Review Article

Mckeown esophagogastrectomy

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Abstract: Esophageal cancer is increasing in incidence faster than other cancers in the US. Outcomes after esophagectomy may be related to many factors, including the age of the patient, the stage of the tumor, the operative approach, and the incidence of postoperative morbidity. Pulmonary complications are the major source of morbidity and mortality following esophageal resection, and numerous studies have identified various factors associated with these complications. Various operative approaches have been applied to the management of esophageal cancer, with the goal of optimal oncologic results with the lowest possible morbidity and mortality. The McKeown esophagogastrectomy is applicable for most patients with esophageal cancer, and the technique and results are reviewed.

Keywords: Esophageal cancer; esophagogastrectomy; outcomes; minimally invasive surgery

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Introduction

The incidence of esophageal cancer is increasing faster the other cancers in the US (1). Esophageal resection remains the treatment standard for resectable esophageal cancer and for some benign esophageal conditions (2). However, despite surgical and anesthetic advances over the years, morbidity and mortality rates of ER have been consistently higher than those associated with other commonly performed general and thoracic surgical procedures (3). Despite improvements in perioperative care, surgical techniques, and anesthetic techniques, ER remains a formidable operation.

Many analyses have been performed to identify the most important risk factors for complications after ER (4-12). Based upon these data, it is clear that the most important cause of significant morbidity and mortality after ER is the development of pulmonary complications (10-18). Several factors have been associated with pulmonary complications after esophagectomy, including issues related to the preoperative status (age, nutritional status, induction therapy, baseline pulmonary function, ethanol use, smoking history, poor performance status), intra-operative details (stage/location of tumor, surgical approach, estimated blood loss, length of surgical procedure, entry into two separate body cavities; disruption of bronchial innervation and lymphatic circulation), and postoperative details (pulmonary toilet, vocal cord paralysis or recurrent laryngeal nerve palsy, postoperative respiratory muscle dysfunction) (4-12). The purpose of this review is to describe the McKeown esophagectomy and its role in the management of esophageal cancer.

McKeown esophagogastrectomy

The most common surgical approaches to accomplish resection of esophageal cancer include transhiatal, Ivor Lewis, and McKeown (3 incision) esophagogastrectomy (1). While the issue of 2-field *vs.* 3-field lymph node dissection is important, it will not be addressed in this review (1,19). The Ivor Lewis approach is defined by the following sequence: abdominal exploration, stomach mobilization; lymph node dissection; feeding jejunostomy (laparoscopic or open); thoracic esophageal mobilization; lymph node dissection; anastomosis (thoracoscopic or open). Potential advantages of the Ivor Lewis approach includes lower stricture, leak, and aspiration rates (1). McKeown esophagectomy is defined by: thoracic esophageal mobilization; lymph node

dissection; ligate thoracic duct (thoracoscopic or open); abdominal exploration (laparoscopic or open); stomach mobilization; lymph node dissection; feeding jejunostomy; left cervical incision for anastomosis (1). Potential advantages of the McKeown approach compared to the Ivor Lewis include less chance of local recurrence, anastomosis in neck easier to manage if leak occurs, and less need to expand the thoracic incision since the anastomosis is in the neck instead of the chest.

Choosing the operative approach

One of the important principles of surgery is that the Siewert tumor type should be assessed in all patients with adenocarcinomas involving the gastroesophageal junction prior to surgical resection in order to choose the correct approach (1,20). The Siewert tumor types are summarized as: Siewert type I: adenocarcinoma of the lower esophagus (often associated with Barrett's esophagus) with the center located within 1 cm above and 5 cm above the anatomic gastroesophageal junction; Siewert type II: true carcinoma of the cardia at the gastroesophageal junction, with the tumor center within 1 cm above and 2 cm below the gastroesophageal junction; Siewert type III: subcardial carcinoma with the tumor center between 2 and 5 cm below gastroesophageal junction, which infiltrates the gastroesophageal junction and lower esophagus from below.

McKeown esophagectomy is appropriate for all patients with Siewert type I and II patients, as well as all patients with tumor above the gastroesophageal junction, up to the level of the clavicle. Ivor Lewis esophagectomy is also appropriate for Siewert I and II tumors, and perhaps some Siewert III tumors, although many of these patients are treated with sub-total gastrectomy as a gastric as opposed to esophageal cancer (1). Most importantly, Ivor Lewis should not be applied to tumors at or above the level of carina due to the risk of a positive esophageal surgical margin.

Minimally invasive approaches

Minimally invasive esophagectomy (MIE) strategies have been proposed to decrease morbidity and improve quality of life after esophagectomy (21-24). MIE approaches include the use of thoracoscopy with or without laparoscopy for Ivor Lewis or McKeown resections, as it is likely that omission of thoracotomy is more important than the omission of open abdominal incision. In a study of MIE in 222 patients, mortality rate was 1.4% and hospital stag was only seven days (22). However, larger multi-institutional analyses have not been successful in demonstrating major advantages for the MIE approach. In one study, retrospective comparison of 446 patients was performed, including 114 open, 309 thoracoscopic assisted, and 23 totally MIE. The median hospital stay was not statistically different (14 *vs.* 13 *vs.* 11 d, respectively). In addition, there was no difference in lymph node retrieval or survival. The authors conclude that MIE appears to be safe with equivalent survival, but with no advantages identified (23). Another large study analyzed esophagectomies performed in the UK from 2005-2010. There were 7,502 esophagectomies, including 15.4% MIE. Of note, the percentage of esophagectomies performed minimally invasively increased over time, and between 2009 and 2010, 24.7% of resections were MIE. There was no difference between open and MIE approaches (4.3% *vs.* 4.0%, respectively; P=0.61). Furthermore, there was no difference in postoperative complication rate (38% *vs.* 39%; P=0.46) in open and MIE groups, respectively. A higher reintervention rate was associated with the MIE group than with the open group (21% *vs.* 17.6%, P=0.006; odds ratio, 1.17; 95% confidence interval, 1.00-1.38; P=0.040) (24).

Conclusions

The multidisciplinary evaluation of patients with esophageal cancer is essential. Induction therapy esophagogastrectomy is the best option for most patients with T2N0 disease or greater (1). Centers and surgeons with more extensive experience have the best outcomes (3). The choice of operative approach should be based on tumor location and surgeon experience, and the McKeown approach is likely the most versatile, with numerous advantages over other approaches. Minimally invasive strategies are proliferating, although the advantages of MIE have not yet been demonstrated to the degree that advantages for other minimally invasive procedures, such as thoracoscopic lobectomy. Nevertheless, as more experience and data is gathered for MIE, approaches that avoid thoracotomy are preferable.

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