

Laparoscopic surgery or pneumatic dilatation for oesophageal achalasia?

Valmontas Valiukėnas,

Jurgita Adomavičiūtė,

Vytautas Lipnickas,

Gintautas Brimas,

Kęstutis Strupas

*Abdominal Surgery Department,
Vilnius University Hospital
Santariškių Klinikos, Lithuania*

Background. The aim of this study was to review the results in the management of achalasia by laparoscopic oesophageal cardiomyotomy with anterior fundoplication and endoscopic pneumatic balloon dilatation at Vilnius University Hospital.

Materials and methods. This is a retrospective study of 21 patients (9 male and 12 female; median age 51 years) who underwent laparoscopic cardiomyotomy and anterior fundoplication, and 27 patients (9 male and 18 female; median age 57 years) who had had pneumatic balloon dilatation for achalasia at our institution during five years. Clinical, radiological, and physiological characteristics were analyzed retrospectively, with an emphasis on the outcome and complications. Oesophageal symptoms were quantified before and after the treatment using a disease severity scale.

Results. Both groups achieved significant clinical improvement. Follow-up in 6 months was available for 20 patients (70.4%) with pneumatic dilatation and for 20 patients (94%) with myotomy and anterior fundoplication. In the surgical group, one (4.7%) intraoperative complication, mucosal perforation, occurred that was sutured laparoscopically. There were two (7.4%) complications, oesophageal perforations, in the pneumatic dilatation group which required urgent surgery. After a median follow-up of 17 months (range 10–43) 12 patients (63%) were found to be asymptomatic.

Conclusions. Our institutional initial experience in the management of classic oesophageal achalasia demonstrated that laparoscopic cardiomyotomy with anterior partial fundoplication achieves excellent symptomatic relief and it can be performed with minimal morbidity.

Key words: achalasia, pneumatic dilatation, laparoscopic myotomy

INTRODUCTION

Achalasia is a primary motility disorder of the oesophagus, occurring in approximately 1 per 100,000 population per year. In the normal oesophagus, peristaltic waves follow each swallow, while in case of achalasia a neuromuscular defect produces a marked decrease or absence of oesophageal body peristalsis. In achalasia, the lower oesophageal sphincter is hypertonic producing resting pressures above normal and relaxing incompletely after swallowing. This produces a functional obstruction resulting in dilation and elongation of the body of the oesophagus with a rapid narrowing at the cardia. There are some historical aspects concerning the evolution in the treatment of this disorder. Sir Thomas Willis, an Englishman, described cardiospasm and treated a patient by dilation using a sponge attached to whalebone in 1672 (1). Ernest Heller, a German, did the first successful oesophagomyotomy in 1913 (2). In 1937, Lendrum proposed that failure of the lower oesophageal sphincter to re-

lax caused functional oesophageal obstruction. Dor reported his anterior partial fundoplication in 1962 (3), and Toupet reported his posterior partial fundoplication in 1963 (4). Shimi did the first Heller myotomy laparoscopically in 1991 (5). The reason for this disorder is the degeneration of microscopic ganglion cells in Auerbach's myenteric plexus (6). Clinical diagnosis is always symptom-based: dysphagia, retrosternal pain, regurgitation of stagnant food, weight loss. Oesophageal manometric study is the gold standard for establishing the diagnosis of achalasia. Although elevated LES pressures (>35 mm Hg) may be evident, the most classic and specific manometric finding is incomplete sphincter relaxation, which occurs in more than 80% of the patients (7). Barium oesophagogram reveals a dilated oesophagus with a classic "bird's beak" of the GE junction, with atonic and dilated oesophageal body. Oesophagogastroduodenoscopy (EFGDS) is always necessary to distinguish from the secondary form of achalasia due to malignancy.

The treatment of achalasia is palliative since the underlying motility disorder cannot be corrected. Relief of dysphagia and the obstructing high-pressure of the lower oesophageal sphincter with the prevention of gastroesophageal reflux constitutes the goal of therapy. *Clostridium botulinum* toxin injection ini-

Correspondence to: Valmontas Valiukėnas, Abdominal Surgery Department, Vilnius University Hospital Santariškių Klinikos, Santariškių 2, LT-08661 Vilnius, Lithuania. E-mail: valmantas.valiukenas@santa.lt

tially relieves symptoms in about 85% of patients. It has a high failure rate, and a temporary benefit (symptom recurrence occurs in more than 50% patients in 6 months) requires repeated injections and may produce scarring that can make subsequent surgery more difficult and hazardous (7). Pneumatic dilatation is the most effective non surgical therapy for achalasia. The reported incidence of perforation of the oesophagus ranges from 0% to 15% (8). Laparoscopic myotomy of the LES is by far the best treatment modality with satisfactory long-term results. Intraoperative endoscopy during videoscopic Heller myotomy guides the extent and adequacy of myotomy (9). Although post-operative complications are rare (less than 4%) (10), the most commonly seen ones are: mucosal leakage, incomplete myotomy, gastroesophageal reflux. In this paper our task was to analyse our results in 1 and 6 months after surgery and endoscopic dilation for not complicated achalasia and to compare with the results available in literature.

MATERIALS AND METHODS

Between January 2001 and September 2006, 21 patients underwent laparoscopic Heller's myotomy with anterior fundoplication, and 27 patients had endoscopic dilation for the treatment of oesophageal achalasia (Table 1). There were 9 males and 12 females (median age 51 years) in laparoscopic myotomy group and 9 males and 18 females (median age 57 years) in dilation group (Table 1). We performed a retrospective study comparing the results of 21 laparoscopic operations to those of 27 achalasia patients who underwent endoscopic dilation at our institution during the same period. Differences between patients groups are not statistically significant. Indication for pneumatic dilatation was classic achalasia confirmed by clinical signs and instrumental findings. Dilatation was performed in one session by using a

Rigiflex 3.5 cm diameter dilator. The balloon was inflated for 60 seconds to the pressure of 300 mmHg. Since 2003, with growing experience in laparoscopic technique we prefer surgery for the treatment of achalasia. Indication for laparoscopic myotomy was classic achalasia confirmed by clinical signs and instrumental findings. The preoperative assessment was made on the basis of endoscopy, barium swallow, in some cases manometry, and a clinical scale (Table 2) for dysphagia, regurgitation and chest pain. According to the radiological findings, the disease was graded at stage I (oesophageal diameter <4 cm) in 8 patients, stage II (between 4 and 6 cm) in 35, and stage III (>6 cm) in the remaining 5 (Table 1). Patients were seen 4 weeks postoperatively. Subsequently, they were interviewed by telephone in 6 months. All the variables were stored in the Excel database to which the SPSS-13 statistical program was applied. For statistical comparisons, the Mann-Whitney test was used. A *p* value <0.05 was considered as significant.

SURGICAL TECHNIQUE

Five ports are placed. After incision of the phrenoesophageal membrane, dissection is limited to the anterior aspect of the oesophagus and the superior part of diaphragmatic crura. Myotomy is started with the hook on the anterior aspect of the distal oesophagus. Myotomy is then extended caudally with a sharp hook for almost 2 cm below the cardia and 5 cm above. When myotomy is performed endoscopy allows to check for completeness of the myotomy itself and for mucosal integrity. The anterior fundoplication is then constructed: the anterior fundic wall is sutured first to the left then to the right muscle edges of the myotomy with interrupted sutures; the proximal sutures on both sides also include the crura to keep the myotomy borders open and to prevent their approximation.

Table 1. Patients' characteristics

	Pneumatic dilatation	Laparoscopic myotomy
Number of patients	27	21
Male / female	9/18	9/12
Mean age	57 (range 19-81)	51 (range 23-80)
Mean symptom duration (year)	6.5 (range 1-42)	5 (range 1-20)
Disease severity score before treatment	8 (6-10)	7 (5-9)
Stage I (<4cm)	3	5
Stage II (4-6 cm)	22	13
Stage III (>6 cm)	2	3

Table 2. Achalasia severity score

	Score			
Symptoms	0	1	2	3
Dysphagia to solids	No	Weekly	Daily	Each meal
Dysphagia to liquids	No	Weekly	Daily	Each meal
Active regurgitation	No	Weekly	Daily	Each meal
Passive regurgitation	No	Monthly	Weekly	Daily
Chest pain	No	Monthly	Weekly	Daily

RESULTS

Both groups had achieved significant clinical improvement. Follow-up was available for 20 patients (70.4%) with pneumatic dilatation and for 20 patients (95%) with myotomy and partial fundoplication. In the surgical group, one intraoperative complication (4.7%), mucosal perforation, occurred that was sutured laparoscopically. The median operating time was 77 min (range 60–100), and the median hospital stay was 3 days (range 1–6). The median follow-up was 21 months (1–62 months). One patient (4.7%) complaining of transient dysphagia improved in a month without any additional procedures, and two patients (9.4%) had symptoms of reflux. The preoperative disease severity score of 7 (5–9) was reduced to 2 (1–4) ($p < 0.0001$). All the surgical procedures were completed laparoscopically. Oral feeding was resumed after a mean of two days (range 1–3). There were two complications in pneumatic dilatation group (7.4%), esophageal perforations, which required urgent surgery. The median hospital stay was 4 days (range 2–16). After a median follow-up of 17 months (range 10–43) 12 patients (63%) were asymptomatic, four patients (20%) experienced symptoms of heartburn and three had those of dysphagia (15%). Three patients (15%) needed repeated dilatation within 6 months. Improvement in swallowing of liquids, chest pain, and heartburn was also statistically significant. Disease severity score of 8

(6–10) was reduced to 3 (2–6) ($p < 0.0001$). Patients’ follow-up consisted of clinical control one and six months after the surgery. In 6 months we had statistically significant differences in the disease severity score between groups. The median score in the surgical group was 1 point (range 0–2) and was significantly lower than that in the dilatation group 3 (range 2–6) ($p < 0.05$). Eight patients were lost from follow-up because they changed their contact telephone numbers.

DISCUSSION

Pharmacological therapy (11, 12), *clostridium botulinum* toxin (BT) injection into LES (13), forceful hydrostatic oesophageal dilatation (12, 14, 15), and laparoscopic myotomy are currently available treatment methods for classic achalasia. The injection of botulinum toxin into the lower oesophageal sphincter is a relatively new procedure. It has a high recurrence rate and a temporary benefit, requires repeated injections, and may produce scarring that can make subsequent surgery more difficult and hazardous. Furthermore, six months after this procedure, the rate of relapse is more than 50% (16). The injection of botulinum toxin is less efficacious than the pneumatic dilatation in patients with achalasia (17). There is a tendency to give BT injections for elderly patients, when they have contraindications for pneumatic balloon dilatation or surgical treatment because

Table 3. Differences between groups after the treatment

	Pneumatic dilatation n = 27	Laparoscopic myotomy n = 21	p value
Hospital stay	4 (2–16)	3 (1–6)	NS
Perforation rate	7.4%	4.7%	NS
Disease severity score in 1 month	3 (2–5)	2 (1–4)	NS
Disease severity score in 6 months	3 (2–6)	1 (0–2)	$p < 0.05$
Follow-up	70.4%	95%	–

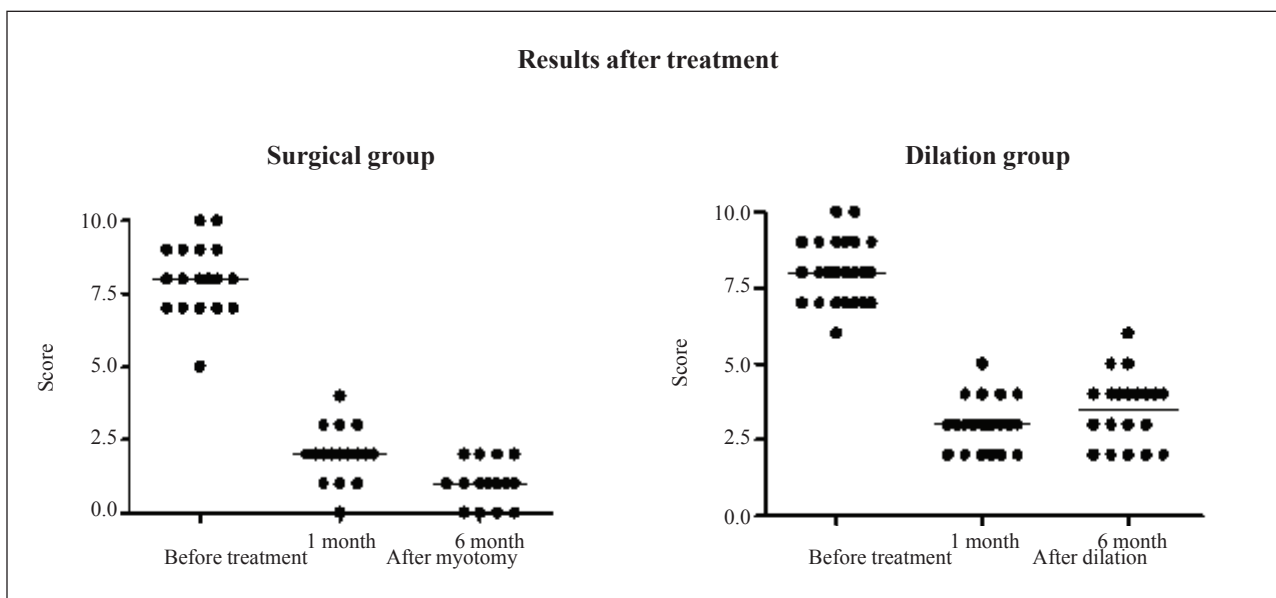


Fig. 1. Disease severity score distribution between groups before and after the treatment

of other diseases. In general, pneumatic dilatation is the most efficacious non surgical technique in the treatment of achalasia. The aim of pneumatic dilatation is to disrupt lower circular muscle fibres preventing mucus. This procedure requires only overnight observation, and the initial treatment is less expensive than surgery. One session of pneumatic dilatation treatment produces good results: 40–78% (12). Our results after pneumatic dilatation are comparable. Complications of pneumatic dilatation include oesophageal perforation (3%–15%), bleeding and gastroesophageal reflux. After dilatation we had two abdominal oesophageal perforations (7.4%). Further treatment was needed with a prolonged hospital stay and increasing patient morbidity. Besides, repeated pneumatic dilatations induce oesophageal scarring that can increase the risk of oesophagus perforation. Csendes et al demonstrated good results in 65% of patients after pneumatic dilatation and in 95% patients after myotomy in a prospective randomized study comparing forceful dilation and esophagomyotomy (14). Studies from the Universities of Iowa, Wisconsin, and Illinois, as well as the Mayo Clinic report 30% to 85% better results after myotomy than after forceful dilatation (18, 19). A collected review by Ferguson found a 71% rate of improvement with pneumatic dilation in 1049 patients and an 89% rate in 1199 surgical patients (7). Long-term follow-up study revealed that only 50% of the patients had no complaints 5 years after pneumatic dilatation procedure (20). Therefore, we prefer surgical treatment for achalasia. Shorter hospital stay, shorter disability period and better cosmetic effects are the most attractive videolaparoscopic operation factors.

Several issues concerning esophagomyotomy should be tackled. How long should the myotomy last? How far from gastroesophageal junction must the myotomy be? Is an antireflux procedure necessary? Will inadequate myotomy fail to relieve the dysphagia or will it cause gastroesophageal reflux?

The goals of our operation techniques are: minimal dissection of hiatus, accurate dissection between mucus and muscular lumen, cut of all the muscular fibres in endoscopic control. The length of myotomy should be 6–7 cm (2 cm in stomach). Anterior fundoplication reduces the risk of gastroesophageal reflux and covers the unrecognized mucosal micro perforations. Laparoscopic Heller myotomy has been reported to be followed by a short-term success rate in the range of 90%. Our results also confirmed this statement. Perforation rate during laparoscopic myotomy in our study was 4.7%. Intraoperative endoscopy did not have any influence on the postoperative morbidity and, in our opinion, must be obligatory. The long-term follow-up after myotomy has 80% remission rate and 10% gastroesophageal reflux rate (21–23). In our study, patients after surgery did not have heartburn in a short-term follow-up. The advocates of anterior fundoplication declare the results of operations to be good enough to make anterior fundoplication standard (24–26). The only randomized clinical trial showed rationale for the addition of a partial fundoplication (Dor procedure) to prevent reflux after the cardiomyotomy (24). The application of minimal invasive surgery makes alterations in the algorithm of achalasia treatment (27). Despite the fact that a significant number of patients with a newly diagnosed achalasia can be treated successfully by pneumatic dilatation, surgical myotomy was still found to be superior in long-term follow-up. Kostic et al performed

randomized trial and stated that laparoscopic cardiomyotomy combined with partial fundoplication appeared to be superior to pneumatic balloon dilatation in newly diagnosed idiopathic achalasia (28). In our experience, both dilatation and laparoscopic myotomy had similar clinical results in six months' follow-up. Our choice of laparoscopic myotomy and anterior fundoplication for patients with newly diagnosed achalasia was very much influenced by our experience in treating reflux disease and availability of skilful surgeons. According to literature, the minimally invasive surgical treatment seems to yield better results (29, 30). Based on our analysis of this small series and follow-up results after 6 months, we conclude that laparoscopic Heller myotomy with partial anterior fundoplication is an effective treatment for patients with classic achalasia.

CONCLUSIONS

Our initial experience suggests that laparoscopic cardiomyotomy with anterior partial fundoplication achieves excellent symptomatic relief for patients with achalasia and it can be performed with minimal morbidity. The intraoperative endoscopy ensures good visualization of completeness of myotomy and potential mucosal lesions and should be done obligatory. Our data indicate that after 6 months' follow-up statistically better results are observed after laparoscopic myotomy than after dilatation. Laparoscopic surgery seems to be the treatment of choice for achalasia as a primary procedure.

Received 6 October 2007

Accepted 5 November 2007

References

1. Spiess AE, Kahrilas PJ. Treating achalasia: from whalebone to laparoscope. *JAMA* 1998; 280: 638–42.
2. Heller E. Extramukose Cardioplastie beim chronischen Cardiospasmus mit Dilatation des Oesophagus. *Mitt Grenzgeb Med Chir* 1913; 27: 141.
3. Dor J, Humbert P, Dor V, Figarella J. L'interet de la technique de Nissen modifiée dans la prevention de reflux apres cardiomyotomie extramuqueuse de Heller. *Mem Acad Chir (Paris)* 1962; 88: 877–83.
4. Toupet A. Tehnique d'oesophago-gastroplastie avec phrenicogastropexie appliquee dan la cure radicale des hernias hiatales et comme complement de l'operation d'Heller dans les cardiospasmus. *Mem Acad Chir (Paris)* 1963; 89: 394–9.
5. Shimi S, Nathanson LK, Cuschieri A. Laparoscopic cardiomyotomy for achalasia. *J R Coll Surg Edinb* 1991; 36: 152–4.
6. Clause RE. Motor disorders. In: Sleisinger MH, Fordtran JS, eds. *Gastrointestinal Disease*, 5th ed. Philadelphia: WB Saunders Co; 1995: 350–63.
7. Ferguson MK. Achalasia: current evaluation and therapy. *Ann Thorac Surg* 1991; 52: 336–42.
8. Abir F, Modlin I, Kidd M, Bell R. Surgical treatment of achalasia: current status and controversies. *Digestive Surgery* 2004; 21(3).
9. Pinotti HW, Ceconello I, Zilberstein B. The surgical treatment of achalasia. In: Wastell N, Nyhus LM, Donahue PE,

- eds. Surgery of the Esophagus, Stomach and Small Intestine, 5th ed. Boston: Little, Brown & Co; 1995: 150–7.
10. Bonavina L, Nosadini A, Bardini R, Baessato M, Perrachia A. Primary treatment of esophageal achalasia. Long-term results of myotomy and Dor fundoplication. *Arch Surg* 1992; 127: 222–7.
 11. Traube M, Dubovik S, Lange RC, McCallum RW. The role of nifedipine therapy in achalasia: results of a randomized, double-blind, placebo-controlled study. *Am J Gastroenterol* 1989; 84: 1259–62.
 12. Csendes A, Braghetto I, Korn O, Csendes P, Burdiles P. Achalasia of the esophagus: natural history and alternatives in treatment. In: *Surgery of the Esophagus, Stomach and Small Intestine*, 5th edn. Boston: Little, Brown and Co; 1995: 134–49.
 13. Pasricha PJ, Ravich WJ, Hendrix TR, Sostre S, Jones B, Kalloo AN. Treatment of achalasia with intrasphincteric injection of botulinum toxin. *Ann Intern Med* 1994; 121: 590–1.
 14. Csendes A, Braghetto I, Henriquez A, Cortes C. Late results of a prospective randomised study comparing forceful dilatation and oesophagomyotomy in patients with achalasia. *Gut* 1989; 30: 299–304
 15. Vantrappen G, Hellems J, Deloof W, Valembois P, Vandembroucke J. Treatment of achalasia with pneumatic dilatations. *Gut* 1971; 12: 268–75.
 16. Pasricha PJ, Rai R, Ravich WJ et al. Botulinum toxin for achalasia: long-term outcome and predictors of response. *Gastroenterology* 1996; 110: 1410.
 17. Vaezi MF, Richter JE, Wilcox CM et al. Botulinum toxin versus pneumatic dilatation in the treatment of achalasia: a randomized trial. *Gut* 1999; 44: 231.
 18. Anselmino M, Perdakis G, Hinder RA, Poleshuk PV, Wilson P, Terry JD, Lanspa SJ. Heller myotomy is superior to dilation for the treatment of early achalasia. *Arch Surg* 1997; 132: 233–40.
 19. Donahue PE, Samelson S, Schlesinger PK, Bombeck CT, Nyhus LM. Achalasia of the esophagus. Treatment controversies and the method of choice. *Ann Surg* 1986; 203: 505–11.
 20. West RL, Hirsch DP, Bartelsman JF et al. Long term results of pneumatic dilation in achalasia followed for more than 5 years. *Am J Gastroenterol* 2002; 97: 1346.
 21. Patti MG, Molena D, Fisichella PM et al. Laparoscopic Heller myotomy and Dor fundoplication for achalasia. *Arch Surg* 2001; 136: 870–77.
 22. Suarez J, Mearin F, Boque R et al. Laparoscopic myotomy vs. endoscopic dilation in the treatment of achalasia. *Surg Endosc* 2002; 16: 75–7.
 23. Abir F, Modlin I, Kidd M et al. Surgical treatment of achalasia: current status and controversies. *Dig Surg* 2004; 21: 165–76.
 24. Richards WO, Torquati A, Holzman MD et al. Heller myotomy versus Heller myotomy with Dor fundoplication for achalasia. A prospective randomized double blind clinical trial. *Ann Surg* 2004; 240: 405–15.
 25. Ramacciato G, Da'ngelo FA, Aurello P et al. Laparoscopic Heller myotomy with or without partial fundoplication: a matter of debate. *World J Gastroenterol* 2005; 11: 1558–61.
 26. Dempsey DT, Delano M, Bradley K et al. Laparoscopic esophagomyotomy for achalasia. Does anterior hemifundoplication affect clinical outcome? *Ann Surg* 2004; 239: 779–87.
 27. Chen LQ, Chughtai T, Sideris L et al. Long-term effects of myotomy and partial fundoplication for esophageal achalasia. *Dis Esophagus* 2002; 15: 171–9.
 28. Kostic S, Kjellin A, Ruth M et al. Pneumatic dilatation or laparoscopic cardiomyotomy in the management of newly diagnosed idiopathic achalasia. Results of a randomized controlled trial. *World J Surg* 2007; 31: 470–8.
 29. Perrone JM, Frisella M, Desai KM et al. Results of laparoscopic Heller-Toupet operation for achalasia. *Surg Endosc* 2004; 18: 1565–71.
 30. Fernandez AF, Martinez MA, Ruiz J et al. Six years of experience in laparoscopic surgery of esophageal achalasia. *Surg Endosc* 2003; 17: 153–6.

Valmontas Valiukėnas, Jurgita Adomavičiūtė, Vytautas Lipnickas, Gintautas Brimas, Kęstutis Štrupas

KARDIJOS ACHALAZIJOS GYDYMAS: LAPAROSKOPINĖ MIOTOMIJA AR PLĖTIMAS BALIONU?

Santrauka

Stemplės achalazija yra retas pirminis funkcinis stemplės susirgimas. Šiuo metu taikomi gydymo būdai – medikamentinis gydymas botulino toksino injekcija, stemplės plėtimas balionu ir laparoskopinė ar torakoskopinė miotomija. Nors pastaraisiais metais laparoskopinių operacijų privalumai yra akivaizdūs, tačiau gastroenterologai vis dar teikia pirmenybę stemplės pneumodilatacijoms, motyvuodami operacijos ir pooperacinių komplikacijų tikimybe. Šio straipsnio tikslas – išanalizuoti kardiologijos gydymo patirtį Santariškių klinikų Pilvo chirurgijos centre. Per penkerius metus klinikoje gydyti 48 pacientai. Diagnozė nustatyta remiantis klinika, gastroduodenoskopija, rentgenologiniu tyrimu, o kai kuriems pagal stemplės manometrijos duomenis. Pacientų skundai prieš ir po gydymo įvertinti specialia skale. 27 pacientams taikytas stemplės plėtimas, o 21 atlikta laparoskopinė miotomija. Abiejose pacientų grupėse po taikyto gydymo pasiektas patikimas klinikinis pagerėjimas ($P < 0,0001$). Dviem pacientams plėtimas komplikavosi stemplės plyšimu (7,4%). Operuotų pacientų grupėje vienas stemplės pažeidimas buvo susiūtas tos pačios operacijos metu (4,8%). Mūsų klinikos patirtis rodo, kad laparoskopinė miotomija dėl minimalių komplikacijų gali būti pirmiausiai pasirenkamas gydymo metodas, nes po 6 mėnesių operuotų ligonių gydymo rezultatai, vertinant ligos sunkumo skalės balus, yra statistiškai geresni.

Raktažodžiai: achalazija, stemplės plėtimas, laparoskopinė miotomija