

Anaesthetic Considerations for Third-Space Endoscopy.

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Submitted: 05 Sep 2026

Revised: 14 Sep 2026

Accepted: 20 Sep 2026

Published: 30 Sep 2026

Access This Article Online



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How to cite this article: Nisha Rajmohan, Harindran Narendran, Anu Joseph, Janet Sara Abraham, Suresh G Nair. Anaesthetic Considerations for Third-Space Endoscopy . TAISAK 2026; 2(2): 11-21

ABSTRACT

Newer mode of submucosal approach in endoscopy have opened up newer arenas in treatment of gastrointestinal (GI) diseases. Third space endoscopy (TSE) is an emerging area of interest in the treatment of GI diseases using this technique. This includes procedures like peroral endoscopic myotomy (POEM), Z POEM, gastric POEM, submucosal tunnelling endoscopic resection. Anaesthetic challenges faced are prolonged procedure duration, shared airway, aspiration of gastric contents, non-operating room anaesthesia, carbon dioxide insufflation and its complications. Vigilant monitoring of oxygenation, ventilation, end-tidal carbon dioxide, airway pressures, haemodynamics and close interaction between anaesthesiologist and endoscopist are essential for early recognition of insufflation-related complications. Proper standardization of protocols and training are needed for the anaesthesia personnel for prompt and safe delivery of anaesthesia.

Keywords: Endoscopy gastrointestinal, Pyloromyotomy, Anaesthesia, General, Aspiration

Introduction

The last decade witnessed exponential advances in therapeutic endoscopic procedures resulting a wide range of gastro intestinal (GI) diseases being amenable to treatment endoscopically. [1]

Conventional endoscopic procedures like colonoscopy, gastroscopy and oesophagus -duodenoscopy (OGD), performed in the natural lumen of the gastrointestinal tract (GI tract) is considered as first space endoscopy. For the second space endoscopy or natural orifice transluminal endoscopic surgery

(NOTES), peritoneal cavity (second space) is accessed endoscopically through one of the natural orifices. Because of high risk of complications and dearth of suitable instruments, NOTES faded away. In 2007, Sumiyama introduced third space endoscopy (TSE), which utilizes the potential space between the mucosal and muscularis layers of the GI tract to execute therapeutic interventions for various diseases. [1,2] The first successful peroral endoscopic myotomy (POEM) for achalasia in human was carried out by Inoue et al. [3] In following years TSE was established all over the world not only for the treatment of achalasia but also other GI disorders. [1,2] Some of the common procedures currently described as TSE include POEM, G-POEM, Z-POEM, submucosal tunnelling endoscopic resection (STER), and other tunnelling techniques. [1,3] Endoscopic submucosal dissection (ESD), is not traditionally considered to be TSE. But anaesthetic implications associated with TSE such as prolonged endoscopic manipulation, the need for immobility and potential bleeding or perforation are similar to TSE.

TSE are complex procedures which require dedicated anaesthesia services. They are different from the traditional endoscopic procedures as they required general anaesthesia with endotracheal intubation (GETA) and continuous CO₂ insufflation into the submucosal tunnel with its attendant complications.[1]

The aim of this narrative review is to discuss the major anaesthetic considerations associated with TSE, with particular emphasis on POEM and CO₂ insufflation-related complications.

Evolution and spectrum of third-space endoscopy

Third space endoscopy is the minimal invasive alternatives to conventional surgery and is associated with good outcome and low risk of complications. [4] All third space endoscopy procedures have similar technique. A mucosal incision is created by the endoscopic instrument to enter submucosal

tunnel. Thereafter myotomy /subepithelial tumour dissection is done. Submucosal entry point is closed with endoscopic clips.[4] The major TSE procedures are included in Table 1.

Anaesthetic challenges in third-space endoscopy

The major anaesthetic challenges can be grouped into five areas, aspiration risk especially in POEM, sharing of airway and ventilation management, CO₂ insufflation with systemic absorption, recognition and management of insufflation-related complications, management of other complications like perforation or bleeding and anaesthesia in a remote environment..[4,5]The anaesthesiologist should be familiar with the steps of the endoscopic procedure to anticipate the various physiological effects of CO₂ insufflation and potential complications .Close communication between the endoscopist and the anaesthesiologist is essential as sudden increase in airway pressures and EtCO₂ can be a due to the procedure and not due to an anaesthetic problem .

Preoperative assessment

Patients should undergo protocol-based pre-anaesthetic assessment including medical history, physical examination, airway evaluation, and appropriate laboratory investigations. American Society of Anaesthesiologists (ASA) physical status should be documented. [2,5] Particular attention should be given to cardiopulmonary disease because CO₂ absorption and pressure-related changes may have greater physiological consequences in patients with limited cardiovascular or respiratory reserve.

A detailed drug history has to be sought as patients scheduled for POEM might be on nitrates or calcium antagonists to reduce the lower oesophageal sphincter tone (LES) tone. This might lead to headaches, orthostatic hypotension, and oedema.[4]

Aspiration risk and Fasting guidelines

In a patient with achalasia cardia there was always a possibility of preprocedural/intraproce-dural aspiration. [4] Ask for history of severe reflux, regurgitation, pneumonia, and weight loss. They can have aspiration pneumonitis (acute and chronic), diffuse aspiration bronchiolitis, isolated bronchospasm, and aspiration pneumonia. Chronic interstitial fibrosis can occur due to periodic aspiration. Respiratory function may be impaired in up to 50% of patients. A preprocedural chest x-ray is a must. Patients may also present with retrosternal pain; a cardiac evaluation might be required in these patients. [4,5]

No guideline exists for pre-operative fasting time for POEM to date. Extended fasting time is often required (up to 48 h) to minimize the risk of aspiration. Clear liquid diet for 24 hours /low residue diet for 48 hours/no solids for 3-5days (sigmoid oesophagus) are advised. [2,4] Prophylactic OGD before the procedure is controversial. [4,5,6,7] Proton pump inhibitors are given before POEM. Preoperative intravenous antiemetic and acid aspiration prophylaxis is preferred in these cases. [4,5] The oesophageal dissection can result in migration of gastro intestinal bacteria to mediastinum, peritoneal and pleural cavity.[4] Hence antibiotic prophylaxis is a must. Chlorhexidine mouth wash is also important for oral decontamination.[5]

Setting up the endoscopy suite for third space endoscopy

TSE should ideally be performed in a unit equipped to provide full anaesthetic support and manage major airway, respiratory and cardiovascular complications. The endoscopy suite should have anaesthesia workstation, airway and resuscitation equipment, difficult-airway cart, capnography and other standard monitoring, reliable suction, equipment for emergency decompression, surgical backup when required by institutional protocol.[4]

The Japan Gastroenterological Endoscopy Society

(JGES) POEM guideline emphasizes that institutions performing POEM should have appropriate multidisciplinary expertise and the capability to manage major complications, including urgent surgical intervention. [2]

Anaesthesia for POEM

This is one of the commonest third space endoscopy done world over. POEM is a treatment option for achalasia and for other oesophageal spastic disorders. [2] Anaesthesia of choice for is general anaesthesia with endotracheal intubation (GETA) in order to prevent unintentional patient movement, to reduce mediastinal emphysema by a positive intrathoracic pressure, to reduce the risk of aspiration, maintenance of a stable endoscopic field and for facilitation of management of sudden respiratory deterioration. [2,4,5]

The incidence of adverse events (bleeding, perforation, and CO₂ insufflation-related complications) was lower in POEM under GETA than under intravenous sedation.[6] The JGES guideline specifically recommends GETA for POEM. [2]

Induction

Types and doses of hypnotics, opioids, and inhalation anaesthetics depend on the patient's underlying disease and hemodynamic status. Propofol is the most commonly used induction agent with fentanyl, sufentanyl or remifentanyl. Some studies have also described the use of dexmedetomidine. [4] Rapid sequence induction (RSI) with Rocuronium or succinylcholine is mandatory a slight head-up position.[4] Assistant pressing the cricoid cartilage and with minimal or without positive pressure ventilation via face mask is controversial.[2,4] Cuffed flexometallic tubes /endotracheal tubes with supraglottic suction ports/normal endotracheal tubes are used and tube was fixed to right side of mouth to facilitate entry of endoscope.[5,8,9] Eyes are protected and patient is positioned supine or

semi left lateral position. [2,4] The abdomen is exposed to assist in detecting and treating pneumoperitoneum. Scopolamine, given to inhibit abnormal spastic contraction of the oesophagus may provoke tachycardia.[4] Gas insufflation is essential for the formation of a submucosal tunnel and proper visualization. CO₂ is the most commonly used gas because it is non-combustible, inexpensive, and colourless. It is safer than air as it is rapidly absorbed into the body, excreted by the lungs, dissolves well in water, reducing the risk of embolism. [5] Capnography should be closely monitored by anaesthesiologists aiming to maintain EtCO₂ below 45mm Hg.

Maintenance of Anaesthesia

Anaesthesia should provide adequate depth and immobility while minimizing excessive haemodynamic depression. Both volatile and intravenous techniques may be used according to patient characteristics and institutional practice. Neuromuscular blockade may facilitate procedural conditions, particularly during prolonged procedures, but should be appropriately monitored and reversed.

Monitoring during POEM

Standard monitoring should include electrocardiogram, pulse oximetry, capnography non-invasive or invasive blood pressure according to underlying comorbidities, and neuromuscular monitoring.[4] Continuous monitoring of airway pressure and EtCO₂ is mandatory because it helps in early detection of pneumoperitoneum, pneumothorax or other insufflation-related complications. [4] Peak airway pressure (P_{max}) is maintained 20% of baseline. A close watch is kept on the neck, chest and abdomen for diagnosing subcutaneous emphysema.[5]

Endoscopic CO₂ insufflation during POEM is implicated in the physiological changes occurring during the procedure. Cardiovascular responses include increased mean arterial pressure (MAP) and heart rate (HR) similar to the response in laparoscopic surgery. Subcutaneous, submucosal, and mediastinal CO₂ absorption leads respiratory acidosis. [4,5] Mechanical vascular compression, sympathetic stimulation and secretion of transmitters are few of the other effects of CO₂ insufflation. Ventilatory adjustments can normally avoid hypercarbia.[4] Increased P_{max} implies elevated intra-abdominal pressure-gastric distension or pneumoperitoneum. POEM-related increase in P_{max} and PaCO₂ are difficult to control by anaesthesiologists alone. A short period of cessation of the procedure by the endoscopist may all that will be required to offset these changes. Changes in systemic vascular resistance and reduced lung compliance are also noted.[4]

Adverse events during third space endoscopy : Diagnosis and management

The incidence of adverse events ranges from 7.5% to 55.5%. The immediate post operative complications which has to be managed perioperatively will be described briefly .The insufflation related adverse effects include subcutaneous emphysema, capnothorax, capnoperitoneum, retroperitoneal CO₂, mediastinal emphysema, and capnopericardium.[10] The oesophageal dissection may result in CO₂ escaping into the mediastinum, thoracic, and/or peritoneal cavity producing insufflation related complications.[4] A high degree of suspicion is necessary to diagnose these. Most of them resolve spontaneously without any intervention.[3] So, the decision to intervene has to be made based on patient characteristics, endoscopist and anaesthesiologist opinion.

Possible physiological changes in TSE

Subcutaneous emphysema

It is common during TSE procedures performed in oesophagus, is self-limiting and usually gets resolved within 24–48 hours. 60% of the instances of EtCO₂ >50 mm Hg is associated with subcutaneous emphysema. The increased CO₂ absorption can be managed by hyperventilation to some extent. In case of persistent severe hypercarbia with respiratory acidosis, arrhythmias and change in lung compliance, identify the area of the most severe subcutaneous emphysema. After alcohol swab is applied, the skin is punctured with a short 26-gauge needle and the surrounding skin tissue with crepitus is squeezed manually. The ultimate solution is to end the procedure quickly. Extubation is delayed and carried out only after leak test and after decrease in neck circumference.[5]

Capnoperitoneum / Retroperitoneal CO₂

Capnoperitoneum (12.7%) may occur when CO enters the peritoneal cavity. Small volumes may be asymptomatic, whereas significant accumulation can cause abdominal distension, increased intra-abdominal pressure, reduced venous return and impaired ventilation. [3] Haemodynamic consequences may include reduced preload and cardiac output, particularly in patients who are hypovolaemic or have limited cardiovascular reserve. When significant tension pneumoperitoneum develops, insufflation should be stopped and decompression should be considered. [2,5] Gastric decompression may also be useful when gastric distension contributes to increased intra-abdominal pressure.

There can also be accumulation of retroperitoneal CO₂ (16.7%). Fluoroscopy can differentiate retroperitoneal CO₂ from capnoperitoneum. In case, there is accumulation of significant retroperitoneal CO₂, temporary pausing of the procedure and modification of ventilatory settings has to be done.

Pneumomediastinum

Pneumomediastinum occurs when CO escapes from the submucosal tunnel into the mediastinum. Small, clinically insignificant pneumomediastinal collections are relatively common after POEM. [3,11,12] An increase in EtCO₂, decrease in saturation of peripheral oxygen (SpO₂), inability to archive the desired tidal volume despite maximal safely attainable manual ventilation, subcutaneous emphysema, hypotension, cardiac arrhythmia, and hemodynamic collapse point to a pneumomediastinum. Diagnosis is done using a chest radiography. De-aeration and positive pressure ventilation with suitable ventilator settings is the management of this condition. In case of tension pneumomediastinum emergency depression is warranted.

Capnothorax

Capnothorax is uncommon. It should be suspected when there is reduced chest wall excursion on the affected side and increased airway pressure. Temporary pausing the procedure in small capnothoraces may improve the condition. Drainage may be required in large capnothorax. Tension pneumothorax requires emergency needle decompression. [13,14]

Capnopericardium

Capnopericardium is rare and usually goes undetected (2.4%). It is managed by withholding the procedure for few minutes. Tension capnopericardium is life threatening and early detection is paramount. [15,16] Haemodynamic collapse, absence of ETCO₂ and ECG changes with life threatening arrhythmias are warning signs. Tension capnopericardium is a life-threatening complication which required immediate withdrawal of endoscope with cardiopulmonary resuscitation. Pericardial decompression with needle pericardiocentesis or percutaneous drain placement is done immediately.

Bleeding and mucosal injury

Mucosal injury and bleeding may occur during tunnelling or myotomy. [2,10,17] Minor bleeding is usually controlled endoscopically. Major bleeding is uncommon but may result in haemodynamic instability and require transfusion, endoscopic intervention or surgical management.

From an anaesthetic perspective, adequate intravenous access should be established for patients at increased risk, and blood products should be available according to patient characteristics and institutional policy.

Perforation and leakage

Mucosal perforation or inadvertent full-thickness injury can result in mediastinal or peritoneal contamination. [10,17] Anaesthetic deterioration may be the first indication of a significant procedural complication. Sudden hypotension, hypoxaemia, rising airway pressure, subcutaneous emphysema or unexpected changes in EtCO₂ should therefore prompt communication with the endoscopist and assessment for perforation and gas escape.

Post operative course

Postprocedural management, investigations, resumption of diet differs between centers. Usually, all patients are kept nil per oral (NPO) over night after the procedure and continued on intravenous antibiotics. After ensuring no evidence of leakage by water soluble contrast oesophagogram on a postoperative day one, a soft pureed diet is started.[2] Postoperative supervised incentive spirometry is beneficial for preventing atelectasis.

Observation in the intensive care unit should be considered in patients with persistent hypercapnia/desaturation, extensive subcutaneous emphysema, pneumothorax/pneumoperitoneum with physiological consequences, haemodynamic instability, major bleeding, suspected perforation or leakage.

Anaesthesia for other third-space procedures

Endoscopic submucosal dissection (ESD)

ESD permits en-bloc resection of selected superficial gastrointestinal neoplasms.[18] Although ESD is not universally categorized as TSE, its anaesthetic implications overlap with those of advanced endoscopic procedures.

Procedural duration may be prolonged, and patient movement can interfere with precise dissection. Deep sedation is used in many centers in lower GI ESD, while GETA may be preferred for selected upper gastrointestinal or prolonged procedures.

Per-oral pyloromyotomy (POP)/gastric per-oral endoscopic pyloromyotomy (G-POEM)

G-POEM, also known as peroral pyloromyotomy, is increasingly used in selected patients with medically refractory gastroparesis. [1,3,18,19] The anaesthetic considerations overlap with POEM, although aspiration risk may be particularly important because gastroparesis is characterized by delayed gastric emptying.

Patients should therefore be carefully assessed for recent vomiting, gastric retention, diabetes and autonomic dysfunction, opioid use, electrolyte abnormalities, nutritional deficiencies, difficult airway or aspiration risk. GETA is frequently used in view of aspiration risk.

Zenker's per-oral endoscopic myotomy (Z-POEM)

Z-POEM is a submucosal tunnelling technique used to treat Zenker's diverticulum. [1,3,18] The major

anaesthetic concern is the possibility of retained food and secretions within the diverticulum, particularly in patients with severe dysphagia and regurgitation. Aspiration precautions are therefore important.

The procedure is performed in the upper GI tract and generally requires a secured airway and procedural immobility. Recent literature supports Z-POEM as an increasingly established minimally invasive treatment, although technique and perioperative practice continue to evolve. [18]

Submucosal tunnelling endoscopic resection (STER)

STER allows removal of selected subepithelial lesions through a submucosal tunnel while maintaining mucosal integrity. [1,3,18,21] This procedure can be done under intravenous sedation or GEDA depending on the site of tumours, comorbidities, presence of obstruction or bleeding. CO-related complications such as subcutaneous emphysema and pneumothorax have been reported.

Prevention of insufflation-related complications

Several strategies may reduce the incidence or severity of CO-related adverse events.

Use of CO rather than air

CO should be used for TSE because of its rapid absorption and pulmonary elimination. [2,5,15]

Low-flow insufflation

Excessive insufflation should be avoided. Lower flow rates may reduce the development of clinically significant gas-related complications. Usually flows

less than 1.2l/min is used. [4,5,10,13]

Close communication

The endoscopist should inform the anaesthesiologist about changes in insufflation pressure, tunneling difficulties, suspected perforation and other procedural events. [5,13]

Vigilant monitoring

Increasing EtCO₂, peak airway pressure or abdominal girth may be early indicators of gas escape. Hyper ventilation when EtCO₂ is 40-45 mmHg and stopping the procedure for some time may be required. [4]

Early intervention

Once significant insufflation-related complications are suspected, continuing the procedure without modification may worsen the problem. Early cessation or reduction of insufflation and decompression when indicated are important. [4]

Practical approach to sudden intraoperative deterioration

A sudden increase in airway pressure, hypercapnia, hypoxaemia or haemodynamic instability during TSE should trigger a structured assessment. [Fig 1] The key principle is that unexplained deterioration during TSE should not automatically be attributed to anaesthetic depth or airway problems. Procedure-related gas escape must be actively considered.

Peak inspiratory pressure control for TSE

Inoue et al. insisted that positive pressure ventilation should be preferred at higher pressures than those

generated by endoscopic CO₂ insufflation to reduce mediastinal emphysema and the risk of embolization. [2] Loser et al. reported the mean P_{max} of patients needing percutaneous abdominal needle decompression (PND) was 22.8 cmH₂O. [4] They set the indication for PND at approximately 20% from the baseline P_{max}. Another study managed the patient's P_{max} under 38 cmH₂O. [6] Increasing P_{max} to >38 cmH₂O was managed by pulling back the endoscope from the tunnel and inserting it in the stomach lumen to suction excess CO₂. Baseline P_{max} may vary among patients depending on body mass index or underlying pulmonary disease, Goudra et al considered it better to maintain P_{max} at <30 cmH₂O. [7]

Percutaneous abdominal needle decompression

PND is done when there are clinical signs of increased abdominal pressure such as tympanic percussion sounds, distension of abdomen, subcutaneous emphysema, increased P_{max} with negative effect on the pulmonary mechanics, decreased venous return and decreased visceral organ perfusion. It is an invasive procedure with a 14- or 16-gauge angiocatheter cannula or a Veress needle is inserted under asepsis under ultrasound guidance. Point of the needle insertion is at the right upper abdominal quadrant at least 5 cm below the rib cage after confirming that the lower edge of the liver could not be palpated. A study has proposed for a needle decompression in the event of ETCO₂ > 50 mm Hg, or peak airway pressure (P_{max}) >35 cm H₂O along with abdominal distension. [4,22]

Future directions and research gaps

Despite rapid expansion of TSE, anaesthesia-specific evidence remains limited. The JGES POEM guideline itself noted that much of the available evidence was of relatively low quality. [2]

Several areas require further investigation such as

fasting protocols, pre procedure OGD, optimal ventilation strategy, definition and grading systems for complications and their management.

Conclusion

Careful preoperative assessment, appropriate airway protection, controlled ventilation and vigilant monitoring are essential for safe anesthetic management. Third-space endoscopy presents anaesthetic challenges, like increased chance of aspiration, CO₂-related physiological changes and insufflation-related complications. Early recognition and prompt management of complications, with closed interaction between the anesthesiologist and endoscopist, can improve patient safety. Standardized anesthetic protocols and further prospective research are essential to optimize perioperative care across the expanding horizon of third-space endoscopic procedures.

References

1. Nabi Z, Haza A, Reddy DN. Third-space endoscopy: current techniques, clinical applications, and future directions. *J Int Med Res.* 2026; 54: 03000605261465587.
2. Inoue H, Shiwaoku H, Iwakiri K, Onimaru M, Kobayashi Y, Minami H, et al. Clinical practice guidelines for peroral endoscopic myotomy. *Dig Endosc.* 2018;30(5):563-579.
3. Shanbhag AB, Thota PN, Sanaka MR. Recent advances in third space or intramural endoscopy. *World J Gastrointest Endosc* 2020; 12: 521-531
4. Löser B, Recio Ariza O, Saugel B, Reuter DA, Zöllner C, Werner YB, et al. Anesthesia for patients undergoing peroral endoscopic myotomy procedures: A review of the literature. *Anesth Analg* 2020; 130:1331–40.

5. Sarkar S, Khanna P, Gunjan D. Anesthesia for Per-oral endoscopic myotomy (POEM) - not so poetic! *J Anaesthesiol Clin Pharmacol*. 2022; 38:28-34.
6. Yang D, Pannu D, Zhang Q, White JD, Draganov PV. Evaluation of anesthesia management, feasibility and efficacy of peroral endoscopic myotomy (POEM) for achalasia performed in the endoscopy unit. *Endosc Int Open*. 2015;3:E289–95.
7. Goudra B, Singh PM, Gouda G, Sinha AC. Peroral endoscopic myotomy-initial experience with anesthetic management of 24 procedures and systematic review. *Anesth Essays Res*. 2016; 10:297–300.
8. Tanaka E, Murata H, Minami H, Sumikawa K. Anesthetic management of peroral endoscopic myotomy for esophageal achalasia: A retrospective case series. *J Anesth* 2014;28:456–9.
9. Saxena P, Pippenger R, Khashab MA. Preventing aspiration during peroral endoscopic myotomy. *J Anesth* 2014; 28:959.
10. Jayan N, Jacob JS, Mathew M, Mukkada RJ. Anesthesia for peroral endoscopic myotomy: A retrospective case series. *J Anaesthesiol Clin Pharmacol* 2016; 32:379-81.
11. Kim GE, Kim DK, Choi JW, Chung IS, Jung DW. The safety of endoscopic esophageal procedures under general anesthesia. *Korean J Anesthesiol*. 2017 Oct;70(5):555-560.
12. Yang S, Zeng MS, Zhang ZY, Zhang HL, Liang L, Zhang XW. Pneumomediastinum and pneumoperitoneum on computed tomography after peroral endoscopic myotomy (POEM): postoperative changes or complications? *Acta Radiol*. 2015 Oct; 56(10):1216-21.
13. Rajmohan N, Sadath A, Nelson F, Vamadevan BT. Problems in beginning a "POEM". *Indian J Anaesth*. 2019 Jun;63(6):508-510.
14. Kang S, Kim Y, Kim DH. A rare complication: Tension pneumothorax after peroral endoscopic myotomy. *International Journal of Gastrointestinal Intervention*. 2022 Jul 31;11(3):139-42.
15. Maher SZ, Chintanaboina J, Eun Kim D, Mathew A. Pneumopericardium Complicating Per-Oral Endoscopic Myotomy Due to Inadvertent Use of Air Instead of Carbon Dioxide. *ACG Case Rep J*. 2018 Aug 15;5:e59
16. Kim D, Haouzi P. Tension Pneumopericardium during peroral endoscopic myotomy: a case report and review of literature. *Chest*. 2016 Oct 1;150(4): 265A.
17. Chavan R, Nabi Z, Reddy DN. Adverse events associated with third space endoscopy: Diagnosis and management. *International Journal of Gastrointestinal Intervention*. 2020 Apr 30;9(2):86-97.
18. Hayat M, Yang D, Draganov PV. Third-space endoscopy: the final frontier. *Gastroenterology Report*. 2023 Jan 1;11: goac077.
19. Vohra I, Gopakumar H, Adler DG. G-POEM for gastroparesis: past, present and future. *Curr Opin Gastroenterol*. 2023;39(5):390-396.
20. Fernandes YR, Funari MP, Sakai CM, Maluf-Filho F. POEM for Zenker's diverticulum (Z-POEM): technical advances, challenges and complications – a narrative review. *Clinics (Sao Paulo)* 2026;81: 100897.
21. Liapis SC, Baloyiannis I, Perivoliotis K, Lytras D, Tzovaras G. Submucosal Tunneling Endoscopic Resection for Upper Gastrointestinal Subepithelial Lesions: A Systematic Review and Meta-Analysis. *J Gastrointest Cancer*. 2025 Apr 29;56(1):110.
22. Löser B, Werner YB, Punke MA, Saugel B, Haas S, Reuter DA, et al. Anesthetic considerations for patients with esophageal achalasia undergoing

peroral endoscopic myotomy: A retrospective case series review. Can J Anaesth 2017;64:480-8.

Conflict of Interest - Nil

Financial support - Nil

Table 1 : Procedures using third space endoscopy with the diseases amenable to treatment

Third space endoscopic procedures	Diseases amenable to treatment
Per oral endoscopic myotomy (POEM)	Achalasia, Diffuse oesophageal spasm, Jackhammer oesophagus, gastro oesophageal junction outflow obstruction
Per oral pyloromyotomy (POP)/ Gastric Peroral Endoscopic Myotomy (GPOEM)	Gastroparesis
Submucosal tunnelling endoscopic resection (STER)/Peroral endoscopic tumour resection (POET)	Subepithelial tumours
Submucosal tunnelling endoscopic septum division (STESD), Z POEM	Zenker's diverticulum
Per rectal endoscopic myotomy (PREM)	Hirschsprung disease
Per oral endoscopic tunnelling for restoration of oesophagus (POETRE)	Complete oesophageal obstruction, strictures
D-POEM	Management of epiphrenic diverticula

Fig 1 – Structured assessment of unexplained deterioration during TSE

