

Early Results of the Use of Acellular Dermal Allograft in Type III Paraesophageal Hernia Repair

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ABSTRACT

Background: Type III paraesophageal hernias are diaphragmatic defects with the risk of serious complications. High recurrence rates associated with primary suture repair are significantly improved with the use of a tension-free repair with prosthetic mesh. However, mesh in the hiatus is associated with multiple complications. A bio-engineered material from donated human tissue offers an attractive alternative material for hernia repair. This report is on the first series of laparoscopic type III paraesophageal hernia repairs with acellular dermal allografts (AlloDerm, Lifecell Corporation, Branchburg, NJ) in 11 patients with follow-up evaluation.

Methods: From August 2003 to June 2004, 11 patients underwent laparoscopic repair of type III paraesophageal hernias with acellular dermal allografts. Patients were evaluated postoperatively with a symptoms questionnaire and barium esophagram.

Results: All patients were available for follow-up; however, 2 refused a barium esophagram. Average length of hospital stay was 3 days. Follow-up evaluation was at a mean interval of 1 year. Postoperatively, 9 of 11 patients reported no symptoms. Barium esophagram revealed one recurrence in an asymptomatic patient.

Conclusion: Type III paraesophageal hernia can be laparoscopically repaired successfully with acellular dermal allografts.

Key Words: Paraesophageal hernia, Hiatal hernia, Fundoplication, Laparoscopy, Acellular dermal allograft, AlloDerm.

INTRODUCTION

Type III paraesophageal hernia (PEH) typically presents later in life and is thought to be an acquired condition. As the population ages, the prevalence of paraesophageal hernia will most likely rise. Pain, chronic blood loss, and the threat of incarceration have traditionally driven surgical repair. Recurrence rates of up to 44% have been reported with primary surgical repair.¹ This has led to the use of prosthetic reinforcement to achieve a strong, tension-free repair. And, in fact, multiple small series with variable means of follow-up have reported lower recurrence rates with a prosthesis.²⁻⁴ However, the erosion of a plastic prosthesis into the esophagus, infection, and stricture have all been reported.^{5,6} We hypothesized that the use of a biologic material may provide the strength of a prosthetic repair without the associated risks. We report on the use of a new acellular material to buttress the repair of the PEH defect in 11 patients.

METHODS

Eleven patients with PEH underwent elective laparoscopic repair by the senior author (DST) between August 2003 and June 2004. These were consecutive patients who were determined as needing prosthetic reinforcement at the time of surgery based on hiatal defects >5 cm in transverse diameter. Seven of the patients underwent reoperations involving prolonged dissection. Follow-up occurred postoperatively and again at a median interval of 1 year (range, 8 to 19 months) at which time a symptom questionnaire was administered and a barium esophagram obtained. Two patients refused radiographic follow-up but agreed to the questionnaire.

Our technique was to dissect the hernia sac from the mediastinum beginning at the left crus and proceeding anteriorly to the right crus. The esophagus was completely mobilized into the mediastinum preserving the vagi; the

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hernia sac was then excised. The short gastric arteries were divided and the crura approximated by using interrupted 0 Ethibond sutures (Ethicon, Cincinnati, OH). AlloDerm (AlloDerm; Lifecell Corporation, Branchburg, NJ) material measuring 4x10 cm and cut into a Y-shape was then secured over the approximated crura by using 2-0 Ethibond suture and 5-mm spiral tacks (**Figure 1**). A second piece of 4x10-cm material bridging any remaining opening at the hiatus and reinforcing the crura was laid on top and secured primarily with 5-mm spiral tacks (**Figure 2**). If there was significant crural separation, the AlloDerm was used as an interposition graft, rather than creating significant tension in the closure. A 360-degree fundoplication completed the repair; no sutures were used to anchor the wrap in the abdomen.

RESULTS

All patients were available for follow-up; however, 2 refused a barium esophagram. Patient characteristics are provided in **Table 1**. There were no deaths and no complications except 1 case of gas bloat requiring NGT decompression. Average length of stay was 3 days (range, 1 to 6). Nine of the 11 patients reported excellent results with complete resolution of their symptoms following repair. One patient complained of mild dysphagia, and 1 remained on acid suppression for mild heartburn. Follow-up questionnaires at a mean interval of 1 year revealed that all patients were satisfied with the results of the operation (**Table 2**).



Figure 1. AlloDerm cut into Y-shape secured over approximated crura.

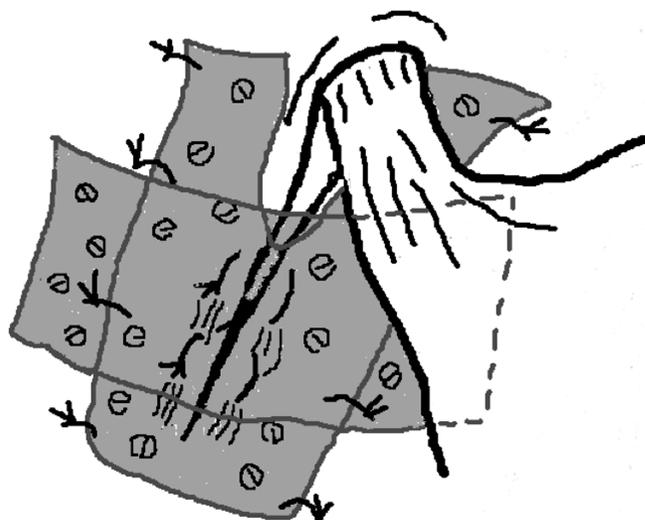


Figure 2. Second piece of AlloDerm as interposition graft, if needed.

| | |
|-----------------------|------------|
| Median age, y (range) | 41 (26–60) |
| Male:Female | 9:2 |
| Prior hiatal surgery | 7 |
| PEH repair only | 1 |
| Fundoplication only | 4 |
| Both | 2 |
| Symptoms | |
| Heartburn | 9 |
| Dysphagia | 6 |
| Regurgitation | 5 |
| Post prandial pain | 3 |
| Early satiety | 3 |
| Bloating | 2 |

Barium esophagram revealed intact repairs in 8 of the 9 patients studied. One patient had partial reherniation of the fundoplication into the mediastinum, but was asymptomatic (**Figure 3**).

DISCUSSION

PEH are acquired diaphragmatic defects containing variable amounts of stomach, with or without other intraabdominal organs. These probably result from a combination of genetic weakness and stress over time. These hernias have a risk for serious complications, such as

Table 2.
Outcome: Symptoms and Recurrence

| | Symptoms | Recurrence |
|--------|----------|------------|
| None | 9 | 1 |
| Mild | 2 | 0 |
| Severe | 0 | 0 |

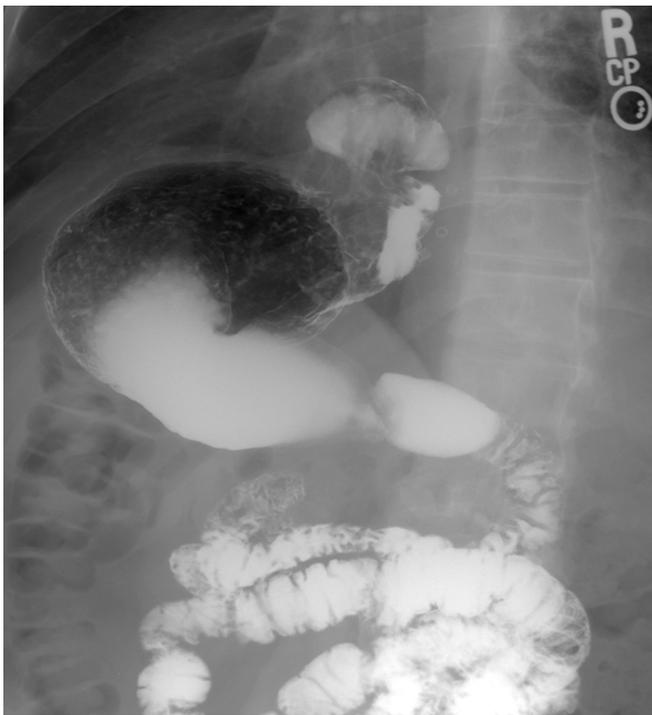


Figure 3. Partial reherniation of fundoplication into mediastinum in asymptomatic patient.

strangulation, necrosis, or gastric perforation, and when symptomatic should be repaired. Laparotomy or thoracotomy, or both, were the traditional approaches to repair, producing acceptable results but with high morbidity.^{7,8} The transabdominal open approach has reported radiographic recurrence rates between 5% to 44%.^{1,9} The laparoscopic approach is associated with less morbidity, but is technically challenging and some have questioned its durability. Hashemi et al¹⁰ reported a 42% radiographic recurrence rate with primary laparoscopic repair versus 15% in those undergoing open repair. More recent laparoscopic series have reported better results, possibly as a result of the increased use of prosthetic reinforcement.²⁻⁴ The thin attenuated crura often found with PEH would seem to require buttressing if recurrence is to be avoided. There is convincing evidence from hernia defects else-

where in the body that better results are achieved when a tension-free repair with prosthetic reinforcement is used. Frantzides³ has reported the only randomized trial of suture repair versus prosthetic closure using polytetrafluoroethylene (PTFE) in PEH over 8 cm. There was a 22% recurrence rate with primary repair versus none in the PTFE group.

The hiatal defect is unique in that it contains a hollow organ and is in constant motion. While plastic prosthetics have been used with excellent results, the risk of erosion is real and can be devastating.⁵ In addition, plastic is at risk for infection and has caused esophageal stricture.⁶ Also many clinical situations exist in which the use of synthetic materials is suboptimal, such as in cases of immunocompromised patients, enterocutaneous fistulae, or recent intraabdominal infections. In these cases, if synthetic materials are used and become infected, then the prosthesis generally needs to be removed. Previous work in the rabbit model has shown that autologous thoracodorsal fascial grafts, when used for abdominal wall reconstruction, become revascularized, retain cellular architecture, and resist infection better than prosthetic material does.¹¹ Autologous fascial grafts, however, have limited supply and produce donor-site morbidity. Initial observational reports using porcine small intestine submucosa to repair large paraesophageal defects have been published.^{12,13} AlloDerm is an acellular dermal matrix processed from banked human cadaver skin with favorable in vivo characteristics. In-growth of fibroblasts, neovascularization, and subsequent collagen production has been demonstrated in histologic studies of AlloDerm grafts 6 months after implantation.¹⁴ This material is efficacious in a variety of applications, including burns,¹⁵ periodontal disease,¹⁶ as a soft tissue filler,¹⁷ and for dural replacement.¹⁸ AlloDerm has been shown to function at least as effectively as Gore-Tex in ventral hernia repair in the rabbit model.¹⁹ Its favorable handling characteristics and extreme pliability once rehydrated suggest that it may be less prone to erode into the esophagus than other materials.

CONCLUSION

Our study found that laparoscopic repair with an AlloDerm graft as a reinforcing patch over the hiatal closure was effective in PEH repair. Patients undergoing the procedure reported excellent symptom relief with a low radiographic recurrence rate. Repeat radiographic evaluation is planned at 5 years to evaluate longer-term results.

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