Original Article

Whole-process nursing management for laparo-gastroscopic esophagectomy

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Background: Advances in surgical, anesthesia, and nursing techniques have allowed the development of laparo-gastroscopic esophagectomy (LGE) as a minimally invasive treatment of esophageal cancer. This study summarizes the experience of patient whole-process nursing management for patients who received LGE.

Methods: The implementation of LGE at Zhongshan Hospital, Fudan University, was initiated in June 2020. The procedure is indicated for patients with thoracic conditions that can compromise the outcomes of traditional surgical procedures, and is performed coordinately by thoracic surgeons and endoscopists. A whole-process nursing protocol covering peri-operative patient management was proposed based on the LGE procedure. The operative outcomes were analyzed in this study.

Results: The data of 10 consecutive patients who received LGE and the whole-process nursing protocol were analyzed, and all patients were compliant with the nursing protocol. Intra-operatively, there were no complications or conversions to other surgical methods. Post-operatively, pulmonary complications occurred in 2 cases [1 patient experienced aspiration, underwent preventive tracheotomy, and was discharged on postoperative day (POD) 10; 1 patient developed a left pleural effusion requiring puncture and drainage, and was discharged on POD 7]. The 30-day mortality was not recorded from the primary LGE cohort.

Conclusions: The whole-process nursing protocol showed safety and feasibility for patients who underwent LGE. In the future, more specialized and whole-process nursing management will be carried out for patients undergoing such operations.

Keywords: Esophageal cancer; laparo-gastroscopic esophagectomy (LGE); holistic nursing management; nursing experience

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Introduction

Laparo-gastroscopic esophagectomy (LGE), which integrates the gastroscopic esophageal mobilization and laparoscopic gastric conduit formation, is a surgical innovation for esophageal cancer (EC) patients with thoracic co-morbidities (1). However, the promising results of LGE may not be seen with holistic nursing management.

As an evolution to transhiatal esophagectomy, LGE minimizes manipulation injury by using a single gastroscope to mobilize the esophagus within the mediastinum (2). The procedure offers a chance of cure for patients who are not candidates for conventional surgical methods (3). It is well known that surgical resection of EC carries a high risk of morbidity and mortality as compared to other major operations (4). As such, a comprehensive nursing care protocol covering the whole process would be beneficial for enhanced patients' recovery.

With LGE, there are new requirements for whole-process nursing management of EC patients. Based on our primary experience of performing LGE, we herein report our results and the whole-process nursing management protocol for the care of these patients. We present the following article in accordance with the TREND reporting checklist (available at https://jgo.amegroups.com/article/view/10.21037/jgo-22-669/rc).

Methods

Patients

The records of consecutive patients with EC who underwent LGE from July 2020 to August 2021 at Zhongshan Hospital, Fudan University were retrospectively reviewed. The surgical candidates received an endoscopic biopsy, a positron emission tomography-computed tomography (PET-CT) scan, pulmonary function test, and were evaluated under multi-disciplinary discussion. The indication for LGE was cT1–3N0M0 disease with 1 of the following conditions: (I) history of surgery in the right thoracic cavity; (II) history of pulmonary diseases with radiologic evidence (i.e., tuberculosis/bronchiectasis); (III) evidence of eligibility for additional esophagectomy after endoscopic dissection for superficial EC. All patients signed informed consent. The original LGE procedure was described in our previous report (1).

Holistic nursing management

Preoperative nursing

Transcervical LGE is indicated for patients with thoracic conditions that increase the risk of conventional procedures, and as such the nursing protocol focused on minimizing potential pulmonary complications and includes the following.

Rehabilitation training

Patients were instructed to have rehabilitation training before surgery. Diaphragmatic breathing (*Figure 1*): inspiratory muscle training (IMT) was performed sitting in a chair and wearing a nose clip; patients were instructed to breathe in as strongly and deeply as possible and then breathe out as slowly and deeply as possible (4). Effective coughing training (*Figure 2*): patients were in a sitting or semi-recumbent position and leaning forward. They inhaled deeply and held the breath for 3–5 s, and then made a bursting cough, coughing up secretions or foreign bodies in the airway (5).

Nutrition assessment

All patients received a comprehensive assessment of their nutritional status. Nutritional risk screening was performed immediately after admission, and nutritional status was scored using anthropometric measurements, age, recent weight loss, dietary intake, and disease severity. The total score ranged from 0 to 7 points, and a score >3 indicated a risk of malnutrition and the need for nutritional support before surgery.

Preoperative preparation

(I) Preoperative visit: preoperative assessment was performed the day before surgery by the nurse who was to participate in the procedure (6). Any history of chronic disease was fully assessed. The nurse explained the operation to the patient, including the duration of the surgery and preoperative fasting. (II) Surgical instruments: the instruments required (*Box 1*) for LGE were prepared by the scrub nurse and their counts were confirmed independently by the scrub nurse from surgical and endoscopic nurses.

Intraoperative nursing

(I) Circulating nurses prepared instruments and equipment 30 min in advance of the operation. Preoperative preparation shortened the operation time, and thus potentially reduced the occurrence of postoperative pulmonary complications. (II) Operating room setting: the three-dimensional (3D) imaging system and insufflator

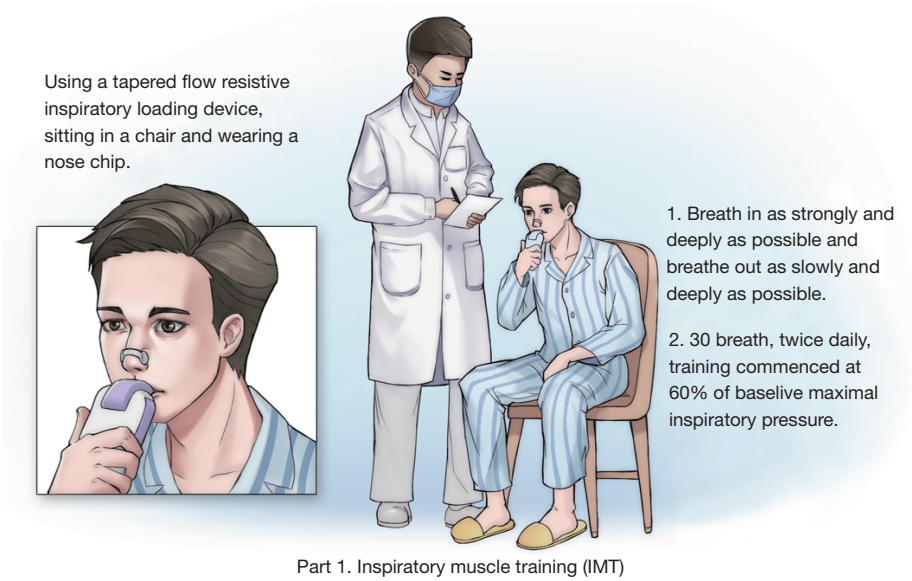

Figure 1 Preoperative inspiratory muscle training.

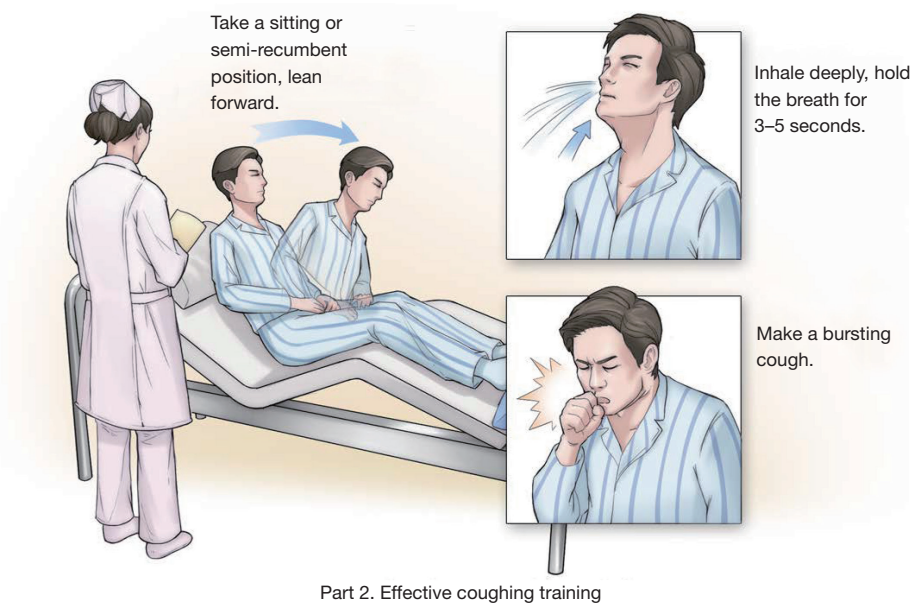

Figure 2 Preoperative effective coughing training.

Box 1 Instruments for laparo-gastroscopic esophagectomy

Endoscope host machine (Olympus, CV-290), carbon dioxide gas supply device for endoscope (UCR Olympus), endoscopic electrosurgery workstation (ERBE VIO200D + JET2 + EIP2), gastroscope (Olympus GIF-H260), water-supply gastroscope (Olympus GIF-Q260J), water injection bottle (MAJ-902), one set of endoscopic instruments (transparent tip cap, type I Hybrid, disposable hot biopsy forceps, disposable mucosal injection needle, disposable trap), endoscope machine, 5 mm absorbable vascular clamp, 10 mm absorbable vascular clamp, one set of endoscopic instruments (two grips, two separation pliers, scissors, electric coagulation hook, suction device), ultrasonic knife, one set of standing thoracotomy instruments.

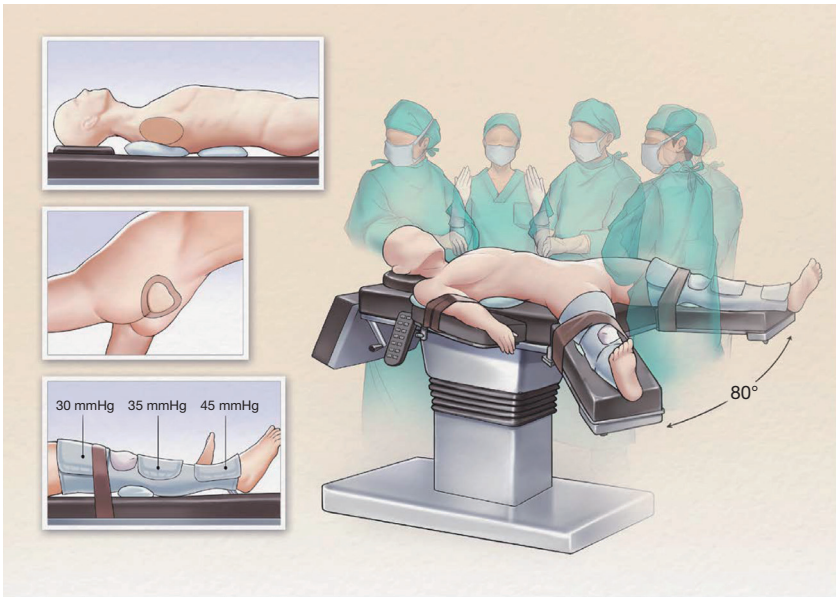

Figure 3 Intraoperative patient positioning.

were placed at the patient's head, the abdominal CO_2 pneumoperitoneum pressure was set at 12–14 mmHg, the scopist stood between the patient's legs facing the 3D monitor, the surgeon and assistant surgeon stood at the right and left side of the patient, and the scrub nurse and the instrument table were stationed beside the patient's right lower extremity, so as to facilitate the delivery of instruments to the surgeons. The endoscope system was placed on the right side of the patient. Endoscopists and nurses stood on the left cranial side of the patient, opposite to the endoscopic display. With the described set-up, the operating spaces did not interfere with each other, and the endoscopists and thoracic surgeons could operate simultaneously. (III) Patient positioning (*Figure 3*): the patient was placed in the French spilt leg position, with a soft pillow placed under the chest, and upper limbs fixed on both sides. The patient's lower extremities were abducted at 80 degrees. An anti-thrombotic pump was used on both lower extremities to keep the lower limbs in a functional position. An elastic stocking or intermittent pneumatic compression was used for the prophylaxis of deep venous thrombosis. (IV) Aseptic technique and tumor-free principle (*Figure 4*): The use of a single aseptic surgical towel simplified the tedious towel laying steps in the French spilt leg position, and avoided post-operative infection. The aseptic surgical towel carried an endoscopic instrument storage bag, which is convenient for the surgeon to collect and place the surgical instrument on the table. The surgical and endoscopic instruments were kept separate, and the tissues from different incisions were also kept separate and recorded independently. To assure all instruments and other materials were accounted correctly, the circulating nurse and endoscopic nurse maintained a count of the instruments and materials, separately.

Postoperative care

Respiratory nursing

Respiratory rate and rhythm were monitored after the operation. The cough of patients after EC surgery is weakened due to the effect of narcotic drugs and pain. Patients are prone to pneumonia and atelectasis, resulting in hypoxia, dyspnea, and even respiratory failure (7). Therefore, patients were assisted with producing and an effective cough and sputum, and were encouraged to perform standardized abdominal breathing and other respiratory exercises. Patients were placed in a semi-decubitus position to reduce the incidence of reflux aspiration.

Tube management

A nasojejunal tube and a cervical drainage tube were placed at the end of the operation. Since early ambulation is encouraged, the tubes were fixed to avoid displacement.

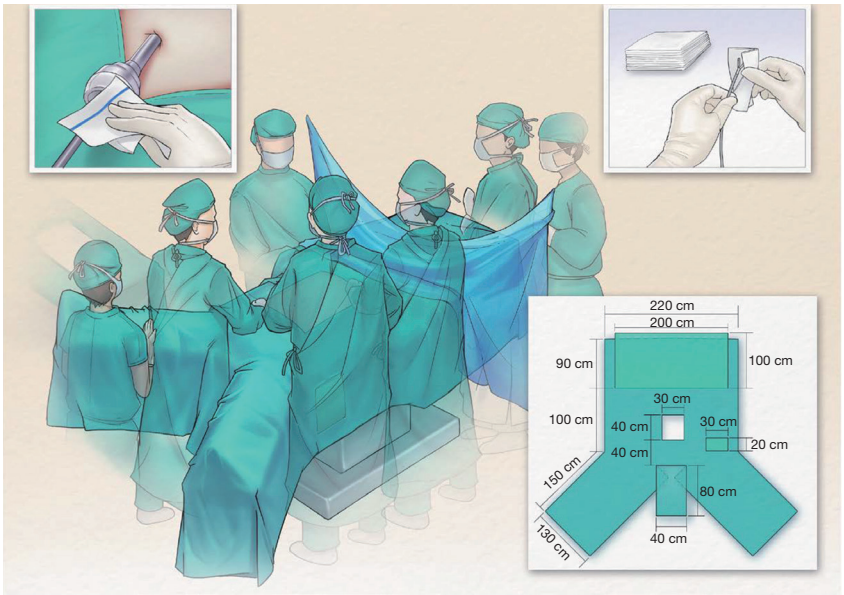

Figure 4 Aseptic technique and tumor-free principle.

The cervical drainage tube was frequently checked for potential folding and distortion. The drainage fluid was observed to identify gastro-esophageal leakage following the operation (8).

Pain management

On postoperative day (POD) 1, the surgical nurse conducted a follow-up visit. After the effects of postoperative anesthesia subsides, neck wound pain increases, and can affect recovery (9). During follow-up visits, surgical nurses appropriately comforted patients, reduced environmental stimulation, informed patients that postoperative pain is a normal phenomenon, and helped to improve their pain tolerance. If necessary, sedation and analgesia were given to reduce the pain level. Based on patient self-evaluation pain scores, severe pain was treated with analgesia drugs as prescribed by doctors. Multi-mode analgesia can reduce the pain and improve patient comfort.

Early ambulation

Postoperatively, patients were encouraged to ambulate early and perform simple activities, exercise breathing function. These efforts can effectively improve blood circulation, increase the gastrointestinal tract and bodily oxygen supply, and accelerate wound healing. After waking up from the operation, patients were assisted with active bed training, including abdominal massage and upper and lower limb stretching, 2–3 times/day, with 10 repetitions each session (10). Patients were encouraged to move in and around the bed, slowly, and to gradual increase the activity level (*Figure 5*).

Data collection

From June 2020 to August 2021, 11 patients underwent LGE. Of these, 7 patients were male and 4 were female, and the mean age of the patients was 68.82±3.83 years. Patient clinical features are summarized in *Table 1*.

Statistical analysis

Data were summarized as the mean and standard deviation or median and interquartile range, as appropriate, for continuous variables; and absolute number and percentage for categorical variables.

Ethical statement

The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The LGE procedure was approved by the Technical Committee of Zhongshan Hospital, Fudan University (No. ZS-2021-041) and the study was approved by the Ethics Committee board of Zhongshan Hospital, Fudan University (No. B2021-782R). Informed consent was taken from all the patients.

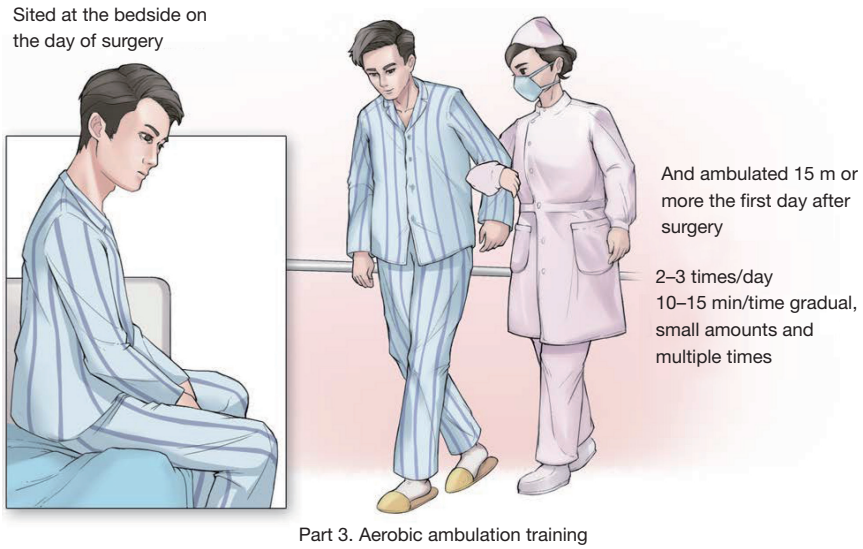

Figure 5 Postoperative nursery care.

Table 1 Results from LGE cohort

No.	Patients		Co-morbidities	Tumor		Operation duration (min)	Pathology				Complications	LOS (days)
	Gender	Age (years)		Location	Length (cm)		Histology	T	N	M		
1	Male	67	RUL lobectomy	M	1.2	240	SCC	1	0	0	NA	9
2	Male	69	COPD	M	2.5	260	SCC	3	0	0	Aspiration	10
3	Male	74	RUL lobectomy	L	0.5	210	SCC	2	0	0	NA	8
4	Female	63	ESD	M	3	180	SCC	MM	0	0	NA	7
5	Male	62	COPD; ESD	M	1.4	190	AD	2	1	0	NA	7
6	Male	68	ESD	M	3	210	SCC	MM	0	0	NA	5
7	Female	73	Tuberculosis	M	4	200	SCC	3	0	0	NA	7
8	Female	69	COPD	U	3	Null	SCC	Null	0	1	NA	Null
9	Male	68	COPD	M	2	180	SCC	SM	0	0	Pleural effusion	7
10	Male	72	Bronchiectasis	M	3	200	SCC	2	0	0	NA	6
11	Male	61	Tuberculosis	M	2.8	170	SCC	2	0	0	NA	7
12	Male	69	ESD	M	1.5	220	SCC	SM	0	0	NA	8

LGE, laparo-gastroscopic esophagectomy; RUL, right upper lung; COPD, chronic obstructive pulmonary disease; ESD, early supported discharge; M, middle thoracic esophagus; L, lower thoracic disease; U, upper thoracic disease; SCC, squamous cell carcinoma; AD, adenocarcinoma; MM, muscularis mucosae; SM, submucosa; T, tumor; N, node; M, metastasis; LOS, length of stay.

Results

Of the 11 patients who underwent LGE, LGE was excluded in 1 patient due to extensive tumor lesions to the cervical esophagus. The operation was canceled, and the patient received neoadjuvant chemo-radio therapy. The remaining 10 LGE surgeries were completed without conversions. Post-operative pulmonary complications occurred in 3 cases, 2 of which were pleural effusions requiring catheter drainage. A preventive tracheotomy was performed on 1 patient due to a history of cerebral infarction. No postoperative anastomotic leakage, postoperative infections,

intraoperative and postoperative pressure ulcers, or catheter slippage occurred. The mean postoperative intensive care unit (ICU) duration was 4.3±2.49 days (range, 2–11 days) and the mean postoperative hospital stay was 7.3±1.48 days (range, 5–11 days). No intraoperative hypothermia, or postoperative deep vein thrombosis occurred. No death occurred within 30 days after surgery.

Discussion

In this study, the preliminary results of LGE indicated the feasibility and safety of this technique. Nurses were able to skillfully cooperate with the surgeon during the operation, and strictly implemented material inventory and isolation techniques. Even with pulmonary co-morbidities, EC patients underwent LGE recovered well under our whole process nursing protocol.

Esophagectomy is technically demanding, and carries a high risk of complications. As such, nursing care is important to achieve enhanced recovery after this traumatic surgery. An LGE without a chest incision is less invasive and less painful than conventional transthoracic surgeries, and no chest drainage tube needs to be placed after surgery, which facilitates early ambulation. In transcervical LGE, enhanced recovery after surgery (ERAS) is indicated to the entire perioperative nursing management, including preoperative psychological care, nutritional care, and respiratory function exercises, to promote the recovery of pulmonary function. The ERAS also helps to reduce the psychological pressure experienced by patients, thus promoting better recovery and shorter length of hospital stay.

The LGE uses a single flexible gastroscope instead of multiple rigid surgical instruments. The procedure avoids artificial pneumomediastinum, which also contributes to the risk of complications. The procedure saves serious consequences of accidental injury by collision of instruments, especially accidental tracheal injury during esophageal mobilization. There is no need to change the position of the patient during the operation, thus eliminating fluctuations of blood pressure and heart rate for position change (11,12). In the transthoracic minimally invasive esophagectomy (MIE), the patient is positioned semi-prone, which may cause stiffness of the right arm joint, brachial plexus nerve injury, and postoperative pain. There is also intraoperative pressure on the patient's eyes and auricles, and there is a risk of poor fixation of the tracheal tube. The surgical position for LGE (French-split leg position) minimizes these risks and improves patient comfort postoperatively.

Early metastases or local recurrence is closely related to surgical procedures (13). Due to the limitation of operation space, the difficulty of removing a tumor and surrounding tissue is increased, and the surface of long instruments such as separating forceps and electrocoagulation hooks are easily stained with tumor cells, which can spread to the surgical incision with the up and down sliding movements of the instruments (14,15). In contrast, the LGE adopts an effective isolation measure of separate placement of the thoracic mediastinal endoscope and abdominal lumpectomy instruments, which minimizes the potential risk of tumor cell implantation at the incisions.

Compared with the transthoracic minimally invasive esophagectomy (MIE), the intraoperative care of LGE is more rigorous, focusing on two independent counts during the operation, and the counts for the 2 different parts should be recorded separately. During the operation, an additional counting step should be introduced after the cervical stage is completed. In this step, the circulating nurse and the scrub nurse jointly count the gauze and instruments in the abdominal incision, the circulating nurse and the endoscopic nurse jointly count the gauze and instruments in the neck incision to ensure that the 2 sets of instruments are not confused and the counting is correct.

Thoracic surgical nurses with 5 years or more experience were selected to form the LGE surgery nursing contingent and to cooperate with professional teams in the training processes of "Pre-practice, Theory and Re-practice". "Pre-practice" is a method that augments the conventional learning method. Before theoretical education, a real-life introduction to mediastinal endoscopy is conducted, including the system components and their roles, and the operation of mediastinal endoscopy machine and hybrid knife. This enables the operating room nurses to understand the endoscopy system intuitively, and lays the foundation for subsequent theoretical education. The day before surgery, the specialist team leader is responsible for preparing the instruments and equipment needed for the operation, and for coordinating the preparation of endoscopic instruments with nurses of the endoscopy center to ensure a smooth procedure. After "Re-practice", the specialist nurses provide specialized education on thoracic surgery in terms of surgical coordination, instrument preparation, and operation points, in preparation for general training.

Unlike conventional endoscopic surgery, 2 senior endoscopic nurses are required to respond to intraoperative emergencies during LGE. In order to adapt to the

procedures in the operating room, intensive training on the concept of asepsis and training on the key points of aseptic technique are conducted before the operation. In addition, there is communication with the endoscopic surgeon to understand the process, steps, and key points of the operation. To ensure a smooth operation, the processes of endoscopic cleaning, disinfection, and sterilization are fully standardized.

Conclusions

The study was limited by the small number of patients without controls, and because all procedures were performed at a single center. Meanwhile, the preoperative preparation and use of the endoscope for this procedure takes time, and the learning curve for nurses is somewhat steep. In the future, more specialized and whole-process nursing management will be carried out for patients undergoing LGE.

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Footnote

Reporting Checklist: The authors have completed the TREND reporting checklist. Available at https://jgo.amegroups.com/article/view/10.21037/jgo-22-669/rc

Data Sharing Statement: Available at https://jgo.amegroups.com/article/view/10.21037/jgo-22-669/dss

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://jgo.amegroups.com/article/view/10.21037/jgo-22-669/coif). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The LGE procedure was approved by the Technical Committee of Zhongshan Hospital, Fudan University (No. ZS-2021-041) and the study was approved by the Ethics Committee board of Zhongshan Hospital, Fudan University (No. B2021-782R). Informed consent was taken from all the patients.

References

1. Shen Y, Zhang Y, He M, et al. Advancing Gastroscope From Intraluminal to Extraluminal Dissection: Primary Experience of Laparo-gastroscopic Esophagectomy. Ann Surg 2022;275:e659-63.
2. Pan ZJ, Su F, Shen YX, et al. Transmediastinal minimally invasive esophagectomy: review of the literatures and technical progress. Chinese Journal of Thoracic Surgery (Electronic Edition), 2020;7:197-202.
3. Orringer MB, Marshall B, Chang AC, et al. Two thousand transhiatal esophagectomies: changing trends, lessons learned. Ann Surg 2007;246:363-72; discussion 372-4.
4. Guinan EM, Forde C, O'Neill L, et al. Effect of preoperative inspiratory muscle training on physical functioning following esophagectomy. Dis Esophagus 2019;32:doy091.
5. Brocki BC, Andreasen JJ, Langer D, et al. Postoperative inspiratory muscle training in addition to breathing exercises and early mobilization improves oxygenation in high-risk patients after lung cancer surgery: a randomized controlled trial. Eur J Cardiothorac Surg 2016;49:1483-91.
6. Shi JJ, Xu L, Wei XD. Surgical cooperation experience of inflatable mediastinoscope combined with laparoscopic radical resection of esophageal carcinoma. World Latest Medicine Information 2018;18:94-102.
7. Jiang YR, Yu Y. TV mediastinal microscopically esophageal surgery perioperative respiratory care. International Journal of Nursing 2018;37:3064-6.
8. Wang W, Yuan HL, Zhang X, et al. Effect of preoperative

comprehensive perioperative nursing intervention on postoperative thoracoscopy combined with esophageal cancer. Journal of Laparoscopic Surgery 2021;26:155-6.
9. Su EC, Su JW, Liang QM, et al. Effect of preoperative comprehensive perioperative nursing intervention on postoperative thoracoscopy combined with esophageal cancer. International Journal of Nursing 2021;40:521-4.
10. Zhang RN, Peng B, Zheng SX. Perioperative nursing care of cervical esophageal carcinoma. Chinese Journal of Practical Nursing 2010; 26:59.
11. Böttger T, Terzic A, Müller M, et al. Minimally invasive transhiatal and transthoracic esophagectomy. Surg Endosc 2007;21:1695-700.
12. Gan X, Wang X, Zhang B, et al. Lymphadenectomy along bilateral recurrent laryngeal nerves under single-incision mediastinoscopy. Ann Thorac Surg 2020;109:e449-52.
13. Zhou ZX. Research progress of surgical instruments carrying tumor exfoliated cells and their treatment methods. Journal of Nursing 2011;18:12-4.
14. Vergote I, Marquette S, Amant F, et al. Port-site metastases after open laparoscopy: a study in 173 patients with advanced ovarian carcinoma. Int J Gynecol Cancer 2005;15:776-9.
15. Yang YM, Xu SP. Causes and prevention of tumor implantation in the incision of laparoscopic cholecystectomy. Chinese Nursing Research 2010;24:228-9.

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