Surgical Management of Esophageal Cancer

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The T and N status of esophageal carcinoma is most accurately assessed by?

- A. Upper gastrointestinal series
- B. Computed tomographic scan of the chest with double contrast
- C. Endoscopic ultrasound (EUS)
- D. Positron emission tomography (PET scan)
- E. Magnetic resonance imaging (MRI)
Which of the following statements about the incidence, location, and type of esophageal cancer is TRUE?

- A. The overall rate is decreasing
- B. Proximal squamous cell lesions are increasing
- C. Proximal adenocarcinomas are increasing
- D. Distal adenocarcinomas are increasing
- E. Distal squamous cell cancers are decreasing
Questions

When mobilizing the stomach in an esophagectomy, which vessel is preserved?

- A. Left gastric artery
- B. Short gastric arteries
- C. Left gastroepiploic artery
- D. Right gastroepiploic artery
In a patient without metastatic disease who completes neoadjuvant chemotherapy and radiation therapy, the 5-yr survival after complete resection would be?

- A. 5%
- B. 10%
- C. 35%
- D. 50%
- E. 75%
Questions

Substantial mortality from anastomotic leakage

- A. Transthoracic (Ivor Lewis) esophagectomy
- B. Transhiatal esophagectomy
- C. Both
- D. Neither
History & Physical

- 48 yo female c/o dysphagia since 5/2008, primarily solid foods then progressing to liquids w/100 lb wt loss over 10 months. Pt c/o post-prandial vomiting.

- PMH: htn, DM, asthma

- PSH/ FHx: denies

- SocHx: 1 ½ ppw x30yrs; occ etoh 3-4/wk

- Physical Exam: No significant findings
CT chest/abd/pelvis
10/15/2008 – mass mid-esophagus w/proximal dilatation @aortic arch & extending to low pulmonary vein (4.2x2.7cm)
Studies

- Bronchoscopy 10/16/2008 –
  - Whitish lesion post tracheal wall above carina, histo neg

- ENT laryngoscopy –
  - No vocal cord paralysis/involvement

- PET scan –
  - Neg
Cardiopulmonary Function

- PFTs 10/17/2008 –
  - FEV₁ 2.06 (64%);
  - FEV₁/FVC 77%;
  - DLCO 17.9 (78%)

- Echo –
  - EF 60%, nl LVSF & wall motion, PAP 34, mild MR/TR

- Stress echo –
  - peak stress EF 75%
Friable tumor 70% circumference upper 1/3 esophagus w/ulcerated narrowing & severe obstruction

T3 Nx Mx
Chemotherapy & XRT

  - 3960 cGy to esophagus & supraclavicular region

- Chemotherapy
  - Cisplatin & 5-FU

- Sx improved

- Re-gained 50 lbs w/appetite simulants
**Laboratory work-up**

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- **TP**: 6.6
- **AST**: 43
- **ALT**: 30
- **CEA**: 2.3
- **Alb**: 3.3
- **MCV**: 89
- **RDW**: 13.3
- **Tbili**: 0.2
- **AP**: 84
- **AMY**: 52
- **Dbili**: 0
- **Lip**: 91
Esophageal CA

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Operative Report – 2/10/2009

- Exploratory laparotomy, gastric mobilization, pyloromyotomy, feeding jejunostomy
- Esophagoscopy
- Right thoracotomy, esophagectomy w/esophagogastric anastomosis

<table>
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<tr>
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<th>PRBCS</th>
<th>EBL</th>
<th>UO</th>
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<td>13.5 hrs</td>
<td>11.5 L</td>
<td>2 Units</td>
<td>700 mL</td>
<td>1200 mL</td>
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Ivor Lewis Esophagectomy
Esophageal CA

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Celiac Node
Hospital Course

- POD#2
  - Extubated
  - 2U PRBCs
  - Tube feeds

- POD#7
  - Esophagogram neg

- POD#9
  - D/C home
Esophageal Cancer
Introduction

- Incidence increasing
- 4% of all cancers dx’d each year
- Overall poor rate of survival
- Adenocarcinoma has risen 6x over last quarter century

- Squamous cell carcinoma
  - Smoking & ETOH
- Adenocarcinoma
  - Barrett’s Esophagus
  - Long-standing GERD
Dysphagia

Endoscopy:
- Chronic GERD
- BE surveillance

Bleeding (anemia or hematemesis)

Chest or abd pain
Diagnosis

- Confirm dx: Bx
- EsophagoGastroDuodenoscopy
- Endoscopic US
- Endoscopic Mucosal Resection
Resectability

- Determine extent of dz
  - Local, regional & systemic
  - CT chest
  - PET scan
  - PET-CT
Pre-operative Assessment

- Evaluate physiologic status
  - Cardiac & pulmonary reserve
    - PFTs
    - Noninvasive cardiac stress eval
  - Nutritional status

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Principles of Esophagectomy

- Standard of care for non-metastatic esophageal CA
- 1° goal: complete (R₀) resection of tumor & surrounding lymph nodes
  - Maximize opportunity for cure
  - Minimize incidence of local recurrence
- Earlier lesions: more physiologic outcome
- Advanced locoregional dz w/good cardiopulmonary reserve: extended lymphadenectomy
Neoadjuvant Therapy

- Candidates for resection
  - Neoadjuvant chemotherapy
  - Concurrent radiation therapy
- Good performance status & bulky disease
- 20-30% rate of complete response
- Afterwards, re-stage w/barium swallow & CT
- Resection in 2-3 wks after Chemo/XRT
Different Surgical Approaches

- Transhiatal
  - Blind dissection in chest
  - Cervical esophagogastrostomy
- Ivor-Lewis
  - Abdominal/thoracic dissection
  - Intra-thoracic esophagogastrostomy
- En bloc esophagectomy
  - Left thoracoabdominal
  - Cervical esophagogastrostomy
- Minimally invasive
  - Laparoscopic
  - ± thoracoscopic
Transhiatal Esophagectomy
En Bloc esophagectomy
Reconstruction

- Tubularized or whole stomach
  - Easiest
  - Single anastomosis
  - Enough length for neck
  - Effective alimentary conduit

- Colon
  - Unusable stomach
    - Prior Surgery
    - Extensive tumor

- Intestine
  - Most complex
  - Last resort
Division of Gastrohepatic Ligament & Mobilization of Distal Esophagus
Mobilization of Stomach
& Duodenum

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Pyloromyotomy & Feeding Jejunostomy
Exposure & Mobilization of Esophagus

- Azygos Vein Ligated and Divided
- Diaphragm
- Retracted Right Lung
- Aorta

- Left Recurrent Laryngeal Nerve and Nodes
- Right Recurrent Laryngeal Nerve and Nodes
- Left Vagus Nerve
- Azygos Vein (Ligated)
- Left Lung
- Thoracic Duct
- Subcarinal and Hilary Nodes
- Pericardium
- Periesophageal Nodes
Esophageal CA

Excision & Removal Specimen

Stomach and Esophagus Approximated with Single Stitch

Gastrostomy Made with Electrocautery for Technique with Stapled Anastomosis
Esophagogastric Anastomosis
How to determine which procedure?
Esophageal CA

Tumor Depth

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Nodal metastasis

- Exceedingly rare in CA limited to lamina propria
- Increases in incidence w/deeper penetration
  - Recent analysis of 23 pts w/complete lymphadenectomy for intramucosal CA, 1020 LNs examined:
    - 1 LN (0.09%) in 1 pt (4%) detected w/metastasis
      - Lamina propria (0 of 13; 0%)
      - Superficial muscularis mucosa (1 of 10; 10%)

Prevalence of nodal metastases & 5-yr Survival by depth of tumor penetration

AJCC Nodal Staging

- **Regional lymph nodes (N)**
  - Nx  cannot be assessed
  - N0  No regional node metastasis
  - N1  Regional node metastasis

- **Distant metastasis (M)**
  - Mx  cannot be assessed
  - M0  No distant metastasis
  - M1a  Celiac or supraclavicular node
  - M1b  Nonregional nodal metastasis or distant metastasis
Proposed Modification of Nodal Status in AJCC Staging


- Location (3yr survival):
  - Nonregional: 0% (n=17)
  - Regional: 24% (n=441)
  - Celiac: 23% (n=73)

- Revised nodal status (3yr survival):
  - pN0: 0 nodes – 63% (n=496)
  - pN1: 1-3 nodes – 32% (n=292)
  - pN2: >3 nodes – 14% (n=222)
  - pN3: nonregional nodes – 0% (n=17)

Location & #LNhs independent predictors survival

Revised: celiac nodes are regional & includes #LN

Algorithm for Management of Esophageal CA

Initial assessment:
1. History and physical
2. CT chest/abdomen/pelvis
3. Endoscopy and biopsy
4. PET or PET-CT
5. EUS

Early disease (no visible lesion) in a large segment of Barrett's:
- EMR
  - Limited to lamina propria
  - Vagal sparing esophagectomy
  - Evaluate for antireflux surgery

Early disease in a small tongue of Barrett's:
- EMR
  - Into muscularis mucosa
  - En bloc esophagectomy

Early disease (with visible lesion) in a large segment of Barrett's:
- EMR
  - Into muscularis mucosa
  - Limited to lamina propria

Locally advanced disease:
- Palliate with stent (if needed)
- Metastatic disease

Good physiological status or comorbid conditions:
- EN bloc esophagectomy

Poor physiological status or comorbid conditions:
- Transhiatal esophagectomy

1. Perforation
2. Bleeding

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Early disease (no visible lesion) in a large segment of Barrett’s:
- EMR

Limited to lamina propria:
- Limited to lamina propria
- Into muscularis mucosa
- Into muscularis mucosa
- G. muscular

Evaluate for anti-reflux surgery:
- En bloc esophagectomy
- En bloc esophagectomy
- En bloc esophagectomy
- En bloc esophagectomy

Vagal sparing esophagectomy:
- Vagal sparing esophagectomy

Intra-operative frozen section for invasion into muscularis propria:
- En bloc esophagectomy

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D. Neither
The esophagus is a muscular tube extending from the pharynx to the stomach.

- **4 segments**
  - **Cervical esophagus**
    - From the inferior aspect of the cricoid cartilage to the thoracic inlet (suprasternal notch, ~18 cm from incisors)
  - **Thoracic esophagus**
    - Upper thoracic
      - Thoracic inlet to level of tracheal bifurcation; 18-23 cm.
    - Mid thoracic
      - Tracheal bifurcation midway to gastroesophageal junction; 24-32 cm.
    - Lower thoracic
      - Midway between tracheal bifurcation and gastroesophageal junction to GE junction, including abdominal esophagus; 32-40 cm.
  - **Abdominal**
    - Considered part of lower thoracic esophagus; 32-40 cm.