INTRODUCTION

With the continuous development of minimal invasive surgical techniques, video-assisted thoracoscopic operation has been successfully applied in esophageal cancer radical resection. Thoracoscopic esophageal operation with the virtue of small wound, slight pain, small effect on lung function, safe and reliable has overcome the shortcomings of the traditional operation that has more trauma, long postoperative recovery time and more complications. It conforms to the trend of minimally invasive surgical operation and accord with the development requirements of esophageal surgery. It is an ideal operation method in the treatment of esophageal carcinoma. But the specific operation still remains to be perfected further. Selection of surgical incision, methods of esophagus-stomach anastomosis, dissection of the lymph nodes, and so on are subject to further refinement.

The objective of this study was to determine the feasibility of esophagogastric anastomosis in esophageal cancer radical resection under thoracoscopic combined with laparoscopy in terms of complications and operation time.

METHODOLOGY

An analysis of clinical data of 136 cases undergoing thoracoabdominal combined endoscopic radical resection of esophageal cancer from June 2008 to June 2012 was finished. All the patients were finally diagnosed by gastroscopic biopsy before operation, and the informed consents were signed conventionally.

Operation was performed under general anesthesia with double-lumen endobronchial tube. The patient was placed into the left prone forward position, the first incision was done about 1 cm long in 7 or 8 intercostal on the midaxillary line of the right chest and placed thoracoscopic to explorate, then 3 incisions of about 1.5 cm were made customarily, one was in the 8th intercostal space and another in the 5th intercostal space near the posterior axillary of the right thoracic, the last was in the third intercostal space on the anterior axillary line.

The esophagus was dissected with endoscopic instruments. When the tumor is located in the middle or upper esophagus, esophageal to thoracic entrance was isolated. The lower esophagus cancer patients were
dissected to the 5 cm above the upper end of the tumor. Esophagus was freed to the esophageal hiatus. After pectoral lymphadenectomy, the patients were placed supine and stomach was freed under laparoscope. Five trocars were punctured as the operating holes. The first trocar (10 mm) was 1 cm distance umbilical superior margin, then aeroperitoneum was created and abdominoscope was inserted. The pressure was maintained at 12 - 15 mmHg. The second trocar (7 mm) was under the costal margin 3 - 4 cm on the right midclavicular line, the third trocar (10 mm) was under the costal margin 3 - 4 cm on right anterior axillary line, the fourth trocar (7 mm) was under the costal margin 3 - 4 cm on left anterior axillary line and the fifth trocar (10 mm) was under the xiphoid 2 cm. Stomach was dissociated with celioscope, the arteria gastrica dextra of superior and middle segment esophageal carcinoma patients were closed from the No. 3 ramus to the proximal end of arcus minor ventriculi. Part of the lesser curvature of the stomach was removed and the cardiac closure edge was embedded with seromuscular layer. The stomach of superior and middle segment esophageal carcinoma patients was to make tubular stomach that was about 20 cm long and the diameter 5 cm. The tubular stomach was dragged to the neck through the esophagus bed and was anastomosed with esophageal by hand. The inferior segment esophageal carcinoma cases took the left anterior oblique. The esophageal hiatus aperture was enlarged to about 4 cm and the stomach was dragged to the cavitas thoracis through the esophagus bed, then the xiphoid operation hole diameter was expanded to about 3 cm and circular stapler was placed through the esophageal hiatus into the right thoracic cavity. The esophagogastric anastomosis was finished with thoracoscope in the right thoracic cavity. All patients had a stomach tube, a duodenal feeding tube and a chest tube placed.

All data was analyzed with the Statistical Package for Social Sciences (SPSS) version 17 statistical software package, the incidence of anastomotic fistula was tested by Fisher’s exact test. The rest of the results were tested by the independent sample t-test; p < 0.05 was thought to be statistically significant. The data is shown in Table I.

### RESULTS

There were 86 (63.3%) males and 50 females (36.76%) patients. Median age was 64.6 years (39 - 81 years). The mean tumor length was 4.6 cm. There were 18 patients with superior segment esophageal carcinoma, 63 patients with middle segment esophageal carcinoma and 55 patients with inferior segment esophageal carcinoma.

The operation time of patients whose anastomotic stoma was in the cervical part averaged 4.5 hours. Average operation bleeding volume was 110 ml. The number of cleaned lymph node was 18.6 (average), the thoracic lymph nodes were 9.3 among the total. The average hospitalization days were 12.7 days. There were 4 anastomotic fistula cases and no death.

The operation time of patients whose anastomotic stoma was intrathoracic averaged 3.1 hours. Operation bleeding volume was 86 ml on an average. The number of cleaned lymph node was 18.3 averagely, the thoracic lymph nodes were 9.2 among the total. The average hospitalization days were 12.4 days. There were no anastomotic fistula and no death.

The operation time and the intraoperative blood loss of the patients with intrathoracic mechanical anastomosis were significantly lower than that of cervical anastomosis. The anastomotic fistula frequency, postoperative recovery time, and lymph node dissection rate had no statistically by significant difference.

### DISCUSSION

Esophagogastric cancer radical resection under thoracoscopy combined with laparoscopy is less traumatic with fewer respiratory complications, quick recovery and many other advantages but the main method of esophagogastric anastomosis is cervical anastomosis.7-9 The tension of the anastomotic stoma is larger because of the high anastomotic location, longer time of operation, the operation space is small, the anastomosis and the surrounding tissue is polluted during the process of anastomosis and the cervical anastomosis lack pleural tissue coverage.10-14 All these can lead to the stoma ischemia and necrosis; the incidence of anastomotic leakage is relatively high.

The stomach tube production is controversial too, the gastric lesser curvature has a longer cutting edge because of the tubular gastrectomy and the distal blood supply will have an impact. The incidence of gastric volvulus is increased because the gastric tube becomes slender. On the other hand, the cost of operation is greatly increased when gastric tube is made with more closure or linear cutter. The excised part of the normal

---

**Table I**: Comparison of different anastomosis outcome.

<table>
<thead>
<tr>
<th>Item</th>
<th>Cervical anastomosis (81 cases)</th>
<th>Intrathoracic anastomosis (55 cases)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average operation time</td>
<td>4.5 ± 0.26 hour</td>
<td>3.1 ± 0.18 hour</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Operation bleeding volume</td>
<td>110 ± 29.76 ml</td>
<td>86 ± 10.29 ml</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Thoracic lymph node groups</td>
<td>9.3 ± 2.07 group</td>
<td>9.1 ± 1.72 group</td>
<td>0.522</td>
</tr>
<tr>
<td>Average hospitalization days</td>
<td>12.7 ± 3.93 day</td>
<td>12.4 ± 1.06 day</td>
<td>0.582</td>
</tr>
<tr>
<td>Anastomotic fistula</td>
<td>4 case</td>
<td>0 case</td>
<td>0.147</td>
</tr>
</tbody>
</table>
stomach tissue has important physiological functions such as the secretion of gastric acid, pepsin, gastrin and so on. The effect of minimally invasive approach about gastric tube was contentious.15-18

For a long-time, esophageal anastomotic leakage has been considered a common and serious complication. The application of stapler in the esophageal cancer radical resection under thoracoscopy combined with laparoscopy is still in the exploration stage. The gastroesophageal mechanical anastomosis is an effective and reasonable way.19-21 The authors tried to finish the gastroesophageal anastomosis through the chest small incision with stapler, but this method was given up because the anastomotic angle was poor and the operation was difficult. At last, after several attempts, authors identified to expand the diameter of xiphoid operation hole to about 3 cm and placed circular stapler through the esophageal hiatus into the right thoracic cavity and the esophagogastric anastomosis was finished with thoroscope in the right thoracic cavity. By this means, the operation time and the intraoperative blood loss of the patients with intrathoracic mechanical anastomosis was significantly lower than that of cervical anastomosis. The operation cost was greatly reduced because there was no need to make gastric tube. The anastomotic fistula incidence of the patients with intrathoracic mechanical anastomosis was significantly lower than that of the patients with cervical anastomosis but had no statistically significant difference. It may be due to the number of the samples being less. The authors intend to expand the number of samples for further analysis and hope to provide new and more efficient ideas for esophageal cancer surgery.

CONCLUSION

Esophagogastric anastomosis finished with stapler in right thoracic cavity though superior belly incision and diaphragmatic hiatus was found to be more effective because the operation time and the intraoperative blood loss of the patients was significantly lower than that of cervical anastomosis.

REFERENCES