Minimally Invasive McKeown Esophagogastrectomy

Masters of Minimally Invasive Thoracic Surgery
6th Annual Meeting
Waldorf Astoria Orlando
September 20-21, 2013

Gary Hock Professor and Vice-Chair of Surgery
Section Chief, Thoracic Surgery, Duke University Medical Center
Medical Director, Duke Comprehensive Cancer Institute
Disclosures

No conflicts related to this presentation
Increasing Deaths from Esophagus Cancer in US

B. Esophageal adenocarcinoma
Males

Females

Analysis of Outcomes

- Most common stage at surgery is stage III (T3N1)
- Survival with tri-modality therapy is 20-40%
- Operative mortality in published series: 4-10%
- Focus should be on minimizing operative mortality and improving patient selection
Esophagogastrectomy: Standard Resections

- **Standard**
  - Ivor Lewis
  - 3-incision (McKeown)
  - Thoracoabdominal
  - Transhiatal

- **Minimally Invasive Esophagectomies (MIE)**
  - VATS + laparoscopic/laparotomy + cervical
  - Laparoscopic + thoracotomy/VATS
3-Incision (McKeown)

1. Thoracic esophageal mobilization; lymph node dissection; ligate thoracic duct (VATS or open)
2. Abdominal exploration; stomach mobilization; lymph node dissection; feeding jejunostomy
3. Left cervical incision for anastomosis

Advantages: less chance of local recurrence, anastomosis in neck easier to manage
Esophageal Cancer: Improving Outcomes

Ivor Lewis

1. Abdominal exploration; stomach mobilization; lymph node dissection; feeding jejunostomy (laparoscopic or open)
2. Thoracic esophageal mobilization; lymph node dissection; anastomosis (VATS or open)

Advantages: lower stricture, leak, and aspiration rates
Lymph Node Dissection

1. All thoracic nodes
2. Left gastric pedicle nodes
3. Celiac axis nodes
4. Gastro-hepatic ligament nodes

Target: At least 16
# The Effect of a Multidisciplinary Thoracic Conference (MTC) on Treatment of Patients With Esophageal Carcinoma


<table>
<thead>
<tr>
<th>2001-2007</th>
<th>Before MTC (n=117)</th>
<th>MTC (n=138)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete Staging Evaluation</td>
<td>67%</td>
<td>97%</td>
<td>0.0001</td>
</tr>
<tr>
<td>Mult-D evaluation prior to Tx</td>
<td>72%</td>
<td>98%</td>
<td>0.0001</td>
</tr>
<tr>
<td>NCCN Guidelines adherence</td>
<td>83%</td>
<td>98%</td>
<td>0.0001</td>
</tr>
<tr>
<td>Days from Dx to Tx (mean)</td>
<td>27</td>
<td>16</td>
<td>0.0001</td>
</tr>
</tbody>
</table>
Pt's with resectable (T2-3N0-1M0) tumors

Preop CRT ( carboplatin/paclitaxel) + RT (41.4 Gy) followed by surgery vs. surgery alone

366 pts enrolled (2004-8); male 284, adeno 273

Toxicities (grade ≥ 3) in the CRT arm: <5%
## CROSS Study

<table>
<thead>
<tr>
<th></th>
<th>CRT+Surgery</th>
<th>Surgery Alone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resection Rate</td>
<td>90%</td>
<td>86%</td>
</tr>
<tr>
<td>R0 Resection Rate</td>
<td>92%*</td>
<td>69%</td>
</tr>
<tr>
<td>pCR</td>
<td>29%</td>
<td>NR</td>
</tr>
<tr>
<td>In-hospital Mortality</td>
<td>4%</td>
<td>4%</td>
</tr>
<tr>
<td>Median OS</td>
<td>49 months*</td>
<td>24 months</td>
</tr>
<tr>
<td>1, 2 ,3, 5 yr survival</td>
<td>82, 67, 58, 47%*</td>
<td>70, 50, 44 34%</td>
</tr>
</tbody>
</table>
A Survival According to Treatment Group

- CRT+surgery
- Surgery alone

P = 0.003
### Esophageal Cancer: Improving Outcomes

<table>
<thead>
<tr>
<th>Subgroup</th>
<th>Univariate Hazard Ratio (95% CI)</th>
<th>Adjusted Hazard Ratio (95% CI)</th>
<th>P Value for Adjusted Hazard Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>All patients</td>
<td>0.657 (0.495–0.871)</td>
<td>0.665 (0.500–0.884)</td>
<td>0.005</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>0.913 (0.482–1.729)</td>
<td>0.928 (0.487–1.766)</td>
<td>0.82</td>
</tr>
<tr>
<td>Male</td>
<td>0.612 (0.446–0.841)</td>
<td>0.614 (0.447–0.845)</td>
<td>0.003</td>
</tr>
<tr>
<td><strong>Histologic type</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>0.627 (0.056–6.970)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adenocarcinoma</td>
<td>0.732 (0.524–0.998)</td>
<td>0.741 (0.536–1.024)</td>
<td>0.07</td>
</tr>
<tr>
<td>Squamous-cell carcinoma</td>
<td>0.453 (0.243–0.844)</td>
<td>0.422 (0.226–0.788)</td>
<td>0.007</td>
</tr>
<tr>
<td><strong>Clinical N stage</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0.414 (0.234–0.732)</td>
<td>0.422 (0.239–0.747)</td>
<td>0.003</td>
</tr>
<tr>
<td>1</td>
<td>0.793 (0.567–1.108)</td>
<td>0.807 (0.576–1.130)</td>
<td>0.21</td>
</tr>
<tr>
<td>Could not be determined</td>
<td></td>
<td>0.552 (0.066–4.602)</td>
<td></td>
</tr>
<tr>
<td><strong>WHO performance score</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0.617 (0.452–0.844)</td>
<td>0.625 (0.456–0.857)</td>
<td>0.004</td>
</tr>
<tr>
<td>1</td>
<td>0.864 (0.433–1.726)</td>
<td>0.898 (0.753–1.631)</td>
<td>0.77</td>
</tr>
</tbody>
</table>

- **Chemoradiotherapy and Surgery Better**
- **Surgery Alone Better**
Trends in Hospital Volume and Operative Mortality for High-Risk Surgery
Finks JF, et al. NEJM 2011; 364:2128-2137

• Median hospital volumes of 4 cancer resections analyzed using Medicare database 1999-2008
• Lung, esophagus, pancreas, and bladder
• Operative mortality declined for all procedures
• Higher volumes explained a large portion of the decline in mortality for pancreatectomy (67%), cystectomy (37%), and esophagectomy (32%), but not for the other procedures
Risk-Adjusted Mortality Associated with Cancer Resections among Medicare Patients, 1999 -2008

Esophageal Cancer: Improving Outcomes
We started a comprehensive evaluation prior to oral feedings following esophagectomy after demonstrating that pneumonia strongly predicts mortality: HR for death = 20

Rigorous swallowing evaluation with clinical observation, cineradiography, and fiberoptic endoscopy was used prior to oral feedings.

Comprehensive Evaluation for Aspiration After Esophagectomy 
Reduces the Incidence of Post-Operative Pneumonia
Berry et al, J Thorac Cardiovasc Surg 2010; 140: 1266-72

- 799 patients (379 early era, 420 later era)
- 30-day mortality = 3%
- Postop aspiration 12%; pneumonia 14%
- Age (p<0.0001), cervical anastomosis (p=0.0009) predicted aspiration (multivariable model)
- Incidence of postop pneumonia was significantly decreased (10% vs 18%, p=0.002) in the later era
Endoscopic Resection

1. High grade dysplasia (Carcinoma in situ)

2. T1aN0, superficial T1bN0
Radio Frequency Ablation

1. High-grade dysplasia, <10 cm

2. Low-grade dysplasia

3. ? Metaplasia
Photodynamic Therapy

1. T1a tumors not amenable to EMR in marginally operable patients

2. HGD in RFA failures

3. Advanced endoluminal disease, symptomatic, after radiation
Esophagectomy without Induction Therapy

1. High grade dysplasia, T1
   - Extensive, failed mucosal ablation, patient choice

2. Selected T2N0 (dose reduction=no Rx)

3. Medical contraindications to tri-modality therapy
   - Age, performance status, perforation, bleeding
Induction CRT + Surgery

Standard of care based on selected studies and meta-analyses

1. Most patients with T3 or N1 disease

2. Selected patients with T2N0
Surgery + Adjuvant Therapy

1. Patients with unexpected N1 or M1a disease

2. Patients who refused induction therapy
Modern Esophageal Resection

- Multidisciplinary evaluation is essential
- Induction therapy esophagogastrectomy is the best option for most patients with $\geq$T2N0
- Centers with experience have the best outcomes
- Approaches that avoid thoracotomy are preferable
- Perioperative mortality $\leq 2\%$
- Best predictor of post-operative outcome: pneumonia
Minimally Invasive McKeown

- Thoracoscopic mobilization
- Lymph node dissection
- Ligation of thoracic duct
- Gastric mobilization and lymph node dissection
- No pyloroplasty
- Feeding jejunostomy
- Stapled cervical anastomosis
Esophageal Cancer: Improving Outcomes

Stomach

Esophagus
Esophageal Cancer: Improving Outcomes