Esophageal Clinical and Pathological Staging Case Scenarios

Case #1

HPI: Bill Butler is a 65-year-old male, occasional cigar smoker, h/o PTCAx1, who is referred for surgical evaluation and treatment of newly diagnosed GEJ esophageal adenocarcinoma without dysphagia. Patient reports that on 2/20/23, he became acutely ill with nausea, diaphoresis, and syncope. His wife had thought him to be unresponsive with cessation of breath and loss of pulse, and therefore did CPR. He did recover consciousness and started vomiting up blood, and subsequently was transferred to a local hospital for emergent workup and care. He was found to be anemic and subsequent upper endoscopy on 2/21/23 showed two esophageal ulcers found at GEJ, one with large adherent clot that revealed invasive adenocarcinoma, well to moderately differentiated. He does admit that he has had a history of reflux but had stopped taking his omeprazole a few years back due to an improvement in symptoms. He had not had any prior endoscopy. EUS was performed on 3/8/23, staging the lesion as T2NO. Patient met with an oncologist who stated that best plan would be to move forward with surgical resection at this time with possible systemic therapy in the adjuvant setting depending on pathology. He reports no weight loss.

Patient had myocardial perfusion stress test done 12/13/22, which showed left ventricular myocardium with uniform radiotracer distribution, without perfusion defect. The left ventricle is normal in size with no segmental wall motion abnormality. EF is approximately 67%. Patient states that he stopped Plavix at the time of his syncopal episode in February, as his stent was placed 5 years ago. Per his cardiologist, he was cleared for esophagectomy.

PET/CT done 3/6/23 showed a focus of FDG uptake in the distal esophagus that does not have a definite CT correlate, and no FDG evidence of metastatic disease. Patient was scheduled for a 2-stage robotic Ivor Lewis esophagectomy on 4/10/23 and 4/11/23.

In a thoracic surgery clinic visit prior to surgery the patient denies any dysphagia or odynophagia. He has had no further nausea, vomiting, hematochezia, abdominal pain, diarrhea, or constipation. He is active and can perform ADLs without difficulty. He stopped a keto diet recently after his dietician advised against it. He denies fevers, chills, night sweats, weight loss or progressive fatigue.

PMH: Patient has a past medical history of CAD s/p PCI (2018), GE reflux, hyperlipidemia.

PSH: Patient has a past surgical history of hemorrhoidectomy (unknown date).

Social History: Patient reports smoking history of cigar smoking a few days a week. He has never smoked cigarettes and never used smokeless tobacco. He reports drinking 2 glasses of wine a week. He reports that he never has used drugs. He is married and lives with his wife. ECOG performance status is 0.

CT Abdomen/Pelvis with IV Contrast

Performed: 2/20/2023 at 1834

CLINICAL HISTORY: Abdominal pain

TECHNIQUE: CT of the abdomen and pelvis was performed with 80 ml of Omnipaque-350 administered intravenously. This exam was performed according to our departmental dose optimization program. Up-to-date CT equipment and radiation dose reduction techniques are utilized as appropriate.

Exposure: 1: Series: AbdPelvis 3.0 Br40 1: Anatomy: Abdomen: Phantom: 32 cm: CTDIvol: 20 mGy; DLP: 1094 mGy-cm

COMPARISON: None

FINDINGS:

The visualized portion of the lung bases are normal. The heart is normal in size. There is no pericardial or pleural effusion.

The liver, spleen, adrenal glands, gallbladder, and pancreas are normal. Both kidneys have a normal CT appearance. The abdominal aorta is normal. The inferior vena cava is normal. There are no abnormal enlarged periaortic, pericaval, or retrocrurual lymph nodes. The small bowel is mildly distended, and fluid filled. There is no evidence for bowel obstruction. The appendix is normal without findings to suggest acute appendicitis. The colon is normal.

There are no pelvic masses. There is no free fluid in the pelvis. There is no inguinal, iliac, or femoral adenopathy.

The bladder is normal in contour without mass or thickening.

The lumbar spine is unremarkable. There is mild anterior compression of the T12 vertebral body. There age of this is uncertain.

IMPRESSION:

1. MILDLY DISTENDED FLUID FILLED LOOPS OF SMALL BOWEL THROUGHOUT THE ABDOMEN RAISING THE POSSIBLITY OF A MILD DIFFUSE ENTERITIS. THERE IS NO BOWEL OBSTRUCTION.
2. NORMAL APPENDIX
3. OTHERWISE, UNREMARKABLE CT OF THE ABDOMEN AND PELVIS

PET/CT FDG

COMPLETED DATE: 3/6/2023

CLINICAL INDICATION: Malignant neoplasm of lower third of esophagus

TECHNIQUE: Following administration of approximately 15.3 mCi F18-FDG, 42 minutes quiet uptake was completed. Subsequently, PET acquisition was performed. A separate low dose CT was then completed from the orbits to the mid-thighs. Blood glucose = 111 mg/dl.

Radiation Dose: CTDI: 7.58 DLP 673.2

COMPARISON: None

FINDINGS:

HEAD AND NECK: Physiologic activity seen at the base of the brain and the neck. No abnormal focus of increased activity is identified. The nasopharynx, oropharynx, and hypopharynx are normal. The parotid, submandibular, and thyroid glands are normal. No FDG avid lymphadenopathy.

CHEST: Physiologic activity within the mediastinum measures 3.2 SUV max. No FDG avid axillary, mediastinal or hilar lymphadenopathy. The heart is normal in size with coronary artery calcifications. No pericardial effusion. No FDG avid pulmonary nodule, mass or other lesion. No pleural fluid.

ABDOMEN AND PELVIS: A focus of FDG uptake in the distal esophagus measures 2.4 SUV max without definite CT correlate. Physiological activity is seen within the gastrointestinal and genitourinary tracts. The liver, spleen, gallbladder, pancreas, and bilateral adrenal glands are within normal limits. Evaluation of the kidneys is within normal limits bilaterally without hydronephrosis. There may be a stone I the distal right ureter. Normal appendix. Evaluation of the GI tract is limited by lack of distention and retained stool. No ascites. No FDG avid abdominal adenopathy. The aorta is atherosclerotic. The urinary bladder contains excreted FDG. The prostate is normal in size. No FDG avid pelvic adenopathy.

BONES: No suspicious focus of increased activity identified.

IMPRESSION: As given in the clinical history, there is a focus of FDG uptake in the distal esophagus that does not have a definite CT correlate. No FDG evidence of metastatic disease.

PROCEDURE PERFORMED: Endoscopic Ultrasound, esophagogastroduodenoscopy, biopsy

DATE OF PROCEDURE: 3/8/2023

INDICATION(S): GE junction cancer

BACKGROUND: This 65-year-old male presented to an outside facility with new onset of dysphagia and was found to have adenocarcinoma. This procedure was planned for local staging.

PROCEDURE DETAIL AND TECHNIQUE: After an informed consent was obtained, the patient was placed in the left lateral decubitus position. He received intravenous sedation. After sedation was achieved, an Olympus diagnostic upper endoscope and then a radial-scanning scope were sequentially introduced and passed to the pylorus. The perigastric and esophagus were carefully examined. The procedure was terminated.

CONSENT: The patient was given specific details of the intended procedure, including the indication, how it would be done, the potential risks and their likelihood, and possible alternatives if the EUS was not done. Possible risks that included bleeding, infection and perforation had been explained to the patient. If needle sampling of the pancreas was done, pancreatitis might also occur. Collectively, the patient should expect less than one in 1,000 chance of encountering a complication if a simple diagnostic procedure was done and 1 in 200 chance of some complications if needle sampling was carried out.

PROCEDURE FINDINGS: The endoscopic examination showed a normal proximal to mid esophagus. The Z line was at roughly 40-41 cm, with a slightly raised lesion at 40 cm that extended to 42 cm/gastric cardia. A retroflex examination proximally showed no fundic lesion. Even the GE junction lesion was difficult to visualize during the retroflex examination. The rest of the stomach was unremarkable.

Sonographically, the pancreatic body and tail appeared normal. A brief examination of the liver was unremarkable. The proximal gastric wall up to the esophagus was carefully examined and no definite gastric wall lesion was seen. No perigastric lesion was identified. The mucosal lesion corresponded with a superficially identified lesion on EUS, involving the mucosa and submucosa. It was best seen posteriorly and on the right posterior aspect of the esophagus, occupying no more than 1/4 of the circumference of the esophagus. The lesion was roughly 2-2.5 cm in length. The muscularis propria was not involved. No node was seen in the mediastinum.

After the EUS, the upper endoscope was re-introduced to biopsy the lesion.

Estimated blood loss: 0 ml

IMPRESSION(S):

1. T2 lesion involving the mucosa and most of the submucosa at the posterior/right posterior aspect of the GE junction/cardia

2. No nodes noted

3. This is a T2N0 lesion of 2-2.5 cm in length and involves no more than 1/4 of the esophageal circumference

Pathology:

PATHOLOGY REPORT
COLLECTED: 2/21/2023 11:56 AM
PROCEDURE: Upper GI endoscopy and biopsy
CLINICAL INFORMATION: GI bleed. Esophageal ulcer versus possible mass at gastroesophageal junction.
SPECIMEN(S):
A. GE junction biopsy
B. Antrum and body biopsy
DIAGNOSIS:
A. Biopsy, GE junction:
Invasive well to moderately differentiated adenocarcinoma
B. Biopsy, antrum and body:
Mild chronic anral and oxyntic gastritis.
Negative for Helicobacter pylori (Diff-Quik stain)
No intestinal metaplasia or neoplasm identified.
Comment: Mismatch repair protein and HER2 immunostains will be performed on block A1 and reported in an addendum.

SURGICAL PATHOLOGY REPORT
COLLECTED: 4/11/2023
PROCEDURE: Minimally Invasive Ivor Lewis Esophagectomy
A. LYMPH NODE, LEVEL 7 SUBCARINAL, DISSECTION:
- Eleven lymph nodes with no metastatic carcinoma identified (0/11)
B. LYMPH NODE, RIGHT LEVEL 10 HILAR, DISSECTION:
- Two lymph nodes with no metastatic carcinoma identified (0/2)
C. LYMPH NODE, LEFT LEVEL 10 HILAR, DISSECTION:
- Two lymph nodes with no metastatic carcinoma identified (0/2)
D. SOFT TISSUE, RIGHT LEVEL 8 PARAESOPHAGEAL, EXCISION:
- Fibroadipose tissue with no significant histopathologic changes
- No carcinoma identified
E. LYMPH NODE, RIGHT LEVEL 9 PULMONARY LIGAMENT, EXCISION:
- Two lymph nodes with no metastatic carcinoma identified (0/2)
F. LYMPH NODE, LEFT LEVEL 10 HILAR #2, DISSECTION:
- Two lymph nodes with no metastatic carcinoma identified (0/2)
G. LYMPH NODE, LEFT LEVEL 4, DISSECTION:
- Nine lymph nodes with no metastatic carcinoma identified (0/9)
H. LYMPH NODE, RIGHT LEVEL 4, DISSECTION:
- Eleven lymph nodes with no metastatic carcinoma identified (0/11)
I. LYMPH NODE, RIGHT LEVEL 2, DISSECTION:
- Five lymph nodes with no metastatic carcinoma identified (0/5)
J. STOMACH, EXCISION:
- Portion of stomach with oxyntic mucosa with mild chronic active gastritis
- No carcinoma identified
- No Helicobacter pylori identified
- No intestinal metaplasia or dysplasia identified
K. ESOPHAGUS AND STOMACH, ESOPHAGOGASTRECTOMY:

- Invasive adenocarcinoma of the gastroesophageal junction (see synoptic report)
- Forty lymph nodes with no metastatic carcinoma identified (0/40)
- Focal intestinal metaplasia adjacent to carcinoma at the gastroesophageal junction
- Background stomach with oxyntic mucosa with mild chronic gastritis
- No significant active inflammation identified
- No Helicobacter pylori identified
- No intestinal metaplasia or dysplasia identified
- Background esophagus with focal ulceration and focal dilated vein with fibrin thrombus

Tumor

Tumor Site: Esophagogastric junction (EGJ)
Relationship of Tumor to
Esophagogastric Junction: Tumor midpoint is located at the esophagogastric junction
Histologic Type: Adenocarcinoma
Histologic Grade: G2: Moderately differentiated
Tumor Size: Greatest dimension: 2.0 cm
Tumor Extent: Tumor invades the submucosa
Treatment Effect: No known presurgical therapy
Lymphovascular Invasion: Not identified
Perineural Invasion: Not identified

Margins

Margin Status for
Invasive Carcinoma: All margins negative for invasive carcinoma
Closest Margin(s) to Invasive Carcinoma: Radial
Distance from Invasive Carcinoma to Closest Margin: Exact distance in cm: 0.3 cm (as measured microscopically)
Margin Status for Dysplasia and Intestinal Metaplasia: All margins negative for dysplasia
Margins: All margins are uninvolved by invasive carcinoma, dysplasia, and intestinal metaplasia
Margins examined: Proximal, distal, radial/adventitial
Distance of invasive carcinoma from closest margin: 0.3 cm
Closest margin(s): Radial/adventitial

Regional Lymph Nodes

Regional Lymph Node Status: All regional lymph nodes negative for tumor
Number of Lymph Nodes Examined: Exact number: 84

Distant Metastasis

Distant Site(s) Involved: Not applicable

Pathologic Stage Classification (pTNM, AJCC 8th Edition)

Primary Tumor (pT): pT1b: Tumor invades the submucosa
Regional Lymph Nodes (pN): pN0: No regional lymph node metastasis

Stage 1 Minimally Invasive Ivor-Lewis Esophagectomy

DATE OF OPERATION: **4/10/2023**

PATIENT NAME: Bill Butler

PREOPERATIVE DIAGNOSIS: Esophageal cancer

POSTOPERATIVE DIAGNOSIS: Esophageal cancer

SURGEON: Ida Best, MD

ASSISTANT: A. M. Doctor, MD, A. Cutter, MD

OPERATION(S) PERFORMED:
1. Robotic vascular conditioning of gastric conduit.
2. Robotic assisted staging laparoscopy, multiple biopsies and lymph node dissection.
3. Esophagogastroduodenoscopy.
4. Fiberoptic bronchoscopy.

ANESTHESIA: GETA

ESTIMATED BLOOD LOSS: 50 cc

OPERATIVE FINDINGS: There was no evidence of any peritoneal studding or any implants on the liver. On retroflexion, there was no evidence of any tumor invasion into the cardia of the stomach. Excellent hemostasis. No evidence of hemorrhage. All staple lines intact.

OPERATIVE PROCEDURE:
After informed consent was obtained, the patient was brought to the operating room. Anesthesia was induced. The patient was intubated after which a time-out was performed. The patient was identified. Thereafter, the procedure was started. Bronchoscopy was undertaken. The tracheobronchial tree was evaluated. There was no evidence of any endotracheal or endobronchial lesions, and the tracheobronchial tree was clear. At this point, the bronchoscope was withdrawn. Gastroscopy was undertaken. A gastroscope was introduced to the oropharynx. The esophagus was intubated. The gastroscope was introduced into the stomach. The stomach was insufflated, and the gastroscope was retroflexed. The GE junction was evaluated. There was no tumor grossly that we could see into the cardia. The gastroscope was then straightened out again. The pylorus was intubated. There were no lesions in the duodenum. The gastroscope was pulled back into the stomach and the pylorus identified. the stomach was desufflated and the gastroscope was withdrawn.

Thereafter, the abdomen was prepped and draped in the usual sterile fashion. Veress needle technique was used to insufflate the abdomen at Palmer's point, after which a 30-degree scope was used to introduce the robotic 8mm trocar Paramedian to the umbilicus under direct visualization. With the camera in the insufflated abdomen, after which under direct visualization, the abdomen was surveyed. There was no evidence of any peritoneal studding or any neoplasm of the liver. Therefore, incisions were made in the abdomen for insertion of the remaining robotic trocars for progression of the case. One 12mm robotic trocar was placed in the RLQ and 2 remaining 8mm robotic trocars as well as a

12mm assistant port in the right lower quadrant. A nathanson retractor was utilized to retract the liver. The patient was then placed in steep reverse Trendelenburg. The robot was then docked and the instruments inserted.

The gastrohepatic ligament was identified and transected using the robotic vessel sealer until the right crus identified. This carried us along the anterior border of the phrenoesophageal ligament as well, which was also transected and carried circumferentially.

We then turned out attention to the retroesophageal space, which was also dissected free as well, as well as the left crus. We then turned our attention to the greater curvature of the stomach. We identified the gastroepiploic artery, which was intact. We then began to transect the short gastric vessels, dividing the gastro-splenic ligament and ligation transection of the short gastric vessels was achieved using the robotic vessel sealer. Once this was done, we carried it all the way up to the left crus and freed up the entire gastroesophageal connections to the crura, both left, right, posterior and anterior. Once this was done, we then continued our dissection along the greater curvature, dividing the gastrocolic ligament and being careful to stay away from the gastroepiploic artery. We continued this until most of the stomach was free. We then began to dissect the stomach free from its retrogastric adhesions, which were numerous. We carefully and meticulously dissected it free until the entire stomach was free of attachments posteriorly as well. We then identified the left gastric artery and vein. We then dissected the celiac axis and the left gastric artery and vein. This was done to allow for lymph node dissection of the celiac lymph node which was carefully and meticulously dissected away from the axis and sent off for pathology. Next we turned our attention to the left gastric artery and vein. We then dissected the left gastric artery and vein. This was done to allow for lymph node dissection of the left gastric lymph node which was carefully and meticulously dissected away from the vessels and sent off for pathology. At this point, the left gastric artery and vein were taken using a robotic vascular stapler.

Then abdomen was evaluated for hemostasis. At this point, we were satisfied. The robotic instruments were removed, and the robot undocked. The abdomen was desufflated, the trocars were removed, and the skin was closed with staples.

At the end of the case, sponge and needle counts were correct. The patient was extubated and taken to the PACU in stable condition.

Stage 2 Minimally Invasive Ivor-Lewis Esophagectomy

DATE OF OPERATION: **4/11/2023**

PREOPERATIVE DIAGNOSIS: Esophageal adenocarcinoma

POSTOPERATIVE DIAGNOSIS: Same

SURGEON: Ida Best, MD

ASSISTANT: A. M. Doctor, MD, A Cutter, MD

OPERATION(S) PERFORMED:
1. Robotic Esophagectomy with esophagogastric anastomosis in the chest
2. Robotic Right thoracic lymphadenectomy and esophageal mobilization.
3. Creation of Omental Flap and coverage of anastomosis and staple line
4. Multilevel intercostal nerve blocks.
5. Robotic assisted Laparoscopy and creation of gastric conduit.
7. Fiberoptic bronchoscopy.
8. Esophagogastroduodenoscopy

ANESTHESIA: GETA

ESTIMATED BLOOD LOSS: 100cc

OPERATIVE FINDINGS: Upon robotic re-exploration of the abdomen, there appeared to be a well perfused stomach. Therefore, we proceeded with our esophagectomy. Again, there was no evidence of peritoneal disease. The anastomosis was at 24cm.

OPERATIVE PROCEDURE:
After informed consent was obtained, the patient was identified and brought to the operating room, where anesthesia was induced. The patient was intubated with a dual-lumen endotracheal tube. Fiberoptic bronchoscopy was undertaken to ensure proper placement of the endotracheal tube and to evaluate the tracheobronchial tree. The tracheobronchial tree was clear and intact, and the endotracheal tube was properly positioned. At this point, the bronchoscope was withdrawn. Thereafter, the abdomen was prepped and draped in the usual sterile fashion. The previous incision was accessed and used to insufflate the abdomen, after which a 30-degree scope was used to re-introduce all of the robotic ports and assistant port under direct visualization. A Nathanson retractor was placed. Once the trocars were in place, the abdomen was surveyed. The stomach appeared healthy and pink after the prior esophagectomy staging portion.

We ensured that the stomach and GEJ were appropriately free from all of its attachments. All of the entire gastric conduit looked viable. There were no areas of demarcation. We therefore began to tubularize the stomach using multiple firings of the robotic 45 green loaded stapler. The first load was at the incisura and a black staple load was used to begin the conduit at the lesser curve. Following that, we used multiple firings to create an approximately 2.0 cm wide gastric conduit all the way up to the gastric fundus, staying away from the angle of His.

Once this was performed and we divided the entire gastric conduit, we then attached the gastric conduit to the gastroesophageal specimen remnant using one 0 Vlock suture, with a 24 Blake drain attached to the divided specimen to act as a buttress when retracted into the chest. We then desufflated the abdomen, removing the trocars under direct visualization. The fascia was closed using 0 Vicryl sutures for the 12mm trocar sites. The skin was then reapproximated using staples and the Blake drain were sutured in using 2-0 nylon. At the end of this portion of the case, the sponge and needle counts were correct.

At this point, the patient was placed into the left lateral decubitus position and the right side up. The chest was prepped and draped in the usual sterile fashion. Our robotic incisions were made, with two 12mm trocars, one in the inframammary line mid clavicular and one in the posterior 8th intercostal space. Another 8mm robotic trocar in the 3rd intercostal space just anterior to the trapezius muscle and finally the camera port in the posterior axillary line in the 9th intercostal space. Another 15mm assistant port was placed in the posterolateral chest at the diaphragmatic level. Once this was done, the robot was docked and the robotic instruments inserted. The lung had been isolated. We turned our attention to the inferior pulmonary ligament, which was taken down using vessel sealer. We carried this dissection to the level of the inferior pulmonary vein. We began our dissection of the esophagus by starting on the pericardium and carrying the dissection all the way up into the subcarinal space. The left and right mainstem bronchi were identified. The subcarinal lymph node packet was carefully and meticulously dissected out using the vessel sealer and blunt dissection. There were dense adhesions and scarring between the esophagus and the tracheobronchial tree. We therefore continued with great care and carefully and meticulously dissected the tissues free, taking care not to cause any injury. Once this was done, we carried our dissection all the way up along the esophagus, taking all of the lymph nodes and periesophageal tissue, until we reached the azygous vein. We then turned our attention back down towards the hiatus and identified the azygous vein and opened up the pleura over that. The periesophageal tissue on this side was also dissected carefully all the way up to the azygous vein. We then took the retroesophageal tissue as well, creating a window behind the esophagus. We then placed a 1/2-inch Penrose drain around the esophagus and created a leash. Once we had this in place, we continued our circumferential dissection of the esophagus, along with the periesophageal tissue and lymph nodes, making sure that we had good hemostasis throughout the procedure. Once we reached the level of the azygous vein, we divided the azygous vein using a robotic vascular stapler and continued our dissection cephalad, nearly to the level of the thoracic inlet. We identified the anterior and posterior vagal nerves, and transected them using the robotic vessel sealer. Once this was done, we continued our dissection bluntly identifying the superior vena cava and the trachea as well, being careful to stay away from them. We also identified the membranous trachea of the intermediate bronchus as well as the right mainstem and left mainstem bronchi and stayed away from those as well during our dissection. Once we completed this, we were satisfied that we had complete mobilization of the esophagus both proximally and distally, from the hiatus all the way up to nearly the level of the thoracic inlet. Once we had done this, we reevaluated the area and evaluated for bleeding. There was no evidence of bleeding. We were satisfied with our hemostasis. We had full mobilization of the esophagus and the periesophageal tissue, and lymph nodes as well.

We then transected the esophagus with a green loaded robotic stapler just below the level of the thoracic inlet ensuring good perfusion with ICG. We then delivered the specimen into the thoracic cavity making sure the conduit was not twisted. We then transected the tip of the gastric conduit with a robotic black 45 load. About a 5mm otomy was made in the gastric conduit and an end to side anastamosis with a robotic 45 load stapler was performed. The anastamosis was then closed using two layers of 3-0 absorbable Stratafix suture. The anastomosis was completed and once the

anastomosis was completed, we performed an endoscopy. There was a widely patent anastamosis with smooth transition into the neo esophagus. The anastomosis was completely intact and patent. We then performed a leak test and we could confirm no bubbling to represent an anastamotic leak. Once we were satisfied with this, we placed one straight 20-French chest tube, which was held in place and sutured in place using 2-0 monocryl and 1 Vicryl sutures. The blake drain was placed posterior to the conduit and the chest tube placed posterior to the lung The lung was then reexpanded and the chest tube was in good position and the lung expanded well. All of the incisions were closed in 2 layers using a deep layer of 2-0 Vicryl and skin was closed using running 4-0 Monocryl. At the end of the case the sponge and needle counts were correct.

A fiberoptic bronchoscopy was then undertaken to clean out the tracheobronchial tree and evaluate the membranous trachea, which was intact. There was no evidence of any injury to any portion of the membranous trachea or the bronchi, or the segmental or subsegmental tracheobronchial tree. At this point, we removed the bronchoscope and the case was considered over. At this point, the patient was awakened from anesthesia and extubated. The patient tolerated this procedure well and was taken to the SICU in stable condition.

Case #2

HPI: Peter Parkour is a 76-year-old white male, former 50 py smoker, with PMHx significant for HTN, HLD, CAD, severe aortic stenosis, s/p TAVR in 2019, abdominal trauma with stab wound in 1973 s/p ex lap with bowel repair, DM II, CKD, BPH, and COVID-19 infection in 2020 requiring hospitalization. He was initially seen by thoracic surgery clinic on 6/28/2022 and was referred for surgical evaluation and treatment of poorly differentiated GEJ adenocarcinoma diagnosed on EGD with biopsy on 6/9/2022. Pt reported massive GI bleed requiring hospitalization, intubation, and blood transfusion at OSH in 8/2021. At that time, he reported an EGD with esophageal ulceration. He has been on pantoprazole since that time. He states that he has no longer had melena or signs/symptoms of GI bleed, however reports onset of dysphagia to solid foods, occasional constipation, weight loss, and occasional night sweats. He also admits to SOB With exertion, such as with hiking. He performs ADLs and walks without difficulty or assistance. He denies fatigue, headache, dizziness/lightheadedness, blurry vision, cough, hemoptysis, heartburn, regurgitation, chest pain, abdominal pain, N/V/D, leg pain/swelling, extremity numbness/tingling/weakness, bone pain.

He returns to the thoracic surgery clinic on 10/11/2022 after completion of neoadjuvant chemoradiation with 50Gy/25Fx and concurrent carbo/taxol completed 9/2/22. He feels well after chemoradiation and is currently having no issues with swallowing. He has maintained is weight and his energy level is very good. He hikes every morning. He denies fatigue, F/C, HA, dizziness/lightheadedness, blurry vision, cough, hemoptysis, heartburn, regurgitation, CP, abdominal pain, N/V/D, leg pain/swelling, extremity numbness/tingling/weakness, bone pain.

Patient was seen by his cardiologist for cardiology clearance prior to surgery who stated that because the patient can take multiple stairs without symptoms, has good physical capacity, had no significant CAD on his cardiac cath in 2018, and had no ischemic changes to his EKG during his visit, the patient can procedure with surgery without any other additional cardiology studies.

PET/CT done 6/24/22 showed moderate increased activity at the gastroesophageal junction, presumably at the site of the biopsy proven adenocarcinoma, with no other foci of suspicious increased activity to suggest metastatic disease. Restaging PET/CT done 10/10/2022 showed mild activity at the gastroesophageal junction, showing improvement in the size and activity at the site of the biopsy proven adenocarcinoma. The patient was scheduled for a 3-hole McKeown esophagectomy on 11/7/2022. Minimally invasive would be attempted in the abdomen, but there would be a low threshold to convert to laparotomy if it was not possible due to his prior abdominal surgery.

PMH: Patient has a past medical history of hypertension, hyperlipidemia, coronary artery disease, severe aortic stenosis s/p TAVR (transcatheter aortic valve replacement) in 2019, Diabetes mellitus Type 2, chronic kidney disease, and COVID-19 infection with hospitalization in 2020.

PSH: Patient has a past surgical history of TAVR (2019), exploratory laparotomy with bowel repair following abdominal trauma (1973).

Social History: Patient reports that he quit smoking in 2010. Smoking history included the use of cigarettes. He has a 50.00 pack-year smoking history. He never used smokeless tobacco. He reports rare use of alcohol. He reports that he does not use drugs. He is married and lives with his wife. ECOG performance status is 1.

CT CHEST ABDOMEN PELVIS W CONTRAST

COMPLETED DATE: 6/13/2022 11:52 AM

CLINICAL INDICATION: Cancer of the esophagus.

COMPARISON: CT angiogram of the chest, abdomen, and pelvis with contrast dated 12/26/18.

TECHNICAL FACTORS: CT scan of the chest abdomen and pelvis was performed with IV contrast. Additional 2-D reformatted images were performed.

IMAGING MEDICATION: iohexol (OMNIPAQUE) 300 mg/mL injection 100 mL

FINDINGS:

TUBES AND IMPLANTS: There are no tubes or implants noted

CHEST:

LUNG AND LARGE AIRWAYS: 4 mm pulmonary nodule seen within the anterior segment of the right upper lobe without change. Pleural based nodule inseparable from the minor fissure is without change.

PLEURA: There are no pleural effusions.

AORTA: Status post TAVR.

CORONARY ARTERY: Calcifications are seen in the right and left coronary arteries.

PULMONARY ARTERIES: Normal appearance.

HEART: The heart is normal in size.

MEDIASTINUM AND HILA: There are no enlarged hilar or mediastinal lymph nodes.

CHEST WALL AND LOWER NECK: Unremarkable.

ABDOMEN:

LIVER: The liver is normal. There are no focal hepatic lesions.

VEINS: The hepatic, portal, splenic, and superior mesenteric veins are patent.

BILE DUCTS: There is no biliary dilatation.

GALLBLADDER: The gallbladder is unremarkable. No gallstones or wall thickening.

SPLEEN: The spleen is normal in size and appearance.

PANCREAS: The pancreas is normal with no evidence for mass or ductal dilatation.

ADRENALS: The adrenal glands are normal, without nodularity.

KIDNEYS: Normal in appearance.

AORTA/IVC: The aorta is atherosclerotic.

CELIAC/MESENTERIC ARTERIES: The central visceral vessels are patent.

MESENTERIC LYMPH NODES: No enlarged mesenteric lymph nodes.

PERITONEUM: No ascites or free air, no fluid collection.

RETROPERITONEUM: There are no enlarged retroperitoneal lymph nodes.

BOWEL: Scattered diverticula in the sigmoid colon is seen.

PELVIS:

REPRODUCTIVE ORGANS: The prostate and seminal vesicles are normal.

PELVIC LYMPH NODES: There are no enlarged pelvic sidewall or inguinal lymph nodes.

PELVIC PERITONEUM/EXTRA PERITONEUM: No ascites or free air, no fluid collection.

URETERS: The distal ureters are nondilated.

URINARY BLADDER: Normal.

PELVIC BOWEL: Large and small bowel loops are normal in caliber and appearance.

ABDOMINAL WALL: Ventral hernia containing fat.

BONES: No suspicious osseous lesions.

IMPRESSION:

1. Stable pulmonary nodule in the right upper lobe.
2. Status post TAVR.
3. Coronary artery disease.
4. No CT evidence of metastatic disease in the chest, abdomen and pelvis.

NUC MED PET/CT SKULL-THIGH

COMPLETED DATE: 6/24/2022 10:06 AM

CLINICAL INDICATION: 76 year old male with biopsy-proven (6/9/2022) poorly differentiated adenocarcinoma at the gastroesophageal junction, for initial staging.

COMPARISON: CT chest abdomen pelvis 6/13/2022

TECHNICAL FACTORS: Following the intravenous injection of 14.9 mCi of F18-deoxyglucose, a PET study was obtained with a PET-CT scanner from the base of the brain to the mid thigh. The study was registered and fused with the CT scan acquired during the procedure.
Blood glucose prior to injection: 112 mg/dl
Uptake time: 67 min.

FINDINGS:

NECK: No focal areas of increased activity are seen in the neck and in the supraclavicular regions.

CHEST: No focal areas of increased activity are seen in the axilla and in the chest wall.
No focal areas of increased activity are seen in the hilar regions and in the mediastinum. Status post TAVR. Coronary artery calcifications.
Stable subcentimeter nodule in the right upper lobe (2-84), too small to definitively characterize by PET.

ABDOMEN: Moderate increased activity (SUV max = 5.4) at the gastroesophageal junction, presumably at site of biopsy-proven adenocarcinoma. No other areas of increased activity are seen in the remaining abdomen. There is physiologic activity in the liver, spleen and kidneys. The pancreas and adrenals are unremarkable.

PELVIS: No focal areas of increased activity are seen in the pelvis. There is evidence of physiologic activity in the bladder and bowel. No focal areas of increased activity are seen in the inguinal regions.

SKELETON: No focal areas of increased activity are seen in the visualized skeleton. There are degenerative changes of the thoracolumbar spine.

IMPRESSION:
1. Moderate increased activity at the gastroesophageal junction, presumably at site of biopsy-proven adenocarcinoma.
2. No other foci of suspicious increased activity to suggest metastatic disease.
3. Stable subcentimeter nodule in the right upper lobe is too small to definitively characterize by PET. Attention on follow-up.

A CT scan was performed and was used for attenuation correction and anatomic correlation. No separate report for the CT scan obtained for attenuation correction will be issued.

PROCEDURE PERFORMED: Upper endoscopic ultrasound

DATE OF PROCEDURE: 7/7/2022

INDICATION: Staging of esophageal adenocarcinoma

BACKGROUND: This is a 76 year old male with newly diagnosed GEJ carcinoma EUS for staging. Refer to note in patient chart for documentation of history and physical.

PROCEDURE DETAIL:

After obtaining informed consent, the endoscope was passed under direct vision. Throughout the procedure, the patient's blood pressure, pulse, and oxygen saturations were monitored continuously. The

Olympus GF-UCT180 s/n 7510705 Linear Scope was introduced through the mouth, and advanced to the second part of duodenum. The was introduced through the mouth, and advanced to the second part of duodenum. The patient tolerated the procedure well.

PROCEDURE FINDINGS:

ENDOSCOPIC FINDINGS:

- A medium-sized, ulcerating mass with no bleeding was found at the gastroesophageal junction, 43 cm from the incisors.
- The mass was partially obstructing and partially circumferential (involving one-half of the lumen circumference). The mass
- extended 2 cm into the posterior cardia where a clean based ulceration without high risk stigmata was noted.
- The entire examined stomach was endoscopically normal.
- The examined duodenum was endoscopically normal.

ENDOSONOGRAPHIC FINDINGS:

- The esophagus, stomach and duodenum were visualized endosonographically.
- A hypoechoic and homogenous mass was found in the gastroesophageal junction. The lesion was partially circumferential (involving 50% of the lumen). The endosonographic borders were well-defined. The mass measured up to 10 mm in thickness. There was sonographic evidence suggesting invasion into the muscularis propria (Layer 4). An intact interface was seen between the mass and the adjacent structures suggesting a lack of invasion.
- Three lymph nodes were visualized in the perigastric region. The largest measured 11 mm in maximal cross-sectional diameter. The nodes were irregular and ovoid, hypoechoic and homogenous and had well defined margins. The nodes were deep to the tumor, precluding FNB.
- The visualized liver demonstrated diffuse hyperechogenicity suggestive of fatty liver. No focal masses were noted.
- The pancreas was notable for hyperechoic stranding and lobularity. The main duct measured up to 4 mm in the head and tapered to 1-2 mm in the neck, body and tail.
- Visualized portions of the bile duct (5 mm), gallbladder, left kidney, left adrenal gland, spleen, and region of the celiac axis were normal on ultrasound examination.

Impression:

- An ulcerated mass was found in the gastroesophageal junction. This was staged T2 (based on invasion into) N0 Mx by endosonographic criteria.
- Sonographic evidence of hepatic steatosis.
- No specimens collected.

Complications: No immediate complications.

Estimated Blood Loss: Estimated blood loss was minimal.

Pathology:

PATHOLOGY REPORT
COLLECTED: 6/9/2022
PROCEDURE: Upper GI endoscopy and biopsy, colonoscopy and biopsy
CLINICAL INFORMATION: 76-year-old male with history of esophageal ulcer with massive GI bleed in 2021. This is a follow up procedure.
DIAGNOSIS:
A. STOMACH, ANTRUM, BIOPSY:
- Oxyntic mucosa with no significant histopathologic changes
- No Helicobacter pylori identified
- No intestinal metaplasia or dysplasia identified

B. GE JUNCTION, ULCER, BIOPSY:
- Poorly differentiated adenocarcinoma, at least intramucosal (see comment)
- Squamous mucosa with Candida esophagitis

C. CECUM, POLYP, BIOPSY:
- Fragments of tubular adenoma

D. SIGMOID COLON, POLYP, BIOPSY:
- Fragments of tubular adenoma

COMMENT: The possibility of deeper invasion cannot be excluded. Clinical correlation is recommended.

SURGICAL PATHOLOGY REPORT
COLLECTED: 11/9/22
PROCEDURE: Modified McKeown Esophagectomy
A. **ESOPHAGUS AND PROXIMAL STOMACH, ESOPHAGECTOMY WITH CERVICAL ESOPHAGOGASTRIC ANASTOMOSIS:**
- Poorly-differentiated adenocarcinoma at the gastroesophageal junction
- Scattered residual glands and single cells in a 4.0 cm treated tumor bed
- Metastatic adenocarcinoma in two (2) of seventeen (17) lymph nodes
- Margins uninvolved by adenocarcinoma
- Areas of focal ulceration in tumor bed
- Please see synoptic report for staging details

Tumor
Tumor Site: Distal esophagus (low thoracic esophagus)
Esophagogastric junction (EGJ)
Proximal stomach/cardia
Relationship of Tumor to Esophagogastric Junction: Tumor midpoint is located at the esophagogastric junction
Distance of tumor center from esophagogastric junction: Cannot be determined
Histologic Type: Adenocarcinoma
Histologic Grade: G3: Poorly differentiated, undifferentiated
Tumor Size: Cannot be determined
Explain: Residual single cells and glands scattered in 4.0 cm tumor bed
Tumor Extent: Tumor invades adventitia
Treatment Effect: Present, with residual cancer showing evident tumor regression, but more than single cells or rare small groups of cancer cells (partial response, score 2)

Lymphovascular Invasion: Not identified

Margins

Margin Status for
Invasive Carcinoma: All margins negative for invasive carcinoma
Closest Margin(s) to Invasive Carcinoma: Radial
Distance from Invasive Carcinoma to Closest Margin: Exact distance in cm: 0.3
Margin Status for Dysplasia and Intestinal Metaplasia: Not applicable
Margins: All margins are uninvolved by invasive carcinoma, dysplasia, and intestinal metaplasia
Margins examined: proximal, distal, radial
Distance of invasive carcinoma from closest margin: 0.3
Closest margin(s): Radial (Esophageal adventitial)

Regional Lymph Nodes

Regional Lymph Node Status: Tumor present in regional lymph node(s)
Number of Lymph Nodes with Tumor: Exact number: 2
Number of Lymph Nodes Examined: Exact number: 17

Distant Metastasis

Distant Site(s) Involved: Cannot be determined

Pathologic Stage Classification (pTNM, AJCC 8th Edition)

TNM Descriptors: y (posttreatment)
Primary Tumor (pT): pT3: Tumor invades adventitia
Regional Lymph Nodes (pN): pN1: Metastasis in one or two regional lymph nodes

Hybrid McKeown Esophagectomy

DATE OF OPERATION: 11/07/2022

PREOPERATIVE DIAGNOSIS: Esophageal cancer.

POSTOPERATIVE DIAGNOSIS: Esophageal cancer.

OPERATIONS PERFORMED:

- Right VATS mobilization of esophagus, mediastinal lymphadenectomy.
- Diagnostic laparoscopy.
- Exploratory laparotomy
- Extensive lysis of adhesions (> 1 hour)
- ABThera appliance

SURGEON: Eric Pepper, MD

ASSISTANT: A. M. Doctor, MD, A. Cutter, MD

ANESTHESIA: General

BACKGROUND: The patient is a 76-year-old man, a former 50-pack year smoker, with a history of coronary artery disease, hypertension, hyperlipidemia, aortic stenosis requiring TAVR in 2019, prior abdominal trauma from a stab wound in 1973 requiring exploratory laparotomy and bowel resection, type 2 diabetes, chronic kidney disease, BPH, who was diagnosed with T2 N0 esophageal adenocarcinoma and underwent neoadjuvant chemoradiation. The patient now presents for definitive operative intervention.

OPERATIVE FINDINGS:

- The esophagus was mobilized via right VATS.
- Diagnostic laparoscopy revealed severe dense adhesions precluding a minimally invasive approach.
- Exploratory laparotomy confirmed extensive adhesions requiring extensive lysis of adhesions.
- The abdomen was left open with an ABThera appliance.

OPERATIVE PROCEDURE: After appropriate consent was obtained, the patient was taken to the operating room. Safe induction of general anesthesia using a double-lumen endotracheal tube was achieved. The patient was rotated into the left lateral decubitus position. The chest was prepped and draped in the usual sterile fashion. A formal time-out was conducted.

The operation started with the right VATS mobilization of the esophagus. A 3 cm incision was made in the 6th intercostal space, midclavicular line. No underlying adhesions were noted. A 1 cm incision was made in the 8th intercostal space posteriorly. A 3 cm incision was made in the 4th intercostal space mid axillary line. A wound protector was used. A 2 cm incision was made in the auscultatory triangle. The thoracoscope was introduced and the chest cavity was examined. There was no gross evidence of metastatic disease. The Harmonic scalpel was used to divide the inferior pulmonary ligament. The posterior hilar dissection was carried out anterior to the esophagus from the esophageal hiatus to the azygos vein. Similarly, dissection posterior to the esophagus was carried out using Harmonic scalpel controlling branches of the aorta. A Penrose drain was used to retract the esophagus. The azygos vein

was divided using a vascular stapler. The dissection was then carried further cephalad, taking care not to injure the airway. Thoracic lymphadenectomy was performed. The dissection was then carried inferiorly toward the esophageal hiatus. Following this mobilization, the Penrose was removed and the chest was drained with a single 24-French Blake drain. The thoracic incisions were reapproximated in layers using Monocryl sutures.

Next, the patient was rotated into supine position. The right arm was tucked and the left arm was abducted. The neck, chest, and abdomen were re-prepped and draped in a sterile fashion. A Veress needle at Palmer's point was used to insufflate the abdomen to 10 mmHg using. The abdomen was accessed using the Optiview technique through a paramedian incision. Diagnostic laparoscopy demonstrated extensive dense adhesions throughout the abdomen. This precluded a minimally invasive approach. Next, an exploratory laparotomy was performed. Extensive lysis of adhesions commenced. Given the complexity of the adhesions, an intraoperative consultation with Dr. G. Inard was obtained. The lysis of adhesions continued liberating the bowel from the ligament of Treitz to the terminal ileum. Following lysis of adhesions, the small bowel was fully examined. 3-0 Vicryl sutures were placed in a Lembert fashion to reinforce areas of serosal tears in two areas of the small bowel. There was no evidence of full-thickness bowel injury. SPY-PHI was performed to assess perfusion, which appeared intact both to the stomach via the right gastroepiploic artery as well as the small bowel. The abdomen was irrigated with warm saline. An ABThera appliance was placed, and the abdomen was left open, with a plan to return for reexploration and completion esophagectomy. The patient was extubated and transported to the recovery room in stable condition.

Hybrid McKeown Esophagectomy

DATE OF OPERATION: 11/09/2022

PREOPERATIVE DIAGNOSIS: Esophageal cancer.

POSTOPERATIVE DIAGNOSIS: Esophageal cancer.

OPERATIONS PERFORMED:

- Exploratory laparotomy.
- Creation of a gastric conduit.
- Esophagectomy with cervical esophagogastric anastomosis.
- Abdominal closure.

SURGEON: Eric Pepper, MD

ASSISTANT: A. M. Doctor, MD, A. Cutter, MD

ANESTHESIA: General

BACKGROUND: The patient is a 76-year-old man, a former 50 pack year smoker, with a history of coronary artery disease, hypertension, hyperlipidemia, aortic stenosis requiring TAVR in 2019, prior abdominal trauma from a stab wound in 1973 requiring exploratory laparotomy and bowel resection, type 2 diabetes, chronic kidney disease, BPH, who was diagnosed with T2N0 esophageal adenocarcinoma and underwent neoadjuvant chemoradiation. The patient underwent a right VATS mobilization of esophagus, diagnostic laparoscopy, exploratory laparotomy, and extensive lysis of adhesions with open abdomen on November 7, 2022. The patient now returns for completion esophagectomy and abdominal closure.

OPERATIVE FINDINGS: Well perfused gastric conduit. Viable small bowel. Replaced left hepatic artery was divided, given proximity to gastric conduit, and left gastric artery origin, which was divided for conduit creation and esophagogastric resection.

OPERATIVE PROCEDURE: After appropriate consent was obtained, the patient was taken to the operating room. Safe induction of general endotracheal anesthesia was achieved. The patient was positioned supine. Both arms were tucked. All bony prominences were adequately padded, and the neck, chest, and abdomen were prepped and draped in the usual sterile fashion. The ABThera wound appliance was removed. The abdomen was explored. There were no adhesions. The small bowel appeared viable. The right gastroepiploic artery was again palpated and had an excellent pulse. The liver was examined and there were no grossly visible nodules or other sites of metastatic disease. The left lateral segment of the liver was mobilized by dividing the triangular ligament and retracted laterally. The gastrohepatic ligament was divided. There was a replaced left hepatic artery which was dissected and was divided in order to mobilize the esophagus and prepare the gastric conduit. The spleen was elevated with laparotomy pads to facilitate dissection of the greater curvature. The short gastric arteries were divided, and the greater curvature of the stomach was mobilized using a combination of electrocautery and vascular load stapler. Dissection was carried distally taking care not to injure the right gastroepiploic artery, which throughout the mobilization was palpated and confirmed to be intact. A Kocher maneuver was performed ensuring that the pylorus could easily reach the esophageal hiatus without tension. Following further dissection posterior to the stomach, the left gastric artery was easily identified and divided using a vascular stapler.

At this point, the stomach was circumferentially free. The conduit was fashioned, at least 3 cm wide, using a black load tissue stapler. The staple line was reinforced using a 3-0 PDS suture in a running Lembert fashion. The conduit was then attached to the distal esophageal stump. The hiatus was dissected further to facilitate the gastric conduit pull-through. Next attention was turned to the cervical portion of the operation. A 15 cm incision anterior to the sternocleidomastoid was performed. The platysma was divided. The sternocleidomastoid was retracted laterally. Care was taken to avoid injury to the carotid artery. A branch of the facial vein was controlled and divided. The omohyoid muscle was identified and divided. The thyroid was retracted medially. Further dissection identified the cervical esophagus, which was dissected circumferentially and encircled with a Penrose. The esophagus was completely mobilized to the thoracic inlet where there was free communication within the thoracic cavity and cervical wound. Next, the thoracic esophagus along with the conduit were delivered into the cervical wound and the esophagectomy was completed with proximal division of the cervical esophagus. The margin was sent for pathology. Proximally an esophagoscopy and distally a gastrotomy were performed and a side-to-side esophagogastric anastomosis was performed using a tissue stapler. The distal gastric conduit appeared to be well perfused. The nasogastric tube was passed under direct visualization, positioned proximal to the pylorus. The esophagogastrostomy was closed in 2 layers using running Monocryl sutures and interrupted Lembert silk sutures. Hemostasis was adequate.

Next, the abdomen was irrigated. Hemostasis was adequate. The fascia was reapproximated using 0 looped PDS suture in a running fashion. The wound was irrigated, and the skin was reapproximated using skin clips. The cervical wound was reapproximated in layers using a 3-0 Monocryl suture and skin clips for the skin. A 19-French Blake drain was left within the cervical wound. At the end of the procedure, all sponge and needle counts were reported as correct x2. Given that the patient arrived to the operating room with an open abdomen, an abdominal x-ray was performed, as is the protocol at our institution. On the x-ray, there was no evidence of retained objects. The patient was then awakened, extubated, and transported back to the surgical ICU in stable condition.