

# Limitations of the US Food and Drug Administration laparoscopic banding trial

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Martin et al [1] report on findings from a US Food and Drug Administration (FDA)-supervised trial of Inamed's laparoscopic banding system. The data being reported are important since they provide valuable information collected in an externally monitored clinical trial, a rarity in the bariatric surgery literature. None of the plethora of studies reporting favorable results with banding procedures had this level of monitoring and these data should serve as a reference for laparoscopic banding outcomes. However, there are some important caveats.

Laparoscopic banding procedures are a valuable adjunct for managing severe obesity. Gone are the days when only 1 operation was advocated since only the gastric bypass had a favorable risk benefit ratio. Now laparoscopic banding operations provide an alternative with lower operative risk. However, weight loss results are modest compared to those observed for gastric bypass. Long-term outcomes for a US population remain poorly defined.

Martin's study is composed of 2 trials. The first (trial A) was a multicenter open-label clinical trial of the laparoscopic banding system that had 3-year follow-up. Serving as the basis for Inamed's FDA application, this trial was widely criticized for its high complication rate compared to the already extensive international experience. The trialists were early in their learning curve for the operation, finding that their technique for band placement was problematic. The second trial (trial B) was similar to trial A but used the pars flacida technique for some of the band placements and only included surgeons with demonstrated laparoscopic surgery skills. The latter investigation had less rigorous follow-up that was limited to 1 year.

Learning curves were evident. Trial A had a 43% complication rate that was substantially reduced once the learning curve was passed. Trial B's complication rate was 25%. Although these numbers appear high, they include all sorts of adverse events, many that are of little consequence to patients. If one assesses the major complications (perfora-

tions, erosions, hepatic or splenic injury) the complication rate in trial A was 2.4% during the first year and 2.1% for trial B; these major complication rates are much less than for gastric bypass and are consistent with reports from numerous laparoscopic banding procedure case series. Most interestingly, there was substantial heterogeneity across sites for the various complication rates. For example the revision rate ranged from 0 in one site to a high of 22% for another. Like with any surgery, results depend on the surgeon's cumulative experience and commitment to refining the technical aspects of a procedure.

Despite the plethora of reports claiming that high surgical volumes are associated with better outcomes, there was no such association in this study. The overall complication rate was 46%. Fig. 1 demonstrates the 95% Poisson confidence interval and observed complication rates for the 8 centers. All but 1 center fall within the expected range that can be explained by sampling phenomena for an expected complication rate of 46%. One of the lowest volume centers had a lower than expected complication rate. These results raise an interesting challenge for the volume-outcome hypothesis of surgical outcomes. This is especially pertinent to bariatric surgery, where both the American College of Surgeons and the American Society of Bariatric Surgery have required that a facility have more than 125 cases per year to be considered a Center of Excellence. Most volume-outcome studies rely on administrative databases that have limited and imprecise clinical information collected retrospectively. Martin's data are powerful because they were collected prospectively in the careful and complete manner required for FDA device approval. The quality of these data exceeds any that has been used to examine the bariatric surgery volume-outcome relationship and clearly shows that they are not related.

Weight loss patterns differ between laparoscopic banding operations and Roux-en-Y gastric bypass operations. Weight loss is rapid after a Roux-en-Y gastric bypass, reaching its maximum within about 1 year of the operation. In contrast, weight loss is progressive for several years after banding. Several studies show that the amount of weight lost is the same for the operations at about 5 years. Trial A patients lost the maximum weight at 1 year with little

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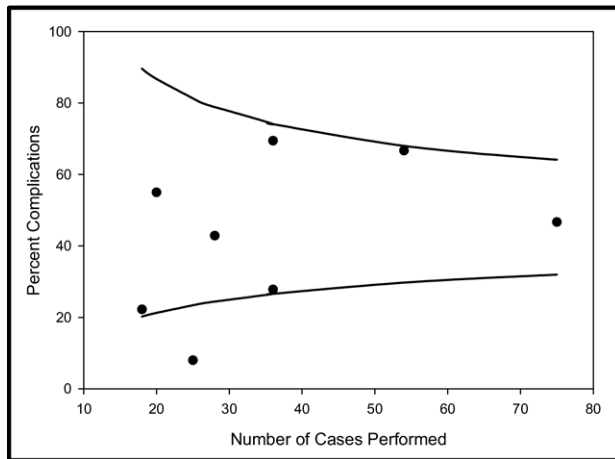


Fig. 1. Complication rates as a function of the number of cases performed at the 8 centers participating in trial A. Solid lines represent the 95% Poisson confidence interval for an expected 46% complication rate. Rates falling within the confidence interval are expected based on sampling errors that are possible as the number of cases performed per facility became smaller.

further weight loss in years 2 and 3. Why is this? Adjustable banding procedure outcomes are sensitive to a patient's follow-up plan. Obesity is a chronic illness that must be viewed as a condition requiring life-long treatment. As surgeons, we would like to perform an operation that provides profound and long-lasting weight loss associated with little risk for complications. Operations resulting in substantial weight loss such as the biliopancreatic diversion or duodenal switch procedure leave patients at risk for malnutrition and a host of nutritional disorders. Even the venerable gastric bypass causes anemia and other problems requiring life-long medical follow-up.

Critics of laparoscopic banding procedures cite the need for intense follow-up and slow weight loss. Is that so bad? Band placement can be viewed as an adjunct to a comprehensive weight loss program involving continuous dietary monitoring. This standard should be the same for any weight loss operation. The more aggressive procedures can fail, with patients experiencing weight gain or develop nutritional complications because of inadequate monitoring. All weight loss procedures should have a standardized follow-up plan. In trial A patients were seen at 3 weeks following their operation and again at 3, 6, 9, 12, 18, 24, 30, and 36 months. Trial B patients were only seen at 6 and 12 months after the 3-week visit. No standardized plan for managing band fills was used. During this trial, insurance coverage for the operation was unusual. The trial's sponsor did not pay for the operation so that patient enrolled had to either pay cash or qualify for indigent care. Follow-up for trials A and B was poor; in the 70% range. Studying a patient population that potentially had limited access to routine care undoubtedly resulted in less than optimal outcomes.

Band success is very much dependent on routine follow-up and standardized and management protocols. Results from Australia have been very good, as demonstrated in carefully executed randomized controlled trials [2]. Laparoscopic band patients from this group continue to lose

weight for as long as 5 years. A key to their success has been in the postoperative band management plan. Patients are seen every 4 to 6 weeks during the first postoperative year and undergo approximately 3 to 6 adjustments in that time period. They are then followed every 3 to 6 months for 2 more years [3]. This contrasts with trials A and B, where follow-up was relatively sparse. Perhaps more aggressive postoperative band management would have resulted in more substantial weight loss.

Interpretation of this study and its results must be made in the context of its design limitations. Unlike multicenter controlled trials for medicines, the consistency of the therapy delivered for surgical trials can be highly variable. Not all surgeons have the same technical abilities, nor are they equivalent in their abilities to perform certain operations. Evaluation of 1 operation over another in a randomized trial requires that surgeons performing the procedures have demonstrated expertise. If the same surgeon performs both operations and is better at 1 relative to the other, then the trial will not result in a fair comparison. Thus, careful consideration of the *surgeon's* outcomes must be considered when assessing a surgical clinical trial. One of the best examples for how these matters can be dealt with emanates from the Veteran Administration's randomized trial for laparoscopic and open hernia surgery. Surgeons had to have performed at least 25 of each operation that was being studied, submit to a standardized protocol for how to perform the procedure, and be observed by the study's principal investigators to ensure technical proficiency and protocol adherence [4,5]. The hernia trial established important standards for the design and execution of randomized trials for surgical procedures. Unfortunately, design rigor was lacking in Martin's laparoscopic banding trial. In trial A, there was no indication that the surgeons had any demonstrable expertise with laparoscopic banding operations. In trial B, surgeons had to have performed more than 25 laparoscopic Nissen fundoplications or gastric bypass procedures, but they still did not have any specific experience with laparoscopic banding operations. One must conclude that the surgeons were early in their learning curve. This trial had a high complication rate that most probably could be much lower had the surgeons been more experienced with the specific operation being tested. Unfortunately, despite rigorous FDA-level follow-up, this trial cannot be considered a definitive assessment for laparoscopic banding procedures since the technical aspects of the operations were not optimized.

Aside from the technical skills issues, this study is limited by evolution of the operative technique during the trial. When the study began, the trialists applied the perigastric technique for band placement. This entails identifying a location along the gastric lesser curvature below a calibrating balloon, dissecting through the gastrohepatic ligament and entering the lesser sac behind the stomach. An instrument is then passed to the angle of His and the band placed [6]. This approach has been abandoned because the disruption of the stomach's posterior attachments enables it to prolapse through the band. The retrogastric dissection also risks gastric perforation. During the course of Martin's study, the band placement technique was changed, recognizing that some of the observed complications were avoidable. The pars flaccida technique was adopted mid-trial.

This involves opening the pars flaccida adjacent to the lesser curvature to identify the right crus. Dissection is carried out along the crus above the lesser sac, avoiding its disruption. The band is then placed above the level of the lesser sac to minimize the risk of gastric prolapse. The anterior stomach is sutured in front of the band to reduce the risk of prolapse [7]. This study's high complication rate is difficult to interpret since the perigastric technique was known to be associated with frequent, avoidable complications and was used for part of this trial.

What can we learn from Martin's study? Methodologic standardization is difficult in surgical trials. Investigators must use standardized operative techniques and only surgeons with demonstrable expertise in the procedures being investigated should perform operations under investigation. We also glean that despite serious limitations in Martin's trial, weight loss achieved was far more substantial than has been observed in any medication-based report: more than 80% of patients undergoing band procedures lost more than the 10% of their initial body weight at 1 year, a standard for weight loss success established by the Institute of Medicine. Although imperfect, this study demonstrated impressive amounts of weight loss that exceeds anything that can be achieved by nonsurgical means. Despite the less than perfect study design for laparoscopic banding procedure clin-

ical trials, a recent comprehensive review by Blue Cross/Blue Shield concluded that since bands result in substantial weight loss with few complications, they can be recommended for obesity treatment [8].

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