OESOPHAGECTOMY

Minimising operative mortality

Mark Smithers

Department of Surgery, University of Queensland
Princess Alexandra & Mater Private Hospitals
OESOPHAGECTOMY;
Minimising operative mortality

Mortality and Time:

<table>
<thead>
<tr>
<th>Decade</th>
<th>patients</th>
<th>% op mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960 - 1979</td>
<td>83,783 pts</td>
<td>29%</td>
</tr>
<tr>
<td>1980 – 1988</td>
<td></td>
<td>13%</td>
</tr>
<tr>
<td>1990 – 2000</td>
<td>70,756 pts</td>
<td>6.7%</td>
</tr>
</tbody>
</table>

30 day 4.9%
In hospital 8.8%

## Oesophagectomy

### Operative Mortality Rates

<table>
<thead>
<tr>
<th>Period</th>
<th>Rate</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1935 - 45</td>
<td>&gt;50%</td>
<td>Various series</td>
</tr>
<tr>
<td>1960 - 79</td>
<td>29%</td>
<td>Earlam</td>
</tr>
<tr>
<td>1972 - 81</td>
<td>1.4%</td>
<td>Akiyama</td>
</tr>
<tr>
<td>1979 - 93</td>
<td>1.7%</td>
<td>O’Rourke</td>
</tr>
</tbody>
</table>
Gastro-oesophageal Project – prospective data collection

146 pts: Oesophagus (66)
Ca Cardia (80)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>pts</th>
<th>mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resection</td>
<td>58</td>
<td>17 (29%)</td>
</tr>
<tr>
<td>Stent</td>
<td>33</td>
<td>9 (27%)</td>
</tr>
<tr>
<td>Laparotomy</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>No treatment</td>
<td>39</td>
<td></td>
</tr>
</tbody>
</table>

Resection rate = 40%
OESOPHAGEAL CARCINOMA

TREATMENT OVERVIEW

Thoracic Oesophagus

- Palliative Intent
  - Stent
- Curative Intent
  - Surgery
OESOPHAGEAL CARCINOMA

TREATMENT OVERVIEW - 2010

Thoracic Oesophagus

Palliative Intent
- Stent or Chemo/XRT

Curative Intent
- Definitive Chemo/Radiotherapy
- Surgery
- Neoadjuvant Therapy and Surgery
- Directly to Surgery
Outcomes from oesophageal cancer

Improvements since 1980

- Use of Neoadjuvant Therapy
- Improved palliative therapies
- Surgery in specialist unit / specialist support
- Definitive Chemoradiation available as alternative to resection
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operated Pts</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patients</td>
<td>58 (7.25 / yr)</td>
<td>720 (22.5% / yr)</td>
</tr>
<tr>
<td><strong>Mean Age</strong></td>
<td>62</td>
<td>62.5 (16-85)</td>
</tr>
<tr>
<td><strong>Hospital Stay</strong></td>
<td>25.3 +/- 16</td>
<td>16 (8 – 123)</td>
</tr>
<tr>
<td><strong>Mortality</strong></td>
<td>29%</td>
<td>1.9%</td>
</tr>
<tr>
<td><strong>1 yr surv</strong></td>
<td>36%</td>
<td>76%</td>
</tr>
<tr>
<td><strong>2 yr surv</strong></td>
<td>19%</td>
<td>60% (5 yr = 40%)</td>
</tr>
</tbody>
</table>
OESOPHAGEAL CARCINOMA

Minimising operative mortality

Patient Selection

Intra-operative care

Post-operative management

Volume / Outcome
OESOPHAGEAL CARCINOMA

Minimising operative mortality

Patient Selection

Intraoperative care

Post-operative management
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Patient Assessment:
Risk Analysis – everytime we see a patient

Important given nonoperative therapy available.
Combine – physiologic parameters
- clinical judgement

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**Risk Factors:**


523 pts:

<table>
<thead>
<tr>
<th>risk factors</th>
<th>risk rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age &gt;62 yrs</td>
<td>1.8</td>
</tr>
<tr>
<td>Blood Loss &gt; 1000</td>
<td>2.2</td>
</tr>
<tr>
<td>Smoker</td>
<td>2.0</td>
</tr>
<tr>
<td>Incentive spirometry &lt;2.5</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Risk Prediction 70%
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Risk Factors:
Operative Mortality = 5.8%

Risks: increased age
respiratory complications
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Risk Factors:
>1700 pts: op mort 9.8% morbidity – 49%

Risk Operative mortality:
Univariate
– op time; COAD; IDDM; Smoking

Multivariate Regression analysis
- Increased age; blood transfusion;
  preop functional status
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Risk Factors:


Age: Risk of death x2 every ten years (after 59 yrs)

FEV1: Each decrease 20% - mortality increase x 50%
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Risk Factors:
Steyerberg et al J Clin Oncol 2006;24:4277-4284

1317 pts: increased risk op mort

Increased Age
Comorbidity: pul; renal; liver
Diabetes
Neoadjuvant RT or CRT
Volume of cases
## Oesophagectomy: Risk for op. mortality

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>–1</td>
</tr>
<tr>
<td>65</td>
<td>0</td>
</tr>
<tr>
<td>80</td>
<td>1</td>
</tr>
<tr>
<td>Comorbidity</td>
<td></td>
</tr>
<tr>
<td>Pulmonary</td>
<td>1</td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>1</td>
</tr>
<tr>
<td>Diabetes</td>
<td>1</td>
</tr>
<tr>
<td>Hepatic</td>
<td>1</td>
</tr>
<tr>
<td>Renal</td>
<td>1</td>
</tr>
<tr>
<td>Neoadjuvant therapy</td>
<td></td>
</tr>
<tr>
<td>Radiotherapy</td>
<td>1.5</td>
</tr>
<tr>
<td>Chemoradiotherapy</td>
<td>1</td>
</tr>
<tr>
<td>Hospital volume; No. of esophagectomy/year</td>
<td></td>
</tr>
<tr>
<td>Low (1)</td>
<td>0</td>
</tr>
<tr>
<td>Intermediate (1.1-2.5)</td>
<td>–0.5</td>
</tr>
<tr>
<td>High (2.6)</td>
<td>–1.5</td>
</tr>
<tr>
<td>Very high (± 50)</td>
<td>–2</td>
</tr>
</tbody>
</table>

Score Chart:
Estimate 30-Day Mortality Surgery for Esophageal Cancer

Steyerberg et al. J Clin Oncol 2006;24:4277-4284
Oesophagectomy: Risk for op. mortality

Estimated surgical mortality in relation to the sum score.

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Patient Assessment: Role of MDT

Before and after MDT – Outcomes 77 pts

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>operation – nonresection</td>
<td>26%</td>
<td>13% p=0.001</td>
</tr>
<tr>
<td>Operative mortality</td>
<td>26%</td>
<td>5.7% p=0.004</td>
</tr>
<tr>
<td>5 yr survival</td>
<td>10%</td>
<td>52% p=0.0001</td>
</tr>
</tbody>
</table>

Stephens MR et al Dis Esoph 2006;19:164-171
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Minimising operative mortality

Patient Selection

Intra-operative care

Post-operative management

Volume / Outcome
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Risk Factors: Technical Complications

- Recurrent laryngeal nerve palsy
- Anastomotic leak
- Conduit ischaemia / necrosis
- Chylothorax
- Gastric Outlet obstruction
- Haemorrhage
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Risk Factors: Technical Complications


1996 – 2001: 510 patients; 138 (27%) complications

increased stay

Increased mortality 12.3% vs 3.8%
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**Risk Factors: Technical Complications**


_Hong Kong: 1990 – 2002; 434 patients; all SCC_

_Technical complications = 22.6% (RLN – 50%)_

<table>
<thead>
<tr>
<th>Complication</th>
<th>Technical</th>
<th>nontechnical</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulmonary</td>
<td>37.8%</td>
<td>10.7%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Hospital mortality</td>
<td>9.2%</td>
<td>3.3%</td>
<td>&lt;0.025</td>
</tr>
</tbody>
</table>

_No influence on cancer survival_
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Patient Selection

Intra-operative care

Post-operative management
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Complications
• Require early diagnosis
• Early / active intervention
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Complications – early recognition

Atrial Fibrillation


Hong Kong: 1982 – 2000; 921 patients; all SCC

Atrial Fibrillation: 198 (22%) Higher rate

• pulmonary complications
• anastomotic leak
• nonanastomotic leak (conduit and other)
• surgical sepsis
• Mortality x 3.7
Atrial Fibrillation


Hong Kong: 1982 – 2000; 921 patients; all SCC

Atrial Fibrillation: 198 (22%)

<table>
<thead>
<tr>
<th></th>
<th>AF Group</th>
<th>Non AF Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>1982 -1990</td>
<td>33%</td>
<td>10%</td>
</tr>
<tr>
<td>1991 – 2000</td>
<td>12%</td>
<td>3%</td>
</tr>
</tbody>
</table>
OESOPHAGECTOMY
Complications – Early recognition

Atrial Fibrillation
Hong Kong: 1982 – 2000; 921 patients; all SCC

Atrial Fibrillation and Sepsis
• onset one day before clinical sepsis
• between days 3 -10
• x 6 rate of enteric leak
• between days 0-3 not related to sepsis
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Complications – Early recognition

Anastomotic / Conduit – Role of CRP

50 patients – 4 leak, 3 tip necrosis, 2 conduit ischaemia (18%)

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Improving operative mortality

Surgical Volume: Meta-analysis
1990 – 2003: 13 studies

Very low Volume <5 / yr         High Volume >20 / yr

Op Mort       18%                     4.9%

Conclusion: Resection by surgeons with 20 or more / yr

Metzger R et al. Dis Esophagus 2004;17:310-4
# OESOPHAGECTOMY; Improving operative mortality

**Surgical Volume:**

N=4349; hospital mortality and volume 1994-97

<table>
<thead>
<tr>
<th>Av annual volume</th>
<th>1(worst)</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5(best)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1.3</td>
<td>21.8</td>
<td>17.1</td>
<td>16.9</td>
<td>13.3</td>
<td>8.1</td>
</tr>
</tbody>
</table>

Predict 1998-99: procedure volume predictive volume better than historical op mortality

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**Surgical Volume: NSW 2000-2005**

N=2082 pts; resection = 321 (15%)
30 day op mort = 3.7%

<table>
<thead>
<tr>
<th></th>
<th>low (&lt;10)</th>
<th>mid (11-20)</th>
<th>high (&gt;20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Op. Mort</td>
<td>6.4%</td>
<td>4.3%</td>
<td>2.6%</td>
</tr>
<tr>
<td>Complications</td>
<td>23.4%</td>
<td>31%</td>
<td>18.7%</td>
</tr>
</tbody>
</table>

OESOPHAGECTOMY

Surgical Volume:
NHS executive – Commissioning Cancer Services

2001 – Oesophago-gastric centres
• evaluate minimum 100 cases / year
• resection rate 40 / yr
OESOPHAGEAL RESECTION

EFFECT OF HIGH VOLUME EXPERIENCE

Increased expertise of the whole team

Ward – nurses, physiotherapy, junior staff

Operating room

Anaesthetics

Intensive care / high dependency unit

Training
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Surgical Volume: Review of literature

- there is no defined cut off for lowest number
- centralisation to dedicated centres appropriate
- multidisciplinary approach
- centralisation validates good clinical research

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Improving operative mortality

• Advances Surgical treatment
• Advances anaesthesia
• Advances ICU
• Patient Selection – medical / staging
• Surgical Volume
• Early recognition / management complications