Thieme

Endoscopic management of gastrointestinal motility disorders – part 2: European Society of Gastrointestinal Endoscopy (ESGE) Guideline

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Bibliography

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Appendix 1s – 3s
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MAIN RECOMMENDATIONS

ESGE suggests flexible endoscopic treatment over open surgical treatment as first-line therapy for patients with a symptomatic Zenker's diverticulum of any size.
Weak recommendation, low quality of evidence, level of agreement 100 %.

ESGE recommends that emerging treatments for Zenker's diverticulum, such as Zenker's peroral endoscopic myotomy (Z-POEM) and tunneling, be considered as experimental;

these treatments should be offered in a research setting only.
Strong recommendation, low quality of evidence, level of agreement 100 %.

ESGE recommends against the widespread clinical use of transoral incisionless fundoplication (TIF) as an alternative to proton pump inhibitor (PPI) therapy or antireflux surgery in the treatment of gastroesophageal reflux disease (GERD), because of the lack of data on the long-term outcomes, the inferiority of TIF to fundoplication, and its modest efficacy in only highly selected patients. TIF may have a role for patients with mild GERD who are not willing to take PPIs or undergo antireflux surgery.
Strong recommendation, moderate quality of evidence, level of agreement 92.8 %.

ESGE recommends against the use of the Medigus ultrasonic surgical endostapler (MUSE) in clinical practice because of insufficient data showing its effectiveness and safety in patients with GERD. MUSE should be used in clinical trials only.
Strong recommendation, low quality evidence, level of agreement 100 %.

ESGE recommends against the use of antireflux mucosectomy (ARMS) in routine clinical practice in the treatment of GERD because of the lack of data and its potential complications.
Strong recommendation, low quality evidence, level of agreement 100 %.

ESGE recommends endoscopic cecostomy only after conservative management with medical therapies or retrograde lavage has failed.
Strong recommendation, low quality evidence, level of agreement 93.3 %.

ESGE recommends fixing the cecum to the abdominal wall at three points (using T-anchors, a double-needle suturing device, or laparoscopic fixation) to prevent leaks and infectious adverse events, whatever percutaneous endoscopic cecostomy method is used.
Strong recommendation, very low quality evidence, level of agreement 86.7 %.

ESGE recommends considering endoscopic decompression of the colon in patients with Ogilvie's syndrome that is not improving with conservative treatment.
Strong recommendation, low quality evidence, level of agreement 93.8 %.

ESGE recommends prompt endoscopic decompression if the cecal diameter is > 12 cm and if the Ogilvie's syndrome exists for a duration of longer than 4 – 6 days.
Strong recommendation, low quality evidence, level of agreement 87.5 %.

SOURCE AND SCOPE

This Guideline is an official statement of the European Society of Gastrointestinal Endoscopy (ESGE). It provides guidance on the endoscopic management of Zenker's diverticulum, gastroesophageal reflux disease, intractable constipation, and Ogilvie's syndrome. The Grading of Recommendations Assessment, Development, and Evaluation (GRADE) system was adopted to define the strength of recommendations and the quality of evidence.

1 Introduction

Therapeutic gastrointestinal (GI) endoscopy is rapidly evolving. Its role in the management of motility disorders of the digestive tract is increasing. The purpose of this Guideline is to provide guidance on various aspects of the endoscopic management of GI motility disorders. This is the second of two parts of the guideline, and is dedicated to Zenker's diverticulum, gastroesophageal reflux disease (GERD), intractable constipation, and Ogilvie's syndrome. The first part, published as a separate manuscript, focused on achalasia and gastroparesis.

2 Methodology

The ESGE commissioned this Guideline (Guideline Committee chair, J.v.H.) and appointed a Guideline leader (B.W.); he identified six clinical conditions of abnormal GI motility in which therapeutic endoscopy is one of the treatment possibilities: Zenker's diverticulum, achalasia, GERD, gastroparesis, intractable constipation, and Ogilvie's syndrome. These six areas were at a later stage agreed on by the Guideline committee members.

In March 2018, an email was sent out to several key opinion leaders in the field of therapeutic endoscopy to identify potential Guideline committee members. Individual ESGE members were informed about this Guideline and were asked to apply if they were interested in participating with this Guideline. Three individual members (V.L.-Z., H.L., and F.P.) were selected based on their expertise and scientific output. In addition, the European Society of Neurogastroenterology and Motility (ESNM) was approached for collaboration and scientific input. As a result, the ESNM appointed on request four Guideline committee members regarded as experts in the field of GI motility and therapy (D.P., E.S., J.T., and R.T.). Finally, a Guideline committee was formed comprising 18 members, and covering the six areas of this guideline. Six task forces were created, based on the six clinical conditions. Each task force had one or two task

ABBREVIATIONS

ARMS	antireflux mucosectomy
CT	computed tomography
EGJ	esophagogastric junction
EMR	endoscopic mucosal resection
ESD	endoscopic submucosal dissection
ESGE	European Society of Gastrointestinal Endoscopy
ESNM	European Society of Neurogastroenterology and Motility
GERD	gastroesophageal reflux disease
GI	gastrointestinal
G-POEM	gastric peroral endoscopic myotomy
GRADE	Grading of Recommendations Assessment, Development, and Evaluation
LAPEC	laparoscopically assisted percutaneous endoscopic cecostomy
LES	lower esophageal sphincter
PEG	polyethylene glycol
POEM	peroral endoscopic myotomy
PPI	proton pump inhibitor
RCT	randomized controlled trial
SB knife Jr.	Stag Beetle knife Junior
TIF	transoral incisionless fundoplication
UEG	United European Gastroenterology
Z-POEM	Zenker's POEM

force leaders, and each group member was assigned to one or more task forces (**Appendix 1s**, see online-only Supplementary Material). The kick-off meeting for this Guideline was held during United European Gastroenterology (UEG) Week, on 21 October 2018, in Vienna.

During a teleconference in November 2018, clinical questions were formulated for the six clinical conditions. Subsequently, these clinical questions were translated into research questions (**Appendix 2s**). The questions followed the PICO format (P, population in question; I, intervention; C, comparator; and O, outcomes of interest) wherever appropriate. Subsequently, systematic literature searches were done using Medline, Embase, and Cochrane library.

Evidence levels and recommendation strengths were assessed using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) system [1]. Further details on the methodology of ESGE guidelines have been reported elsewhere [2]. The results of data extraction are presented in **Appendix 3s**.

Available literature, draft recommendations, and strength of evidence were discussed during a face-to-face meeting with all group members at Schiphol Airport, Amsterdam on 12 April 2019.

In order to establish consensus-based recommendations, a modified Delphi process [3] was organized using an online voting platform (www.surveymonkey.com). Voting was based upon a five-point Likert scale (1, strongly disagree; 2, disagree; 3, neither disagree nor agree; 4, agree; 5, strongly agree). A recommendation was approved if >75 % of the members agreed (reflected by a Likert score of 4 – 5). In total three iterations of the online voting process were needed to come to the final document.

In January 2020, a draft prepared by B.W. was sent to all group members. After the agreement of all group members had been obtained, the manuscript was reviewed by the ESGE Guideline Committee Chair (J.v.H.) and two external reviewers, and was sent for further comments to the ESGE national societies and individual members. After this, it was submitted to *Endoscopy* for publication.

3 Zenker's diverticulum

Zenker's diverticulum is a pulsion diverticulum that develops in an area of weakness of the posterior hypopharynx known as the Killian triangle (between the thyropharyngeus and cricopharyngeal muscle fibers of the inferior constrictor). It is a relatively uncommon condition, with an overall prevalence estimated to be between 0.01 % and 0.11 % in the American population; it occurs most frequently in men between their 7th and 8th decades [4, 5]. Clinically, Zenker's diverticulum may manifest with symptoms such as dysphagia or regurgitation, and its associated complications [6].

The pathophysiology of Zenker's diverticulum is not fully understood, but the most widely proposed hypothesis is that a motor abnormity of the cricopharyngeus muscle creates a high pressure zone that facilitates herniation of the hypopharyngeal mucosa through the weak zone, the Killian triangle, resulting in diverticulum development [7, 8].

3.1 Diagnosis of Zenker's diverticulum

RECOMMENDATIONS

ESGE recommends the use of barium swallow radiography with video fluoroscopy in the evaluation of patients with (suspected) Zenker's diverticulum.
Strong recommendation, very low quality of evidence, level of agreement 100 %.

ESGE suggests against the use of manometry as standard in the diagnostic work-up of patients with Zenker's diverticulum.
Weak recommendation, very low quality of evidence, level of agreement 100 %.

The diagnosis of Zenker's diverticulum is suspected on the basis of clinical symptoms and is confirmed by a barium swallow with video fluoroscopy. Although Zenker's diverticulum can be diagnosed by endoscopy, fluoroscopy is considered essential because it not only provides information on pouch size, but will also give "dynamic" information on regurgitation and aspiration. This is important in determining whether Zenker's diverticulum is the real cause of a patient's symptoms.

Studies on the clinical value of manometry in Zenker's diverticulum are missing. The working group however recommends against the routine use of esophageal manometry in the work-up of patients with (suspected) Zenker's diverticulum. In individual cases (e. g. in small Zenker's diverticulum), esophageal manometry can be used to rule out other causes of similar symptoms.

3.2 Treatment options for Zenker's diverticulum

3.2.1 First-line treatment

RECOMMENDATION

ESGE suggests flexible endoscopic treatment over open surgical treatment as first-line therapy for patients with a symptomatic Zenker's diverticulum of any size.

Weak recommendation, low quality of evidence, level of agreement 100 %.

Treatment is indicated for symptomatic Zenker's diverticulum. Currently, there are three main treatment options for Zenker's diverticulum: open surgery (i. e. transcervical diverticulectomy, diverticulopexy with myotomy of the cricopharyngeus muscle, or diverticular inversion) [9, 10]; rigid endoscopy (i. e. endoscopic stapling or CO_2 laser treatment) [11, 12]; and flexible endoscopy. The key common intervention in all three options is division of the cricopharyngeus muscle that forms the septum between esophagus and the pouch. The goal of treatment is to reduce the size of the diverticulum and improve pharyngeal motor function, thus improving the symptoms of dysphagia and regurgitation.

Flexible endoscopic septum division involves the use of a flexible endoscope to carry out septal myotomy [13]. Various incision techniques have been described for cutting the septum that contains the cricopharyngeus muscle. The single-incision technique involves a midline incision of the cricopharyngeus muscle with the option of clipping the base [14]. The double-incision technique allows a wider septum to be dissected. It involves creating two incisions that are 1 cm apart from each other and the septum in between is resected using a snare before the base is clipped [15].

There are no prospective comparative studies between surgery (by rigid endoscopic or open approach) and flexible endoscopic treatment. One large retrospective study by Shahawy et al. compared 36 patients treated by endoscopic septotomy with 31 patients treated by diverticulectomy and myotomy, and found dysphagia recurrence in 39 % vs. 0 % (P = 0.001) at 2 months in the endoscopic vs. surgical treatment groups, respectively, with 13 % vs. 31 % complication rates after each treatment (P = 0.08) [16]. Two large systematic reviews and meta-analyses involving 3079 and 596 patients concluded that clinical success rates were significantly different, at 82 % – 87 % with the endoscopic approach vs. 94 % – 96 % with the open surgical approach [17, 18]. The complication rate was 7 % – 9 % with the endoscopic treatment vs.11 % – 15 % with the open surgical approach.

Of note, most data from the literature mentioning endoscopic treatment for Zenker's diverticulum actually refer to laser or stapler septotomy using a rigid endoscope and performed by an ENT surgeon. This is important because rigid endoscopy is not always possible in elderly patients, with technical treatment failures of 6 % – 7 % [17].

Most of the relevant data on the efficacy and safety of flexible endoscopic septotomy for the treatment of Zenker's diverticulum are summarized in the meta-analysis from Ishaq et al. [19]; however, for most of this data, there is no direct comparison to surgical treatment. In this work, including 813 patients, the pooled success rate of flexible endoscopic septotomy was 91 %, with an 11.3 % adverse event rate and 11 % recurrences. The limitations of surgery and rigid endoscopy, such as the need for general anesthesia and the high rate of intraoperative abandonment owing to restricted neck mobility in the elderly, combined with the seemingly higher complication rates of surgery with comparable success rates have led to our recommendation on the use of flexible endoscopic techniques as the first-line therapy for Zenker's diverticulum.

3.2.2 Recurrent Zenker's diverticulum

RECOMMENDATION

ESGE suggests treatment by flexible endoscopy for recurrent Zenker's diverticulum.

Weak recommendation, low quality of evidence, level of agreement 100 %.

Regardless of the treatment modality used, recurrence of Zenker's diverticulum is not uncommon. Predictors of symptom relapse that occurs within 48 months of endoscopic therapy include: pretreatment Zenker's diverticulum size (≥ 50 mm), post-treatment Zenker's diverticulum size (≥ 10 mm), and the length of the septotomy (≤ 25 mm) [20].

Endoscopic management of recurrence after surgery or endoscopic stapling can be particularly challenging. No comparative studies have been carried out between surgery (endoscopic or open approaches) and flexible endoscopic treatment as therapy for pretreated patients with Zenker's diverticulum.

Two small retrospective studies involving 20 and 18 patients reported on the feasibility of rigid endoscopic treatment using a stapler for recurrent Zenker's diverticulum [21, 22]. They reported a short-term clinical remission rate of 81 % – 90 %, with a 20 % – 28 % complication rate after endoscopic therapy, and 5 % recurrence rate. Antonello et al. reported on the feasibility, safety, and effectiveness of flexible endoscopic septotomy for recurrent Zenker's diverticulum in 25 patients, using a diverticuloscope and a septum incision or snare resection of the cricopharyngeus muscle, with similar outcomes when compared with data from 34 treatment-naïve patients treated within the same timeframe: the success, recurrence, and complication rates in naïve vs. recurrent patients were 84 % vs. 82 %, 24 % vs. 15 %, and 8 % vs. 8.8 %, respectively [15]. In their retrospective study using a needle-knife and diverticuloscope (n = 134), Hub-

erty et al. reported recurrence rates of 23.1 %; of those who underwent repeat treatment (n = 23), 78.3 % achieved symptom remission after redo myotomy [14].

Therefore, although the data are limited, flexible endoscopic septotomy appears to perform equally well in recurrent Zenker's diverticulum and treatment-naïve Zenker's diverticulum.

3.3 Flexible endoscopic treatment of Zenker's diverticulum

3.3.1 Use of a diverticuloscope

RECOMMENDATION

ESGE suggests that it is left to the endoscopist's discretion whether or not to use a diverticuloscope when performing a flexible endoscopic septotomy for Zenker's diverticulum.

Weak recommendation, low quality of evidence, level of agreement 100 %.

In one retrospective series, diverticuloscope-assisted treatment success was reported to be higher than cap-assisted treatment [23]. In a meta-analysis by Ishaq et al., however, overall use of a diverticuloscope had no impact on success or complications [19].

3.3.2 Minimum size of Zenker's diverticulum

RECOMMENDATION

ESGE suggests symptomatic Zenker's diverticula of any size are amenable to flexible endoscopic treatment, although the usefulness of a diverticuloscope remains uncertain for Zenker's diverticula < 2 cm.

Weak recommendation, very low quality of evidence, level of agreement 100 %.

To our knowledge, no study has addressed the specific question of the minimum size of Zenker's diverticulum that is required for flexible endoscopic treatment. Published case series on flexible endoscopic septotomy have included patients with diverticula of mean size 20 – 50 mm [19]), with a possible optimal efficacy of endoscopic treatment for Zenker's diverticula between 30 and 50 mm in size [20].

Although most endoscopic studies have included patients with Zenker's diverticula measuring between 20 and 50 mm, there is no minimum size for symptomatic Zenker's diverticula to be considered amenable to endoscopic treatment. If the size is below 20 mm, however, the usefulness of a diverticuloscope is questionable.

3.3.3 Emerging endoscopic techniques for the treatment of Zenker's diverticulum

RECOMMENDATION

ESGE recommends that emerging treatments for Zenker's diverticulum, such as Zenker's peroral endoscopic myotomy (Z-POEM) and tunneling, be considered as experimental; these treatments should be offered in a research setting only.

Strong recommendation, low quality of evidence, level of agreement 100 %.

New, alternative strategies for treating Zenker's diverticulum by means of flexible endoscopy are emerging. For instance, tunneling techniques used to cut the lower esophageal sphincter (LES) in patients with achalasia (peroral endoscopic myotomy; POEM) or the pylorus in gastroparesis (gastric peroral endoscopic myotomy; G-POEM) have recently been applied to Zenker's diverticula as well. Yang et al. collected data on 75 patients treated by Zenker's POEM (Z-POEM) across 10 centers and found a technical success rate of 97 %, complication rate of 6.7 % (1 bleed and 4 perforations – all managed conservatively), clinical success rate of 92 %, and observed only one recurrence after a median follow-up of 10 months [24]. To date, the reported studies on alternative endoscopic treatments for Zenker's diverticulum have mainly consisted of case reports and series that lack long-term follow-up data, with strong publication bias and possible underestimation of complication rates. More studies are needed to define their role in the management of Zenker's diverticulum.

3.3.4 Use of CO_2 during endoscopic Zenker's diverticulum treatment

RECOMMENDATION

ESGE recommends routine use of CO_2 in the endoscopic treatment of Zenker's diverticulum.

Strong recommendation, very low quality evidence, level of agreement 100 %.

Although there are no comparative data in Zenker's diverticulum, there is a sufficient body of evidence in a relatively comparable treatment modality, namely POEM for achalasia, that CO_2 reduces the risk of subcutaneous emphysema. In Zenker's diverticulum, once the cricopharyngeus muscle has been dissected, the only posterior barrier to the superior mediastinum is the buccopharyngeal fascia. CO_2 is reabsorbed more quickly than room air and its use reduces the risk of gas-related complications, such as pneumomediastinum and subcutaneous emphysema.

3.3.5 Use of prophylactic antibiotics

RECOMMENDATION
ESGE does not recommend routine administration of prophylactic antibiotics before or after endoscopic septotomy for Zenker's diverticulum.
Strong recommendation, low quality of evidence, level of agreement 92.9 %.

In a meta-analysis by Ishaq et al., 7/20 studies on conventional endoscopic treatment of Zenker's diverticulum used prophylactic antibiotics. Meta-regression analysis for overall safety showed that prophylactic administration of antibiotics was not associated with a reduction in complications [19].

3.3.6 Extent of myotomy

RECOMMENDATION
ESGE recommends performing a complete myotomy of the cricopharyngeus muscle when performing endoscopic septotomy.
Strong recommendation, low quality of evidence, level of agreement 93.8 %.

All expert endoscopists involved in the treatment of Zenker's diverticulum by flexible endoscopy strongly advocate a full transection of the cricopharyngeus muscle. Direct evidence from the literature to support this is lacking; however, from a pathophysiological standpoint, a full myotomy of the cricopharyngeus muscle is essential to prevent the recurrence of symptoms. The value of cutting deeper is controversial.

Costamagna et al. reported failure at 6 months if the length of the septotomy was < 2.5 cm or the pretreatment pouch was > 5 cm, and failure at 48 months if the septotomy length was < 2.5 cm or the post-procedure Zenker's diverticulum size > 10 cm [20]. However, the authors' measurement of septotomy length is debatable as they measured pouch size before and after treatment using a marked catheter. They extrapolated that the pouch size is equal to the septum length, but there is no peer evidence to support this assumption.

3.3.7 Use of clips at the base of the septotomy

RECOMMENDATION
ESGE suggests that the decision to deploy clips at the base of the septotomy should be dictated by endoscopist practice or clinical need (bleeding or suspected perforation).
Weak recommendation, low quality of evidence, level of agreement 100 %.

Clips are widely used at the base of the septotomy by the majority of endoscopists, despite there being no evidence of their impact on adverse events, such as bleeding or perforation. In a recent meta-analysis by Ishaq et al., six studies deployed clips during the procedure but meta-regression analysis showed this had no impact on adverse events, such as perforation [19].

3.3.8 Endoscopic knives and electrocoagulation settings

Almost every kind of endoscopic submucosal dissection (ESD) device has been used to treat Zenker's diverticulum. Early work was done by Ishioka with the needle-knife papillotome [25]. The advantages of the needle-knife include its low cost and easy availability, but its disadvantages include downward cutting, which is linked with complications.

The HookKnife (Olympus, Tokyo, Japan) was originally designed for ESD. The tip of the knife is bent at a right angle; with the rotatable "hook" measuring 1.3 mm and the arm measuring 4.5 mm. This design enables the cricopharyngeal muscle fibers to be isolated, pulled upwards, and then cut. Theoretically, the upwards pull of the septal fibers minimizes perforation risk. Repici et al. reported a complication rate of 6.3 % and overall success rate of 90.6 % for HookKnife myotomy [26]. Similar findings were presented by Rouquette et al. who showed overall success rates of 91.7 %, complication rates of 8.4 %, and recurrence in 12.5 % of patients [27].

The Stag Beetle knife Junior (SB knife Jr., Sumitomo Bakelite Co., Tokyo, Japan) is a scissor-shaped cutting tool that can be used to divide the septum and is often used with a diverticuloscope or cap. Both blades of the SB knife Jr. are insulated externally. It has two practical advantages over other cutting devices. First, the SB knife Jr. allows an incision from the apex to the base of the septum but with a scissor-like movement, which pulls the muscle fibers towards the endoscope while cutting. In addition, the 360° rotational ability increases therapeutic precision and prevents unwanted deep incisions that may lead to perforation. In a retrospective study of 31 patients undergoing SB knife septal myotomy, Battaglia et al. described a median procedure time of only 14 minutes, with 83.9 % of patients in remission from symptoms after a median follow-up of 7 months [28]. The efficacy and safety data were replicated in 52 patients by Goelder et al., who reported a low recurrence rate of 9.6 % over 6 months, without the occurrence of perforation or mediastinitis [29].

The settings for the electrosurgical generators vary between the different brands and models and can be different for different devices. Therefore, specific settings for the electrosurgical generator being used should be requested from the manufacturer.

3.3.9 Post-procedural care

No specific recommendations regarding the postoperative care of patients can be deduced from the analysis of the current literature. However, after the procedure, patients should be carefully monitored to recognize possible complications. Patients are routinely kept nil per os for 24 hours. In many published series, patients were allowed liquid diet the next day if their

course was unremarkable. There is no evidence to support a contrast study being a prerequisite to resume oral intake unless a perforation is suspected.

4 Gastroesophageal reflux disease

GERD is a common condition that affects approximately 8.8 % – 25.9 % of European adults [30]. Medical therapy using proton pump inhibitors (PPIs) and surgical treatment by means of fundoplication are both proven to be effective. Some patients are either reluctant to use chronic medication or are allergic to PPIs, but do not want to undergo a surgical solution. In addition, chronic PPI use imposes significant costs.

In the past, several endoscopic treatment modalities have been evaluated, but most of these were finally withdrawn from the market owing to lack of efficacy or major side effects [31 – 37]. Nowadays, several new endoscopic modalities are on the market or are being evaluated.

4.1 Transoral incisionless fundoplication (TIF)

RECOMMENDATION

ESGE recommends against the widespread clinical use of transoral incisionless fundoplication (TIF) as an alternative to PPI therapy or antireflux surgery in the treatment of GERD, because of the lack of data on the long-term outcomes, the inferiority of TIF to fundoplication, and its modest efficacy in only highly selected patients. TIF may have a role for patients with mild GERD who are not willing to take PPIs or undergo antireflux surgery.

Strong recommendation, moderate quality of evidence, level of agreement 92.8 %.

Transoral incisionless fundoplication (TIF) is performed with an endoscopic suturing device using T-fasteners and aims to create a gastroplication that reinforces the antireflux barrier. TIF has been evaluated in five randomized controlled trials (RCTs) in patients mostly with moderate GERD, excluding those with large hiatal hernias (> 2 cm), Los Angeles grade C or D esophagitis, or Barrett's esophagus [38 – 42]. TIF was evaluated after 6 months of follow-up and compared with a sham procedure [42], a sham procedure and PPI therapy [41], or in an unblinded manner with PPI therapy [38 – 40]. A meta-analysis showed that a clinical response, defined by an improvement of at least 50 % in the GERD health-related quality of life (GERD-HRQL) scores or remission of heartburn and regurgitation, was observed in 66 % of patients treated with TIF and 30 % of the control groups [43]. Objective measurement of reflux showed a limited decrease in esophageal acid exposure in patients treated with TIF, a similar level of decrease to that observed in patients taking PPIs.

No long-term data are available from RCTs, but results from uncontrolled studies show decreased effectiveness over time, with PPI cessation rates ranging from 70 % at 6 months to 34 % at 5 years, which suggests the procedure has a short-term benefit in two-thirds of patients. Severe adverse events, including esophageal perforation and bleeding, have been reported in 2.4 % of patients [43]. TIF was also compared to Nissen fundoplication in a prospective open study [44]. Objective and symptomatic evaluation of reflux showed superiority of the surgical fundoplication.

To conclude, TIF may improve GERD symptoms in the short term, but long-term control of reflux is not achieved in the majority of patients with well-characterized and uncomplicated GERD. The exact positioning of TIF in the armamentarium remains unclear: it might offer some symptomatic relief for patients who are intolerant to PPIs, not willing to take PPIs, or for those who have persistent regurgitation on PPIs but are reluctant to undergo antireflux surgery.

4.2 Medigus ultrasonic surgical endostapler (MUSE)

RECOMMENDATION

ESGE recommends against the use of the Medigus ultrasonic surgical endostapler (MUSE) in clinical practice because of insufficient data showing its effectiveness and safety in patients with GERD. MUSE should be used in clinical trials only.

Strong recommendation, low quality evidence, level of agreement 100 %.

The Medigus ultrasonic surgical endostapler (MUSE; Medigus, Omer, Israel) is a system that integrates flexible videoendoscopy with an ultrasonic range finder and a surgical stapler. At the center of the endoscope is a rigid section of approximately 66 mm that holds a cartridge containing five 4.8-mm standard "B"-shaped titanium surgical staples. The tip of the endoscope contains an anvil for the staples as well as two small screws. An ultrasonic range finder measures the distance between an ultrasonic mirror in the cartridge and the tip of the endoscope.

Currently, the MUSE device has been evaluated in a prospective multicenter trial including 66 patients with a short-term follow-up period [45]. After 6 months, the GERD-HRQL score improved by more than 50 % while off PPI therapy in 73 % of patients (95 % confidence interval [CI] 60 % – 83 %) and 42 patients (64.6 %) were no longer using daily PPI medication. Two patients suffered from severe complications (empyema in one, hemorrhage in the other). The 4-year follow-up data were reported in 37 of the initial 66 patients [46]. Both the GERD-HRQL and percentage of patients off PPIs had decreased slightly but significantly over time; however, they remained significantly better than at baseline.

Danalioglu et al. compared the results of the MUSE in 11 patients with laparoscopic fundoplication in 16 patients [47]. Patients however were not randomized, and a hiatal hernia of > 3 cm was an exclusion criterion for MUSE only. In this small retrospective study, laparoscopic fundoplication appeared to be more effective after a 6-month follow-up period, and one

severe complication (esophageal perforation) was seen in the MUSE group.

Overall, data on the safety and efficacy of MUSE in the treatment of GERD are scarce and sham-controlled trials are lacking, as are studies randomizing patients between MUSE and laparoscopic fundoplication. ESGE therefore recommends against the use of MUSE outside of the context of clinical trials.

4.3 Radiofrequency energy application to the LES (Stretta)

RECOMMENDATION

ESGE suggests that Stretta can be considered in selective patients only, for the sake of symptom relief and in the absence of erosive esophagitis and a hiatal hernia.

Weak recommendation, moderate level of evidence, level of agreement 92.9 %.

Radiofrequency energy application to the LES (Stretta; Restech, Houston, Texas, USA) is an endoscopically-guided method in which radiofrequency current is conducted by a series of radially arranged needles positioned over the esophagogastric junction (EGJ). Although the exact mechanism by which Stretta opposes further gastroesophageal reflux is still unclear, the technique is supposed to induce inflammatory changes that result in submucosal fibrosis, with a subsequent increase in LES pressure and/or decrease in LES compliance. Stretta is not recommended in patients with erosive esophagitis or hiatal hernia. It should be noted that Stretta is not available in some countries.

To date there have been four RCTs, 23 cohort studies, and two systematic reviews (one of which was a meta-analysis). The four RCTs included three that compared Stretta with sham therapy [48 – 50], and one that compared Stretta with PPI use [51]. Overall, the quality of evidence from the RCTs on the efficacy of the Stretta procedure is low, especially as the most important objective outcome parameters, such as acid exposure time, have often been omitted. No convincing evidence has been provided that Stretta normalizes acid exposure or LES pressure, but results from these RCTs converge to show some significant improvement in symptom burden and quality of life in the short term, although longer term data are still lacking.

The meta-analysis performed by Fass et al. included both RCTs and cohort studies [52]. They concluded that Stretta is efficacious in improving both objective and subjective clinical end points, except basal LES pressure. Lipka et al. published a systematic review that was limited to the four RCTs [53]. The pooled results showed no difference between Stretta and sham or management with PPIs in patients with GERD for the outcomes of mean percentage time the pH was less than 4 over a 24-hour time course, LES pressure, ability to stop PPIs, or health-related quality of life.

In terms of the comparison of Stretta vs. fundoplication, two non-randomized prospective comparative studies have been published, but the methodology of these studies was flawed (with selection criteria differing in the two groups) and the definitions of end points and symptom measurements were heterogeneous [54, 55]. However, some improvement in symptom scores was observed in both studies, while another prospective study of Stretta as rescue therapy after failed laparoscopic fundoplication also proved useful in a subset of patients [56].

4.4 Antireflux mucosectomy (ARMS)

In antireflux mucosectomy (ARMS), an endoscopic mucosal resection (EMR) is performed at the level of the cardia over 180 – 270° degrees of the circumference. The concept behind ARMS is based on observations of the scars that result after ESD or EMR of gastric lesions. In this case, the scarring resulting from the healing of the mucosal resection at the level of the cardia leads to a narrowing of the EGJ and changes the angle of His, thereby potentially reducing gastroesophageal reflux.

RECOMMENDATION

ESGE recommends against the use of antireflux mucosectomy (ARMS) in routine clinical practice in the treatment of GERD because of the lack of data and its potential complications.

Strong recommendation, low quality evidence, level of agreement 100 %.

Only three case series (single-arm interventional studies) have been reported including in total 39 PPI-refractory GERD patients without a sliding hernia or with a hernia no bigger than 2 cm [57 – 59]. A clinical response was achieved in 69 % – 80 % of patients, with dysphagia occurring in 13 %. Patient numbers are too small to draw any conclusions on safety and efficacy, and controlled data are lacking.

5 Intractable constipation

Constipation is a common clinical condition. It is generally treated with dietary measures, lifestyle modifications, (osmotic) laxatives, or a combination thereof. In patients with intractable symptoms, retrograde or antegrade lavage can be considered.

Percutaneous endoscopic cecostomy tube placement describes a technique of placing tubes in the colon. The general technique is comparable to percutaneous endoscopic gastrostomy tube placement; however, as the tube is placed directly into the colon, the risk of complications is generally higher and a significant mortality is noted. The most common indication for percutaneous endoscopic cecostomy tube placement is relief of colonic obstruction or antegrade irrigation for colonic motility disorders [60]. In general, studies on percutaneous endoscopic cecostomy are rare and data collection is retrospective.

Therefore, the aim within this ESGE guideline is for the first time to provide guidance on the technique and management of percutaneous endoscopic cecostomy tube placement.

5.1 Indications for percutaneous endoscopic cecostomy

RECOMMENDATION

ESGE recommends endoscopic cecostomy only after conservative management with medical therapies or retrograde lavage has failed.

Strong recommendation, low quality evidence, level of agreement 93.3 %.

To date, no specific literature is available regarding the comparative efficacy of medical therapy, retrograde lavage, and endoscopic cecostomy in the treatment of constipation. In general, endoscopic cecostomy is a high risk procedure with significant morbidity and even mortality and is therefore only applied for intractable cases [60 – 63]. Accordingly, conservative approaches should be extensively used before the indication for endoscopic cecostomy is met.

5.2 Periprocedural management of endoscopic cecostomy

The procedure should be performed with CO_2 insufflation with the patient in the left lateral or supine position. The puncture should be performed under aseptic conditions.

5.2.1 Bowel preparation

There are no studies regarding bowel preparation for patients in whom endoscopic cecostomy is performed. Rigorous bowel preparation is, however, mandatory as abundant fecal remnants might increase the risk of septic complications, and severe constipation is the dominant symptom in these patients. A regimen of 7 days of fiber-free diet and 3 days of polyethylene glycol (PEG) solution prior to percutaneous endoscopic cecostomy is adopted by some expert centers.

5.2.2 Use of prophylactic antibiotics

RECOMMENDATION

ESGE recommends antibiotic prophylaxis starting before and continuing for 3 days after the procedure.

Strong recommendation, very low quality evidence, level of agreement 93.3 %.

No study has yet addressed the need for antibiotic prophylaxis for cecostomy. However, in view of the potential fecal contamination, antibiotic therapy is generally used in practice [61, 64 – 66]. Moreover, patients requiring an endoscopic cecostomy might be critically ill. Antibiotic prophylaxis should follow local protocols, but could consist of amoxicillin – clavulanic acid (1 g) or ofloxacin + metronidazole (500 mg) 1 hour before the procedure, with this mostly being maintained until 72 hours after cecostomy.

5.3 Techniques for endoscopic cecostomy

RECOMMENDATION

ESGE recommends fixing the cecum to the abdominal wall at three points (using T-anchors, a double-needle suturing device, or laparoscopic fixation) to prevent leaks and infectious adverse events, whatever percutaneous endoscopic cecostomy method is used.

Strong recommendation, very low quality evidence, level of agreement 86.7 %.

Three main techniques of percutaneous endoscopic cecostomy have been used in clinical practice [61, 63, 66 – 69]: the pull-through method, the “introducer” method, and laparoscopically assisted percutaneous endoscopic cecostomy (LAPEC). The limited data do not provide evidence as to which method should be preferred. As cecostomy is accompanied by a relatively high frequency of adverse events, which may be serious (especially if no fixation of the cecum is used), the procedure should be reserved for patients with otherwise intractable constipation without any other therapeutic option. The necessary steps for percutaneous endoscopic cecostomy include: good bowel cleansing, use of sedation, disinfection of the abdominal wall, transillumination, and fixation of the cecum to the abdominal wall. In procedures where metal anchors are used, these should be removed within 3 – 4 weeks of percutaneous endoscopic cecostomy tube placement.

5.3.1 Pull-through method

For the pull-through method [63, 69], a colonoscopy is first performed to identify a site for insertion. The point of maximal transillumination is infiltrated with local anesthetic and the cecum is fixed at three points under endoscopic control. An 18 G Seldinger needle (in children, 12 G) is then passed through the abdominal wall at the center of the sutured triangle and a guidewire is passed through the needle and grasped by a snare. The guidewire is withdrawn from the anus and a tube (14 – 20 Fr in adults; 12 Fr in children) is attached to it and pulled through the abdominal wall. The final position of the internal bolster is checked endoscopically and the tube is attached to the abdominal wall by an external bolster.

5.3.2 Introducer method

For the introducer method [61, 66], after a site for puncture and fixation of the cecum has been identified, a small incision or a puncture is made and, using a Seldinger technique, an introducer is advanced into the cecum, before a definitive catheter is placed and fixed. Chait Trapdoor percutaneous cecostomy catheters (“multiple pigtails”) or balloon catheters (11 – 15 Fr) are the most frequently used with this technique. Chait Trapdoor cecostomy catheters may have several advantages: no balloon rupture (and subsequent leak) can occur, no buried bumper syndrome can occur, granulation tissue over-

growth occurs less frequently, and these catheters are easily exchangeable.

5.3.3 Laparoscopically assisted percutaneous endoscopic cecostomy (LAPEC)

For LAPEC [67, 68], a colonoscopy is first performed to identify the cecum. Fixation is then performed laparoscopically or under laparoscopic control. A cecostomy tube is placed laparoscopically. Although the procedure can be performed with a single laparoscopic port for the camera, several centers add two extra ports to allow the cecum to be held to facilitate needle insertion and for suturing of the cecum to the abdominal wall.

5.4 Choice of technique for endoscopic cecostomy

RECOMMENDATION

ESGE suggests the endoscopic route in critically ill patients in whom cecostomy is considered.

ESGE suggests laparoscopically assisted percutaneous endoscopic cecostomy (LAPEC) as the preferred technique for patients whose clinical condition is good.

Weak recommendation, very low quality evidence, level of agreement 86.7 %.

A direct comparison between purely endoscopic cecostomy and LAPEC is not available from the literature. The technical success rates of purely endoscopic cecostomy are greater than 80 %; complications occur in 30 % – 40 % of patients, and quality of life improves in general for most patients, although acceptance is reduced in about 25 % of patients, mostly because of pain [61 – 64, 70 – 75]. While most complications are minor, deaths have been reported secondary to endoscopic cecostomy-induced (fecal) peritonitis. LAPEC shows a success rate of 95 %, which is higher than the technical success rate reported for endoscopic cecostomy [67]. In critically ill patients, however, the endoscopic route might be preferred in order to avoid surgery and extensive sedation.

5.5 Colostomy at other locations

RECOMMENDATION

ESGE recommends performing endoscopic colostomy at no locations other than the cecum unless this is technically not feasible.

Strong recommendation, very low quality evidence, level of agreement 93.3 %.

Although data show the feasibility of performing colostomy at locations other than the cecum (left colon – descending or sigmoid) for patients suffering from constipation, there are no data demonstrating any advantage of this approach [69, 74, 76, 77]. Importantly, in some studies, there was a very high and unacceptable incidence of serious adverse events [69, 74]. In one retrospective study, analyzing 31 patients who underwent endoscopic colostomy on the left side of the colon, recurrent complications and infection caused significant morbidity and necessitated percutaneous endoscopic colostomy tube removal in most patients (13 of the 14 patients with constipation had to have the tube removed). Moreover, two patients died because of fecal peritonitis [74].

6 Ogilvie’s syndrome

Ogilvie's syndrome, also known as acute colonic pseudo-obstruction, refers to pathologic dilatation of the colon without underlying mechanical obstruction [78]. It occurs primarily in patients with serious comorbidities.

In patients with signs or symptoms of acute colonic dilatation, the presence of mechanical large-bowel obstruction should be excluded with an abdominal computed tomography (CT) scan or water-soluble contrast enema. Furthermore, routine blood testing, including complete blood count, serum electrolytes, renal function assessment, and thyroid function, should be performed during the initial evaluation to check for predisposing and potentially correctable factors (i. e. electrolyte imbalance, renal insufficiency, infection, and hypothyroidism).

6.1 Indications for endoscopic treatment

6.1.1 Endoscopic decompression vs. neostigmine

RECOMMENDATION

ESGE recommends considering endoscopic decompression of the colon in patients with Ogilvie’s syndrome that is not improving with conservative treatment.

Strong recommendation, low quality evidence, level of agreement 93.8 %.

Conservative therapy is the initial step in the management of patients with Ogilvie’s syndrome. In the current literature, the following actions have been described: discontinuation of narcotics, anticholinergics, and calcium-channel antagonists; correction of electrolyte abnormalities; nil per os; decompressing the GI tract by nasogastric tube and/or rectal tube insertion, and frequent position changes [79]. Because these recommendations have never been studied as a single intervention, their effects are unknown.

In patients with Ogilvie’s syndrome that is not improving with conservative treatment, both endoscopic decompression therapy and medical therapy with intravenous neostigmine are considered valid treatment options. The efficacy of endoscopic decompression was investigated in several retrospective studies, in which the overall success rates varied between 36 % and 88 % [79 – 81].

In a recent study, Peker et al. demonstrated that, compared with neostigmine, endoscopic decompression was more effective as an initial therapy and was more effective at avoiding a

second treatment modality (total response 82 % vs. 49 %, $P<0.001$) [80]. Comparable results were shown in the study of Tsirline et al. in which colonoscopy was significantly more successful than single or repeated neostigmine administration (no further therapy after one or two interventions: 75.0 % vs. 35.5 %, $P<0.001$; and 84.6 % vs. 55.6 %, $P=0.003$, respectively) [81]. However, in these two retrospective studies, the efficacy of neostigmine treatment was much lower compared with previous studies, in which the efficacy of neostigmine ranged between 61 % and 100 % [79, 82 – 84].

Regarding safety, the risk of perforation due to endoscopic decompression is described in 0 – 5 % of patients [79]. However, perforations are also described in patients with Ogilvie's syndrome receiving conservative or neostigmine treatment [81]. Ross et al. demonstrated that patients who fail on medical management and require interventional procedures, including endoscopic decompression, experience increasing morbidity and mortality with increasing invasiveness of the procedure, likely reflecting the severity of their conditions [85].

Because no prospective head-to-head comparisons between endoscopic decompression and neostigmine treatment are available, no recommendation can be made for the superiority of one of these two treatment strategies in patients with Ogilvie's syndrome that is not improving with conservative treatment. Furthermore, there is a large heterogeneity regarding the patient population, definition of success, and treatment protocols, which makes a good comparison between studies difficult. The choice of treatment should also depend on local expertise and the local situation, for instance the access to urgent colonoscopy.

6.1.2 Criteria for prompt endoscopic decompression

RECOMMENDATION

ESGE recommends prompt endoscopic decompression if the cecal diameter is >12 cm and if the Ogilvie's syndrome exists for a duration longer than 4 – 6 days.

Strong recommendation, low quality evidence, level of agreement 87.5 %.

The relationships between cecal diameter and duration of distension in patients with Ogilvie's syndrome and risk of perforation and ischemia were investigated in two retrospective studies. In one study, the risk of perforation and/or ischemia was higher with increasing cecal diameter: <12 cm, 0 % (n = 44); 12 – 14 cm, 7 % (n = 29); >14 cm, 23 % (n = 69). A cecal diameter >14 cm was associated with a two-fold increase in mortality. In addition, a delay in decompression was associated with higher mortality: <4 days, 15 %; 4 – 7 days, 27 %; >7 days, 73 % [86]. Johnson et al. demonstrated that the risk of perforation was related more to duration of cecal distension (>6 days) than to the absolute cecal size [87].

When colonic ischemia and/or perforation occur, patients are no longer considered eligible for endoscopic management and should be referred for surgery.

6.1.3 Recurrence of Ogilvie's syndrome

RECOMMENDATION

ESGE recommends considering repeated endoscopic decompression for recurrence of Ogilvie's syndrome.

Strong recommendation, low quality evidence, level of agreement 92.9 %.

The risk of recurrence of Ogilvie's syndrome after an initial successful decompression varies widely in the current literature, ranging from 0 – 38 % in patients previously treated with neostigmine and 0 – 50 % after endoscopic decompression [88].

Repeated endoscopic decompression for recurrence of Ogilvie's syndrome may still be effective. Some studies report similar success rates of a second or third colonic decompression compared with the initial decompression, although the sample sizes were small [81, 89]. Other studies suggest that repeated endoscopic decompression is associated with lower, but still acceptable, sustained clinical success rates: Geller et al. showed that clinical success was achieved in a significantly higher percentage of patients undergoing a single decompression compared with those requiring multiple procedures (95 % vs. 56 %, $P<0.05$) [88]. In the study of Vanek et al., repeat colonoscopic decompression demonstrated an 87 % success rate, comparable with the initial colonoscopies, but a higher recurrence rate of 40 % vs. 22 % after the initial colonoscopies [86].

As for the initial treatment for Ogilvie's syndrome that is not responding to conservative management, no prospective head-to-head comparisons between endoscopic decompression and neostigmine treatment are available for recurrent Ogilvie's syndrome, making the choice of treatment dependent on local expertise and the local situation, such as the access to urgent colonoscopy.

6.2 Periprocedural management of endoscopic decompression

6.2.1 Use of a decompression tube

RECOMMENDATION

ESGE recommends the placement of a decompression tube in the right or transverse colon after endoscopic decompression as this seems to be associated with lower recurrence rates.

Strong recommendation, low quality evidence, level of agreement 92.9 %.

Several old retrospective studies investigated the use of decompression tube placement after endoscopic decompression in patients with Ogilvie's syndrome. Geller et al. showed in a study comprising 50 patients that the rate of clinical success, defined as a sustained decompression, was 80 % in

patients with endoscopic decompression tube placement vs. 25 % without tube placement [88]. Placement of a decompression tube in the right or transverse colon had a similar effect (90 % vs. 83 %, $P > 0.05$); however, the success rate was lower after tube placement in the hepatic flexure (63 %), splenic flexure (75 %), or descending colon (0 %) [88]. These findings are in line with those of smaller studies [90 – 92].

In conclusion, most data suggest lower recurrence rates in patients with decompression tube placement after endoscopic decompression. Tube placement in the right or transverse colon seems to have similar effects. However, these conclusions are based on relatively old and small retrospective studies and RCTs are missing. There is no information mentioned in the literature regarding the duration for which the decompression tube should be kept in place. In clinical practice, however, decompression tubes are kept in place for 1 – 3 days, and spontaneous expulsion of the tube before the intended time of removal is not a rare event. Low (intermittent) suction can be applied, and regular flushing (every 2 – 4 hours) with 20 – 30 mL of normal saline is generally advised to maintain patency.

6.2.2 Bowel preparation

RECOMMENDATION

ESGE recommends against the use of oral bowel preparation solutions prior to colonic decompression as these may worsen dilatation of the colon.

Strong recommendation, very low quality evidence, level of agreement 93.8 %.

There are no studies regarding bowel preparation in patients with Ogilvie's syndrome undergoing endoscopic decompression. However, use of oral bowel preparation solutions is not recommended prior to colonic decompression as these may worsen dilatation of the colon in the absence of bowel transit. The usefulness of enemas before endoscopic decompression has never been investigated and remains unclear.

6.2.3 Post-procedural oral PEG solution

RECOMMENDATION

ESGE recommends the administration of oral PEG solution in patients with Ogilvie's syndrome after initial resolution of colonic dilatation as it decreases the risk of recurrence.

Strong recommendation, low level of evidence, level of agreement 100 %.

One small randomized placebo-controlled trial including 30 patients who initially responded to neostigmine or colonoscopic decompression demonstrated that administration of oral PEG solution significantly decreases the rate of relapse compared with placebo (0 % vs. 33 %, $P = 0.04$) [93]. The prescription of other types of laxatives after successful decompression, especially those exerting an effect on colonic motility, seems reasonable and rational, but supportive studies are lacking.

6.3 Role of percutaneous endoscopic colostomy

RECOMMENDATION

ESGE recommends considering percutaneous endoscopic colostomy/cecostomy for patients with Ogilvie's syndrome that is refractory to pharmacologic and endoscopic treatment, especially in those not amenable to surgical intervention because of an increased perioperative risk.

Strong recommendation, very low quality evidence, level of agreement 80.0 %.

Several studies report data regarding percutaneous endoscopic colostomy placement for various indications; however, the total number of patients with Ogilvie's syndrome is relatively low. Baraza et al. performed 35 percutaneous endoscopic colostomies in 33 patients, of whom four had recurrent Ogilvie's syndrome and were considered poor candidates for an operation [69]. Symptoms resolved in 74 % of all patients, including in three of the four patients with recurrent Ogilvie's syndrome. Major complications occurred in four patients: three cases of peritonitis secondary to fecal contamination and one death. In another small study, eight percutaneous endoscopic cecostomies were performed: six for colonic pseudo-obstruction and two for chronic constipation [63], with seven of the eight cases successful and resulting in clinical improvement. One patient required surgical removal of the percutaneous endoscopic cecostomy tube for fecal spillage resulting in peritonitis. In a retrospective study from Cowlam et al., an improvement in symptoms was reported in 81 % of 31 patients after a percutaneous endoscopic colostomy was performed, including in five patients with acute-on-chronic colonic pseudo-obstruction. One of these five patients died from fecal peritonitis; in three, the tube was removed because of infection [74]. Similar results were shown in other case reports [71, 94, 95].

Percutaneous endoscopic colostomy, although certainly not devoid of complications, has two potential advantages over surgery in patients with refractory Ogilvie's syndrome. Most importantly, general anesthesia can be avoided. Furthermore, tube placement is reversible after an improvement in symptoms. Therefore, percutaneous endoscopic colostomy should be considered as an alternative to surgery in patients with Ogilvie's syndrome that is refractory to pharmacologic and endoscopic treatment, despite the fact that there are no comparative data.

Disclaimer

The legal disclaimer for ESGE guidelines [2] applies to this Guideline.

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References

[1] Atkins D, Best D, Briss P et al. Grading quality of evidence and strength of recommendations. BMJ 2004; 328: 1490

[2] Dumonceau JM, Hassan C, Riphaus A et al. European Society of Gastrointestinal Endoscopy (ESGE) guideline development policy. Endoscopy 2012; 44: 626–629

[3] Linstone HA, Turoff M. The Delphi Method: Techniques and Applications. 2002: Available from: https://web.njit.edu/~turoff/pubs/delphibook/index.html

[4] Watemberg S, Landau O, Avrahami R. Zenker's diverticulum: reappraisal. Am J Gastroenterol 1996; 91: 1494–1498

[5] Wheeler WI. Pharyngocele and dilatation of pharynx, with existing diverticulum at lower poertion of pharynx lying posterior to the oesophagus, cured by pharyngotomy, being the first case of the kind recorded. Dublin J Med Sci 1886; 82: 349–357

[6] Negus V. Pharyngeal diverticula: observations on their evolution and treatment. Br J Surg 1950; 38: 129–146

[7] Fulp S, Castell D. Manometric aspects of Zenker's diverticulum. Hepatogastroenterology 1992; 39: 123–126

[8] Cook I, Gabb M, Panagopoulos V et al. Pharyngeal (Zenker's) diverticulum is a disorder of the upper esophageal sphincter opening. Gastroenterology 1992; 103: 1229–1235

[9] Mantsopoulos K, Psychogios G, Künzel J et al. Evaluation of the different transcervical approaches for Zenker diverticulum. Otolaryngol Head Neck Surg 2012; 146: 725–729

[10] Yuan Y, Zhao Y, Hu Y et al. Surgical treatment of Zenker's diverticulum. Dig Surg 2013; 30: 207–218

[11] Leong S, Wilkie M, Webb C. Endoscopic stapling of Zenker's diverticulum: Establishing national baselines for auditing clinical outcomes in the United Kingdom. Eur Arch Otorhinolaryngol 2012; 269: 1877–1884

[12] Luna R, Collard J. Transoral stapled diverticulotomy. Rev Col Bras Cir 2009; 36: 268–270

[13] Mulder CJ, den Hartog G, Robijn RJ et al. Flexible endoscopic treatment of Zenker's diverticulum: a new approach. Endoscopy 1995; 27: 438–442

[14] Huberty V, El Bacha S, Blero D et al. Endoscopic treatment for Zenker's diverticulum: Long-term results (with video). Gastrointest Endosc 2013; 77: 701–707

[15] Antonello A, Ishaq S, Zanatta L et al. The role of flexible endotherapy for the treatment of recurrent Zenker's diverticula after surgery and endoscopic stapling. Surg Endosc 2016; 30: 2351–2357

[16] Shahawy S, Janisiewicz AM, Annino D et al. A comparative study of outcomes for endoscopic diverticulotomy versus external diverticulectomy. Otolaryngol Head Neck Surg 2014; 151: 646–651

[17] Verdonck J, Morton RP. Systematic review on treatment of Zenker's diverticulum. Eur Arch Otorhinolaryngol 2015; 272: 3095–3107

[18] Albers D, Kondo A, Bernardo W et al. Endoscopic versus surgical approach in the treatment of Zenker's diverticulum: systematic review and meta-analysis. Endosc Int Open 2016; 04: E678–E686

[19] Ishaq S, Hassan C, Antonello A et al. Flexible endoscopic treatment for Zenker's diverticulum: A systematic review and meta-analysis. Gastrointest Endosc 2016; 83: 1076–1089.e5

[20] Costamagna G, Iacopini F, Bizzotto A et al. Prognostic variables for the clinical success of flexible endoscopic septotomy of Zenker's diverticulum. Gastrointest Endosc 2016; 83: 765–773

[21] Oestreicher-Kedem Y, Wasserzug O, Sagi B et al. Revision endoscopic stapler Zenker's diverticulotomy. Surg Endosc 2016; 30: 2022–2025

[22] Buchanan MA, Riffat F, Mahrous AK et al. Endoscopic or external approach revision surgery for pharyngeal pouch following primary endoscopic stapling: Which is the favoured approach? Eur Arch Otorhinolaryngol 2013; 270: 1707–1710

[23] Costamagna G, Iacopini F, Tringali A et al. Flexible endoscopic Zenker's diverticulotomy: cap-assisted technique vs. diverticuloscope-assisted technique. Endoscopy 2007; 39: 146–152

[24] Yang J, Novak S, Ujiki M et al. An international study on the use of peroral endoscopic myotomy in the management of Zenker's diverticulum. Gastrointest Endosc 2020; 91: 163–168

[25] Ishioka S, Sakai P, Maluf Filho F et al. Endoscopic incision of Zenker's diverticula. Endoscopy 1995; 27: 433–437

[26] Repici A, Pagano F, Danese S et al. Endoscopic flexible treatment of Zenker's diverticulum: a modification of the needle-knife technique. Endoscopy 2010; 42: 532–535

[27] Rouquette O, Abergel A, Mulliez A et al. Usefulness of the Hook knife in flexible endoscopic myotomy for Zenker's diverticulum. World J Gastrointest Endosc 2017; 9: 411–416

[28] Battaglia G, Antonello A, Realdon S et al. Flexible endoscopic treatment for Zenker's diverticulum with the SB Knife. Preliminary results from a single-center experience. Dig Endosc 2015; 27: 728–733

[29] Gölder SK, Brueckner J, Ebigbo A et al. Double incision and snare resection in symptomatic Zenker's diverticulum: A modification of the stag beetle knife technique. Endoscopy 2018; 50: 137–141

[30] El-Serag HB, Sweet S, Winchester CC et al. Update on the epidemiology of gastro-oesophageal reflux disease: A systematic review. Gut 2014; 63: 871–880

[31] Cohen LB, Johnson DA, Ganz RA et al. Enteryx implantation for GERD: Expanded multicenter trial results and interim postapproval follow-up to 24 months. Gastrointest Endosc 2005; 61: 650–658

[32] Wong RF, Davis TV, Peterson KA. Complications involving the mediastinum after injection of Enteryx for GERD. Gastrointest Endosc 2005; 61: 753–756

[33] Fockens P, Bruno MJ, Gabbrielli A et al. Endoscopic augmentation of the lower esophageal sphincter for the treatment of gastroesophageal reflux disease: multicenter study of the Gatekeeper Reflux Repair System. Endoscopy 2004; 36: 682–689

[34] Fockens P, Cohen L, Edmundowicz SA et al. Prospective randomized controlled trial of an injectable esophageal prosthesis versus a sham procedure for endoscopic treatment of gastroesophageal reflux disease. Surg Endosc 2010; 24: 1387–1397

[35] Mahmood Z, McMahon BP, Arfin Q et al. Endocinch therapy for gastro-oesophageal reflux disease: A one year prospective follow up. Gut 2003; 52: 34–39

[36] Schiefke I, Zabel-Langhennig A, Neumann S et al. Long term failure of endoscopic gastroplication (EndoCinch). Gut 2005; 54: 752–758

[37] Siersema PD. Endoscopic therapeutic esophageal interventions: what is new? What needs further study? What can we forget? Curr Opin Gastroenterol 2005; 21: 490–497

[38] Rinsma NF, Farré R, Bouvy ND et al. The effect of endoscopic fundoplication and proton pump inhibitors on baseline impedance and heartburn severity in GERD patients. Neurogastroenterol Motil 2015; 27: 220–228

[39] Witteman BPL, Conchillo JM, Rinsma NF et al. Randomized controlled trial of transoral incisionless fundoplication vs. proton pump inhibitors for treatment of gastroesophageal reflux disease. Am J Gastroenterol 2015; 110: 531–542

[40] Trad KS, Barnes WE, Simoni G et al. Transoral incisionless fundoplication effective in eliminating GERD symptoms in partial responders to proton pump inhibitor therapy at 6 months: The TEMPO randomized clinical trial. Surg Innov 2015; 22: 26–40

[41] Hunter JG, Kahrilas PJ, Bell RCW et al. Efficacy of transoral fundoplication vs omeprazole for treatment of regurgitation in a randomized controlled trial. Gastroenterology 2015; 148: 324–333

[42] Håkansson B, Montgomery M, Cadiere GB et al. Randomised clinical trial: Transoral incisionless fundoplication vs. sham intervention to control chronic GERD. Aliment Pharmacol Ther 2015; 42: 1261–1270

[43] Huang X, Chen S, Zhao H et al. Efficacy of transoral incisionless fundoplication (TIF) for the treatment of GERD: a systematic review with meta-analysis. Surg Endosc 2017; 31: 1032–1044

[44] Frazzoni M, Conigliaro R, Manta R et al. Reflux parameters as modified by EsophyX or laparoscopic fundoplication in refractory GERD. Aliment Pharmacol Ther 2011; 34: 67–75

[45] Zacherl J, Roy-Shapira A, Bonavina L et al. Endoscopic anterior fundoplication with the Medigus Ultrasonic Surgical Endostapler (MUSE™) for gastroesophageal reflux disease: 6-month results from a multicenter prospective trial. Surg Endosc 2015; 29: 220–229

[46] Kim HJ, Kwon CII, Kessler WR et al. Long-term follow-up results of endoscopic treatment of gastroesophageal reflux disease with the MUSE™ endoscopic stapling device. Surg Endosc 2016; 30: 3402–3408

[47] Danalioglu A, Cipe G, Toydemir T et al. Endoscopic stapling in comparison to laparoscopic fundoplication for the treatment of gastroesophageal reflux disease. Dig Endosc 2014; 26: 37–42

[48] Arts J, Bisschops R, Blondeau K et al. A double-blind sham-controlled study of the effect of radiofrequency energy on symptoms and distensibility of the gastro-esophageal junction in GERD. Am J Gastroenterol 2012; 107: 222–230

[49] Corley DA, Katz P, Wo JM et al. Improvement of gastroesophageal reflux symptoms after radiofrequency energy: A randomized, sham-controlled trial. Gastroenterology 2003; 125: 668–676

[50] Abdel Aziz AM, El-Khayat HR, Sadek A et al. A prospective randomized trial of sham, single-dose Stretta, and double-dose Stretta for the treatment of gastroesophageal reflux disease. Surg Endosc 2010; 24: 818–825

[51] Coron E, Sebille V, Cadiot G et al. Clinical trial: Radiofrequency energy delivery in proton pump inhibitor-dependent gastro-oesophageal reflux disease patients. Aliment Pharmacol Ther 2008; 28: 1147–1158

[52] Fass R, Cahn F, Scotti DJ et al. Systematic review and meta-analysis of controlled and prospective cohort efficacy studies of endoscopic radiofrequency for treatment of gastroesophageal reflux disease. Surg Endosc 2017; 31: 4865–4882

[53] Lipka S, Kumar A, Richter JE. No evidence for efficacy of radiofrequency ablation for treatment of gastroesophageal reflux disease: a systematic review and meta-analysis. Clin Gastroenterol Hepatol 2015; 13: 1058–1067

[54] Richards WO, Houston HL, Torquati A et al. Paradigm shift in the management of gastroesophageal reflux disease. Ann Surg 2003; 237: 638–649

[55] Liang W-T, Yan C, Wang Z-G et al. Early and midterm outcome after laparoscopic fundoplication and a minimally invasive endoscopic procedure in patients with gastroesophageal reflux disease: a prospective observational study. J Laparoendosc Adv Surg Tech 2015; 25: 657–661

[56] Noar M, Squires P, Khan S. Radiofrequency energy delivery to the lower esophageal sphincter improves gastroesophageal reflux patient-reported outcomes in failed laparoscopic Nissen fundoplication cohort. Surg Endosc 2017; 31: 2854–2862

[57] Inoue H, Ito H, Ikeda H et al. Anti-reflux mucosectomy for gastroesophageal reflux disease in the absence of hiatus hernia: A pilot study. Ann Gastroenterol 2014; 27: 346–351

[58] Benias P, D'Souza L, Lan G et al. Initial experience with a novel resection and plication (RAP) method for acid reflux: a pilot study. Endosc Int Open 2018; 06: E443–E449

[59] Hedberg HM, Kuchta K, Ujiki MB. First experience with banded anti-reflux mucosectomy (ARMS) for GERD: feasibility, safety, and technique (with video). J Gastrointest Surg 2019; 23: 1274–1278

[60] Holm AN, Baron TH. Palliative use of percutaneous endoscopic gastrostomy and percutaneous endoscopic cecostomy tubes. Gastrointest Endosc Clin N Am 2007; 17: 795–803

[61] Duchalais E, Meurette G, Mantoo SK et al. Percutaneous endoscopic caecostomy for severe constipation in adults: feasibility, durability, functional and quality of life results at 1 year follow-up. Surg Endosc 2015; 29: 620–626

[62] Küllmer A, Schmidt A, Caca K. Percutaneous endoscopic cecostomy (introducer method) in chronic intestinal pseudo-obstruction: Report of two cases and literature review. Dig Endosc 2016; 28: 210–215

[63] Lynch CR, Jones RG, Hilden K et al. Percutaneous endoscopic cecostomy in adults: a case series. Gastrointest Endosc 2006; 64: 279–282

[64] Ricard J, Quénéhervé L, Lefevre C et al. Anterograde colonic irrigations by percutaneous endoscopic caecostomy in refractory colorectal functional disorders. Int J Colorectal Dis 2019; 34: 169–175

[65] Didailler R, Denost Q, Loughlin P et al. Antegrade enema after total mesorectal excision for rectal cancer: the last chance to avoid definitive colostomy for refractory low anterior resection syndrome and fecal incontinence. Dis Colon Rectum 2018; 61: 667–672

[66] Uno Y. Introducer method of percutaneous endoscopic cecostomy and antegrade continence enema by use of the Chait Trapdoor cecostomy catheter in patients with adult neurogenic bowel. Gastrointest Endosc 2006; 63: 666–673

[67] Koyfman S, Swartz K, Goldstein AM et al. Laparoscopic-assisted percutaneous endoscopic cecostomy (LAPEC) in children and young adults. J Gastrointest Surg 2017; 21: 676–683

[68] Rodriguez L, Flores A, Gilchrist BF et al. Laparoscopic-assisted percutaneous endoscopic cecostomy in children with defecation disorders (with video). Gastrointest Endosc 2011; 73: 98–102

[69] Baraza W, Brown S, McAlindon M et al. Prospective analysis of percutaneous endoscopic colostomy at a tertiary referral centre. Br J Surg 2007; 94: 1415–1420

[70] Rivera MT, Kugathasan S, Berger W et al. Percutaneous colonoscopic cecostomy for management of chronic constipation in children. Gastrointest Endosc 2001; 53: 225–228

[71] Ramage JI, Baron TH. Percutaneous endoscopic cecostomy: a case series. Gastrointest Endosc 2003; 57: 752–755 3

[72] Cascio S, Flett ME, De La Hunt M et al. MACE or caecostomy button for idiopathic constipation in children: A comparison of complications and outcomes. Pediatr Surg Int 2004; 20: 484–487

[73] Biyani D, Barrow E, Hodson P et al. Endoscopically placed caecostomy buttons: A trial ACE procedure. Colorectal Dis 2007; 9: 373–376

[74] Cowlam S, Watson C, Elltringham M et al. Percutaneous endoscopic colostomy of the left side of the colon. Gastrointest Endosc 2007; 65: 1007–1014

[75] Graham CD, Rodriguez L, Flores A et al. Primary placement of a skin-level cecostomy tube for antegrade colonic enema administration using a modification of the laparoscopic-assisted percutaneous endoscopic cecostomy (LAPEC). J Pediatr Surg 2019; 54: 486–490

[76] Rawat DJ, Haddad M, Geoghegan N et al. Percutaneous endoscopic colostomy of the left colon: A new technique for management of intractable constipation in children. Gastrointest Endosc 2004; 60: 39–43

[77] Rao AS, Loftus CG, Baron TH. Buried bumper syndrome arising from a percutaneous endoscopic cecostomy tube. Gastrointest Endosc 2011; 73: 168–169

[78] Ogilvie H. Large-intestine colic due to sympathetic deprivation; a new clinical syndrome. Br Med J 1948; 2: 671–673

[79] Saunders MD. Acute colonic pseudo-obstruction. Best Pract Res Clin Gastroenterol 2007; 21: 671–687

[80] Peker KD, Cikot M, Bozkurt MA et al. Colonoscopic decompression should be used before neostigmine in the treatment of Ogilvie's syndrome. Eur J Trauma Emerg Surg 2017; 43: 557–566

[81] Tsirline VB, Zemlyak AY, Avery MJ et al. Colonoscopy is superior to neostigmine in the treatment of Ogilvie's syndrome. Am J Surg 2012; 204: 849–855

[82] Ponec RJ, Saunders MD, Kimmey MB. Neostigmine for the treatment of acute colonic pseudo-obstruction. NEJM 1999; 341: 137–141

[83] Elsner JL, Smith JM, Ensor CR. Intravenous neostigmine for post-operative acute colonic pseudo-obstruction. Ann Pharmacother 2012; 46: 430–435

[84] Valle RGL, Godoy FL. Neostigmine for acute colonic pseudo-obstruction: A meta-analysis. Ann Med Surg 2014; 3: 60–64

[85] Ross SW, Oommen B, Wormer BA et al. Acute colonic pseudo-obstruction: Defining the epidemiology, treatment, and adverse outcomes of Ogilvie's syndrome. Am Surg 2016; 82: 102–111

[86] Vanek VW, Al-Salti M. Acute pseudo-obstruction of the colon (Ogilvie's syndrome). Dis Colon Rectum 1986; 29: 203–210

[87] Johnson CD, Rice RP, Kelvin FM et al. The radiologic evaluation of gross cecal distension: Emphasis of cecal ileus. Am J Roentgenol 1985; 145: 1211–1217

[88] Geller A, Petersen BT, Gostout CJ. Endoscopic decompression for acute colonic pseudo-obstruction. Gastrointest Endosc 1996; 44: 144–150

[89] Jetmore AB, Timmcke AE, Gathright JB et al. Ogilvie's syndrome: Colonoscopic decompression and analysis of predisposing factors. Dis Colon Rectum 1992; 35: 1135–1142

[90] Harig JM, Fumo DE, Loo FD et al. Treatment of acute nontoxic megacolon during colonoscopy: tube placement versus simple decompression. Gastrointest Endosc 1988; 34: 23–27

[91] Lavignolle A, Jutel P, Bonhomme J et al. Ogilvie's syndrome: results of endoscopic exsufflation in a series of 29 cases. Gastroenterol Clin Biol 1986; 10: 147–151

[92] Pham TN, Cosman BC, Chu P et al. Radiographic changes after colonoscopic decompression for acute pseudo-obstruction. Dis Colon Rectum 1999; 42: 1586–1591

[93] Sgouros SN, Vlachogiannakos J, Vassiliadis K et al. Effect of polyethylene glycol electrolyte balanced solution on patients with acute colonic pseudo obstruction after resolution of colonic dilation: A prospective, randomised, placebo controlled trial. Gut 2006; 55: 638–642

[94] Ponsky JL, Aszodi A, Perse D. Percutaneous endoscopic cecostomy: a new approach to nonobstructive colonic dilation. Gastrointest Endosc 1986; 32: 108–111

[95] Salm R, Rückauer K, Waldmann D et al. Endoscopic percutaneous cecostomy (EPC). Surg Endosc 1988; 2: 92–95

Appendix 1s

Task force	**Members** (task force leaders indicated by asterisk)
Zenker's diverticulum	SI*, MB, JMG, VLZ, JM, HN, FP, DR, BW
Achalasia	AB*, RS*, MB, JMG, HL, JM, DP, FP, ES, DR, PF, BW
GERD	RT*, MB, AB, SI, VLZ, HL, HN, FP, ES, RS, DR, PF, BW
Gastroparesis	JM*, MB, JMG, VLZ, HL, HN, DP, FP, JT, BW
Intractable constipation	HN*, SI, JM, JT, RT, BW
Ogilvie's syndrome	BW*, SM, JT, RT

Appendix 2s part a

Zenker's diverticulum

Clinical questions

- General
  - How should patients with suspicion of Zenker's diverticulum (ZD) be assessed / what is the optimal work-up (role of fluoroscopy, manometry, etc)
  - What is the optimal treatment for ZD
- Technical
  - How should an endoscopic treatment for ZD be performed

Research questions

- What is the efficacy and safety of endoscopic treatment of Zenker's diverticulum compared to surgery
- What is the position of other types of endoscopic treatment (other than the regular septotomy) in the treatment of ZD
  - Tunnelling techniques / Z-POEM
    (since there are very little data to support recommendations here we should mention tunnelling (with either a long or ultrashort tunnel / keyhole), but we should not try to review this in depth: mentioning it as an emerging technique)

- What is the role of fluoroscopy in the work-up of ZD
- What is the role of manometry in the work-up of ZD

- Is there a minimum size for a ZD to be amenable for endoscopic treatment
  - Is there a role for endoscopic therapy in case of a symptomatic cricopharyngeal bar / m.cricopharyngeus hypertrophy

- What is the efficacy and safety of endoscopic treatment compared to surgical treatment for recurrences (and failures?) after initial treatment of ZD

- For all types of treatment:
  - what should be the pre-procedural care (fasting, type of sedation / tracheal intubation, systemic antibiotics, anticoagulation and platelet inhibitors)
  - which settings should be used
  - which knifes should be used

- for 'regular' septotomy:
  - What is the role of an overtube / diverticuloscope
  - Is a cap useful for performing diverticulotomy
  - What is the maximal / optimal depth of the septotomy?

        - Should clips be used at the bottom of the septotomy

    - For all treatments, what is the most optimal post-op care (x-ray? Re-endoscopy?, duration of admission, restart of oral intake, duration of post-op antibiotics, when to resume anticoagulation)

Appendix 2s part b

GERD

Clinical questions

- General
  - Is there a role for endoscopic therapy in GERD, and if so, in which group of patients
- Technical (only valid if do not we recommend against endoscopic therapy for GERD
  - How should endoscopic plications be delivered
  - How should radiofrequency energy delivery (Stretta) be performed
  - how should antireflux mucosectomy (ARMS) be delivered

Research questions

  - What is the effectivity and safety of the transoral incisionless fundoplication (TIF2)
    - Compared to medical therapy
    - Compared to antireflux surgery
  - What is the effectivity and safety of the Medigus Ultrasonic Surgical Endostapler (MUSE)
    - Compared to medical therapy
    - Compared to antireflux surgery
  - What is the effectivity and safety of the Stretta procedure for gastroesophageal reflux
    - Compared to medical therapy
    - Compared to antireflux surgery
  - What is the effectivity and safety of the ARMS procedure for gastroesophageal reflux
    - Compared to medical therapy
    - Compared to antireflux surgery

Appendix 2s part c

Intractable constipation

Clinical questions

- General
  - What is the role of endoscopic cecostomy for colonic antegrade lavage in the management of patients with intractable constipation
    (we will keep in mind to mention other indications for cecostomy in the GL, depending on what evidence will come across during the literature searches)
- Technical
  - How should endoscopic cecostomy be performed / what is the optimal technique to perform an endoscopic cecostomy

Research questions

- What are the technical success rates and complication rates of endoscopic cecostomy
- What are the clinical success rates of / patient acceptance of / quality of life after endoscopic cecostomy
- What is the safety and efficacy of endoscopic cecostomy compared to surgical techniques such as laparoscopic approach
- What is the efficacy of endoscopic cecostomy compared to medical therapy / retrograde lavage
- What is the optimal technique to perform an endoscopic cecostomy
- Is there an indication to perform an endoscopic colostomy at a location other than the cecum (e.g. sigmoid, ascending colon)?
- Is antibiotics required (what type of antibiotics)
- What is the optimal preparation of a patient before cecostomy / what is the most optimal preoperative management of patients undergoing endoscopic cecostomy (bowel prep, anticoagulation / platelet inhibitors, prophylactic antibiotics, type of sedation)
- How should patients be managed postoperatively
- How to manage complications of endoscopic cecostomy

Appendix 2s part d

Ogilvie's syndrome

Clinical questions

- General
  - How should patients with Ogilvie's syndrome be treated
  - What are the indications for intervention in patients with Ogilvie's syndrome (when should patients with Ogilvie's syndrome be treated)
- Technical
  - How should a proper endoscopic decompression be performed in patients with Ogilvie's syndrome

Research Questions

- General
  - Is colonic decompression effective when compared to surgery, medical therapy, or conservative therapy in patients with Ogilvie's Syndrome
  - Is colonic decompression safe when compared to surgery, medical therapy, or conservative therapy in patients with Ogilvie's Syndrome
  - When (at what diameter of the colon) should endoscopic decompression be performed
  - How to rule out other causes of colonic dilatation
  - What should the post-procedural care look like
  - What is the risk of recurrence of Ogilvie's syndrome
  - How should recurrences be treated
- Technical
  - Should patients receive any form of bowel prep before endoscopic intervention
  - Is there an additional effect of leaving a decompression catheter in place

Appendix 3s part a

Zenker's diverticulum - data extraction

Author (year)	Methods			Population			Intervention			Outcomes		Remarks
	Design	Randomization / blinding		N	Age	Inclusion criteria	Protocol (details) of Intervention	Protocol (details) of Comparison	Follow-up	Outcome measures (+ definitions)	**Outcomes of interest*** **Efficacy:** dysphagia score Clinical remission (Y/N) endoscopic remission regression of the diverticulum at VSS recurrence **Safety** Complications/ (S)AEs	
Shahawy (2014)	Retrospective	No	No	67	68.5	ZD proven (barium swallow)	Endoscopic (CO2 or stapler) (n=36)	Diverticulectomy and myotomy (n=31)	2m	Dysphagia score (0-4), recurrence of ZD, adverse events	39% recurrences (ENDO) vs 0% (OPEN), p= 0.00011 Complications: 13% vs 31%, p=0.08	Almost no follow up data in this series
Verdonk (2015)	systematic review	No	No	71 studies, 3079 patients	NA	> 20 patients, FU > 12 months, reporting on all patients	endoscopic (stapler, laser, coagulation) (n=1089)	diverticulectomy and myotomy (n=1990), diverticulopexy (n=317)	NA	technical success, recurrence, complications, mortality, LOS	Success rate: 82% (endo) vs 96% (surg), p <0.001 technical success 86% vs 99%, p< 0.05 mortality 0.4 vs 0.9%, p= NS, complications 7% vs 11%, p= NS, LOS 3.9 vs 8.4 days, p<0.001	No data on the mean length of the follow-up, only scarce data on flexible endoscopy techniques
Albers (2016)	systematic review	No	No	11 studies, 596 patients	NA	Endoscopic vs open surgical treatments	Endoscopic (stapler, laser, coagulation), (n= 300)	Diverticulectomy and myotomy, diverticulopexy, (n= 296)	NA	Recurrence, complications	Recurrence: 13% vs 6% (p = 0.001), complications = 9% vs 15%, p= 0.02	
Repici (2010)	Prospective	No	No	32	75	ZD proven (barium swallow)	Septotomy with cap and hook knife	NA	24m	Success (dysphagia score /4), recurrences, complications	Clinical remission: 87.5% at 1 month, complications 6% (2/32), recurrences = 6%	
Al Khadi (2010)	Prospective	No	No	18	80	ZD proven (barium swallow)	Septotomy with needle knife, NG tube	No	28m	Success (dysphagia score /4), recurrences, complications	Clinical remission = 77%, Complications 6%, recurrence = 11%	
Manno (2014)	Prospective	No	No	19	74	ZD proven (barium swallow)	Septotomy, diverticuloscope, IT knife	No	27m	Success (dysphagia score /4), recurrences, complications	Clinical remission = 100%, Complications = 0%, recurrences 11%	
Laquière (2014)	Prospective	No	No	42	75	ZD proven (barium swallow)	Septotomy, diverticuloscope, Dual / hybrid knife	No	16m	Success (dysphagia score /4), recurrences, complications	Clinical remission = 88%, recurrences = 14%, complications: 19%	
Costamagna (2016)	Prospective	No	No	89	70	ZD proven (barium swallow)	Septotomy, diverticuloscope, kneedle knife	No	48m	Success (dysphagia score /4), recurrences, complications	Clinical remission = 69% at M6, 46% at 48M, recurrences = 11%, complications: 3%	
Antonello (2016)	Retrospective	No	No	25	68	Recurrent ZD	Septotomy, diverticuloscope, snare resection	No	18m	Success (dysphagia score /4), recurrences, complications	Clinical remission = 84%, recurrences = 24%, complications: 8%	
Oestreicher (2016)	Retrospective	No	No	20	66	Recurrent ZD	Stapler diverticulotomy or open surgery	No	NA	Success (dysphagia score /4), recurrences, complications	Clinical remission = 90%, recurrences = 5%, complications: 20%	
Buchanan (2013)	Retrospective	No	No	18	62	Recurrent ZD	Stapler diverticulotomy or open surgery	No	24m	Success (dysphagia score /4), recurrences, complications	Clinical remission = 81%, recurrences = NA complications: 13%	
Pang (2018)	Retrospective	No	No	64	74	ZD proven (barium swallow)	Myectomy (n=20)	myotomy (n=44)	11m	Dysphagia score (0-4), recurrence of ZD, adverse events	0% recurrences (myectomy) vs 23% (myotomy), p= 0.07 dysphagia score change: 1 vs 1 (p= ns) complications = 2% vs 5% (p= 0.2)	
Golder (2018)	Retrospective	No	No	16	70	ZD proven (barium swallow)	Septotomy, diverticuloscope, snare resection	No	3m	Dysphagia score (0-4), recurrence of ZD, adverse events	Clinical remission = 87%, recurrences = 6%, complications: 0%	

Author (year)	Methods		Population			Intervention			Outcomes		Remarks
	Design	Randomization / blinding	N	Age	Inclusion criteria	Protocol (details) of Intervention	Protocol (details) of Comparison	Follow-up	Outcome measures (+ definitions)	**Outcomes of interest*** **Efficacy:** - Symptoms scores - Clinical remission (Y/N) - Need of re-intervention - QoL **Safety** - Complications/ (S)AEs - Occurrence of GERD **Other relevant outcomes**	
Christiaens (2007)	Case series	No	21	77.5	ZD with dysphagia. Mean dysphagia score: 1.5	Monopolar coagulation forceps with Hood. **Fluoroscopy and Manometry not used**	No	23 months	Relief of the dysphagia (main outcome). Dysphagia score (0-4). Adverse events	Post-procedure dysphagia: 0. Clinical success (single session): 90.5%. 100% in two sessions. Adverse events: Emphysema (1 patient: 5%)	
Repici (2010)	Case series	No	32	74.8	ZD with dysphagia.	Hook-knife. **Fluoroscopy and Manometry data not provided**	No	24 months	Relief of the dysphagia (main outcome). Dysphagia score (0-4). Adverse events	Dysphagia improvement from 2.9 to 0.6. Clinical success (single session): 87.5%. Overall success rate 90.6%. Complications in two patients 6.25% (bleeding and cervical emphysema)	
Battaglia (2015)	Case series	No	31	71	ZD with dysphagia.	SB-knife. **Manometry data not provided**	Fluoroscopy divided ZD in small (<2cm), medium (2-4cm) and large (>4cm)	7 months	Relief of dysphagia. Adverse events	Clinical success: 83.9%. Adverse events: 1 patient (melena: 3.2%)	
Li (2018)	**Meta-analysis. 13 studies**	No	589	No	ZD with dysphagia.	Needle-knife. **Fluoroscopy and Manometry data not provided**	No	12 months	Relief of the dysphagia (main outcome). Adverse events	Clinical success: 88%. Overall complicacion:13% (bleeding 5%, perforation 7%). Overall recurrence rate 14%.	
De la Morena (2016)	Case series	No	57	71.8	ZD with dysphagia.	Needle-knife with diverticuloscope. **Fluoroscopy and Manometry data not provided**	No	30 months	Relief of dysphagia. Adverse events	Clinical success: 90%. Adverse events: bleeding (33%), emphysema (1 patient, 1.57%)	
Wilsem (2017)	Case series	No	17	69.8	ZD with dysphagia.	Rotatable surgical stapler. **Fluoroscopy and Manometry data nor provided**	No	2 months	Technical success. Adverse events	Technical success (64.7%). Adverse events: 12% (2 patients)	
Gölder (2018)	Case series	No	16	70	ZD with dysphagia.	Double incision and snare resection (DISR). **Fluoroscopy pre and post DISR**	No	3 months	Relief of dysphagia. Adverse events	Clinical success: 94%. No adverse events	
Pang (2018)	Case series	No	64	73.8	ZD with dysphagia.	Retrospective analysis. Cricopharyngeal (CP) myotomy vs myectomy	CP Myotomy (n=44) vs. CP Myectomy (n=10)	41 weeks	**Recurrence of ZD (based on symptoms or fluoroscopy).** Clinical success. Adverse events	Technical success 100% in both cohorts. Recurrence of ZD (15.6%: 22.7% in CP myotomy and 0% in CP myectomy). Clinical success: 87.5% (86% in CP myotomy vs 90% in CP myectomy). Adverse events: bleeding (12.5%: 11.4% in CP myotomy and 10% in CP myectomy	

*Please extract each outcome of interest (if reported), extract other outcomes if deemed relevant.

Appendix 3s part b

GERD – data extraction

TIF

Author (year)	Methods			Population			Intervention			Outcomes		Remarks
	Design	Randomization / blinding		N	Age	Inclusion criteria	Protocol (details) of Intervention	Protocol (details) of Comparison	Follow-up	Outcome measures (+ definitions)	**Outcomes of interest*** **Efficacy:** - Symptoms scores - Clinical remission (Y/N) - Need of re-intervention - QoL **Safety** - Complications/ (S)AEs - Occurrence of GERD **Other relevant outcomes**	
Hakansson et al 2015	Double-blind sham-controlled study	Yes	Double-blind	44	41 (TIF), 62 (Sham)	Age 18–80 years, on daily PPIs for >6 months, documented PPI-dependent, persistent GERD symptoms without PPI therapy, evidence of two or more of the following while off PPI therapy (>10 days), erosive esophagitis [Los Angeles LA grade A, B or C], abnormal ambulatory pH study, moderate to severe GERD symptoms, normal or near normal esophageal motility.	TIF2 procedure, PPI for 6 weeks post procedure then stop	Sham upper GI endoscopy, PPI for 6 weeks post procedure then stop	6 month	Primary: time to treatment failure: need for PPI treatment to control reflux disease: moderate or severe heartburn and/or acid regurgitation during the last 7 days before the respective visit, esophagitis of at least grade B at endoscopy, requirement of continuous PPI treatment for more than 8 weeks to control reflux symptoms or need for a reintervention. Secondary: Frequency and intensity of GERD symptoms assessed by the Quality of Life in Reflux and Dyspepsia (QOLRAD) questionnaire and Gastrointestinal Symptom Rating Scale (GSRS), PPI usage, esophageal acid exposure, healing of reflux esophagitis, geometry of GOJ (Hill grading) and the side-effects of the respective intervention	Time in remission: 197 days (TIF) vs 107 days (sham), 59% of TIF patients in clinical remission after 6 months; Median GERD symptoms scores, as reflected by the QOLRAD estimates, improved significantly at the 6 month follow-up after active intervention [from 4.9 (range 1.96–6.44) at baseline to 6.4 (range 4.38–7) at 6-month follow-up; P = 0.0005], whereas no change was discernible in the sham group [from 4.8 (1.80– 6.44) at baseline to 5.2 (4.28–6.88) at 6-months follow- up, P = 0.34].; In the TIF2 group, the median GSRS score improved from 14 (range 10–21) to 10 (6–19) (P = 0.004). In the sham group, the median GSRS score did not change [from 14.0 (6.3–21.8) to 12.6 (5.9–21.2), P = 0.396].; 59% of patients off PPI at 6 months after TIF vs 18% after sham (P = 0.01). Normalization of acid exposure: 69% after TIF vs 20% after sham (P = 0.04). Adverse events: no serious, more common after TIF (but not significant), 1 case of dysphagia lasting 3 months after TIF	Patients from the sham group classified as 'treatment failure' were offered TIF after completing the 6-month follow-up and followed thereafter according to clinical routines.
Hunter et al, 2015	Randomized, sham, placebo controlled	Yes	Single-blind	87 (TIF), 42 (sham)	52 'TIF), 55 (sham)	patients between the ages of 18 and 80 years with more than 6 months of GERD symptoms and troublesome regurgitation, despite a minimum PPI dose of 40 mg daily. Troublesome regurgitation was defined as mild symptoms for 2 or more days per week or moderate to severe symptoms more than 1 day per week. Symptom assessment used the following 3 validated tools: the Reflux Disease Questionnaire (RDQ), the Gastroesophageal Reflux Symptom Score, and the GERD-Health Related Quality of Life on PPI and off PPI for at least 7 days. Abnormal amounts of gastroesophageal reflux off PPI for 7 days was confirmed by distal esophageal pH <4 for >5.3% of at least 1 of the 2 days that pH was measured with a Bravo probe. High resolution esophageal manometry confirmed the absence of esophageal motor dysfunction. EGD was performed to grade the appearance of the antireflux barrier (Hill grade), to confirm the absence of long segment Barrett's esophagus, and to grade esophagitis, if present. Cine-esophagography was performed to confirm the absence of hiatal hernia or a hiatal hernia _2 cm in length.	TIF2 procedure, 2 weeks omeprazole 40 mg then placebo	Sham procedure, 2 weeks omeprazole 40 mg then continue omeprazole	6 months	The primary study end point was the elimination of troublesome regurgitation, per Montreal consensus definition, defined as mild symptoms occurring 2 or more days a week, or moderate to severe symptoms occurring more than 1 day a week. The elimination of troublesome regurgitation was evaluated with the RDQ questionnaire. Secondary end points included early failure (defined as moderate to severe regurgitation at any time >12 weeks after surgery and after a doubling of medication, PPI, or placebo) and control of intraesophageal acid exposure. Other secondary outcomes assessed included improvement in various symptom scores (particularly heartburn), healing of esophagitis, common side effects associated with treatment (bloating and dysphagia), and significant adverse events.	Elimination of troublesome regurgitation: 67% (TIF/placebo) vs45% (sham/PPI) (p = 0.023). Equivalent reductions of heartburn and regurgitations scores in TIF and sham groups at 6 months. % acid exposure decreased from 9.3 to 6.4% at 6 months after TIF (< ,001) vs no change in sham group (8.6 to 8.9%). Severe complications: 3 after TIF, 1 after sham	Once the blind was broken, failed TIF patients were given PPI and sham patients were offered TF both for ethical reasons and to make study enrollment more attractive to potential participants

Trad et al, 2015	Prospective, comparative, randomized study with crossover group	Yes	No	63 (40 TIF) 23 PPI)	54 (TIF), 50 (PPI)	patients with daily troublesome regurgitation and/or atypical GERD symptoms (Montreal criteria) on PPIs, abnormal 48-hour ambulatory pH test defined as% time pH <4 greater than 5.3% of the total recording period and a history of daily PPI use for at least six months.	TIF2 procedure, PPI for 2 weeks then stop	PPI twice daily, cross-over into TIF2 after 6 months	6 months	The primary endpoint was elimination of daily troublesome regurgitation or atypical symptoms. Clinical success was defined by the elimination of troublesome regurgitation per Montreal consensus definition, as evaluated by the RDQ questionnaire. The elimination of daily troublesome atypical symptoms was assessed by the RSI questionnaire (each individual atypical score ≤2) score. Secondary endpoints included PPI use, healing of reflux esophagitis and normalization of esophageal acid exposure (EAE). Heartburn, dysphagia and bloating were assessed using GERD-HRQL; excess flatulence was assessed with a standalone question.	Elimination of daily troublesome regurgitation or atypical symptoms: 97% (TIF) vs 50% (PPI) RR = 1.9, 95% CI = 1.2-3.1 (P < .001). Complete elimination of all daily troublesome GERD symptoms other than heartburn was observed in 62% (24/39) of patients in the TIF group compared with 5% (1/21) in the PPI group, RR = 12.9, 95% CI = 1.9-88.9 (P < .001).Secondary: At 6-month follow-up, 90% (35/39, 95% CI = 0.76-0.97) of patients in the TIF group had completely stopped taking PPIs; 3% (1/39, 95% CI= <.0001 to 0.14) of patients were taking PPIs on demand and 8 % (3/39, 95% CI = 0.02-0.21) were back on daily PPIs. In the TIF group, 54% of patients had normalized esophageal acid exposure (off PPIs) compared to 52% of patients on maximum dose PPI in the control group, RR = 1.0, 95% CI = 0.6-1.7 (P = .914).Complete healing or reduction in reflux esophagitis at 6 months was achieved in 90% (18/20) of patients in the TIF group (off PPIs) compared with 38% (5/13) in PPI group, RR = 2.3, 95% CI = 1.2-4.7 (P = .018). 90% of patients in the TIF group (off PPIs) reported elimination of daily troublesome heartburn versus 13% of patients in the PPI group; RR = 7.2, 95% CI = 2.0-26.6 (P = .003). The median heartburn score in the TIF group, as evaluated by the GERD-HRQL questionnaire, improved significantly falling from 19 (range = 4-30) on PPIs before TIF to 2 (range = 0-26) off PPIs (P < .001); in the PPI group the median heartburn score also improved, decreasing from 17 (range = 7-27) on screening to 11 (range = 0-27).	Longer term follow-up after cross-over: 1, 3 and 5 years reported
Wiiteman et al, 2015	Prospective, randomized controlled study	Yes	No	60 (TIF: 40, PPI: 20)	44.7	GERD controlled with PPI therapy, age 18-75, , hiatal hernia ≤2 cm, proven reflux while off PPIs, on daily PPIs for ≥1 year, recurrence of GERD symptoms after cessation of PPIs (GERD-HRQL score difference of >10 between on and off PPIs), normal or reduced lower esophageal sphincter resting pressure (5–40 mm Hg) at manometry	TIF2 procedure (40)	Continuation of PPI therapy (20)	6 months	Primary outcome measure was GERD-related quality of life. Secondary outcome measures were esophageal acid exposure, number of reflux episodes, PPI usage, appearance of the gastroesophageal valve, and healing of reflux esophagitis.	GERD-HRQL: 12.4 (TIF) vs 25.1 (PPI) (p<0.001); % patients with GERD-HRQL improvement > 50%: 55% (TIF) vs 5% (PPI) (p<0.0001). Total % time pH<4: 7.7% (TIF) vs 6% (PPI) (NS); LES resting pressure: 18.2 (TIF) vs 13.6 (p = 0.004), esophagitis %: 14% (TIF) vs 10 % (PPI) (NS). Adverse events 3 pneumonias, 1 severe epigastric pain after TIF	Crossover for the PPI group was allowed after 6 months.
Rinsma et al, 2015	Prospective, randomized controlled study	Yes	No	47		chronic (>6 months) GERD symptoms, such as heartburn, regurgitation, or retrosternal pain, and were at least partially responsive to acid suppressive medication. GERD was well documented by upper GI endoscopy and 24-h MIIpH monitoring, showing esophagitis and/or pathologic acid exposure time (pH <4.0 during >4.0% of time) with a high (≥95%) symptom association probability. Patients with reflux esophagitis grade D (L.A. classification), Barrett's epithelium, hiatal hernia >2 cm, esophageal motility disorder on manometry, a history of previous antireflux surgery, or severe co-morbidity were excluded	TIF2 procedure	Continuation of PPI therapy	6 months	GERD-HRQL, acid exposure time	GERD HRQL 8.5 (TIF) vs 23.6 (PPI), (p<0.001) Acid exposure time: 6.9 (TIF) vs 5.9% (PPI) (NS)	
Huang et al, 2017	Systematic review with meta-analysis			5 RCT and 13 prospective observational studies			188 TIF	105 (PPIs/sham)	6 months		65.96 % attained the standard of responsiveness in 6 months, compared with 30.48 % among those who did not undergo TIF. TIF procedure showed similar efficacy with respect to esophageal acid exposure time compared with PPIs and improved patients' acid exposure time compared with sham groups. 3 severe adverse events	Conclusion of the study: TIF is an alternative intervention in controlling GERD-related symptoms with comparable short-term patient satisfaction. Long-term results showed decreased efficacy with time. Patients often resume PPIs at reduced doses in the near future

*Please extract each outcome of interest (if reported), extract other outcomes if deemed relevant.

MUSE

Author (year)	Methods		Population			Intervention			Outcomes		Remarks
	Design	Randomization / blinding	N	Age	Inclusion criteria	Protocol (details) of Intervention	Protocol (details) of Comparison	Follow-up	Outcome measures (+ definitions)	**Outcomes of interest*** **Efficacy:** dysphagia score; Clinical remission (Y/N); endoscopic remission; regression of the diverticulum at VSS; recurrence **Safety** Complications/ (S)AEs	
Zacherl, Surg Endosc 2015	Prospective	no / no	69	56-F 42-M	GERD	Endoscopic anterior fundoplication using MUSE ™	None	6M	GERD related QOL score (HRQL) and >50% reduction in PPI and reduction of acid pH monitoring	Procedure time 58 min Endoscopy room and 77 Min in theatre, 48/66 >50% reduction GERD-HRQL (73%), 2 SAE (empyema and upper GIB), 2 Moderate AE, 4 mild AE, 16/72 had chest pain	Only 6 month follow up in this series
Roy-Shapira, Surg Endosc 2015	Pilot	no / no	15	46	GERD (pH <4 >7%, pH<4 between 4-7% with >50% correlation of symptoms with reflux (BMI>35 and HH >3cm excluded)	Endoscopic anterior fundoplication using MUSE ™	None	5 year	Not defined	At 5 years - 7/13 (64%) no symptoms, 3/13 (23%, reduced use of PPI	2 procedure abandoned
Joo Kim, Surg Endosc 2016	series (6 centers)	no / no	39	18-70	GERD	Endoscopic anterior fundoplication using MUSE ™	None	5 year FU of the Zacherl series - 37/39 4 years data available	GERD related QOL score (HRQL) and >50% reduction in PPI and reduction of acid pH monitoring	69% off PPI at 4 years, reduction of GERD-HQOL score 62-82%	

Stretta

Author (year)	Methods		Population			Intervention			Outcomes		Remarks
	Design	Randomization / blinding	N	Age	Inclusion criteria	Protocol (details) of Intervention	Protocol (details) of Comparison	Follow-up	Outcome measures (+ definitions)	**Outcomes of interest*** **Efficacy:** - Symptoms scores - Clinical remission (Y/N) - Need of re-intervention - QoL **Safety** - Complications/ (S)AEs - Occurrence of GERD **Other relevant outcomes**	
DAS B, 2015	Literature review		Five papers comparing Stretta with the best medical and surgical treatments for GORD: Coron et al.; July 2008; France Yan et al.; December 2015; China Liang et al.; Aug 2015; China Richards et al.; May 2003; USA Liang et al.; August 2014; China		Stretta vs PPI or LF	Stretta	Surgery (LF), PPI		QOL, acid exposure, safety	Surgery more effective than Stretta Higher rate of adverse events with surgery Stretta somehow reduces PPI need	
Hopkins J, 2015	Literature review		Review of 4 RCTs, Corley et al 2003 Coron et al, 2008 Aziz et al, 2010 Arts et al, 2012 4 long term FU Triadafilopoulos 2002		Stretta vs sham or PPI	Stretta	PPI (on etrial) Sham (3 RCTs)		PPI use QOL, safety Heartburn score acid exposure	Conflicting: Overall, data suggest that Stretta procedure has an acceptable safety profile and may be effective in reducing symptom burden and QOL scores up to 8 years post-intervention. Evidence for any sustained improvement in objective outcomes is poor and Stretta seems inferior when compared to surgical intervention	
Lipka S, 2015	systematic review and meta-analysis of RCTs		4 RCTs, 165 pts		Stretta vs sham or PPI	Stretta	Sham, PPI		Physiologic parameters of GERD, including normalization of esophageal pH values and augmentation of lower esophageal sphincter pressure (LESP). Secondary outcomes were health-related quality of life (HRQOL) and ability to stop the use of proton pump inhibitors (PPIs).	No difference between Stretta and sham or management with PPI	
Fass et al, 2017	systematic review and meta-analysis of RCTs and cohort studies		4 RCTs, 23 cohort studies, and 1 registry						QOL, heartburn, PPI use, acid exposure	Stretta procedure significantly improves subjective and objective clinical endpoints, except LES basal pressure	

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ARMS

Author (year)	Methods		Population			Intervention			Outcomes		Remarks
	Design	Randomization / blinding	N	Age	Inclusion criteria	Protocol (details) of Intervention	Protocol (details) of Comparison	Follow-up	Outcome measures (+ definitions)	**Outcomes of interest*** **Efficacy:** - Symptoms scores - Clinical remission (Y/N) - Need of re-intervention - QoL **Safety** - Complications/ (S)AEs - Occurrence of GERD **Other relevant outcomes**	
Innoua (2014)	Case series	No	10	Not provided	PPI-refractory GERD without sliding hernia	Circumferential (n=2) or crescentic (n=8) ARMS of the esophagogastric junctional mucosal with EMR or ESD	Before AMS vs After ARMS	36 months-10 years	Severity of GERD symptoms evaluated with DeMeester score. Esophageal function tests with esophageal manometry, 24-h pH monitoring and Bilitec	Significant improvement of GERD symptoms (DeMeester score 3.2 vs 1.2. P=0.0152). Significant improvement in Bilitec (52% vs. 4%, P=0.05). 24-h pH-monitoring pH<4 from 29.1% vs. 3.1%Circumferential ARMS induced stricture formation (n=1, 50%)	PPI could be discontinued without problems
Benias (2018)	Case series	No	10	56.5	PPI-refractory GERD without sliding hernia no more than 2cm	Resection and Plication method (RAP)	Before-RAP and After-RAP	24 months	GERD-HRQL (Health Related Quality of Life. Adverse events	GERD-HRQL Pre-RAP (26.2) vs Post-RAP (4.3). Clinical Response (PPI discontinuation): 80%. Stricture formation: 10% (1 patient)	
Hedberg (2019)	Case series	No	19	57.1	PPI-refractory GERD without sliding hernia no more than 2cm	ARMS using multi-band endoscopic banding system	Before AMS vs After ARMS	6 months	GERD-HRQL, Reflux Severity Index (RSI). Dysphagia score	Clinical response (69%: discontinued PPI use). Dysphagia: 16%	Patients without clinical response went to anti-reflux surgery

*Please extract each outcome of interest (if reported), extract other outcomes if deemed relevant.

Appendix 3s part c

Intractable constipation – data extraction

Cecostomy

Author (year)	Methods		Population			Intervention			Outcomes		Remarks
	Design	Randomization / blinding	N	Age	Inclusion criteria	Protocol (details) of Intervention	Protocol (details) of Comparison	Follow-up	Outcome measures (+ definitions)	**Outcomes of interest*** **Efficacy:** - Symptoms scores - Clinical remission (Y/N) - Need of re-intervention - QoL **Safety** - Complications/ (S)AEs - Occurrence of GERD **Other relevant outcomes**	
Ricard (2019)	Case series. Two centers	No	69	48.3	Antegrade colonic enema to manage intractable chronic constipation. Evaluate the efficacy of PEC (percutaneous endoscopic cecostomy). 3 types of patients: constipation, incontinence and rectal resection	7 days of fiber free diet. 3 days of oral PEG. Antibiotic prophylaxis (amoxicillin-clavulanic 1g or ofloxacin 200 mg with metronidazole 500 mg) 1 h before PEC. Colonoscopy under general anesthesia. CO2 insufflation. Left lateral or supine position. Puncture disinfected with antiseptic solution	Retrospective analysis. 3 groups of patients	3 months	Quality of life and GI symptoms evaluated with standardized questionnaires in each visit. Success of PEC: absence of removal of the catheter during follow-up, improvement of QoL and GI symptoms, and yes to recommend the PEC for others. Adverse events (infections, pain and perforation)	Significantly improvement in GIQoL. Success of PEC: 58% (constipation group), 74% (incontinence group) and 90% (rectal resection). Adverse events: post-procedure pain (51%), chronic pain (51%), minor wound infection (19%), hypertrophic granulations at PEC site (42%), Catheter removal (29%). During follow-up 5 patients underwent surgery	PEC for antegrade colonic enemas improves significantly the quality of life of patients with colorectal disorders refractory to medical treatment
Strijbos (2018)	Case series. Single-institution	No	12	56	Chronic intestinal pseudo-obstruction (CIPO)	Percutaneous endoscopic colostomy in ascending colon. Bowel preparation: bisacodyl 10mg 2 days before + standard Moviprep (macrogol 2L). Antibiotic prophylaxis: Amoxicillin-clavulanic 1g before PEC and 5 days after 500mg/125mg (po). Conscious sedation with midazolam 5mg + fentanyl 100 ug. Insufflation with CO2. After procedure: Antegrade lavage immediately after (500 ml warm water)	No	40 months	Improvement of constipation symptoms (Global Physician Assessment -GPA Scale: 1-6 points). Procedural success. Clinical success. Complications	GPA Scale: 8 patients good effect / 4 patients moderate effect. Technical success in 100%. Complications: 3 patients (25%) with local site infection. 1 patient (8%) with local abscess. Persistent abdominal pain in 2 patients (16.7%). Long-term response in 66%. Buried bumper in 1 patient (8.3%)	
Didailler (2018)	Case series. Two centers	No	25	62	Refractory low anterior resection syndrome and fecal incontinence after total mesorectal excision	Percutaneous endoscopic cecostomy (PEC). Bowel preparation: 7 days of fiber-free diet and 3 days PEG. Antibiotic prophylaxis: amoxicillin-clavulanic 1g or ofloxacin + metronidazole 500 mg 1 h before PEC and 72 h after. CO2 insufflation. Left lateral or supine position. Puncture site disinfected with antiseptic solution. Patient discharged 1 to 7 days after PEC	Before and After antegrade enema	8 months	Low anterior resection syndrome score (LARS) Wexner score (WS) Gastrointestinal Quality of Life Index (GQoLI). Stoma formation and failure of the procedure	LARSA (33 vs. 4, p<0001), WS (16 vs. 4, p<0.001), GQoLI (73 vs 104, p<0.001). Local abscess was 8%. Sweating (28%). Local pain (36%). Duration of the procedure 33 minutes. Postoperative complication 4 patients (16%)	PEC avoids definitive colostomy in 22 (88%)
Küllmer (2016)	Case series. Single-institution	No	2	67	Chronic intestinal pseudo-obstruction (CIPO)	PEC (percutaneous endoscopic cecostomy). Antibiotic prophylaxis data not provided. Colonic preparation with PEG	No	6 months	Procedural success. Clinical success. Complications	100% procedural and clinical success. 0% of complications	
Duchalais (2015)	Case series. Single-institution	No	21		CIPO	Percutaneous endoscopic cecostomy (PEC). Bowel preparation: PEG 2L/day and fiber-free diet 7 days prior PEC. PEG 4L/day 48 h before PEC. Antibiotic prophylaxis: Amoxicillin-clavulanic 1g (1 h before iv and 7 days after po). General anesthesia. Supine position	No	6 months	Procedural success. Clinical success. Complications. Quality of life and GI symptoms evaluated with standardized questionnaires in each visit. Success of PEC: absence of removal of the catheter during follow-up, improvement of QoL and GI symptoms, and yes to recommend the PEC for others. Adverse events (infections, pain and perforation)	Technical success in 19 patients (90.4%). Clinical success in 11 patients (61%). Mean duration procedure 22 min. Median postoperative hospital stay 4 days. Complication: 1 patient (5%) acute abdominal pain. 10 patients (50%) granulomatous tissue. 9 patients (45%) with chronic pain. 7 patients (35%) serous leakage. 2 patients (10%) local site infection	
Rao (2011)	Case report	No	1	43	CIPO	Percutaneous endoscopic cecostomy (PEC)	No	72 weeks	Procedural success. Clinical success. Complications	100% procedural and clinical success. 100% of complications (Buried bumper syndrome)	

Berger (2008)	Case report	No	1	72	CIPO	PEC (percutaneous endoscopic cecostomy). Bowel preparation with PEG solution. Fasting. Conscious sedation. Antibiotic prophylaxis (broad-spectrum iv) 24 h before and after	No	Not provided	Procedural success. Clinical success. Complications	100% procedural and clinical success. 0% of complications	
Lykke (2006)	Case report	No	1	52	CIPO	PEC (percutaneous endoscopic cecostomy). Bowel preparation with PEG solution. Fasting. Conscious sedation. Antibiotic prophylaxis (broad-spectrum iv) 24 h before and after	No	4 months	Procedural success. Clinical success. Complications	100% procedural and clinical success. 0% of complications	
Lynch (2006)	Case series. Single institution	No	7	79	CIPO	PEC (percutaneous endoscopic cecostomy). 2 days of bowel preparation: 1 day with clear liquids and second day with PEG solution. In colon not well prepared repeat PEG solution. Fasting. Conscious sedation. Antibiotic prophylaxis (broad-spectrum iv) 24 h before and after	No	31 weeks	Procedural success. Clinical success. Complications	100% procedural and 100% clinical success. 20% of complications (peristomal infection treated with antibiotic). 10% of severe peritonitis require surgery	Mild complication
Uno (2006)	Case series. Single institution	No	20	67	CIPO	PEC (percutaneous endoscopic cecostomy). Antibiotic prophylaxis: Kanamycine sulfate 3 g orally (3 days before) + Piperacillin 24 h before and 48 h after. Bowel preparation with PEG. Conscious sedation	No	8.8 months	Procedural success. Clinical success. Complications	100% procedural success. 5% of bleeding (1 patient). 25% of granulation tissue around the stoma	
Ramage (2003)	Case series. Single institution	No	5	59.2	CIPO	PEC (percutaneous endoscopic cecostomy). Antibiotic prophylaxis 1 hour before and 24 h after (inpatient: piperacillin/tazobactam / outpatient: amoxicillin-clavulanic). Bowel preparation with PEG. Fasted 8 hours before PEC. Conscious sedation. Supine position	No	26 weeks	Procedural success. Clinical success. Complications	100% procedural. 40% of complications (leakage/fever and bleeding)	
Wills (2003)	Case report	No	1	35	CIPO	PEC (percutaneous endoscopic cecostomy). Antibiotic prophylaxis: neomycin 1g by mouth 24 h before + cefotaxime and vancomycin after. Bowel preparation with PEG	No	Not provided	Procedural success. Clinical success. Complications	100% procedural and clinical success. 0% of complications	
Rivera (2001)	Case series. Single-institution	No	12	17 month-22y	CIPO	PEC (percutaneous endoscopic cecostomy). Perioperative management: General anesthesia (n=11) / conscious sedation (n=1). Antibiotic prophylaxis (metronidazole and gentamicin) for 24 hours. Bowel preparation not provided	No	13 months	Procedural success. Clinical success. Complications	100% procedural success. 25% of mild complications (fever and pain). 8.3% (1 patient) with severe peritonitis with death. 41% with granuloma tissue around the stoma	
De Peppo (1999)	Case series. Single-institution	No	3	No	Fecal incontinence	PEC (percutaneous endoscopic cecostomy). Perioperative management: enteral nutrition 2 days before. Antibiotic prophylaxis (2 days before till 3 days after): clarithromycin + metronidazole (both 50mg/kg/day). Fasted 24 hours before. Bowel preparation with PEG (15-35 ml/kg). General anesthesia	No	15 months	Procedural success. Clinical success. Complications	100% procedural and clinical success. 0% of complications	
Ganc (1988)	Case report	No	1	83	CIPO	PEC (percutaneous endoscopic cecostomy). Antibiotic prophylaxis and colonic preparation data not provided	No	Not provided	Procedural success. Clinical success. Complications	100% procedural and clinical success. 0% of complications	
Salm (1988)	Case report	No	1	65	CIPO	PEC (percutaneous endoscopic cecostomy)	single-dose antibiotic prophylaxis	Not provided	Procedural success. Clinical success. Complications	100% procedural and clinical success. 0% of complications	
Ponsky (1986)	Case series. Single-institution	No	2	82	CIPO	PEC (percutaneous endoscopic cecostomy)	No	Not provided	Procedural success. Clinical success. Complications	100% procedural and clinical success. 0% of complications	

*Please extract each outcome of interest (if reported), extract other outcomes if deemed relevant.

Appendix 3s part d

Ogilvie's syndrome – data extraction

Comparative efficacy and safety of endoscopic decompression											
Author (year)	**Methods**		**Population**			**Intervention**			**Outcomes**		**Remarks**
	Design	**Randomization / blinding**	**N**	**Age**	**Inclusion criteria**	**Protocol (details) of Intervention**	**Protocol (details) of Comparison**	**Follow-up**	**Outcome measures (+ definitions)**	**<u>Outcomes of interest*</u> **Efficacy:** - Symptoms scores - Clinical remission (Y/N) - Need of re-intervention - QoL **Safety** - Complications/ (S)AEs - Occurrence of GERD **Other relevant outcomes**	
Haj (2018)	Retrospective	N.A.	Total 37 Group 1 (conservative): 19 Group 2 (interventional): 18	67	Clinical criteria, including imaging evidence of colonic dilation ≥9cm	Conservative (observation, rectal tube, nasogastric tube, fluid resuscitation, and correction of electrolytes)	Interventional management included administration of neostigmine, decompressive colonoscopy and/or sigmoidoscopy, placement of a gastrostomy tube with wall suction, and surgical interventions such as colostomy or colectomy.	?	**Primary** - inpatient mortality and time to resolution of obstruction. **Secondary:** -Clinical complications (ischemia or perforation of the colonic wall) -Primary failure of treatment or recurrence of Ogilvie's syndrome during the same inpatient admission -Severe bradycardia leading to clinical symptoms NB definitions Resolution: normal imaging or relief of abdominal distention on physical examination with return of bowel movements. Complications included bradycardia secondary to neostigmine, recurrence of Ogilvie's syndrome, progression of distension, and colonic ischemia requiring surgery	**Efficacy** -Overall time to resolution was 5 days, with no difference in either group -The rate of resolution also did not differ between the 2 groups - <u>Additionally, the rate of resolution did not differ with the different interventional management options including neostigmine, colonoscopy, and surgery</u> **Safety** -Overall, 15 patients (41%) experienced an Ogilvie-syndrome-related complication, as defined, with recurrence of Ogilvie's syndrome being the most common (24%) -Patients in the interventional management group were more likely to experience complications (61%vs 21% in the conservatively managed group; P=.01); bradycardia after administration of neostigmine was the most common complication experienced in this group (17%) and 1 patient (6%) developed colonic ischemia after an initial colonoscopy, requiring urgent colectomy. - Multiple regression analysis to identify independent risk factors for developing an Ogilvie's-syndrome-related complication: risk of a complication (as defined) was reduced when conservative management was used.	Possible bias as to which patients had conservative or interventional management (ie, sicker patients with more advanced disease had more aggressive interventional management), however matched for comorbidity and bowel diameter.
Peker (2017)	Retrospective	N.A.	Total 68 (all fair-poor response after conservative therapy 24 hours) Group 1: 31 Group 2: 37	61	Symptoms of bowel obstruction and colonic dilatation without underlying mechanical obstruction. Inclusion after 24 conservative therapy and no response	Group 1 Group 1 comprised patients who underwent colonoscopic decompression, because they had a poor first response to neostigmine treatment	Group 2 Colonoscopic decompression was performed following conservative treatment. Patients whose response was poor 24 h after decompression were treated with neostigmine (group 2)	1-month follow-up period.	Treatment outcome was assessed on an ordinal scale as poor, fair, or good clinical response (resolution of abdominal distention with the passage of flatus and stool.)	**Efficacy** -Response to first intervention was statistically significant ($p < 0.01$): 48 vs 84% --> better in group 2 -The total response to colonoscopic and neostigmine treatment was significantly greater than colonoscopic treatment: 81.5% vs 48,% ($p < 0.01$). -No recurrence was determined during the 1-month follow-up in both groups. -No difference in hospital stay. **Safety** No complications were observed	Colonoscopic decompression as a first-line treatment performed by experienced endoscopists is more effective than treatment with neostigmine, and it prevents more patients from having to undergo a second treatment modality. There was no significant etiologic factor in the univariate analysis that affected neostigmine treatment, but there was a poor response to colonoscopic treatment with old age, male sex, and the presence of cardiac disease
Ross (2016)	Retrospective	N.A.	Total 106784 pt -96657 (90.5%) MM -2915 (2.7%) ENDO -6731 (6.3%) SURG -481 (0.5%) SAC.	64.4-69.6	Any diagnosis of colonic pseudo-obstruction by ICD-9 code (560.89)	Patients were analyzed by treatment into four groups: - Medical management (MM) - Colonoscopy alone [(endoscopy-only group) ENDO] - surgery alone (SURG) - surgery and colonoscopy (SAC).		?	Primary outcomes of interest were medical and procedural morbidity and inpatient mortality	**Safety** Multivariate analyses: increasing procedure invasiveness was independently associated with higher odds of medical complications, procedural complications, and death ($P < 0.0125$).	Those who fail MM and require procedures have increasing morbidity and mortality with increasing invasiveness, likely reflecting the severity of their conditions.

Tsirline (2012)	Retrospective	N.A.	100	60.7	Patients with Ogilvie's syndrome were identified on the basis of encounter diagnoses and neostigmine administration records.			?	Number of treatments Clinical success (defined as poor, fair, or good on the basis of clinical and radiographic parameters. Cecal diameter change (assessed by 2 surgeons) Complications of each treatment	**Efficacy** Colonoscopy was significantly more successful than neostigmine (defined as no further therapy requirement), both after 1 intervention (75.0% vs 35.5%, P .0002) and up to 2 interventions (84.6% vs 55.6%, P .0031). Furthermore, a single colonoscopy was more effective than either 1 or 2 administrations of neostigmine (75.0% vs 55.6%, P .044) Clinical response (poor, fair, or good) was significantly better after colonoscopy than neostigmine after 1 or 2 interventions (P .0028 and P .00079, respectively) Cecal diameters decreased after either intervention but significantly more after colonoscopy than neostigmine Recurrence: 9 of 38 patients who initially underwent colonoscopy requiring further treatment (23.7%). The rate of sustained response to a single administration of neostigmine was only 36%, **Safety** There were 3 perforations (3.8%) after interventions (1/52 after colonoscopy and 2/44 after neostigmine) and 4 spontaneous perforations.	Conclusion: On the basis of our experience, the success rate of colonoscopy is higher than that of either single or repeat neostigmine administration, and it does not carry a higher complication rate.
Vanek (1986)	Retrospective	N.A.	393 (literature) + 7 own center	56.6 (v) en 59.9 (m)	Acute dilatation of the colon without organic obstruction was the criterion for inclusion in this study.	Treatment consisted of conservative procedures, colonoscopy, and surgery		?		**Efficacy** The initial colonoscopy decompressed the colons of 102 (82%) of 125 patients. The recurrence rate was 22 %. Twenty-three repeat colonoscopies demonstrated an 87 percent success rate, but a higher recurrence rate of 40%. Twenty-two (18%) of 125 patients required surgery after initial colonoscopy. Success rates surgical procedures depending on type of procedure. **Safety** Conservative treatment and colonoscopy produced a lower mortality and morbidity rate than surgical procedures. Colonoscopy: 2% perforations	Surgery when colonoscopy failed

*Please extract each outcome of interest (if reported), extract other outcomes if deemed relevant.

When to perform endoscopic decompression

Author (year)	Year of publication	Methods			Population			Intervention			Outcomes		Remarks
		Design	Randomization / blinding		N	Age	Inclusion criteria	Protocol (details) of Intervention	Protocol (details) of Comparison	Follow-up	Outcome measures (+ definitions)	**Outcomes of interest*** **Efficacy:** Symptoms (abdominal pain, bowel movements) Colonic diameter Length of hospital stay Need fort colectomy Recurrence **Safety** Adverse events Complications Perforation Septicemia	
Vanek	1986	Retrospective	N.A.	N.A.	393 (literature) + 7 own center --> maximum diameter coecum noted in 221 patients, mean: 13.1 cm	56.6 (v) en 59.9 (m)	Acute dilatation of the colon without organic obstruction was the criterion for inclusion in this study.	Treatment consisted of conservative procedures, colonoscopy, and surgery		?		Frequency of Perforation or Ischemia vs. Cecal Diameter: <12: 0% (n=44) 12-14: 7% (n=29) >14: 23% (n=69) Mortality vs. Delay in Decompression <4 days: 12/82: 15% 4-7 days: 3/11: 27% >7 days: 8/11: 73%	Results of the comparison of cecal diameter and mortality may be biased, because data were obtained in only 144 of 400 patients. There was a two fold increase in mortality when the cecal diameter was greater than 14 cm. Only 104 cases were available for comparing mortality and length of time between occurrence of abdominal distention and adequate decompression. There was a fivefold increase in mortality when the delay in decompression was seven days or more after diagnosis, as compared with less than four days. The status of the dilated colon significantly influences mortality.
Geller	1996	Retrospective	N.A.	N.A.	Total 50 -41 pt (82%) one colonoscopic decompression - 9 pt with multiple (2 to 4) colonoscopic decompressions Total number of colonoscopies: 62 -54 (87%) with decompression tube placement -8 (13%) decompression tube placement	68	The criteria for diagnosing acute colonic pseudo-obstruction were (1) acute abdominal distention, (2) colonic dilatation on plain abdominal films, and (3) absence of mechanical obstruction as confirmed by Hypaque enema or colonoscopy. After 24-48 conservative treatment. NB cecum size: mean 13 ± 3 (range 9-20) and 13 -+2 (range 9-15)	N.A.	N.A.	?	Early success was defined as a reduction of colonic diameter following the procedure by plain abdominal x-rays or physical examination. Clinical success was defined as sustained decompression without additional endoscopic intervention.	**Efficacy** -Clinical success was 80% (43 of 54) with endoscopic decompression tube placement and 25% (2 of 8) without tube placement. -Decompression tube positioned in the right colon and in the transverse colon had similar clinical success. <u>There were no significant differences between the single versus multiple decompression groups in regard to age, cecum size, comorbidity, or mortality (p > 0.05).</u> **Safety** Endoscopic perforation occurred in 1 patient (2%)	
Jetmore	1992	Retrospective	N.A.	N.A.	48 patients: - 3 spontaneous resolution - 45 patients colonoscopic decompressions	67 years (range, 36-90 years)	For the diagnosis of Ogilvie's syndrome to be made, the following criteria were met: 1) The transverse cecal diameter on a plain anteroposterior radiograph was increased above normal (9 cm or greater). 2) Abdominal distention was present. 3) No mechanical obstruction was present, as proven by colonoscopy or contrast enema. 4) Colonic dilatation was acute and occurred during hospitalization. Chronic megacolon in ambulatory outpatients was excluded.			?		3/48 resolved spontaneously with medical treatment. 45/48 patients had colonoscopic decompression --> In 84.4% (38/45), colonoscopic therapy was successful. 5 patients (11%) required an operation after colonoscopy. <u>Average cecal diameter in patients with successful colonoscopic decompression was 12.4 cm but was larger for patients requiring more than one colonoscopy (13.3 cm) and for those who failed colonoscopic therapy (13.4 cm)</u> **Safety** No complications or deaths were directly attributable to colonoscopy	
Johnson	1985	Retrospective	N.A.	N.A.	46 patients: -25 cecal ileus -12 colonic ileus *-4 Nonvolvulus causes of obstruction.* *-4 volvulus* 1 patient no category	the age range was 24-85 years.	A retrospective review of plain abdominal radiographs in 46 patients with gross cecal distension (>10 cm) was performed.			?		Cecal ileus: - 15/25 conservative treatment: 4 perforations -2/25 Colonoscopic decompression: 1 perforation. - 8/25 surgical, 0 perforations Colonic ileus: - 11/12 conservative treatment: 1 perforation 1/12 Colonoscopic decompression: 0 perforations. The absolute diameter of the cecum did not seem to correlate with the risk of perforation. The risk of perforation was related more to duration of cecal distension than to absolute cecal size. -->mean duration of distention in patients who perforated of 6 days compared to 2 days in those who did not	No match in originally search We use the term cecal ileus to describe the situation in which a mobile cecum is dilated out of proportion to the rest of the colon and rotated anteromedially We use the term colonic ileus when there is relatively uniform and continuous gas distension of the entire colon, and the cecum is in the usual position in the right lower abdomen. When contrast enemas were performed in either cecal or colonic ileus, there was no obstruction to the retrograde filling of the entire colon.

Role of leaving a decompression tube

Author (year)	Year of publication	Methods			Population			Intervention			Outcomes		Remarks
		Design	Randomization / blinding		N	Age	Inclusion criteria	Protocol (details) of Intervention	Protocol (details) of Comparison	Follow-up	Outcome measures (+ definitions)	**Outcomes of interest*** **Efficacy:** Symptoms (abdominal pain, bowel movements) Colonic diameter Length of hospital stay Need for colectomy Recurrence **Safety** Adverse events Complications Perforation Septicemia	
Geller	1996	Retrospective	N.A.	N.A.	Total 50 -41 pt (82%) one colonoscopic decompression - 9 pt with multiple (2 to 4) colonoscopic decompressions Total number of colonoscopies: 62 -54 (87%) with decompression tube placement -8 (13%) decompression tube placement	68	The criteria for diagnosing acute colonic pseudo-obstruction were (1) acute abdominal distention, (2) colonic dilatation on plain abdominal films, and (3) absence of mechanical obstruction as confirmed by Hypaque enema or colonoscopy. After 24-48 conservative treatment.	N.A.	N.A.	?	Early success was defined as a reduction of colonic diameter following the procedure by plain abdominal x-rays or physical examination. Clinical success was defined as sustained decompression without additional endoscopic intervention.	**Efficacy** -Clinical success was 80% (43 of 54) with endoscopic decompression tube placement and 25% (2 of 8) without tube placement. -Decompression tube positioned in the right colon and in the transverse colon had similar clinical success. **Safety** Endoscopic perforation occurred in 1 patient (2%)	
Harig	1988	Retrospective	N.A.	N.A.	Total 20 A decompression tube was placed in 11 and no tube in 9.	?	?			?		**Efficacy** -Decompression was achieved in all patients with a decompression tube compared with only 5 (56%) in patients without a decompression tube -Despite early success, we note that sustained clinical success without decompression tube placement was poor (25%). No recurrence in group with decompression tube. **Safety** There was no morbidity observed from either decompression or tube placement	No full text available
Nano	1987	Retrospective	N.A.	N.A.	Total 17 patients (unresponsive to conservative therapy) who received endoscopic intervention	?	?	Either colonoscopic suction decompression (CSD) or colonic suction decompression with proximal colonic tube placement (CDT) for continuous decompression.		?		**Efficacy** 13/17 (76%) resulted in successful acute decompression. Recurrences occurred in 6/13 (45%) (3/7 in the colonoscopic suction decompression group and three of six in the colonic tube placement group) **Safety** There were no instances of colonic perforation	No full text available
Pham	1999	Retrospective	N.A.	N.A.	Total 24 patients	65	The criteria for ACPO were defined as rapid development of abdominal distention, abdominal x-ray showing right colon gaseous distention with cecal diameter >- 9 cm, pre- dominance of right colon dilation (to exclude chronic idiopathic megacolon), and no mechanical obstruction at colonoscopy				Successful colonoscopy was defined as reaching the right colon or cecum. Radiographic resolution was defined as the return to a normal gas pattern on plain abdominal radiograph. Clinical resolution was defined as the return to normal colonic function without additional endoscopic or operative intervention	**Efficacy** After colonoscopic decompression, 11 patients received long colonic tubes, three received rectal tubes, and eight had no placement of a decompression tube. Cecal diameter changes on postcolonoscopy Day 1 were-3.1-+2.3cm, -3+2cm, and-0.6-+3.8cm, respectively. Thus, the placement of long colonic tubes and rectal tubes appeared to give better decompression than colonoscopy alone ($P < 0.05$), although this was done according to clinician preference and was not randomized	
Lavignolle	1986	Retrospective	N.A.	N.A.	Total 29 patients -14 patients were treated by colonoscopic decompression alone -15 endoscopic decompressions were systematically completed by intubation of the colon. The tube was removed after 2 to 13 days	?	?			?		**Efficacy** Endoscopic decompression was successfully achieved in all cases Colonic dilatation recurred in 6 patients in the first group and in one patient in the second group (p less than 0.05) **Safety** No complications due to the endoscopic procedures occurred in this series	**No full text available, in French** Not clear what kind of tube + location Our results also suggest that colonoscopic intubation should be used prophylactically in order to avoid recurrences

*Please extract each outcome of interest (if reported), extract other outcomes if deemed relevant.

Preventing recurrence/post-procedural care: what is the most appropriate post-procedural care after endoscopic decompression for Ogilvie's syndrome?

Author (year)	Year of publication	Methods			Population			Intervention			Outcomes		Remarks
		Design	Randomization / blinding		N	Age	Inclusion criteria	Protocol (details) of Intervention	Protocol (details) of Comparison	Follow-up	Outcome measures (+ definitions)	**Outcomes of interest*** **Efficacy:** Symptoms (abdominal pain, bowel movements) Colonic diameter Length of hospital stay Need for colectomy Recurrence **Safety** Adverse events Complications Perforation Septicemia	
Sgouros	2006	RCT	Yes	Yes	30		30 consecutive patients who presented with abdominal distension and radiographic evidence of colonic dilation, with a cecal diameter > or = 10 cm, that resolved conservatively NB 8 patients endoscopic decompression	To receive daily 29.5 g of PEG (n = 15)	To receive similar placebo (n = 15)	7 days	Resolution of the syndrome was defined as a >10% reduction in abdominal distension with a >20% concomitant reduction in cecal diameter on abdominal radiographs within three hours of neostigmine administration or immediately after colonoscopic decompression. Relapse (treatment's failure) was defined as a cecal diameter >8 cm with a concomitant >10% increase on abdominal radiographs with respect to the value that each patient had after initial resolution of the syndrome.	**Efficacy** 5 (33.3%) patients in the placebo group had recurrent cecal dilation compared with none in the PEG group (p=0.04). Therapy with PEG resulted in a significant increase in stool and flatus evacuations (p=0.001 and 0.032, respectively) as well as in a significant decrease in the diameter of caecum, ascending and transverse colon, and abdominal circumference (p = 0.017, 0.018, 0.014, and 0.008, respectively). **Safety** Therapy with PEG did not result in any serious adverse events and none of the patients stopped therapy. PEG group: 4 pts nausea, 1x vomiting, 3 pts mild abdominal colicky pain Placebo group: 1 pt nausea, 1 pt mild abdominal colicky pain	

Risk of recurrence: What is the risk of recurrence of Ogilvie's syndrome? (NB after successful endoscopic decompression)

Author (year)	Year of publication	Methods			Population			Intervention			Outcomes		Remarks
		Design	Randomization / blinding		N	Age	Inclusion criteria	Protocol (details) of Intervention	Protocol (details) of Comparison	Follow-up	Outcome measures (+ definitions)	**Outcomes of interest*** **Efficacy:** Symptoms (abdominal pain, bowel movements) Colonic diameter Length of hospital stay Need for colectomy Recurrence **Safety** Adverse events Complications Perforation Septicemia	
Haj	2018	Retrospective	N.A.	N.A.	Total 37 Group 1 (conservative): 19 Group 2 (interventional): 18	67	Clinical criteria, including imaging evidence of colonic dilation ≥9cm	Conservative (observation, rectal tube, nasogastric tube, fluid resuscitation, and correction of electrolytes)	Interventional management included administration of neostigmine, decompressive colonoscopy and/or sigmoidoscopy, placement of a gastrostomy tube with wall suction, and surgical interventions such as colostomy or colectomy.	?	**Primary** - inpatient mortality and time to resolution of obstruction. **Secondary:** -Clinical complications (ischemia or perforation of the colonic wall) -**Primary failure of treatment or recurrence of Ogilvie's syndrome during the same inpatient admission** -Severe bradycardia leading to clinical symptoms NB definitions Resolution: normal imaging or relief of abdominal distention on physical examination with return of bowel movements. Complications included bradycardia secondary to neostigmine, recurrence of Ogilvie's syndrome, progression of distension, and colonic ischemia requiring surgery	16% recurrence in conservative group, 33% recurrence in intervention group	Possible bias as to which patients had conservative or interventional management (ie, sicker patients with more advanced disease had more aggressive interventional management), however matched for comorbidity and bowel diameter. No decompression tube
Peker	2017	Retrospective	N.A.	N.A.	Total 68 (all fair-poor response after conservative therapy 24 hours) Group 1: 31 Group 2: 37	61	Symptoms of bowel obstruction and colonic dilatation without underlying mechanical obstruction. Inclusion after 24 conservative therapy and no response	Group 1 Group 1 comprised patients who underwent colonoscopic decompression, because they had a poor first response to neostigmine treatment	Group 2 Colonoscopic decompression was performed following conservative treatment. Patients whose response was poor 24 h after decompression were treated with neostigmine (group 2)	1-month follow-up period.	Treatment outcome was assessed on an ordinal scale as poor, fair, or good clinical response (resolution of abdominal distention with the passage of flatus and stool.)	No recurrence was determined during the 1-month follow-up in both groups (according to test, however in table 4 patients in both groups: 11.8-12.9%)	Colonoscopic decompression as a first-line treatment performed by experienced endoscopists is more effective than treatment with neostigmine, and it prevents more patients from having to undergo a second treatment modality. There was no significant etiologic factor in the univariate analysis that affected neostigmine treatment, but there was a poor response to colonoscopic treatment with old age, male sex, and the presence of cardiac disease
Vanek	1986	Retrospective	N.A.	N.A.	393 (literature) + 7 own center	56.6 (v) en 59.9 (m)	Acute dilatation of the colon without organic obstruction was the criterion for inclusion in this study.	Treatment consisted of conservative procedures, colonoscopy, and surgery		?		The initial colonoscopy decompressed the colons of 102 (82 percent) of 125 patients. **The recurrence rate was 22 percent.** Twenty-three repeat colonoscopies demonstrated an 87 percent success rate, but a **higher recurrence rate of 40 percen**t.	Surgery when colonoscopy failed in total 4 patients with endoscopic placement of colonic tubes.

Geller	1996	Retrospective	N.A.	N.A.	Total 50 -41 pt (82%) one colonoscopic decompression - 9 pt with multiple (2 to 4) colonoscopic decompressions Total number of colonoscopies: 62 -54 (87%) with decompression tube placement -8 (13%) decompression tube placement + overview literature: Results of endoscopic decompression in acute colonic pseudo-obstruction in large (n > 20) published series	68	The criteria for diagnosing acute colonic pseudo-obstruction were (1) acute abdominal distention, (2) colonic dilatation on plain abdominal films, and (3) absence of mechanical obstruction as confirmed by Hypaque enema or colonoscopy. After 24-48 conservative treatment. NB cecum size: mean 13 ± 3 (range 9-20) and 13 -+2 (range 9-15)	N.A.	N.A.	?	Early success was defined as a reduction of colonic diameter following the procedure by plain abdominal x-rays or physical examination. Clinical success was defined as sustained decompression without additional endoscopic intervention.	18% recurrence after successful endoscopic decompression **Overview literature (including Vanek, Harig, Jetmore)** Recurrences rates after endoscopic decompression: 0-50%	
Harig	1988	Retrospective	N.A.	N.A.	Total 20 A decompression tube was placed in 11 and no tube in 9.	?	?			?		4/9 recurrence in group without decompression tube (44%) 0/11 recurrences in group with decompression tube (0%)	**No full text available**
Jetmore	1992	Retrospective	N.A.	N.A.	48 patients: - 3 spontaneous resolution - 45 patients colonoscopic decompressions	67 years (range, 36-90 years)	For the diagnosis of Ogilvie's syndrome to be made, the following criteria were met: 1) The transverse cecal diameter on a plain anteroposterior radiograph was increased above normal (9 cm or greater). 2) Abdominal distention was present. 3) No mechanical obstruction was present, as proven by colonoscopy or contrast enema. 4) Colonic dilatation was acute and occurred during hospitalization. Chronic megacolon in ambulatory outpatients was excluded.			?		The overall rate of recurrent cecal dilatation requiring intervention following initial decompression was 29% (13/45).	
Nano	1987	Retrospective	N.A.	N.A.	Total 17 patients (unresponsive to conservative therapy) who received endoscopic intervention	?	?	Either colonoscopic suction decompression (CSD) or colonic suction decompression with proximal colonic tube placement (CDT) for continuous decompression.		?		Recurrences occurred in 6/13 (45%) (3/7 in the colonoscopic suction decompression group and three of six in the colonic tube placement group)	**No full text available**
Lavignolle	1986	Retrospective	N.A.	N.A.	Total 29 patients -14 patients were treated by colonoscopic decompression alone -15 endoscopic decompressions were systematically completed by intubation of the colon. The tube was removed after 2 to 13 days	?	?			?		Colonic dilatation recurred in 6/14 (43%) patients in the first group and in 1/15 (1%) patient in the second group (p less than 0.05)	**No full text available, in French** Not clear what kind of tube + location Our results also suggest that colonoscopic intubation should be used prophylactically in order to avoid recurrences