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Original Paper

SURGICAL TREATMENT OF ACHALASIA: RESULTS AND QUALITY OF LIFE

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Achalasia is a primary defect of esophageal motility of unknown aetiology, characterised by peristaltic dysfunction of the esophagus and impaired relaxation of the lower esophageal sphincter. The most common symptoms are dysphagia, regurgitation, weight loss, and chest burning. There are various treatment options for achalasia: botulinum toxin injections, pneumatic dilatation, Heller myotomy, and peroral endoscopic myotomy. The aim of the study was to access the efficacy and quality of life of patients with achalasia after surgical treatment — laparoscopic Heller myotomy and Dor fundoplication. All of the patients after surgery had a high gastrointestinal quality of life index. For all patients, during the follow-up period (median 2.4 years), the intensity of clinical symptoms after the procedure declined. Laparoscopic Heller myotomy with Dor fundoplication is a safe and effective method of treating achalasia and can reduce clinical symptoms and improve patients' quality of life.

Keywords: *Heller myotomy, Dor fundoplication, anterior fundoplication.*

INTRODUCTION

Achalasia is a primary defect of esophageal motility of unknown aetiology, characterised by peristaltic dysfunction of the esophagus and impaired relaxation of the lower esophageal sphincter. Men and women are equally ill and the incidence is 0.3–1.63 / 100 000 per year (Clark *et al.,* 2017). The most common symptoms are dysphagia – 90%, regurgitation – 75%, weight loss – 50%, and chest burning – 40%. Diagnostic methods for achalasia include upper endoscopy (may be normal in the early stages), where esophageal dilation, residues of food and fluid in the esophagus, and compressed gastroesophageal junction may be present. These symptoms help to differentiate it from pseudoahalasia, e.g., due to oncology. Another diagnostic method is esophageal X–ray with barium. Symptoms of a bird's beak, esophageal dilation and contrast evacuation disorders will be seen. Esophageal manometry is a gold standard to diagnose achalasia. It may reveal incomplete relaxation of the lower esophageal sphincter and esophageal peristalsis disfunction (Vela *et at.,* 2004).

There are various treatment options for achalasia: botulinum toxin injections, pneumatic dilatation, Heller myotomy, and peroral endoscopic myotomy (POEM). These treatment options have different long-term treatment effectiveness. Botulinum toxin injection is a safe method. Serious complications (mediastinitis and allergic reactions) are very rare. The main disadvantage is the short-term effect. Clinical efficacy after six months is 51.8%, after 12 months — only 37.5% (Khashab *et al.,* 2020). There is no data about GERD symptoms after the procedure. Pneumatic dilatation is also a safe method. Serious complications include esophageal perforation (2.8%) and severe bleeding (2%). Clinical efficacy is 83% for six months. After five years, 35% of patients need re-dilatation. GERD symptoms after the procedure count up to 9% (Khashab *et al.,* 2020). POEM was first presented in 2010 (Inoue *et al*., 2010). Serious complications such as mucosal injuries (4%), severe bleeding (0.2%), and esophageal perforation (0.2%) are quite rare. Clinical efficacy is 93% (six months); after five years — 83%. GERD symptoms after the procedure are present in 9% of patients. Abnormal acid reflux (pH monitoring) occurs in up to 47%

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cases (after eight months). This is a relatively new method and there have been only a few prospective randomised trials, which means that there is little data on long-term efficacy (Khashab *et al.,* 2020).

Laparoscopic Heller myotomy (Fig. 1) with Dor fundoplication (Fig. 2) procedure consists of two steps: 1) myotomy — division of the muscles and 2) fundoplication — prevention of the reflux. The clinical success rate is 88% at 40-month follow-up. The most common complications are intraoperative mucosal perforation — 9.7% (detected intraoperatively and sutured) and postoperative major complications (bleeding, peritonitis) — 2.4%. GERD symptoms — 11.5%. Pathological acid reflux (pH monitoring) occurs in 11.1% of cases (Ross *et al.,* 2015).

The aim of the study was to assess the efficacy and quality of life (QoL) of patients with grade II and III achalasia before and after surgical treatment — laparoscopic Heller myotomy with Dor fundoplication.

MATERIALS AND METHODS

A prospective case-controlled study was performed in Rīga East Clinical University Hospital (Latvia). In total, fourteen achalasia patients underwent laparoscopic Heller myotomy and Dor fundoplication from July 2016 to June 2020. Patients with achalasia grade II (nine patients) and grade III (five patients) were included in the study. Data on the clinical evaluation and QoL before therapy and after the operation were collected and analysed. The postoperative follow-up period was from six months to five years (median follow-up — 2.4 years).

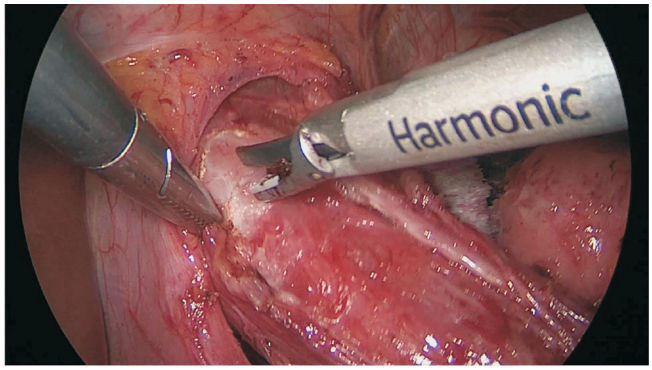


Fig. 1. Surgical technique – Heller myotomy.

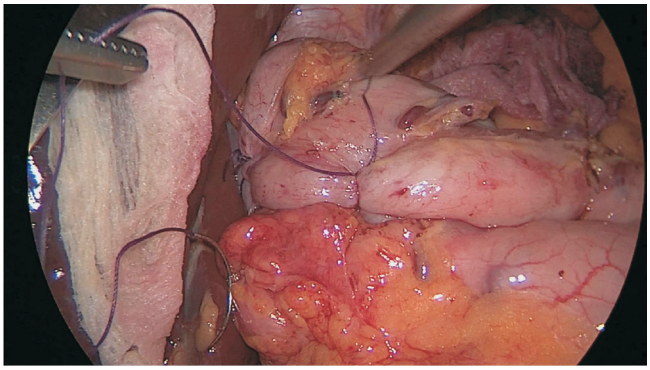


Fig. 2. Surgical technique – Dor fundoplication.

The Eckardt clinical scoring system and Gastrointestinal Quality of Life Index (GIQLI) scores were used (Table 1).

Table 1. The Gastrointestinal Quality of Life Index (GIQLI)

GIQLI Survey Questionnaire.
1. How often during the past 2 weeks have you had pain in the abdomen?
1. All the time 2. Most of the time 3. Some of the time 4. A little of the time 5. Never
2. How often during the past 2 weeks have you had a feeling of fullness in the upper abdomen?
1. All the time 2. Most of the time 3. Some of the time 4. A little of the time 5. Never
3. How often during the past 2 weeks have you had bloating (sensation of too much gas in the abdomen)?
1. All the time 2. Most of the time 3. Some of the time 4. A little of the time 5. Never
4. How often during the past 2 weeks have you been troubled by excessive passage of gas through the anus?
1. All the time 2. Most of the time 3. Some of the time 4. A little of the time 5. Never
5. How often during the past 2 weeks have you been troubled by strong burping or belching?
1. All the time 2. Most of the time 3. Some of the time 4. A little of the time 5. Never
6. How often during the past 2 weeks have you been troubled by gurgling noises from the abdomen?
1. All the time 2. Most of the time 3. Some of the time 4. A little of the time 5. Never
7 How often during the past 2 weeks have you been troubled by frequent bowel movements?
1. All the time 2. Most of the time 3. Some of the time 4. A little of the time 5. Never
8. How often during the past 2 weeks have you found eating to be a pleasure?
1. All the time 2. Most of the time 3. Some of the time 4. A little of the time 5. Never
9. **Because of your illness, to what extent have you restricted the kinds of food you eat?**
1.Very much 2. Much 3. Somewhat 4. A little; 5. Not at all
10. During the past 2 weeks, how well have you been able to cope with everyday stresses?
1. Extremely poorly 2. Poorly 3. Moderately 4. Well 5. Extremely well
11. How often during the past 2 weeks have you been sad about being ill?
1. All the time 2. Most of the time 3. Some of the time 4. A little of the time 5. Never

Continuation of Table 1. The Gastrointestinal Quality of Life Index (GIQLI)

GIQLI Survey Questionnaire.
12. How often during the past 2 weeks have you been nervous or anxious about your illness?
1. All the time 2. Most of the time 3. Some of the time 4. A little of the time 5. Never
13. How often during the past 2 weeks have you been happy with life in general?
1. Never 2. A little of the time 3. Some of the time 4. Most of the time 5. All the time
14. How often during the past 2 weeks have you been frustrated about your illness?
1. All the time 2. Most of the time 3. Some of the time 4. A little of the time 5. Never
15. How often during the past 2 weeks have you been tired or fatigued?
1. All the time 2. Most of the time 3. Some of the time 4. A little of the time 5. Never
16. How often during the past 2 weeks have you felt unwell?
1. All the time 2. Most of the time 3. Some of the time 4. A little of the time 5. Never
17. Over the past week, have you woken up in the night?
1. Every night 2. 5–6 nights 3. 3–4 nights 4. 1–2 nights 5. Never
18. Since becoming ill, have you been troubled by changes in your appearance?
1. A great deal 2. A moderate amount 3. Somewhat 4. A little bit 5. Not at all
19. Because of your illness, how much physical strength have you lost?
1. A great deal 2. A moderate amount 3. Somewhat 4. A little bit 5. Not at all
20. Because of your illness, to what extent have you lost your endurance?
1. A great deal 2. A moderate amount 3. Somewhat 4. A little bit 5. Not at all
21. Because of your illness, to what extent do you feel unfit?
1. Extremely unfit 2. Moderately unfit 3. Somewhat unfit 4. A little unfit 5. Fit
22. During the past 2 weeks, how often have you been able to complete your normal daily activities (school, work, household)?
1. All the time 2. Most of the time 3. Some of the time 4. A little of the time 5. Never
23. During the past 2 weeks, how often have you been able to take part in your usual patterns of leisure or recreational activities?
1. All the time 2. Most of the time 3. Some of the time 4. A little of the time 5. Never
24. During the past 2 weeks, how much have you been troubled by the medical treatment of your illness?
1. Very much 2. Much 3. Somewhat 4. A little 5. Not at all
25. To what extent have your personal relations with people close to you (family or friends) worsened because of your illness?
1. Very much 2. Much 3. Somewhat 4. A little 5. Not at all
26. To what extent has your sexual life been impaired (harmed) because of your illness?
1. Very much 2. Much 3. Somewhat 4. A little 5. Not at all
27. How often during the past 2 weeks have you been troubled by fluid or food coming up into your mouth (regurgitation)?
1. All the time 2. Most of the time 3. Some of the time 4. A little of the time 5. Never
28. How often during the past 2 weeks have you felt uncomfortable because of your slow speed of eating?
1. All the time 2. Most of the time 3. Some of the time 4. A little of the time 5. Never
29. How often during the past 2 weeks have you had trouble swallowing your food?
1. All the time 2. Most of the time 3. Some of the time 4. A little of the time 5. Never
30. How often during the past 2 weeks have you been troubled by urgent bowel movements?
1. All the time 2. Most of the time 3. Some of the time 4. A little of the time 5. Never
31. How often during the past 2 weeks have you been troubled by diarrhoea?
1. All the time 2. Most of the time 3. Some of the time 4. A little of the time 5. Never
32. How often during the past 2 weeks have you been troubled by constipation?
1. All the time 2. Most of the time 3. Some of the time 4. A little of the time 5. Never
33. How often during the past 2 weeks have you been troubled by nausea?
1. All the time 2. Most of the time 3. Some of the time 4. A little of the time 5. Never
34. How often during the past 2 weeks have you been troubled by blood in the stool?
1. All the time 2. Most of the time 3. Some of the time 4. A little of the time 5. Never
35. How often during the past 2 weeks have you been troubled by heartburn?
1. All the time 2. Most of the time 3. Some of the time 4. A little of the time 5. Never
36. How often during the past 2 weeks have you been troubled by uncontrolled stools?
1. All the time 2. Most of the time 3. Some of the time 4. A little of the time 5. Never

A standardised quality of life assessment questionnaire contained 36 questions with the 5 – point Lickert scale (0-1-2-3-4), each with a score of 0–4 points. Calculation of the score was: most desirable option — 4 points, least desirable option — 0 points; GIQLI score: sum of the points. Global score: 0–144 points; higher score means better QoL; normal = 125 points (Eypasch *et al.,* 1995). The Eckardt scale (Table 2) evaluates the most common symptoms of achalasia using a numerical rating scale (0–3 points): 0 – none; 1 – sometimes; 2 – every day; 3 – constantly with maximum number of points – 12 points. A lower score indicates fewer clinical symptoms. An Eckardt score ≤ 3 is considered normal (Eckardt *et al.*, 1992).

Data statistical analysis was performed using the SPSS software (IBM SPSS Statistics. v. 23.0. Chicago. IL. USA).

The study was conducted in accordance with the Declaration of Helsinki and consent from the Rīga East University Hospital Ethics Committee was obtained.

RESULTS

All fourteen patients underwent laparoscopic Heller myotomy and anterior fundoplication successfully. The average operation time was 125 minutes (Tables 3, 4). During surgery, two (14%) patients had a defect in the esophageal mucosa, which was successfully sutured with 3/0 absorbent sutures in a single layer. The postoperative period was without complications. By comparing the data of the preoperative and postoperative period after Heller myotomy, we found that the intensity of esophageal achalasia symptoms decreased significantly — the median Eckardt score decreased from 8.64 to 1.14 ($p = 0.0235$) (Table 5, Fig. 3). All patients after surgery had an Eckardt score ≤ 3 (median follow-up 2.4 years) and postoperative QoL scores were higher than those of preoperative. There were no complications. The GIQLI quality of life index increased significantly after surgery — 74 points on average before the operation (66–89) and 130 points on average after the operation (117–141), ($p = 0.0470$) (Table 6, Fig. 4, 5). Almost all (10 of 14 patients) noted major improvement in emotional and social factors such as coping with stress, nervousness and managing daily activities. More than half of the patients (60%) remarked not only total absence of gastrointestinal symptoms, but also improvement in physical factors. Follow up GIQLI scores after six months in 53% of the patients were more than two times higher than those of preoperative. All of the patients had a normal or above normal (normal = 124) GIQLI score (range: 117–141) (Fig. 5). None of the patients had the intensity of any of the most common symptoms of achalasia more than mild.

Table 2. Eckardt scale

Score	Weight loss (kg)	Dysphagia	Retrosternal pain	Regurgitation
0	None	None	None	None
1	< 5	Occasional	Occasional	Occasional
2	5–10	Daily	Daily	Daily
3	> 10	Each meal	Each meal	Each meal

Table 3. Demographic and treatment data

Patient No.	Age	Sex	Achalasia grade	Surgery (min.)
1	64	F	II	170
2	34	M	II	155
3	71	M	II	115
4	40	F	II	135
5	43	M	II	75
6	53	M	III	140
7	72	F	II	160
8	51	F	II	75
9	36	F	II	90
10	60	F	III	90
11	70	F	III	160
12	63	F	II	90
13	34	F	III	170
14	40	M	III	125

Table 4. Average hospital stay and operation time

Average hospital stay (days)	**Average operation time (minutes)**
6 (range 2–8)	125 (range 75–170)

Table 5. Eckardt before and after the surgery

Preoperative median Eckardt	Postoperative median Eckardt
8.64	1.14 ($p = 0.0235$)

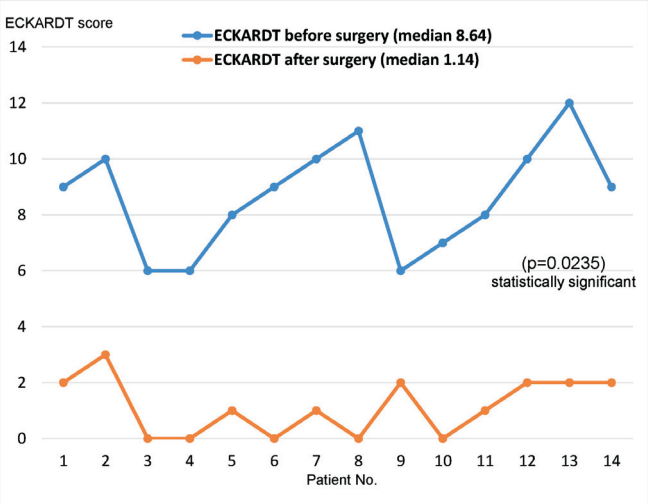


Fig. 3. Eckardt score before and after the surgery.

DISCUSSION

There are four main treatment options for achalasia: botulinum toxin injections, pneumatic dilatation, laparoscopic Heller myotomy, and POEM. Botulin toxin injection is a safe procedure with valuable results, but may be short-

Table 6. GIQLI before and after the surgery

Preoperative median GIQLI	Postoperative median GIQLI
74 (range 66–89)	130 (range 117–141) $p = 0.0470$

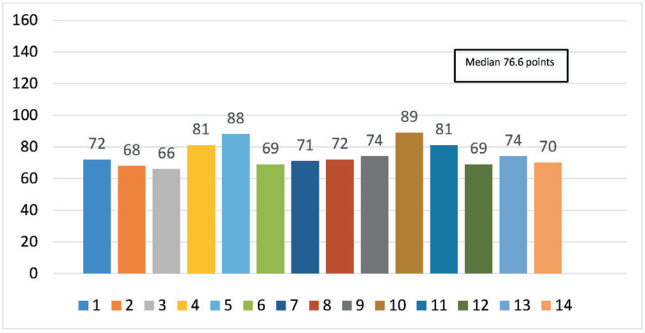


Fig. 4. GIQLI before the surgery.

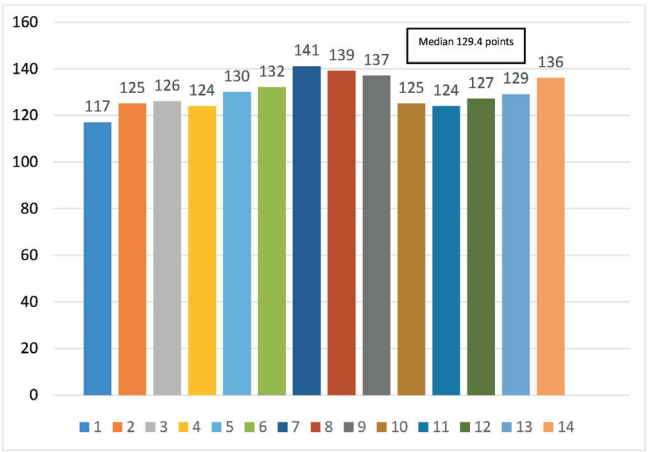


Fig. 5. GIQLI after the surgery.

acting and could be recommended for temporally relief of achalasia before another procedure, or if the patient is not candidate for definitive treatment (Khashab *et al.,* 2020). Pneumatic dilatation, laparoscopic Heller myotomy, and POEM are effective treatment modalities and the decision should be based on local expertise, achalasia type and patient's preference (Khashab *et al.,* 2020). The main disadvantages of pneumatic dilation are higher risk of major mucosal injury and lower clinical success rate, as compared to laparoscopic Heller myotomy (Persson *et al.,* 2015). POEM is a relatively new procedure with little information about long-term results. This endoscopic manipulation has an excellent short-term clinical success rate — 93% with very low serious adverse event possibility (Meng *et al.,* 2017). The main disadvantage after POEM is the absence of an anti-reflux procedure. This could lead to a high frequency of gastroesophageal reflux after such treatment, for example, it was shown that abnormal esophageal acid exposure occurred in 47% patients after POEM (Akintoye *et al.,* 2016). Laparoscopic Heller myotomy is a minimally invasive procedure, which is usually performed in combination with fundoplication. This distinguishes the procedure from the abovementioned treatment options, because it decreases the possibility of postoperative reflux. In our study, laparoscopic Heller myotomy with Dor fundoplication showed excellent results with clinical success rate of 100% (by Eckardt scale) after a median 2.4-year follow-up and high postoperative quality of life with a median level of 130 points (GIQLI). Similar results have been reported in the literature — a recent meta-analysis that included 5834 patients in 53 studies (five randomised controlled trials and 48 prospective or retrospective cohort studies), the clinical success rate after laparoscopic Heller myotomy was 87.7% with a mean follow-up of 40 months (Schlottmann *et al.,* 2018). Our study showed that laparoscopic Heller myotomy with Dor fundoplication had a low complication rate with 0% postoperative complications and only two intraoperative adverse events with mucosal injury, which were successfully treated during laparoscopy and had no effect on postoperative recovery. Our results match literature data; for example, in a recently published nationwide study with 1237 patients, major complications after laparoscopic Heller myotomy occurred in only 2.4% cases (Ross *et al.,* 2015). Our study has the limitation of a small number of patients, but achalasia is a rare disease, and such operations have not been done frequently in Latvia. Considering this, it would be reasonable to concentrate such patients in high-volume centres. Based on this study, we can conclude that laparoscopic Heller myotomy with Dor fundoplication is a feasible and safe operation with a low complication rate, excellent postoperative results and it can be recommended as a preferred treatment option in patients with achalasia.

CONCLUSIONS

1. The GIQLI quality of life index was close to normal or normal in all patients during the follow-up period (median 2.4 years) after laparoscopic Heller myotomy and Dor fundoplication.

2. All patients with grade III achalasia after laparoscopic Heller myotomy and Dor fundoplication had a high GIQLI gastrointestinal quality of life index (117 or higher).

3. In all patients during the follow-up period (median 2.4 years), the intensity of clinical symptoms (Eckardt scale) after laparoscopic Heller myotomy and Dor fundoplication achalasia did not exceed 3 points, which is considered as a normal intensity level.

4. Laparoscopic Heller myotomy with Dor fundoplication is a safe and effective method of treating achalasia and can reduce clinical symptoms and improve the patients' quality of life.

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BARĪBAS VADA AHALĀZIJAS ĶIRURĢISKA ĀRSTĒŠANA: REZULTĀTI UN DZĪVES KVALITĀTE

Ahalāzija ir barības vada motilitātes traucējumi, kam raksturīga barības vada peristaltikas disfunkcija un barības vada apakšējā slēdzējmuskuļa spazma. Visbiežāk sastopamie simptomi ir disfāgija, regurgitācija, svara zudums un dedzināšanas sajūta aiz krūšu kaula. Ahalāzijai ir dažādas ārstēšanas iespējas — botulīna toksīna injekcijas, pneimatiskā dilatācija, Hellera miotomija un perorālā endoskopiskā miotomija. Šī pētījuma mērķis bija izvērtēt ķirurģiskās ārstēšanas efektivitāti un dzīves kvalitāti pacientiem ar ahalāziju pēc operācijas — laparoskopiskas Hellera miotomijas un Dor fundoplikācijas. Visiem pacientiem pēc operācijas bija augsts kuņģa–zarnu trakta dzīves kvalitātes indekss. Visiem pacientiem pēcoperācijas novērošanas periodā (vidēji 2,4 gadi) klīnisko simptomu intensitāte pēc procedūras samazinājās. Var secināt, ka laparoskopiskā Hellera miotomija ar Dor fundoplikāciju ir droša un efektīva ahalāzijas ārstēšanas metode, kas var samazināt klīniskos simptomus un uzlabot pacientu dzīves kvalitāti.