Non small cell lung Cancer

Every patient with locoregional NSCLC should be approached as a potential candidate for surgery
5-year Survival

Mountain CF, 2001
Lung Cancer

T= Primary Tumor

N= Lymph Node

M= Metastasis
pStage I

5-yrs survival: 67%

5-yrs survival: 57%
pTNM Staging

Stage I: All T1-T2 and N0 tumors
pStage II

5-yrs survival: 55%

5-yrs survival: 39%
pTNM Staging

Stage II: T1-T2 and N1 and T3 N0 tumors

% Survival

- Hilar (n=48)
- Lobar (n=30)

Years
Type surgery & outcome

Mortality (%): 7
Morbidity (%): 48
Higher Stages

Stage IIIA: T3N1 or any T1-3N2
Stage IIIB: T4 or N3
Stage IV: Unresectable disease (except solitary brain and adrenal mts)

Multimodality Therapy
Multidisciplinary approach

Preoperative or Neoadjuvant

Intraoperative

Perioperative

Postoperative or Adjuvant

Time
Complete Resection

Surgeon is morally certain he or she has encompassed all tumor disease

Proximal margins of resected specimen are microscopically free of tumor

Within each major lymphatic drainage region, the most distal node is microscopically tumor free

Capsules of resected nodes are intact
Principles of Surgical Oncology

- Circulating tumour cells
- Lipopolysaccharide
- Inflammatory cytokines
- Immunosuppression

+ 

Minimal residual disease

Accelerated systemic or local recurrence
Principles of Surgical Oncology

- 2 hrs
  Depressed
  Lymphocyte transformation

- 14 days
  Restoration of
  cellular immunity
  Post-thoracotomy

- Day 21
  Restored cellular immunity to tumor-associated antigens

- Surgery
  Day 4
  Restoration of
  cellular immunity
  Post-MIC

- Day 21
  Restoration of delayed-type hypersensitivity response

Immunological “window of opportunity”
N2 Tumors

Cure Rate

<table>
<thead>
<tr>
<th>N0</th>
<th>N2</th>
</tr>
</thead>
<tbody>
<tr>
<td>50-80%</td>
<td>10-30%</td>
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</tbody>
</table>
Nodes Mets Pathway (Right)

Hata et al., 1990
Nodes Mets Pathway (Left)

Hata et al., 1990
N2 Tumors

Multiple levels of involvement
Nodal vs. extranodal disease
Superior vs. inferior mediastinum
Bulky clinical vs. minimal CT nodes
Only 20% of N2 are resectable

TBP

Mediastinoscopy

Bronchoscope
Trachea
Left primary broncus
Unusual tissue sampled for biopsy

Multiple levels of involvement
Nodal vs. extranodal disease
Superior vs. inferior mediastinum
Bulky clinical vs. minimal CT nodes
Only 20% of N2 are resectable
T3-4 Tumors

Tumors invading any mediastinal structures or organs
Pancoast Tumors

Shaw-Paulson
## Pancoast Results

<table>
<thead>
<tr>
<th>Authors</th>
<th>№</th>
<th>5-yrs survival (%)</th>
<th>Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paulson <em>et al.</em> (1986)</td>
<td>79</td>
<td>35</td>
<td>3</td>
</tr>
<tr>
<td>Ginsberg <em>et al.</em> (1994)</td>
<td>100</td>
<td>26</td>
<td>4</td>
</tr>
<tr>
<td>Dartevelle <em>et al.</em> (1998)</td>
<td>70</td>
<td>34</td>
<td>-</td>
</tr>
<tr>
<td>Rusch <em>et al.</em> (2001)</td>
<td>111</td>
<td>70 CR (2-yr)</td>
<td>2.7</td>
</tr>
<tr>
<td>Wright <em>et al.</em> (2002)</td>
<td>35</td>
<td>84 (4-yrs)</td>
<td>-</td>
</tr>
</tbody>
</table>
Hannover Intrathoracic Study Group: Phase II study

- Carboplatin (AUC2) and paclitaxel (40 mg/m² days 1, 8, 15, 22, 29) & RT (45 Gy week 1-5, day 1-5);
- 30 patients were evaluable;
- Complete resection in 100%, 43% of them pathological CR to induction treatment;
- The actuarial 3-year survival is 52% and the median survival has not been reached yet
Recent technical advances

- Lobectomy can be done via anterior approach alone
- Use of cadaveric vessels for subclavian vessels
- Vertebral body invasion is not a contraindication
- Divide vessels to gain access & revascularize them
- Perform cervical and mediastinal lymphadenectomy but avoid chest wall reconstruction anteriorly
- Be aggressive: pain control, frequent bronchoscopies and non-invasive ventilation
- Physiotherapy is key: Lymph drainage, early mobilization, etc.
Operations for intrathoracic vessels

- NSCLC (Stage III B)
- Mediastinal tumors
- Primary cardiovascular
- Primary chest wall
- Others (rare)
Vascular T4 NSCLC
Vascular T4 NSCLC
Vascular T4 NSCLC
Airway T4 NSCLC

Technical Innovations of Carinal Resection for Nonsmall-Cell Lung Cancer

Paolo Macchiariini, MD, PhD, Matthias Altmayer, MD, Tetsuhiko Go, MD, Thorsten Walles, MD, Karl Schulze, MD, Ingeborg Wildfang, MD, Axel Haverich, MD, PhD, Michael Hardin, PhD, and the Hannover Interdisciplinary Intrathoracic Tumor Task Force Group

Department of General Thoracic Surgery, University of Barcelona, Spain; Department of Cardiovascular and Vascular Surgery, Hannover Medical School, Germany; Department of Thoracic Surgery, Fukushima Medical Hospital, Fukushima, Japan; Departments of Anesthesiology and Radiation Oncology, Saiseikai Hospital, Hannover, Germany; and Information Systems, Statistics, and Management Sciences, University of Alabama, Tuscaloosa, Alabama

Background. We present our perioperative management of operable nonsmall-cell lung cancer invading the tracheobronchial bifurcation and the results obtained.

Methods. Fifty consecutive patients undergoing carinal surgery with radical lymphadenectomy over a 5-year period were studied.

Results. Eighteen patients (36%) were N2 and had chemoradiation (46 ± 6 Gy) preoperatively. Surgery included 31 carinal pneumonectomies (24 right, 10 left), 11 carinal lobectomies (n = 6 or bilobectomies (n = 5), and 5 carinal resections, with (n = 3) and without (n = 2) reconstructions. Patients were ventilated through low tidal volume controlled techniques except during aperistalsis and reconfiguration, during which the apneic hyperventilation techniques were used. High inspiratory oxygen concentrations, multiple collapse and expansion, hypoperfusion of the ipsilateral lung, and fluid overload were avoided. All patients but 1 were extubated in the operating room, 7 ± 5 minutes after skin closure. Operative mortality (less than 30 days) and morbidity were 4% (n = 2) and 37% (n = 18), respectively. All R1 resections but 1 (98%) were complete. The number of resected nodes per patient was 9 ± 2, and 7 (6%) of the 52 patients who had negative preoperative positron emission tomography results had micrometastatic mediastinal nodes. With a median follow-up of 36 months, actuarial 5-year and disease-free survivals were 51% and 47%, respectively. Disease-free survival was significantly affected by sublobar resection (tracheobronchial angle invasion versus less than 0.5 cm from carina, p = 0.03) and nodal status (N1 versus N1-2, p = 0.02) in the multivariate analysis.

Conclusions. Preoperative chemoradiation, carinal lobectomy, or left pneumonectomy, and radical lymphadenectomy do not worsen the therapeutic index of carinal surgery. The high incidence of micrometastatic nodes in positron emission tomography-negative patients claims AQ1 resection mediastinoscopy and radical lymphadenectomy.

(Am Thorac Surg 2006;82:2060-2066) © 2006 by The Society of Thoracic Surgeons
Eligibility: (Stages IIIB)

Node-negative
- Surgery

Node-positive
- Mediastinoscopy
- Chemoradiation (Carboplatin/Taxol + 45 Gy)
- No-Redo mediastinoscopy
- Surgery
# Surgical outcome

## Operative

<table>
<thead>
<tr>
<th>Mortality</th>
<th>1 (3%)</th>
</tr>
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<tbody>
<tr>
<td>Morbidity</td>
<td>14 (39%)</td>
</tr>
<tr>
<td>Major</td>
<td>4</td>
</tr>
<tr>
<td>Minor</td>
<td>10</td>
</tr>
</tbody>
</table>

Neoadjuvant vs. not, $p=0.027$

Projected Survival (%)

Time (months)

N0-1

N2
Oncological outcome

- All but 1 had a R0 resection;
- 39% of pretreated N2 pts were pathologically downstaged to N1 or N0;
- PET scan was false negative in 7 (32%);
- Multivariate DFS analysis: endobronchial extension (<0.5 cm from carina vs. tracheobronchial angle) and N status (N0 vs. N1 & N2)