Anesthesia for Esophageal Dilation Procedure in a World Gastroenterology Organizing Endoscopy Training Center

Somchai Amornyotin MD*,
Siriporn Kongphlay BNS*

** Department of Anesthesiology, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand*

Objective: *The study is aimed to report and evaluate the choices and techniques, drugs used and complications of anesthesia in the patients undergoing esophageal dilation procedure in a World Gastroenterology Organizing Endoscopy Training Center in a developing country.*

Material and Method: *Retrospectively analyzed the patients on whom esophageal dilation procedure had been performed during the period of December, 2010 to June, 2014 in a World Gastroenterology Organizing Endoscopy Training Center in Thailand. The patients' characteristics, pre-anesthetic problems, causes of stricture, anesthetic techniques, drugs, duration of anesthesia, and anesthesia-related complications were assessed and summarized by using descriptive statistics.*

Results: *During the study period there were 223 procedures. The majority of ASA physical status classification was I (42.6%) and II (48.0%). Most common pre-anesthetic problems were hematologic disease (19.3%), electrolyte imbalance (16.6%), hypertension (13.0%) and diabetes mellitus (7.2%). Most common cause of stricture was corrosive esophagitis. Intravenous sedation with and without topical anesthesia was the main anesthetic technique. The mainly used sedoanalgesic agents were fentanyl, propofol and midazolam. The overall anesthesia-related complication rate was 18.4%. Hypotension (12.1%) was the most frequent anesthetic complication.*

Conclusion: *All of the esophageal dilation procedures, intravenous sedation with or without topical pharyngeal anesthesia could be performed safely and effectively in the appropriate patients. However, clinical signs should be carefully observed and the anesthetic personnel had to optimize the patient's condition for safety and be beware of complications.*

Keywords: *Anesthetic management, Esophageal dilation, Esophageal stricture, Efficacy, Safety, Endoscopic unit*

J Med Assoc Thai 2017; 100 (Suppl. 7): S188-S194
Full text. e-Journal: *http://www.jmatonline.com*

Esophageal stricture is a problem frequently encountered by gastroenterologists. Dilation of strictures is indicated whenever there is associated clinically significant functional impairment or a need to access beyond the stricture for diagnosis or therapy. Dilation may be performed using a variety of devices. Several dilators have specific characteristics. To date, the indications for esophageal dilation have also expanded. The esophageal dilation procedure can be performed under fluoroscopic guidance or with a combination of fluoroscopic and endoscopic techniques. Various techniques of anesthesia are utilized during dilation, including intravenous sedation or general anesthesia[1,2].

The relatively low morbidity and mortality of esophageal dilation has encouraged its widespread use. However, dilation should be undertaken as a planned procedure where possible in patients who have been adequately investigated and prepared. To date, there are increasing numbers of patients at the extreme of health status and patients with a multitude of comorbid problems. In our training center, most of these procedures are performed by endoscopists under some forms of anesthesia. The choices and techniques of anesthesia and drug selection vary according to the condition of the patients, familiarity of the anesthesiologists and satisfaction of the endoscopists[3,4]. Little is known about practices in anesthesia and monitoring during esophageal dilation procedure in the endoscopic training center in Thailand. Subsequently, the anesthesia-related complications have altered over time. The objective of this study was to report and evaluate the choices and

Correspondence to:
Amornyotin S, Department of Anesthesiology and Siriraj GI Endoscopy Center, Faculty of Medicine Siriraj Hospital, Mahidol University, 2 Wanglang Road, Bangkoknoi, Bangkok 10700, Thailand.
Phone: +66-2-4197978, Fax: +66-2-4113256
E-mail: somchai.amo@mahidol.ac.th

techniques of anesthesia, drug usage and anesthesia-related complications during and immediately after the esophageal dilation procedure.

Material and Method

This study was approved by the Institutional Review Board (Si 596/2012). Data were reviewed from anesthetic, procedure records and history charts of the patients who underwent esophageal dilation during a period from December 2010 to June 2014 at the World Gastroenterology Organizing Endoscopy Training Center, Thailand. The general data included gender, age, weight, height and American Society of Anesthesiologists (ASA) physical status. The anesthetic data included pre-anesthetic problems, causes of stricture, choice of anesthesia, duration of anesthesia, anesthetic drug usage, hemodynamic parameters including systolic and diastolic blood pressure, heart rate and oxygen saturation as well as anesthesia-related complications.

Statistical analysis

Results were reported as mean and standard deviation (SD) or percentage (%) when appropriate. Data were analyzed using PASW Statistics for Windows, 18.0 Chicago: SPSS, Inc.

Results

There were 223 esophageal dilation procedures performed during the study period. The majority of the patients were male (50.7%) with ASA physical status II (48.0%). Mean age was 48.1±17.1 years. The mean duration of anesthesia was 29.0±16.9 minutes. Most of pre-anesthetic problems were hematologic disease (19.3%), electrolyte imbalance (16.6%), hypertension (13.0%) and diabetes mellitus (7.2%). Corrosive esophagitis was the most causes of esophageal stricture (Table 1). Clinical monitoring observed by the anesthetic personnel consisted of noninvasive blood pressure, heart rate, pulse oxymetry, and electrocardiogram.

Table 2 shows anesthesia-related data. The majority of the procedures were carried out under intravenous sedation with and without topical anesthesia (37.1% and 37.1%). The mainly used sedoanalgesic agents were fentanyl, propofol and midazolam. The most common neuromuscular blocking drug was succinylcholine. In addition, sevoflurane was the most inhalation agent. These anesthetic drugs are usually utilized in a combination regimen.

Table 3 demonstrates the hemodynamic parameters including systolic and diastolic blood pressure, heart rate and oxygen saturation. In addition, anesthesia-related complications during and immediately after the procedure are demonstrated in Table 4. No serious anesthetic complications occurred during the study. The overall anesthesia-related complication rate was 18.4%. The majority of these complications was cardiorespiratory system in nature and was associated with sedation and analgesia. Hypotension (12.1%) which was promptly corrected by administration of vasopressor and fluid loading was the most frequent anesthesia-related complication.

Table 1. Characteristics of patients, duration of anesthesia and pre-anesthetic problems and causes of stricture

	n = 223
Age (yr)	48.1±17.1
Gender: Male	113 (50.7)
Weight (kg)	49.9±13.01
Height (cm)	58.3±11.8
ASA physical status	
I	95 (42.6)
II	107 (48.0)
III	21 (9.4)
Duration of anesthesia (min)	29.0±16.9
Pre-anesthetic problems	
Hematologic disease	43 (19.3)
Electrolyte imbalance	37 (16.6)
Hypertension	29 (13.0)
Diabetes mellitus	16 (7.2)
Cardiovascular disease	14 (6.3)
Others	47 (21.1)
Causes of stricture	
Corrosive esophagitis	90 (40.4)
Tumor	50 (22.4)
Achalasia	38 (17.0)
Post-surgical and radiation	29 (13.0)
Others	16 (7.2)

Data presented as number (%) or mean ± standard deviation
ASA = American society of Anesthesiologists

Discussion

Esophageal dilation is indicated in the treatment of symptomatic obstruction of esophagus. This obstruction might develop as a consequence of anatomical and functional disorders. The primary objective of esophageal dilation is to relieve symptoms, permit maintenance of oral nutrition, and decrease the risk of pulmonary aspiration. Endoscopy and contrast radiology are both helpful and are often complimentary.

To date, several devices for dilation have been developed. Esophageal dilation is associated with less invasiveness and complications, shorter hospital stay, and lower cost. However, there have been some problems of dilation-related complications including perforation, bleeding and pulmonary aspiration[2,5].

Esophageal dilation is generally performed by using endoscopy. Fluoroscopy is recommended when using non-wire-guided dilators during dilation of complex esophageal strictures or in the patients with tortuous esophagus[6,7]. All patients should be asked to fast for 4 to 6 hours to ensure an empty esophagus and stomach during the procedure. However, patients with achalasia are susceptible to esophageal stasis and prolonged fast or esophageal lavage should be required. Additionally, anticoagulants should be discontinued. Routine antibiotic administration is not recommended. Esophageal dilation is commonly performed in an outpatient setting.

Generally, early improvement in the ability to swallow is accomplished in essentially all patients. However, longer-term outcomes are influenced by the underlying pathological condition. In benign strictures, a graded stepwise approach to between 13 and 20 mm provides good relief in 85 to 93% of cases[1,2]. Relief of malignant dysphagia with dilation is only transient, and dysphagia caused by external compression of the esophagus does not generally respond to dilation. Repeated dilatations are needed in non-peptic stricture, fibrous stricture and a maximum dilator size <14 mm. Factors associated with a poor response to balloon dilation of benign strictures are a length of >8 cm and a small predilation luminal diameter. For peptic strictures, smaller lumen diameter, number of dilations needed, presence of a hiatal hernia >5 cm, and persistence of heartburn after dilation were

Table 2. Anesthesia-related data

	n = 223
Anesthetic technique	
Intravenous sedation with topical anesthesia	74 (33.2)
Intravenous sedation	86 (38.6)
Topical anesthesia	6 (2.7)
General anesthesia with endotracheal tube	47 (21.1)
General anesthesia via tracheostomy tube	10 (4.5)
Intravenous drugs	
Propofol	205 (91.9)
Thiopental	7 (3.1)
Midazolam	124 (55.6)
Fentanyl	212 (95.1)
Pethidine	4 (1.8)
Succinylcholine	43 (19.3)
Atracurium	11 (4.9)
Cis-atracurium	9 (4.0)
Vecuronium	1 (0.4)
Rocuronium	1 (0.4)
Inhalation agents	
Nitrous oxide	15 (6.7)
Isoflurane	6 (2.7)
Sevoflurane	44 (19.7)
Desflurane	2 (0.9)

Data presented as number (%)

Table 3. Hemodynamic parameters: systolic and diastolic blood pressure (mmHg), heart rate (beat/minute) and oxygen saturation (SpO_2, %)

	SBP	DBP	HR	SpO_2
Baseline	124.9 (23.3)	74.2 (11.9)	76.8 (13.1)	99.9 (0.2)
5 min after insertion	120.5 (22.9)	71.3 (12.1)	76.3 (12.7)	100.0 (0.1)
10 min after insertion	116.5 (22.6)	68.9 (12.4)	76.1 (12.4)	100.0 (0.0)
15 min after insertion	116.0 (20.9)	69.3 (11.9)	76.4 (12.2)	100.0 (0.0)
20 min after insertion	115.5 (20.7)	69.4 (13.0)	75.2 (13.6)	99.9 (1.7)
25 min after insertion	117.0 (19.5)	71.8 (13.5)	75.1 (13.8)	100.0 (0.0)
30 min after insertion	118.6 (20.2)	71.8 (13.5)	76.7 (14.5)	100.0 (0.0)
35 min after insertion	117.9 (17.8)	71.7 (13.2)	76.3 (15.0)	100.0 (0.0)
40 min after insertion	117.6 (19.1)	70.6 (12.9)	76.6 (15.7)	100.0 (0.0)
45 min after insertion	115.9 (17.8)	69.9 (12.9)	76.7 (13.7)	100.0 (0.0)

Data presented as mean $\pm$ SD
SBP = Systolic blood pressure; DBP = Diastolic blood pressure; HR = Heart rate; SpO_2 = Oxygen saturation

Table 4. Anesthesia-related complications during and immediately after the procedure

	n = 223
Overall	41 (18.4)
Hypotension	27 (12.1)
Hypertension	5 (2.2)
Bradycardia	7 (3.1)
Tachycardia	1 (0.4)
Bronchospasm	1 (0.4)

Data presented as number (%)

significant predictors of early symptomatic recurrence[8]. In addition, nonpeptic strictures was also a significant predictor of early symptomatic recurrence[9].

The role of the anesthesiologist in the esophageal dilation procedure is to facilitate patient safety and procedural efficacy as well as to ensure that the patient will have minimal pain during and after the procedure. Some patients may tolerate dilation with topical anesthesia. However, sedation is usually used[10]. To date, there is evidence that esophageal dilation could be safely performed with sedation and/or general anesthesia. Although the use of sedation and/or anesthesia during this procedure is supposed to be extensively accepted, the data from different studies indicate that patterns of use of anesthetic agents may principally depend on cultural, or even regional and local differences. Moreover, there are limited data in the training centers in the developing countries.

This study demonstrated that intravenous sedation with or without topical anesthesia was commonly used for the esophageal dilation procedure in an endoscopy unit outside the operating room. The result of this study is similar to the other studies[2,10]. Sedation for esophageal dilation procedure is intended to provide moderate to deep sedation as defined by the American Society of Anesthesiologists (ASA)[11]. The proper administration of sedation and/or anesthesia for this procedure is as essential to the successful procedure as skillful maneuvering of the endoscopist. Recently, there are concerns about our practice of sedation and anesthesia, involving issues of safety, patient satisfaction, and cost. The goal of anesthesia during this procedure is to relieve the patient's preexisting pain and anxiety as well as the pain of the procedure itself, and the amount of postoperative pain expected. The level of sedation/anesthesia is balanced with the stimulus of the procedure.

Esophageal dilation procedures are generally performed either with sedation in the endoscopy room, or under general anesthesia in the operating room. The decision to use general anesthesia is usually based on the patients' parameters such as age, diagnosis, respiratory compromise and severity of disease. Most anesthesiologists in our center commonly performed general anesthesia with endotracheal tube for this procedure in children, full stomach patients, severe or complicated esophageal stricture, patients with severe co-morbidities, and patients with esophageal malignancy. In our experience, we recommend that signs and symptoms of esophageal stricture are very important. An adequate evaluation of these signs and symptoms is needed before the procedure. In mild or moderate signs and symptoms of esophageal stricture, we can safely use sedation for this procedure. Consequently, benign esophageal strictures could be effectively done by using sedation technique.

The differences in usage of sedation and anesthesia between among countries have been accredited to cultural differences. In Siriraj Hospital, intravenous sedation technique is commonly used for various procedures outside the operating room[12-15]. General anesthesia with endotracheal tube for esophageal dilation is usually utilized in the pediatric patients and in the patients with malignant esophageal strictures, patients with high risk of aspiration, and patients with full stomach. It has several advantages including prevention of an aspiration risk, a high successful completion rate, and hemodynamic stability. In contrast, intravenous sedation is utilized in patients without risk of aspiration, patients with benign esophageal pathology, and in non-complicated procedures.

The commonly used sedoanalgesic drugs are shorter-acting drugs including propofol, fentanyl and midazolam because of their relatively rapid onset and rapid offset[4,16]. Propofol had been widely used by anesthesiologists for this procedure. It has anxiolytic, hypnotic, amnestic, antiemetic and anesthetic properties. Fentanyl has a rapid onset, short duration of action, lack of direct of myocardial depressant effects, and absence of histamine release, making it an ideal agent for use in endoscopic sedation. Midazolam is an ideal agent to provide anxiolysis and anterograde amnesia for short procedures. Importantly, fentanyl and midazolam could be reversed by the appropriate medication. However, propofol could produce cardiorespiratory depression. The use of propofol for sedation requires specific training and experience and

should be rigorously offered only under optimal conditions[3,4,16,17]. Succinylcholine is commonly used for tracheal intubation because of rapid sequence induction. Similarly, sevoflurane is the most common inhalation agent used during short period of anesthesia.

Topical pharyngeal anesthesia with or without moderate sedation could be utilized for the esophageal dilation procedure[10]. Cardiovascular effects may occur during esophageal dilation under intravenous sedation. However, these effects are also observed in the general anesthesia. Jakobsen et al evaluated the cardiovascular effects of esophageal dilation under general anesthesia in ten consecutive patients with benign esophageal strictures. Their study demonstrated that four patients developed significant hypotension at the time of balloon inflation with two patients requiring medical intervention. Tachycardia and ST-deviation happened in four and three patients, respectively. All cases of myocardial ischemia were related to the time of extubation. No permanent complications were noticed, and all patients could be discharged within 24 hours after the procedure. Pneumatic dilation of the esophagus under general anesthesia may be associated with significant hypotension[18].

The procedure-related complications of esophageal dilation are perforation, bleeding, and pulmonary aspiration. The most serious complication is perforation. The perforation rate for esophageal strictures after dilation has been reported to be 0.1% to 0.4%[19]. However, our study does not focus on the procedure-related complications. The patients undergo esophageal dilation with deep sedation or with general anesthesia are the potential for risks. The present study clearly recommends that cardiovascular complications may be significantly more frequent in the patients who undergo this procedure. The most common anesthesia-related complication was hypotension. In Siriraj Hospital, there were no serious anesthesia-related complications occurring during the study period.

There are several limitations of this study that should be noted. First, the study is retrospective in nature. The main limitation of this study is its reliance on self-reported data. These self-reporting data may tend toward an underestimation of unpleasant data. Second, this is a World Gastroenterology Organizing Endoscopy Training Center in Thailand. The results could not be reproduced constantly in other settings. Third, there are several anesthesiologists and endoscopists performing this procedure. A wide variability of experience might occur. However, the authors assume that the data are realistic and reveal daily clinical practice. Finally, our results may not be applicable to patients in the developed countries.

In conclusion, esophageal dilation is a minimally invasive procedure for treatment of esophageal strictures from various pathologies. Intravenous sedation with and without topical anesthesia were commonly used for this procedure. Cardiovascular-related complication was the most frequent anesthetic complication. Anesthesia by anesthetic personnel appeared to be safe and effective. There was no need for special equipment/drugs in anesthesia. However, clinical signs should be cautiously observed and the anesthetic personnel had to optimize the patient's condition for safety and be beware of complications.

What is already known on this topic?

Esophageal dilation is a minimally invasive procedure for treatment of esophageal strictures which requires some forms of anesthesia. Cardiovascular-related complication is the most frequent anesthetic complication. Anesthesia by anesthetic personnel appears to be safe and effective.

What this study adds?

Intravenous sedation with and without topical anesthesia could be performed in the appropriate patients with proper assessment and preparation as well as adequate monitoring. General anesthesia with endotracheal tube is usually used in the patients with malignant esophageal strictures, patients with high risk of aspiration, and patients with full stomach.

Acknowledgements

The authors Kamonpan Homchuangsub for her assistance organizing and coordinating this study.

Potential conflicts of interest

None.

References

1. Riley SA, Attwood SE. Guidelines on the use of oesophageal dilatation in clinical practice. Gut 2004; 53 (Suppl 1): i1-6.
2. Egan JV, Baron TH, Adler DG, Davila R, Faigel DO, Gan SL, et al. Esophageal dilation. Gastrointest Endosc 2006; 63: 755-60.
3. Amornyotin S. Registered nurse-administered sedation for gastrointestinal endoscopic procedure. World J Gastrointest Endosc 2015; 7: 769-76.

4. Amornyotin S. Sedation and monitoring for gastrointestinal endoscopy. World J Gastrointest Endosc 2013; 5: 47-55.
5. Therasse E, Oliva VL, Lafontaine E, Perreault P, Giroux MF, Soulez G. Balloon dilation and stent placement for esophageal lesions: indications, methods, and results. Radiographics 2003; 23: 89-105.
6. Wang YG, Tio TL, Soehendra N. Endoscopic dilation of esophageal stricture without fluoroscopy is safe and effective. World J Gastroenterol 2002; 8: 766-8.
7. Blount KJ, Lambert DL, Shaffer HAJr, de Lange EE. Fluoroscopically guided balloon dilation of the esophagus. SeminIntervent Radiol 2010; 27: 232-40.
8. Said A, Brust DJ, Gaumnitz EA, Reichelderfer M. Predictors of early recurrence of benign esophageal strictures. Am J Gastroenterol 2003; 98: 1252-6.
9. Chiu YC, Hsu CC, Chiu KW, Chuah SK, Changchien CS, Wu KL, et al. Factors influencing clinical applications of endoscopic balloon dilation for benign esophageal strictures. Endoscopy 2004; 36: 595-600.
10. Petrini J, Egan JV. Risk management regarding sedation/analgesia. Gastrointest Endosc Clin N Am 2004; 14: 401-14.
11. American Society of Anesthesiologists Task Force on Sedation and Analgesia by Non-Anesthesiologists. Practice guidelines for sedation and analgesia by non-anesthesiologists. Anesthesiology 2002; 96: 1004-17.
12. Amornyotin S, Na-pomphet S, Wongwathanyoo T, Chalayonnavin V. Anesthesia for endoscopic retrograde cholangiopancreatography (ERCP) from 1999-2003 in Siriraj Hospital: a retrospective study. J Med Assoc Thai 2004; 87: 1491-5.
13. Amornyotin S, Jirachaipitak S, Wangnatip S. Anesthetic management for radiofrequency ablation in patients with hepatocellular carcinoma in a developing country. J Anesth Crit Care 2015; 3: 00086.
14. Amornyotin S, Aanpreung P, Prakarnrattana U, Chalayonnavin W, Chatchawankitkul S, Srikureja W. Experience of intravenous sedation for pediatric gastrointestinal endoscopy in a large tertiary referral center in a developing country. Paediatr Anaesth 2009; 19: 784-91.
15. Amornyotin S, Parichatikanond P, Reunreung W. Anesthesia for embolization from 2003-2004 in Siriraj Hospital: a retrospective study. Siriraj Med J 2007; 59: 161-3.
16. Amornyotin S. Sedative and analgesic drugs for gastrointestinal endoscopic procedure. J Gastroenterol Hepatol Res 2014; 3: 1133-44.
17. Amornyotin S. Intravenous sedation techniques for gastrointestinal endoscopy. J Gastroenterol Hepatol Res 2016; 5: 2050-7.
18. Jakobsen CH, Rasmussen V, Rosenberg J. Cardiovascular effects of oesophageal dilation under general anaesthesia. Dan Med Bull 1999; 46: 252-4.
19. Hernandez LV, Jacobson JW, Harris MS. Comparison among the perforation rates of Maloney, balloon, and savary dilation of esophageal strictures. Gastrointest Endosc 2000; 51: 460-2.

การระงับความรู้สึกสำหรับการถ่างขยายหลอดอาหารในศูนย์ฝึกอบรมส่องกล้องระบบทางเดินอาหาร

สมชาย อมรโยธิน, ศิริพร คงพลาย

ภูมิหลัง: หัตถการถ่างขยายหลอดอาหาร เป็นหัตถการชนิดหนึ่งสำหรับผู้ป่วยที่มีหลอดอาหารตีบตันจากหลายสาเหตุการทำหัตถการชนิดนี้ จำเป็นต้องใช้การระงับความรู้สึก สามารถทำได้ทั้งในห้องผ่าตัดและในห้องส่องกล้องนอกห้องผ่าตัด

วัตถุประสงค์: ศึกษาชนิดของการระงับความรู้สึก ยาระงับความรู้สึกที่ใช้ และภาวะแทรกซ้อนของการระงับความรู้สึก สำหรับผู้ป่วยที่มารับการทำหัตถการถ่างขยายหลอดอาหารในศูนย์ฝึกอบรมส่องกล้องระบบทางเดินอาหารนอกห้องผ่าตัด

วัสดุและวิธีการ: ศึกษาย้อนหลังผู้ป่วยที่มารับการทำหัตถการถ่างขยายหลอดอาหารระหว่างเดือนธันวาคม พ.ศ. 2553 ถึง เดือนมิถุนายน พ.ศ. 2557 ในโรงพยาบาลศิริราช ประเทศไทย บันทึกข้อมูลทั่วไปของผู้ป่วย โรคหรือปัญหาก่อนการระงับความรู้สึก สาเหตุของหลอดอาหารตีบตัน ชนิดของการระงับความรู้สึก ยา และระยะเวลาของการระงับความรู้สึกที่ใช้ รวมทั้งภาวะแทรกซ้อนของการระงับความรู้สึก

ผลการศึกษา: ผู้ป่วยทั้งหมด 223 คน มารับการทำหัตถการถ่างขยายหลอดอาหารส่วนใหญ่มี ASA physical status II ร้อยละ 48.0 โรคหรือปัญหาก่อนการระงับความรู้สึกที่พบบ่อย คือ โรคเลือดร้อยละ 19.3, ความผิดปกติของอิเล็คโตรไลต์ ร้อยละ 16.6, ความดันโลหิตสูงร้อยละ 13.0 และโรคเบาหวานร้อยละ 7.2 สาเหตุส่วนใหญ่ของหลอดอาหารตีบตันเกิดจาก corrosive esophagitis ส่วนใหญ่ใช้ยาระงับความรู้สึกทางหลอดเลือดดำและใช้ยาระงับความรู้สึกทางหลอดเลือดดำร่วมกับการระงับความรู้สึกเฉพาะที่ยาระงับความรู้สึกที่ใช้ส่วนใหญ่คือ fentanyl, propofol และ midazolam พบภาวะแทรกซ้อนของการระงับความรู้สึกทั้งหมดร้อยละ 18.4 ภาวะความดัน เลือดต่ำพบได้บ่อยที่สุดร้อยละ 12.1

สรุป: การทำหัตถการถ่างขยายหลอดอาหารในผู้ป่วยที่เหมาะสมสามารถทำได้สำเร็จและปลอดภัย โดยวิธีการให้ยาระงับความรู้สึกทางหลอดเลือดดำอย่างเดียวหรือให้ร่วมกับการระงับความรู้สึกเฉพาะที่ อย่างไรก็ตามการเฝ้าระวังการเปลี่ยนแปลงทางคลินิกของผู้ป่วยและภาวะแทรกซ้อนของการระงับความรู้สึกที่อาจจะเกิดขึ้นมีความจำเป็น