



Laparoscopic Heller myotomy and Dor fundoplication for the treatment of achalasia

Assessment in relation to morphologic type

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Abstract

Background: The significance of laparoscopic Heller myotomy and Dor fundoplication (LHD) for the treatment of achalasia in relation to the severity of the lesion has not been sufficiently assessed.

Methods: Of patients who were diagnosed with achalasia from August 1994 to February 2004, 55 individuals who underwent LHD served as subjects. The therapeutic effects of LHD were assessed in terms of operation time, intraoperative complications, postoperative hospital stay, and symptom improvement in relation to morphologic type (spindle type, Sp; flask type, Fk; and sigmoid type, Sig). Degree of symptomatic improvement was classified into four grades: excellent, good, fair, and poor.

Results: Breakdown of morphologic type was as follows: Sp, $n = 29$; Fk, $n = 18$; and Sig, $n = 8$. Excluding one patient for whom conversion to open surgery was required, median average operation time for 54 patients was 160 min. As to intraoperative complications, esophageal mucosal perforation was seen in nine of the 55 patients (16%); however, conversion to open surgery could be avoided by suturing the affected area. Moreover, intraoperative bleeding of at least 100 g was seen in five of the 55 patients (9%), with one Fk patient requiring conversion to open surgery and transfusion. Median postoperative hospital stay was 8 days. Degree of dysphagia relief was excellent in 45 patients (83%), good in eight patients (15%), and fair in one patient (2%). Excellent improvement was obtained in 90%, 88%, and 50% in Sp, Fk, and Sig patients, respectively. Reflux esophagitis was seen in two patients, and was treated with a proton pump inhibitor.

Conclusions: The results of the present study suggest that classification of morphologic type is a useful parameter in predicting postoperative outcome in achalasia. In order to achieve excellent symptomatic relief, surgery for achalasia should be recommended for but not limited to Sp and Fk types.

Key words: Achalasia — Laparoscopic surgery — Heller myotomy — Dor fundoplication — Morphologic type

Achalasia is a functional disorder of the esophagus characterized by absent or weakened esophageal body peristalsis and inadequate relaxation of the lower esophageal sphincter. Treatment options for achalasia include drug therapy, botulinum toxin injection into the lower esophageal sphincter, pneumatic dilatation, and surgery, of which surgery is associated with most favorable outcome [7, 10]. However, the incidence of achalasia is low, at one in 100,000 in Japan, and the effectiveness of surgical treatment is yet to be widely accepted. Recently, with the introduction of laparoscopic techniques and devices, surgery is increasingly performed for achalasia. In the present study, we investigated the therapeutic effects of laparoscopic surgery in relation to morphologic type.

Materials and methods

Of patients who were diagnosed with achalasia based on the results of barium esophagography or esophageal manometry between August 1994 and February 2004, 55 who underwent laparoscopic Heller myotomy and Dor fundoplication served as subjects (Table 1). They consisted of 31 men and 24 women ranging in age from 18 to 82 years, with a median age of 42 years. From each patient, information including disease duration, past history of pneumatic dilation, and symptoms (dysphagia and chest pain) were collected from charts.

Laparoscopic Heller myotomy and Dor fundoplication was performed through five ports using two 12-mm trocars and three 5-mm trocars. First, the first 12-mm trocar was inserted above the umbilicus by the open method. Then, under laparoscopic guidance, the first 5-mm trocar was inserted into the right subcostal region on the anterior axillary line, the second 5-mm trocar was inserted into the epigastric region on the midline, the second 12-mm trocar into the left subcostal region on the mid-clavicular line, and the third 5-mm trocar into the left subcostal region on the anterior axillary line. Extramucosal myotomy (Heller method) was performed from approximately 8 cm proximal to

Table 1. Characteristics of patients^a

Parameter	Sp (<i>n</i> = 29)	Fk (<i>n</i> = 18)	Sig (<i>n</i> = 8)
Median age (yr)	40 (24–68)	40 (18–76)	49 (28–82)
Male:female	13:16	11:7	7:1
Dysphagia	29 (100%)	18 (100%)	8 (100%)
Chest pain	12 (41%)	2 (11%)	2 (25%)
Median duration of symptoms (yr)	4 (0.5–20)	5 (1–30)	11 (3–30)
Pneumatic dilatation before surgery	9 (31%)	6 (33%)	3 (38%)

^a Sp, spindle type; Fk, flask type; Sig, sigmoid type

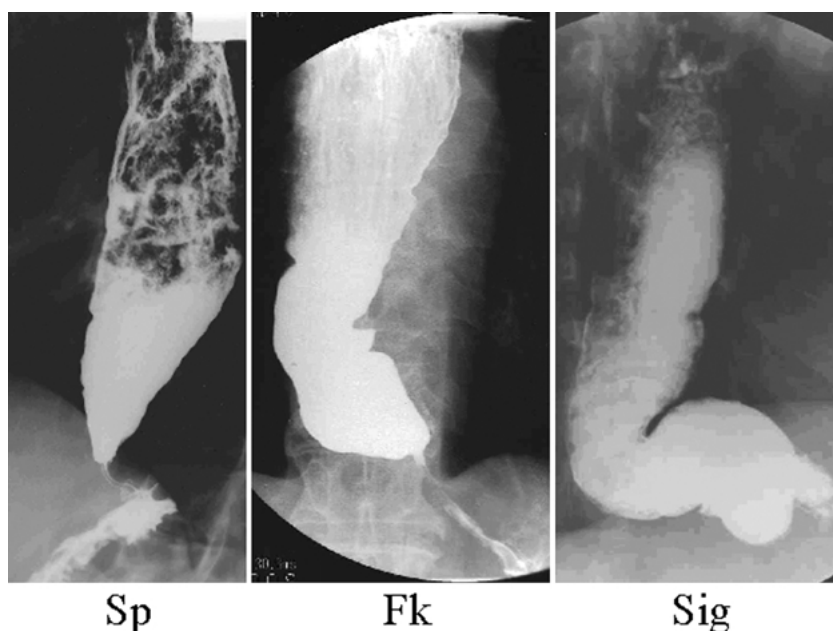


Fig. 1. Classification of distal esophageal morphology (Sp, spindle type; Fk, flask type; Sig, sigmoid type).

approximately 2 cm distal the esophagogastric junction to relieve dysmotility. As an antireflux procedure, 180° fundoplication of the anterior wall (Dor procedure), was performed over a 56 Fr esophageal bougie. As a principle, several short gastric vessels were divided to avoid tension on the wrap. In patients with Sig, we peeled off the distal esophagus as much as possible from the periesophageal region, and secured the distal esophagus with the diaphragmatic crus using sutures.

Before and after surgery, the upper gastrointestinal tract was examined radiographically and endoscopically in all patients. Postoperative assessment was performed 3–6 months after surgery. The severity of achalasia was classified according to the following classification based on the maximum transverse diameter of the esophagus on preoperative upper gastrointestinal series: grade I, <3.5 cm; grade II, 3.5–6.0 cm; and grade III, ≥6.0 cm. In addition, based on the shape of the distal esophagus, achalasia was classified into the following morphologic types; spindle (Sp) type, flask (Fk) type, and sigmoid (Sig) type (Fig. 1). Furthermore, operation time, intraoperative complications, postoperative hospital stay, and symptomatic improvement were analyzed. The patients were asked to rate the outcome of the procedure according to the following scale: “excellent” indicated 100% patient satisfaction because of disappearance of the symptom; “good” indicated approximately 70% or more patient satisfaction because although the symptom persisted it was tolerable; “fair” indicated less than 70% patient satisfaction; and “poor” indicated the symptom had not changed or had worsened. In addition, endoscopy was performed postoperatively to ascertain presence or absence of reflux esophagitis.

We analyzed our data statistically using the chi-square test to see whether the morphologic type, esophageal dilatation, or the combination of both parameters affected the results of the surgical treatment. The level of significance was set at $p < 0.05$.

Results

Morphologic type and severity of esophageal dilatation

Breakdown of morphologic type was as follows: Sp, *n* = 29; patients; Fk, *n* = 18; and Sig, *n* = 8. Among the Sp patients, severity of esophageal dilatation was assessed as grade I in 3, grade II in 22, and grade III in 4. Among the Fk patients, severity was classified as grade II in 8 and grade III in 10. Among the Sig patients, severity was assessed as grade II in 2 and as grade III in 6. Median maximum transverse diameter was 45 mm (range 25–82 mm) in Sp, 60 mm (range 40–83 mm) in Fk and 69 mm (range 55–100 mm) in Sig.

Operative time, intraoperative complications, and postoperative hospital stay

Of the 55 patients, conversion to open surgery was required in one Fk patient, and as a result, this patient was excluded from the analyses of operative time and postoperative hospital stay. Among the remaining 54 patients, median operative time was 160 mins (range 110–240 min) overall; 165 min (range 110–240 min) in Sp patients; 150 min (range 120–205 min) in Fk patients;

	Sp	Fk	Sig
I	⊙⊙⊙		
II	⊙⊙⊙⊙⊙ ⊙⊙⊙⊙⊙ ⊙⊙⊙⊙⊙ ⊙○○○	⊙⊙⊙⊙ ⊙⊙⊙	○○
III	⊙⊙⊙⊙	⊙⊙⊙⊙⊙ ⊙⊙⊙○△	⊙⊙⊙ ⊙○○

Fig. 2. Degree of dysphagia relief based on morphologic type and severity of esophageal dilatation (⊙ excellent, ○ good, △ poor).

and 170 min (range 135–205 min) in Sig patients. Hence, no marked difference in operative time was apparent among the three types. As to intraoperative complications, esophageal mucosal perforation occurred in nine (16%) of the 55 patients (5 Sp, 3 Fk, and 1 Sig), but conversion to open surgery was avoided by suturing the affected area. Moreover, intraoperative blood loss of 100 g or more was seen in five patients (9%) (three Sp and two Fk), and conversion to open surgery and blood transfusion were required in one Fk patient. Hence, the overall incidence of conversion to open surgery and of blood transfusion was 2% each. Overall, median postoperative hospital stay was 8 days (range 4–35 days): 8 days (range 4–18 days) for Sp patients, 7 days (range 4–19 days) for Fk patients, and 8 days (range 4–35 days) for Sig patients. One patient with Sig had loss of appetite and moderate dysphagia, and underwent pneumatic dilatation once during the hospitalization period. Therefore, the postoperative hospitalization period lasted 35 days.

Relationship between improvement of symptoms and morphologic type or esophageal dilatation, and presence or absence of postoperative reflux esophagitis

Dysphagia, the main symptom of achalasia, was observed preoperatively in all patients. Seventeen patients (31%) reported chest pain: 12 Sp patients (41%), three Fk patients (17%), and two Sig patients (25%). Degree of dysphagia relief was excellent in 45 patients (83%), good in eight patients (15%), fair in one patient (2%), and poor in no patients. Excellent:good:fair ratio was 26:3:0 for Sp patients, 15:1:1 for Fk patients, and 4:4:0 for Sig patients (Fig. 2). Hence, the proportion of patients experiencing excellent relief was 90%, 88% and 50% for Sp, Fk, and Sig patients, respectively. The morphologic type significantly affected the results of the surgical treatment ($p = 0.023$). In other words, in patients with Sp or Fk, the improvement was significantly better as compared to those with Sig (odds ratio 8.2,

95% confidence interval 1.1–58, $p = 0.006$). Esophageal dilatation did not significantly affect the results of the surgical treatment ($p = 0.682$). On the other hand, the combination of both parameters affected the results of the surgical treatment ($p = 0.027$). The improvement was significantly better in patients with Sp-I, Sp-II, Sp-III, or Fk-II as compared to those with Fk-III, Sig-II, or Sig-III (odds ratio 5.5, 95% confidence interval: 1.0–38, $p = 0.02$).

Postoperative pneumatic dilatation was required for five patients; that is, two patients with Sp (postoperative improvement was good in both cases), one patient with Fk (postoperative improvement was fair), and two patients with Sig (postoperative rate was good in both cases). Two patients with Sp underwent pneumatic dilatation once each. One patient with Fk underwent pneumatic dilatation once. One patient with Sig underwent pneumatic dilatation once, but another patient underwent pneumatic dilatation three times. Reflux esophagitis was seen in two patients (one Sp patient and one Sig patient) (4%), and was treated successfully with a proton pump inhibitor.

Discussion

The disease state of achalasia has been assessed based on the following parameters as measured by esophageal motor function testing: lower esophageal sphincter (LES) pressure; frequency of inadequate relaxation of LES; presence/absence of esophageal body peristalsis; and the height and speed of esophageal peristalsis. According to the achalasia classification system used in Japan, morphologic type is determined based on the shape of the lower esophagus, while severity of esophageal dilatation is determined based on the maximum transverse diameter of the esophagus. These variables are currently used as pathologic parameters. In terms of morphologic type, disease state is more severe and esophageal motor function deteriorates from Sp to Fk to Sig. As to surgical indications, patients with Fk with

grade II or III and those with Sig are considered good candidates, and pneumatic dilatation is performed in many institutions to treat the Sp type. Achalasia is a benign disease, for which surgery does not cure the pathologic process but instead aims primarily at symptomatic relief. Therefore, in the present study, we investigated the therapeutic effects of laparoscopic Heller myotomy and Dor fundoplication in relation to disease severity and type. No marked differences were apparent in operative time, intraoperative complications, or postoperative hospital stay among the three morphologic types. As to the degree of dysphagia relief, which was the most important surgical outcome, the proportion of patients reporting excellent relief was 83% overall. Among the three morphologic types, this ratio was close to 90% for Sp and Fk patients, but was clearly lower at 50% for Sig patients. In Western countries, therapeutic results for laparoscopic Heller myotomy and Dor fundoplication for the treatment of achalasia have been documented since the latter half of the 1990s. Rosati and colleagues [8] performed laparoscopic Heller myotomy and Dor fundoplication on 61 patients, and reported favorable results: excellent in 87.9% and good in 10.3%. In addition, Fernandez and colleagues [2] performed either laparoscopic Heller myotomy and Dor fundoplication or Heller myotomy and Toupet fundoplication on 110 patients, and obtained extremely favorable results: excellent in 103 patients and good in three patients. However, these authors did not describe preoperative disease states. Several other studies have also reported favorable rates of dysphagia relief (85–93%) [1, 3–5, 9, 11]. Pechlivanides and colleagues [6] classified preoperative disease state from stages I to IV based on maximum transverse diameter of the esophagus in a small series of achalasia patients ($n = 29$). Their classification was as follows: stage I, <40 mm; stage II, 40–60 mm; stage III, ≥ 60 mm; and stage IV, sigmoid configuration of the lower esophagus, regardless of maximum diameter. In their report, the outcome in all stage I and II patients was excellent. In 12 stage III patients, outcome was excellent in seven and good in four, and in four stage IV patients, outcome was good in two and bad in two. These results suggested that preoperative stage affects postoperative outcome. The present study based on morphologic type also demonstrated that when surgery was performed for patients with advanced achalasia, excellent improvement in dysphagia could not necessarily be obtained. However,

our results in patients with Sig were excellent in 50% and good in 50%, and none was associated with poor outcome. However, morphologic type does seem to be useful in predicting the postoperative outcomes for achalasia. In order to obtain excellent results of postoperative dysphagia, we believe that surgery should be recommended for patients with Sp- or Fk-type esophageal achalasia, before they become Sig type.

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