Use of a Mobilized, Perfused, Falciform Ligament Patch for Repair of Paraconduit Herniation after Robotic Assisted Ivor Lewis Esophagectomy.

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PII: S2666-2507(24)00101-9
DOI: https://doi.org/10.1016/j.xjtc.2024.02.023
Reference: XJTC 1639

To appear in: JTCVS Techniques

Received Date: 14 November 2023
Revised Date: 1 February 2024
Accepted Date: 16 February 2024

Please cite this article as: Kashyap SS, Abbas KA, Herron R, Abbas FA, Chudnovets A, Abbas G, Use of a Mobilized, Perfused, Falciform Ligament Patch for Repair of Paraconduit Herniation after Robotic Assisted Ivor Lewis Esophagectomy., JTCVS Techniques (2024), doi: https://doi.org/10.1016/j.xjtc.2024.02.023.

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Title: Use of a Mobilized, Perfused, Falciform Ligament Patch for Repair of Paraconduit Herniation after Robotic Assisted Ivor Lewis Esophagectomy.

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Disclosure statement: The authors have no conflicts of interest to disclose.

Funding statement: There is no funding to declare.

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Word count: 736
Central Message

We describe a novel technique for robotic repair of paraconduit hernia after minimally invasive esophagectomy that utilizes the falciform ligament as an autologous mesh to cover the hiatus.

Central Picture Legend

Reduced conduit sutured to the hiatus and reinforced with a mobilized falciform ligament.
Introduction

Paraconduit herniation is a known complication of esophagectomy, with an increased incidence noted after esophagectomy using minimally invasive approaches.\(^1\)\(^-\)\(^3\) Paraconduit hernias most often occur to the left and anterior of the gastric conduit.\(^4\) This is thought to be secondary to the location of the right gastroepiploic arcade, because surgeons are less likely to place sutures adjacent to the arcade for fear of injuring the gastric conduit’s sole blood supply. Presentation may range from an incidental finding to respiratory and gastrointestinal symptoms including acute bowel obstruction. A watch-and-wait strategy can be employed if a patient is truly asymptomatic after a thorough assessment, but we encourage most patients with symptomatic hernia to undergo repair.\(^5\)

In this article, we present a novel technique of coupling laparoscopic robotic reduction of hernia and cruroplasty with utilization of a mobilized falciform ligament to buttress and patch the esophageal hiatus to exclude the peritoneal contents from the mediastinum.

Case Presentation

The patient highlighted here was a 56-year-old male with a history of T3N2 distal esophageal adenocarcinoma. We received consent from the patient to present the details of this case; IRB approval was not required. The patient underwent neoadjuvant chemoradiation followed by robotic-assisted minimally invasive esophagectomy (RAMIE) and feeding jejunostomy tube placement. During RAMIE, we routinely place a stitch posterior to the conduit to approximate the right and left crura, narrowing the
hiatus, and place a stitch between the conduit and the crura to discourage herniation. The patient underwent an R0 resection, and the postoperative course was uneventful. A computed tomography (CT) scan during follow up 2 years after RAMIE revealed paraconduit herniation of the colon at the splenic flexure (Figure 1). The patient was symptomatic and agreed to robotic-assisted repair of the hernia.

**Operative Technique**

The patient was placed in reverse Trendelenburg position with his arms abducted. Four 8-mm robotic ports and an assistant port were placed (Figure 2). A Nathanson liver retractor was introduced through a stab wound in the epigastrium. After appropriate adhesiolysis was completed, the herniated contents were reduced. A left cruroplasty was performed using horizontal mattress suturing with 0 Ethibond suture (Johnson & Johnson) between the apex and the body of the left crus. Another stitch was placed between the anterior wall of the conduit and the hiatus to further narrow the hiatus anteriorly.

The falciform ligament was then lysed and mobilized from the anterior abdominal wall. After thorough dissection, the ligament was brought under the left lobe of the liver, making sure that its blood supply, which arises from the hepatic branches in the liver hilum, was preserved. The falciform ligament was then sutured to both crura using V-Loc suture (size 0, Medtronic) and to the anterior surface of the gastric conduit using interrupted (3-0) vicryl sutures. (Video 1)

The patient’s postoperative course after repair was uneventful, and he was discharged home, tolerating a liquid diet, on postoperative day 1. Since discharge, he
has been followed with serial imaging, with no evidence of recurrent disease or hernia during 2 years of follow-up. At our institution, this approach has been used to repair 2 of 3 paraconduit hernias that presented in 138 patients who underwent conventional minimally invasive esophagectomy (MIE) or RAMIE from May 2017 to March 2023. Both patients remain free from hernia recurrence.

**Discussion**

We developed this novel technique of utilizing a mobilized falciform ligament patch during hernia repair to address the problem of hernia recurrence. The falciform ligament can be used irrespective of the patient’s body habitus because the primary benefit comes from the fibrotic ligament rather than the attached adipose tissue.

Paraconduit hernias after RAMIE or conventional MIE are common, with a reported incidence of 4.3%-15%.\(^1\)\(^-\)\(^4\),\(^6\),\(^7\) Ivor Lewis MIE or RAMIE is associated with a higher incidence of symptomatic paraconduit herniation (9.4%) as compared with open esophagectomy (1.5%).\(^2\) Currently, most approaches described for repair of paraconduit herniation entail minimally invasive reduction of the herniated contents, cruroplasty, and suture fixation of the conduit to the hiatus.\(^8\) Hernia recurrence after repair occurs in 14-29% of patients.\(^2\),\(^3\),\(^9\)

While a larger series with sufficient follow up is required to compare hernia recurrence with the falciform patch with other approaches, the absence of recurrence in our patients thus far is encouraging. Based on our limited and short experience, we believe that this technique will reduce the risk of hernia recurrence. An added
advantage of the falciform-patch repair is that suture placement does not have to be near the vital gastroepiploic arcade.
References


Supplemental References


FIGURE LEGENDS

Figure 1. Sagittal (a) and axial (b) images from the patient’s CT scan demonstrating paraconduit herniation of the splenic flexure of the colon through the esophageal hiatus (indicated with blue arrows).

Figure 2. Port placement for robotic-assisted hernia repair and mobilization of a falciform ligament patch. 1: 8-mm robotic port, right paramedian mid-clavicular line, for Cadiere forceps. C: 8-mm robotic port, 2 cm above and to the left of the umbilicus, for camera. 3: 8-mm robotic port, 15 cm from tip of the xyphoid process mid-clavicular line, for harmonic scalpel. 4: 8-mm robotic port, left subcostal area, for double-fenestrated tip-up grasper. A: 12-mm port, right lower quadrant, used by assistant. L: stab wound, epigastrum, for liver retractor. Diagram was previously published by Musgrove et al. Shanghai Chest, 2020, used under CC BY-NC-ND-4.0 (https://creativecommons.org/licenses/by-nc-nd/4.0/).

VIDEO LEGENDS

Video 1. Technique for robotic mobilization of falciform ligament and use as a patch during paraconduit hernia repair.