

Gastric Plication Can Reduce Slippage Rate After Laparoscopic Gastric Banding

A. Hussain, H. Mahmood, S. El-Hasani

ABSTRACT

Background: Laparoscopic insertion of a gastric band for weight reduction is increasingly performed in obese and morbidly obese patients. Complication rates after gastric band insertion are reduced by using certain techniques.

Patients and Methods: This was a prospective study of all patients who underwent laparoscopic adjustable gastric band (LAGB) insertion at our unit. This procedure is performed through the classical 4-port technique and the use of a liver retractor. The pars flaccida method is performed in all patients, and the gold finger, a malleable instrument, is used to guide the band through the retroesophageal window in patients with difficult anatomy. Band slippage is avoided by using 2 types of gastric plication, depending on the anatomical characteristics of the stomach. Outcomes and morbidity are recorded, and patients are followed up in outpatient clinics.

Results: Laparoscopic adjustable gastric band (LAGB) insertion was performed in 464 patients. A single consultant surgeon performed all procedures over a 2-year period. From August 2005 through August 2007, 380 (81.89%) women and 84 (18.10%) men were included in this study. The mean age was 41 years (range, 21 to 62). The mean body mass index was 43 (range, 35 to 62). Morbidity included dysphagia, epigastric pain, port displacement, port infection, erosion, and acute respiratory distress. Only one (0.21%) case of band slippage was reported. The mean follow-up was 26 months (range, 18 to 42).

Conclusion: Laparoscopic gastric plication adds greater security and provides optimum gastric band placement. It is an effective method to reduce slippage after gastric band insertion.

Key Words: Laparoscopic gastric band, Plication technique, Anterior slippage, Posterior slippage, Longitudinal

plication, Transverse plication, Oblique plication, Gastrogastric stitches.

INTRODUCTION

Following the major pioneering milestones of Wilkinson and Peloso, who placed a nonadjustable band around the upper part of a patient's stomach in 1978, and Hallberg and Forsell, as well as Kuzmak, who worked on separate continents to develop the clinical application of adjustable gastric bands in the early 1980s,¹ laparoscopic adjustable gastric band (LAGB) insertion has gained popularity as a minimally invasive method for reducing weight in patients with moderately high body mass index (BMI). It is associated with fewer complications and mortality compared with other procedures like laparoscopic gastric bypass. Many reports in the literature have defined its benefit in not only weight control but also its efficacy to cure or improve type 2 diabetes mellitus in these patients.²⁻⁴

One of the important technical aspects of the procedure is to prevent postoperative gastric slippage around the band. The prerequisite for the slippage in gastric band surgery is the redundant part of the stomach, which constitutes mainly the anterior gastric wall to the left of the band. Accordingly, different methods are described in the literature to prevent such problems, including the 2-step technique that involves a crural dissection towards the angle of His through a gastrohepatic ligament approach, pars flaccida, by anchoring the fundus to the left crus (single stitch or 2 stitches), and recently the Birmingham plication stitch.⁵⁻⁹ As a result, a wide range of slippage rates has been reported (**Table 1**). The pars flaccida technique is associated with a significantly lower incidence (1.4% versus 24%) of slippage compared with the perigastric method.^{14,19} The causes of slippage include surgeon's lack of experience; poor surgical technique; patient factors, such as poor chewing techniques and gulping food, which contribute to LAGB movement and cause slippage or pouch dilation. Slippage could occur with the large band, because the band will be loose, and a potential space between the band and the stomach is the prerequisite for the slippage.^{15,20}

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Table 1.
Slippage Rates and Surgical Techniques of Laparoscopic Gastric Band Insertion

Reference	Slippage Rate	No of Subjects	Technique	Year of Publication
10	2.72	110	Pars flaccida	2002
11	3.7	984	Pars flaccida	2003
12	8.6	500	Pars flaccida	2003
13	3.1	445	Pars flaccida	2004
14	1.4	970	Pars flaccida Perigastric	2005
	20.5	044		
15	0.90	400	Pars flaccida	2006
16	3.0	400	Pars flaccida	2007
17	5.0	660	Pars flaccida	2008
18	0.8	415	Mesh pars flaccida	2008
	0.0	131	Mesh plication pars flaccida	

The band is inserted around the gastroesophageal junction (GOJ). However, anteriorly, part of the stomach constitutes a small or a virtual gastric pouch. The main redundant part of the stomach is inferior and to the left of the band. After the gastro-gastric (G-G) stitches to secure the band are put in place, the redundant part of the stomach may slip and rotate beneath the band. Fixing this part of the stomach, therefore, will reduce the slippage.

The aim of this study was to investigate the efficacy of gastric plications to reduce gastric band slippage.

METHODS

This was a prospective study of all patients who were assessed preoperatively and underwent LAGB insertion by using pars flaccida and gastric plication techniques. This study comprised 464 (81%) of 570 patients. The initial 106 patients were excluded from the study, because they represent the caseload for achieving proficiency. Inamed's BioEnterics (USA) LAP-BAND system was used from August 2005 to November 2006, while Allergan's (USA) LAP-BAND AP system (small and large) was used for the rest of study period. The details of the procedure were explained to the patients, and all patients signed an informed consent. Bariatric surgery was introduced at Princess Royal University Hospital several years ago, and the outcomes have been encouraging. Modification of gastric band insertion and plication techniques (which have been acknowledged by Singhal et al, Birmingham stitch) was discussed in our division surgery meeting, approved by the chairman, and considered a step forward. The preoperative investigations included complete blood cell count,

biochemistry, thyroid function test, and cortisol level. Other tests, such as imaging and endoscopy, were performed only when indicated. All patients were seen by our nurse practitioner to explain the perioperative care, and the follow-up program.

LAGB insertion was performed with the classical 4-port technique and the use of a liver retractor. The pars flaccida method was performed in all patients, and the gold finger was used to guide the band through the retroesophageal window in patients with difficult anatomy. The upper gastric fat pad was dissected for better placement and suitable band size assessment.

The band was secured in position by using 3 to 4 G-G stitches in addition to 2 of the 3 types of gastric plications, depending on the anatomical characteristics of the stomach in every patient.

The first type was the longitudinal plication (LP) (**Figures 1 and 2**), which we used when there was a large fundus hanging between the upper pole of the spleen laterally and the band medially (when this distance was >10 cm). This was plicated longitudinally (by passing the needle several times through the stomach wall to gather it) and stitched to the left crus or to the diaphragm to fix it (similar to a Birmingham gastropexy suture).⁸

We used transverse plication TP (**Figure 3 and 4**) when there was laxity of the stomach to the left of the band (when the distance from the band to the extreme fundal edge is >10 cm), in which the plication was performed from the edge of the greater curvature transversely toward the band aiming for the gastro-gastric (G-G) stitching site.

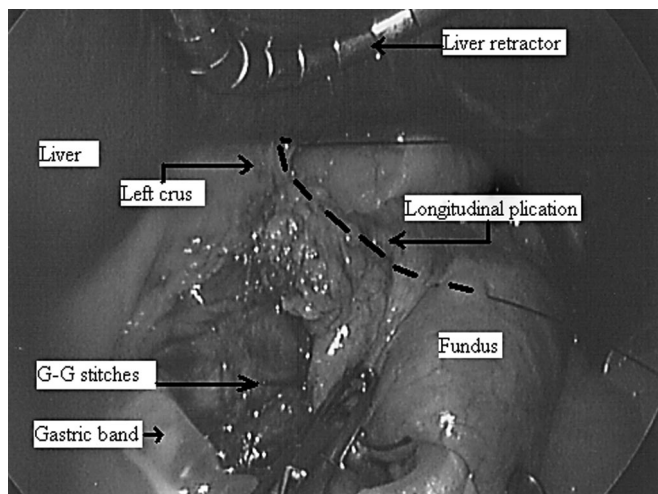


Figure 1. Longitudinal plication, first step.

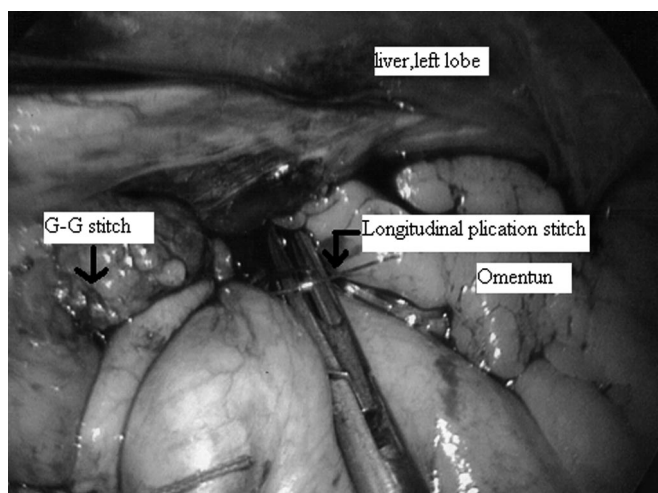


Figure 2. Longitudinal plication, final step.

The oblique plication (OP) (Figure 5 and 6) was performed by starting stitching on the greater curvature and progressing infero-medially parallel to the band itself towards the lesser curvature in oblique fashion (when the distance between the band and the greater curvature edge of the body of the stomach was >10 cm). All these plications were done using a single prolene suture with extracorporeal knot (Figure 7).

A combination of 2 types of plication (longitudinal and transverse or oblique) after inserting G-G stitching was applied in every patient to secure the band in position and to prevent slippage. Longitudinal plication was used in all patients, while the other 2 types were used according to the stomach anatomy and volume of redundancy in transverse and oblique directions. The plications can be done

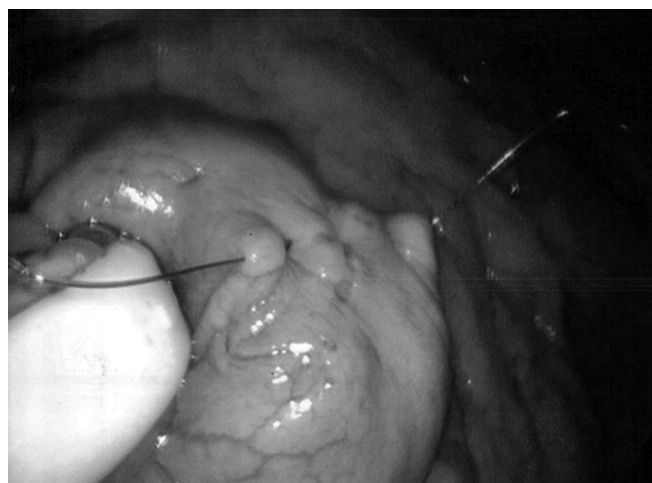


Figure 3. Transverse plication, first step.

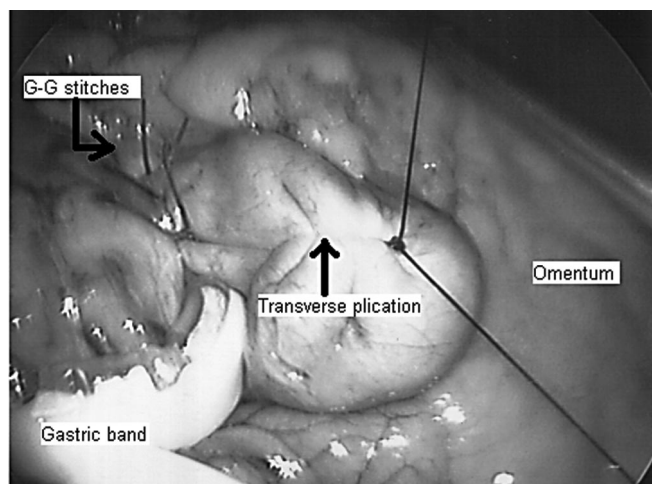


Figure 4. Transverse plication, final step.

in <5 minutes without significant prolongation of the operative time. Radiological band adjustment was organized for 6 weeks postoperatively and subsequently was achieved at our unit. All patients are seen in the outpatient clinic on monthly basis or as required.

RESULTS

From August 2005 through August 2007, 464 patients underwent laparoscopic band insertion; 380 (81.89%) women and 84 (18.10%) men were included in this study. The mean age was 41 years (range, 21 to 62). The mean body mass index (BMI) was 43 (range, 35 to 62). The mean follow-up was 26 months (range, 18 to 42). Inamed's BioEnterics LAP-BAND system was used in 268

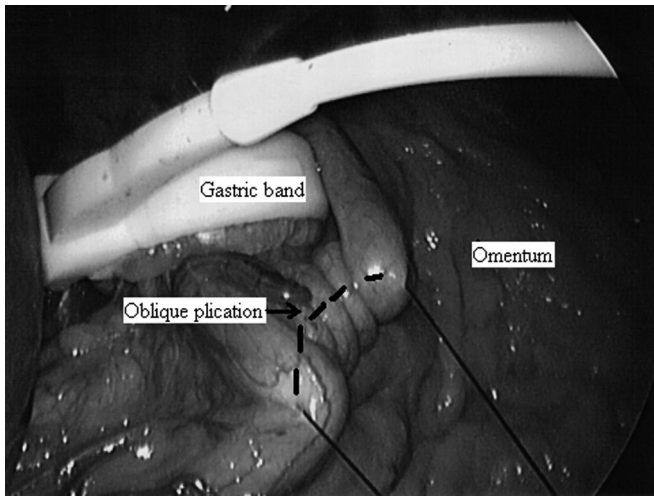


Figure 5. Oblique plication, first step.

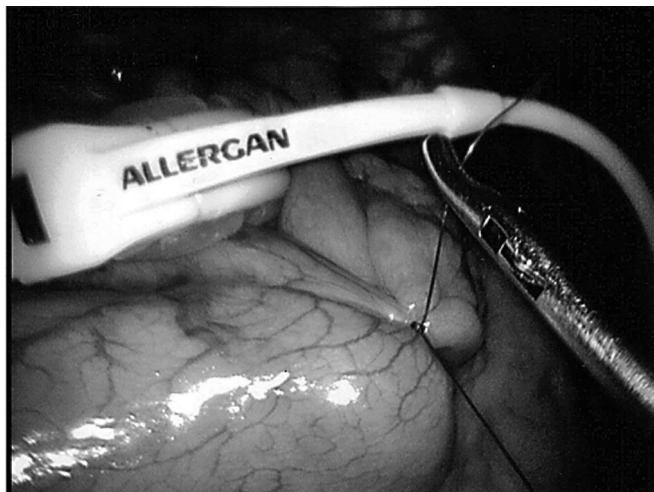


Figure 6. Oblique plication, final step.

(57.75%) patients, while Allergan's LAP-BAND AP system was used in 196 (42.24%) patients.

Four patients had their operations halted due to large rigid fatty livers. Two of them came back for surgery after being on a strict preoperative diet for one month and thus were included in this study. Another 2 operations were abandoned because of the presence of large hiatal hernias in the patients. One operation was abandoned because of anaphylaxis following intravenous Augmentin at the induction of anesthesia. These patients were excluded from the study.

One (0.21%) patient needed revision of a displaced port, one (0.21%) patient needed revision early after surgery due to a tight band causing dysphagia. The small band

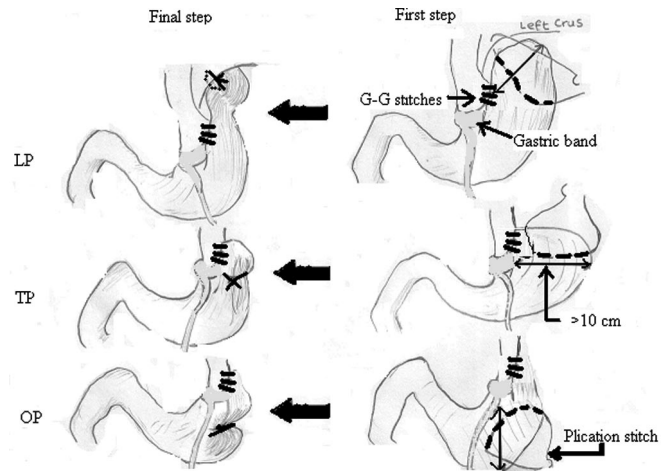


Figure 7. Schematic representation of different types of plication, LP=longitudinal plication, TP=transverse plication, OP=oblique plication.

was removed, and a large size band was inserted by using the same technique. Lateral prolapse that was considered as slippage was diagnosed in one (0.21%) patient (Allergan AP system, small band was used) and one (0.21%) patient developed persistent epigastric pain. One (0.21%) case of band erosion was diagnosed, and the patient underwent laparoscopic removal of the band. Port-site infection was reported in 5 (1.07%) patients. The port was removed in 4 patients, and one was successfully managed with drainage and antibiotics.

Our serious morbidity was severe respiratory distress due to an asthmatic episode 2 hours after surgery in one (0.21%) patient who needed intensive therapy unit (ITU) admission and ventilation for 24 hours. He was discharged after 5 days. One (0.21%) patient developed severe bronchospasm due to an anaphylactic reaction to Augmentin after induction of anesthesia and port insertion. She was resuscitated successfully and subsequently discharged. There were no mortalities (Table 2).

DISCUSSION

Complications associated with gastric band insertion are a challenging problem. Surgeons are striving to treat or reduce the rate of complications by different methods including invention of new techniques.

Revisory surgery to remove the original band and to insert a new one is a choice to treat slippage²¹; however, multiple operations may be needed in 23% of patients with increasing cost and complications.^{17,22} The golden rule of "prevention is better than the cure" is always

Table 2.
Complications

Complication	Number (%)	Treatment
Displaced port	1 (0.21)	Revision
Tight band caused dysphagia	1 (0.21)	Revision
Lateral prolapse	1 (0.21)	Revision
Band erosion	1 (0.21)	Laparoscopic removal of the band
Port site infection	5 (1.07)	Port removal, drainage and antibiotics
Severe respiratory distress	1 (0.21)	Intensive care admission
Allergic reaction to Augmentin	1 (0.21)	Steroid, fluid and antihistamine
Epigastric pain	1 (0.21)	No cause was found / Analgesia

applicable, and a method such as pars flaccida is a further step to reduce the slippage rate.^{23,24} Boschi et al¹⁵ reported a simple concept of application of 2 nonabsorbable sutures between the gastric fundus and left hemidiaphragm to prevent slippage, which resulted in a slippage rate of 4% in a series of 400 patients. Singhal et al⁸ experienced only 3 slippages (2 partial and 1 complete) in a series of 1140 LAGB patients. The Birmingham stitch technique was used for a slippage rate of 0.26%, which is the lowest reported rate in any large published series. Thornton et al¹⁸ suggested the mesh plication pars flaccida technique to reduce band slippage.

The problem of prolapse or pouch dilatation following gastric band insertion is an ever-increasing problem, which correlates with surgeon experience.²⁵ Two types of slippage exist. One is posterior slippage (PS) when the stomach below the band herniates through the space between the band and the upper part of the stomach forming an obstructed or strangulated pouch. Such a pouch is associated with stagnation, reflux, vomiting, and band displacement. In case of PS, the posterior wall of the stomach under the band moves up into the supraband compartment, and this can be prevented by inserting the band above the lesser sac. The lesser sac has upper peritoneal reflection; therefore, as long as the band is above the peritoneal reflection exactly at the GOJ, then there will be no posterior slippage and thus slippage can be prevented completely.²⁶

If the band violates the lesser sac and goes beneath the peritoneal reflection, the stomach will easily herniate

through the band. Therefore, PS occurs in patients with transbursal band placement, but it never occurs after suprabursal band placement.²⁷

The anterior slippage (AS), on the other hand, is more complex. We think it is likely to be due to 2 mechanisms. The G-G stitches may give way, and consequently the stomach beneath the band will be free to herniate superiorly through the band. The other mechanism is contributed to by the redundant part of the stomach and greater curvature below the band. To avoid AS, we normally apply the first G-G stitch as high as possible on both sides of the stomach across the band and near the left crus of the diaphragm. Other possible causes may be due to nausea and vomiting (either because of a tight band, the patient ate too much, too fast, or some food got stuck in the pouch, or gastroenteritis, and other such things) that cause the lower stomach to prolapse up through the band.

It is important to clear the fat pad on the stomach superior to the band so the G-G stitching is truly incorporating the stomach wall and not the fat pad, which will inevitably cut through and give way. The advantage of plication techniques is to make sure that the anterior part of the stomach beneath the band is not redundant, and thus it eliminates the slippage and its serious complications.²⁸

In our practice, we apply LP in every case, because usually there is a redundant fundus occupying the space above the upper pole of the spleen and the band. The assessment of the stomach size and especially the fundus is important to apply a specific type of plication. We depend on the measurement of the stomach from the gastroesophageal junction to the pylorus and from the lesser sac to the extreme left edge of the fundus. Measurement using the marked tip of the grasper is used to calculate the approximate size. The most important however is the size of the free fundus, which is measured from the left side of the band to the extreme left edge of the fundus. Usually the distance is >10 cm and therefore LP is applied. The stitch is inserted through the fundus parallel to the longitudinal axis of the greater curvature by carefully stitching the stomach to the left crus of the diaphragm and avoiding the vessels (same as the Birmingham stitch technique).⁸

If there is wide redundant stomach between the greater curvature and the band edge (>10 cm), TP is applied, whereby the stitch is inserted across the stomach from the greater curvature toward the band.

Occasionally, an oblique redundant part of the stomach (>10 cm) is inferior to the band, and this is liable to slip

in the unstitched area (medial to the G-G stitching), which can be well fixed using OP. This is achieved by starting the stitching at the greater curvature of the stomach extending obliquely parallel to the band down to the lesser curve of the stomach.

We used the pars flaccida technique for LAGB insertion, and since 2005 we have applied 2 of the 3 described gastric plication techniques on each patient. These techniques are easy to learn, simple, do not need extra dissection, and can be done in a short time. We appreciate that our follow-up is relatively short and are hopeful that our long-term study in the future will confirm our initial encouraging results. The longer the follow-up the higher the slippage rate. This is true for LAGB insertion using techniques other than plication methods. Watkins et al²⁹ reported a cumulative slippage rate at 1, 2, and 3 years of 0.4%, 2.4%, and 10%, respectively.

We have only one case of slippage, a patient who presented with dysphagia. Two types of plications were used to fix the band in the original operation, namely longitudinal and transverse. Complete deflation of the band did not relieve the symptom, and further contrast study and laparoscopy proved the diagnosis of lateral slippage of the band that was removed during laparoscopy. A large Allergan AP band was inserted with an uneventful postoperative outcome.

The question of why this patient developed slippage is difficult to answer, because she underwent the same technique as the other 463 patients. However, it is possible that patient factors, such as chewing or eating habits, may have played a role in the slippage. The other possible factor could be G-G suture failure.

We believe our low rate of slippage during the mean follow-up of 26 months is due to the plication techniques rather than something else we are doing. As pointed out above, the initial steps are the same as those most other surgeons are currently doing; yet, others have reported higher slippage rates. Having said that, a control group of patients will definitely confirm whether our low slippage rate is due to the plication methods we used. However, due to theoretical justification of the plication technique, the relatively higher slippage rate with currently used techniques and the commitment to offer the patients the best and safest available intervention, we did not insert a gastric band in any patient without adding plication as a method of fixation and securing the band to prevent slippage.

CONCLUSION

Utilizing gastric plication techniques, we have experienced a very low slippage rate that is very favorable compared with the slippage rate reported in the literature. It is easy to perform, does not need extra dissection. Possibly a randomized controlled trial will confirm its effectiveness in prevention or reducing gastric band slippage.

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