

BARIATRIC MEDICINE ALERT

A monthly survey of developments in bariatric medicine

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Bariatric Medicine Alert's physician editor, Namir Katkhouda, is a consultant for Baxter, Ethicon, Storz, and Gore. Peer reviewer Rebecca Kelso, MD, reports no financial relationships relevant to this field of study.

Vitamin Deficiency after Laparoscopic Roux-en-Y GB

ABSTRACT & COMMENTARY

By Helen Sohn, MD

Assistant Professor of Surgery, Department of Surgery, USC

Dr. Sohn reports no financial relationship relevant to this field of study.

Synopsis: *Vitamin deficiencies after laparoscopic Roux-en-Y gastric bypass are more common and involve more vitamins, even those that are water soluble, than previously appreciated.*

Source: Clements RH, et al. Incidence of vitamin deficiency after laparoscopic Roux-en-Y gastric bypass in a university hospital setting. *Am Surg.* 2006;72:1196-1202.

VITAMIN DEFICIENCY AFTER GASTRIC BYPASS SURGERY IS A known complication. The purpose of this study was to measure the incidence of vitamin deficiency after laparoscopic Roux-en-Y gastric bypass in a university hospital setting. All patients who underwent laparoscopic Roux-en-Y gastric bypass from January 2002 to December 2004, and completed a 1- and 2-year follow-up after surgery, were selected. Of the total 498 patients, 318 (65%) had vitamin results at the one-year follow up. Of the 366 eligible for the 2-year follow up, 141 (39%) had vitamin results. Patients were further grouped based on gender, race, and Roux limb length, and the incidence of vitamin deficiencies were also studied.

The incidence of vitamin A (retinol) deficiency was 11%, vitamin C was 34.6%, vitamin D25OH was 7%, vitamin B1 was 18.3%, vitamin B2 was 13.6%, vitamin B6 was 17.6%, and vitamin B12 was 3.6% 12 months after surgery. There was no statistical difference in the incidence of vitamin deficiencies between one and 2 years. In univariate and multivariate logistic regression of one- and 2-year follow up, black patients (vitamins A, D, and B1 for 1 year and B1 and B6 for 2 years) and women (vitamin C at 1 year) were more likely to have vitamin deficiencies. Vitamin deficiencies after laparoscopic Roux-en-Y gastric bypass are more common and involve more vitamins, even those that are water soluble, than previously appreciated.

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Black patients tend to have more deficiencies than other groups. The bariatric surgeon should be committed to the long-term follow-up and care of these patients. Further prospective and randomized studies are necessary to provide appropriate guidelines for supplementation. (*Am Surg.* 2006;72:1196-1202.)

■ **COMMENTARY**

The fact that vitamin deficiencies are common after a surgical procedure that restricts the intake and absorption of nutrients, is not alarming. That is the reason why all these patients are placed on chewable vitamins postoperatively and given vitamin B12 injections. What this study shows is that the deficiency is underestimated and that close follow up and supplementation is important in hopes of preventing clinical manifestation of the deficiency. It is debatable whether additional supplementation is indeed necessary in patients with subclinical deficiencies when there is no control group to compare to.

Clements and colleagues comment on the fact that there is no control group. They admit that the vitamin levels were not checked preoperatively due to practicalities. I assume that means they were not checked due to lack of reimbursement. And we assume that their vitamin levels were normal because they did not display any symptoms. That is a big assumption, considering that their unbalanced and unhealthy dietary habits and intakes, along with other factors, are what

got them to a point of needing gastric bypass surgery. Yet even without symptoms, the levels were checked and followed closely after the surgery. Another way to get control data would have been to check vitamin levels on a group of patients with similar body mass index. And how about if we put normal people on the same dietary restrictions as those after gastric bypass surgery? What would be the prevalence of vitamin deficiency in a group of patients who have limited dietary habits for one reason or another? What about non-obese people that undergo a gastric resection or a small bowel resection, restricting either the intake or the absorption of nutrients but not for the purpose of weight loss? Would these people have similar vitamin deficiencies if we measured their levels? And should we put all asymptomatic people on supplementation, or do we just need better balanced diet?

It becomes evident that we don't have vitamin levels on these other groups of people because we don't check the levels routinely unless they manifest symptoms of vitamin deficiency. So what do these subclinical vitamin deficiencies in one group of patients mean to us? Should we focus on supplementation while placing restrictions (not only the amount) on their diet? We should instead focus on taking steps toward establishing healthier and more balanced dietary habits, especially after procedures that reduce the intake and/or the absorption of nutrients. (This commenter does not profess to practice nor even know how to achieve such healthy habits.) ■

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Questions & Comments

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8:30 a.m. and 4:30 p.m. ET, Monday-Friday.

Surgical Revision of Loop ("Mini") GB Procedure

ABSTRACT & COMMENTARY

By Namir Katkhouda, MD, FACS

Synopsis: *The results of this preliminary review have confirmed that MGB does require revision in some patients and that conversion to RYGB is a common form of revision.*

Source: Johnson WH, et al. Surgical revision of loop ("mini") gastric bypass procedure: Multicenter review of complications and conversions to Roux-en-Y gastric bypass. *Surg Obes Relat Dis.* 2007;3:37-41.

BACKGROUND: THE CLAIM THAT THE "MINI"-GASTRIC BYPASS (MGB) PROCEDURE, WITH ITS LOOP GAS-



trojejunostomy, is safer and equally effective to the Roux-en-Y gastric bypass (RYGB) procedure has been promoted before validation. Rumors of unreported complications and the accuracy of follow up are additional concerns. This study was undertaken to identify MGB patients who require, or required, revisional surgery at 5 hospitals within the region of the United States where the MGB procedure originated to assess the claim that revision to RYGB is rarely needed.

Methods: The databases of 5 medical centers were retrospectively searched to identify patients undergoing surgical revision after a MGB procedure, all of which had been done elsewhere.

Results: A total of 32 patients were identified who presented with complications after undergoing an MGB procedure and required, or require, revisional surgery. The complications included gastrojejunostomy leak in 3, bile reflux in 20, intractable marginal ulcer in 5, malabsorption/malnutrition in 8, and weight gain in 2. Of the 32 patients, 21 required conversion to RYGB, and an additional 5 have planned revisions in the future. Also, 2 patients were treated with Braun enteroenterostomies and 4 required one or more abdominal explorations.

Conclusions: The results of this preliminary review have confirmed that MGB does require revision in some patients, and that conversion to RYGB is a common form of revision. A national registry to record the complications and the number of revisions is proposed to gain insight into the need for revision after MGB and other nontraditional bariatric procedures.

■ COMMENTARY

Johnson and colleagues have reviewed retrospective databases from 5 medical centers to identify patients who underwent revisions of the loop minigastroic bypass. They found 32 patients who underwent a revision, with 20 patients diagnosed with bile reflux and 5 patients diagnosed with marginal ulcers. These results, according to Johnson et al, contradict the notion that the loop gastric bypass is a very safe procedure. Moreover, data was only pulled from one area of the United States, and the data from the rest of the Country is unknown. Johnson et al hypothesize that the original gastric bypass was initially made with a horizontal gastric pouch attached to a gastroenterostomy. It led to numerous marginal ulcers and severe bile reflux and, thus, was abandoned.

The current loop gastric bypass, as proposed by Rutledge¹³, is constructed around a vertical pouch along the lesser curvature in order to lessen bile reflux problems.

This article seems to show that these problems are still present, even if the denominator is unknown. Bile esophagitis is, on the other hand, very rare following the standard Roux-en-Y gastric bypass.

Does this mean that the loop gastric bypass should be abandoned? The answer is no because there is not enough conclusive scientific evidence that the procedure is detrimental to the patients. The corollary of this statement is that Johnson et al promoting this controversial operation should maintain a database with a long-term follow up of an acceptable number of patients, and this database should be made readily available for scientific assessment, and comparative trials should be undertaken. An effort in this direction was made recently by a publication in 2005 by a Taiwanese team of a study comparing the laparoscopic Roux en Y gastric bypass to the mini bypass in a good peer review journal. The study was criticized for its small sample size and possible bias. More comparative studies should be encouraged. ■

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Laparoscopic Conversion of a GB into Normal Anatomy

ABSTRACT & COMMENTARY

By *Namir Katkhouda, MD, FACS*

Synopsis: Restoration of normal anatomy after RYGBP is feasible.

Source: Himpens J, et al. Laparoscopic conversion of the gastric bypass into a normal anatomy. *Obes Surg.* 2006;16: 908-912.

BACKGROUND: LAPAROSCOPIC ROUX-EN-Y GASTRIC bypass (RYGBP) is considered a non-reversible procedure. The laparoscopic conversion of RYGBP into a normal anatomy was reported here.

Methods: In June 2004, a laparoscopic RYGBP was performed in a 46-year-old female sweet-eater with a BMI of 46 kg/m². After 7 months, the patient

reported a significant, and incapacitating, dumping syndrome without postprandial hypoglycemia. She requested conversion to a normal anatomy; hence, a laparoscopic RYGBP reversal was performed. The BMI at the time was 27 kg/m².

Results: Operative time was 95 minutes, and intra-operative blood loss was 150 mL. The patient had an uneventful recovery and was discharged home on the fifth postoperative day. At 6 months follow up, her BMI was 27 kg/m², and barium swallow showed good passage, with good gastric motility. After one year, the BMI is still unchanged and she is doing well.

Conclusion: Restoration of normal anatomy after RYGBP is technically feasible.

■ COMMENTARY

This paper presents a laparoscopic conversion of a Roux-en-Y into the previous anatomy. Technically, it does not seem to be a challenge to Himpens and colleagues, who are experienced laparoscopic surgeons with numerous years of experience under their belt; but the readers should be forewarned, this is a difficult operation and if the laparoscopic gastric bypass is a 10 on the scale of difficulty, this operation described here is a 15. It is true though that the lack of adhesions and the minimal scarring following a laparoscopic operation makes it easier to convert than an open VBG into a lap gastric bypass for example. The discussion then focuses on the indications for such a conversion. In this case reported, it was a sweet eater who was having intolerable dumping. That is reasonable, but the other reasons brought forth in the discussion are more debatable.

The first one is cholelithiasis, and the need to access the common bile duct. It is not clear why a restoration of normal gastric anatomy would be better than a simple transgastric ERCP through the remaining stomach, a technique more seductive and technically much less invasive than the operation proposed here. The second indication discussed by Himpens et al is the cancer of the remaining stomach. Again, this is not clear why this will work. Himpens et al say "obviously the bypassed stomach is inaccessible for routine endoscopy." It is not clear where the connection is to the proposed operation.

The final 2 reasons are more legitimate: malnutrition following gastric bypass; although very rare, it can be well handled by this operation, and I think that the first step could be a reduction in the length of the Roux-en-Y. Finally, nesidioblastomas are a real problem, and a reversal could be of some help there. The restitution of normal anatomy might be less aggres-

sive therapy, reducing the beta cell trophic factors, which had been increased as a result of the Roux-en-Y gastric bypass. ■

Immediate Diabetes Resolution after GB Surgery

ABSTRACT & COMMENTARY

By Nicole R. Basa, MD

Clinical Instructor, Department of Surgery, UCLA Division of Minimally Invasive and Bariatric Surgery

Dr. Basa reports no financial relationships relevant to this field of study.

Synopsis: *Bypassing the duodenum and proximal jejunum causes improvement in blood glucose control in patients with Type 2 Diabetes as demonstrated by a surgical diabetic rat model.*

Source: Rubino F, et al. The mechanism of diabetes control after gastrointestinal bypass surgery reveals a role of the proximal small intestine in the pathophysiology of type 2 diabetes. *Ann Surg.* 2006;244:741-749.

BACKGROUND: MOST PATIENTS WITH TYPE 2 DIABETES who undergo Roux-en-Y Gastric Bypass (GB) surgery experience immediate resolution of their diabetes. Immediately, in the postoperative period, blood sugars improve prior to any weight loss changes. The rearranged intestine appears to play a role in the improved glucose homeostasis. There are 2 working hypotheses to why this occurs: 1) enhanced delivery of nutrients to the distal intestine, with increased secretion of hindgut signals to improve glucose control or 2) excluding the proximal intestine to change glucose signaling.

Methods: Goto-Kakizaki (GK) type 2 diabetic rats underwent 3 different types of operations: 1) Duodenal-jejunal Bypass (DJB), 2) stomach-preserving RYGB, which excludes the proximal intestine, and 3) a Gastrojejunostomy (GJ), whereby a loop of jejunum is connected to the stomach to create a shortcut to the hindgut without a bypass of any intestine.

Results: DJB-treated rats had better oral glucose tolerance compared with controls. GJ did not affect glucose control, but exclusion of the duodenum in reoperated rats did improve glucose control. Restoration of duodenal nutrient passage in DJB rats reestablished poor glucose control.

Conclusions: This study demonstrates that the bypass of the proximal small intestine improves glucose homeostasis, independent of food intake, body weight, and malabsorption or nutrient delivery to the hindgut.

■ COMMENTARY

This study demonstrates how surgical treatment for morbid obesity affects glucose homeostasis. Clinically, blood sugars of patients with diabetes type 2 show dramatic improvement soon after gastric bypass surgery. The improvement of diabetes occurs within the immediate postoperative period. It is not due to the long-term effects of decreased food intake or weight loss. These long-term findings improve other comorbidities due to morbid obesity, such as hypertension, sleep apnea, gastroesophageal reflux disease, and degenerative joint disease.

By performing surgery in diabetic rats, different types of operations were used to assess if improved glucose control was due to the absence of nutrients passing the proximal small bowel vs accelerated nutrients passing to the hindgut. Sham-operated, pair-fed animals, as well as unoperated, pair-fed animals were used as controls. This study nicely demonstrated that the diabetic rats that had a proximal intestinal bypass had a marked improvement in glucose tolerance. The rats with a loop gastrojejunostomy were noted to have no benefit in glucose homeostasis. These same rats were operated on again 4 weeks later to divide the connection between the stomach and the duodenum. The reoperated rats showed improved glucose control due to the presumed lack of nutrient flow within the proximal small bowel. These results corroborate Rubino and Marescaux's earlier work, which demonstrated that DJB ameliorates type 2 diabetes in diabetic rats very rapidly and more effectively than by restricting food intake in matched nonoperated animals.¹

Several other clinical studies showed that excluding the duodenum improves glucose control in diabetic patients. Early data from 1955 showed that diabetic patients who required a subtotal gastrectomy and a bypass of their proximal duodenum and jejunum were noted to have markedly improved blood glucose levels.²

The dramatic finding that by bypassing the proximal small intestine Type 2 diabetes can be cured, is impressive. This finding has sparked research into finding out the hormone that is secreted in the prox-

imal small intestine which is responsible for improved glucose control. If this hormone is found, millions of people who suffer from Type 2 diabetes may benefit. If a hormone is not found, patients who suffer from type 2 diabetes, who have a BMI less than 35, may benefit from a Roux-en-Y GB, or some form of this operation which bypasses the proximal small bowel. ■

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Gallbladder Management During LRYGB Surgery

ABSTRACT & COMMENTARY

By Richard M. Peterson, MD, MPH

Clinical Instructor of Surgery, Department of Surgery, USC

Dr. Peterson reports no financial relationships relevant to this field of study.

Synopsis: *The incidence of symptomatic gallstones requiring cholecystectomy after laparoscopic Roux en Y gastric bypass is low.*

Source: Patel KR, et al. Gallbladder management during laparoscopic Roux-en-Y gastric bypass surgery: Routine preoperative screening for gallstones and postoperative prophylactic medical treatment are not necessary. *Am Surg.* 2006; 72:857-861.

IN THE BARIATRIC SURGERY LITERATURE, THE OPTIMUM approach to the gallbladder is controversial. Recommendations range from concomitant cholecystectomy to selective screening and postoperative medical prophylaxis.

In the field of bariatric surgery, the approach to dealing with gallstones is varied and controversial. Patel and colleagues reviewed their experience at UCLA and used their conclusions to propose a means for a more selective, and possibly more cost-effective, approach to gallbladder disease as it relates to the bariatric surgery patient and surgeon.

The approaches that are utilized range from no evaluation of gallbladder symptomatology, simple history taking, ultrasound evaluation, concomitant cholecystectomy at time of bypass surgery for asymptomatic and acalculous gallbladder disease, and cholecystectomy for asymptomatic and symptomatic gallstone disease. Additionally, those not performing pre-emptive cholecystectomy may choose to use an agent such as Ursodeoxycholic acid (ursodiol) in order to reduce stone formation. Patel et al found that the studies evaluating the use of ursodiol discovered a low rate of biliary disease in compliant patients. However, contrary to that, those studies highlighting poor compliance cited rates as high as 28% stone formation.

In the series by Patel et al, 193 patients were included in their evaluation from January 2003 to January 2005. Only 12 patients (6%) required cholecystectomy. The reasons for surgery were acute cholecystitis (5 patients, 2.5%), biliary colic (5 patients, 2.5%), and gallstone pancreatitis (2 patients, 1%). In their analysis and review they found that the incidence of patients requiring cholecystectomy following laparoscopic gastric bypass was similar to the studies where patients were treated with bile salts and were poorly compliant. The rate of symptomatic gallbladder disease was essentially the same.

Patel et al point out that the addition of a cholecystectomy in this patient population can add operative time, increase length of stay, and add to the complexity of the operation. "Routine prophylactic cholecystectomy in this group can be technically demanding secondary to body habits, hepatomegaly, and the large amount of intra-abdominal fat, potentially increasing the incidence of complications." This addition, then, may be putting patients at increased risk for a problem that may never develop.

In our series of laparoscopic gastric bypass procedures at USC, we employ a similar approach to evaluation and postoperative treatment of the gallbladder as Patel et al. We have seen a similar low rate of symptomatic gallbladder disease, necessitating surgical intervention. Additionally, we do not routinely utilize bile salts in our patients for gallstone formation prophylaxis. I would agree with Patel et al's conclusions that routine preoperative screening or medical prophylaxis may not be necessary, but further studies to support this and make the information more generalizable are needed. ■

3-Year Follow-Up Comparing Laparoscopic vs Open GB

ABSTRACT & COMMENTARY

By *Namir Katkhouda, MD, FACS*

Synopsis: *In this randomized trial with a 3-year follow-up, we found that laparoscopic gastric bypass was equally effective as open gastric bypass with respect to weight loss and improvement in comorbidities and quality of life.*

Source: Puzziferri N, et al. Three-year follow-up of a prospective randomized trial comparing laparoscopic versus open gastric bypass. *Ann Surg.* 2006;243:181-188.

OBJECTIVE: TO ANALYZE LONG-TERM WEIGHT LOSS, changes in comorbidities and quality of life, and late complications after laparoscopic and open gastric bypass.

Early results from our prospective, randomized trial comparing the outcome of laparoscopic vs open gastric bypass demonstrated less postoperative pain, shorter length of hospital stay, fewer wound-related complications, and faster convalescence for patients who underwent laparoscopic gastric bypass.

Methods: Between May 1999 and March 2001, 155 morbidly obese patients were enrolled in this prospective trial, in which 79 patients were randomized to laparoscopic gastric bypass and 76 to open gastric bypass. Two patients in the laparoscopic group required conversion to open surgery; their data were analyzed within the laparoscopic group on an intention-to-treat basis. The 2 groups were well matched for body mass index, age, and gender. Outcome evaluation included weight loss, changes in comorbidities and quality of life, and late complications.

Results: The mean follow up was 39 ± 8 months. There were no significant differences in the percent of excess body weight loss between the 2 groups at the 3-year follow up (77% for laparoscopic versus 67% for open). The rate of improvement, or resolution, of comorbidities was similar between groups. Improvement in quality of life, measured by the Moorehead-Ardelt Quality of Life Questionnaire, was observed in both groups, without significant differences between groups. Late complications were simi-

lar between groups, except for the rate of incisional hernia, which was significantly greater after open gastric bypass (39% versus 5%, $P < 0.01$), and the rate of cholecystectomy, which was greater after laparoscopic gastric bypass (28% vs 5%, $P = 0.03$).

Conclusions: In this randomized trial with a 3-year follow-up, we found that laparoscopic gastric bypass was equally effective as open gastric bypass with respect to weight loss and improvement in comorbidities and quality of life. A major advantage at long-term follow-up for patients who underwent laparoscopic gastric bypass was the reduction in the rate of incisional hernia

■ COMMENTARY

Puzziferri and colleagues present a very important paper on the follow up of their first study, which showed clearly superior benefits of the laparoscopic approach over the open approach on a short-term follow up. Here they have a follow up of 39 months on 75% of their patients, which is excellent, even if they tend to believe that it is not close to Porries 90 plus over a long period. Many bariatric surgeons would like the same.

In this study, Puzziferri et al show an excellent 77% weight loss and no statistical difference with the open operation. The resolution of comorbidities is the same, and very high, with almost 100% diabetes, which is a logical finding because of the effects of the bypass on the bypassed duodenum, and its implication in the regulation of glucose, following the important work of Francesco Rubino. The main difference is in the rates of incisional hernias, which is very high, as expected in the open group. Of note, the small bowel obstruction rate is similar in both groups, even if some studies have shown recently that the laparoscopic procedure has a slightly higher rate. Finally, only 14% of patients in the laparoscopic group had anemia; none of the patients developed severe malnutrition. This is in accordance with our belief that malnutrition is rare following laparoscopic gastric bypass, provided the patients take their vitamins. This is also due to a natural evolution of the stoma and the pouch, which tend to widen with time, allowing for more food intake.

In summary, this paper proves that the laparoscopic operation is a better option than the open one and should indeed be considered the standard of care for treatment of morbid obesity. As mentioned appropriately in the article, there are no reasons left for the payors to even question this. ■

CME Questions

11. Resolution of type 2 diabetes following laparoscopic gastric bypass:
- is due to the bypass of the duodenum.
 - is due to the bypass of the jejunum.
 - a and b
12. Conversion of a laparoscopic bypass to normal anatomy:
- is a common procedure.
 - is sometimes required for treatment of excessive weight gain.
 - is sometimes required for excessive weight loss.
 - a and b
13. The incidence of gallstones following weight loss surgery:
- is increased.
 - is decreased.
 - warrants a prophylactic cholecystectomy during the initial procedure.
 - a and b

Answers: 11. (a); 12. (c); 13. (a)

CME Objectives

The objectives of *Bariatric Medicine Alert* are to:

- discuss the clinical implications of various types of bariatric surgery;
- discuss comorbidities resulting from obesity, as well as secondary pathologies resulting from bariatric surgery;
- review peri-operative and post-operative procedures to ensure long-term success, lower mortality from surgery, and a decrease in comorbidities;
- review current data regarding use of obesity drugs, as well as nutritional support in the fight against obesity. ■

CME Instructions

Physicians participate in this CME program by reading the issue, using the references for research, and studying the questions. Participants should select what they believe to be the correct answers, then refer to the answer key to test their knowledge. To clarify confusion on any questions answered incorrectly, consult the source material.

After completing the semester's activity, participants must complete the evaluation form provided at the end of each semester (June and December) and return it in the reply envelope to receive a letter of credit. When your evaluation is received, a letter of credit will be mailed to you. ■

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