

# Initial Experience and Result of Thoracoscopic and Laparoscopic Esophagectomy

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**Background:** Conventional esophagectomy requires either a laparotomy or a thoracotomy. Currently, the minimally invasive esophagectomy is an evolving alternative to the open technique.

**Objective:** Assess and evaluate the early outcomes of the authors' experiences with the minimally invasive esophagectomy for esophageal cancer.

**Material and Method:** Outcome data were collected prospectively from 28 consecutive patients, 22 men and six women with a mean age of 63 years and a range of 36-77 years.

**Results:** Thoracoscopic esophageal mobilizations were successful in 17 patients. Four patients were converted to open thoracotomy. Laparoscopic gastric mobilizations were successful in eight patients and only one patient was converted to laparotomy. Mortality was one (3.5%), and perioperative morbidity was nine (32%), including pneumonia, pleural effusion, wound infection, anastomotic leakage, and hoarseness.

**Conclusion:** Minimally invasive esophagectomy is feasible and can be performed at the Prince of Songkla University Hospital. Optimal results require appropriate patient selection and surgeon experience.

**Keywords:** Esophageal cancer, Esophagectomy, Minimal invasive surgery

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An esophagectomy is one of the most complex operations, with notable morbidity and mortality. The two most common approaches are the transthoracic and blunt transhiatal esophagectomy. The principle of both surgical techniques is to mobilize the esophagus in the thorax and the stomach in the abdomen before esophageal resection and anastomosis.

Minimally invasive surgical approaches to an esophagectomy have been gaining wider acceptance as an alternative to the traditional open esophagectomy, however, the minimizing approach is difficult and requires advanced laparoscopic and thoracoscopic skills. To assess the efficacy of the minimalist procedure when weighed against the more traditional techniques, the authors prospectively examined the outcomes of an early series of patients who underwent an esophagectomy using a minimally invasive approach at Prince of Songkla University Hospital in southern Thailand,

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which has the highest incidence of esophageal cancer in Thailand<sup>(1)</sup>.

## Material and Method

From June 2005 to May 2007, 28 consecutive patients underwent thoracoscopic and/or laparoscopic esophagectomy by a single surgeon (S Sunpaweravong) and assistants at the surgical department of Prince of Songkla hospital, using a modified version of the minimally invasive operative technique as previously described by Nguyen<sup>(2)</sup>. The present study was pre-approved by the Faculty of Medicine; Prince of Songkla University Ethics Committee Group. Demographic, perioperative, and postoperative outcome data were collected.

## Thoracoscopic esophageal mobilization

The patient is intubated with a double-lumen tube and placed in the left lateral decubitus position, with the surgeon standing on the right and the assistant on the left. Four thoracoscopic ports are introduced

into the right chest. The lung is retracted laterally using a fan retractor. The mediastinal pleura overlying the esophagus is divided to expose the intrathoracic esophagus and the azygos vein is divided using an endoscopic stapler. A Penrose drain is placed around the esophagus to facilitate esophageal retraction. The esophagus is circumferentially mobilized with the periesophageal tissue and paraesophageal lymph nodes from the hiatus up to the thoracic inlet. A 28 F chest tube is inserted through the 10-mm port site.

#### **Laparoscopic gastric mobilization**

The patient is placed in a supine position. The surgeon remains on the right. Five abdominal ports are used and a pneumoperitoneum is established. The greater curvature of the stomach is mobilized by using the ultrasonic coagulating shears with the right gastroepiploic and the right gastric vessels preserved. The left gastric vessels are divided by an endoscopic stapler. Lymph nodes along the celiac axis are dissected with the specimen. The crura of the diaphragm and the phrenoesophageal membrane are dissected to open a hiatus. A gastric tube is constructed with an endoscopic stapler. The authors did not perform pyloroplasty and feeding jejunostomy.

Some patients receive an intrathoracic anastomosis via a right thoracotomy incision (laparoscopic gastric mobilization with thoracotomy) while others get anastomosis at the neck via a left neck incision (laparoscopic transhiatal esophagectomy, thoracoscopic esophageal mobilization with laparotomy, or combination of thoracoscopic and laparoscopic technique). All anastomoses use a conventional hand-sewn technique.

#### **Results**

Twenty-two men and six women were enrolled in the present study with a median age of 63 years (range 36-77). Indications for operation were intrathoracic esophageal cancer in 22 cases (upper 1, mid 10, lower 11) and cervical esophageal-hypopharyngeal cancer in six. Neoadjuvant chemoradiation was used in seven patients. The authors did not use the laparoscopic approach in any patients who had had a previous laparotomy.

Thoracoscopic esophageal mobilizations were successfully completed in 17 patients. Four patients required nonemergent conversions including two for dense pleural adhesions, one with an adherent tumor, and one with failure of ventilation in one lung. Laparoscopic gastric mobilizations were successfully

completed in eight patients and only one patient was converted to laparotomy due to gastric tearing.

Blood loss ranged from 100 to 500 ml (median, 200 ml). One 48-year-old patient did not survive the procedure. This patient had a squamous cell carcinoma in the mid-esophagus with an underlying disease of diabetes, and after receiving neoadjuvant chemoradiation a thoracoscopic esophageal mobilization with laparotomy for gastric mobilization and anastomosis at the neck was done without intraoperative complication. However, he later developed postoperative pneumonia and multisystem organ failure.

Overall, nine patients (32%), including the one who died, had complications. There were six pneumonias (21%), five pleural effusions (18%), two wound infections (7%), two anastomosis leakages (7%), and one hoarseness (3.5%).

#### **Discussion**

Esophagectomy remains an important method of treatment for resectable esophageal cancer although it is technically difficult with relatively high rates of both morbidity and mortality<sup>(3,4)</sup>. The esophagectomy approach remains controversial. The advantage of the transhiatal technique is less trauma to patients who are elderly or suffer from chronic obstructive pulmonary disease<sup>(5-7)</sup>, while the disadvantage of the transhiatal esophagectomy is that it is difficult to stage the disease properly and do an enbloc resection because of the limitations of lymph node dissection<sup>(8,9)</sup>.

Minimally invasive surgery has revolutionized surgical practice, including the esophagectomy. There are many different minimalist approaches, but most involve either thoracoscopy or laparoscopy, or a combination of the two. Asian patients suffer mostly from squamous cell carcinoma of the middle esophagus, which requires thoracoscopic esophageal mobilization as an integral part of minimal invasive esophagectomy. A purely laparoscopic transhiatal approach without a thoracic phase is preferred in Western countries that have higher incidences of gastro-esophageal junction adenocarcinoma.

Compared to the open esophagectomy approach, trials using a minimally invasive esophagectomy approach have shown a shorter hospital stay with comparable major morbidity and mortality rates<sup>(10)</sup>. However, this minimally invasive technique demands considerable skill and experience, and involves a relatively steep learning curve. A limitation of the minimally invasive approach is difficulty in resecting a bulky tumor such as a tumor adherent to an adjacent

organ especially the tracheo-bronchial tree, in which situation the open technique is favored.

Compared to the conventional transhiatal approach, the laparoscopic transhiatal esophagectomy technique enhances visualization, mediastinal node dissection, and avoidance of injury to vital structures<sup>(11,12)</sup>.

Compared to the conventional transthoracic approach, the thoroscopic technique reduces postoperative pain and also results in noticeably better postoperative pulmonary function<sup>(13)</sup>.

Conversion to open surgery was required in approximately 10% of the patients in earlier series including the present study. The reasons for the required conversion included lung adhesion, injury to an adjacent organ, bleeding, encountering an advanced tumor, loss of one lung ventilation, and equipment failure<sup>(14)</sup>.

In the present study, the authors had one mortality (3.5%), a rate consistent with recent series examining the minimally invasive and conventional esophagectomy approaches in high volume centers (1.4-5.5%)<sup>(15-20)</sup>.

In conclusion, the authors have added to the literature demonstrating that thoroscopic and laparoscopic esophagectomies are feasible and can be performed with morbidity and mortality comparable to, and even better than, the traditional approach. Further randomized studies are recommended to examine the cost-benefit features of the minimally invasive esophagectomy compared with the traditional approaches.

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## ประสบการณ์เบื้องต้น และผลการผ่าตัดมะเร็งหลอดอาหารด้วยวิธีส่องกล้องช่องอกและช่องท้อง

สมเกียรติ สรรพวิรวงศ์, สิริพงษ์ ชีวชนาภรณ์กุล, ศักดิ์ชาย เรืองสิน

**ภูมิหลัง:** การผ่าตัดมะเร็งหลอดอาหาร ได้มีการพัฒนาจากการผ่าตัดเปิดช่องท้อง หรือเปิดช่องอกมาเป็นการผ่าตัดโดยใช้กล้องส่องช่องท้อง หรือ ช่องอกแทน

**วัตถุประสงค์:** การศึกษานี้เพื่อดูผลการผ่าตัดผู้ป่วยมะเร็งหลอดอาหารโดยวิธีส่องกล้อง

**วัสดุและวิธีการ:** ข้อมูลการผ่าตัดในผู้ป่วย 28 ราย เป็นเพศชาย 22 ราย เพศหญิง 6 ราย อายุเฉลี่ย 63 ปี (พิสัย 36-77 ปี)

**ผลการศึกษา:** การผ่าตัดเลาะหลอดอาหาร โดยวิธีส่องกล้องผ่านช่องอก สามารถทำผ่าตัดสำเร็จ 17 ราย และมีผู้ป่วย 4 ราย ต้องเปลี่ยนวิธีผ่าตัดเป็นเปิดแผลช่องอก สำหรับการผ่าตัดโดยวิธีส่องกล้องผ่านช่องท้อง สามารถผ่าตัดสำเร็จ 8 ราย และมี 1 ราย ต้องเปลี่ยนเป็นวิธีผ่าตัดเปิดแผลช่องท้อง มีผู้ป่วยเสียชีวิตหนึ่งราย และพบภาวะแทรกซ้อนจากการผ่าตัด 9 ราย โดยเกิดภาวะปอดอักเสบติดเชื้อ มีน้ำในช่องอก มีแผลผ่าตัดติดเชื้อ รอยต่อรั่ว และเสียงแหบ

**สรุป:** การผ่าตัดมะเร็งหลอดอาหารด้วยวิธีส่องกล้องสามารถทำได้ โดยมีภาวะแทรกซ้อนไม่มากกว่าวิธีการผ่าตัดแบบแผลเปิดเดิมที่เคยมีการรายงาน ผลการผ่าตัดที่ดีขึ้นกับการพิจารณาเลือกผู้ป่วยที่จะมาผ่าตัด และประสบการณ์ของศัลยแพทย์

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