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# Complete endoscopic/transgastric retrieval of eroded gastric band: description of a novel technique and review of the literature

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**Abstract** Complications of laparoscopic adjustable gastric banding (LAGB) include band slippage, material infection, and band erosion. Band erosion can lead to chronic infection, obstruction, delayed perforation, and ineffectiveness; therefore, removal is indicated. A myriad of approaches exist for band removal and many authors have described novel techniques. A minimally invasive approach, including laparoscopic or endoscopic assistance, is favored given the reduction of postoperative complications compared with laparotomy. We present a novel approach to band retrieval following partial erosion involving a complete endoscopic/transgastric technique. Perioperative management and a review of the literature also are described.

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In conjunction with a widespread increase in rates of severe obesity, volume for bariatric procedures has grown worldwide. Among all bariatric operations available, laparoscopic adjustable gastric banding (LAGB) has gained tremendous popularity and is being offered as the sole surgical option in some centers [1]. The principle advantages described to patients include safety of operation, short recovery, and potential reversibility. Disadvantages include the need for frequent follow-up with band adjustments and inferior weight loss compared with other surgical modalities [2]. Furthermore, late complications, such as band slippage and band erosion have been described at rates of 0.3–14 % [3–7]. Recognition of band erosion should prompt referral for removal, because the ultimate sequelae can include chronic material infection, obstruction, or delayed perforation. We present a novel technique for band retrieval that involves a combined endoscopic/transgastric approach as well as a review of the various methodologies currently described in the literature.

## Case history and operative technique

A 51-year-old female presented with a body mass index (BMI) of 45 kg/m$^2$ and associated comorbidities, including hypertension, osteoarthritis, and gastroesophageal reflux disease (GERD). She underwent initial placement of a LAGB at an outside institution in 2004, but this was ultimately removed in 2006 due to band erosion. After removal of the band, the patient experienced weight regain and

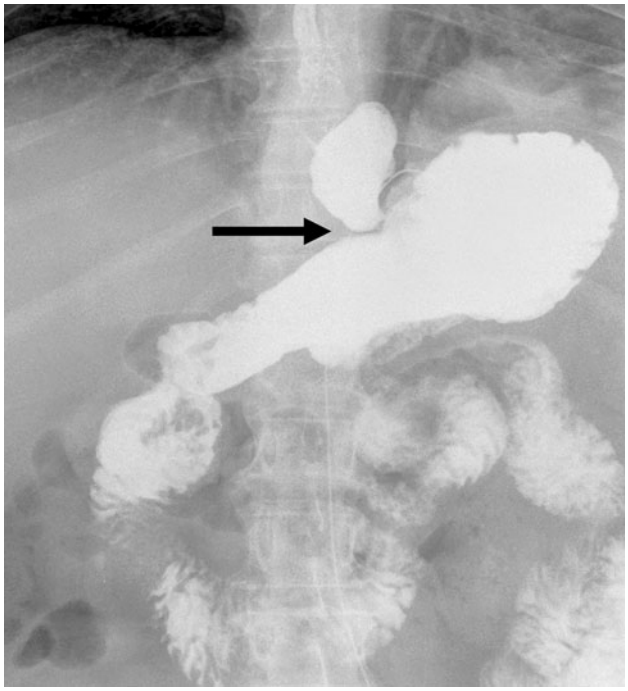

**Fig. 1** Upper GI series (*arrow* depicts contrast flow around the band)

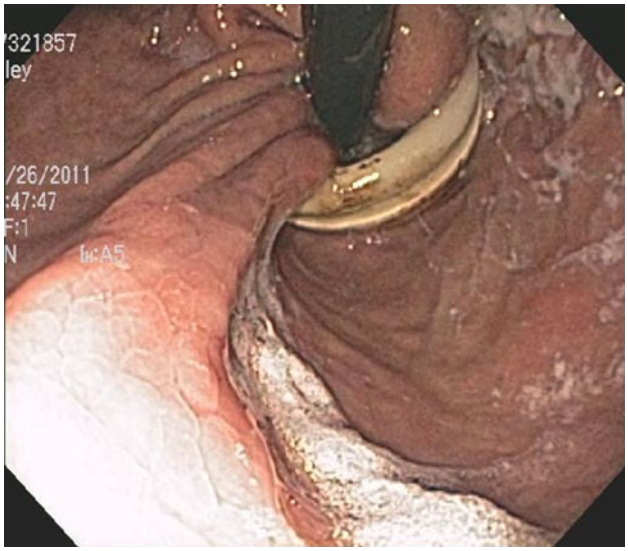


**Fig. 2** Upper endoscopy with intraluminal band erosion

presented again in 2010 for a weight loss option. The surgeon felt that an appropriate amount of time had elapsed to allow for full healing of the stomach, and the patient was offered repeat LAGB. Replacement of LAGB was performed in 2010; however, she experienced multiple port site infections and the port was ultimately removed. The intra-abdominal portion of the band and tubing was left in situ. The patient ultimately presented to our center with complaints of nausea, vomiting, and dysphagia. An upper GI series suggested contrast flow around the band, concerning for band erosion (Fig. 1). Upper endoscopy confirmed greater than 50 % band erosion with no exposed band buckle (Fig. 2).

A lengthy discussion with the patient in regards to operative technique ensued, including open, laparoscopic, endoscopic, or some combination thereof for retrieval. An emphasis on safety and feasibility was explained and the patient consented. In the operating room, a purely endoscopic attempt using endoscissors and rat-tooth retraction was unsuccessful. Ultimately, a transgastric 7–8-mm transgastric trocar was placed under endoscopic view. Using the same concept of gastric access as in percutaneous gastrostomy tube placement, transillumination, finger indentation, and the "safe tract" technique were used to access the gastric lumen safely [8] (Fig. 3). Ultrasonic

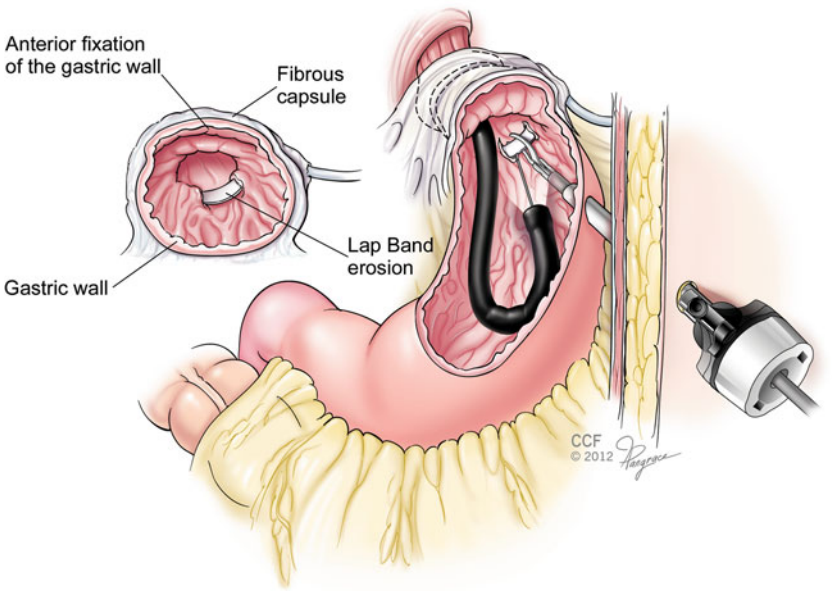


**Fig. 3** Depiction of endoscopic/transgastric retrieval of eroded gastric band

**Fig. 4** Transgastric use of ultrasonic shears to divide exposed band

shears were used through the transgastric port to divide the exposed portion of the band (Fig. 4).

The imaging for the procedure was provided by positioning the endoscope in a retroflexed view. Once the buckle was exposed, counter-traction was provided by an endoscopic rat-tooth forceps. Following division of the band, the band and tubing complex was pulled within the gastric lumen. A polypectomy snare was used to encircle the edge of the band and the entire complex was removed through the patient's mouth (Fig. 5).

An 18-Fr Malecot gastrostomy tube was then inserted through the 7–8-mm trocar and T-fasteners were used to appose the stomach to the anterior abdominal wall (Fig. 6). A Malecot tube was chosen over a standard pull-type PEG, because this tube could be placed directly through the 7–8-mm trocar as described in the SLiC technique by Sabnis et al. [9]. Because no bumper is present on the Malecot tube, T-fasteners were placed in the method described by Timratana et al. [10] to limit the risk of tube dislodgement and further pneumoperitoneum caused by prolonged endoscopy.

**Fig. 5** Fully retrieved band and tubing complex

**Fig. 6** Post-procedure gastrostomy tube placement

Postoperatively, the patient was admitted for observation. An upper GI series obtained on postoperative day 1 showed normal contrast flow through the stomach and an expected amount of pneumoperitoneum given the manipulation through the transgastric port. The patient remained asymptomatic and was discharged within 24 h (Fig. 7). At 2-week follow-up, she remained asymptomatic, tolerating a regular diet, and at which time the gastrostomy tube was removed.

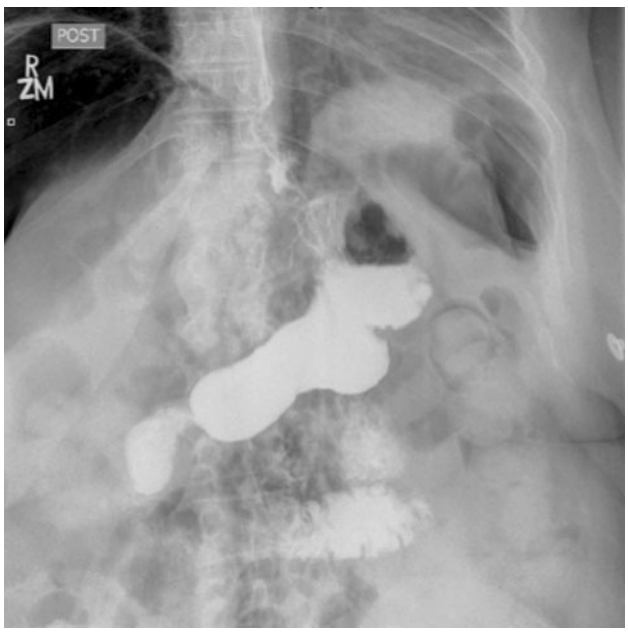


**Fig. 7** Postoperative upper GI series

## Discussion

LAGB in the United States has increased in frequency from 1% of bariatric operations in 2004 to 29 % of bariatric operations in 2008 [1]. Potential benefits include decreased complexity, perioperative complications, and length of stay compared with other bariatric operations. Other attractive features include adjustability of the band system without alteration of a patient's anatomy, as well as potential reversibility. Disadvantages include decreased effectiveness in weight loss with high complication and failure rates over time. Suter et al. [11] report a long-term complication rate of 33 % with only 43 % of patients maintaining >50 % excess body weight loss (EWL) at 7 years. Furthermore, although major complications are relatively rare, instances, such as band slippage and band erosion, may ultimately lead to reoperation. The Achilles heel of LAGB remains material erosion into the gastric lumen, and diagnosis ultimately requires band removal.

Band erosions are categorized as early (<6 months) or late (>6 months) depending on timing from initial operation. Early erosions are uncommon and are typically secondary to unrecognized gastric injury during dissection and may present with acute peritonitis requiring emergent band removal and gastric repair [12]. Most patients with late band erosion present with either wound infection or weight recidivism, because the restrictive aspect of the band is lost following erosion [13]. Surgical approaches for band removal involve a spectrum of options ranging from open laparotomy to endoscopy. The choice often centers on several factors, including surgeon experience, available equipment, extent of band erosion, and severity of illness at presentation. The goal of the procedure is to remove not only the eroded band, but also the tubing and subcutaneous access port.

### Transabdominal removal

The complete transabdominal approach is performed either via laparotomy or laparoscopy. Patients with early gastric erosions secondary to unrecognized gastric injury may require laparotomy for removal due to sepsis. Complications related to laparotomy, including wound infection and hernia formation, are higher in the morbidly obese patient [14, 15]. For this reason, a laparoscopic technique is preferred when a transabdominal approach is chosen in the elective setting [16, 17]. Regardless of transabdominal method used, removal of the band often is hindered by extensive adhesive reaction and band location near the gastroesophageal junction. To retrieve the band, its surrounding capsule must be violated, which creates a gastrotomy in inflamed tissue. The port, band, and tubing are then retrieved and the gastrotomy is repaired. Repair of this defect can be challenging given the quality of tissue and proximity to the gastroesophageal junction, both of which put the patient at risk for postoperative suture line dehiscence. Kohn et al. reported identifying 53 gastric erosions in a total of 2,097 patients who underwent LAGB during a 10-year period, for an erosion rate of 2.53 % [18]. In this study, laparoscopic removal was achieved in 49 patients by excision of the band capsule, direct band removal, and primary gastrotomy repair with omental buttress. The approach resulted in one major complication (gastric leak) and four minor complications, with a mean length of stay of 4 days [18].

### Combined endoscopic/laparoscopic transgastric removal

Because of the potential complications associated with direct band removal, some authors recommend transgastric retrieval to avoid the foreign body reaction at the hiatus [16, 17, 19]. A combined transgastric approach will circumvent violation of the band capsule that occurs during a complete transabdominal approach. In this method, endoscopy can be used for viewing the gastric band while laparoscopy assists with transgastric access on the anterior gastric wall, distal to the eroded band. Transgastric ports are placed and the band is divided laparoscopically. The intra-abdominal tubing is cut and the band can be retrieved either through the gastrotomy or through the patient's mouth via the endoscope. The remaining tubing and access port also are removed. The port site gastrotomies are then closed laparoscopically.

Currently, the literature describing this technique is limited to case reports and small series. However, authors report excellent short-term outcomes, no postoperative complications, and minimal length of stay [16, 17, 19].

### Endoscopic removal

Complete endoscopic removal has been reported with the use of a specialized band cutter. In this technique, a cutting wire must be placed around a portion of the band and then retrieved through the working channel of the endoscope. Using a cutter device, the band is divided and the band and tubing are retrieved through the mouth after the port is separated from the tubing. The access port is then removed.

In a series of 20 patients reported by Mozzi et al., complete endoscopic retrieval was successful in 16 patients. The four failed cases required surgical retrieval secondary to complications from the cutting device. One patient who underwent laparoscopic removal had a prolonged stay from an anterior gastric leak [20]. In a similar study, Chisholm et al. performed 50 endoscopic retrievals with success in 46 (92 %), thereby leading them to

conclude that the first-line approach for band retrieval should via the endoscope [21]. Likewise, Neto et al. identified 82 band erosions over a 5-year period and were successful with endoscopic retrieval in 78 (95 %). In their approach, five patients were found to have pneumoperitoneum, only one of whom required laparoscopy for treatment [22].

Currently, the endoscopic cutting device is not approved by the Food and Drug Administration in the United States; therefore, it is not available at most centers. Furthermore, the complete endoscopic removal requires advanced endoscopic skills and can only be performed if the buckle portion of the band is eroded into the lumen.

Endoscopic transgastric removal

In the current study, we present the first reported complete endoscopic/transgastric retrieval of an eroded band with an excellent outcome. This technique has subsequently been used in two cases without complication and is now considered the first-line approach at our center. All three patients were discharged within 24 h, and gastrostomy tubes were removed at 2-week follow up visit. In this procedure, the common and familiar tools employed in laparoscopy (trocar and ultrasonic shears) are paired with endoscopy to complete the operation in a simple and effective fashion.

## Conclusions

As the volume of LAGB continues to increase, so too will the number of complications related to the procedure. Although there are many options available to treat band erosion, this study illustrates that an endoscopic/transgastric approach can be applied by most centers with minimal equipment and endoscopic skill. The basic principles described in this manuscript and video will allow for a safe retrieval of an eroded gastric band in most instances. Our described technique relies solely on the endoscope for imaging, with no need for a laparoscopic, transgastric port placement. The procedure was performed in the operating room, which allowed for a stepwise approach to solve the problem and an ability to remove the port under anesthesia if needed. Using the principles of PEG tube placement, the stomach can be safely accessed and a working port placed for additional manipulation and advanced energy and tools.

Whereas our patient had a gastrostomy tube placed for 2 weeks, it also is feasible to use T-fasteners and endoscopic clip placement for mucosal closure. Many groups have described methods of gastrostomy closure, particularly when performing natural orifice translumenal endoscopic surgery (NOTES) [23]. This alteration in technique would preclude the use of a gastrostomy tube placement. However, more research is needed before claiming this variation as a safe alternative. Further advancements in endoscopic tools and techniques continue to enhance a surgeon's ability to operate in the transgastric space, thereby increasing minimally invasive solutions for complex surgical problems.

**Disclosures** S. Brethauer has served as a consultant and received honoraria from Apollo EndoSurgery, Bard, Covidien, and Ethicon. B. Chand has served as a consultant and received honoraria from Bard, Covidien, Ethicon, and Sanofi-Aventis. K. El-Hayek and P. Timratana have no conflict of interest or financial ties to disclose.

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