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Robotic Heller Myotomy

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ABSTRACT

Achalasia is an esophageal motor disorder characterized by the failure of the lower esophageal sphincter (LES) to relax and the loss of peristalsis in the esophageal body. Treatment options aim to alleviate the elevated pressure of the LES and include direct botulinum toxin injection, pneumatic dilation, per-oral endoscopic myotomy (POEM), and Heller myotomy.

Traditionally, laparoscopic Heller myotomy with partial fundoplication has been the gold standard for treating achalasia. However, the robotic approach is gaining popularity for

foregut operations. The robotic system facilitates an extended esophageal mediastinal dissection further up into the chest. It also offers excellent visualization of the esophageal layers, resulting in a smoother and safer myotomy.

The addition of a partial fundoplication, whether anterior or posterior, to Heller myotomy significantly reduces the risk of esophageal reflux. This risk decreases from approximately 50% without a fundoplication to less than 10% with a partial fundoplication. The robotic technique, with its enhanced precision and visualization, represents a promising advancement in the management of achalasia.

INTRODUCTION

Achalasia, a primary motility disorder of the esophagus, finds its most effective treatment in surgery[1]. Laparoscopic myotomy and fundoplication have been recognized for their outstanding results[1,2]. The utilization of the robotic platform for Heller myotomy enhances the precision of dissection, particularly in the mediastinal region, and offers superior visualization of the esophageal layers. This contributes to a smoother and safer myotomy procedure[2].

Achalasia, characterized by a slow progression, typically manifests between the ages of 20 and 40, showing no gender predilection. The interval from the onset of symptoms to presentation spans approximately 6 years[3,4]. Dysphagia stands out as the most common symptom, initially affecting the passage of solid foods and progressing to liquids[3]. The hindrance in food progression down the esophagus prompts 60–90% of patients to report regurgitation, leading to aspiration and chronic pulmonary symptoms. Other associated symptoms encompass weight loss, recurrent pneumonia, chronic cough, and heartburn resulting from food and acid stasis[5].

CASE REPORT

This case is on a 32-year-old male patient presented with a three-year history of progressive dysphagia, accompanied by noticeable weight loss. Initial high-resolution esophageal manometry revealed ineffective esophageal dysmotility in 100% of swallows. A subsequent examination conducted two years later confirmed the diagnosis of achalasia. Contrasted X-ray imaging of the esophagus, stomach, and duodenum unveiled an incipient megaesophagus.

Despite undergoing unsuccessful clinical treatment, the patient has been advised to undergo a robotic Heller myotomy, employing the da Vinci XI robot for the procedure.

Multiple small incisions, four or five, are made in the abdominal wall to introduce the robotic arms. A 30-degree camera guides the remainder of the operation through robotic arm 2. The left robotic arm (arm 1) employs Cadiere forceps, while the right robotic arm (arm 3) utilizes the curved bipolar dissector, vessel sealer, and fenestrated forceps. An accessory robotic arm (arm 4), positioned to the surgeon's right (patient's left) of the right robotic arm, employs tip-up fenestrated forceps.

The surgical procedure commences with the division of the gastrohepatic ligament. The region overlying the right crus is meticulously cleared just below the gastroesophageal junction, extending across and dividing the phrenoesophageal ligament. For anterior or Dor partial fundoplication, dissection is limited to the anterior aspect of the esophagus, preserving a significant portion of the phrenoesophageal ligament.

A blunt dissection of the periesophageal space is carried out anteriorly, extending well into the mediastinum. Mobilization of the esophagus for a minimum of 8 cm is ensured, with special attention to identifying and preserving the vagus nerve during this phase.

The myotomy is executed with careful precision (Figure 1), utilizing a combination of energy and blunt dissection. The myotomy extends 8 to 10 cm proximal to the gastroesophageal junction (Figure 2) onto the esophagus and 2-3 cm caudally onto the stomach. Care is taken to extend the myotomy down to the sling fibers, and if energy is employed, caution is exercised to prevent heat burns on the esophageal mucosa.

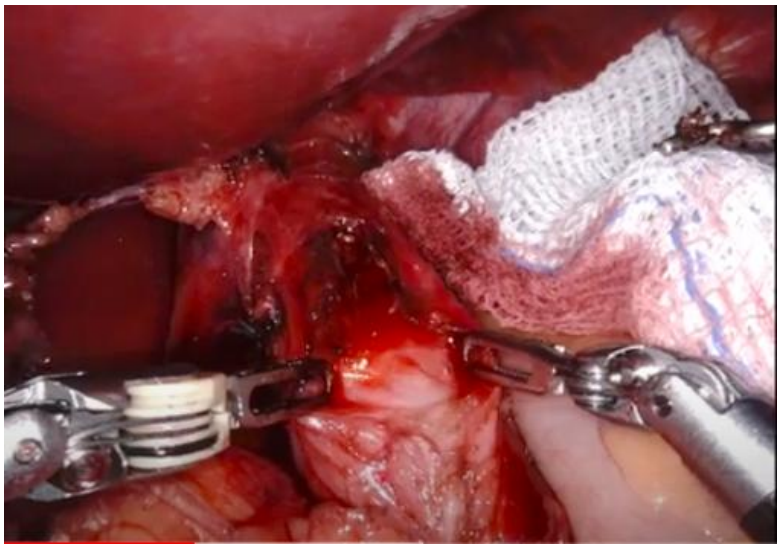

Figure 1: Starting the myotomy with blunt dissection

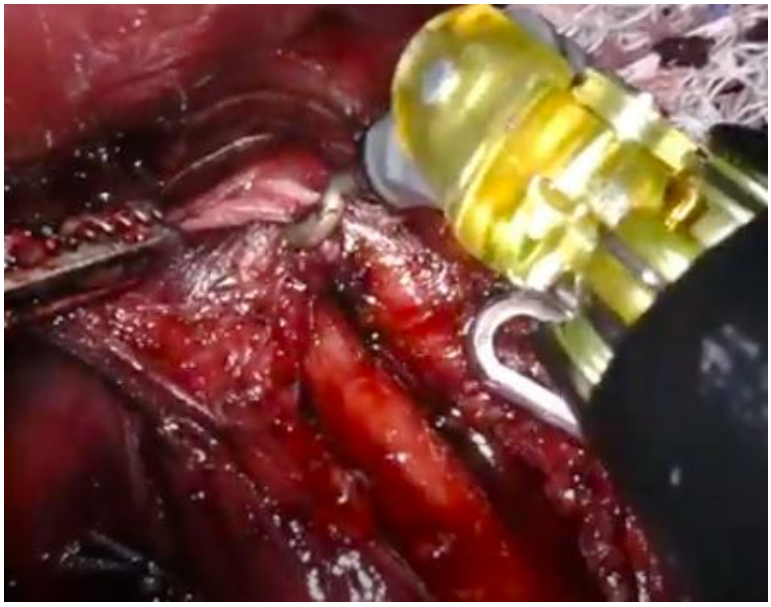

Figure 2: Showing the myotomy using monopolar energy

Given the disruption of the lower esophageal sphincter (LES), an anti-reflux fundoplication is generally performed to minimize the risk of significant gastroesophageal reflux. The choice between fundoplication techniques depends on surgeon preference, patient symptoms, and preoperative physiological testing and radiographic studies assessing esophageal motility. A partial 180-degree anterior Dor fundoplication (Figure 3) is the preferred option, and upon completion of the myotomy, the fundus of the stomach is meticulously inspected to ensure an adequate number of short gastric arteries are taken for a tension-free anterior fundoplication.

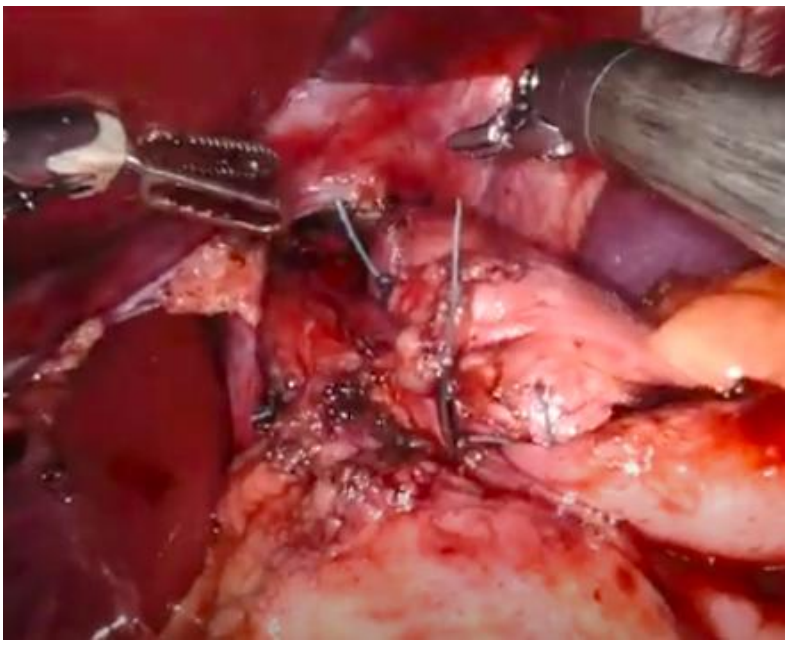

Figure 3: Dor fundoplication

Robotic hook forceps, cadiere, scissors, bipolar fenestrated and needle holder were used. Procedure duration was 90 minutes with docking lasting for 4 minutes, uneventful. The patient was discharged from the hospital 18 hours after the procedure, on a fractionated liquid diet. The patient is currently undergoing outpatient follow-up, with good acceptance of the general diet.

DISCUSSION

The da Vinci robotic platform inherently offers advantages over laparoscopy[1,3]. The technical ease and three-dimensional visualization that the robot provides are just some of the advantages that make it a very promising technology. Although many surgeons anecdotally believe that robotic assistance is beneficial, in reality, few studies have compared the results of robotic Heller myotomy with the standard laparoscopic approach[2,3,4].

Ensuring safety stands as a paramount consideration in this operation. Robotic Heller myotomy (RHM) exhibits minimal postoperative or perioperative complications[4]. The literature places significant emphasis on the rate of esophageal mucosal perforation. Case reports indicate no instances of mucosal perforation, with only one noted in retrospective reviews[5].

In a comprehensive examination of myotomy's evolving role, Allaix and Patti underscore findings from two distinct studies comparing mucosal perforation rates in laparoscopic Heller myotomy (LHM) and RHM[6]. LHM reports rates of 16% and 8%, while RHM consistently shows a 0% perforation rate in both studies[6]. A meta-analysis further reinforces RHM's safety profile, citing significantly fewer mucosal injuries and asserting its superiority over the laparoscopic approach[7].

Technical advantages of RHM are attributed to enhanced 3-D visualization and increased maneuverability of surgical instruments[8]. The improved visualization and precision control are thought to contribute to fewer mucosal perforations and enable the execution of longer myotomy incisions. On the flip side, when considering drawbacks of robotic operations, several studies underscore the cost factor[8,9].

CONCLUSION

In conclusion, in the hands of experienced surgeons, the robotic platform may be safer than the standard laparoscopic approach for treating achalasia, with several research studies

pointing to a decrease in perforations and the question of cost-effectiveness remains an important issue.

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