Preoperative Assessment of the Patient For Pulmonary Resection

55 y.o. Male, Carcinoma Right Middle and Lower Lobes, ? Pneumonectomy

Peter Slinger MD, FRCPC          University of Toronto
## Pulmonary Resection Morbidity and Mortality

<table>
<thead>
<tr>
<th></th>
<th>All Cases (LCSG ’89)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mortality</strong></td>
<td>4%</td>
</tr>
<tr>
<td><strong>Respiratory Complications</strong></td>
<td>21%</td>
</tr>
<tr>
<td><strong>Cardiac Complications</strong></td>
<td>15%</td>
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LUNG SUBSEGMENTS

Total subsegments = 42
Example: right lower lobectomy
Postoperative FEV$_1$ decrease = 12/42 (29%)
Prediction of Postoperative Respiratory Failure in Patients Undergoing Lung Resection for Cancer

- 156 patients, lobect.88, pneumonect.26 respiratory complications 26%

- ppoFEV1 >50%: no/minor complic's.
- ppoFEV1 <40%: +/- major resp. complic's.
- ppoFEV1 <30%: 10/10 postop. ventilation 6/10 died

Relationship Between Pulmonary Function and Lung Cancer Surgical Outcome

N = 110, Lobx 60%, Px 33%, Segm./Wdg. 17% Age 69 +/- 8 yr., M/F 60/40 %

Survive/No Maj. Resp. Complic.: 96 (87%)
- ppoFEV1 = 58 % (+/- 15%)
- ppoFEV1 = 1.4 L

Death/Resp. Failure:
- 14 (13%)
- ppoFEV1 = 42% (+/- 13%) p< .001
- ppoFEV1 = 1.0 L (n.s.)

Suggested Threshold: ppoFEV1 = 40%

Diffusing Capacity Predicts Morbidity after Lung Resection

National Emphysema Treatment Trial
NEJM 348: 2059-78, 2003

Increased Risk of Death:
- Homogeneous Emphysema
- FEV1 < 20%
- DLCO < 20%
Resection of Lung Cancer Is Justified in High-risk Patients Selected by Exercise Oxygen Consumption

mean preop. FEV1 = 41%, lobect./wedge/segment.

<table>
<thead>
<tr>
<th>VO2 max</th>
<th>n</th>
<th>complic's</th>
<th>mortal.</th>
</tr>
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<tr>
<td>&gt; 20 ml/kg/min</td>
<td>10</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>15-20 ml/kg/min</td>
<td>5</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>&lt;15 ml/kg/min</td>
<td>5</td>
<td>5</td>
<td>1</td>
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</table>

Lance Armstrong

- VO2 max = 85ml/kg/min
- J Appl Physiol 98: 2191, 2005
The “3-Legged Stool” of Pre-Thoracotomy Respiratory Assessment:

<table>
<thead>
<tr>
<th>Lung Mechanics</th>
<th>Parenchymal Function</th>
<th>Cardio-Pulm. Reserve</th>
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<tbody>
<tr>
<td>FEV 1 (ppo &lt; 40%)</td>
<td>DLCO (ppo &lt; 40%)</td>
<td>VO2 max (15 ml/kg/min)</td>
</tr>
<tr>
<td>MVV, FVC</td>
<td>PaO2 &lt; 65</td>
<td>Stair climb &gt;2 flt.</td>
</tr>
<tr>
<td>RV/TLC</td>
<td>PaCO2 &gt; 45</td>
<td>6 min walk (/30)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Exercise SpO2</td>
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Post-thoracotomy Anesthetic Management:

**Predicted Postop. FEV1 (ppo FEV1%)**

- **> 40%**
  - Extubate in OR if patient “AWaC”
  - (alert, warm and comfortable)

- **40-30%**
  - Extubate if other factors favorable:
  - Exercise Tol., DLCO, V/Q scan Assoc. diseases

- **30-20%**
  - Consider Extub. if all favorable plus TEA
  - Other patients: staged wean of ventilation
Post-thoracotomy Cardiac Complications

# pats.

Days Post-op.

- **Ischemia**
- **Arrhythmia**
Cardiac Risk Assessment for Thoracotomy

(ACC/AHA Guidelines, Anesth Analg 2007, 104:15-26)

Intermediate Clinical Predictors
- Mild Stable Angina, Prev. MI
- Diabetes
- Compensated /prev. CHF

Poor Functional Capacity

Non-Invasive Testing

Abnormal

Adequate Functional Capacity

OK

OR
His Cigarette and Mine

It's CHESTERFIELD

Yours too for a full share of Mildness, Better Taste and Smoother Smoking...that's what you and all other cigarette smokers are looking for...and you get it in Chesterfield's Right Combination of the world's best cigarette tobaccos.

Make your next pack Chesterfields...regardless of price there is no better cigarette made today.

EVERYWHERE YOU GO They Satisfy
<table>
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<th>&gt;80 Years (Osaki ’94)</th>
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<td>44%</td>
</tr>
<tr>
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<td>15%</td>
<td>44%</td>
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Stair Climbing Predicts Post-lobectomy Complications in the Elderly

n= 109, Age >70, mortal. 3%, morbid. 27%

- ppo FEV1 %  p= 0.05
- Cardiac co-morbidity p= 0.02
- Stair climbing p= .002

Pre-thoracotomy Cardiac Risk Assessment

Elderly

Poor/Mod. Ex.Tol < 4 METS
Non-invasive Test.
High Risk
? Angio.

Excellent Ex.Tol >> 4 METS
Intermed/Low Risk Op.
OR

Low Risk
Intercurrent Respiratory Problems in COPD

- Infection
- Bronchospasm
- Atelectasis
- Nutrition/exercise
Pre-anesthetic Considerations for Lung Cancer (the “4 Ms”)

- **Mass Effects**
- **Metabolic Effects**: Na+, Ca++, Eaton-Lambert
- **Metastases**
- **Medications**: Bleomycin, Adriamycin, Cis-Platinum
Helping Surgical Patients Quit Smoking


Surgical Benefits:
- Decrease ST changes intraop.: 2 days
- Decrease wound complic’s: >4wk.
- Decrease Resp. Complications:
  Cardiac: >8 wk.
  Thoracic: > 4 weeks

Abstinence @ 1yr:
- After ACB: 55%
- Angioplasty: 25%
- Angiography: 14%

Preoperative Physiotherapy

- Proven decrease in pulmonary complications in COPD
- Particularly in patients with excessive secretions
- No proven superior modality

Warner DO, Anesthesiology 2000, 92: 1467
Will this patient tolerate a pneumonectomy?
Will this patient tolerate a pneumonectomy?

- Age 55
- FEV1 50%
- DLCO 45%
- Exercise tol.
  3 flights
- V/Q R:L
  40: 60
- pH 7.44
- PaCO2 48
- PaO2 68
Will this patient will tolerate a pulmonary resection?

**Surgical Options:**

- Sleeve Resection
- Bi-lobectomy
- Segment/Wedge Resection
- VATS
- Emphysema Surg.
- LVR/Bullectomy
Initial Pre-Anesthetic Assessment for Pulmonary Resection

- **All patients:** Exercise tolerance, ppoFEV1%, D/C smoking, Regional analg., ? Imaging
- **ppoFEV1 < 40 %:** DLCO, Exercise test, V/Q scan
- **Cancer patients:** the “4-Ms”, s. electrolytes
- **COPD:** ABG, chest physio., bronchodilators
Final Pre-Anesthetic Assessment for Pulmonary Resection

- Review Initial Assessment and Test Results
- Examine the Chest X-ray and CT scan
Preoperative Assessment for Thoracic Surgery, References:


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