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Laparoscopic myotomy or pneumatic dilatation for achalasia treatment?

Research Article

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Abstract: Background: The aim of this study was to compare the long-term results between laparoscopic myotomy and pneumatic dilatation in achalasia treatment.
Method: A retrospective study was conducted involving 46 achalasia patients. Twenty-three patients underwent laparoscopic Heller myotomy with partial (Toupet) fundoplication (I group), other 23 – endoscopic pneumatic dilatation (II group). Long-term results included evaluation of dysphagia according Vantrappen and Hellemans and intensity of heartburn.
Results: The patients in these two groups were similar in terms of age, weight and height. The median follow up was 44 months in I group, 47 months in II group. Laparoscopic myotomy was effective in 82.6% of patients (excellent and good results), while pneumatic dilatation was effective in 52.2% of patients ($p<0.05$). 39% of patients had postoperative heartburn in I group and 43% in II group.
Conclusions: According our study results, laparoscopic Heller myotomy was more effective than endoscopic pneumatic dilatation in achalasia treatment. Heartburn is a common complaint after these two procedures.

Keywords: *Achalasia • laparoscopic Heller myotomy • pneumatic dilatation*

1. Introduction

Esophageal achalasia is the most commonly diagnosed primary esophageal motor disorder and the second most common functional esophageal disorder, that causes progressive dysphagia, regurgitation and weight loss [1]. The incidence of achalasia is about one in 100,000 of the population, affecting both sexes equally and usually presenting between the ages of 25 and 60. The pathophysiologic abnormalities are thought to result from neurodegenerative changes involving a reduction in myenteric plexus neurons in the lower esophageal sphincter (LES) and in the esophageal body [2]. The main functional abnormality in achalasia – poor esophageal emptying – is treated by reducing LES pressure so that gravity promotes the passage of food. Treatment options include endoscopic injection of botulinum toxin into the distal esophagus, balloon dilation, medical treatment with calcium channel blockers or nitroglycerin, and laparoscopic myotomy [2-8]. All interventions result in short-term relief of symptoms.

Retrospective studies have shown better results with myotomy performed by an experienced surgeon, and the prospective randomized trial myotomy, gave better long-term results compared with pneumatic dilatation [9]. The optimal approach is still a matter of debate, as there is a lack of high-quality randomized and controlled trials. The question regarding the choice between pneumatic dilation and Heller myotomy is not clear either. Both seem to have similar efficacy with expected symptom resolution at about 85% [10].
The aim of our study was to compare the long-term results between the laparoscopic Heller myotomy and pneumatic dilatation for achalasia patients

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Table 1 Classes on the effectiveness of achalasia treatment

Classes	Dysphagia
Excellent (0)	Completely free of symptoms;
Good (I)	Occasional (less than once a week) dysphagia or pain of short duration defined as retrosternal hesitation of food lasting from 2-3 s to 2-3 min and disappearing after drinking fluids;
Moderate (II)	Dysphagia more than once a week lasting less than 2-3 min and not accompanied by regurgitation or weight loss;
Poor (III)	Dysphagia more than once a week or lasting 2-3 min or longer or accompanied by regurgitation or weight loss.

Table 2 Heartburn standard grading system

Grade	Heartburn
0	None
I	Minimal-episodic, no treatment is required
II	Moderate-controlled with medication
III	Severe-interferes with daily activity or not controlled with medication

2. Materials and methods

This was a retrospective study, in which 46 patients with achalasia were studied. Patients were treated in clinic of surgery and in clinic of gastroenterology during January 1998 – December 2005 years. All patients gave their written informed consent, and the local ethics committee approved the study (No.BE-2-44). Patients with dysphagia complaints usually arrived to abdominal surgeon or gastroenterologist consultation in consulting university clinic. After radiological examination with barium contrast, esophagogastroduodenoscopy (EGD) and manometric studies achalasia was diagnosed. Diagnosis of achalasia was confirmed by manometric analysis in all patients: elevated resting lower esophageal sphincter (LES) pressure (> 45 mmHg); incomplete LES relaxation after a swallow; a peristalsis in the smooth muscle portion of the body of the esophagus. When the diagnosis was confirmed, consulting surgeon or gastroenterologist in detail explained to the patient possible achalasia treatment approaches (laparoscopic surgery and endoscopic dilatation), and additional benefits and risks. The main attention was attracted to patient's general condition, coo morbidities, previous intraabdominal operations and patient choice. The final treatment (laparoscopic surgery or endoscopic dilatation) decision was obtained by consensus agreement.

Postoperative investigations included hospital stay, early dysphagia, intraoperative and postoperative complications rate. A careful clinical assessment was performed by questionnaire in each patient before and late after surgery or manipulation. The results of achalasia treatment were divided into four classes according to Vantrappen and Hellemans [11] (Table 1). Heartburn grade was evaluated according standard grading system (Table 2).

Excellent (0) and good (I) were considered as indicative of efficient treatment, while moderate (II) and poor (III) – inefficient treatment. Clinically significant heartburn was considered, when heartburn grade was II or III.

2.1. Operative technique

Patient is placed in lithotomy position with the surgeon standing between the legs. Five troacars are placed and the liver is retracted to patient's right side. The authors at the Department of surgery, University Hospital, performed all operations.

The myotomy is performed with ultrasonic hook, 7–9 cm in length on the anterior surface of the esophagus. The myotomy extends 1.5–2 cm beyond the gastro-esophageal junction followed by the full mobilization of the gastric fundus, total hiatal dissection and a posterior Toupet (180°) fundoplication. If a perforation occurs, the mucosal edges are re-approximated with interrupted 4-0 vicril sutures tied intracorporally. This is followed by underwater insufflations of the perforation.

2.2. Pneumatic dilatation

Upper endoscopy is performed under conscious sedation in the left lateral position. A Savary guide-wire is placed in the stomach and a Rigiflex balloon passed over it. Patient is then placed in the supine position. After the balloon is centered across the gastro-esophageal junction under fluoroscopic guidance, it is distended 7–12 psi, enough to obliterate the waist, and maintained for 60 s. Patient is returned to the left lateral position and the balloon is deflated and removed. Patient is then sent for gastrografin followed by barium swolow to exclude esophageal perforation. The maximal balloon size used was 35 mm in 12 patients and 40 mm in 10 patients. All the patients required two dilatations.

2.3. Statistical analysis

Fisher's exact test was used to compare the success and complications of different treatment modalities. The patient age, achalasia anamnesis, hospital stay and

Table 3 Patient general characteristics

Parameter *Median (min – max)*	I gr. LCM (n=23)	II gr. PD (n=23)	p
Age (year)	50.3 (19–67)	68.5 (57 – 80)	p<0.05
Gender: male female	 11 12	 12 11	 ns ns
History of achalasia (months)	60.1 (3–240)	51.7 (1–288)	p < 0.05
Follow-up (months)	43.8 (15–88)	46.6 (20–90)	ns
Dysphagia before treatment (classes): I II III	 0 2 21	 0 7 16	 ns p<0.05 p<0.05

Table 4 Perioperative follow-up results

Parameter *Median (min – max)*	I gr. LCM (n=23)	II gr. PD (n=23)	p
Hospital stay (days)	6.1 (4–10)	6.8 (2–25)	ns
Operating (manipulation) time (min)	130.1 (125–180)	22 (15–35)	p<0.05
Mucosal perforation during operation (%)	4 (17.4%)	-	-
Esophageal perforation during manipulation (%)	-	0	-
Postoperative complications (%)	0	-	-
Early dysphagia (intrahospital)	0	0	ns

Table 5 Long-term results

Parameter	I gr. LCM (n=23)	II gr. PD (n=23)
Dysphagia classes : 0 I II III	 14 5 2 2	 7 5 9 2
Heartburn grade : 0 I II III	 12 2 9 0	 10 3 10 0

follow-up period between the groups were compared using the unpaired Mann-Whitney U test. P<0.05 was considered significant.

3. Results

From January 1998 to December 2005, 46 patients with achalasia were treated: 23 underwent Heller myotomy plus Toupet fundoplication (I group – LCM) and 23 underwent pneumatic dilatation (II group – PD). Patient general characteristics are summarized in Table 3.

PD and Heller myotomy with Toupet fundoplication were the initial treatment in all 46 patients and they had no achalasia treatment before. All surgeries were completed with laparoscopic technique. Perioperative follow-up results are summarized in Table 4.

Esophageal mucosal perforation rate during operation was 17.4%.

Complete information to assess the clinical efficiency of achalasia treatment was available in all 46 patients, who were followed for a mean of 44 months in I gr. and 47 months in II gr. Long-term results are summarized in Table 5.

Laparoscopic myotomy plus Toupet fundoplication was effective in 82.6% of patients (good and excellent results), while pneumatic dilatation was effective in 52.2% of patients (p<0.05). Clinical significant heartburn had 39% of patients after surgical procedure and 43% of patients after pneumatic dilatation (p>0.05).

4. Discussion

Achalasia results from irreversible destruction of esophageal myenteric plexus neurons causing aperistalsis and failed lower sphincter relaxation. The only therapies that adequately compensate for this dysfunction for a sustained time are pneumatic dilation and Heller myotomy.

Treatment success in achalasia has been usually defined based on symptom improvement [12]. Comparisons across studies are difficult because definitions of success very from strict criteria (symptoms once per week or less) [13] to more liberal endpoints

such as a 50% decrease in symptoms or the lack of need for repeat treatment [14]. Our definition of efficient achalasia treatment (dysphagia less than once a week or retrosternal pain up to 2-3 min) was chosen because it is a reasonable endpoint from the clinical standpoint. This descriptive symptom classification system has been proposed and used by several authors [11,13].

We do not routinely repeat esophageal manometry and radiological investigations after treatment, which has been used by others as an objective measure of treatment effectiveness [14]. Vaezi et al. [15] demonstrated that patients with poor esophageal emptying on radiological investigation may have near complete symptom resolution. These findings clearly show that clinical symptoms alone are not reliable in assessing treatment success, and objective assessment of treatment might be required to achieve higher treatment success.

Prospective, randomized trial compared pneumatic dilatation to Heller myotomy via thoracotomy, reporting 95% nearly complete symptom resolution in the surgical group compared with 51% in the dilatation group after 5 years [9]. Over the past 15 years the high success rate of laparoscopic Heller myotomy for achalasia has brought a shift in practice; surgery has become the preferred treatment of most gastroenterologists and other referring physicians [16]. The results of uncontrolled and retrospective trials had shown that pneumatic dilatation is 72% effective versus 92% for the laparoscopic Heller myotomy [12]. Our study results also demonstrate, that surgical treatment (laparoscopic Heller myotomy) offers better long term success comparing with pneumatic dilatation. Our rates of symptomatic improvement after laparoscopic Heller myotomy (82.6%) are acceptable and comparable to those reported in the literature.

Our perforation rate following laparoscopic procedure (17.4%) is higher than 5% reported in the literature [1]. On the other hand, all the mucosal injuries were detected and repaired during the operation, so we had no consequences of this complication.

Pneumatic dilatation is considered to be a safe and efficient treatment of achalasia. Some studies demonstrated success rates between 60% and 85% [9,12,17,18]. Katz et al. [18] showed that, even after a mean follow-up of 6.5 years, pneumatic dilatation was still successful in 85% of the 72 patients. These figures contrast with our study results, demonstrating only 52.2% success rate after a mean follow-up of 46.6 months. But West et al. [13] reported, that the rate of efficient achalasia treatment by pneumatic dilatation was ranging from 50% for the patient population treated ≥5 years ago to 40% in the patients who were treated more than 15 years ago. As we used the same definition of success, the mean follow-up period is also comparable, our study results, regarding pneumatic dilatation, are similar.

Although dysphagia relief is maintained in 80-95% of laparoscopic Heller myotomy patients [12], persistent dysphagia and postoperative gastro-esophageal reflux (GER) are the most cited reasons for surgical failure.

Arguments for and against addition of a fundoplication after Heller myotomy has been going on for many years. Ferguson reviewed the literature and reports a rate of 7.4% for a abdominal approach with fundoplication and a 9-10% rate for a thoracic approach regardless of concurrent fundoplication [19]. Burpee et al. [20] revealed an unacceptable rate (60%) of gastro-esophageal reflux in laparoscopic Heller myotomy without an antireflux procedure, proved by objective analysis. Richards et al. [21] in theirs randomized double-blind clinical trial comparing the outcome of myotomy plus Dor fundoplication versus myotomy alone have shown that the former operation is superior in terms of reflux control. Lyass et al. [22] in their meta-analysis found that the difference in the rate of GER diagnosed in postmyotomy pH studies in wrapped and no wrapped patients was not significant (7.9 vs. 10%, respectively; p=0.75). There was also no significant difference in the incidence of postmyotomy GER symptoms in wrapped and no wrapped patients (5.9 vs. 13% respectively; p=0.12). Authors concluded that reflux is not necessarily eliminated with the addition of a partial fundoplication. Based on available data, it is difficult to determinate the true incidence of postoperative GER in achalasia patients.

Our study results demonstrate that 39% patients had postoperative clinical significant heartburn. This is a very high heartburn rate, although we performed a posterior Toupet (180°) fundoplication to every patient. Many surgeons have reported excellent results with this approach, both with relief of dysphagia and low rates of postoperative reflux [23,24]. While analyzing our results, we think, that surgical approach influenced such a high rate of postoperative heartburn. We always performed total hiatal region dissection, completely dividing the phreno-esophageal ligament, which acts as an anchor for the lower esophageal sphincter mechanism. We also divided the short gastric vessels, fully mobilized the cardia to perform the posterior Toupet fundoplication. Considering our results, from 2005 we are performing the Heller-Dor operation with limited surgical dissection of the cardia and not dividing the short gastric vessels.

The weakness of our study is that it is a retrospective one but not a randomised clinical trial. Considering the nature of this study, patients were not randomized, but distributed to one of the groups (PD or laparoscopic myotomy) according patient's general condition, coo

morbidities, previous operations and patient choice. Considering this, cohort of these two groups is not homogenous: older patients with coo morbidities underwent pneumatic dilatation, whereas younger patients had laparoscopic myotomy.

5. Conclusion

According our study results, laparoscopic Heller myotomy was more effective than endoscopic pneumatic dilatation in achalasia treatment. Heartburn was equally common complain after these two procedures.

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