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# Laparoscopic Heller Myotomy Remains the Gold Standard for Achalasia

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## Abstract:

The intersection of technologies has led to new approaches to disease processes such as achalasia. Two approaches that have emerged include laparoscopic Heller myotomy with Dor fundoplication, and POEM procedure. Both represent minimally invasive approaches, and each has advantages and disadvantages. The major drawback of the POEM procedure is the inability to perform a concurrent anti-reflux procedure. As a result, laparoscopic Heller myotomy with Dor fundoplication remains the procedure of choice in our institution for the vast majority patients with achalasia.

The principles of the operative procedure will be outlined:

**1/ Mobilization of the distal esophagus.**

**2/ Division of the esophageal fat pad**

**3/ Identification of the GE junction.** Score the esophagus and proximal stomach to create the proposed line of separation of the muscles, extending approximately 10 - 12 cm in length, and at least 2 cm below the GE junction.

**4/ Muscle division.** Typically, it starts on the gastric side, move to the esophageal side, and divide the muscles over the GE junction last. All tethering bands must be divided.

**5/ Completion endoscopy** must be performed for two reasons:

- a/ to check for leak by insufflating the myotomy and submerging it underwater.
- b/ to identify the GE junction and determine that the myotomy extends at least 2 cm beyond it.

**6/ An anterior Dor fundoplication** should be carried out, or conversely, a Toupet fundoplication.

**7/** Following the procedure, the patient is kept NPO until a

water-soluble contrast swallow study is obtained the following morning to check for leaks and progress the diet subsequent to a normal study.

**Keywords:** Achalasia, Laparoscopic Heller Myotomy, Dor Fundoplication, Peroral Endoscopic Myotomy (POEM), Minimally Invasive Surgery

Achalasia is a rare motility disorder of the esophagus with a global incidence of approximately 1 per 100,000 population per year, and an estimated 20,000 to 40,000 people affected in the US<sup>1,2</sup>. Degeneration of the inhibitory ganglia at the GE junction leads to impaired lower esophageal sphincter (LES) relaxation and increased LES tone. Aperistalsis of the esophageal body leads to progressive esophageal dilation. The principal symptoms include progressive dysphagia and regurgitation. The presentation is usually chronic, with a gradual increase in symptoms and weight loss, but can also be acute, with pronounced dysphagia and the inability to eat or swallow liquids<sup>3</sup>.

The treatment options for achalasia include laparoscopic Heller myotomy with Dor fundoplication, per oral endoscopic myotomy (POEM), pneumatic balloon dilatation, and Botox injection into the LES<sup>1,3,4</sup>. Although pneumatic balloon dilatation has been a long-standing option for definitive treatment with good success rates<sup>2</sup>, its popularity has decreased as other minimally invasive procedures have emerged. A recent systematic review and meta-analysis assessing the efficacy and safety of pneumatic dilation in achalasia found perforation rates ranging from 1.0 – 3.2% for all patients undergoing dilation depending on balloon size, with an extremely high

perforation rate of 9.3% for those patients undergoing first time dilation with a 35mm balloon<sup>5</sup>. Botox administration can be useful in the management of patients with achalasia, but it does not provide a permanent solution<sup>2,3</sup>. However, in those patients with severe symptomatology, such as the complete inability to swallow, our experience suggests that Botox administration can be very useful in alleviating symptoms in the short term. By relaxing the LES and allowing patients to swallow within a few days, nutritional status and patient well being can improve because the patient is able to eat. After about 6 weeks, an elective definitive operation can be undertaken with less risk than an acute surgical intervention when the patient is nutritionally compromised<sup>4</sup>.

With the advent of laparoscopic surgery, laparoscopic Heller myotomy with Dor (anterior) fundoplication became the definitive operation to treat achalasia in the vast majority of patients<sup>6</sup>. However, with the introduction of a less-invasive endoscopic approach first reported by Inoue in 2010<sup>7</sup>, the popularity of the POEM (Per-Oral Endoscopic Myotomy) procedure has skyrocketed. Multiple studies, both retrospective and a recent randomized prospective clinical trial, have confirmed that both approaches are effective in improving dysphagia<sup>8-14</sup> and are equivalent with the exception of type 3 (spastic) achalasia where POEM offers better relief of dysphagia and pain related to esophageal spasm<sup>9,12</sup>. However, type 3 is the least common subtype<sup>1</sup>. On the other hand, the major disadvantage of the POEM procedure is that it cannot be coupled with an anti-reflux operation. Therefore, although POEM has a high success rate at relieving the symptoms of dysphagia<sup>7,8,10,12</sup>, there is a much higher rate of GERD symptomatology and esophageal acid exposure when compared to laparoscopic Heller myotomy coupled with an anti-reflux operation. In a meta-analysis comparing the two techniques, esophageal pH monitoring demonstrated abnormal acid exposure in 14.9% of patients following laparoscopic Heller myotomy with fundoplication compared to 39.3% in those patients following POEM procedure<sup>11</sup>. In a case-control study from two high volume centers using propensity score matching to compare POEM with laparoscopic Heller myotomy with Dor fundoplication, abnormal acid exposure was found at 4 years in 38% of patients in the POEM group, compared to 17% in the laparoscopic Heller Myotomy/Dor group<sup>14</sup>. In a recent randomized controlled trial, reflux esophagitis was present at 2 years in 44% of patients who underwent POEM procedure compared to 29% in the laparoscopic Heller myotomy/Dor fundoplication group<sup>8</sup>.

Both techniques have been embraced in our institution and both are suitable for patients with achalasia. However, in my

experience, most patients opt for laparoscopic Heller myotomy with Dor Fundoplication when presented with data that indicates that the reflux rate is much higher with the POEM procedure. The only exception is those patients with type 3 or spastic achalasia in whom the ability to do a longer myotomy with the POEM procedure leads to significantly better results in terms of improving dysphagia and pain relief<sup>9</sup>.

Patients who have had a previous Heller myotomy with Dor fundoplication and have failed with recurrence of dysphagia are excellent candidates for POEM procedure<sup>15,16</sup>. Likewise, patients who have recurrent dysphagia after the POEM procedure are candidates for either another POEM procedure, or laparoscopic Heller myotomy with Dor fundoplication<sup>15,16</sup>. Finally, patients who have undergone a POEM procedure and have intractable reflux may be considered for a laparoscopic partial fundoplication such as a Dor (anterior) fundoplication or Toupet (270 degrees posterior) fundoplication.

The principles of the operative procedure are the following:

**1. Mobilization of the Distal Esophagus**

**2. Division of the Esophageal Fat Pad**

**3. Identification of the Gastroesophageal (GE) Junction**

- a. Score the Esophagus and proximal stomach to indicate the proposed line of separation of the muscles, extending approximately 10 – 12 cm in length, and at least 2 cm below the GE junction.

**4. Muscle Division**

- a. Typically, it starts on the gastric side, move to the esophageal side, and divide the muscles over the GE junction last. All tethering bands must be divided.

**5. Completion Endoscopy**

Must be performed for two reasons:

- a. To check for leak by insufflating the esophagus and submerging the myotomy underwater.
- b. To identify the GE junction and determine that the myotomy extends at least 2 cm beyond it.

**6. Anterior Dor Fundoplication**

**7. Water-soluble contrast swallow study**

- a. Following the procedure, the patient is kept NPO and obtain a water-soluble contrast swallow study the following morning to check for leaks and progress the diet subsequent to a normal study.

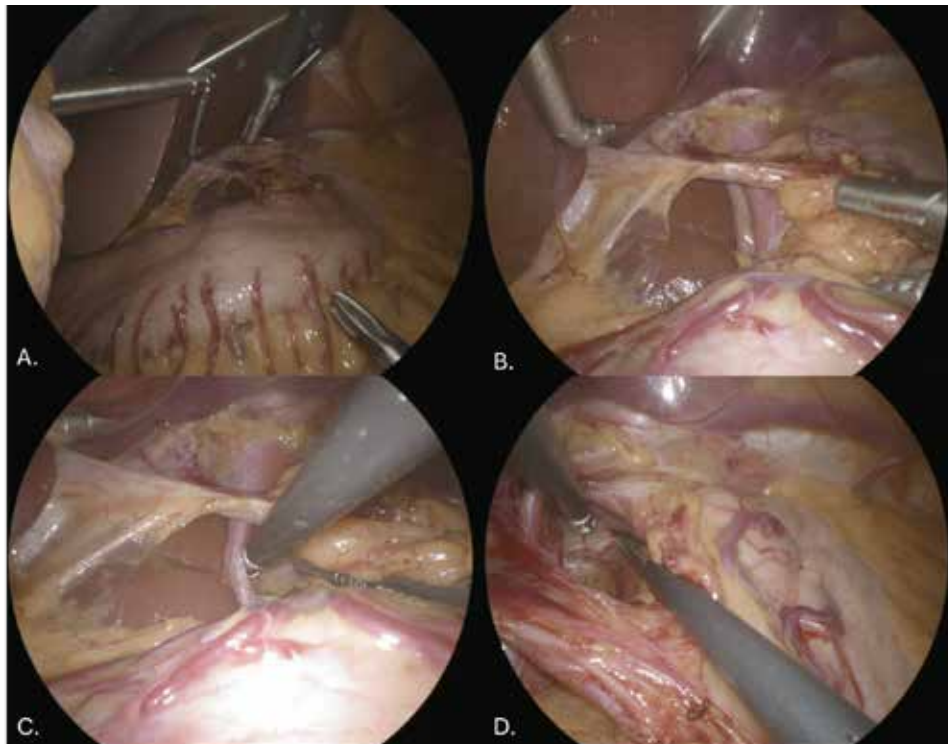
**Trocar Position**

The RUQ port is utilized for liver retraction. The high epigastric port and the left upper quadrant port are the principle dissecting ports. The supraumbilical port is used for visualization and the left lower paramedian port is used for retraction.

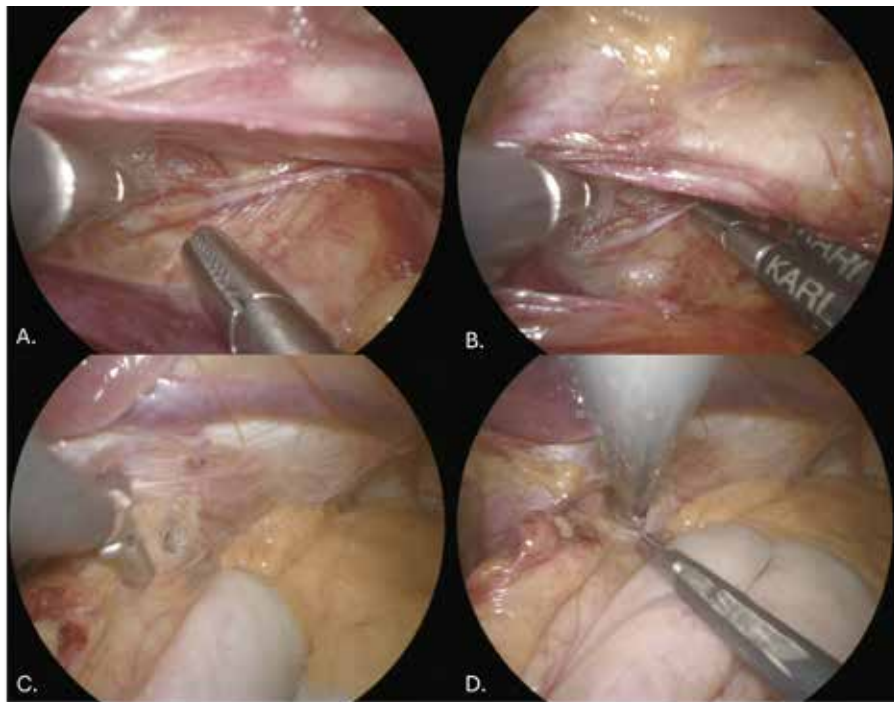


*Nathanson liver retractor: (A) Preoperative planning of port placements  
(B) Ports placed with Nathanson retractor and laparoscopic camera inserted*

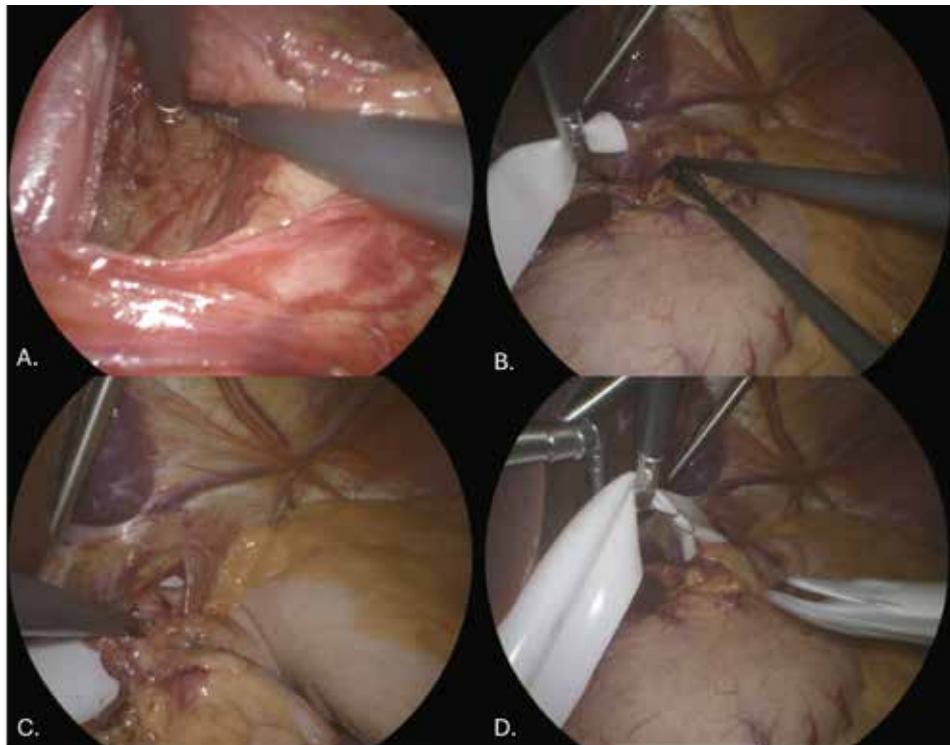
When performing a laparoscopic Heller myotomy, there are several key technical considerations:



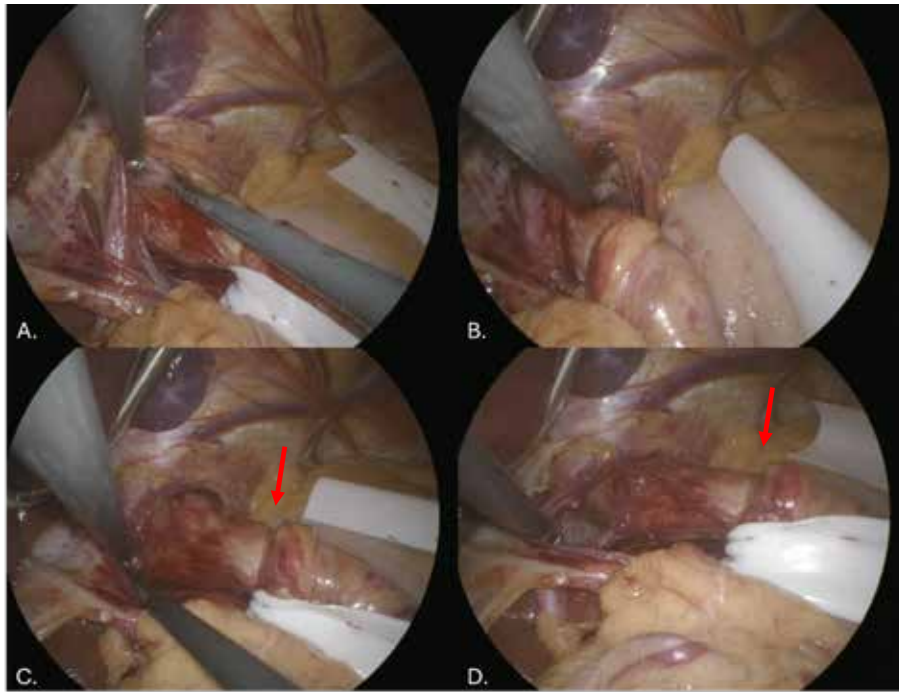
**Figure 1:** The set up for Laparoscopic Heller myotomy (LHM) is identical to laparoscopic Nissen fundoplication. The gastro-hepatic omentum is opened, and in this case an accessory left hepatic artery is preserved (Image A, B, & C). The peritoneum over the right crus is opened, and the esophagus progressively separated from the right crus in the loose areolar and avascular plane (Image D). The intent is to encircle the esophagus to give more exposure and control.



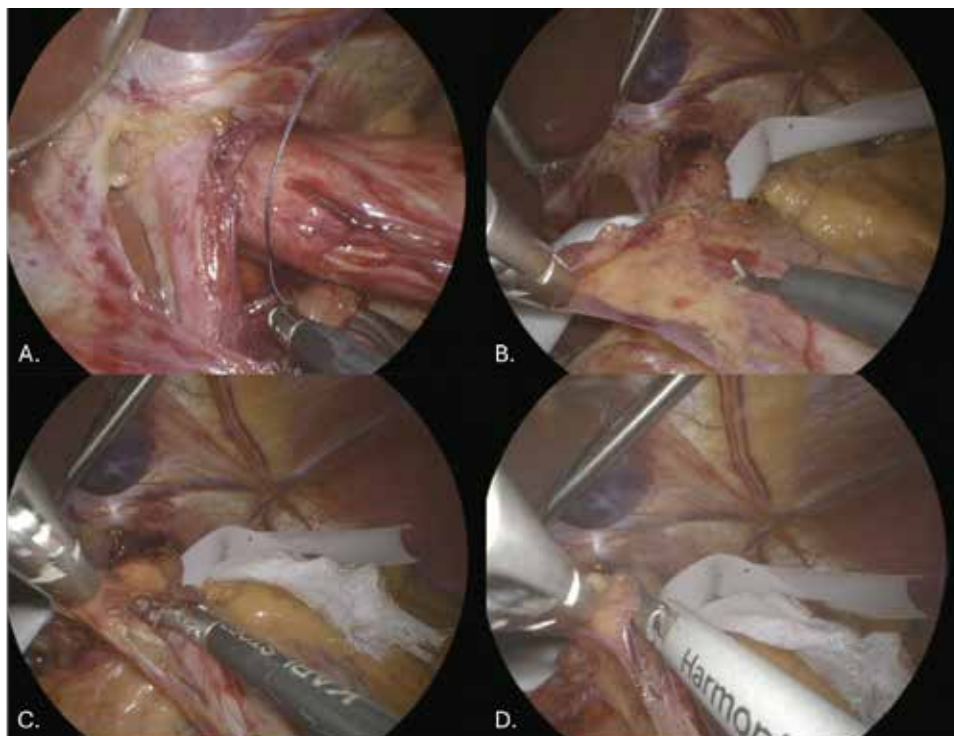
**Figure 2:** A retro-esophageal window is then created. You can clearly see the posterior trunk of the vagus which is preserved and brought forward with the esophagus as the window is created (Images A & B). The anterior dissection is then extended to identify the left crus, and then separate the esophagus from the left crus just like was done on the other side (Images C & D).



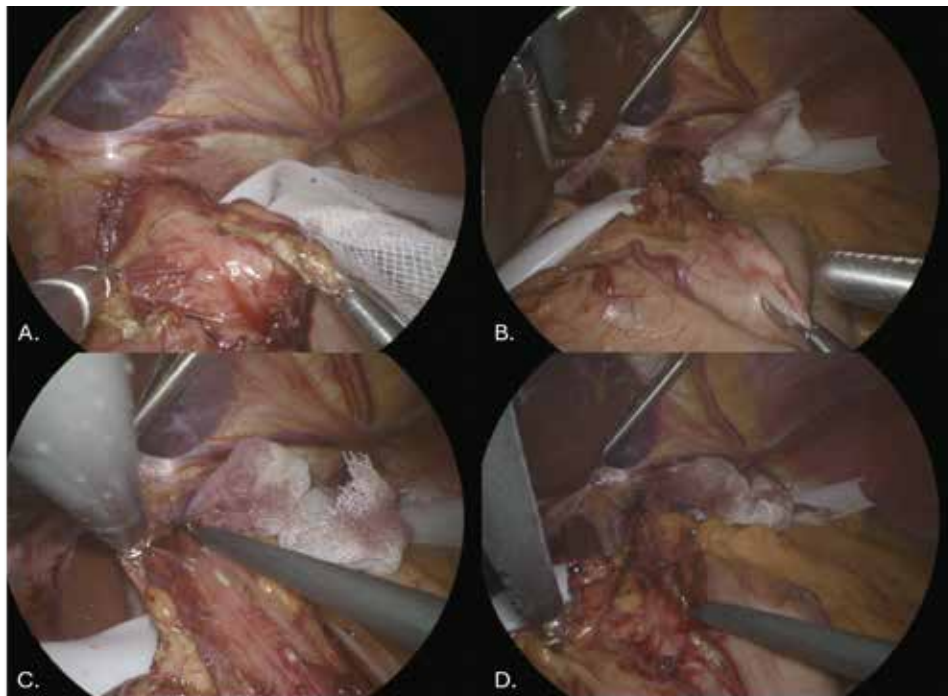
**Figure 3:** The left and right crura have been separated from the esophagus and a sufficient retro-esophageal window has been created (Image A). A Penrose drain is passed behind the esophagus and then brought together and clipped to create a “handle” to provide traction and assist with further mobilization of the esophagus (Images B, C, & D).



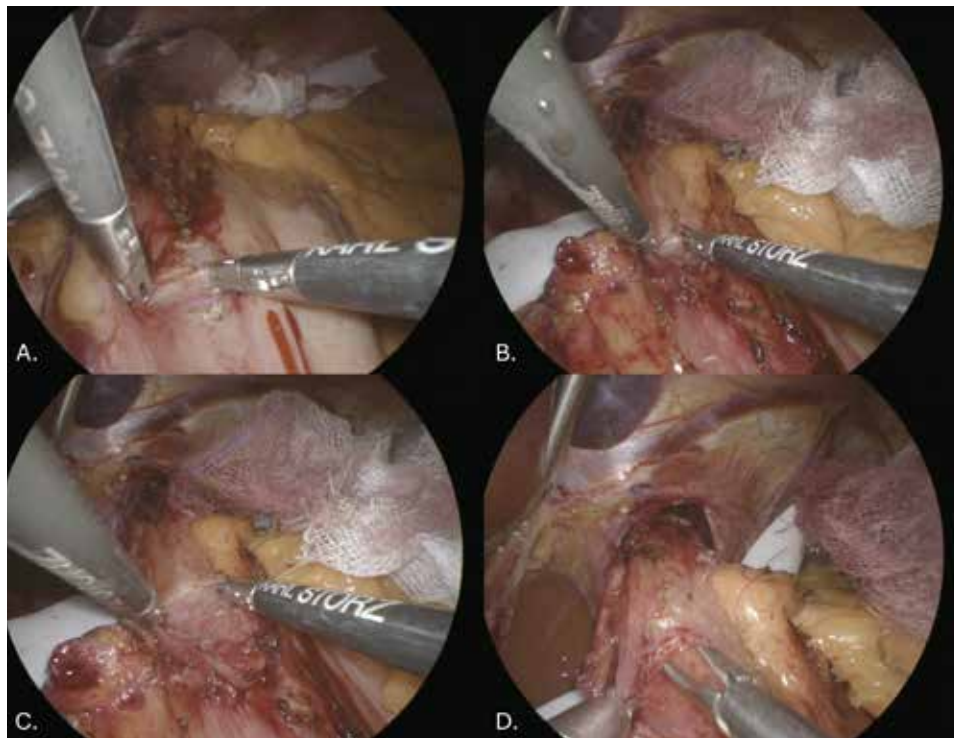
**Figure 4:** With downward traction on the esophagus, division of the attachments on all sides allows for progressive mobilization of the esophagus ensuring that a sufficiently long anterior myotomy can be carried out (Images A, B, & C). Note the clearly narrow and fibrotic appearing GE junction and the clearly dilated esophagus above it (Images C & D, Red Arrows).



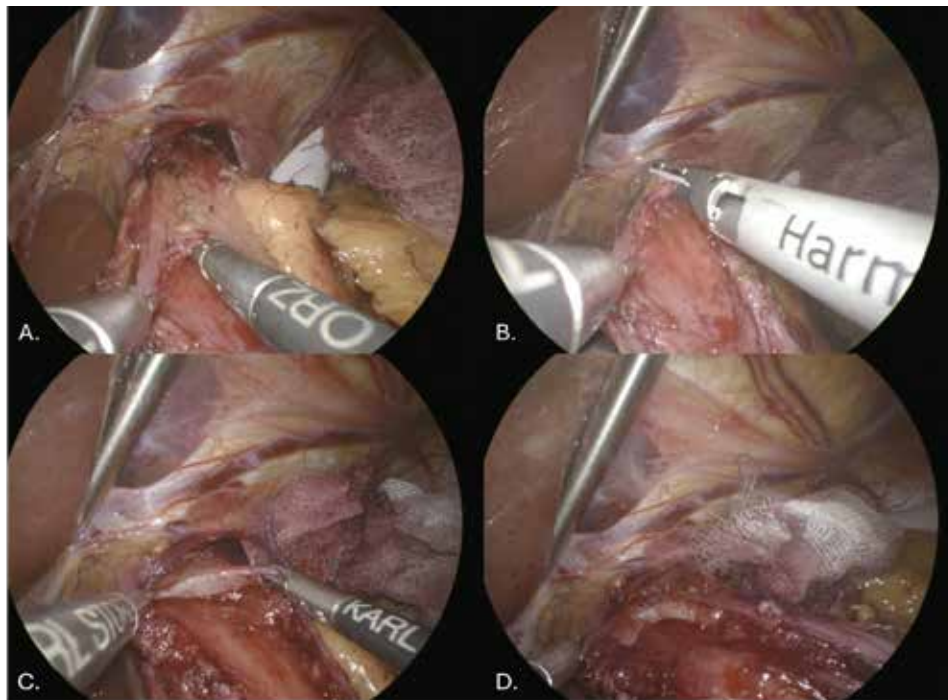
**Figure 5:** When necessary, the hiatus is repaired. In this case the crura are brought together with a single stitch (Image A). Next, the esophageal fat pad must be divided to expose the anterior wall of the esophagus (Images B, C, & D).



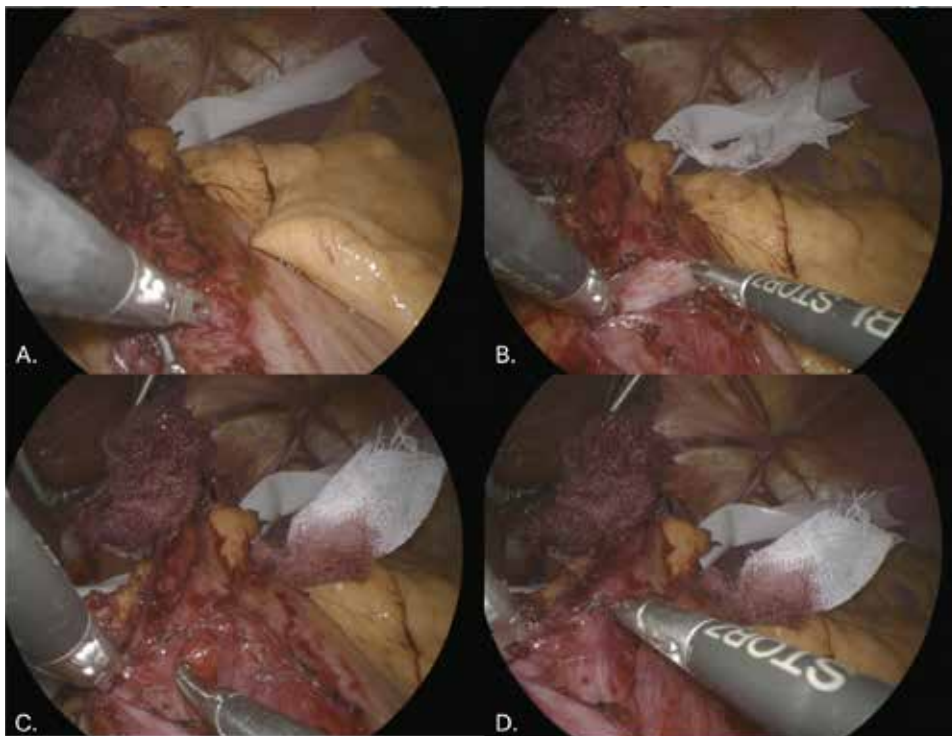
**Figure 6:** The anterior esophagus is completely exposed after division of the esophageal fat pad (Image A). The esophagus is then placed on traction by grasping the anterior wall of the stomach and pulling vigorously towards the feet (Image B). This then creates excellent exposure of the anterior wall and allows for the serosa to be scored with the L-hook (Image C & D).



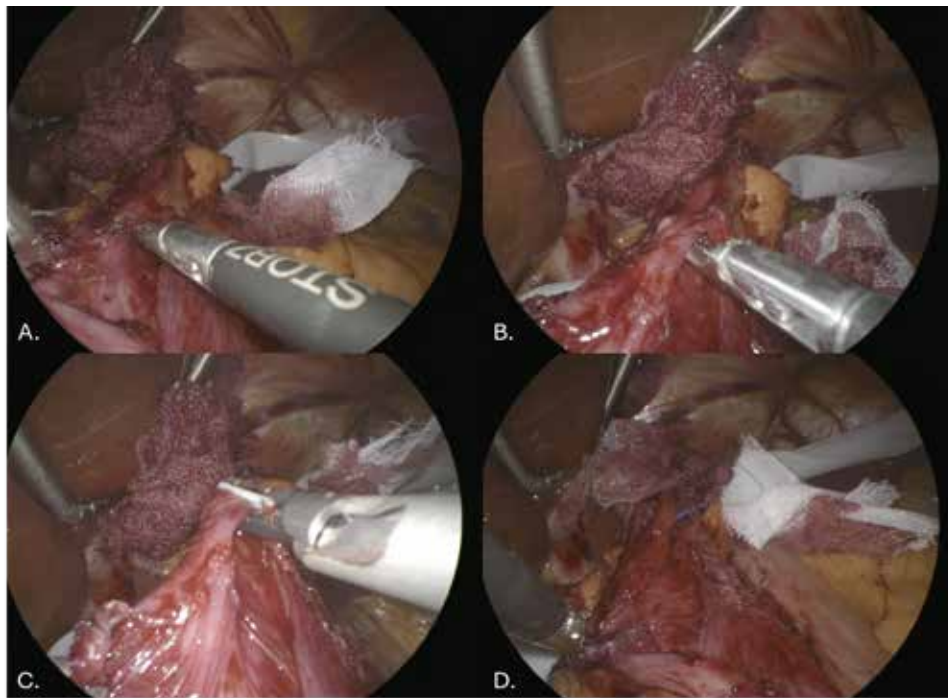
**Figure 7:** On either the gastric side or the esophageal side, the muscle can be pulled apart gently in order to expose the underlying mucosa (Image A). Typically, it starts on the gastric side (Image A) but it is harder to obtain a good submucosal plane over the stomach. Once it is reasonably open, shifting to the esophageal side follows (Image B,C,D). Over the esophagus it is much easier to identify and dissect the submucosal plane. Once the mucosal plane is identified, the Maryland dissector is particularly useful in spreading the plane open (Image D).



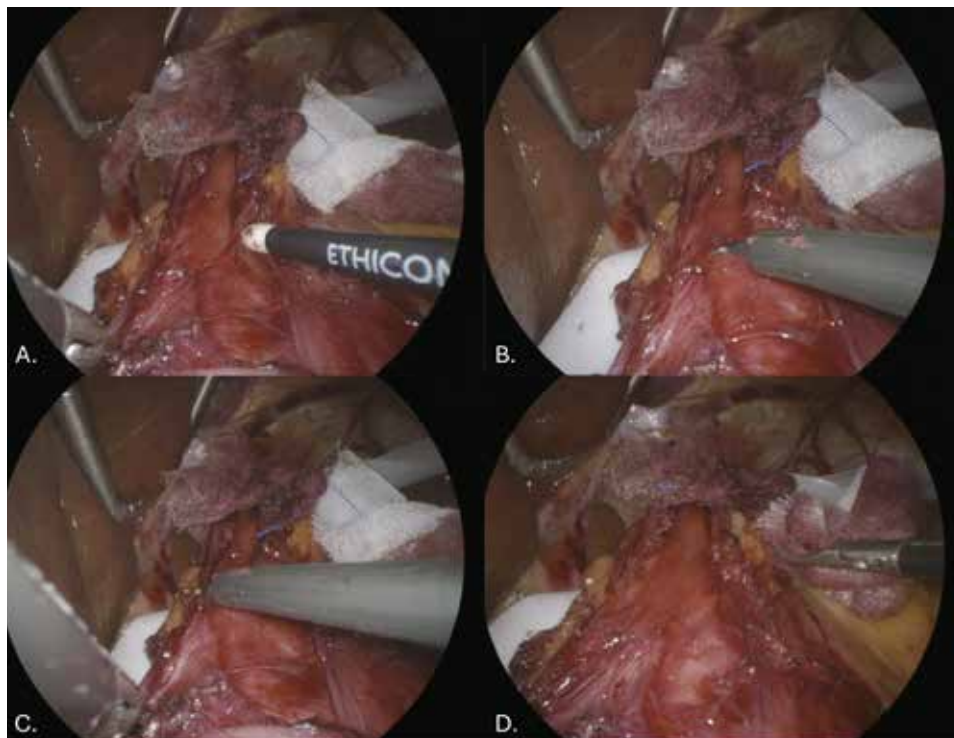
**Figure 8:** Once the muscle has been separated from the underlying mucosa (Image A), it can be divided with either the L-hook or the Harmonic Scalpel. Authors prefer the Harmonic Scalpel (Image B). Division should be rapid with minimal thermal spread. In these pictures the myotomy has been extended proximally to its furthest extent on the esophagus (Image C and D).



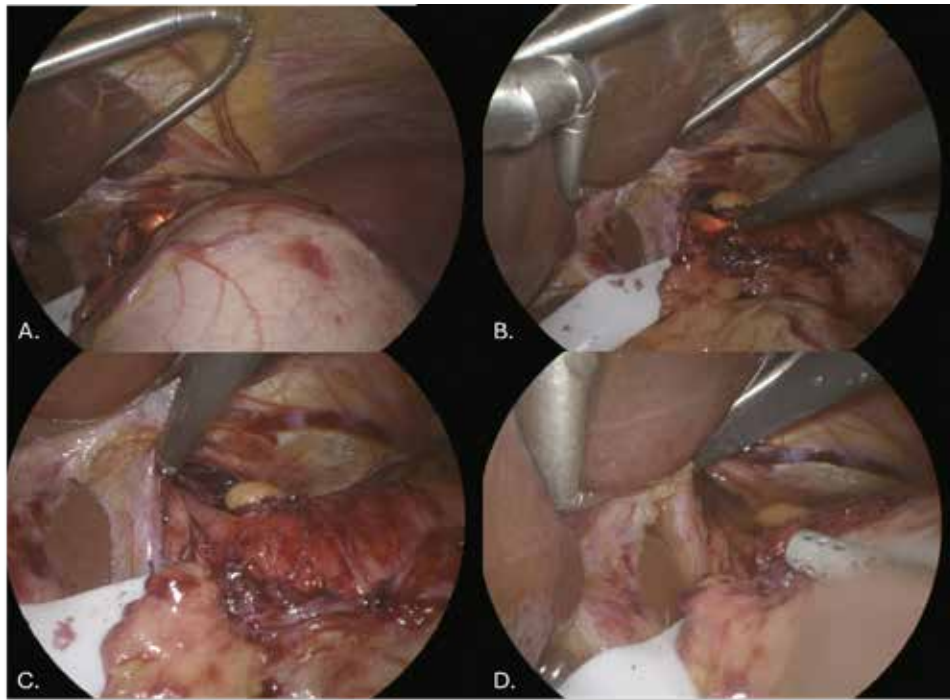
**Figure 9:** Once the esophageal side is completed, we return to the gastric side to complete the muscular division more difficult to complete because of adherence. On the gastric side, the plane is more “sticky”, but the technique is the same (Images A, B, C, & D).



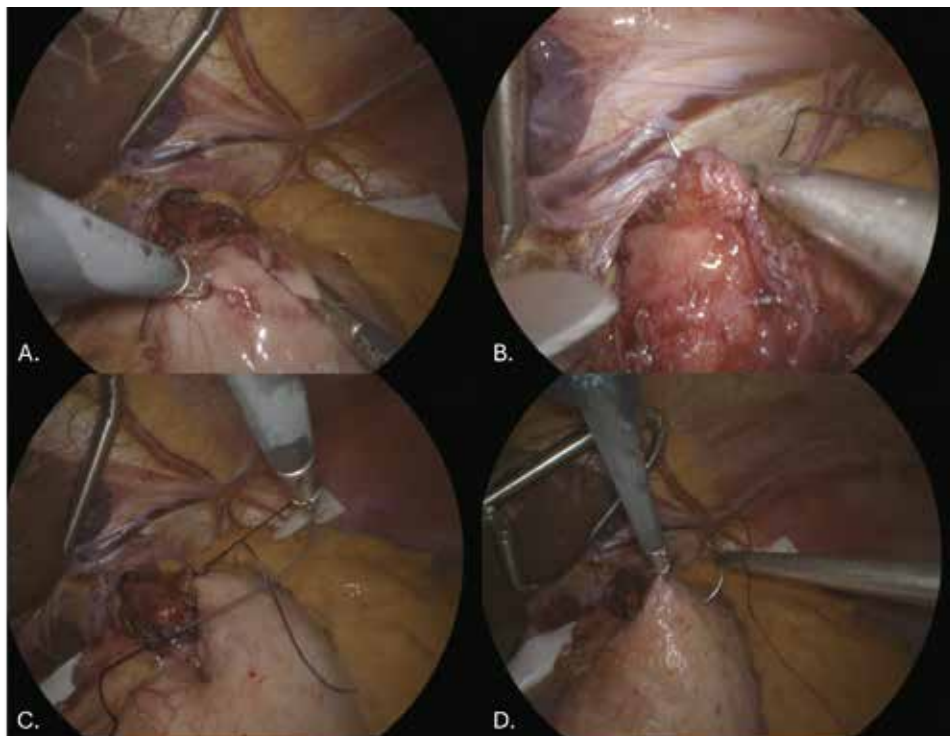
**Figure 10:** The adherence of the muscular fibers is greatest at the GE junction. This is particularly true if the patient has previously had Botox or dilations. At the level of the GE junction you can appreciate a thickened fibrotic band that must be very carefully dissected free from the underlying mucosa (Images A & B). Once this is divided (Image C), the myotomy is wide open and the mucosa bulges through (Image D).



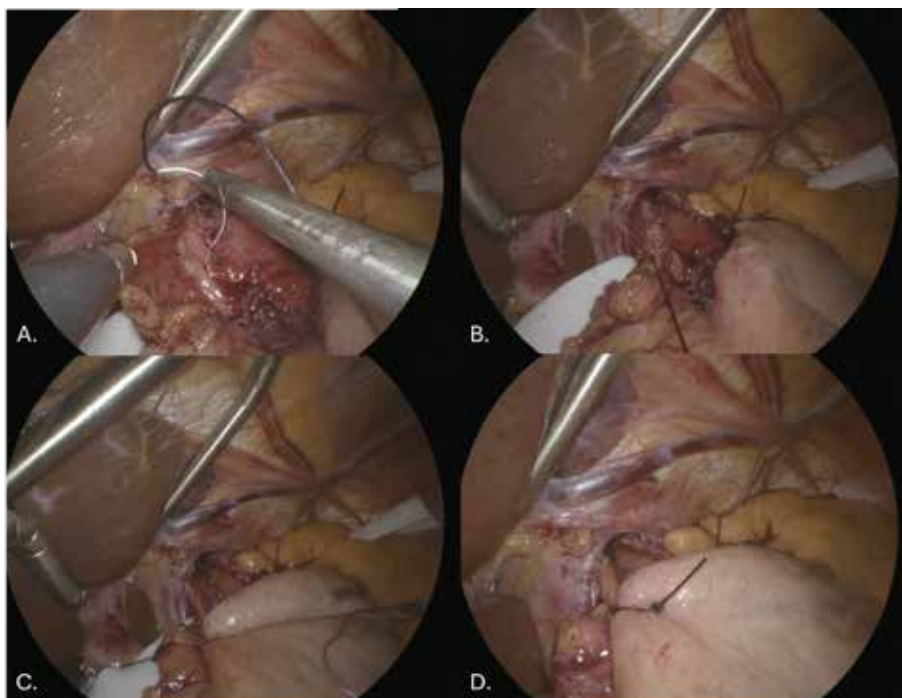
**Figure 11:** Small residual bands or strands can be brushed away with an endoscopic peanut (Image A), or dissected and divided with the L-hook (Images B & C) until the myotomy is clear of any tethering bands or strands (Image D).



**Figure 12:** At the end of the case, the myotomy is checked for the extent onto the stomach, and for any leaks by submerging the myotomy in saline (Image A). Air bubbles once the myotomy is submerged is an important clue to the presence of a leak. The GE junction can easily be identified by endoscopy. By depressing the myotomy on the gastric side, one can easily see the extent of the myotomy on the gastric wall (Images B & C). Typically, 2 cm beyond the GE junction is desired. Finally, once inflated, the myotomy should balloon out without any tethering bands or strands (Image D).



**Figure 13:** An anterior (Dor) fundoplication is carried out by bringing the anterior fundus up over the GE junction and suturing it to the cut edge of the esophageal muscle (Images A, B, C, & D). This is done on the left side first, and then the right side.



**Figure 14:** The fundus is sutured to the muscle on the right side (Image A & B). Finally, the completed fundoplication (Image C & D).

### Conclusion:

Laparoscopic Heller myotomy with Dor fundoplication is an excellent option for most patients with achalasia. With careful dissection and meticulous attention to the steps of the operation depicted here the procedure can be performed safely and with excellent outcomes.

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