

Thoracoscopic Surgery for Esophageal Cancer

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Esophagectomy is the appropriate treatment for patients with resectable esophageal cancer. In common with conventional surgeries, controversy exists about what is the best approach and extent of the dissection. For many years, the procedure of choice for the incision has been the Ivor Lewis procedure, later modified. The tumor is resected through a right thoracotomy combined with a laparotomy with cervical esophagogastric anastomosis.^{1,2} The advantage of this operation is that the perfect exposure allows complete esophageal dissection and possible en bloc lymphadenectomy.^{3,4} Although the benefit of an extended lymphadenectomy for thoracic esophageal cancer remains to be proven by a prospective randomized study, there is evidence that survival is better after extended rather than conventional lymphadenectomy.^{5,6} The disadvantages are pulmonary complications related to the necessary thoracotomy and collapse of the right lung. As esophagectomy is invasive, major complications including anastomotic leakage, recurrent laryngeal nerve injury and myocardial infarction are frequent. Regardless of the approach, esophagectomy with lymphadenectomy is associated with considerable morbidity and mortality.⁷

Pulmonary complications can be overcome by a transhiatal approach, as described by Orringer et al., in which the esophagus is dissected free through the enlarged hiatus. After an esophageal-proximal gastric resection, the gastric tube created is anastomosed with the cervical esophagus through a combined cervical-abdominal approach, thus avoiding a thoracotomy.⁸ DePaula et al. were the first group to report on a large series of patients undergoing laparoscopic transhiatal esophagectomy.⁹ However, the disadvantages of the transhiatal approach are the partly blind dissection of the esophagus and the tumor. It is also limited to tumors of the distal esophagus.

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One strategy to reduce surgical invasiveness is to perform radical esophagectomy via thoracoscopy rather than as an open procedure. In 1992, Cuschieri et al. described their initial experience with a small series of patients with esophageal cancer. Resection of the esophagus and the mediastinal lymphadenectomy were performed through a right thoracoscopic approach.¹⁰ Since the first report by Cuschieri et al., results for thoracoscopic esophagectomy have been reported by a number of centers.¹⁰ The feasibility of the technique is well documented; however, the initial results of the thoracoscopic approach did not show a real benefit over the open approach, especially owing to a high number of pulmonary complications.¹¹⁻¹⁷

Despite reports of there being no real advantages, a new impetus was given to the thoracoscopic approach for esophageal resection by Japanese centers, and from Luketich et al. from Pittsburgh.¹⁸ One reason for the disadvantages is that previous studies might have only contained a small number of patients and lacked appropriate statistical power.

Akaishi et al. performed en bloc total esophagectomy with radical lymphadenectomy by right thoracoscopy in 39 patients with esophageal cancer. The rest of the operations were carried out by conventional means. Operating time was 200 ± 41 min, blood loss was 270 ± 157 ml, and 19.7 ± 11 lymph nodes were harvested. No deaths occurred, and 22 of the 39 patients showed only a slight decrease in their vital capacity and did not require postoperative respiratory support. An important finding was that the decline in pulmonary function was significantly less than in an open technique.¹⁹ Similar results were achieved by Kawahara et al. in their series of 23 patients.²⁰ Osugi et al. described their experience with a three-field lymphadenectomy. They compared 77 patients with a squamous cell cancer approached by a minithoracotomy, and 72 patients approached conventionally in a 3-stage procedure. Retrieved lymph nodes (33 vs 32 nodes), longer thoracic operation time (227 vs 186 min), less vital capacity reduction (15% vs 22%, $p=0.016$), and a simi-

lar 3- and 5-year survival rate (70% and 55% vs 60% and 57% for the open procedure, respectively) were remarkable. Their conclusion was that thoroscopic resection provided comparable results to open radical esophagectomy with less surgical trauma.²¹⁾ The same Japanese group showed the importance of the learning curve in reducing operating time and obtaining better outcomes with this approach. They compared the outcomes of the first 34 patients operated on with the last 46 patients. The latter group showed significant reductions in blood loss, thoroscopic time, incidence of postoperative respiratory complications, and an increase in the number of retrieved lymph nodes.²²⁾ The estimated risk for thoroscopic resection appeared to be less after the first 20 cases. These results were confirmed by Taguchi et al. and by Smithers et al. in Australia.^{23,24)} Luketich et al. described their recent experience with 222 patients, most of whom underwent an esophageal resection with thoracoscopy and laparoscopy performed. The most important contribution was that the median intensive care unit (ICU) stay was one day and total hospital stay was just 7 days with an operative mortality of 1.4%.¹⁸⁾ Quality of life scores were similar to preoperative values and population norms. The results from Nguyen et al.²⁵⁾ with 46 consecutive patients were concordant with those obtained by Luketich et al.¹⁸⁾ Furthermore, some recent reports have indicated the advantage of the thoroscopic procedure with robotic assistance, but the full role of the promising robotic assisted esophageal resection remains to be better defined.^{26, 27)}

A radical esophagectomy can be performed thoracoscopically with beneficial outcomes by experienced surgeons. As efficacy improves with the surgeons experience, satisfactory outcomes will be obtained only in centers performing a sufficient number of esophageal surgeries. These centers are teaching various different surgical techniques to surgeons in their programs, and some randomized protocols are being designed to compare, not only the short- but also the long-term oncologic outcome results of minimally invasive approaches with those of conventional techniques.^{28,29)}

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