Operative Techniques in Thoracic and Cardiovascular Surgery

Laparoscopic Paraesophageal Hiatus Hernia Repair

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For a benign condition, paraesophageal hiatal hernia (PEH) is the source of considerable controversy in the minimally invasive surgery and thoracic surgery literature. Controversies exist as to who should undergo repair, how the repair should be performed, and what the natural history is for asymptomatic patients. The first repairs performed by Collis and others in the 1950s began as a thoracoabdominal approach, and Dr Belsey perfected his repair via left thoracotomy. The open abdominal approach was also widely used and studied by a number of centers and includes the Hill repair, popularized by Dr Lucius Hill in Seattle, WA. The use of laparoscopy to repair paraesophageal hernias began with the first laparoscopic cases in the early 1990s. Since then, it has become an accepted or even preferred method to repair uncomplicated paraesophageal hernias.

The advantages of laparoscopy are well known, including shorter hospital stays, reduced postoperative pain, faster return to normal activity, and avoidance of lengthy abdominal or thoracic incisions as well as their attendant complications of chronic pain, incisional herniation, pneumonia, etc. As of 2011, more than 70% of all diaphragmatic hernia repairs were performed laparoscopically, according to the National Inpatient Sample (hcupnet.ahrq.gov; Data Partners: www.hcup-us.ahrq.gov/hcupdatapartners.jsp). The median length of stay was 2 days vs 7 and 6 days for open abdominal and thoracic repairs, respectively. The difficulty with the laparoscopic repair is an increased recurrence rate of 10%-40% over that of repairs that anchor the stomach and the esophagogastric junction (EGJ) in the abdomen, for example, the Belsey Mark IV repair or the Hill repair. The National Inpatient Sample documented more than 10,000 laparoscopic paraesophageal hernia repairs in 2011, more than 7000 in 2010, and more than 6000 in 2009.

These numbers likely include both thoracic and laparoscopic surgical procedures and possibly procedures performed for PEH and bariatric indications. At any rate, this population is increasing and more patients are presenting for repair. In an analysis of the New York inpatient population, as more repairs were carried out, fewer patients were presenting emergently.[5] The emergent population has a higher morbidity and mortality rate, has a longer length of stay, and likely is associated with higher costs to the health care system. In a population from Virginia Mason Medical Center in Seattle, WA, we found that almost all patients presented with a symptomatic paraesophageal hernia, and most of these were symptomatically improved following repair. The symptoms frequently associated with paraesophageal hernias include reflux, regurgitation, early satiety, dysphagia, chest or abdominal pain, shortness of breath, anemia, and various other symptoms related to these, such as modifications of eating habits, avoiding late meals, and postprandial difficulties. We also found that certain symptoms were associated with the degree of herniation: smaller hernias were associated with heartburn and regurgitation, hernias with 50%-75% of the stomach herniated were associated with anemia, and the largest hernias were associated with dyspnea, early satiety, and decreased meal size.[3,4]

The laparoscopic paraesophageal hernia repair has evolved over time, and experts in the field recently weighed in on various modifications to reduce the rate of recurrence. The use of a mesh was studied in a landmark article from the University of Washington, and it was found to not reduce the rate of recurrence in long-term follow-up and to cause problems such as erosion into the esophagus, which has been reported with both the GORE-TEX and polypropylene meshes. More recently, surgeons have used relaxing incisions in the diaphragm to reduce tension on the crural closure. The diaphragm may then be closed with a mesh away from the esophagus, which prevents complications from mesh erosion. Dr Demeester described a number of refinements to minimize recurrence in a recent article.[1] The group at Swedish Medical Center in Seattle has also described their laparoscopic Nissen-Hill repair, which uses the antireflux attributes of the Nissen operation with the anchoring sutures of the Hill repair.[2]

The basic outline of an uncomplicated laparoscopic PEH repair is described in the following section. In my experience, even hernias encompassing 100% of the stomach can be repaired laparoscopically, although it should be emphasized that if one is not making progress in excising the sac, or there is difficult anatomy that is not seen well enough, conversion to a laparotomy or a thoracotomy should be performed without hesitation.

The steps of the operation are as follows: (1) division of the gastrohepatic ligament to the diaphragm, (2) entry into the plane outside the hernia sac either at the point of attachment of the gastrohepatic ligament to the diaphragm

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or along the medial edge of the right crus, (3) reduction of the hernia sac and its contents into the abdomen, (4) identification of the esophagus and the vagus nerves, (5) division of the short gastric arteries, (6) excision of the hernia sac and determination of esophageal length, (7) performance of a lengthening procedure if needed, (8) closure of the crura, and (9) fundoplication with fixation of the wrap to the diaphragm or the crura. For any paraesophageal hernia repair, the essentials are reduction and excision of the sac, determination of esophageal length, crural closure, and fixation of the EGJ or fundoplication.

Laparoscopic equipment used for most procedures should be adequate for a paraesophageal hernia repair. I do prefer to use the 45° laparoscope, and typically use the 10-mm version, principally because my preferred entry method is with an optical or "view" trocar, where one visualizes each layer of the abdominal wall while entering the abdomen (one must use a 0° scope with these trocars). The ability for the 45° scope to visualize around corners is essential in this challenging location. As detailed in Figure 1, the camera port is placed just to the left of midline at 15 cm from the xiphisternum. Another trocar of 11 or 12 mm is used as the left upper quadrant trocar, approximately 12 cm from the xiphisternum, close to the costal margin. The larger trocar is used in case a Collis gastroplasty is needed, as described later, to accommodate the Endo GIA stapler. It should be 4 fingerbreadths or 8-10 cm from the camera port. Other 5-mm trocars are also placed at least 8-10 cm apart, 1-2 in the right upper quadrant and 1 lower on the left flank. We use the Nathanson liver retractor, which is placed at the xiphisternum with a 5-mm trocar, making the fascial track for this instrument, the trocar is replaced by the liver retractor and it may then be used in another location (Figs. 2-9).