

Laparoscopic Heller Myotomy and Dor Fundoplication for Esophageal Achalasia in Children

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Background/Purpose: In the past, surgical treatment in achalasia usually has been reserved for patients whose dysphagia does not respond to pneumatic dilatation. The success of minimally invasive myotomy, however, has resulted in a shift in practice in adult patients, whereby laparoscopic surgery is becoming preferred as primary treatment by most gastroenterologists and surgeons. The aim of this study was to assess the efficacy of laparoscopic Heller myotomy and Dor fundoplication for esophageal achalasia in children.

Methods: Thirteen patients with esophageal achalasia (median age, 15 years; 6 boys and 7 girls; median duration of symptoms, 24 months) underwent laparoscopic Heller myotomy and Dor fundoplication between 1996 and 1999. Two patients had been treated previously by pneumatic dilatation, and 1 patient had received intrasphincteric Botulinum toxin injections.

Results: Median duration of the operation was 130 minutes. The patients were fed after an average of 33 hours, and they all left the hospital within 2 days. At a median follow-up of 19 months, there was no residual dysphagia in any patient.

Conclusions: Laparoscopic Heller myotomy and Dor fundoplication were effective and safe for children with esophageal achalasia. Hospital stay and recovery time was short, and the functional results were excellent. These data support the notion that laparoscopic Heller myotomy should become the primary treatment of esophageal achalasia in children. *J Pediatr Surg* 36:1248-1251. Copyright © 2001 by W.B. Saunders Company.

INDEX WORDS: Esophageal achalasia, laparoscopic Heller myotomy, pneumatic dilatation, botulinum toxin.

IN ESOPHAGEAL ACHALASIA, surgical treatment traditionally has been reserved for patients who have residual dysphagia after pneumatic dilatation. The success of minimally invasive myotomy, however, has resulted in a shift in practice in adult patients, whereby today laparoscopic surgery is preferred by most gastroenterologists and surgeons as the primary treatment.¹⁻⁴

The goal of this study was to assess the efficacy of laparoscopic Heller myotomy and Dor fundoplication for esophageal achalasia in children.

MATERIALS AND METHODS

Between October 1996 and July 1999, 13 patients with esophageal achalasia underwent laparoscopic Heller myotomy and Dor fundoplication (1 patient had a myotomy only) at the University of California San Francisco, CA and Children's Mercy Hospital, Kansas City, MO. There were 6 boys and 7 girls whose median age was 15 years (range,

6 to 17 years). The median duration of symptoms was 24 months. Before being referred for surgery, 2 patients had been treated by pneumatic dilatation (mean, 2 per patient), and 1 patient by intrasphincteric injection of botulinum toxin. In response to these treatments, dysphagia improved for an average of 3 months. Four patients had been given acid-reducing medications on the assumption that their symptoms were caused by gastroesophageal reflux.

Preoperative Evaluation

Symptoms. The patients scored the severity of symptoms before and after surgery using a 5-point scale from 0 (no symptom) to 4 (disabling symptom). The ability to swallow was graded as follows: excellent (no dysphagia); good (occasional dysphagia, once a week or less); fair (frequent dysphagia, more than once a week requiring dietary adjustments); poor (severe dysphagia, with inability to eat solid food). Before surgery all patients had dysphagia and regurgitation. Four patients had heartburn.

Barium esophagram. The distal esophagus showed the characteristic "bird beak" deformity in all patients. The esophagus was dilated (diameter, 8 cm) in one patient (Fig 1).

Endoscopy. Endoscopy in all patients excluded the presence of a peptic or neoplastic stricture.

Esophageal manometry. Esophageal manometry was performed in all patients. The catheter was placed under fluoroscopic guidance in the patient with a dilated esophagus. Lower esophageal sphincter (LES) pressure averaged 31 ± 12 mm Hg. LES relaxation in response to swallowing was partial (<20%) or absent in all patients. Primary esophageal peristalsis was absent in all patients.

Ambulatory pH monitoring. The study was performed preoperatively in the 2 patients who had been treated by pneumatic dilatation. The reflux score was normal in both patients (ie, < 15).

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Fig 1. Dilated esophagus.

Surgical Technique

After induction of general endotracheal anesthesia, the patient was positioned supine on the operating table. The patient's legs were extended on stirrups with the knees flexed 20° to 30°. The surgeon stood between the patient's legs. Five trocars were used (Fig 2A). The gastrohepatic ligament was divided, and the right pillar of the crus was identified and separated from the esophagus by blunt dissection. The peritoneum and phrenoesophageal membrane overlying the esophagus were divided, the left crus was identified and also was separated from the esophagus. Mobilization of the esophagus was limited to the lateral and anterior aspects, leaving the posterior attachments intact. The myotomy was performed with the hook monopolar cautery in the 11 o'clock or 1 o'clock position (depending on the surgeon's preference) with respect to the esophageal circumference. The myotomy was 5 to 6 cm long and extended for 1.0 to 1.5 cm onto the gastric wall (Fig 2B). The short gastric vessels were divided, and a Dor fundoplication (a 180° anterior fundoplication) was constructed. Two rows of sutures were used, each consisting of 3 stitches. The first row joined the gastric fundus and the left side of the divided esophageal muscle (Fig 2C). The stomach then was folded over the esophagus, and a second row of sutures was placed between the fundus and the right side of the divided esophageal muscle (Fig 2D). The uppermost stitch on each side also incorporated the crus. Finally, 2 additional stitches were placed between the anterior rim of the hiatus and the superior aspect of the fundoplication.²

Follow-Up

No patient was lost to follow-up. All patients were examined 2 and 6 weeks after surgery and were contacted by telephone every 4 to 6 months to assess the swallowing status. The median duration of follow-up was 19 months.

Statistical Analysis

The analysis of variance (ANOVA) test, the Wilcoxon signed-rank sum test, and the Kruskal-Wallis test were used for the statistical evaluation of the data. Differences were considered significant at *P* less than .05.

RESULTS

Operation

All operations were completed laparoscopically. A cholecystectomy also was performed for gallstone disease in one patient. Intraoperative endoscopy was used in 2 patients to help gauge the distal extent of the myotomy. The mean operating time was 144 ± 35 minutes. There were no intraoperative complications. The operation technically was more difficult in 1 patient previously treated by botulinum toxin, because the esophageal mus-

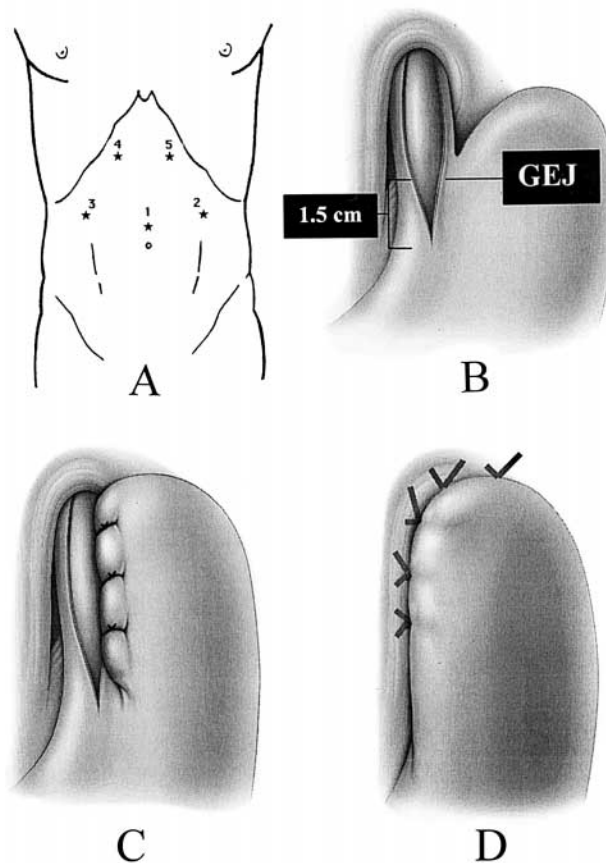


Fig 2. Laparoscopic Heller myotomy and Dor fundoplication. (A) Position of trocars; (B) completed myotomy; (C) Dor fundoplication, left row of sutures; (D) completed Dor fundoplication.

cle had become fibrotic, and the normal anatomic planes were obscured.

Hospital Course

The patients were fed after an average of 33 ± 0.4 hours and left the hospital after 35 ± 27 hours. There were no postoperative complications. All patients returned to regular activity within 2 to 3 weeks.

Symptom Evaluation

All patients had *complete* resolution of dysphagia and regurgitation, and they considered the results of the operation to be excellent. The dysphagia score went from 3.7 ± 0.5 preoperatively to 0 postoperatively ($P < .05$). The regurgitation score went from 2.3 ± 0.9 preoperatively to 0 postoperatively ($P < .05$). One patient complained of mild heartburn postoperatively, but his pH monitoring score was normal. pH monitoring also was performed postoperatively in one asymptomatic patient, and it was normal. Esophageal manometry in these 2 patients showed an LES resting pressure of 9 mm Hg, and in both cases LES relaxation remained incomplete in response to swallowing. Peristalsis remained absent.

DISCUSSION

These results show that: (1) laparoscopic Heller myotomy for achalasia in children was effective, safe, and associated with a short hospital stay and fast recovery; (2) a Dor fundoplication prevented gastroesophageal reflux; (3) the operation was effective when the esophagus was dilated; (4) intrasphincteric injection of botulinum toxin, but not pneumatic dilatation, damaged the esophageal wall.

Esophageal Myotomy by Minimally Invasive Techniques

Pneumatic dilatation and open esophageal myotomy have been the standard treatment for esophageal achalasia in both adults and children for the last 40 years. Traditionally, pneumatic dilatation was the first line of therapy, whereas surgery was reserved for patients whose esophagus was perforated during pneumatic dilatation or who had residual dysphagia after several dilatations.⁵⁻⁷ In 1991 we started applying minimally invasive techniques to the treatment of achalasia by performing a left thoracoscopic myotomy. Even though the relief of dysphagia was excellent, a fundoplication could not be done (at least, it could not be done easily) thoracoscopically, and 60% of patients had gastroesophageal reflux postoperatively.⁸ Therefore, in 1993 we switched to a laparoscopic Heller myotomy with the addition of a Dor fundoplication. This procedure proved to be simpler than a thoracoscopic myotomy, and the Dor

fundoplication sharply decreased the incidence of postoperative gastroesophageal reflux (GER; to 10%).⁹ Encouraged by these results, in 1996, we treated our first child with achalasia. Initially, we operated on patients who had failed to respond to other treatments, but quickly included previously untreated children.

The results in these 13 children were uniformly excellent, even superior to those in adults.² There were no intraoperative or postoperative complications, all children remained in the hospital for about 1 day and were able to return to normal life in less than 3 weeks. One child experienced what was suspected to be intermittent heartburn 2 months after the operation, but 24-hour pH monitoring showed no GER. All other patients are asymptomatic and not taking acid-reducing medications. Based on our overall experience with this Heller myotomy, we feel the fundoplication is important to prevent GER, particularly in children, who might have complications if GER is present during the lengthy remainder of their lives. The Dor fundoplication does not require a posterior dissection of the esophagus and has the advantage of covering the exposed esophageal mucosa.

Traditionally it has been thought that a myotomy does not improve dysphagia in achalasia when the esophagus is markedly dilated, and esophagectomy has been recommended as primary treatment in such cases.^{10,11} We have shown, however, that the outcome of a laparoscopic Heller myotomy is excellent even in the presence of a dilated and sigmoid esophagus,¹² and the results obtained in the child whose esophagus had a diameter of 8 cm (Fig 1) confirm the previous findings. The operation did not take longer, was not associated with postoperative complications, and gave excellent relief of dysphagia. Therefore, we feel that esophagectomy should be reserved for the rare patient with megaesophagus, who has persistent dysphagia not amenable to pneumatic dilatation or a second myotomy.

Pneumatic dilatation does not appear to affect the performance of a Heller myotomy in adults,^{13,14} and our experience with 2 children was similar. Treatment with botulinum toxin, however, resulted in enough inflammation in the sphincter to make the operation more difficult. The experience in adults is similar.^{14,15} Because the results of botulinum toxin treatment are so poor and may interfere with performing a Heller myotomy,¹⁵ this treatment has almost no role in the treatment of children.^{1,15,16}

As shown by our study, laparoscopic Heller myotomy and Dor fundoplication were effective and safe in children with esophageal achalasia. Hospital stay and recovery time were short, and the functional results were excellent. Consequently, laparoscopic Heller myotomy is in a position to become the primary treatment of esophageal achalasia in children.

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