Endoscopic Therapy for Oesophageal Cancer

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Key Words

Endoscopic therapy · Oesophageal cancer · Video-assisted thoracoscopic oesophagectomy · VAT oesophagectomy, surgical approach

Abstract

Transthoracic surgery for oesophageal cancer is associated with a high incidence of respiratory complications. Recent development of minimally invasive oesophagectomy by the use of video-assisted thoracoscopic approach may have a potential to minimize morbidity and mortality. While results from earlier series were equivocal, recent reports have shown an encouraging trend. This article serves to review the recent literature evidence in relation to the surgical approach, safety, efficacy and potential problems of such a highly complex minimally invasive operation.

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Introduction

Oesophageal carcinoma is among the ten most common malignancies in the world. It remains a challenging disease that often has a poor outcome. The overall 5-year survival seldom exceeds 20% despite aggressive therapy. Surgery remains the only possibility of offering cure to

diseases of early and intermediate stages. However, conventional oesophagectomy via open thoracotomy is associated with significant perioperative morbidity and mortality rates, especially pulmonary complications.

Videoscopic assisted thoracoscopic (VAT) oesophagectomy was first described by Cuschieri et al. [1] in 1992. Since then, there have only been a few reports regarding this operation in the 1990s [2–5]. As the results were conflicting from these early series, open surgery remained the mainstay of treatment for oesophageal cancer in many centres. With the advent and incorporation of latest technology, more energy platforms are now available for safer thoracoscopic operation. The use of ultrasonic coagulating devices, especially the 5-mm sears, has made dissection of the mediastinal structures much easier and faster than before. The latest advance of bipolar diathermy as in the vessel sealing system also contributes significantly to the success of more complex operations [6]. This article serves to review the current literature evidence related to endoscopic therapy of oesophageal cancer.

Surgical Approach

Most surgeons prefer a left decubitus position for VAT oesophagectomy. Osugi et al. [7] reported their technique of inserting four 11.5-mm trocars (3rd and 7th ICS on the

midaxillary line, 5th and 7th ICS on the posterior axillary line) for retraction and dissection, and creating a 5-cm minithoracotomy in the 5th ICS at the midaxillary line for the camera. After complete mobilization of the thoracic oesophagus and the tumour, the patient was then repositioned to a supine position for midline laparotomy and gastric mobilization. A 4- to 5-cm long cervical incision was made over the left neck for lymph node dissection and oesophagogastric anastomosis. In the latest series released by Osugi's group [8], this approach required a mean procedure time (thoracic only) of 227 ± 80 min, which was not significantly longer than that of their conventional open thoracotomy (186 ± 35 min). Apparently this is the most common approach adopted by surgeons in Japan.

On the other hand, in a series of 222 patients reported by Luketich et al. [9], only four trocars were inserted. The 10-mm camera port was first introduced through the 7th or 8th ICS just anterior to the midaxillary line. A 5-mm port was inserted at the 8th or 9th ICS just posterior to the axillary line for ultrasonic coagulating sears. Another 10-mm trocar was placed in the anterior axillary line at the 4th ICS for a fan-shaped retractor to retract the lung anteriorly, and the last 5-mm port was inserted posterior to the scapula tip for retraction and countertraction during dissection. Conversion to thoracotomy was required in 12 patients (5.4%). In addition, gastric mobilization was accomplished by laparoscopic means except in 4 patients (1.8%). The overall 30-day mortality was 1.4% ($n = 3$). However, the operating time was not mentioned in this series and comparison with that of the Japanese reports was impossible. In another smaller series of 46 patients reported by Nguyen et al. [10], the mean operating time of such a combined thoracoscopic and laparoscopic oesophagectomy (include 5 cases of benign diseases) was 350 ± 75 min, with a mean thoracoscopic procedure time of only 116 ± 53 min. Thoracoscopic mobilization was unsuccessful in 1 patient due to dense adhesion (2.2%). It is uncertain why the thoracoscopic procedure time is so much shorter than that of the Japanese series, but a difference in the obsession on lymphatic dissection could be an important reason.

Not all surgeons like to start with the thoracoscopic dissection. Kawahara et al. [4] described a rather different sequence for VAT oesophagectomy. In their report the patient was initially placed in a supine position. Gastric mobilization was performed via a median laparotomy, and the oesophagus was transected at the oesophagogastric junction. Following that, a left cervical incision was made to allow neck node dissection and transection

of the cervical oesophagus. The gastric tube created was then pulled up through a retrosternal tunnel for oesophagogastric anastomosis in the neck, which was accomplished before turning the patient to the left decubitus position for the final stage of VAT oesophagectomy. Six trocars were used in the thoracic part, two along the anterior axillary line in the 4th and 6th ICS, two along the midaxillary line in the 5th and 7th ICS, and two along the posterior aspect of the tip of scapula in the 6th and 8th ICS. The videoscope was inserted through the middle lower port. The mean thoracoscopic procedure time of Kawahara's series [4] of 23 patients was 111 min, which was quite comparable with that of Nguyen's series [10]. However, the total operating time was not described.

Inadvertently prolonged and forceful lung retraction has been criticized as a major cause of postoperative pulmonary complications. To avoid this problem some authorities advocate the use of prone positioning during thoracoscopic mobilization of the oesophagus. With the collapsed right lung which spontaneously flopped down by gravity, the oesophagus is exposed for dissection without the need of much lung retraction. In a series reported by Smithers et al. [11], 142 out of 162 patients had oesophageal mobilization successfully performed with such a position. The mean thoracic time was 104 min with an average blood loss of only 165 ml. Thirty-day mortality was 3.3% and in-hospital mortality was 5.3%. The results appear to be superior to that of the lateral approach. However, the true efficacy in minimizing chest complication is difficult to be ascertained by just one single series.

Operative Outcomes

Minimally invasive oesophagectomy cannot have a ground if the operative outcomes are not scientifically compared with that of conventional open method. The series by Orringer et al. [12] of 1,085 patients with open oesophagectomy is one of the largest reported and has been used as a standard for comparison. In their series, the overall anastomotic leak rate was 13% and the perioperative mortality was 4%. In another recent series of 1,777 patients reported by Bailey et al. [13], the perioperative mortality was 10% and the incidence of morbidities was close to 50%. It appears that earlier series of VAT oesophagectomy, especially those before the turn of the 20th century, did not do better than this standard series of open surgery. To the contrary, the VAT approach was often associated with longer operating time and more major complications.

However, more recent series of VAT oesophagectomy with a larger number of cases revealed a remarkable change in the perioperative outcomes. The 30-day mortality rates after minimally invasive oesophagectomy range from 0 to 4.3% only [8–11]. The major complication rate was as low as 17.4% and the highest reported was only 32%. These figures compared favourably with that of the conventional open oesophagectomy.

What interested the investigators most indeed should be the changes in lung function after minimally invasive oesophagectomy. Thus far, only one study has addressed this issue. Taguchi et al. [14] reported the pre- and postoperative lung function changes in 22 patients undergoing thoracoscopic oesophagectomy and compared them with those of 29 patients who had open surgery. In the thoracotomy group, the pre- to postoperative vital capacity was $74.3 \pm 10.6\%$ which was significantly lower than that of the VAT group ($84.9 \pm 10.4\%$, $p = 0.021$). While maximum oxygen uptake was similar between the two groups, dyspnoea was the most common cause for limiting exercise tolerance after thoracotomy. Changes in pre- to postoperative performance status were also significantly more after thoracotomy than thoracoscopic oesophagectomy. The authors concluded that VAT oesophagectomy for oesophageal cancer could preserve pulmonary function and quality of life better when compared to open surgery.

Nevertheless, the necessity of chest physiotherapy after thoracoscopic oesophagectomy was stressed by Nakatsuchi et al. [15] in a recently published randomized trial. In this study, 36 patients were randomly allocated to thoracotomy or thoracoscopic oesophagectomy. Both groups showed a marked reduction in pulmonary function in the early postoperative period and responded to chest physiotherapy in a similar manner. However, 2 weeks after surgery, recovery of some respiratory parameters was significantly better in the VAT group than those with open oesophagectomy. It appears that VAT oesophagectomy may not prevent early postoperative reduction of pulmonary function but allow a faster and more complete recovery of the pulmonary reserve some time after the operation.

It cannot be overemphasized that comparison between minimally invasive oesophagectomy with historical controls can be unfair as there may be bias in patient selection for the new procedure as well as publication bias towards studies with good results. A better way to answer this question is of course by conducting a truly prospective randomized trial, which is currently not available in the literature.

Issue on Learning Curve

Experiences on VAT oesophagectomy were conflicting in earlier series. These studies were often small in sample size and limited for assessing the feasibility and practicability of the operation. Statistical power was generally too low for meaningful comparison between VAT oesophagectomy and the open method. Another major reason for the inconsistent result is the steep learning curve innate with such a complex operation which many of the earlier series had probably yet to go beyond. Dexter et al. [16] reported their experience of VAT oesophagectomy on 24 patients with oesophageal cancer in 1996. The mean thoracoscopic procedure time was 180 min, but postoperative death occurred in 3 patients and 10 further patients developed other major complications. In another series of 29 patients reported by a French group, only 24 had oesophageal dissection achieved by thoracoscopic means [17]. Postoperative respiratory complications happened in 5 patients and anastomotic leak in 5 others. Adding 3 more patients with recurrent laryngeal nerve palsy, the overall major morbidity rate exceeded 50%. Similarly unfavourable results were also reported by several series [18–20]. The safety and efficacy of VAT oesophagectomy for oesophageal cancer had raised considerable concern which rendered further development of this operation slow and haphazard.

Osugi et al. [21] addressed the issue of learning curve in a comparative study. Eighty patients operated with VAT-assisted oesophagectomy in two time slots (34 vs. 46) were compared. The duration of thoracoscopic procedure, blood loss and incidence of postoperative respiratory complications were significantly less in the later group when compared to the earlier group, suggesting that surgeons' experience might make a difference in the early postoperative outcomes after VAT oesophagectomy. Further analysis of the data with multivariate logistic regression demonstrated that surgical experience was the only significant predictive factor for lower risk of pulmonary infection.

Survival Benefit

Data regarding effect of VAT oesophagectomy on the long-term survival of patients with oesophageal carcinoma are scarce in the literature. Most of the reported series had a rather limited period of follow-up. In Luketich's series [9] of 222 patients, the mean follow-up was only 19 months (range 1–68). The Kaplan-Meier survival curve

revealed a cumulative survival of nearly 70% by 40 months for stage I disease, but only around 20% for cancer of more advanced stages. In the series by Osugi et al. [8] comparing VAT oesophagectomy (n = 77) with open surgery (n = 72), the 5-year survival rates were 55 and 57%, respectively, and there was no significant difference between the two groups. From these preliminary results, one may believe that the survival rate after VAT oesophagectomy is reasonably comparable with that of conventional open surgery. Nevertheless, more data should be collected to verify this observation, and ideally a prospective randomized trial should be conducted to provide a better answer for this question.

Conclusions

It appears that VAT oesophagectomy has evolved over the last decade and is becoming mature in terms of technique and experience. Better postoperative outcomes are being observed. Nevertheless, the learning curve is steep and probably this kind of minimally invasive but complex operation should be confined to centres with a high volume load in order to have the most optimal results. More studies, especially in the format of randomized trial with objective assessment of outcomes, are needed to clarify the true role of VAT oesophagectomy in the treatment of oesophageal cancer.

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