



Laparoscopic mesh cruroplasty for large paraesophageal hernias

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Received: 6 May 2002/Accepted: 11 September 2002/Online publication: 17 February 2003

Abstract

Background: Previous studies have shown that surgical repair of paraesophageal hernias is associated with a high recurrence rate, especially when a laparoscopic approach is used. Anatomic recurrence due to crura breakdown is a primary etiology, which has led us to employ prosthetic mesh reinforcement of large hiatal defects (>5 cm) since 1996. We discuss the evolution of this approach and describe our current technique with limited outcomes in 52 consecutive patients during a 5-year period.

Methods: There were 31 males and 21 females, with a mean age of 57 years (range, 32–77 years) with symptomatic reflux and endoscopic or radiologic evidence of a large paraesophageal hernia. Utilizing a laparoscopic approach, the contents of the sac were reduced and the crura approximated with permanent interrupted sutures and a prosthetic mesh was secured over the repair as an on-lay reinforcement buttress. A Nissen (42) or Tilley (9) fundoplication was performed in all but 1 patient, and 18 patients (34%) required a wedge collis gastroplasty. Fifteen patients (28%) had a previous unsuccessful antireflux operation.

Results: There was no perioperative morbidity or mortality. Follow-up averaged 25 months (range, 7–60 months). Postoperative gastroscopy or barium swallow have been performed in 27 patients to date, with 11 experiencing foregut symptoms. There has been 1 recurrence (1.9%) and no prosthetic erosion.

Conclusion: Early results suggest that prosthetic mesh cruroplasty may be effective in reducing recurrence after laparoscopic repair of large paraesophageal hernias, but long-term follow-up is required in all patients to determine the true incidence of anatomic recurrence and prosthetic erosion.

Key words: Mesh cruroplasty — Paraesophageal — Prosthetic — Laparoscopic

The modern approach to surgical management of gastroesophageal reflux disease (GERD) consists of closure of any associated hiatal defect and construction of an effective antireflux valve [6]. Focus and debate on the various types of funduplications (Nissen, Toupet, Belsey, Hill, etc.) has shifted attention away from the equally important anatomic reconstruction of the diaphragmatic esophageal hiatus. We recognize that an intrathoracic fundoplication is an ineffective reflux barrier and the wrap must reside intraabdominally. This concept is especially important in the management of paraesophageal hernias, in which the hiatus is often greatly enlarged [9]. Several series have demonstrated that open surgical repair of paraesophageal hernias is associated with a recurrence rate of up to 10% [1, 2, 6]. The recurrence rate has also been reported to be higher with a laparoscopic approach, ranging between 23 and 42% [8–10, 15, 16]. Crural breakdown and wrap migration is the etiology in up to 59% of foiled operations [5, 10, 15, 16].

We reported a recurrence rate of 10.6% in 144 laparoscopic patients undergoing a primary repair with a crural opening >5 cm, which promoted us to begin prosthetic reinforcement of large hiatal defects [3, 4, 12]. This article discusses the evolution of our approach and describes our current technique with a retrospective review of our outcomes in a cohort of patients with large paraesophageal hernias managed laparoscopically during a 5-year period.

Materials and methods

Between 1996 and 2001, 52 consecutive patients with symptomatic GERD and endoscopic or radiologic evidence of a large paraesophageal hernia underwent laparoscopic repair. All patients underwent preoperative esophagogastroscopy, and a hiatal defect estimated to be 5 cm or larger with an intrathoracic fundus was considered to be suggestive of a paraesophageal hernia. Radiologic criteria also included a hiatus 5 cm or larger, with gastric fundus present in the

mediastinum. At the time of laparoscopy, the hiatus was measured with an endoscopic ruler in the anterior–posterior plane and verified to be 5 cm or larger. In addition, the gastric fundus had to be in the mediastinum, with an associated sac, to be classified as a paraesophageal hernia. There were 51 type 3 hernias and one type 2 paraesophageal hernia. There were 31 males and 21 females, with an average age of 57 years (range, 32–77 years). Fifteen patients (28%) had undergone a previous failed fundoplication for a paraesophageal hernia that had incorporated sac excision and simple primary suture repair of the hiatus with permanent suture.

Using a laparoscopic approach, the contents of the hernia were reduced and the sac was excised if present. The crural opening was measured with a ruler and was 5 cm or larger in all patients. The crura were reapproximated around a 50-Fr bougie with interrupted permanent sutures placed posterior to the esophagus. A piece of polypropylene mesh, 3 × 5 cm, was then placed over the repair as an on-lay buttress and secured with a hernia stapler along the edges to the crura. The mesh was also secured centrally with a horizontal permanent mattress suture through both crura, taking care that the upper edge of the mesh was positioned at least 1 cm below the upper edge of the crural repair.

A Nissen fundoplication (42) or Tilley fundoplication (9) were performed in all but one patient, who underwent a collis gastroplasty. The Tilley fundoplication is a posterior partial fundoplication, similar to a Toupet, but the crura are approximated primarily and the wrap is suture fixated to the median arcuate ligament as in a Hill repair. Hence, the hybrid between a Toupet and Hill is called the Tilley.

Overall, 18 patients (34%) required a wedge collis gastroplasty to achieve adequate esophageal length if 3 or 4 cm of esophagus would not reside intraabdominally without tension. This was required in 8 patients (53%) in the recurrent group and 10 patients (27%) in the primary group. All but 4 patients were discharged within 23 h on a liquid diet.

Postoperative follow-up was performed with office visits at 3 weeks, 3 months, and 1 year. Questionnaires were mailed yearly to assess symptom recurrence, evaluating heartburn, regurgitation, dysphagia, chest pain, or resumption of medication for GERD. Phone interviews were performed if questionnaires were not returned. Initially, only symptomatic postoperative patients underwent evaluation with a barium swallow, gastroscopy, and 24-h pH study. However, we now perform routine postoperative barium swallows at yearly follow-up visits because we recognized that anatomic recurrences could be silent. We have been unsuccessful in getting many of our asymptomatic patients to repeat a barium swallow due to the inconvenience and managed care constraints.

Results

The average length of surgery was 101 min (range, 45–150 min). There was no perioperative morbidity or mortality.

Follow-up is 7–60 months, with a mean of 25 months. Only one patient is less than 1 year postoperative.

All patients have been assessed subjectively by office visits up to 1 year and then by yearly questionnaires or phone interviews. Objective follow-up has been obtained for 27 (52%) patients to date.

Eleven patients reported foregut symptoms postoperatively, with 9 experiencing heartburn and regurgitation and 2 reporting dysphagia and chest pain. All were evaluated with barium swallow, esophagogastroscopy, and 24-h pH. One anatomic recurrence (1.9%) was demonstrated that resulted from violent retching in the recovery room on the day of surgery. This patient underwent a revision and collis gastroplasty 6 months later due to recurrence of reflux with the intrathoracic wrap.

The two patients with dysphagia had strictures preoperatively and were dilated again with resolution of symptoms. Sixteen additional asymptomatic patients

underwent a repeat barium swallow at 1 year follow up with no anatomic recurrences noted. There have been no erosions.

Discussion

A number of authors have advocated the use of prosthetic material for crural reinforcement [2, 7, 8, 11, 13, 14]. However, the choice of prosthetic material and the shape, location, and placement of the material vary widely. Our technique evolved over a 2-year time frame during which we tried different approaches before adopting an on-lay buttress of polypropylene mesh as a standardized technique.

Occasionally, we have utilized bovine pericardium, polypropylene mesh, and polytetrafluoroethylene (PTFE) as prosthetic material. The ideal prosthetic material in our experience should be inexpensive, transparent, have a low risk of adhesions, and be malleable but maintain some tension so it can be manipulated laparoscopically.

Polypropylene meets all these requirements, but it has a propensity to form adhesions and has erosion potential. Bovine pericardium and PTFE are expensive, adding between \$400 and \$1000 to the operation [3, 8]. In addition, both are opaque, making accurate stapling and suture fixation difficult. The thickness of these two materials also makes stapling with the corkscrew 5-mm stapler difficult. The staple tends to deform the material by twisting the prosthesis as it struggles to perforate the thick solid sheet. A “meshed” material with perforations is much easier to staple in our experience. The expense, opacity, and deformity on stapling led us to abandon these materials.

The shape of the prosthesis is also an undefined area for future research. We initially tried four shapes: “U” shape or horseshoe shape, a “keyhole” patch with a central opening for the esophagus, a tension-free repair with the patch sutured to the crura without direct approximation, and the on-lay buttress overlying the primary suture repair. The on-lay buttress worked best in our experience due to its simplicity. We were concerned about an artificial “ledge” the horseshoe-shaped and keyhole prostheses left on the esophagus, which was visible on endoscopy. Two patients of an initial 10 in whom we utilized bovine pericardium in a keyhole or U-shaped prosthesis complained of significant dysphagia requiring repeated dilatations of a pseudostricture produced by the edge of the patch in contact with the esophagus. We were concerned with long-term contraction of bovine pericardium and believed that no prosthesis should be in contact with the esophagus. We were also concerned that a circumferential prosthesis above the fundoplication would create a second constricting band and more dysphagia. The buttress rectangular shape allowed us to locate the mesh well below the esophagus to avoid direct contact and allow it to be covered by the fundoplication wrap. The tension-free technique is technically challenging because most laparoscopic surgeons are not proficient at continuous suturing techniques. We believe that if it was not teachable,

it was unlikely to be utilized. Further study is required to compare outcomes with the various shaped prostheses to clearly define whether one shape is superior.

The location and placement of the prosthesis have also been debated. We prefer a posterior reapproximation of the crus and placement of the mesh because this is the area of least motion. The mesh is utilized to distribute the force exerted against the repair over a larger area to prevent crural breakdown. It will not always be possible to reapproximate the crura if the tissue is thin or the hernia too large, so techniques such as the tension-free method may occasionally be required.

Preoperative evaluation of hiatal size or whether esophageal shortening will be encountered is difficult, so the laparoscopic foregut surgeon must be ready to perform a collis gastroplasty or prosthetic crural repair if indicated. The primary etiologies of recurrence remain crural breakdown and the short esophagus [5, 6, 9, 10, 15, 16].

The principal concern over the utilization of any prosthetic near the esophagus is the potential for erosion. Some authors believe that it is not a matter of whether erosion will occur, but how often and at what cost [9]. Carlson et al. [2] reported 1 erosion in 44 patients followed for 52 months but no recurrent hernias. The question remains unanswered whether multiple reoperations for crural breakdown carry less risk than reoperations for prosthetic erosions.

A weakness of this series is the limited objective follow-up, with only 52% of patients having a radiologic or endoscopic evaluation; however, all symptomatic patients were evaluated. The literature reveals that most series have limited objective follow-up, ranging from 23 to 75% [9, 15]. If one recalculates our recurrence rate as 1 out of 27 evaluated objectively, we still have a recurrence rate of only 3.7%, which is well below the 23–42% recurrence rate reported in the current literature by groups of experienced foregut surgeons [9, 15]. It appears we have learned nothing from our past experience with inguinal and ventral hernia repairs and the reduction in recurrence from routinely employing mesh prostheses to reinforce weak tissue. A hiatal hernia is still and foremost a hernia, within a muscle, with high recurrence rate if not reinforced.

An issue of concern for many surgeons will be the utilization of polypropylene in cases with potential contamination, such as collis gastroplasty utilized in 18 of our cases. We administer preoperative prophylactic antibiotics and added bacitracin and kannamycin to our saline irrigation fluids to reduce the risk. This study does demonstrate that it is possible and challenges prior perceptions, but the technique is evolving and we do not recommend the widespread adoption of the practice

until long-term outcomes are established. Further studies utilizing other synthetic and new biologic materials are required to establish the optimal material for this location.

Our early results suggest that prosthetic mesh cruroplasty may be effective in reducing the rate of recurrence of large paraesophageal hernias when utilized in conjunction with a collis gastroplasty to restore esophageal length. Long-term follow-up and evaluation in all patients to 10 years are required to determine the incidence of anatomic recurrence or erosion with this technique.

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