Locally Advanced Lung Cancer - Complex Pulmonary Resections: Indications, Evaluation, Technique, Tips and Tricks, and Results - Is it Worth the Risk?

Olaf Mercier
Thoracic Surgery
Marie Lannelongue Hospital
Clinical Case 1

- 62 yo man
- Severe COPD: FEV-1 48%, PO2 at rest = 79mmHg
- Left Lung perfusion = 30%
- RVSP = 41mmHg (Cardiac Echo)
- CT guided biopsy: AdenoK TTF1+
Imaging
Left upper segment resection extented to the bronchial bifurcation + PA reconstruction

- Avoid stretched sutures
- Use PDS and vicryl sutures
- Posterior part first
- The more fragile, the thinner suture
- Respect 3D anatomy of the lung
- Respect bronchial vessels
- Suture coverage (flap)
- Bronchoscopy
Results

R0 resection
No recurrences at 4y FU
Clinical case 2

• 44 yo woman
• Past medical history : #Ø
• Smoker 15 PY
• September 2009 :
Right cervical and upper chest pain (C8-D1)
Horner Sd
no dyspnea, no cough, no dysphonia, no motor or sensitive weakness
PET scan
Angiograms

- Blush tumoral
- Invaded Right subclavian artery
- Invaded right innominate vein
Transoesophageal echography

- Subclavian artery invaded
- Esophagus not invaded

- CT-guided Biopsy = Adenocarcinoma TTF1+ CK7+
- Cerebral MRI : normal
Surgery : 12/03/2009

Upper lobe removed for picture convenience
Pathology

• T4 NO    R0    stage IIIA
• Free margins
• Tumoral thrombosis of jugular vein
Postoperative course

• Uneventfull
• Adjuvant CT
• No RT
• No recurrence at 6y FU
Clinical Case 3

- 28 year-old woman
- Dysphagia
- Posterior mediastinum tumor
- Biopsy through posterolateral thoracotomy: Plasma cell granuloma (myofibroblastic inflammatory tumor)
- Tumor invading esophagus, bronchus, and adventitia of the right side of the thoracic aorta
Post-operative chest X-ray
Six months later
Complex resections

• **Because of the patients**
  - Poor lung function
  - Left heart disease
  - Pulmonary vascular disease

• **Because of the extension of the disease**
  - Mediastinal involvement
  - Vascular involvement
  - Bronchial tree involvement
  - Esophagus involvement
  - Heart involvement
  - Spine and thoracic inlet involvement...etc
Indications for extended resection

- Rule out N2 disease
- Lung function tests (PFTs, Exercise testing)
- Don’t forget pulmonary circulation+++  
  - Cardiac echography  
  - Right heart catheterization – PA blocking
- Associated risk factors (vascular disease)

- For the tumor => Perfectly assess local extension (R0 resection)  
  - MRI for spine resections  
  - Trans esophageal echo for esophagus, aorta, pulmonary vein  
  - Angiograms
Principles of extended/complex surgery for NSCLC

- En bloc R0 resection
- Mediastinal lymph nodes dissection
- Lung sparing surgery
- Lobectomy or pneumonectomy
- Sublobar for compromised lung function

- Safety and feasibility of the resection using most recent technique of vascular surgery, cardio-pulmonary support and plastic surgery
Tumor respecting the intervertebral foramen
Tumor within the canal...

Contraindication
NSCLC invading the thoracic Inlet

Median survival 30 months
38.5%

Median survival 23 months
10.1%

p = 0.2

Patients 107 81 57 41 39 31 28 21 17 12 11
at risk 19 13 9 3 2 1 1
NSCLC invading the spine

| Patients | 98 | 73 | 53 | 34 | 32 | 24 | 22 | 16 | 13 | 10 | 9 |
| at risk  | 28 | 21 | 13 | 10 | 10 | 9  | 7  | 5  | 3  | 2  | 1 |

Median survival 31 months

Median survival 20 months

Sup Sulcus Tm
n=98
5 year survival 37.8%
p=0.38

Sup Sulcus Tm+Vertebrae
n=28
5 year survival 28.6%
Carinal resection
Right upper lobectomy and carinal resection

- Divide the azygos vein
- Pericardial release
- Lower pulmonary vein reimplantation
Carinal resection for NSCLC

Survival

\[ \text{N0/1: 49.8\%} \]
\[ \text{N2+: 17\%} \]

Time (months)

\[ \text{p=0.007} \]
Superior vena cava resection and prosthetic replacement
SVC replacement by PTFE graft size 18
Mean Arterial Pressure
Mean brachiocephalic Venous Pressure
Brain Arterial-Venous Gradient

Basal

During SVC Clamping

Clamping Alone
With Intraluminal Shunt
Volume Expansion & Vasoconstrictive Agents

mm Hg
SVC Replacement for NSCLC

Survival according to nodal status

Survival

N0/1 (n=22) 37.5%
N2+ (n=17) 19.6%

Time (months)

p=0.002
Resection of other mediastinal structures

- Left atrium
- Main pulmonary artery bifurcation
- Aortic arch and descending aorta
- Esophagus
OVERALL SURVIVAL FOR T4 NSCLC (n=271)

Failure
\[ n = 138 \] (51%)

29 local recurrence
94 distant recurrence
15 both

38.4%
Surgery for T4 NSCLC

Survival according to nodal status (n=271)

N0/1 vs N2+ : 208 vs 63
P=0.003
Take home messages

- Mean postoperative mortality rate of NSCLC extended resection is 4% and is essentially related to right pneumonectomy.

- T4 surgery may yield a 43% five year survival rate in N0-N1 tumors.

- Following rules of complete resection in non N2 patients, extended surgeries for NSCLC are worth the risk.