Surg Endosc (2010) 24:2188–2191
DOI 10.1007/s00464-010-0924-2

Routine postoperative upper gastrointestinal fluoroscopy is unnecessary after laparoscopic adjustable gastric band placement

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Received: 4 June 2009 / Accepted: 10 January 2010 / Published online: 27 March 2010

Abstract
Background Laparoscopic adjustable gastric banding (LAGB) has become an accepted procedure for weight loss surgery, particularly due to fewer early complications and decreased mortality in comparison to other bariatric procedures. Many centers use postoperative upper gastrointestinal fluoroscopy (UGI) to ensure stomal patency and gastric integrity at the banding site. However, UGI increases cost and may increase length of stay due to availability. The purpose of this study is to determine whether routine UGI after LAGB is necessary for detection of early complications.
Methods A prospective database of 200 LAGBs performed by a single surgeon over 3 years was reviewed retrospectively. All patients underwent UGI 2–24 h after surgery.
Results Mean age was 43, mean BMI was 45, and mean operative time was 44 min. Forty-four percent of patients stayed overnight. All postoperative UGI results were normal. Six percent underwent intraoperative instillation of methylene blue due to procedural difficulty with no leaks identified. These patients on average were 5 years older ($p < 0.01$) and had an operative time 23 min longer ($p < 0.01$). Differences in gender and BMI were not statistically significant. One patient (0.5%), who had a normal methylene blue test and normal UGI, returned within 2 days with a gastric perforation requiring band explant and gastric repair.
Conclusions We conclude that routine UGI after LAGB is not necessary based on a 0% stomal obstruction rate and detection of not a single gastric leak. Elimination of routine postoperative UGI will decrease cost and length of hospital stay. We suggest a selective approach for those patients at increased risk of early postoperative complications, including those having intraoperative methylene blue instillation, increased length of operation, and increased age.

Keywords Laparoscopic adjustable gastric banding · Upper GI complications · Bariatric surgery · Perforation

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Introduction

Obesity continues to be a growing problem in the United States, affecting 33% of the general population according to a recent CDC study [1]. Bariatric surgery is recognized as one of the best, and perhaps only, long-term treatments for morbid obesity [2]. A variety of procedures have been introduced, and in 1993 the first adjustable gastric band was placed [3]. Since then, there have been several generations of bands along with the addition of the now standard laparoscopic technique [4]. Gastric banding is noted to be effective, with excess weight loss of 45.8 ± 27.4% at 6 months and up to 82.7 ± 4.2% at 10 years in one large series [4]. This has been confirmed by other studies [5].

Laparoscopic adjustable gastric banding (LAGB) has been shown to be a somewhat simpler, faster, reversible, and less morbid procedure than laparoscopic Roux-en-Y gastric bypass (LRYGB). Carucci et al. [6] note in their series that complications in gastric banding include leak (0.5%), poor band orientation and early slips requiring reoperation (1%), early stomal obstruction resolving with conservative management (1.5%), and early dysphagia (14%). Biagini and Karam [4] reviewed 591 patients who underwent LAGB over a 10-year period; in their series, 8.6% required explantation, with complications including band failure (9.3%), slippage (5.3%), erosion (4.6%), infection (2.4%), and poor band position (1.9%). Complications occurred

mainly in the early procedures, likely secondary to the learning curve, band type, and surgical technique. In concurrence with these studies, Lancaster and Hutter [2] compared patients undergoing LRYGB and LAGB from the NSQIP database. They found LRYGB had a longer operative time, more returns to OR, and more major and minor complications compared to LAGB, although all of these occurrences were very low in both groups. LAGB had a mortality rate of 0.09% and a 1% major complication rate. The rate of reoperation was 0.9%. These authors concluded that LAGB is equivalent or slightly safer than LRYGB in the short term [2].

LAGB has become well accepted as a safe procedure. However, many centers have continued to utilize routine early postoperative upper gastrointestinal fluoroscopy (UGI) to evaluate band position and gastric integrity [6–8]. The use of routine UGI may extend length of hospital stay because of exam scheduling, and it increases the overall cost of the procedure [8]. Carucci et al. [6] stated that routine early postoperative UGI is necessary to assess for perforation, obstruction, band orientation, and pouch and stoma size. Pierredon-Foulongne et al. [7] concurred that imaging was key in assessing complications, both early and late. However, as surgeons performing LRYGB have begun publishing data to support exclusion of routine postoperative UGI for this more complicated procedure, it calls into question whether it is necessary after the less complex LAGB [7, 9–11]. Indeed, one recently published study by Frezza et al. [8] sought to verify that UGI is not routinely necessary based on no leaks and no interventions after 97 banding studies. Therefore, this study investigates the hypothesis that routine UGI is not necessary after LAGB.

Materials and methods

Between 2005 and 2008, 200 consecutive laparoscopic adjustable band procedures were performed by a single surgeon (JAM). One hundred eleven procedures were performed at an academic medical center and 89 were performed at an outpatient surgery center. All bands were placed using the pars flaccida technique. For those patients in whom the surgeon identified excessive perigastric fat or a difficult proximal gastric dissection at the Angle of His, dilute methylene blue was instilled per orogastric tube intraoperatively. If gastric integrity was compromised, dye would presumably extravasate from the stomach, thus identifying gastric injury immediately. All patients underwent routine upper gastrointestinal fluoroscopy using thin barium contrast media within 2–24 h after surgery; timing of the exam was based on exam availability. Patients were kept nil per os (NPO) in the hospital or surgery center until results were obtained. Upon satisfactory completion of the exam, patients were discharged. Six weeks postoperatively fluoroscopy was again used for routine band adjustments.

Data including age, gender, BMI, comorbidities, length of surgery, length of stay, UGI results, and complications were recorded for all patients. Patient follow-up ranged from 4 months to 3 years.

Results

Data obtained on 200 patients who underwent LAGB was reviewed. Two patients had undergone previous band placements by other surgeons and underwent reoperations for slipped bands. The mean age was 43 (range = 19–69) years. Seventeen patients (8.5%) were male and 183 (91.5%) were female. Mean BMI was 45 (range = 33–63). BMI at 46 was significantly higher for patients treated at the academic center compared to 43 for patients at the surgery center ($p = 0.02$). Ten percent of patients had no comorbidities. Comorbidities of those who had them included hypertension (47%), gastroesophageal reflux disease (GERD) (36%), sleep apnea (18%), hypercholesterolemia (16.5%), arthritis (15%), asthma (15%), diabetes (14%), depression (11.5%), and coronary artery disease (CAD) (2%). Mean operative time was 44 min (range = 25–100 min). Cases were significantly longer at the academic center (mean = 49 min vs. 38 min, $p < 0.01$). There were no intraoperative complications. Ten patients (5%) underwent anterior cruraplasty for hiatal hernia identified at the time of operation.

Six percent of patients underwent intraoperative intragastric instillation of methylene blue for excessive perigastric fat or difficult dissection. No leaks were identified. Differences between those patients who underwent intraoperative methylene blue instillation and those who did not were analyzed using Student's t test. Those who received methylene blue instillation were, on average, 5 years older ($p < 0.01$), with an operative time 23 min longer ($p < 0.01$). Differences in gender and BMI were not statistically significant. Of those cases performed at the academic center, mean length of stay was 0.86 day, with 80% of patients staying at least one night. All surgery center cases went home within 4 h after surgery.

In the entire series, all postoperative UGI results were found to be normal, with acceptable band position, no stomal obstruction, and absence of contrast extravasation. One patient (0.5%), who had a normal intraoperative methylene blue test and normal postoperative UGI, returned within 2 days with a gastric perforation requiring band explant and gastric repair. Of note, this patient had gastric surgery previously for peptic ulcer disease requiring extensive laparoscopic adhesiolysis of the stomach from the left lateral lobe of the liver at the time of band placement. An additional two

patients returned at 8 and 14 months with acute band slips requiring reoperation. Review of their original operative reports revealed that neither required intraoperative methylene blue instillation and both had normal routine postoperative UGIs. Four patients required readmission for dehydration; again methylene blue was not used in any of these cases nor were there any UGI abnormalities.

Discussion

Routine UGI after LAGB has been recommended as a standard [1, 3, 6]. However, there have been little published data to support this recommendation. There are few papers that evaluate the sensitivity and predictive value of UGI after LAGB. However, there are numerous published studies discussing the controversy regarding its use after LRYGB. Doraiswamy et al. [11] found that UGI had a sensitivity of 33.3% and positive predictive value of 11.1%. Carter et al. [9] found that UGI had a sensitivity of 43% and positive predictive value of 60%, with 99% of routine early postoperative UGIs negative for leak. White et al. [3] observed over 500 patients and had a 0% leak rate, thus making the study unable to evaluate these parameters but suggesting that UGI is not necessary in their patient population. In lieu of routine UGI, these authors suggest a selective approach based on clinical factors. However, while Madan et al. [12, 13] found white blood cell count (WBC) to be remarkably specific, no other predictors carried the same positive predictive value (67%), negative predictive value (99%), sensitivity (75%), specificity (97%), or test efficiency (98%) as UGI. Based on a leak rate of 3%, they felt UGI aided in early diagnosis of leaks and likely decreased morbidity of delayed diagnosis. Raman et al. [14] concurred with this finding, with a 1.2% leak rate on initial postoperative UGI prompting intervention and potentially preventing morbidity. Some authors note that improved experience leads to decreased leak rates, suggesting that UGI is most valuable in early practice and its usefulness should be evaluated in each practice [12, 13, 15]. Rodriguez-Cuellar [15] additionally comments that computed tomography (CT) may be a better mode of evaluation in the future. This perhaps would suggest that the exceedingly small leak rate seen in the less complex LAGB may preclude UGI's usefulness, particularly as the surgeon gains experience.

Additional applicable comments on post-LRYGB UGI include a false sense of security in the setting of clinical factors, expense and time, delay to diet, and risks of diarrhea and aspiration [3, 9, 10]. Also, UGI may miss other areas of concern such as injuries or leaks further downstream [9]. These factors potentially diminish the importance of routine post-LRYGB UGI and perhaps that of routine post-LAGB UGI concomitantly.

Despite the above studies suggesting that UGI may be used selectively after LRYGB, there are few published studies examining the impact of routine early postoperative UGI on LABG. Wiesner et al. [16] correctly stated that nearly all known complications of LAGB can be diagnosed only by fluoroscopy. In their review of 98 LAGB patients, all routine postoperative UGIs showed appropriate band position and no evidence of perforation. There were no early complications in that series, although there were 34 late complications, including concentric pouch dilation, eccentric pouch dilation, eccentric band herniation, system disconnection, band erosion, and peri-port infection. This gives credence to the theory that the early success seen with selective routine postoperative UGI in LRYGB can be extended to LAGB. In further support of this hypothesis, Frezza et al. [8] found that routine postoperative UGI yielded no discernible benefit as no interventions were performed based on UGI results in their review of 97 LAGB patients. In addition, they confirmed that routine UGI increased the cost and length of stay.

In the series presented in this article, routine postoperative UGI did not detect a single early leak, and there was no incidence of early band malposition requiring reoperation. Like some of the large series of LRYGB, the leak rate was very small, and although routine UGI did not detect this, the incidence of leak is so small as to preclude statistical evaluation. Whether this is confirmation of the poor positive predictive value and sensitivity of UGI after laparoscopic obesity surgery found by some authors or, rather, is related to the presence of the band cannot be clearly determined. However, since evaluating these data, we have eliminated routine early postoperative UGI from our practice. UGI utilized in band adjustments at 6 weeks documents band position and evaluates pouch dilation, band herniation or erosion, and system disconnections. Since moving to a selective approach, length of stay in 55 subsequent cases at the academic center has been halved, with mean stay 0.4 day compared to 0.86 day in the study population ($p < 0.01$). In addition, the charge for routine UGI (approximately $1200 in our institution) is eliminated.

Conclusion

Routine UGI after LAGB previously had been a standard in our practice. In this study we reviewed UGI results, finding that they were not predictive of leak, stomal obstruction, or need for reoperation based on a 0% stomal obstruction rate and detection of not one gastric leak. Use of intraoperative methylene blue was used as a surrogate for more difficult operations, suspecting that these cases may still warrant selective use of postoperative UGI. Attempts to predict preoperatively which cases may be more difficult by

evaluating methylene blue use were low yield as these cases were associated only with longer operative time and a 5-year difference in age. Indeed, the single incidence of gastric leak postoperatively was not detected by intraoperative methylene blue instillation. Because the incidence of gastric leak and other complications was so rare in this series, it cannot be determined whether methylene blue instillation is a sensitive test to determine gastric leak. However, because the incidence of leak, stomal obstruction, and band malposition is so low, our results suggest that routine UGI after LAGB is unnecessary. We suggest a selective approach, reserving UGI for patients with subjective increased risk of early postoperative complications, such as those having intraoperative methylene blue instillation and increased length of operation and those who are older. In addition, a heightened awareness of clinical evidence of perforation or obstruction must be maintained, with such evidence mandating early UGI.

Disclosures Drs. Bertelson and Myers have no conflicts of interest or financial ties to disclose.

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