Evidence-Based Practice Guideline for Surgical Treatment of Gastroesophageal Reflux Disease 2018

Ho Seok Seo 1,2, Miyoung Choi 3, Sang-Yong Son 1,4, Min Gyu Kim 1,5, Dong-Seok Han 1,4, Han Hong Lee 1,2

1Guideline Committee of Korean Anti-Reflux Surgery (KARS) Study Group. 2Division of Gastrointestinal Surgery, Department of Surgery, Seoul St. Mary’s Hospital, College of Medicine, The Catholic University of Korea, Seoul, Korea 3Division of Health Technology Assessment Research, National Evidence-based Healthcare Collaborating Agency, Seoul, Korea 4Department of Surgery, Ajou University School of Medicine, Suwon, Korea 5Department of Surgery, Hanyang University Guri Hospital, Hanyang University School of Medicine, Seoul, Korea 6Department of Surgery, Seoul National University Boramae Hospital, Seoul, Korea

ABSTRACT

The prevalence of gastroesophageal reflux disease (GERD) is increasing in Korea, and physicians, including surgeons, have been focusing on its treatment. Indeed, in Korea, medical treatment using a proton pump inhibitor is the mainstream treatment for GERD, while awareness of surgical treatment is limited. Accordingly, to promote the understanding of surgical treatment for GERD, the Korean Anti-Reflux Surgery Study Group published the Evidence-Based Practice Guideline for the Surgical Treatment of GERD. The guideline consists of 2 sections: fundamental information such as the definition, symptoms, and diagnostic tools of GERD and a recommendation statement about its surgical treatment. The recommendations presented 5 debates regarding fundoplication: 1) comparison of the effectiveness of medical and surgical treatments, 2) effectiveness of surgical treatment in cases of refractory GERD, 3) effectiveness of surgical treatment of extraesophageal symptoms, 4) comparison of effectiveness between total and partial fundoplication, and 5) effectiveness of fundoplication in cases of hiatal hernia. The present guideline is the first to demonstrate the efficacy of the surgical treatment GERD in Korea.

Keywords: Fundoplication; Gastroesophageal reflux; Guideline; Systematic review; Treatment

INTRODUCTION

Background

Gastroesophageal reflux disease (GERD) is one of the most common benign diseases of the upper gastrointestinal tract [1-3]. The prevalence of GERD reached 7.3% in 2008, with a mean annual increase of 15.3% in Korea [4]. In Western countries, GERD is typically treated with a proton pump inhibitor (PPI) and fundoplication [5-11]. Despite numerous studies reporting the effectiveness of surgical treatment, medication-oriented treatment remains the mainstay...
because of a lack of awareness of surgical treatment in Korea. Although there are several guidelines for GERD worldwide, the surgical treatment of GERD in Korea has never been reported [5,6,12]. The only 2 guidelines for treating GERD in Korea did not focus on surgical treatment [13,14]. Therefore, the first Korean guideline for GERD was established to provide clear criteria for surgical treatment.

Scope
The present clinical practice guideline is based on the published literature and expert opinions when evidence is lacking. This guideline is specific and comprehensive for the surgical treatment of GERD; however, it does not address issues related to prevention, medical treatment, and postoperative follow-up.

This guideline is intended to help physicians and surgeons as well as endoscopists and radiologists making the diagnosis. It was also designed to allow patients and populations to provide medical information.

METHODS

Constitution of the project groups and review panels
The present guideline was initiated by the Korean Anti-Reflux Surgery (KARS) Study Group. Experts participated in the guideline development methodology (National Evidence-Based Healthcare Collaborating Agency). To develop this guideline, the KARS Study Group organized the guideline committee, which established the project working groups and review panels.

Literature review method
A systematic literature search was performed of MEDLINE, EMBASE, and the Cochrane Library for articles published on or before February 2, 2018. Hand-searching was also performed to complement the results. Relevant studies were searched by pairs of clinical experts. Inclusion and exclusion criteria were predefined and tailored to key questions. Articles were screened by title and abstract and the full text was retrieved for review. Two reviewers performed each step and consensus was reached.

We critically appraised the quality of the selected studies using risk of bias tools. We used the Cochrane Risk of Bias for randomized controlled trials (RCTs) [15], risk of bias for nonrandomized studies for non-RCTs [16], quality assessment of diagnostic accuracy studies-2 for diagnostic studies [17], and a measurement tool to assess systematic reviews for systematic reviews/meta-analyses [18]. The panels independently assessed the studies and consensus was reached. Disagreements were resolved by discussion and a third reviewer.

We extracted the data using a pre-defined format and synthesized it qualitatively. Evidence tables were created according to key questions.

Levels of evidence
Levels of evidence and grading of recommendations were modified based on Scottish Intercollegiate Guidelines Network [19] and Grading of Recommendations, Assessment, Development and Evaluation (GRADE) methods [20]. Level of evidence was classified as 4 levels; the main factors were study design and quality (Table 1). We also considered outcome consistency.
Recommendation grades were classified into 5 levels using modified GRADE methodology: strong for, weak for, weak against, strong against, and no recommendation (Table 2). We considered evidence level, clinical applicability, benefit, and harm as recommendation factors. A committee reviewed the draft of the working group then discussed the grades until consensus was reached.

**RESULTS**

**Definition**

GERD is defined as the stomach contents refluxing into the esophagus and causing uncomfortable symptoms and complications with or without an esophageal mucosal break [21-24]. According to the Montreal Consensus, “GERD is a condition which develops when the reflux of stomach contents causes troublesome symptoms and/or complications” [25]. Complications include esophagitis, asthma due to reflux, aspiration pneumonia, and laryngitis [26-28]. From the surgical point of view, GERD is mainly caused by the failure of anti-reflux barriers such as a defective lower esophagus sphincter (LES), a gastric emptying disorder, or failed esophageal peristalsis [29].

**Symptoms**

Symptoms of GERD vary widely; esophageal symptoms such as heartburn and regurgitation are the most characteristic features, while gastrointestinal symptoms such as dyspepsia, epigastric pain, and somatoform disorder may also occur [30-43]. Extrasophagel symptoms include cough, hoarseness, globus, and shortness of breath, and they may be associated with reflux cough syndrome, reflux laryngitis syndrome, reflux asthma syndrome, and reflux dental erosion syndrome [28,44-52].
Diagnosis and preoperative evaluation

An objective diagnosis of GERD before surgery is essential [53-55]. The purpose of the preoperative examination is to select patients who will benefit from surgical treatment. Controversy persists about the type and order of preoperative examinations [56-58].

Esophagogastroduodenoscopy (EGD)

EGD is the most important diagnostic tool for confirming the diagnosis of GERD. The identification of Barrett’s esophagus, mucosal breaks such as esophagitis, hiatal hernia, and biopsies to rule out malignancy are allowed by EGD [59-65].

24-hour pH monitoring

Another important diagnostic tool is 24-hour pH monitoring [66-68]. Due to the lack of evidence of GERD in EGD, 24-hour pH monitoring is required to distinguish between acid reflux and non-acid reflux [55,69,70]. It is also an important predictive factor of prognosis after surgical treatment [71,72]. This examination should be performed by interrupting the PPI or antisecretory agent [73]. Impedance pH monitoring, which has multiple channels for detecting acid reflux in the esophagus, was recently introduced [74]. However, the benefits of impedance pH monitoring compared with conventional 24-hour pH monitoring is controversial [73,75].

Esophageal manometry

Esophageal manometry is not as important as EGD or pH monitoring, but it can provide important information for the diagnosis of LES [76-78]. Although there is little evidence of the preoperative necessity for esophageal manometry, it is important to identify otorhinolaryngologic problems and esophageal motility disorders including achalasia [79,80].

Barium swallow test

The barium swallow test is less important than other tests but has the advantage of revealing the anatomical structure. Its use may be helpful in cases of a shortened esophagus due to a large hiatal hernia [5].

Further diagnostic tools

Further diagnostic tools such as high-resolution manometry, planimetry, and scintigraphy have been introduced recently, but substantive evidence to support them is lacking [81-86].

Operation indication and efficacy

Medical versus surgical treatment: Is anti-reflux surgery more effective than PPI for treating GERD? (KQ1)

Statement 1. Anti-reflux surgery is recommended to patients with GERD for its symptomatic relief, ability to increase quality of life, superior long-term outcomes, and cost-effectiveness. (level of evidence: high, strength of recommendation: strong for)

Anti-reflux surgery is considered an effective treatment option for GERD and is widely performed in Western countries. Many clinical trials comparing anti-reflux surgery and PPI for GERD were conducted, and these trials found anti-reflux surgery as effective as or more effective than PPI at controlling GERD symptoms over a follow-up period of 5 years [87-96]. In addition, several studies among them demonstrated that anti-reflux surgery was likely to be cost-effective compared to medical treatment [90,92,94]. From mid 2000s, clinical trials
of laparoscopic anti-reflux surgery versus PPI have reported similar outcomes to those of the open approach [90,91,93-95,97,98].

A prospective randomized open parallel-group multicenter trial comparing the efficacy and safety of laparoscopic anti-reflux surgery with that of esomeprazole 20 or 40 mg/d over 5 years in patients with chronic GERD recently demonstrated that esophageal acid exposure was significantly reduced in the laparoscopic anti-reflux surgery group (n=116) compared with the PPI group (n=151) (baseline, 8.6% vs. 8.8%; after 6 months, 0.7% vs. 2.1%; P<0.001; after 5 years, 0.7% vs. 1.9%; P<0.001) [95]. In terms of cost efficacy of anti-reflux surgery, 1 study recently compared the cost-effectiveness of laparoscopic surgery (n=155) and medical management (n=104) using the data of a randomized multicenter trial (REFLUX). The results indicated that laparoscopic anti-reflux surgery is cost-effective provided that its clinical benefits are sustained in the medium to long-term [92]. Thus, anti-reflux surgery is an excellent treatment option with a better long-term effect and cost-effectiveness compared to PPI. In GERD patients, laparoscopic anti-reflux surgery is strongly recommended.

Surgical treatment for refractory GERD: Is anti-reflux surgery more effective than PPI for treating refractory GERD? (KQ2)

Statement 2. Anti-reflux surgery could be considered for a substantial proportion of patients showing an inadequate response to PPI therapy. Thorough examinations for the differential diagnosis and careful patient selection should be performed in those patients prior to the anti-reflux surgery. (level of evidence: moderate, strength of recommendation: weak for)

Surgery for GERD has been proven effective over long-term follow-up [87], but a concern remains about its indications for surgery to include patients who respond poorly to medical therapy. However, a few studies showed that patients with a poor response to PPI treatment can have good surgical outcomes [99-109].

Anvari and Allen [99] first showed that poor responders showed significant improvement in postoperative symptom scores and quality-of-life scores associated with significant reductions in lower esophageal acid exposure when anti-reflux surgery was performed in a specialized center on appropriately selected patients. Wilkerson et al. [100] also demonstrated a significant decrease in postoperative symptom scores in both good and poor responders; however, the poor responders tended to show a lower percentage of excellent or good surgical outcomes (Visick I or II: 94% vs. 87%, respectively; P=0.08). In a recent prospective study, PPI responders and non-responders showed comparable anatomical and functional improvements, but PPI responders reported significant relief of both typical and atypical symptoms than PPI non-responders (heartburn: 93% vs. 73%, P=0.01; regurgitation: 96% vs. 84%, P=0.04; atypical symptoms (asthma/chest pain/cough): 96.6% vs. 83.9%, P=0.002) [108].

Surgical treatment for extraesophageal symptoms: Is anti-reflux surgery more effective than PPI for controlling extraesophageal symptoms? (KQ3)

Statement 3. Anti-reflux surgery is recommended for gastroesophageal reflux patients with extraesophageal manifestations. (level of evidence: moderate, strength of recommendation: strong for)
GERD typically manifests as heartburn and regurgitation, but it can also present as extraesophageal manifestations such as asthma, chronic cough, laryngitis, hoarseness, and chronic sore throat. Despite a lack of well-designed RCTs in this area, some studies have shown that extraesophageal manifestations can be effectively managed by anti-reflux surgery. In incomplete clinical responses to medication, anti-reflux surgery augments the treatment of laryngopharyngeal reflux (LPR) in terms of the reflux symptom index (RSI) score, reflux finding score, and reflux-based specific quality of life scale [110]. Three years of follow-up after anti-reflux surgery showed that it effectively relieved the symptoms of LPR in selected populations. Benefits are seen within 1 month of surgery and persist for at least 3 years [111]. Long-term follow-up data (median follow-up, 91 months) have shown that 61% of patients reported no or mild reflux laryngitis symptoms postoperatively and that 69% of the patients evaluated their voice quality as improved after surgery. The majority of reflux laryngitis patients achieve long-term symptomatic benefit and satisfaction after surgery [112].

Comparing the 25 patients in the anti-reflux surgery group and 28 patients in the PPI group with extraesophageal manifestations, improvements in RSI score (P<0.005) and symptom scores of cough (P=0.032), mucus (P=0.011), and throat clearing (P=0.022) were significantly superior in the surgery group to those in the PPI group [9]. A systemic review and meta-analysis pooled data from 21 reports and reported GERD-related chronic laryngitis patients. The objective response rates were 80% for anti-reflux surgery (95% confidence interval [CI], 67%–93%; 3 studies, 123 patients) versus 64% for anti-reflux medicine (95% CI, 50%–77%; 18 studies, 2,741 patients). There was an increase in the effect among patients treated with surgery [113].

**Surgical technique**

**Total versus partial fundoplication: Is partial fundoplication more effective than total fundoplication for treating GERD? (KQ4)**

The surgical treatment of choice for GERD is total or partial fundoplication [114]. Many studies that compared total and partial fundoplication for GERD proved the effects and side effects of both procedures [114-120].

A meta-analysis of 5 RCTs compared partial (n=227) and total (n=231) fundoplication and reported that esophageal acid exposure (standardized mean difference [SMD], 0.19; P=0.15), esophagitis (19% vs. 13%, P=0.34), heartburn score (SMD, 1.27, P=0.13), dilatation rate (1.4% vs. 2.8%, P=0.39), reoperation rate (5.7% vs. 2.8%, P=0.13), perioperative outcome, regurgitation, PPI use, lower esophageal sphincter pressure, and patient satisfaction with partial fundoplication were similar to that of total fundoplication at 1 year after surgery. In addition, the Dakkak dysphagia score (2.8 vs. 4.8, weighted mean difference: −2.25, P<0.001), gas and bloating (11% vs. 18%, P=0.04), flatulence (14% vs. 25%, P=0.02), inability to belch (19% vs. 31%, P=0.05), and relief of bloating (34% vs. 44%, P=0.04) were lower after partial fundoplication. At 5 years post-surgery, the Dakkak dysphagia score, flatulence, inability to belch, and inability to relieve bloating were still lower after partial fundoplication, while heartburn score, dilatation rate, reoperation rate, PPI use, and patient satisfaction rates were similar [116].
A meta-analysis of 7 RCTs that compared anterior (n=345) and posterior (n=338) fundoplication reported that esophageal acid exposure (3.3% vs. 0.8%, P<0.001), heartburn (21% vs. 8%, P<0.001), and reoperation rate (8% vs. 4%, P=0.06) were higher after anterior fundoplication in the short term. On the other hand, the Dakkak dysphagia score (2.5 vs. 5.7, P<0.001) was lower after anterior fundoplication. Esophagitis, regurgitation, and perioperative outcomes were similar. In the long-term, heartburn (31% vs. 14%, P<0.001), PPI use (25% vs. 10%, P=0.002), and reoperation (10% vs. 5%, P=0.03) rates were higher after anterior fundoplication, while the Dakkak dysphagia score and the inability to belch, gas and bloating, and patient satisfaction rates were similar [118].

**Hiatal hernia**

*Fundoplication in hiatal hernia: Is fundoplication necessary for paraesophageal hernia (PEH)? (KQ5)*

PEH is defined as a defect in the diaphragmatic hiatus that can cause significant sequelae. For many years, the need for fundoplication at the time of laparoscopic repair of PEH has been controversial.

Some authors argue that postoperative gastroesophageal reflux is uncommon in patients without fundoplication. The risk of postoperative dysphagia can be reduced by not performing fundoplication [121,122]. In practice, however, most surgeons tend to perform fundoplication at the time of PEH repair [123,124]. Fundoplication can minimize the possibility of postoperative gastroesophageal reflux caused by disruption of the hiatus. In particular, some data support that fundoplication may anchor the cardia below the diaphragm, thereby decreasing the recurrence rate [124,125].

A recent pilot RCT showed that the routine addition of fundoplication to PEH repair is reasonable for decreasing postoperative reflux and concomitant esophagitis and that fundoplication-related side effects are not clinically significant [126].

**ACKNOWLEDGMENTS**

Review Panel (Steering Committee of Korean Anti-Reflux Surgery [KARS] study group):
Dongbaek Kang (Department of Surgery, Wonkwang University Hospital), Hyoung-Il Kim (Department of Surgery, Yonsei University College of Medicine), Jeong Goo Kim (Department of Surgery, Daejeon St. Mary’s Hospital, The Catholic University of Korea), Jin-Jo Kim (Department of Surgery, Incheon St. Mary’s Hospital, The Catholic University of Korea), Jong-Han Kim (Department of Surgery, Korea University College of Medicine), Joong-Min Park (Department of Surgery, Chung-Ang University College of Medicine), Junhyun Lee (Department of Surgery, Bucheon St. Mary’s Hospital, The Catholic University of Korea), Kyo Young Song (Department of Surgery, Uijeongbu St. Mary’s Hospital, The Catholic University of Korea), Kyung Won Seo (Division of Gastrointestinal surgery, Department of Surgery, Kosin University Gospel Hospital), Oh Kyoungh Kwon (Gastric Cancer Center, Kyungpook National University Chilgok Hospital), Sang-II Lee (Department of Surgery, Chungnam National University Hospital), Sang-Uk Han (Department of Surgery, School of Medicine,
Ajou University), Sungsoo Kim (Department of Surgery, College of Medicine, Chosun University), Sungsoo Park (Department of Surgery, Korea University College of Medicine).

SUPPLEMENTARY MATERIALS

Supplementary Table 1
Quality assessment
Click here to view

Supplementary Table 2
Evidence profile
Click here to view

Supplementary Fig. 1
Flowcharts of the literature search and study selection process.
Click here to view

REFERENCES

1. Jung HK. Epidemiology of gastroesophageal reflux disease in Asia: a systematic review. J Neurogastroenterol Motil 2011;17:14-27.
   PUBMED | CROSSREF
2. Savarino E, de Borroli N, De Cassan C, Della Coletta M, Bartolo O, Furnari M, et al. The natural history of gastro-esophageal reflux disease: a comprehensive review. Dis Esophagus 2017;30:1-9.
   PUBMED
3. Ronkainen J, Agréus L. Epidemiology of reflux symptoms and GORD. Best Pract Res Clin Gastroenterol 2013;27:325-337.
   PUBMED | CROSSREF
4. Kim KM, Cho YK, Bae SJ, Kim DS, Shim KN, Kim JH, et al. Prevalence of gastroesophageal reflux disease in Korea and associated health-care utilization: a national population-based study. J Gastroenterol Hepatol 2012;27:741-745.
   PUBMED | CROSSREF
5. Stefanidis D, Hope WW, Kohn GP, Reardon PR, Richardson WS, Fanelli RD, et al. Guidelines for surgical treatment of gastroesophageal reflux disease. Surg Endosc 2010;24:2647-2669.
   PUBMED | CROSSREF
6. Fuchs KH, Babic B, Breithaupt W, Dallemagne B, Fingerhut A, Furnee E, et al. EAES recommendations for the management of gastroesophageal reflux disease. Surg Endosc 2014;28:1753-1773.
   PUBMED | CROSSREF
7. Richter JE, Kumar A, Lipka S, Miladinovic B, Velanovich V. Efficacy of laparoscopic nissen fundoplication vs transoral incisionless fundoplication or proton pump inhibitors in patients with gastroesophageal reflux disease: a systematic review and network meta-analysis. Gastroenterology 2018;154:1298-1308.e7.
   PUBMED | CROSSREF
8. Semb S, Helgstrand F, Hjørner F, Bytzer P. Persistent severe hypomagnesemia caused by proton pump inhibitor resolved after laparoscopic fundoplication. World J Gastroenterol 2017;23:6907-6910.
   PUBMED | CROSSREF
9. Zhang C, Hu ZW, Yan C, Wu Q, Wu JM, Du X, et al. Nissen fundoplication vs proton pump inhibitors for laryngopharyngeal reflux based on pH-monitoring and symptom-scale. World J Gastroenterol 2017;23:3546-3555.
   PUBMED | CROSSREF
10. Nwokediuko SC. Current trends in the management of gastroesophageal reflux disease: a review. ISRN Gastroenterol 2012;2012:391631.

11. Armijo PR, Hennings D, Leon M, Pratap A, Wheeler A, Oleynikov D. Surgical management of gastroesophageal reflux disease in patients with severe esophageal dysmotility. J Gastrointest Surg 2018. doi: 10.1007/s11605-018-3968-6 [In press].

12. Iwakiri K, Kinoshita Y, Habu Y, Oshima T, Manabe N, Fujiwara Y, et al. Evidence-based clinical practice guidelines for gastroesophageal reflux disease 2015. J Gastroenterol 2016;51:751-767.

13. Lee JH, Cho YK, Jeon SW, Kim JH, Kim NY, Lee JS, et al. Guidelines for the treatment of gastroesophageal reflux disease. Korean J Gastroenterol 2011;57:57-66.

14. Jung HK, Hong SJ, Jo YJ, Jeon SW, Cho YK, Lee KJ, et al. Updated guidelines 2012 for gastroesophageal reflux disease. Korean J Gastroenterol 2012;60:195-218.

15. Higgins JP, Altman DG, Gøtzsche PC, Jüni P, Moher D, Oxman AD, et al. The Cochrane Collaboration’s tool for assessing risk of bias in randomised trials. BMJ 2011;343:d5928.

16. Kim SY, Park JE, Lee YJ, Seo HI, Sheen SS, Hahn S, et al. Testing a tool for assessing the risk of bias for nonrandomized studies showed moderate reliability and promising validity. J Clin Epidemiol 2013;66:408-414.

17. Whiting PF, Rutjes AW, Westwood ME, Mallett S, Deeks JJ, Reitsma JB, et al. QUADAS-2: a revised tool for the quality assessment of diagnostic accuracy studies. Ann Intern Med 2011;155:529-536.

18. Shea BJ, Hamel C, Wells GA, Bouter LM, Kristjansson E, Grimshaw J, et al. AMSTAR is a reliable and valid measurement tool to assess the methodological quality of systematic reviews. J Clin Epidemiol 2009;62:1013-1020.

19. The Scottish Intercollegiate Guidelines Network (SIGN). SIGN 50: a guideline developer's handbook. Edinburgh: SIGN, 2014.

20. Schünemann H, Brozek J, Guyatt G, Oxman AD, eds. Handbook for Grading the Quality of Evidence and the Strength of Recommendations Using the GRADE Approach. [place unknown]: GRADE Working Group, 2013.

21. Dent J, Brun J, Fendrick AM, Fennerty MB, Janssens J, Kahrilas PJ, et al. An evidence-based appraisal of reflux disease management— the Genval Workshop Report. Gut 1999;44 Suppl 2:S1-S16.

22. Chandrasoma P. How the pathologist can aid in the assessment of gastroesophageal reflux disease. Curr Opin Gastroenterol 2018;34:233-242.

23. Kim A, Shin N, Lee HJ, Jo HJ, Kim JY, Kim YK, et al. Histopathological features of the gastroesophageal junction: an Eastern view. Histol Histopathol 2015;30:689-695.

24. Chandrasoma PT. Histologic definition of gastro-esophageal reflux disease. Curr Opin Gastroenterol 2013;29:460-467.

25. Vakil N, van Zanten SV, Kahrilas P, Dent J, Jones R; Global Consensus Group. The Montreal definition and classification of gastroesophageal reflux disease: a global evidence-based consensus. Am J Gastroenterol 2006;101:1900-1920; quiz 1943.

26. Dimenäs E. Methodological aspects of evaluation of Quality of Life in upper gastrointestinal diseases. Scand J Gastroenterol Suppl 1993;199:18-21.

27. Bernard F, Dupont C, Viala P. Gastroesophageal reflux and upper airway diseases. Clin Rev Allergy 1990;8:403-425.

28. Lv HJ, Qiu ZM. Refractory chronic cough due to gastroesophageal reflux: definition, mechanism and management. World J Methodol 2015;5:149-156.
29. Rengarajan A, Bolkhir A, Gor P, Wang D, Munigala S, Gyawali CP. Esophagogastric junction and esophageal body contraction metrics on high-resolution manometry predict esophageal acid burden. Neurogastroenterol Motil 2018;30:e13267.
PUBMED | CROSSREF

30. Dent J, El-Serag HB, Wallander MA, Johansson S. Epidemiology of gastro-oesophageal reflux disease: a systematic review. Gut 2005;54:710-717.
PUBMED | CROSSREF

31. Kahrilas PJ, Jonsson A, Denison H, Wernersson B, Hughes N, Howden CW. Concomitant symptoms itemized in the reflux disease questionnaire are associated with attenuated heartburn response to acid suppression. Am J Gastroenterol 2012;107:1354-1360.
PUBMED | CROSSREF

32. Tack J, Caenepeel P, Arts J, Lee KJ, Sifrim D, Janssens J. Prevalence of acid reflux in functional dyspepsia and its association with symptom profile. Gut 2005;54:1370-1376.
PUBMED | CROSSREF

33. Savarino V, Savarino E, Parodi A, Dulbecco P. Functional heartburn and non-erosive reflux disease. Dig Dis 2007;25:172-174.
PUBMED | CROSSREF

34. de Bortoli N, Tolone S, Frazzoni M, Martinucci I, Sgherri G, Albano E, et al. Gastroesophageal reflux disease, functional dyspepsia and irritable bowel syndrome: common overlapping gastrointestinal disorders. Ann Gastroenterol 2018;31:639-648.
PUBMED

35. Choung RS, Richard Locke G 3rd, Schleck CD, Zinsmeister AR, Talley NJ. Multiple functional gastrointestinal disorders linked to gastroesophageal reflux and somatization: a population-based study. Neurogastroenterol Motil 2017;29.
PUBMED | CROSSREF

36. Fuchs KH, Musial F, Ulbricht F, Breithaupt W, Reinisch A, Babic B, et al. Foregut symptoms, somatoform tendencies, and the selection of patients for antireflux surgery. Dis Esophagus 2017;30:1-10.
PUBMED | CROSSREF

37. Jarbøl DE, Rasmussen S, Balasubramaniam K, Elnegaard S, Haastrup PF. Self-rated health and functional capacity in individuals reporting overlapping symptoms of gastroesophageal reflux disease, functional dyspepsia and irritable bowel syndrome - a population based study. BMC Gastroenterol 2017;17:65.
PUBMED | CROSSREF

38. Lee SW, Lee TY, Lien HC, Peng YC, Yeh HJ, Chang CS. Correlation between symptom severity and health-related life quality of a population with gastroesophageal reflux disease. Gastroenterol Res 2017;10:78-83.
PUBMED | CROSSREF

39. Yamasaki T, Fass R. Noncardiac chest pain: diagnosis and management. Curr Opin Gastroenterol 2017;33:293-300.
PUBMED | CROSSREF

40. Al Saadi T, Idris A, Turk T, Alkhatib M. Epidemiology and risk factors of uninvestigated dyspepsia, irritable bowel syndrome, and gastroesophageal reflux disease among students of Damascus University, Syria. J Epidemiol Glob Health 2016;6:285-293.
PUBMED | CROSSREF

41. Hsu CS, Liu TT, Wen SH, Wang CC, Yi CH, Chen JH, et al. Clinical, metabolic, and psychological characteristics in patients with gastroesophageal reflux disease overlap with irritable bowel syndrome. Eur J Gastroenterol Hepatol 2015;27:516-522.
PUBMED | CROSSREF

42. Rasmussen S, Jensen TH, Henriksen SL, Haastrup PF, Larsen PV, Søndergaard J, et al. Overlap of symptoms of gastroesophageal reflux disease, dyspepsia and irritable bowel syndrome in the general population. Scand J Gastroenterol 2015;50:162-169.
PUBMED | CROSSREF

43. Lee SW, Lien HC, Lee TY, Yang SS, Yeh HJ, Chang CS. Heartburn and regurgitation have different impacts on life quality of patients with gastroesophageal reflux disease. World J Gastroenterol 2014;20:12277-12282.
PUBMED | CROSSREF

44. Hom C, Vaezi MF. Extraesophageal manifestations of gastroesophageal reflux disease. Gastroenterol Clin North Am 2013;42:71-91.
PUBMED | CROSSREF

45. Patel DA, Sharda R, Choksi YA, Slaughter JC, Higginbotham T, Garrett CG, et al. Model to select on-therapy vs off-therapy tests for patients with refractory esophageal or extra-esophageal symptoms. Gastroenterology 2018;155:1729-1740.e1.
CROSSREF
46. Vaezi MF, Katzka D, Zerbib F. Extraesophageal symptoms and diseases attributed to GERD: where is the pendulum swinging now? Clin Gastroenterol Hepatol 2018;16:1018-1029.

47. Herregods TVK, Pauwels A, Tack J, Smout APM, Breidenoord AI. Reflux-cough syndrome: assessment of temporal association between reflux episodes and cough bursts. Neurogastroenterol Motil 2017;29.

48. Jung HK, Choi MG, Baek MK, Wu JC. Development and psychometric assessment of a self-evaluation questionnaire for gastroesophageal reflux disease. J Neurogastroenterol Motil 2018;24:584-592.

49. Hungin APS, Molloy-Bland M, Scarpignato C. Revisiting montreal: new insights into symptoms and their causes, and implications for the future of GERD. Am J Gastroenterol 2018. doi: 10.1038/s41395-018-0287-1 [In press].

50. Li Y, Yu F, Niu L, Long Y, Tay FR, Chen J. Association between bruxism and symptomatic gastroesophageal reflux disease: a case-control study. J Dent 2018;77:51-58.

51. Gelardi M, Ciprandi G. Focus on gastroesophageal reflux (GER) and laryngopharyngeal reflux (LPR): new pragmatic insights in clinical practice. J Biol Regul Homeost Agents 2018;32 Suppl. 2:41-47.

52. Emilsson OL, Benediktsdottir B, Olafsson I, Cook E, Júlíusson S, Berg S, et al. Definition of nocturnal gastroesophageal reflux for studies on respiratory diseases. Scand J Gastroenterol 2016;51:524-530.

53. Bashashati M, Hejazi RA, Andrews CN, Storr MA. Gastroesophageal reflux symptoms not responding to proton pump inhibitor: GERD, NERD, NARD, esophageal hypersensitivity or dyspepsia? Can J Gastroenterol Hepatol 2014;28:335-341.

54. Nasi A, Queiroz NS, Michelsohn NH. Prolonged gastroesophageal reflux monitoring by impedance-phmetry: a review of the subject pondered with our experience with 1,200 cases. Arq Gastroenterol 2018;55 Suppl 1:76-84.

55. Gharib A, Forootan M, Sharifzadeh M, Abdi S, Darvishi M, Eghbali A. Diagnostic efficacy of 24-hr esophageal pH monitoring in patients with refractory gastroesophageal reflux disease. Open Access Maced J Med Sci 2018;6:1235-1238.

56. Fisichella PM, Schlotthmann F, Patti MG. Evaluation of gastroesophageal reflux disease. Updates Surg 2018;70:309-313.

57. Chae S, Richter JE. Wireless 24, 48, and 96 hour or impedance or oropharyngeal prolonged pH monitoring: which test, when, and why for GERD? Curr Gastroenterol Rep 2018;20:52.

58. Świdnicka-Siergiejko AK, Wróblewski E, Hady HR, Luba M, Dadan J, Dąbrowski A. Esophageal pH and impedance reflux parameters in relation to body mass index, obesity-related hormones, and bariatric procedures. Pol Arch Intern Med 2018;128:594-603.

59. Mochizuki N, Fujita T, Kobayashi M, Yamazaki Y, Terao S, Sanuki T, et al. Factors associated with the presentation of erosive esophagitis symptoms in health checkup subjects: a prospective, multicenter cohort study. PLoS One 2018;13:e0196848.

60. Ribolsi M, Cicala M, Zentilin P, Neri M, Mauro A, Efthymakis K, et al. Prevalence and clinical characteristics of refractoriness to optimal proton pump inhibitor therapy in non-erosive reflux disease. Aliment Pharmacol Ther 2018;48:1074-1081.

61. Dewan KR, Patowary BS, Bhattarai S, Shrestha G. Barrett’s esophagus in patients with gastroesophageal reflux disease. J Nepal Health Res Counc 2018;16:144-148.

62. Schlotthmann F, Andolfi C, Herbell FA, Rebecchi F, Allaix ME, Patti MG. GERD: presence and size of hiatal hernia influence clinical presentation, esophageal function, reflux profile, and degree of mucosal injury. Am Surg 2018;84:978-982.
63. Kahrilas P, Yadlapati R, Roman S. Emerging dilemmas in the diagnosis and management of gastroesophageal reflux disease. F1000 Res 2017;6:1748.

64. Muñoz-Largacha JA, Fernando HC, Little VR. Optimizing the diagnosis and therapy of Barrett’s esophagus. J Thorac Dis 2017;9:S146-S153.

65. Omstead AN, Kosovec JE, Matsui D, Martin SA, Smith MA, Aaron Guel D, et al. Serial endoscopic evaluation of esophageal disease in a cancer model: a paradigm shift for esophageal adenocarcinoma (EAC) drug discovery and development. Cancer Invest 2018;36:363-370.

66. Liu S, Xu M, Yang J, Qi H, He F, Zhao X, et al. Research on gastroesophageal reflux disease based on dynamic features of ambulatory 24-hour esophageal pH monitoring. Comput Math Methods Med 2017;2017:9239074.

67. Fass R, Fennerty MB, Johnson C, Camargo L, Sampliner RE. Correlation of ambulatory 24-hour esophageal pH monitoring results with symptom improvement in patients with noncardiac chest pain due to gastroesophageal reflux disease. J Clin Gastroenterol 1999;28:36-39.

68. Chen CL, Orr WC. Analysis of 24-hour esophageal pH monitoring: the effect of state of consciousness. Curr Gastroenterol Rep 2008;10:258-262.

69. Vardar R, Keskin M. Indications of 24-h esophageal pH monitoring, capsule pH monitoring, combined pH monitoring with multichannel impedance, esophageal manometry, radiology and scintigraphy in gastroesophageal reflux disease? Turk J Gastroenterol 2017;28:S16-S21.

70. Frazzoni L, Frazzoni M, de Bortoli N, Tolone S, Martinucci I, Fuccio L, et al. Critical appraisal of Rome IV criteria: hypersensitive esophagus does belong to gastroesophageal reflux disease spectrum. Ann Gastroenterol 2018;31:17.

71. Campos GM, Peters JH, DeMeester TR, Oberg S, Crookes PF, Tan S, et al. Multivariate analysis of factors predicting outcome after laparoscopic Nissen fundoplication. J Gastrointest Surg 1999;3:292-300.

72. Patel A, Wang D, Sainani N, Sayuk GS, Gyawali CP. Distal mean nocturnal baseline impedance on pH-impedance monitoring predicts reflux burden and symptomatic outcome in gastro-oesophageal reflux disease. Aliment Pharmacol Ther 2016;44:890-898.

73. Hoshino M, Omura N, Yano F, Tsuboi K, Yamamoto SR, Akimoto S, et al. Comparison of the multichannel intraluminal impedance pH and conventional pH for measuring esophageal acid exposure: a propensity score-matched analysis. Surg Endosc 2017;31:5241-5247.

74. Frazzoni M, de Bortoli N, Frazzoni L, Tolone S, Savarino V, Savarino E. Impedance-pH monitoring for diagnosis of reflux disease: new perspectives. Dig Dis Sci 2017;62:1881-1889.

75. Shin MS, Shim JO, Moon JS, Kim HS, Ko JS, Choi JH, et al. Impedance-pH monitoring and conventional pH monitoring are complementary methods to detect association between gastroesophageal reflux and apnea-related symptoms in preterm infants and neonates. J Matern Fetal Neonatal Med 2012;25:2406-2410.

76. Vela MF. Diagnostic work-up of GERD. Gastrointest Endosc Clin N Am 2014;24:655-666.

77. Lord RV, DeMeester SR, Peters JH, Hagen JA, Elyssnia D, Sheth CT, et al. Hiatal hernia, lower esophageal sphincter incompetence, and effectiveness of Nissen fundoplication in the spectrum of gastroesophageal reflux disease. J Gastrointest Surg 2009;13:602-610.

78. Zevin B, Jones EL, Martin Del Campo SE, Perry KA. Omission of preoperative esophageal manometry does not alter operative approach or postoperative dysphagia following laparoscopic paraesophageal hernia repair. Dis Esophagus 2017;30:1-6.

79. Herbella FA, Andolfi C, Vigneswaran Y, Patti MG, Pinna BR. Importance of esophageal manometry and pH monitoring for the evaluation of otorhinolaryngologic (ENT) manifestations of GERD: A multicenter study. J Gastrointest Surg 2016;20:1673-1678.

https://doi.org/10.5230/jgc.2018.18.e41
80. Gyawali CP, Roman S, Bredenoord AJ, Fox M, Keller J, Pandolfo JE, et al. Classification of esophageal motor findings in gastro-esophageal reflux disease: conclusions from an international consensus group. Neurogastroenterol Motil 2017;29.

81. Savarino EV, Tolone S, Bartolo O, de Cassan C, Caccaro R, Galeazzi F, et al. The GerdQ questionnaire and high resolution manometry support the hypothesis that proton pump inhibitor-responsive oesophageal eosinophilia is a GERD-related phenomenon. Aliment Pharmacol Ther 2016;44:522-530.

82. Sharma BG, Khanna K, Kumar N, Nishad DK, Basu M, Bhatnagar A. Development and gamma scintigraphy evaluation of gastric retentive calcium ion-based oral formulation: an innovative approach for the management of gastro-esophageal reflux disease (GERD). Drug Dev Ind Pharm 2017;43:1759-1769.

83. Ahuja NK, Clarke JO. The role of impedance planimetry in the evaluation of esophageal disorders. Curr Gastroenterol Rep 2017;19:7.

84. Rey JW, Deris N, Marquardt JU, Thomaidis T, Moehler M, Kittner JM, et al. High-definition endoscopy with iScan and Lugol’s solution for the detection of inflammation in patients with nonerosive reflux disease: histologic evaluation in comparison with a control group. Dis Esophagus 2016;29:185-191.

85. Assirati FS, Hashimoto CL, Dib RA, Fontes LH, Navarro-Rodriguez T. High definition endoscopy and “narrow band imaging” in the diagnosis of gastroesophageal reflux disease. Arq Bras Cir Dig 2014;27:59-65.

86. Rey E, Barceló M, Zapardiel J, Sobreviela E, Muñoz M, Díaz-Rubio M. Is the reflux disease questionnaire useful for identifying GERD according to the Montreal definition? BMC Gastroenterol 2014;14:17.

87. Lundell L, Miettinen P, Myrvold HE, Pedersen SA, Liedman B, Hatlebakk JG, et al. Continued (5-year) followup of a randomized clinical study comparing antireflux surgery and omeprazole in gastroesophageal reflux disease. J Am Coll Surg 2001;192:172-179; discussion 179-181.

88. Lundell L, Miettinen P, Myrvold HE, Hatlebakk JG, Wallin L, Malm A, et al. Seven-year follow-up of a randomized clinical trial comparing proton-pump inhibition with surgical treatment for reflux oesophagitis. Br J Surg 2007;94:198-203.

89. Myrvold HE, Lundell L, Miettinen P, Pedersen SA, Liedman B, Hatlebakk J, et al. The cost of long term therapy for gastro-oesophageal reflux disease: a randomised trial comparing omeprazole and open antireflux surgery. Gut 2001;49:488-494.

90. Cookson E, Flood C, Koo B, Mahon D, Rhodes M. Short-term cost effectiveness and long-term cost analysis comparing laparoscopic Nissen fundoplication with proton-pump inhibitor maintenance for gastro-oesophageal reflux disease. Br J Surg 2005;92:700-706.

91. Mehta S, Bennett J, Mahon D, Rhodes M. Prospective trial of laparoscopic nissen fundoplication versus proton pump inhibitor therapy for gastroesophageal reflux disease: seven-year follow-up. J Gastrointest Surg 2006;10:1312-1316; discussion 1316-1317.

92. Epstein D, Bojke L, Sculpher MJ; REFLUX trial group. Laparoscopic fundoplication compared with medical management for gastro-oesophageal reflux disease: cost effectiveness study. BMJ 2009;339:b2576.

93. Amari M, Allen C, Marshall J, Armstrong D, Goeree R, Ungar W, et al. A randomized controlled trial of laparoscopic Nissen fundoplication versus proton pump inhibitors for the treatment of patients with chronic gastroesophageal reflux disease (GERD): 3 year outcomes. Surg Endosc 2011;25:2547-2554.

94. Grant AM, Boachie C, Cotton SC, Faris R, Bojke L, Epstein DM, et al. Clinical and economic evaluation of laparoscopic surgery compared with medical management for gastro-oesophageal reflux disease: 5-year follow-up of multicentre randomised trial (the REFLUX trial). Health Technol Assess 2013;17:1-1467.

95. Hatlebakk JG, Zerbib F, Bruley des Varannes S, Attwood SE, Eli C, Fiocca R, et al. Gastroesophageal acid reflux control 5 years after antireflux surgery, compared with long-term esomeprazole therapy. Clin Gastroenterol Hepatol 2016;14:678-85.e3.
96. Emken BG, Lundell LR, Wallin L, Myrvold HE, Engström C, Montgomery M, et al. Effects of omeprazole or anti-reflux surgery on lower oesophageal sphincter characteristics and oesophageal acid exposure over 10 years. Scand J Gastroenterol 2017;52:1147.

PUBMED | CROSSREF

97. Mahon D, Rhodes M, Decadt B, Hindmarsh A, Lowndes R, Beckingham I, et al. Randomized clinical trial of laparoscopic Nissen fundoplication compared with proton-pump inhibitors for treatment of chronic gastro-oesophageal reflux. Br J Surg 2005;92:695-699.

PUBMED | CROSSREF

98. Grant AM, Wileman SM, Ramsay CR, Mowat NA, Krukowski ZH, Heading RC, et al. Minimal access surgery compared with medical management for chronic gastro-oesophageal reflux disease: UK collaborative randomised trial. BMJ 2008;337:dec15 2:a2664.

PUBMED | CROSSREF

99. Anvari M, Allen C. Surgical outcome in gastro-esophageal reflux disease patients with inadequate response to proton pump inhibitors. Surg Endosc 2003;17:1029-1035.

PUBMED | CROSSREF

100. Wilkerson PM, Stratford J, Jones L, Sohanpal J, Booth MI, Dehn TC. A poor response to proton pump inhibition is not a contraindication for laparoscopic antireflux surgery for gastro esophageal reflux disease. Surg Endosc 2005;19:1272-1277.

PUBMED | CROSSREF

101. Kamolz T, Granderath FA, Schweiger UM, Pointner R. Laparoscopic Nissen fundoplication in patients with nonerosive reflux disease. Long-term quality-of-life assessment and surgical outcome. Surg Endosc 2005;19:494-500.

PUBMED | CROSSREF

102. Kelly JJ, Watson DI, Chin KE, Devitt PG, Game PA, Jamieson GG. Laparoscopic Nissen fundoplication: clinical outcomes at 10 years. J Am Coll Surg 2007;205:570-575.

PUBMED | CROSSREF

103. Broeders JA, Rijnhart-de Jong HG, Draaisma WA, Bredenoord AJ, Smout AJ, Gooszen HG. Ten-year outcome of laparoscopic and conventional nissen fundoplication: randomized clinical trial. Ann Surg 2009;250:698-706.

PUBMED | CROSSREF

104. Broeders JA, Draaisma WA, Bredenoord AJ, Smout AJ, Broeders IA, Gooszen HG. Long-term outcome of Nissen fundoplication in non-erosive and erosive gastro-oesophageal reflux disease. Br J Surg 2010;97:845-852.

PUBMED | CROSSREF

105. Lal P, Leekha N, Chander J, Dewan R, Ramteke VK. A prospective nonrandomized comparison of laparoscopic Nissen fundoplication and laparoscopic Toupet fundoplication in Indian population using detailed objective and subjective criteria. J Minim Access Surg 2012;8:39-44.

PUBMED | CROSSREF

106. Cao Z, Cai W, Qin M, Zhao H, Yue P, Li Y. Randomized clinical trial of laparoscopic anterior 180° partial versus 360° Nissen fundoplication: 5-year results. Dis Esophagus 2012;25:114-120.

PUBMED | CROSSREF

107. Kellokumpu I, Voutilainen M, Haglund C, Färkkilä M, Roberts PJ, Kautiainen H. Quality of life following laparoscopic Nissen fundoplication: assessing short-term and long-term outcomes. World J Gastroenterol 2013;19:3810-3818.

PUBMED | CROSSREF

108. Hamdy E, El Nakeeb A, Hamed H, El Hemaly M, ElHak NG. Outcome of laparoscopic Nissen fundoplication for gastrooesophageal reflux disease in non-responders to proton pump inhibitors. J Gastrointest Surg 2014;18:1575-1582.

PUBMED | CROSSREF

109. Frazzoni M, Piccoli M, Coniglio R, Manta R, Frazzoni L, Melotti G. Refractory gastroesophageal reflux disease as diagnosed by impedance-pH monitoring can be cured by laparoscopic fundoplication. Surg Endosc 2013;27:2940-2946.

PUBMED | CROSSREF

110. Westcott CJ, Hopkins MB, Bach K, Postma GN, Belafsky PC, Koufman JA. Fundoplication for laryngopharyngeal reflux disease. J Am Coll Surg 2004;199:23-30.

PUBMED | CROSSREF

111. Carania RA, Kavic SM, Roth JS, Lee TH, Meyer T, Fantry GT, et al. Laparoscopic Nissen fundoplication effectively relieves symptoms in patients with laryngopharyngeal reflux. J Gastrointest Surg 2007;11:1579-87; discussion 1587-1578.

PUBMED | CROSSREF
112. Salminen P, Karvonen J, Ovaska J. Long-term outcomes after laparoscopic Nissen fundoplication for reflux laryngitis. Dig Surg 2010;27:509-514.

113. Yang Y, Wu H, Zhou J. Efficacy of acid suppression therapy in gastroesophageal reflux disease-related chronic laryngitis. Medicine (Baltimore) 2016;95:e4868.

114. Catarci M, Gentil eschi P, Papi C, Carrara A, Marrese R, Gaspari AL, et al. Evidence-based appraisal of antireflux fundoplication. Ann Surg 2004;239:325-337.

115. Roks DJ, Broeders JA, Baigrie RJ. Long-term symptom control of gastro-oesophageal reflux disease 12 years after laparoscopic Nissen or 180° anterior partial fundoplication in a randomized clinical trial. Br J Surg 2017;104:852-856.

116. Broeders JA, Roks DJ, Ahmed Ali U, Watson DI, Baigrie RJ, Cao Z, et al. Laparoscopic anterior 180-degree versus nissen fundoplication for gastroesophageal reflux disease: systematic review and meta-analysis of randomized clinical trials. Ann Surg 2013;257:850-859.

117. Broeders JA, Roks DJ, Jamieson GG, Devitt PG, Baigrie RJ, Watson DI. Five-year outcome after laparoscopic anterior partial versus Nissen fundoplication: four randomized trials. Ann Surg 2012;255:637-642.

118. Broeders JA, Roks DJ, Ahmed Ali U, Draaisma WA, Smout AJ, Haezebroek EJ. Laparoscopic anterior versus posterior fundoplication for gastroesophageal reflux disease: systematic review and meta-analysis of randomized clinical trials. Ann Surg 2011;254:39-47.

119. Broeders JA, Mauritz FA, Ahmed Ali U, Draaisma WA, Ruurda JP, Gooszen HG, et al. Systematic review and meta-analysis of laparoscopic Nissen (posterior total) versus Toupet (posterior partial) fundoplication for gastro-oesophageal reflux disease. Br J Surg 2010;97:1318-1330.

120. Hagedorn C, Lööroth H, Rydberg L, Ruth M, Lundell L. Long-term efficacy of total (Nissen-Rossetti) and posterior partial (Toupet) fundoplication: results of a randomized clinical trial. J Gastrointest Surg 2002;6:540-545.

121. Williamson WA, Ellis FH Jr, Streitz JM Jr, Shahian DM. Paraesophageal hiatal hernia: is an antireflux procedure necessary? Ann Thorac Surg 1993;56:447-451; discussion 451-442.

122. Morris-Stiff G, Hassn A. Laparoscopic paraoesophageal hernia repair: fundoplication is not usually indicated. Hernia 2008;12:299-302.

123. Draaisma WA, Gooszen HG, Tournoi E, Broeders IA. Controversies in paraesophageal hernia repair: a review of literature. Surg Endosc 2005;19:1300-1308.

124. Casabella F, Sinanan M, Horgan S, Pellegrini CA. Systematic use of gastric fundoplication in laparoscopic repair of paraesophageal hernias. Am J Surg 1996;171:485-489.

125. Oelschlager BK, Petersen RP, Brunt LM, Soper NJ, Sheppard BC, Mitsumori L, et al. Laparoscopic paraesophageal hernia repair: defining long-term clinical and anatomic outcomes. J Gastrointest Surg 2012;16:453-459.

126. Müller-Stich BP, Achtstä tter V, Diener MK, Gondan M, Warschkow R, Marra F, et al. Repair of paraesophageal hiatal hernias—is a fundoplication needed? A randomized controlled pilot trial. J Am Coll Surg 2015;221:602-610.