Anesthesia for Per-oral endoscopic myotomy (POEM) – not so poetic!

Soumya Sarkar, Puneet Khanna, Deepak Gunjan

Departments of Anaesthesiology, Pain Medicine and Critical Care and 'Gastroenterology and Human Nutrition, AIIMS, New Delhi, India

Abstract

Peroral endoscopic myotomy (POEM) is a promising natural orifice transluminal endoscopic procedure for the treatment of esophageal motility disorders, with similar effectiveness as of Heller myotomy. It is performed under general anesthesia in endoscopy suite. Creation of submucosal tunnel in the esophageal wall is a key component. The continuous insufflation of CO₂ inadvertently tracks into surrounding tissues and leads to capno mediastinum, capno thorax, capno peritoneum, and subcutaneous emphysema. Thus, the challenges, for an anesthesiologist are not only providing remote location anesthesia, increased risk of aspiration during induction, but also early detection of these complications and specific emergency management. Though a therapeutic innovation, POEM remains an interdisciplinary challenge with no specific anesthesia care algorithms and evidence-based recommendations. The purpose of this review is to outline the anesthesia and periprocedural practices based on existing evidence.

Keywords: Anesthesia, complications, management, POEM

In recent times, peroral endoscopic myotomy (POEM) has emerged as an effective endoscopic treatment for achalasia cardia. It is usually performed under general anesthesia in an endoscopy suite. Creation of submucosal tunnel and myotomy are a key component during POEM. As a result, iatrogenic communication can occur between the submucosal space and the mediastinum, retro- and intraperitoneal cavity, which can lead to tension capnothorax, capnomediastinum, or capnoperitoneum by the endoscopically insufflated CO₂. Thus, the anesthesiologists should not only be careful about the risk of aspiration during induction but also be aware of these complications and with specific emergency management. Though a therapeutic innovation, POEM remains an interdisciplinary challenge with no specific anesthesia care algorithms and evidence-based recommendations. The purpose of this review is to outline the anesthesia and periprocedural practices based on existing evidence.

‘Achalasia’ is derived from the Greek word ‘chalasis’ means relaxation. It is a motility disorder of the lower esophageal sphincter with a prevalence of 10 in 100 000 individuals. It is a chronic debilitating disease that manifests as dysphagia, regurgitation, chest pain, and weight loss. It usually manifests between 25 and 60 years of age. The management includes pharmacotherapy with calcium-channel blockers and nitrates, endoscopic botulinum toxin injections, endoscopic pneumatic balloon dilatation, laparoscopic Heller myotomy, and POEM. The basic principle of POEM is of “natural orifice transluminal endoscopic surgery (NOTES)”. POEM has emerged as a standard treatment of achalasia since its inception in 2010. It possesses similar effectiveness as of Heller myotomy with comparatively lower cost and morbidity.

Address for correspondence: Dr. Puneet Khanna, Department of Anaesthesia, Pain Medicine & Critical Care, AIIMS, New Delhi, Ansari Nagar, New Delhi - 110029, India. E-mail: k.punit@yahoo.com

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

How to cite this article: Sarkar S, Khanna P, Gunjan D. Anesthesia for Per-oral endoscopic myotomy (POEM) – not so poetic! J Anaesthesiol Clin Pharmacol 2022;38:28-34.
Several studies have shown a positive intrathoracic pressure under general anesthesia with endotracheal intubation is associated with lesser incidence of iatrogenic events (perforation, bleeding, and CO₂ insufflation-related complications) than intravenous sedation.⁹,¹⁰ Thus, standard equipment, monitoring, and mutual understanding along with closed-loop communication between anesthesiologists and endoscopists is the key for improving patient safety.

**Peroral Endoscopic Myotomy Procedure**

The patient is positioned either in supine or left lateral decubitus. At the beginning residual fluid or food is suctioned and removed from the esophageal lumen with the help of esophagogastroduodenoscope (EGD) [Figure 1]. During the POEM, carbon dioxide insufflation is used for inflation at low flow rate (~1.2 L/min). POEM is done with EGD and a mucosal cap or hood at its tip. A mucosal bleb is created 10–12 cm above the gastroesophageal junction (GEJ) with normal saline mixed with methylene blue or indigo carmine dye [Figure 2]. Colored dye is used to increase visualization and clear delineation of submucosal space. A 2.5 to 3 cm longitudinal mucosal incision is made with the electrocautery knife to expose the submucosal space and entered into the submucosal tunnel. Submucosal dissection is done to create submucosal tunnel by using the electrocautery knife and repeated dyed saline injections till 3 cm below GEJ. Two to three centimeter distal to the mucosal incision site, selective myotomy of the circular muscle fibers, sparing the underlying longitudinal fibers is performed with electrocautery knife till 2 cm below GEJ [Figures 3 and 4]. At the end, the mucosal entry point is closed with standard endoscopic hemoclips [Figure 5].¹¹

**Pre-anesthetic Preparation**

Patients with retrosternal chest pain should have a preprocedural electrocardiogram (ECG) to rule out any pre-existing cardiac ailment. A chest x-ray is also necessary in patient with clinical suspicion of pulmonary infiltrates or history of regurgitation.¹²

According to recent American Society for Gastrointestinal Endoscopy (ASGE) guidelines, POEM is the preferred treatment for management of patients with type III achalasia.¹³ It has been also successfully performed in diffuse esophageal spasm, nutcracker esophagus, and hypercontractile (jackhammer) esophagus.¹⁴ It is avoided in patients with severe cardiopulmonary or other serious disease leading to unacceptable surgical risk, pseudoachalasia, and anticipated difficulty in creation submucosal tunnel due to severe fibrosis and adhesion. Patients with severe thrombocytopenia (<30,000/mL), myelodysplastic syndrome, hypersplenism, patients with mechanical heart valves requiring high-dose anticoagulation are not eligible for POEM [Table 1].¹⁴ Periprocedural anticoagulation and/or antiplatelet therapy is maintained according to the ASGE guidelines [Table 2].¹³

Achalasia patients have an increased risk of aspiration by reflux of esophageal contents due to impaired esophageal emptying.⁴ However, currently there is no guideline for pre-fasting time for POEM. Multiple case series on POEM anesthesia management have reported fasting times from 8 to 48 hours.¹⁶ Majority of them have recommended a clear liquid diet for at least 24 hours or a low residue diet for 48 hours prior to the procedure.¹⁷,¹⁸ At our center, we keep patients on clear liquid diet for 24 hours and keep fasting for 12 hours. Prophylactic use of esophagogastroduodenoscopy for removal of the residual food is debatable. One case series without

---

**Figure 1:** Endoscopic image showing dilated esophageal lumen, which is filled with food residue

**Figure 2:** Mucosal bleb (blue color) after injection of normal saline mixed with methylene blue dye in the submucosal space
prophylactic EGDs advocated for the necessity while the other has found increased risk of aspiration. Nishihara et al. has used gastric tube aspiration before induction in conscious patients for reduction of esophageal pressure. Prophylactic use of proton pump inhibitors, antibiotic prophylaxis and decontamination of oral cavity with chlorhexidine may be beneficial for preventing the postprocedural inflammatory response.

### Monitoring

During the procedure, standardized ASA monitoring of non-invasive blood pressure, electrocardiography (lead II), pulse oximetry, capnography (end tidal $CO_2$), urine output, and temperature are used. Invasive arterial blood pressure monitoring and serial arterial blood gas analysis may be beneficial for patients with known cardiovascular or pulmonary disease. Periodic checking of abdomen, thorax, and neck is required to early detection of capnoperitoneum and subcutaneous emphysema.

### Anesthesia

Prevention of aspiration during induction of anesthesia is the most important step. The incidence of aspiration during induction of general anesthesia in general population is 3 in 10,000. Thus, in majority of the case series, have been advocated for rapid sequence induction (RSI). There is no consensus on using of cricoid pressure and positive pressure ventilation via face mask. There is no ideal i.v. induction agent, with each having own pros and cons (Table 3).

Succinylcholine - the depolarizing neuromuscular blocking agent usually preferred for RSI due to rapid onset of action. Alternatively, nondepolarizing neuromuscular blocking agent like rocuronium can also be used for the RSI. The different types and doses of anesthetic agents are individually selected based up on the patient’s underlying disease and hemodynamic status. Both sevoflurane and propofol have no significant impact on the esophageal sphincter pressure in healthy individuals. However, their effect on achalasia

### Table 1: Indications and Contraindications for POEM

| Indications                  | Contraindications                        |
|------------------------------|------------------------------------------|
| Classic indication:          | Absolute contraindications              |
| Type III achalasia           | Severe cardiopulmonary disease           |
| Type I, Type II achalasia    | Severe thrombocytopenia                  |
| Failed prior treatments      | Pseudoachalasia                          |
| Relative indications:        | Cirrhosis with portal hypertension but no significant esophageal varices |
| Hypertensive motor disorders: | Prior extensive esophageal mucosal resection/ablation involving the POEM field |
| diffuse esophageal spasm,    | Relative contraindications               |
| jackhammer esophagus         | Prior radiation therapy to the esophagus |
|                             | Severe esophagitis                       |
|                             | very large ulcer in the lower esophagus  |
Table 2: ASGE guidelines (2016) for antithrombotic agents in patients undergoing GI endoscopy

| Drugs | Low cardiovascular Risk | High Cardio vascular Risk |
|-------|-------------------------|---------------------------|
| Anti-coagulants (AC) | 1. Discontinue AC 2. Delay reintimating until adequate hemostasis is achieved. | 1. Discontinue AC 2. Bridge therapy 3. Restart warfarin on same day of procedure 4. Delay reintimating NOACs until adequate hemostasis is achieved |
| Antiplatelet agents (APA) | 1. Continue standard doses of aspirin/NSAIDs before switch to aspirin 2. Discontinue thienopyridines at least 5 days before endoscopy or switch to aspirin 3. Dual APA, hold thienopyridines for at least 5 days, continue aspirin | 1. Continue standard doses of aspirin/NSAIDs 2. Discontinue thienopyridines at least 5 days before endoscopy or switch to aspirin 3. Dual APA, hold thienopyridines for at least 5 days, continue aspirin |

1. Defer elective endoscopic procedures, possibly up to 12 months, if clinically acceptable from the time of PCI to DES placement. 2. Avoid cessation of clopidogrel (even when aspirin is continued) within the first 30 days after PCI and either DES or BMS placement when possible. 3. Avoid cessation of all antiplatelet therapies after PCI with stent placement. 4. Perform endoscopic procedures, particularly those associated with bleeding risk, 5–7 days after thienopyridine drug cessation. 5. Aspirin should be continued. 6. Resumption of thienopyridine and ASA drug therapy after the procedure once hemostasis is achieved. A loading dose of the former should be considered among patients at risk for thrombosis.

Table 3: Induction agent considerations

| Induction agent | Advantages | Disadvantages | Suggested use |
|-----------------|------------|--------------|---------------|
| Sodium thiopental 3-7 mg kg⁻¹ | Clear endpoint; rapid one arm brain circulation time | Postoperative nausea and vomiting | Traditional choice |
| Propofol 2.4 mg kg⁻¹ | Greater suppression of laryngeal reflexes Familiarity | CVS depression | When intubating conditions are a concern |
| Etomidate 0.3 mg kg⁻¹ | CVS stability | Adrenal suppression | CVS instability |
| Ketamine 1-2 mg kg⁻¹ | Bronchodilation CVS stimulant; maintains cerebral perfusion pressure in hypotensive situations | Increases ICP | Asthma, Shocked states |

Adequate neuromuscular relaxation is critical as any untoward movement of the patient during the procedure may be detrimental. Pressure control mode of ventilation is preferred as it uses decelerating flow, which tends to compensate for any potential reduction in ventilation caused by pressure limitation and allows gas to be distributed more evenly to areas of the lung with both long- and short-time constants. Adjustment of minute ventilation to maintain an end-tidal carbon dioxide tension (ETCO₂) of 35–45 mmHg is necessary. If hyperventilation alone is insufficient to control the rising ETCO₂, the procedure should be temporarily interrupted for several minutes. Sudden rise in ETCO₂ or peak airway pressure (Ppeak) should immediately be informed to the endoscopist for decompressing the stomach by suctioning excess CO₂. It may be an early indicator of capnothorax.

Löser et al. has found cases with 20% increase from the baseline Ppeak required percutaneous abdominal needle decompression (PND). However, there is no consensus regarding the optimal level of Ppeak. Another study has reported successful management of cases with Ppeak >38 cmH₂O by pulling back the endoscope and suctioning the excess CO₂. PND was performed only with simultaneous rise in Pmax and EtCO₂.

Periodic assessment of the upper abdomen is also necessary for early detection of capnoperitoneum and there by prevention of abdominal compartment syndrome.

Apart from pre-existing pulmonary conditions or extensive emphysema, usually patients are extubated immediately after the procedure whenever possible. A cuff leak test should be done before extubation. Although the incidence of post POEM gastroesophageal reflux between 8.5%- 21.3%, aspiration during emergence after extubation has not been reported.

**Physiological Changes**

During the procedure, continuous gas insufflation is essential for the creation of a submucosal tunnel and visualization.
CO₂ is the preferred gas as it is colorless, non-combustible, water-soluble, systemically absorbed and excreted by the lungs with reduced risk of embolism. Use of air insufflation in POEM is contraindicated. General anesthesia and CO₂ insufflation causes significant physiological changes. Similar to laparoscopic procedure, there is rise in mean arterial pressure (MAP) and heart rate (HR) during POEM. Systemic absorption, sympathetic stimulation and increased catecholamine release may be the cause. Due to persistent CO₂ insufflation, impaired systemic CO₂ balance may lead to respiratory acidosis and increases in peak airway pressure. Raised peak airway pressure implies increase in intra-abdominal pressure. It may be due to gastric distension, retro- or capnoperitoneum. The minute ventilation can be controlled in intubated patients under general anesthesia. CO₂ uptake by insufflation may be alleviated to some degree by hyperventilation. However, hyperventilation is not useful for maintaining normocapnia in subcutaneous emphysema.

**POEM-related Adverse Events**

Early adverse events are mucosal injury, bleeding, subcutaneous emphysema, capnothorax, capnomediatinum, capnoperitoneum, and pleural effusion. Symptomatic gastroesophageal reflux disease and esophagitis are the late complications. The most common adverse events associated with POEM are related to CO₂ insufflation. In contrast to laparoscopic surgery, CO₂ flow is regulated during POEM. Continuous insufflation by CO₂ inadvertently track into surrounding tissues and cause capnmediastinum, capnothorax, capnoperitoneum, and subcutaneous emphysema. The incidences of insufflation-related adverse events, ranges from 7.5% to 55.5%. About 5.1% of the patients develop capnothorax and mucosal tear during POEM has been reported between 0–7%. These are now considered as an integral part of the procedure rather than complications. Mucosal injury, subcutaneous emphysema, and capnoperitoneum can be managed conservatively. Tense capnoperitoneum and capnothorax require needle decompression and chest tube placement.

Subcutaneous emphysema is the common insufflation related adverse event. Earlier detection is important. It has been found that 60% of the instances of raised ETCO₂ >50 mm Hg is associated with subcutaneous emphysema. For extensive cases hyperventilation is not useful, subcutaneous needle drain is required. A careful assessment of airway is necessary due to potential risk of airway obstruction.

The capnoperitoneum (Pnp) may also lead to inferior vena cava compression, preload reduction, and subsequent compromised cardiopulmonary functions. If Pnp occurs percutaneous abdominal needle decompression is required. A study has proposed for a needle decompression in the event of ETCO₂ > 50 mm Hg, or peak airway pressure (Pmax) > 35 cm H₂O along with abdominal distension. Intra-abdominal pressure cannot be measured directly during POEM but the Pmax act as an indirect marker for it. Another study has suggested that Pmax < 38 cm H₂O reduces the risk of capnoperitoneum.

The crucial factor for minimizing these events is the total amount of gas insufflated. It has been found in a recent study that a low-flow CO₂ tubing caused no events of Pnp in comparison to medium- or high-flow CO₂ tubing resulting into 36.7% tense capnoperitoneum. It is has been found that a sparing use of CO₂ in a flow around 1.2 L/min is associated with negligible complication.

The control of Peak airway pressure during POEM is a challenging task. It increases due to gastric distension or capnocaapnoperitoneum. A low tidal volume with increased respiratory rate may be helpful for maintaining minute ventilation. However, Inoue et al. concluded that positive pressure ventilation with higher pressures than those generated by endoscopic CO₂ insufflation is necessary for reducing the risk of mediastinal emphysema and embolization.

Although the POEM-related adverse events are usually well managed without clinical morbidity, patient’s pain and increased use of resources should be reduced. Thus, early detection of the preceding signs with close communication and cooperation are valuable with endoscopists. Finally, a quick procedure may also be helpful for averting these incidents.

**Postoperative Care**

POEM results in a considerable amount of postoperative pain. It is not only one of the most undesirable experience but also bears undesirable cardiovascular effects, respiratory depression, urinary and neuroendocrine dysfunction. Patient-controlled analgesia (PCA) with an opioid may be beneficial. However, they may lead to nausea, vomiting, pruritus, and respiratory depression. Use of multi-modal analgesia by using non-steroidal anti-inflammatory drugs, ketamine, and anti-emetics, has been used to minimize opioid-related side effects.

Exposure to general anesthesia and use of opioids for postoperative pain management can cause postoperative nausea and vomiting (PONV). PONV immediately after the procedure can precipitate bleeding and mucosal tear or esophageal perforation. Women, non-smoker, history of motion
sickness, and the use of postoperative opioids are known as risk factors of PONV. Serotonin (5-hydroxytryptamine, subtype 3 [5-HT3]) receptor antagonists, metoclopramide and dexamethasone have been used for prevention. Alternatively, use of total intravenous anesthesia with propofol reduces the risk of PONV.\(^{[37]}\)

Postprocedural management including investigations and resumption of diet differs between centers. Usually all patients are kept NPO over night after the procedure and continued on intravenous antibiotics. After ensuring no evidence of leakage by water-soluble contrast esophagogram on a postoperative day one, a soft pureed diet is started. Postoperative supervised incentive spirometry is beneficial for preventing atelectasis.\(^{[11]}\)

In conclusion, POEM is endoscopic minimally invasive treatment modality for achalasia. The communication between anesthesiologists and endoscopists is the key for reduction in iatrogenic complications. Further studies regarding preprocedure fasting, ventilation strategies, optimum CO\(_2\) insufflation rate is need of the hour.

Financial support and sponsorship
We did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors for this research.

Conflicts of interest
There are no conflicts of interest.

References
1. Nabi Z, Reddy DN, Ramchandani M. Adverse events during and after per-oral endoscopic myotomy: Prevention, diagnosis, and management. Gastrointest Endosc 2018;87:4-17.
2. Löser B, Werner YB, Löser A, Rösch T, Petzoldt M. Anesthesia in gastrointestinal endoscopy: Peroral endoscopic myotomy. Anesthesiast 2019;68:607-14.
3. Ferguson MK. Achalasia: Current evaluation and therapy. Ann Thorac Surg 1991;52:336-42.
4. Pandolfino JE, Gawron AJ. Achalasia: A systematic review. JAMA 2015;313:1841-52.
5. Kahrilas PJ, Bredenoord AJ, Fox M, Gyawali CP, Roman S, Smout AJ, et al. The Chicago classification of esophageal motility disorders, v3.0. Neurogastroenterol Motil 2015;27:160-74.
6. Campos GM, Vittinghoff E, Rabl C, Takata M, Gadenstätter M, Lin F, et al. Endoscopic and surgical treatments for achalasia: A systematic review and meta-analysis. Ann Surg 2009;249:45-57.
7. Inoue H, Minami H, Kobayashi Y, Sato Y, Kaga M, Suzuki M, et al. Peroral endoscopic myotomy (POEM) for esophageal achalasia. Endoscopy 2010;42:265-71.
8. Zaninotto G, Bennett C, Boeckxstaens G, Costantini M, Ferguson MK, Pandolfino JE, et al. The 2018 ISDE achalasia guidelines. Dis Esophagus 2018;31. doi: 10.1093/dote/doy071.
9. Cho YK, Kim SH. Current status of peroral endoscopic myotomy. Clin Endosc 2018;51:13-8.
10. Inoue H, Tianle KM, Ikeda H, Hosoya T, Onimaru M, Yoshida A, et al. Peroral endoscopic myotomy for esophageal achalasia: Technique, indication, and outcomes. Thorac Surg Clin 2011;21:519-25.
11. Yang D, Fannu 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.
12. Gockel I, Müller M, Schumacher J. Achalasia—a disease of unknown cause that is often diagnosed too late. Dtsch Arztebl Int 2012;109:209-14.
13. Khoshhab MA, Vela MF, Thosani N, Agrawal D, Buxbaum JL, Abbas Fehmi SM, et al. ASGE guideline on the management of achalasia. Gastrointest Endosc 2020;91:213-27.
14. Li QL, Zhou PH. Perspective on peroral endoscopic myotomy for achalasia: Zhongshan experience. Gut Liver 2015;9:152-8.
15. ASGE Standards of Practice Committee, Acosta RD, Abraham NS, Chandrasekhara V, Chatthadi KV, Early DS, et al. The management of antithrombotic agents for patients undergoing GI endoscopy. Gastrointest Endosc 2016;83:3-16.
16. Bang YS, Chunhyun P. Anesthetic consideration for peroral endoscopic myotomy. Clin Endosc 2019;52:549-55.
17. Darisetty S, Nabi Z, Ramchandani M, Chavan R, Kotla R, Nageshwar Reddy D. Anesthesia in peroral endoscopic myotomy: A large tertiary care centre experience. Indian J Gastroenterol 2017;36:305-12.
18. Nishihara Y, Yoshida T, Ooi M, Obata N, Izuta S, Mizobuchi S. Anesthetic management and associated complications of peroral endoscopic myotomy: A case series. World J Gastrointest Endosc 2018;10:193-9.
19. Gouda 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.
20. Abdulla S. Pulmonary aspiration in perioperative medicine. Acta Anaesthesiol Belg 2013;64:1-13.
21. Inoue H, Shiwaku H, Iwakiri K, Onimaru M, Kobayashi Y, Minami H, et al. Clinical practice guidelines for peroral endoscopic myotomy. Dig Endosc 2018;30:563-79.
22. Wallace C, McGuire B. Rapid sequence induction: Its place in modern anaesthesia. Contin Educ Anaesth Crit Care Pain 2014;14:130-5.
23. 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.
24. Saxena E, Pippenger R, Khoshhab MA. Preventing aspiration during peroral endoscopic myotomy. J Anesth 2014;28:959.
25. Lee JH, Chung CJ, Lee SC, Shin HJ. Anesthetic management of transoral natural orifice transluminal endoscopic surgery: Two cases report. Korean J Anesthesiol 2014;67:148-52.
26. Löser B, Werner YB, Punke MA, Saugel B, 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.
27. Myre K, Rostrup M, Buanes T, Stokland O. Plasma catecholamines and haemodynamic changes during capnoperitoneum. Acta Anaesthesiol Scand 1998;42:343-7.
28. Haito-Chavez Y, Inoue H, Beard KW, Draganov PV, Ujiki M, Himmel R, et al. Peroral endoscopic myotomy‑initial experience with anesthetic management of 24 procedures and systematic review. Anesth Essays Res 2016;10:297-300.
29. Khashab MA, Vela MF, Thosani N, Bodrug S, Draganov PV, Ujiki M, et al. ASGE guideline on the management of achalasia. Gastrointest Endosc 2020;91:213-27.
30. Talukdar R, Inoue H, Nageshwar Reddy D. Efficacy of peroral endoscopic myotomy (POEM) in the treatment of
34. Murata H, Ichinomiya T, Hara T. Anesthesia for peroral endoscopic myotomy in Japan. Curr Opin Anaesthesiol 2019;32:511-6.
35. Familiari P, Gigante G, Marchese M, Boskoski I, Tringali A, Perri V, et al. Peroral endoscopic myotomy for esophageal achalasia: Outcomes of the first 100 patients with short term follow-up. Ann Surg 2016;263:82-7.
36. Hopf HW, Weitz S. Postoperative pain management. Arch Surg 1994;129:128-32.
37. Golembiewski J, Chernin E, Chopra T. Prevention and treatment of postoperative nausea and vomiting. Am J Health Syst Pharm 2005;62:1247-60; quiz 1261-2.