication by taking equidistant bites of the anterior and posterior stomach wall from the greater curvature. A 32 French custom dynamic oral-gastric calibration device (patent pending) is placed in situ to facilitate standardization of the plication and reduce the risk of gastric obstruction. This calibration device senses pressure thus gives the surgeon feedback on the tension applied to the outer wall of the stomach whilst the plication is being performed.

Our current technique has been modified from that described above as a consequence of troublesome postoperative symptoms and complications gleaned from our early experience of LGCP. We still do a 2 layered plication but both layers now include continuous sero-muscular suturing. We perform the first plication layer with 2-0 polypropylene and the second layer with 1-0 polypropylene, the distance between stitches being 0.3 - 0.5 cms (Figure 1). We pay meticulous attention to ensuring symmetry of the plicated stomach as well as avoidance of axial rotation of the stomach. We also pay special attention to ruling out a hiatus hernia, and ensuring the fundal plication is not done too tight so as to avoid gastric obstruction.

Exclusion Criteria

Patient outcomes were collected prospectively at three month intervals. Patients that did not have a minimum of 6 months follow up, those requiring early conversion to another procedure e.g. gastric...
banding or those non-compliant with the follow-up protocol were excluded.

Results

A total of 499 patients underwent LGCP surgery from August 2010 to April 2011. This included 467 patients undergoing primary LGCP and 32 patients undergoing LGCP following previous gastric band surgery. In the primary LGCP group (n=467) there were no conversions to open surgery and no mortality. Mean surgical operating time was 40 minutes and mean hospital length of stay was 22 hours.

<table>
<thead>
<tr>
<th>Complication</th>
<th>Frequency</th>
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<tbody>
<tr>
<td>Post-operative gastric obstruction</td>
<td>1.7% (8 patients)</td>
</tr>
<tr>
<td>Upper Gastrointestinal bleeding (suture line)</td>
<td>3% (15 patients)</td>
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<tr>
<td>Post-operative short gastric vessel bleeding</td>
<td>0.4% (2 patients)</td>
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<tr>
<td>requiring re-operation</td>
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<tr>
<td>Perforated gastric ulcer</td>
<td>0.4% (2 patients)</td>
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<tr>
<td>Gastric wall herniation between suture line</td>
<td>1.3% (6 patients)</td>
</tr>
<tr>
<td>Suture line disruption/failure resulting in re-</td>
<td>7% (32 patients)</td>
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<td>plication surgery</td>
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Table 1 – Complication Rates in our 499 Laparoscopic Greater Curvature Plication Cases

1. Complications

The complications in our series are outlined in Table 1. The majority of the complications occurred during the first 100 cases following which modifications in technique have reduced their frequency.

2. Follow Up

325 of the 467 patients were eligible for analysis by way of our follow-up criteria. These included 254 females and 71 males. Mean pre-operative BMI was 39.9 kg/m² (Range 29 - 63 kg/m²). Mean post-operative follow up was 12.5 months (Range 6 – 18 months).

Figure 2 illustrates the mean %EWL at various post-operative time periods. 73% of patients in our study achieved a %EWL ≥ 50%.
No significant differences were observed in weight loss between genders or age groups. Low pre-operative BMIs groups’ demonstrated better weight loss compared to higher BMI groups as shown in Figure 3.

Fifty-five patients (17%) at follow up complained of persistent acid reflux symptoms and 6 patients (2%) complained of dysphagia to solid food. Two patients had their plication reversed and converted to AGB for poor weight loss and 2 patients underwent hiatal hernia repair for persistent acid reflux.

**Conclusions**

Several modifications to our plication and calibration techniques took place in our study with the aim of reducing troublesome post operative nausea, vomiting, acid reflux and dysphagia symptoms as well as major complications.
We must stress the importance of not creating too tight a plication which undoubtedly contributes to postoperative gastric obstruction by way of the infolded fundus obstructing the distal esophagus. ‘Over-plication’ may also lead to persistent acid reflux symptoms, gastric ulcers, herniation of the stomach through the suture line or suture line failure (breakage or loosening). Subsequent addition of an additional restrictive procedure e.g. a gastric band to the plication as opposed to reversing the plication is a better option for patients who have poor weight loss. This is because in our experience reversal of the greater curvature plication can be technically challenging to perform.

We feel strongly LGCP does require an objective and standardized technique. In essence the surgical goal of LGCP is to create a stomach sparing gastric sleeve, with all the components of a gastric sleeve but without the need for a vertical sleeve gastrectomy.

We conclude that LGCP is an effective weight loss procedure, in our series there was 60% EWL at 1 year. Like all bariatric surgeries it has a learning curve. We observed a significant reduction in our complication rate following modification of our technique. However, the strength of any bariatric procedure is based on its’ durability and thus long-term outcome data is essential. Currently published long-term data pertaining to LGCP is elusive but is vitally important if LGCP is to be considered in the surgical armamentarium of bariatric surgeons throughout the world.

References

Evolution of the GaBP Ring™ (Fobi Ring)

Mal Fobi, MD, FACS, FASMBS
Pioneer of the Fobi Gastric Pouch

Dr. Edward Mason, after observing the weight loss from the gastric bypass (GBP) operation, attributed the weight loss to the restrictive capacity of the gastric pouch. This observation led him to introduce a restrictive operation in 1971, the partially transected horizontal gastroplasty with a proximal pouch as small as that of the GBP operation.(1) This was a less invasive operation with less surgical morbidity and no malabsorption or long-term complications as with the GBP. The initial short-term weight loss appeared to be as good as what had been observed with the GBP. This gave birth to various gastroplasty operations from 1971 - 1977 when it became very apparent that the channel between the pouch and the rest of the stomach stretched progressively after the first six months and the operation lost its restrictiveness and therefore its effectiveness.(2) This loss of restrictiveness gave birth to the concept of reinforcement of the gastroplasty stoma, starting with Gomez using a plastic mesh to Kroyer using a Marlex mesh that was ultimately popularized by Dr. Mason in the vertical banded gastroplasty (VBG).(3) Fobi used the VBG starting in 1981 and then switched to the silastic ring vertical gastroplasty (SRVG) in 1983 influenced by the report from Eckhout and Willbanks who had popularized the use of the silastic ring to band the gastroplasty as described by Laws (3). It was about this same time that there were increasing reports of the failures of the gastric bypass operations due to stretching of the pouch and stoma. To address this failure of the gastric bypass due to dilatation of the pouch and stoma, Salmon used a modified gastric bypass operation with a banded gastroplasty within a gastric bypass pouch and Linner used a banded gastric bypass with the silastic ring around the gastroenterostomy.(4) Both modifications were first presented
at the annual symposium on surgical treatment of obesity in 1984, a meeting Fobi held in Los Angeles yearly from 1981 to 1992. Fobi tried the Liner modification in 1984 but had almost 100% ring erosion in the first 27 patients and thus abandoned the technique. By 1985 there were a significant number of patients with intact surgical anatomy after either the VBG or SRVG that were revised to GBP as it became apparent that the GBP operation, even with its shortcomings was a better operation for weight loss and weight loss maintenance than any of the gastroplasty operations.

Forty three patients had a revision from a VBG to a GBP in 1985 and 1986 at the Center for Surgical Treatment of Obesity in Los Angeles, California with the gastro-enterostomy made below the level of the Marlex mesh band because it was not safe or difficult to remove the mesh. In 1989 when the weight loss outcomes were evaluated in this subset of patients as compared to the GBP, VBG and SRVG patients these patients lost more weight and had the best weight loss maintenance. These findings were presented at the ASBS meeting that was held in June 1989 in Toronto, Canada. Ilan Charuzi from Israel presented similar results at that meeting from revising VBG to GBP.

This observation resulted in Fobi’s re-introduction of the banded gastric bypass (BGBP) as a primary operation but this time the silastic ring was placed not at the gastro-enterostomy as described by Liner but at least 2cm above the gastroenterostomy.(5) Surgeons from around the world reported superior results with a banded gastric bypass.(6) Howard et al from Albany State University independently carried out a prospective clinical trial of banded gastric bypass using a marlex mesh as a primary operation versus a vertical banded gastroplasty starting in 1986. The reported weight loss outcomes after 9 years of follow up were published in Obesity Surgery in 1995 and corroborated the superiority of the banded gastric bypass operation over the other GBP modifications.(7) Generally, surgeons performing the banded gastric bypass fashioned their own devices to band the pouch. Fobi used a fashioned silastic ring to band the pouch for his procedures from 1989 to 2002, when he recognized the need for a prefabricated ring that could automatically lock and easily be implanted laparoscopically. This gave birth to the Auto-Lock GaBP Ring™ that is now popularly called the Fobi Ring. It is a patented, pre-fabricated, calibrated and sterilized silicone coated implantable device, available in various sizes, that is designed specifically to control the reservoir capacity in gastric bypass, gastroplasty and sleeve gastrectomy operations.(8,9) It currently has a CE Mark for international use and an investigational device exemption classification in the USA where FDA approval is expected in the second quarter of 2013 when the one year follow up reports from the clinical trials are presented.

![Figure 1 – The GaBP Ring™ is a pre-fabricated, sterilized ring designed to band the proximal pouch of the sleeve gastrectomy and gastric bypass.](image-url)
Writing in *Obesity Surgery* in 1994, the father of the Roux-en-Y gastric Bypass, Dr. Edward Mason, categorically stated that “as Roux-en-Y Gastric Bypass is primarily a restriction operation, just as with VBG, it is important that the outlet of the pouch does not stretch.”(10)  

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9. www.bariattec.com

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**London 2012: The Future of Obesity Treatment**

Owen Haskins, Editor-in-Chief *Bariatric News*
Haris Khwaja, MD, FRCS,
Gianluca Bonanomi, MD, FRCS

The inaugural international symposium ‘London 2012: Future of Obesity Treatment’ was held at the Royal College of Physicians, London, United Kingdom on February 3rd, 2012.

The faculty reviewed the current status of obesity treatment and discussed how best to address the challenges in the future. Mr Gianluca Bonanomi, Symposium Director welcomed delegates and emphasised the importance of future strategies to combat the obesity epidemic, both in terms of prevention and treatment of the disease.

Professor Sir George Alberti, former President of the International Diabetes Federation (IDF) examined how the IDF statement could change the future of obesity treatment. “The reason we issued on a statement was to give access to patients who without surgery would be causing a detrimental effect to their health, possibly reducing their lifespan by 20-30 years. I hope the
statement will impact upon people’s view that surgery is a valid option for treating certain patients, specifically in resolving Type 2 diabetes. Metabolic surgery should be complimentary to medical therapy as it is the most effective treatment for patients with a BMI >35 and with a multi-disciplinary team approach including nutritionist, psychologists it can have considerable long term benefits.”

Dr David Haslam, Chair of the National Obesity Forum, outlined the problems of obesity in the general population and how as a family doctor, he faces obese patients on a daily basis.

“Communication with obese patients is imperative to identify, engage and motivate patients. The next step is to try and make them understand that obesity is having an effect on their blood pressure, cholesterol and their overall quality of life.”

“The role of the GP is badly understood, so my plea to surgeons is following surgery to give the patient as much information as possible about their post-surgery regime (nutritional supplements etc) and please contact us and advise us on what we should be monitoring and how often,” concluded Haslam. “Most GPs are not aware of the risk for post-surgery morbidly obese patients so please communicate the dangers with us.”

Dr Simon Aylwin from Kings College Hospital, London assessed what intervention should be given to patients. “There are a whole host of medical therapies available to treat co-morbidities such as high blood pressure, diabetes, cholesterol, but there are no medical therapies available to treat their obesity.” Aylwin presented economic models that showed if 25% of patients had surgery they would incur less overall costs than patients who continue with medical therapy only, saving approximately £1billion.

Professor John Wilding from the University of Liverpool outlined the current status of medical treatments for obesity and diabetes. “In the diabetic patient the important consideration is the prevention or delay in the development of diabetes related diseases and/or conditions. However, one of the most important concerns of a diabetic patient is weight gain as most of the drugs have the consequence of making them fatter.”

“Diabetes results in significant morbidity and mortality, and we need to manage all the risk factors not just glucose”, concluded Wilding. “Obese patients do less well so we need to combat the obese population.”

Mr Mike Lander, South East Coast of England Specialist Commissioner asked how health care systems afford obesity and diabetes treatment. “Bariatric surgery has lots of evidence that it is cost effective, our own analysis shows that over a ten year period the total cost of treating a patient who is eligible for bariatric surgery (including surgical and post-operative care) is £20,000. By comparison the cost of treating a patient who is eligible for bariatric surgery with primary care is approximately £40,000. We need to be very clear about the right surgical treatment and the right price.”

Professor Sir Steve Bloom from Imperial College, London assessed the pharmaceutical treatments for obesity and stated that as far as obesity is concerned the pharmaceutical industry has not done very well. He explained that despite several promising agents, weight loss has not been sufficient and/or the agents have had severe side effects. “The problem is that PYY is responsible for a lot more than appetite, so by using a blocking agent all the other responses the neurotransmitter affects were also blocked. Therefore, any attempt must be more targeted.”
Dr Christopher Thompson from Harvard University, Boston, USA focused on endoscopic treatments and said that surgery tends to be more effective but a higher risk strategy compared to lifestyle or medical therapy, which though reduce the risk, are less effective. He described several different endoscopic approaches currently on the market or under development including endoscopic suturing devices, gastric balloons, staplers, plicating devices and implantable sleeves.

“Safety is paramount and durability and repeatability do become important for these procedures. In order to treat obesity it is necessary to have a multi-disciplinary approach and different treatment paradigms to facilitate intervention at a variety of different stages of the disease,” he concluded. “The long term efficacy, safety and cost effectiveness need to be assessed, but I am hopeful that endoscopic treatments will be utilised in the fight again obesity.”

Professor Michael Larvin from the Royal College of Surgeons of England stated that UK bariatric surgeons are facing decades of operating on morbidly obese patients as surgery is the only effective, long-term treatment available and is proven safe, however one problem is access.

“A real concern is localism, leaving it to local providers to decide provision with no overall national standards. We would not allow this to happen for cancer, so why would we allow this to happen for obesity?” said Larvin. “This could happen despite the evidence suggesting that over the next 20-30 years obesity-related deaths will reach those of cancer.”

Dr Nicolas Christou from McGill University, Montreal, Canada examined the outcomes from bariatric surgery and said that there should be a more aggressive approach to obesity as lifestyle changes work but only in the short term. “Likewise, surgery does work but only when combined with sustained follow-up with lifestyle modifications. But which surgeries are effective?”

“No matter which procedure you choose, the outcomes show weight loss and improvements in co-morbidities, as long as patients abide by their post-operative regime and attend follow-up sessions,” he stated. “What we must be careful of is that patients do follow post-operative regime and attend follow-up sessions so we can assess (among other things) any sign of nutritional deficiencies.”

According to Christou, the perception of surgery needs to change as at the moment the public and the medical community need to understand that obesity is a disease and just like cancer, it kills.

Dr Philip R Schauer from the Cleveland Clinic, Ohio, USA discussed what evidence is needed to move bariatric and metabolic surgery forward. “The adoption of surgery remains low, in the US, although there are 200,000 procedures each year that is only 1-2% of the patients who are eligible.”

In order to increase the number of procedures, Schauer said that it was necessary to improve the evidence base such as case studies, registries and clinical trials (examining operative morality and complications, short and long term outcomes, weight loss, the effect on co-morbidities, cost of operation and the cost of the natural progression of the disease (of not intervening). The importance of randomized controlled trials in bariatric surgery as exemplified by the STAMPEDE (Surgical Therapy And Medications Potentially Eradicate Diabetes) trial were also described.1

Dr. Carel le Roux from Imperial College, London examined what we know from basic science and looked at the physiology behind bariatric procedures. “We know that the vagal fibres that sit
at the point where the gastric band presses on, are actually important when it comes to signalling to the hypothalamus. Therefore, we now believe that it is the pressure on these fibres at the gastro-oesophageal junction that actually allows people to feel less hungry.”

He added that the change in hunger is not universal and estimates that 20 per cent of patients do not have a reduction in hunger, compared to 80 per cent who do have a reduction.

The symposium concluded with a debate between Professor Alberic Fiennes, President of the British Obesity and Metabolic Surgery Society, Professor Nicholas Finer from University College Hospital, London and Dr. Christopher Thompson from Harvard summarising the respective arguments for surgery, medical treatment and endoscopic treatments for obesity.

The symposium proved to be a tremendous success with over 160 attendees from throughout the world. The event would not have been possible without the hard work and dedication of Rosamunde Wood, Christina Henry, Nuala Davison, Kelly Edmiston and Rukhsana Ali from Chelsea & Westminster Hospital, London for the organisation of the symposium.

References
Laparoscopic Sleeve Gastrectomy with Ileal Interposition: Outcomes

Augusto Tinoco, MD, PhD

Introduction

Standard bariatric surgical procedures employed in the treatment of morbid obesity are considered a safe and effective treatment for Type 2 diabetes mellitus (T2DM), even in individuals with a BMI ≤ 35kg/m². In a recent review, Roux-en-Y gastric bypass (RYGB) and biliopancreatic diversion/duodenal switch (BPD-DS) were reported to induce remission of T2DM in 83.7% and 98.9% of cases, respectively. This is in contrast to gastric banding which produced positive effects on T2DM in only 47.9% of cases.

Since glycemic control can be observed prior to significant weight loss, it has been suggested that T2DM could be regulated by mechanisms involving a group of gastrointestinal hormones known as the incretins, which include gastric inhibitory polypeptide (GIP), peptide YY (PYY) and glucagon-like peptide-1 (GLP-1). These hormones, in conjunction with the central nervous system, influence glucose metabolism by increasing insulin secretion, suppressing post-prandial glucagon secretion and reducing gastric emptying. This results in diminution of food intake, promotion of pancreatic β-cell hypertrophy, differentiation of pancreatic duct cells into insulin-secreting β-cells, reduction of peripheral insulin resistance and suppression of pancreatic β-cell apoptosis.

The incretin effect, mediated by GIP and GLP-1, accounts for 50% to 70% of the insulin response that is essential for glucose homeostasis. Serum concentrations of GIP are near normal in T2DM patients, but tend to decrease as the disease progresses. In contrast, GLP-1 concentrations are low in T2DM patients but, if levels can be restored, the capacity of β-cells to secrete insulin can be re-established even in advanced stages of the disease.

Surgical procedures that facilitate early contact between the nutrients and the ileum stimulate the premature release of incretins and have been shown to promote efficient control of T2DM. Laparoscopic ileal interposition (II) is one such technique that involves introducing a segment of terminal ileum into the proximal jejunum and thus allows the premature exposure of nutrients to the interposed ileum. This results in stimulation of GLP-1 and PYY without disrupting intestinal transit and absorption. The raised level of these anorectic peptides and the delay in gastric emptying causes a reduction in hunger and induces prolonged satiety. Furthermore, a study involving experimental animals has demonstrated that application of the II procedure does not result in problems relating to malnutrition and nutrient absorption.

The identification of ghrelin, an orexigenic hormone (appetite stimulant), signaled the importance of mechanisms involved in the decision to eat. It was shown in patients undergoing RYGB that ghrelin levels did not rise before meals. However, ghrelin stimulates the secretion of counter-regulatory hyperglycaemic hormones such as glucagon, catecholamines, cortisol and growth hormone. Ghrelin also suppresses the secretion of the insulin-sensitizing hormone, adiponectin, by fat cells and, consequently, blocks insulin signaling in the liver and inhibits insulin secretion. In contrast to RYGB, sleeve gastrectomy (SG) foregoes intestinal re-routing but involves removal of the fundus, thus eliminating the diabetic effects of ghrelin.
Following this hybrid procedure (sleeve gastrectomy and ileal interposition), the presence of the terminal ileum near to gastric outlet stimulates the premature production of incretin hormones, whereas gastric resection should reduce ghrelin levels and accelerate stomach emptying. The initial results obtained using this strategy have been very encouraging.\textsuperscript{7,10,11}

**Aim of Study**

The aim of the present study was to evaluate the short- and medium-term effects of laparoscopic SG/II in T2DM patients. The variables investigated were the feasibility of the procedure, remission/improvement of the disease, weight loss, morbidity and mortality.

**Surgical intervention**

A 32F Fouchet catheter was introduced into the stomach and devascularization of the greater curvature, inside the gastroepiploic arcade, with ultrasonic scissors, was done. The sleeve gastrectomy was performed with a linear stapler (green cartridge) beginning at the antrum–body transition, about 5–10 cm from the pylorus, according to the patient’s body mass index (BMI). In patients with BMI <30 kg/m\(^2\), the first gastric sectioning was done 10 cm from the pylorus in the cranial direction. In patients with a BMI > 30 kg/m\(^2\), the starting point was 5 cm from the pylorus. Completion of the gastric resection with a linear stapler (blue load up to the Angle of His) was performed. A 3/0 prolene running suture was used to oversew the sleeve staple line.

For the II, the ligament of Treitz was identified, and the jejunum was divided 30 cm distally. Then, the cecum was identified, and the distal ileum transected 30 cm proximal to the ileocecal valve. A 170 cm of ileum was measured proximally and transected (Figure 1).

**Figure 1: Schematic Diagram demonstrating the ileal segment (red) that will be interposed with the proximal jejunum**
This segment of ileum was interposed in an isoperistaltic way into the proximal jejunum, previously divided. Next, we performed three side-to-side entero-anastomosis. The first one was the ileo-ileostomy, then the jejuno-ileostomy, and finally, the ileo-jejunostomy (Figure 2). All three mesenteric defects were closed with interrupted sutures.

![Figure 2: Schematic Diagram demonstrating the final re-construction of the ileal interposition](image)

**Results**

The study population (n = 30) comprised 10 women (33.3%) and 20 men (66.7%) with an average age of 49.7 ± 8.9 years (median 49 years, range 33–68 years). The average BMI of the population was 30.8 ± 5.1 kg/m² (median 31.1 kg/m²; range 19.9–40.1 kg/m²), and mean time from T2DM diagnosis was 9.9 ± 4.4 years (range 4–20 years).

The average duration of the surgical procedure was 181 ± 53 min, while the mean duration of post-operative hospital stay was 3.2 ± 0.8 days. There were no intra-operative complications and none of the patients required conversion to open surgery. There was no mortality.

Patients were followed-up for a period of between 6 - 18 months (average 13±3.3 months) after surgery. All patients had an improvement in T2DM over the months that followed surgery: remission was observed in 80% of patients such that these subjects no longer required treatment with anti-diabetic drugs.

Pre-surgical BMI was not a determinant factor for the post-surgical remission of T2DM. There were no significant differences between patients in the two different outcome groups (i.e. BMI <30 kg/m² versus BMI >30 kg/m²) with respect to the pre-surgical duration of T2DM. In addition, there were no significant differences between the two groups of patients regarding duration of insulin usage prior to surgery.
Conclusions

The main benefits from application of the SG/II procedure to T2DM patients are adequate glycemic control, satisfactory weight loss and an absence of clinical signs of nutritional deficiencies. Such findings indicate that the surgical treatment, which interferes with the pathophysiology of T2DM, is a promising alternative for patients with non-morbid obesity. Laparoscopic SG/II is an effective, safe and reproducible technique that produces few short- or medium-term complications. However, a much longer post-surgical follow-up is essential in order to answer the critical issues relating to the maintenance of glycemic control.

References

Preventive Nutrition After Bariatric Surgery

Dr. Jacqueline Jacques, ND
Chief Science Officer – Bariatric Advantage

Long-term nutritional care for bariatric surgery patients should start with prevention. The cornerstones of prevention are: dietary modification, nutritional supplementation, routine testing and patient adherence.

Our knowledge about the appropriate levels of nutrients from diet and from supplements required to prevent deficiency and maintain nutritional well-being in bariatric surgery patients is very limited. At the time of this writing, there is a set of guidelines authored by Aillis, et al (1), available from the American Society of Metabolic and Bariatric Surgery (ASMBS) as well as guidelines contained in a joint paper from the American Association of Clinical Endocrinologists, the Obesity Society, and the ASMBS authored by Mechanick, et al (2). While both papers attempt thorough coverage of the territory, it would be fair to say the authors are hampered by the
available data and, ultimately, the majority of the evidence used to create our current guidance is still relative low level, with much reliance on expert agreement. It is advisable for clinicians who are caring for weight loss surgery patients to be familiar with both of these documents, which are available as free downloads on the ASMBS.com website. Both sets of guidelines offer baseline recommendations for Adjustable Gastric Band (LAGB), Roux-en-Y Gastric Bypass (RYGB) and Bilo-pancreatic Diversion the duodenal switch variant (BPD/DS). Neither currently offers recommendations for the Vertical Sleeve Gastrectomy (VSG), though it is likely that some guidance for this procedure is forthcoming.

To date, almost no existing studies ask the question of what levels of any given nutrient would prevent deficiency in most patients with a given bariatric procedure most of the time. The existing data do tell us that relying on dietary intake alone does not appear to be adequate for any procedure. Colossi, et al (3), conducted a 2-year study of 210 RYGB patients to compare their actual dietary intakes of nutrients to basic requirements or Dietary Reference Intakes (DRIs). They found that no patients were able to achieve minimal daily requirements for vitamin A, Vitamin C, Calcium, Iron, B1, B3, B6, Folate, Biotin or Pantothenic Acid. While patients were able to achieve minimal intakes of B12 and riboflavin (B2), B12 deficiency was still common indicating inadequacy of dietary intake. Ledoux, et al (4) compared the nutritional consequences of medical weight loss, LAGB and RYGB. As only the RYGB group was supplemented, the LAGB group can help to teach us about deficiencies that may arise if this group is left unsupplemented. There were 51 LAGB patients included in this paper, from 6 to 60 months post-operative.

<table>
<thead>
<tr>
<th>Nutrient/Product</th>
<th>AGB</th>
<th>RNY/VSG*</th>
<th>BPD-DS</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multivitamin</td>
<td>Multivitamin with minerals 1-2 times daily</td>
<td>Multivitamin with minerals and at least 400mcg folate 2x/day</td>
<td>Multivitamin with minerals and at least 400mcg folate 2x/day</td>
<td>The guideline documents define a multivitamin differently</td>
</tr>
<tr>
<td>Calcium</td>
<td>1200-2000mg calcium per day with vitamin D</td>
<td>.200 to 2000 mg/d calcium citrate with 400-800 IU Vitamin D</td>
<td>.200 to 2000 mg/d calcium citrate with 400-800 IU Vitamin D</td>
<td>Guidelines differ slightly</td>
</tr>
<tr>
<td>Iron</td>
<td>Mechanick et al recommend only in menstruating women</td>
<td>Minimum 18 to 27 mg/day. 40 to 65mg for menstruating women</td>
<td>Minimum 18 to 27 mg/day. 40 to 65mg for menstruating women</td>
<td>ASMBS does not recommend over and above the level in diet/multi</td>
</tr>
<tr>
<td>B12</td>
<td>Mechanick, et al suggest a dose of at least 350mcg PO/day or 500mcg/week intranasal, or 1000mcg/month IM, or 3000mcg/3months IM</td>
<td>Guidelines suggest a dose of at least 350mcg PO/day or 500mcg/week intranasal, or 1000mcg/month IM, or 3000mcg/3months IM</td>
<td>Guidelines suggest a dose of at least 350mcg PO/day or 500mcg/week intranasal, or 1000mcg/month IM, or 3000mcg/3months IM</td>
<td>ASMBS does not recommend B12 over and above the level in a multi with AGB</td>
</tr>
<tr>
<td>Protein</td>
<td>ASMB: 50-80g/day AACE/TOS/ASMB: 60-120g/day</td>
<td>ASMB: 50-80g/day AACE/TOS/ASMB: 60-120g/day</td>
<td>ASMB: At least 90g/d day AACE/TOS/ASMB: 60-120g/day</td>
<td>For BPD-DS, additional amounts of the fat-soluble vitamins A,D, E and K are recommended. Zinc is also a common deficiency and these patients may require more than the level in a multivitamin.</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1: Brief Summary of Preventive Nutrition (Adapted from references 1,2) * As there are no current guidelines for VSG it is being included with RNY
While there was less deficiency in the LAGB patients than in the RYGB patients, deficiencies reported in the LAGB group included: B1, B12 Folate, vitamin A, vitamin E, and iron. Studies in which patients have been instructed to take a multivitamin after surgery have not shown consistent results for prevention of common nutritional problems. This is likely due to multiple factors including, but not limited to: variations of procedure, dietary nutrient content, and patient adherence, and the non-standard definition of a multivitamin. Table 1 summarizes the basic recommendations for preventive supplementation.

Regular scheduled laboratory assessments are important for the identification of nutritional issues that may arise. While nutritional deficiencies can present symptomatically, many have no early symptoms or symptoms such as fatigue or general malaise that are too vague to be tied to any specific nutrient and are easily dismissed by both patient and clinician. The AACE/TOS/ASMBS Bariatric Surgery Guidelines (2) give recommendations for the intervals and the specific tests to be run by procedure. These guidelines are based on the most commonly reported deficiencies, which at this time are clearly the most important. That said, as we have reports in literature of a wide array of “less common” nutritional problems, clinicians should always consider additional testing if a symptomatic patient has normal values for the usual suspects. For example, a patient with a glove and stocking neuropathy who has normal B12 and folate should be tested for thiamine and copper deficiency. Table 2 outlines some of the current guidelines for screening labs.

Adherence to dietary and supplemental recommendations may well be the great Achilles’ heel when we consider obstacles to maintaining nutritional health in bariatric surgery patients. Studies of longer than one year frequently show high attrition rates and poor compliance with dietary supplements. It hardly needs to be said that in the absence of routine follow up and general patient adoption of preventive nutrition, there will be an unfortunate number of problems that might otherwise have been avoidable. In their 2006 study, Ledoux and colleagues (4) rightly concluded:

Efforts should be made to sensitize patients to the importance of taking their prescribed vitamin substitution, but also to sensitize medical staffs to the need for adequate lifelong surveillance to prevent nutritional deficiencies in patients who have undergone bariatric surgery.

While we have a good distance to go before we have more solid evidence-based recommendations for preventive nutrition after bariatric surgery, the current guidelines offer a solid basis to grow from. By incorporating a program of both preventive diet and supplementation together with regular follow-up and testing, clinicians should be able to help patients best avoid potentially harmful nutritional consequences of surgery.

References:
Table 2: Recommendations for Screening Labs and Frequency (Adapted from references 1,2)

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Test(s)</th>
<th>AGB</th>
<th>RNY/VSG*</th>
<th>BPD-DS</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1 (thiamine)</td>
<td>Serum or whole blood thiamine</td>
<td>PRN</td>
<td>Optional/PRN</td>
<td>Optional/PRN</td>
<td>Transketolase activity test can be useful if available, especially to track recovery. Many programs screen at least once in the first 6 months for all procedures. Some check preop</td>
</tr>
<tr>
<td>B6</td>
<td>PLP</td>
<td>Need unknown</td>
<td>With non-resolving anemia</td>
<td>With non-resolving anemia</td>
<td>May also be a useful screen for vitamin adherence</td>
</tr>
<tr>
<td>B12</td>
<td>Serum B12</td>
<td>Every 6 months in the first year then annually</td>
<td>Ever 3-6 months x 2 years then annually</td>
<td>Every 3-6 months for life</td>
<td>Other tests can include MMA and homocysteine</td>
</tr>
<tr>
<td>Folate</td>
<td>Serum or RBC folate</td>
<td>Optional</td>
<td>Optional</td>
<td>Every 3-6 months for life</td>
<td>Homocysteine can also be helpful. Important to consider in pregnancy. May be elevated in SIBO.</td>
</tr>
<tr>
<td>Iron</td>
<td>Iron studies, Ferritin</td>
<td>Every 6 months in the first year then annually</td>
<td>Ever 3-6 months x 2 years then annually</td>
<td>Every 3-6 months for life</td>
<td>Remember that ferritin can be elevated with inflammation for any source or from pregnancy.</td>
</tr>
<tr>
<td>Zinc</td>
<td>Plasma zinc</td>
<td>Need unknown</td>
<td>PRN</td>
<td>Annually or PRN</td>
<td>Can be a cause of PICA hair loss, low testosterone. Plasma zinc may be unreliable with inflammation.</td>
</tr>
<tr>
<td>Copper</td>
<td>Serum copper</td>
<td>PRN</td>
<td>PRN</td>
<td>PRN</td>
<td>With symptoms of B12 myeloneuropathy and normal B12/folate studies. With unresolved anemia especially with neutropenia.</td>
</tr>
<tr>
<td>Selenium</td>
<td>Glutathione peroxidase activity</td>
<td>Need unknown</td>
<td>PRN</td>
<td>Annually or PRN</td>
<td>Meaning of deficiency in this population is somewhat controversial. Consider with unresolved anemias</td>
</tr>
<tr>
<td>Calcium</td>
<td>24-hr Urine or adjusted serum calcium</td>
<td>See notes</td>
<td>Ever 3-6 months x 2 years then annually</td>
<td>Every 6-12 months</td>
<td>Consider bone Alk Phos, N-telopeptide, DXA. N-telopeptide may be a very valuable test with AGB for assessing bone loss</td>
</tr>
<tr>
<td>Bone</td>
<td>iPTH</td>
<td>PRN – see notes</td>
<td>Ever 3-6 months x 2 years then annually</td>
<td>Every 3-6 months for life</td>
<td>Metabolic bone disease is an issue with all procedures. The AACE/TOS/ASMBS guidelines offer additional guidance on prevention and treatment that clinicians should be familiar with.</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>25(OH)D</td>
<td>Every 6 months in the first year then annually</td>
<td>Ever 3-6 months x 2 years then annually</td>
<td>Every 6-12 months for life</td>
<td>Many programs now test pre-operatively. AACE/TOS/ASMBS Suggests it is best to maintain levels at least 30-60 ng/mL.</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>Plasma retinol</td>
<td>Need unknown</td>
<td>PRN</td>
<td>Every 6-12 months for life</td>
<td>Consider with non-correcting microcytic anemia, eye symptoms</td>
</tr>
<tr>
<td>Vitamin E</td>
<td>Plasma tocopherol</td>
<td>Need Unknown</td>
<td>PRN</td>
<td>Every 6-12 months for life</td>
<td>Very little data on deficiency in any procedures</td>
</tr>
<tr>
<td>Vitamin K</td>
<td>K1 and INR</td>
<td>Need unknown</td>
<td>PRN</td>
<td>Every 6-12 months for life</td>
<td></td>
</tr>
<tr>
<td>Protein</td>
<td>Albumen and Prealbumen</td>
<td>PRN</td>
<td>PRN</td>
<td>Every 3-6 months for life</td>
<td></td>
</tr>
<tr>
<td>Carnitine and EFAs</td>
<td>By chromatography method</td>
<td>Need unknown</td>
<td>Need unknown</td>
<td>PRN</td>
<td>Little supportive data on utility of this testing</td>
</tr>
</tbody>
</table>
Expert View Point: Management of Gastro-esophageal Reflux Disease in the Obese Patient

Antonio Claudio Jamel Coelho MD, MsC (Surgery)
Assistant Professor of Surgery, Department of Medicine

Introduction

The association between BMI and Gastro-esophageal reflux disease (GERD) is well described in the published literature (1). Traditional medical treatments for GERD using pro-kinetics, antacids and H2-receptor antagonists (e.g. ranitidine) have now been superseded by the Proton Pump Inhibitors (PPI). PPI therapy along with lifestyle modifications has now become the standard treatment for GERD in the majority of patients.

Laparoscopic anti-reflux surgery as exemplified by the Nissen fundoplication is currently the most commonly practiced surgical treatment for GERD. The obvious benefits of the laparoscopic compared to the open approach relate to less post-operative pain, cosmesis and ease of access to the hiatus. Indeed anti-reflux surgery has now become an attractive option for patients who prefer not to be on long term PPI therapy. In addition it is indicated in those patients that have medically unresponsive GERD or have complications of GERD such as recurrent respiratory infections. The published literature contains several studies comparing surgery versus medical therapy, with no significant differences in long term results.2,3 A recent randomized Canadian trial showed no significant differences over a 3-year period between the medical and surgical treatment groups. However, a better quality of life rating was noted in the surgery arm.3

The Big Controversy

This article will aim to outline the best standard of care for managing the obese patient with GERD based on the current published evidence.

As the prevalence of obesity rises at an alarming rate throughout the world, associated co-morbidities such as metabolic syndrome, diabetes, hypertension and GERD rise in unison. Surgeons are likely to assume that surgical treatment is more effective than medical therapy for GERD treatment, BUT is the evidence strong? The internists and gastroenterologists would not agree and argue: If these patients take their PPI therapy and adhere to lifestyle modifications GERD can be very controlled. This argument is indeed supported in the published literature when analyzing studies comparing PPI therapy Vs Surgical treatment for GERD.3,8

There is little doubt that Roux-en-Y gastric bypass (RYGB) or Bilio-pancreatic diversion (BPD) are well established surgical options that treat both obesity and GERD. However it must be remembered there are many morbidly obese patients who do not want bariatric surgery but would like their reflux treated surgically. Indeed for many of these patients their GERD symptoms are more incapacitating then their obesity.

The issue is: Is the Nissen fundoplication as effective as LRYGB or BPD to treat GERD in the obese? The answer, in my view, is Yes! Indeed there are no differences in the postoperative DeMeester scores of the fundoplication compared to the bariatric surgery groups.4 One possible explanation, is
that the fundal wrap is a physical barrier to the reflux (be it acid or alkaline in origin). In comparison the amelioration of reflux in LRYGB patients as a consequence of the small gastric pouch may explain the improvement of symptoms in obese patients. It must also be remembered that patients who seek anti-reflux surgery who are obese are suffering from GERD and may not be concerned by their obesity while morbidly obese patients often consider their obesity to be their primary complaint and may also suffer from GERD.

Although well established as an effective surgical option for reflux disease in the morbidly obese there are several key points to consider when performing LRYGB in subjects with GERD. Fornari et al, have demonstrated a ‘switch’ in chief complaint of heartburn in 96% of LRYGB patients in the pre-operative period to regurgitation in 64% of patients in postoperative period. Secondly, in 60% of patients there was no improvement in the endoscopic appearance of the oesophagitis after LRYGB.

Great controversy exists in the management of GERD in patients with a BMI 30-35 kg/m² – should a “prophylactic” bariatric operation be performed? Many groups advocate this approach making the assumption that the natural history of obesity in this group is to reach the BMI 35-40 kg/m² and then they will be faced with performing one of the most challenging bariatric operations: converting a Nissen fundoplication to a gastric bypass. There is no denying that this is a challenging procedure reserved for the most experienced of bariatric surgeons as it is obligatory to take down the fundal wrap to avoid the risk of a blind septated chamber below the gastro-esophageal junction. In experienced hands this operation is feasible albeit with higher reported complications rates according to a Mayo Clinic review. However, in the evidence based medical literature we all should abide by, the future chance of performing a challenging operation (Nissen to gastric bypass) should not be used as justification for performing a gastric bypass outside of established bariatric surgery guidelines.

Unless there are internationally endorsed changes in the guidelines for bariatric surgery, I believe we should not perform bariatric surgery in obese patients with GERD in the BMI 30-35 kg/m² range. In my practice, patients with a BMI 30-35 kg/m² and GERD are kept on full dose PPI therapy and observed for two years to assess their symptom control and BMI. Clearly if there is a strong indication for anti-reflux surgery I would perform a Nissen fundoplication but I do counsel the patient that a future gastric bypass, if indicated, will be a challenging procedure and does have a higher complication rate compared to a primary gastric bypass. This discussion often stimulates patients to lose weight following their anti-reflux surgery. For patients with a BMI ≥ 35 kg/m² with GERD, the non-banded laparoscopic gastric bypass is my operation of choice. 

REFERENCES

1. Vicenzo Di Francesco et al. Obesity and gastro-esophageal reflux: Physiopathological mechanisms and role of bariatric surgery; Obesity Surgery 2004,14,1095,1102
8. Mayor S. Proton pump inhibitors match surgery in gastroesophageal reflux. BMJ, 2006 Jan 7;332(7532);10
Technical Section:
Bariatric Surgery on the Super-super morbidly obese (BMI >60 kg/m²)

Bernard Bokobza, MD

The need for bariatric surgery in the super-super morbidly obese patient (BMI > 60 kg/m²) is of paramount importance given its increasing global prevalence in the 21st century. Indeed, operating on this patient population is fraught with many technical challenges that need to be overcome to guarantee excellent outcomes in terms of weight loss/co-morbidity improvement outcomes, morbidity and mortality.

Staging Bariatric Surgery

The value of staging bariatric surgeries by performing a sleeve gastrectomy initially should not be underestimated. The weight loss with a sleeve gastrectomy can make subsequent second stage gastric bypass or duodenal switch technically easier and has proven lower complication rates.1 The sleeve gastrectomy in some patients may indeed be the only operation required depending on the amount of weight loss. However close follow-up is mandatory (every 3 - 6 months), to detect premature plateauing of weight loss or weight regain and subsequent need for timely second stage gastric bypass or duodenal switch. Alternatively placement of an intragastric balloon prior to definitive bariatric surgery has been shown to result in a significant though variable degree of weight loss.2 Laparoscopic gastric banding as a first stage procedure, in my opinion, should not be advocated as subsequent conversion to sleeve or gastric bypass has associated morbidity primarily due to the risk of staple line/anastomotic leak.3

Technical Tricks

The experience of the surgeon in operating on the super super morbidly obese is an important factor in guaranteeing successful outcomes in this patient population.

In addition, there are a multitude of strategies to facilitate operating on the super super morbidly obese. These include:

1) Optimal positioning of the patient

The jejuno-jejunostomy step of the LRYGB can be greatly facilitated by ensuring the patient is in the Trendelenburg position. However one must be aware of the possibility of ventilatory difficulties with prolonged placement in this position.4 Likewise steep reverse Trendelenburg is necessary for the Angle of His dissection and construction of the sleeve or gastric pouch.

2) Patient Factors

Patient habitus is also a factor with the very tall male patient often being a technically easier gastric bypass compared to the small woman, with a narrow thorax, and a short, fatty, small bowel mesentery. Comprehensive laparoscopic exploration is essential to assess liver size and rule out liver pathology, diagnose and divide omental adhesions (especially in LRYGB) and to make an overall
judgment on the feasibility of the procedure. Massive central obesity can result in significant torque when operating on the super super morbidly obese which must be overcome.

The ability to retract the left liver lobe to facilitate construction of the gastric pouch and gastrojejunostomy is also an important consideration be it by way of the Nathanson liver retractor system or the Endoflex liver retractor. Preoperatively, a liver shrinkage diet, or use of an intragastric balloon can help to reduce liver size. Pre-operative liver ultrasound scanning is also advocated by some units as a means to diagnose the massive liver.

3) Optimal Anesthetic Relaxation

The quality of anesthetic relaxation is fundamental to operating on the morbidly obese. Poor relaxation can lead to a difficult technical operation thus increasing the chance of intra-operative and post-operative complications. Higher insufflation pressures, typically 14 - 17 mmHg are often used in bariatric surgery with little deleterious effects. Conversion to laparotomy due to a poor working space, though an option, should not be considered lightly given the poor access to the Angle of His or hiatus compared to laparoscopy. If on laparoscopy the procedure is not possible due to a poor working space and optimal relaxation has been instituted, one should not be afraid to abandon the procedure and come back following a longer period of pre-operative weight loss.

4) Appropriate Bariatric Equipment

Side extensions and foot extensions should be used if necessary whilst operating on the super super morbidly obese. Adequate securing of the patient to the operating table is essential to prevent the risk of sliding of the patient especially when placed in the reverse Trendelenberg position.

Use of long instrument (Verres needle, laparoscopic retractors and laparoscopic energy sources e.g. Hook diathermy or Harmonic scalpels) can be helpful for gastric pouch formation and dissection at the Angle of His in gastric bypass and sleeve gastrectomy. A stepping stool is a useful practical adjunct for the surgeon to facilitate optimal ergonomics when performing bariatric surgery. However it must be stable and wide enough to allow for placement of the electrocautery pedal.

Conclusions

In conclusion, preoperative weight loss by way of a liver shrinkage diet and/or intragastric balloon is an important strategy to make bariatric surgery easier. Long laparoscopic instruments, optimal muscular relaxation and high insufflation pressures are also important strategies. Diagnostic laparoscopy prior to starting bariatric surgery is essential. Consideration for sleeve gastrectomy should be made ideally pre-operatively but also intra-operatively if it is felt it would be the safest option for the patient.

References

Management of Cholelithiasis in Bariatric Surgery – an Evidence Based Update

Dr. Mohammad Hayssam Elfawal MD, FACS

Traditional risk factors for cholelithiasis in the general population are not predictive of symptomatic gallstone formation after bariatric surgery. Rapid weight loss after bariatric surgery predisposes to gallstone development (1). The incidence of cholelithiasis is higher post-gastric bypass or duodenal switch compared to patients undergoing sleeve gastrectomy or gastric banding (2). However, several studies have shown that weight loss of more than 25% may be predictive for the development of symptomatic gallstone disease regardless of the bariatric procedure performed (3).

The gold standard treatment for symptomatic cholelithiasis is laparoscopic cholecystectomy. Several therapeutic strategies have been promoted in the bariatric surgery patient. These include ursodeoxycholic treatment, cholecystectomy for all patients, cholecystectomy for patients with gallstones identified on ultrasound scan pre-operatively and cholecystectomy only for patients with symptomatic gallstone.

Ursodeoxycholic acid

Ursodeoxycholic acid has proven to be effective in reducing the risk of gallstones after bariatric surgery. A prospective randomized double blind study done by Miller et al showed that the use of 600 mgs of ursodeoxycholic acid per day for six months reduces the incidence of gallstones to less than 3% post-bariatric surgery (4).

Prophylactic Cholecystectomy

Some authors have advocated concomitant prophylactic cholecystectomy at the time of gastric bypass regardless of the presence or absence of gallstones or biliary symptoms (5). The minimal additional morbidity associated with cholecystectomy, the low sensitivity and specificity of pre-operative ultrasound scanning in the morbidly obese, the increased incidence of gallstone development post-bariatric surgery and the complexity of the management of common bile duct stones following gastric bypass have provided the impetus for adopting this universal approach. Nougou et al found gallbladder pathology in 82% of cases of patients who underwent simultaneous laparoscopic Roux-en-Y gastric bypass (LRYGB) and cholecystectomy with a mean additional operating time of 19 minutes (5). In contrast Li et al published the Cleveland Clinic Florida experience comparing the incidence of symptomatic gallstone disease in patients who underwent LRYGB (n=670), laparoscopic sleeve gastrectomy (LSG, n=79) and laparoscopic gastric band (LAGB, n=47). There was no significant difference in terms of symptomatic gallstones when comparing the LRYGB or LSG groups. The overall rate of symptomatic gallstones was 8% and the final recommendation was prophylactic laparoscopic cholecystectomy at the time of bariatric surgery is not indicated in the asymptomatic gallstone patient (3).

Selective Cholecystectomy for Asymptomatic Gallstones

The selective approach consisting of performing concomitant laparoscopic cholecystectomy on patients with asymptomatic gallstones (diagnosed pre or intra-operatively) has also been evaluated. The low morbidity of the concomitant cholecystectomy and the increased probability of patients with documented asymptomatic gallstones becoming symptomatic is the rationale behind this approach.
Escalona et al from Chile in their series of 1300 patients that underwent LRYGB did not find a significant difference in terms of operative time, hospital stay or morbidity between patients undergoing concomitant cholecystectomy at the time of bariatric surgery compared to bariatric surgery alone (6). They concluded that laparoscopic cholecystectomy should be done at the time of LRYGB in all patients with a pre-operative ultrasound diagnosis of cholelithiasis.

Selective Cholecystectomy for Symptomatic Gallstone Disease

Concomitant laparoscopic cholecystectomy during bariatric surgery for symptomatic gallstones is considered by most surgeons to be the best approach. However enthusiasm for this strategy should be tempered by the possible increased complexity/operative time of this approach especially in the super morbidly obese patient. Worni et al, in a retrospective review of 7000 patients who underwent LRYGB from 2001-2008 found that concomitant cholecystectomy and LRYGB has decreased significantly over the last decade from 26% to less than 4%. Given the higher rates of postoperative complications, re-interventions, mortality, as well as a longer hospital stay, they concluded that concomitant cholecystectomy should only be considered in patients with symptomatic gallbladder disease (7).

Choledocholithiasis after Laparoscopic Gastric Bypass/Biliopancreatic Diversion-Duodenal Switch

CBD stones after LRYGB or Biliopancreatic Diversion-Duodenal Switch (BPD-DS) can be managed using a variety of techniques. This clinical scenario though uncommon does pose a clinical challenge for the practicing bariatric surgeon. Indeed currently there is no consensus about the management of CBD stones in LRYGB or BPD-DS patients. Although access to the common bile duct is limited, the options include percutaneous or laparoscopic trans-gastric endoscopic retrograde cholangiopancreatography (ERCP), transenteric endoscopic cholangiopancreatography and laparoscopic common bile duct exploration (8-9). Recently, percutaneous transhepatic instrumentation of the common bile duct using endoscopic ultrasound (EUS) also appears safe and feasible. Weilert et al published their data on EUS guided anterograde treatment of CBD atones showing a success rate of 67% (10).

Conclusion

The natural history of patients with asymptomatic gallstones undergoing bariatric procedures is similar to the natural history of asymptomatic stones in the general population. Management of gallstones in patients undergoing bariatric surgery is still controversial. There is Level I evidence to support the use of ursodeoxycholic acid post-bariatric surgery to decrease the rate of symptomatic gallstones. The practice of laparoscopic cholecystectomy at the time of bariatric surgery for asymptomatic cholelithiasis has decreased significantly over the last decade. Concomitant cholecystectomy at the time of bariatric surgery should be reserved for symptomatic gallstone disease during bariatric surgery. 

References:
References, continued


Current Status

Bariatric Surgery in the Middle East Region

Dr. Abdelrahman Nimeri, MD, ABS, FACS

There has been a rapid increase in the prevalence of obesity and Type II diabetes mellitus (T2DM) in the Middle East over the last 20 years. This increase is particularly evident in the United Arab Emirates (UAE) where up to one-third of the population have a BMI ≥ 30 kg/m². In addition, the prevalence of pre-diabetes and T2DM in the UAE population is one of the highest in the world (up to 54% of the native population are either diabetic or pre-diabetic). The Abu Dhabi Cardiovascular Program, a continuation of the Framingham study shows projected mortality of UAE nationals from cardiovascular events exceeding those of the US, UK, Thailand, Singapore and Germany.

Bariatric surgery currently is the only effective long term treatment for morbid obesity and its popularity has also increased in the Middle East. The majority of published bariatric surgery outcomes from the UAE and the Middle East region consist of retrospective or small prospective case series. The commonest bariatric procedures performed in the Middle East region at present are Laparoscopic Adjustable Gastric Banding (LAGB) and Mini-gastric Bypass (MGB). There are only a few reports of Laparoscopic Roux-en-Y gastric bypass (LRYGB). More recently, reports of Laparoscopic Sleeve Gastrectomy and Laparoscopic Greater Curvature Plication (LGCP) have emerged. Reports published from the late 1980s to the late 1990s consisted mostly of open Vertical Banded Gastroplasty (VBG), LAGB and MGB. The increase in the types and volume of bariatric surgery in Asia is similar to that of the Middle East region. In a recent survey of all the representatives of the Asia-Pacific Metabolic and Bariatric Surgery Society (APMBSS) consisting of 12 leading Asian countries except China; a total of 6,598 bariatric procedures were performed by 155 surgeons. The commonest procedures performed in Asia are LAGB (35.9%), LRYGB (24.3%), LSG (19.5%), and MGB (15.4%). From 2005 to 2009, LSG increased from 1% to 24.8% and LRYGB from 12% to 27.7%, a relative increase of 24.8 and 2.3 times respectively. In contrast during the same period, LAGB and MGB decreased from 44.6% to 35.6% and 41.7% to 6.7%, respectively.

The absolute growth rate of bariatric surgery in Asia over the last 5 years was 449% however currently there is no data available regarding the exact growth of bariatric surgery in the Middle East region.
The LRYGB is the commonest operation performed at the Bariatric and Metabolic Institute (BMI) at Shaikh Khalifa Medical Center (SKMC) in Abu Dhabi (Figure 1). BMI Abu Dhabi was established in 2009, and SKMC is the main tertiary referral hospital for bariatric surgery in the United Arab Emirates. The bariatric surgery volume at BMI Abu Dhabi is 60% LRYGB and 35% LSG. Revisional bariatric surgery represents 15-20% of the surgeries done with the main revisional surgeries consisting of conversion of LAGB or VBG to LRYGB.5

References:
The **International Bariatric Club (IBC)** is a non-profit, international organization of bariatric surgeons and educators. The IBC’s mission is to promote and exchange knowledge, ideas, and experience related to the preoperative, intraoperative, and post-operative care of the bariatric patient with bariatric professionals throughout the world.

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