Laparoscopic Antireflux Surgery and Repair of Hiatal Hernia

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Laparoscopic mobilization of the esophagus and esophagogastric (O-G) junction enables the safe and effective performance of endoscopic antireflux surgery for intractable reflux esophagitis. The two antireflux procedures that we have evaluated in clinical practice at this institution are the ligamentum teres cardiopexy (n = 9) and partial posterior fundoplication (n = 5). More recently, laparoscopic repair of large symptomatic hiatal hernia (sliding, paraesophageal, and mixed) has also been introduced (n = 4). The procedure entails reduction of the hernia, mobilization of the O-G junction with crural repair by a continuous suture technique employing a special preformed jamming loop knot, followed by total fundoplication, which is fixed proximal to the anterior margin of the diaphragmatic hiatus and distal to the O-G junction. The early results (maximum follow-up 18 months) of this experience have been favorable, with minimal morbidity, early hospital discharge, and effective control of reflux symptoms without adverse sequelae. Laparoscopic antireflux surgery is an alternative to long-term medication in patients with intractable esophagitis, and laparoscopic repair of large hiatal hernias offers significant advantage over the conventional open surgical approach in terms of rapid convalescence.

The treatment of reflux esophagitis varies from center to center, and some gastroenterologists are reluctant to refer patients for open surgical treatment by the abdominal or thoracic approach. Failure of medical therapy is the commonest indication for surgical treatment, although there is no general agreement on the duration of medical therapy after which treatment is said to have failed. Most antacids including H2-receptor antagonists and alginates control reflux symptoms but do not cure the reflux diathesis, and for this reason symptoms recur on cessation of therapy. Patients are generally referred for surgery either because (1) symptoms persist despite medication or recur soon after withdrawal or (2) the patient is noncompliant with the medication regimen. In the short term, omeprazole has proved more effective than H2 antagonists for healing esophagitis and partial fundoplication (Toupet) for uncomplicated reflux disease unresponsive to medical therapy [4, 5] and laparoscopic repair of large hiatal hernias with crural repair and total fundoplication [6].

Access and Instrumentation

The patient is operated on in the supine position. The surgeon is located on the patient’s left and a vacuum-lock telescope holder (First Assistant, Leonard Inc., Philadelphia, Pennsylvania, U.S.A.) is used. Five trocar cannulas are used as shown in Figure 1. The telescope (30 degrees forward-oblique) is inserted through an 11.0-mm cannula 2.5 cm to the left and above the umbilicus. The other cannulas are placed as follows: below and to the right of the xiphoid process (5.0 mm), 4.0 cm to the right and above the umbilicus (11.0-12.0 mm), midway between the xiphoid and the umbilicus to the right of the linea alba (5.0 mm), and at the lower edge of the left subcostal region (5.0 mm). The laparoscope cannula is introduced blindly after creation of the pneumoperitoneum using a high-flow electronic insufflator, whereas the remaining four are inserted under visual control.

Exposure of the hiatal region and hernia is considerably facilitated by the use of the dipping endoretractor (Karl Storz, Tuttlingen, Germany) (Fig. 2). This instrument fits on the outside of the telescope and is introduced through the same cannula. Suturing (interrupted or continuous) is performed using 5-mm and 3-mm needle holders andatraumatic black silk sutures mounted on the Endoski® needle (Ethicon, Edinburgh, U.K.). Interrupted sutures are tied using the standard microsurgical technique. Continuous suturing (for crural repair and total fundoplication) employs a terminal jamming loop knot.

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Mobilization of the Abdominal Esophagus and O-G Junction

Adequate elevation of the left lobe of the liver to expose the hiatus is essential. It is best achieved with the dipping endoretractor. In its absence, a palpating probe or expanding three-pronged retractor (Karl Storz, Tuttlingen, Germany) introduced through the xiphoid port is used to achieve and maintain the elevation of the left lobe. A 30-degree forward-oblique telescope is necessary to obtain good visualization of the operative field and to permit rapid alterations of the visual field by lateral rotation of the telescope.

A large orogastric tube (or flexible endoscope) is introduced to accentuate the curvature of the esophagus and thereby help in its identification. The other important landmarks are the anterior nerve of Latarget, the anterior margin of the hiatus, and the fundus of the stomach.

The dissection starts high, with division of the peritoneum covering the abdominal esophagus. On the right side it is extended to the adjacent transparent window of the lesser omentum medial to the anterior nerve of Latarget. On the left side, the adjacent gastrophrenic peritoneum sweeping from the fundus to the diaphragm is divided. The peritoneum is then teased down with a pledget swab to expose the anterior surface of the esophagus and the anterior vagus nerve. At this stage the yellow phrenoesophageal membrane is identified and is swept up inside the anterior margin of the hiatus.

The dissection then proceeds on the right side with separation of the right crus from the esophagus using a combination of scissors and blunt dissection. At this stage the lateral strands of the phrenoesophageal membrane are encountered and divided. The dissection is continued in the loose fibroareolar tissue toward the posterior mediastinum until the posterior vagus nerve is encountered loosely adherent to the right posterolateral wall of the esophagus. The vagus is usually accompanied by an artery (branch of the left gastric). The nerve is separated from the esophagus, and the vessel is clipped and divided if necessary. Provided the dissection is kept high, only a few venules are encountered, and they can be safely electrocoagulated with soft monopolar coagulation (to avoid carbonization and electrical arcs) or preferably with the computed automatic bipolar coagulation using the Erbe ACC 450® unit (Fig. 3) (Erbe Elektromedizin, Tubingen, Germany). The risk of inadvertent thermal injury to surrounding structures is virtually eliminated by this microprocessor-controlled H-F generator that incorporates sensor electronics.

On the left side the esophagus is mobilized by scissors from the left crus down to the angle of His after soft coagulation of small phrenic vessels. The adjacent fundus is best mobilized with the L-shaped electrosurgical hook using cutting current with controlled electrocoagulation of the cut (cutting panel, setting 2).

Before the posterior esophageal dissection is commenced, the orogastric tube is withdrawn to the midthoracic level. The posterior dissection is considerably facilitated by the shape memory pseudoelastie dissector (Fig. 4). This prototype instrument is not yet generally available. In its absence, a rigid curved grasper introduced through a flexible cannula (temporarily

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**Fig. 1.** Telescope is inserted through an 11.0-mm cannula 2.5 cm to the left and above the umbilicus. The other cannulas are positioned below and to the right of the xiphoid process (5.0 mm), 4.0 cm to the right and above the umbilicus (11.0-12.0 mm), midway between the xiphoid and the umbilicus to the right of the linea alba (5.0 mm), and at the lower edge of the left subcostal region (5.0 mm).

**Fig. 2.** Dipping endoretractor.

**Fig. 3.** The Erbotom ACC (automatic cut and coagulation) 450®, a high-frequency unit. It incorporates microprocessor technology and sensor electronics, enabling the bipolar electrode to relay signals to the microprocessor, which calculates and delivers in real time the optimal output to achieve bipolar coagulation when set to the automatic mode. Both the initiation and end of coagulation are automatically controlled by the microprocessor.