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Case Report

Minimally Invasive Surgical Approach for Esophageal Adenocarcinoma in a Patient with Previous Belsey Mark IV Fundoplication: A Case Report

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ABSTRACT

Background: Historically, the management for recurrent or persistent Gastro-esophageal reflux disease included selective vagotomy and fundoplication. Despite these surgical interventions, the risk of Barrett's esophagus (BE) and subsequent malignant transformation remains, requiring cancer resection surgery. We present a case of a patient with a gastro-esophageal junction (GEJ) adenocarcinoma, who underwent a pediatric thoracotomy and Belsey Mark IV fundoplication, and was successfully treated by Laparoscopic Ivor-Lewis Esophagectomy (LILE).

Case Presentation: This 64-year-old gentleman with BE and GEJ adenocarcinoma was previously deemed unsuitable for curative surgery due to clinical staging indicating a tumor length of 10cm and suspected invasion of the left pleura. Further staging by Endoscopic ultrasound indicated no evidence of pleural invasion with the distal esophageal thickening in keeping with his previous Belsey Mark IV fundoplication. He underwent neo-adjuvant chemotherapy and a subsequent LILE with complete laparoscopic reversion of the gastric fundoplication without injury to the gastroepiploic artery or fundus. There was sufficient preservation of conduit length to enable a tension free hand-sewn anastomosis with an uneventful post-operative recovery. Final histopathology confirmed ypT1 ypN0 moderately differentiated adenocarcinoma with R0 resection margins. The patient has completed 24 months of cancer recurrence free surveillance.

Conclusion: We describe the successful management of a patient by LILE on a background of previous hiatal fundoplication surgery, previously refused curative surgery. We highlight the importance of EUS as a staging modality for such cases showing invasive disease to increase the final clinical staging accuracy. We suggest a minimally invasive approach may be utilized for successful re-do hiatal dissection as an alternative to a conventional open surgery.

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Background

Symptomatic Gastro-Esophageal Reflux Disease (GERD) is primarily managed by pharmacological intervention with Proton Pump Inhibitors (PPI). Prior to the advent of PPIs, surgical management for symptomatic GERD by selective vagotomy or fundoplication was the established

practice [1]. Untreated GERD has a strong association with Barrett's Esophagus (BE), in which columnar epithelium replaces the stratified squamous epithelium of the esophagus. Between 3-13% of patients with BE develop Intestinal Metaplasia and Esophageal Adenocarcinoma (EAC) [2]. Before the advent of laparoscopic techniques in the 1990s, the Belsey Mark IV Fundoplication operation had been a mainstay in the

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management of GERD and Hiatal Hernia. The technique was described in the 1940s and underwent multiple procedural iterations as a result of serial clinical trials. Over a period of a 20 years the understanding of lower esophageal junction anatomy and physiology, in conjunction with advances in diagnostic techniques, refined the surgical technique [3].

The Belsey Mark IV consists of an anterior 270° partial fundoplication, fixed to the under surface of the diaphragm and performed through a left-sided thoracotomy [4]. This hiatal procedure may potentially impact the ability to perform oncological surgery for EAC by a Laparoscopic Ivor-Lewis Esophagectomy (LILE) approach. We describe the case of a patient who successfully underwent a LILE following a pediatric Belsey Mark IV Fundoplication after comprehensive staging investigations.

Case Presentation

A 64-year-old gentleman, with BE and a prior left thoracotomy for a Belsey Mark IV fundoplication at the age of 6, was referred to our tertiary Esophago-Gastric cancer unit with a radiologically staged T3 N0 M0 Siewert Type 1 gastro-esophageal junction adenocarcinoma. The EAC was within a 10cm segment of BE and had been diagnosed on routine Esophago-gastro-duodenoscopy (EGD) surveillance. The index Computed Tomography (CT) imaging reported two distinct esophageal tumors extending cranio-caudally from mid- to distal esophagus with invasion of the left pleura, deeming him unsuitable for curative surgery at his local hospital (Figures 1 & 2). His past medical history was unremarkable apart from his previous surgery. His medication included once daily PPI. He had a 12-pack year history of smoking and a consumption of 30 units of alcohol per week.



Figure 1: Pre-operative axial cross-sectional image of the gastro-esophageal junction and appearances of tumor with fundoplication wrap *in situ* (white arrow).

A repeat EGD, CT-Positron Emission Tomography (CT-PET) imaging and Endoscopic Ultrasound (EUS) were performed after clinical review at our center. The primary EAC extended from 29 to 34cm from the incisors, which breached the muscularis propria on EUS. In addition, a 5cm hiatal hernia with endoscopic features of a previous fundoplication, was also identified. The patient was discussed at the multi-disciplinary tumor board meeting and the patient was deemed resectable given his primary tumor had been clearly mapped and the other periesophageal features were related to his previous fundoplication. He completed four cycles of neo-adjuvant chemotherapy (5FU, Folinic acid, Oxaliplatin, Docetaxel) on a curative pathway. Following completion of

chemotherapy, repeat CT and EUS imaging showed regression of the tumor to the deep mucosa without lymphadenopathy.

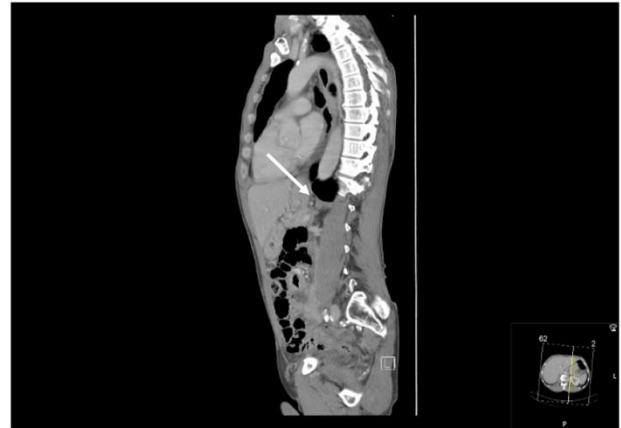


Figure 2: Pre-operative sagittal image of esophagus including the tumor at the gastroesophageal junction and the gastric fundoplication (white arrow).

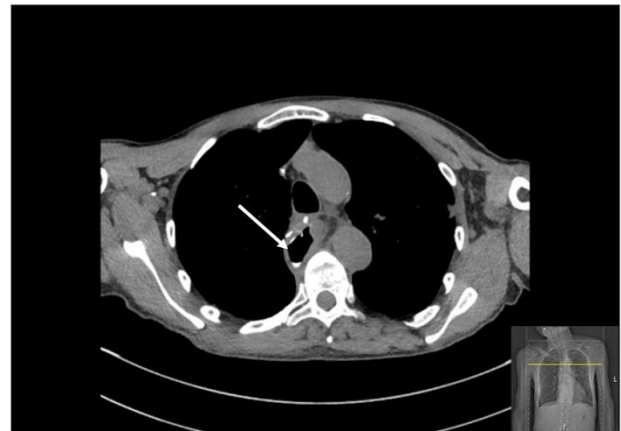


Figure 3: Post-operative axial cross-sectional image of the esophago-gastric anastomosis (white arrow).

The patient underwent a LILE with feeding jejunostomy and insertion of elective tracheostomy. The laparoscopic findings indicated a large hiatal hernia with adhesions between the gastric fundal wrap, the esophagus and thoracotomy wound to the crura. Adhesions to the fundus and greater curve were adjacent to the Right Gastro-epiploic artery arcade. Careful laparoscopic dissection was undertaken to release the adhesions without injuring the vascular supply to the gastric conduit. The majority of crural adhesions were centered around the Belsey Mark IV fundoplication, with particular care taken not to damage the gastric fundus and compromise the length of the gastric conduit. Our standard oncological resection encompasses partial excision of the right and left crural pillars adjacent to the tumor, excision of the pericardial fat pads, aortic adventitia and the hiatal hernia sac to ensure a clear circumferential resection margin (CRM). All of these steps were undertaken laparoscopically, despite his prior hiatal surgery. A formal right posterolateral thoracotomy was performed to complete the thoracic esophageal dissection with para-esophageal, mediastinal and sub-carinal lymphadenectomy. The anastomosis was 8-10cm below the thoracic inlet, with the principle of careful hiatal dissection preserving conduit length and enabling a tension-free, well-perfused anastomosis. Two large-bore thoracic tube drains were placed in the right apex and base.



Figure 4: Post-operative sagittal image of the gastric conduit extending through the hiatus (white arrow).



Figure 5: Post-Operative coronal image of the gastric conduit with thoracic esophago-gastric anastomosis and a well-positioned, non-distended conduit (white arrow).

He made an uneventful post-operative recovery with weaning of mechanical ventilation from Day 2. Inotropes were titrated and ceased by Day 7, with jejunostomy feeding commencing at day 4. He had a 16-day stay on the Intensive Care Unit to facilitate post-operative pulmonary rehabilitation and ensure return to normal respiratory function. The total inpatient hospital stay was 22 days, with the patient being discharged home on a soft diet. Final histopathological analysis confirmed ypT1 ypN0 (0/42 lymph nodes involved) moderately differentiated adenocarcinoma with R0 proximal, distal and CRM resection margins. Follow up CT imaging confirmed a well-placed non-distended conduit (Figures 3-5).

Five months post-surgery, the patient complained of symptomatic dysphagia and underwent an EGD with pneumatic dilatation for an anastomotic stricture. This procedure was repeated on two further occasions with good effect. He has returned to his normal activities of daily living and maintains a normal enteral diet and preservation of his weight. At 24 months post-operative follow-up, the patient remains well with no signs of local or distant disease recurrence.

Discussion

Here we describe the successful management of a patient with a history of anti-reflux surgery by minimally invasive Ivor-Lewis Esophagectomy, who was deemed inoperable after initial clinical

staging. We highlight the importance of tandem CT, CT-PET and EUS imaging for the accurate staging of EAC in such cases with a history of previous hiatal surgery. EUS enables accurate tumor specific loco-regional staging with studies suggesting a sensitivity of 81% for T1 and T2 tumors, increasing to 92% for T3 and T4 tumors [5, 6].

LILE is considered an oncologically appropriate approach for Siewert Type I and II adenocarcinomas and this should not be compromised in those patients with previous hiatal surgery. This case has shown that with careful surgical dissection, there is minimal risk to the conduit such that a standard gastric conduit reconstruction can be utilized. A history of anti-reflux surgery is reported to significantly increase the risk of post-operative complications such as anastomotic leak and re-operation after esophagectomy [7]. We present a case where a laparoscopic abdominal approach was utilized with an uneventful post-operative recovery.

Conclusion

We present a successful case of LILE with a R0 resection and good survivorship of a patient (more than 24 months to date), who was previously deemed not suitable for potentially curative management. We suggest staging with CT-PET and EUS has a crucial role in these patients and indicate the importance of the multi-disciplinary team discussion involving specialist upper Gastrointestinal surgeons experienced in both benign (anti-reflux) and oncology surgery.

Author Contributions

Conception and design: S. Kumar; Administrative support: None; Manuscript writing: R. Goburdhun, M. Likos-Corbett, P.H. Patel, S. Kumar; Manuscript editing: R. Goburdhun, P.H. Patel; S. Kumar; Final manuscript review: R. Goburdhun, M. Likos-Corbett, P.H. Patel, C. Groves, J. Chow, A-M. Young, S. Uren, M.A. Chaudry, S. Kumar.

Ethical Approval

There is no ethical approval associated with this case report.

Consent for Publication

The patient provided written informed consent was obtained from the patient for publication of this case report and any accompanying images.

Conflicts of Interest

None.

Abbreviation

GERD: Gastro-Esophageal Reflux Disease
PPI: Proton Pump Inhibitor
BE: Barrett's Esophagus
EAC: Esophageal Adenocarcinoma
EGD: Esophago-Gastro-Duodenoscopy
CT: Computed Tomography
CT-PET: CT Positron Emission Tomography
EUS: Endoscopic Ultrasound
CRM: Circumferential Resection Margin

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