Hiatal Hernia After Esophagectomy: Analysis of 2,182 Esophagectomies From a Single Institution

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Background. **Esophageal resection is a complex operation often associated with morbidity. Hiatal hernia after esophagectomy is an unusual complication. We reviewed our experience with this complication.**

Methods. **From February 1988 through February 2009 we performed 2,182 esophagectomies. Fifteen (0.69%) patients experienced a hiatal hernia. We reviewed our prospective database for demographics, presentation, operative approaches, and outcomes.**

Results. **There were 14 men and 1 woman with a mean age of 59 years. Hernia developed after Ivor Lewis approach in 9, transhiatal in 5, and substernal colon interposition in 1. Presenting symptoms included pain in 7 patients, obstructive symptoms in 5, high chest tube output in 2, shortness of breath in 2, diarrhea in 1, and cough with dysphagia in 1. Two patients were asymptomatic. Radiographic studies revealed bowel in the left chest in 11 patients, right chest in 2, bilaterally in 1, and posterior mediastinum in 1. Hernia repair was through the abdomen in 14 patients and left chest in 1. All had reduction of the herniated contents and closure of the defect; 2 required mesh. There was no early mortality. Complications included wound infection, deep venous thrombosis, chylothorax, urinary retention, sacral decubiti, atrial arrhythmias, respiratory failure, and empyema. Mean follow-up was 34 months. Ten patients are still alive. There have been two hernia recurrences.**

Conclusions. **Hiatal hernia after esophagectomy is rare. Repair can be accomplished with low mortality; however, there is substantial morbidity. Because of the increased risk of incarceration or strangulation, these herniae should be repaired. Long-term outcome is usually excellent.**

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Esophagectomy is a complex operation with the potential for substantial morbidity. When resecting the esophagus, the diaphragmatic hiatus often requires widening to allow the conduit to pass freely into the chest and prevent conduit obstruction. However, enlargement of the hiatus increases the risk of a hernia developing and allowing abdominal contents to pass into the chest. We reviewed our experience with esophagectomy to estimate the incidence of this rare type of hernia, and to describe the presentation and management of this problem.

Patients and Methods

From February 1988 through February 2009 we performed 2,182 esophageal resections at Mayo Clinic in Rochester, Minnesota. A retrospective review of these patients was performed of our prospectively maintained general thoracic surgery database. There were 15 (0.69%) patients who required reoperation at our institution to repair herniation of abdominal contents through the diaphragmatic hiatus after esophagectomy. Medical records were reviewed for demographics, presentations, operative procedures (approaches for primary resection and herniorrhaphy), and outcomes. Morbidity was defined as any postoperative complication occurring within 30 days of the index procedure or during that hospitalization. Mortality was defined as death within 30 days of the index procedure or during that hospitalization. Baseline characteristics and event rates were reported as a median with the data ranges. Follow-up for patients who had herniorrhaphy was complete in 100%, and was defined as the time between the herniorrhaphy and the last known follow-up. Survival was reported as the patient's status at the time of last follow-up. The Mayo Foundation Institutional Review Board approved this study.

Results

There were 14 men and 1 woman; the median age when herniation was discovered was 61 years (range, 34 to 76 years). All initial esophagectomies, with the exception of one, were performed at Mayo Clinic, Rochester, Minnesota. Seventy-two percent of all of the esophageal resections performed during this period were performed through an Ivor Lewis or transhiatal approach. Of the 15

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patients who experienced diaphragmatic hernias, an Ivor Lewis approach was used in 9 patients, and a transhiatal approach was used in 5. One patient required reconstruction with an esophagojejunal free graft combined with a substernal right colon interposition. There was no difference in the hernia incidence when comparing an Ivor Lewis approach (9 of 978; 0.92%) and a transhiatal approach (5 of 601; 0.83%). Histopathologic examination indicated adenocarcinoma in 13 patients, squamous cell carcinoma in 1, and high-grade dysplasia in 1. Preoperative radiation and chemotherapy was administered to 9 patients. One patient received preoperative radiation only. All of the cancers were located in the distal esophagus. The pathologic TNM stage was 0 in 2 patients, py0 in 5, IB in 1, pyIIB in 1, IIIA in 1, pyIIIA in 4, and stage IV in1. Thirteen patients underwent widening of the esophageal hiatus at the time of the original esophagogastrectomy.

Presenting symptoms of herniation included pain in 7 patients, nausea and vomiting with obstructive symptoms in 5, high chest tube output in 2, shortness of breath in 2, diarrhea in 1, and cough and dysphagia with a tracheoesophageal fistula in 1. Two patients were asymptomatic, with hernias found incidentally on follow-up imaging. All patients had radiographic evidence of herniation; either a chest roentgenogram or computed tomography demonstrated loops of bowel in the left chest in 11 and in the right chest in 2. One patient had small bowel in bilateral pleural spaces, and another had small bowel contained in the posterior mediastinum. Median time between the original esophagectomy and repair of the hernia was 1 year 9 months (range, 3 days to 12 years). An elective operation was performed in 13 patients, and 2 required emergent procedures.

At reoperation, colon was found within the hernia sac in 6 patients, small bowel in 5, and both in 4. Ischemic small bowel and colon were found in 1 patient each, requiring partial small bowel resection and subtotal colectomy, respectively. One patient required partial omentectomy because of necrotic omentum. Herniorrhaphy was through the abdomen in 14 patients and left chest in 1. All had reduction of the herniated contents and closure of the defect around the conduit. Mesh was required to repair the defect in 2 patients. There were no injuries to the conduit. Median length of hospitalization after reoperation was 10 days (range, 4 to 28 days). For those without complications, the median length of hospitalization was 7 days (range, 4 to 10 days), but for those with complications, the median length of hospitalization was 15 days (range, 5 to 28 days). Complications occurred in 9 of the 15 patients (60%) and included wound infection, deep venous thrombosis, atrial arrhythmias, anemia, chylothorax requiring reoperation, urinary retention, sacral decubitus ulceration, pneumonia, respiratory failure, and empyema requiring decortication. There was no operative mortality.

Follow-up was complete in all patients who underwent a herniorrhaphy for a median of 1 year 11 months (range, 2 months to 14 years). There have been 5 deaths occurring at 5, 9, 12, 28, and 69 months after repair of the hernia. Three patients died of their esophageal malignancy, 2 patients died of unknown cause, 8 are alive with no evidence of disease, and 2 are alive with recurrence of their esophageal malignancy. There have been two hernia recurrences (13.3%). One occurred during the hospitalization after initial repair before discharge, but because it was small (1 to 2 cm) and completely asymptomatic, it was not initially re-repaired. However, re-repair was required 26 months later because of shortness of breath secondary to a large amount of bowel in the left chest. The second recurrence occurred 8 months after the initial repair, and was repaired through a laparotomy while a simultaneous ventral hernia repair was performed. At 4 months' follow-up, he has not had further recurrence.

Comment

Diaphragmatic hernia after an esophagectomy is an unusual complication that we found to have an incidence of slightly greater than 1 in 200 patients. We did not specifically look for a diaphragmatic hernia in all patients after an esophagectomy and many have continued follow-up at another institution; therefore, some may have experienced a hernia we are not aware of, so the overall incidence may be higher. There are 82 reported patients with hiatal hernia after esophagectomy in the English literature [1–26]. The incidence of this complication ranges from 0.4% to 6% after open esophagectomy [1]. After a minimally invasive esophagectomy, the incidence appears to be slightly higher at 2.7% to 4.5% [1, 2, 14, 19]. Kent and colleagues reported the incidence of diaphragmatic hernia after esophagectomy to be 0.8% with the open approach and 2.8% with the minimally invasive esophagectomy [1]. The hernia can occur as an early or late complication. In the early postoperative period, the most likely explanation is that there are fewer peritoneal adhesions [2]. With longer follow-up, it is theorized this complication is a result of progressive hiatal dilation as a result of increased intraabdominal pressure and suction effect of the negative intrathoracic pressure. This result is magnified by the increased use of minimally invasive approaches that decrease the amount of postoperative adhesions [2, 13, 14]. An alternative explanation regarding minimally invasive esophagectomy may be that when performing the esophageal mobilization, the hiatus is made larger than with the open technique because of the distortion of the hiatus from the abdominal insufflation or the need to have a larger passage way to avoid undue tension on the conduit as it is pulled up to the neck or upper thorax. Another possible explanation for the low reported incidence of this postoperative complication is the overall poor survival after esophagectomy for malignant disease. In patients with locally advanced disease, long-term cure rates of 25% to 30% are commonly reported. It is worth noting that of the 15 patients in our series, 9 had very early stage disease.

Presentation of patients with a diaphragmatic hernia after an esophagectomy is variable. The scope ranges from a small portion of patients who present with no