Lung Transplantation

Objectives

• Indications for lung transplant
• Contraindications for lung transplant
• Considerations for ILD patients
• Pre lung transplant work up
• Post transplant course

History

Adult Lung Transplants
Major Indications by Year (Number)

Which of the following is an absolute contraindication to lung transplant?

A. Hepatitis C
B. Active Mycobacterium Tuberculosis
C. Coronary artery disease
D. HIV
E. Age > 65 years
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A. Hepatitis C  
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C. Coronary artery disease  
D. HIV  
E. Age > 65 years

**Absolute Contraindications**
- Malignancy
- Major organ dysfunction
- Significant coronary artery disease
- Obesity (BMI > 35 kg/m²)
- Significant chest wall or spinal deformity
- Uncorrectable bleeding diathesis
- Acute medical instability
- Chronic Infections with resistant/highly virulent microbes
- Active Mycobacterium TB
- Unreliable or lack of social support
- Psychiatric or psychological illness
- Lack of rehabilitation potential
- Substance abuse

**Relative Contraindications**
- Age (how old is old)
- Obesity (BMI 30-35)
- Severe malnutrition
- Severe osteoporosis
- Extensive prior chest surgery
- Mechanical ventilation and/or extra-corporeal life support
- Hepatitis B/C
- HIV
- Highly resistant bacterial infections
- Severe CAD
- Medical comorbidities

**Age as a Criterion for Lung Transplant**
- Age > 65 years is a relative contraindication to lung transplantation.
- Careful assessment of comorbidities, rather than age alone.

**Age – Is it just a number?**

- **Heart Lung Transplant**
- **Bilateral Lung Transplant**
- **Single Lung Transplant**

<table>
<thead>
<tr>
<th>Age</th>
<th>5 year survival</th>
<th>p</th>
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<tbody>
<tr>
<td>&lt; 60 years</td>
<td>52.2%</td>
<td>p = 0.95</td>
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<tr>
<td>&gt; 60 years</td>
<td>47.5%</td>
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*Age > 60 does not appear to have a significant impact on short term or long term mortality in carefully selected patients.*
Retrospective UNOS database review 2005 - 2012
Compared short-term and long-term outcomes in age range 65 – 79 years with standard recipient age range 12 – 64 years

Well selected, elderly patients up to age 74 years are being offered lung transplantation with acceptable outcomes.
BLT has acceptable short term and long term outcomes in this growing patient population.
Above the age of 75 years, lung transplantation is associated with poor outcomes.

Usual interstitial pneumonitis (UIP) or fibrosing non-specific interstitial pneumonitis (NSIP), regardless of lung function.
Abnormal lung function: FVC <80% (pred) or DLCO <40% (pred).
Dyspnea or functional limitation due to lung disease.
Any oxygen requirement.
Inflammatory ILD: Persistent dyspnea, oxygen requirement, and/or lung function after a clinically indicated trial of medical therapy.
Listing time

- Decline in FVC $\geq 10\%$ and/or DLCO $\geq 15\%$ during 6 months of follow-up.
- Desaturation to $<88\%$ or distance $<250$ m on 6MW test or $>50$ m decline in 6MW distance over a 6-month period.
- Pulmonary hypertension (PHTN) on right heart catheterization or 2-d echocardiography.
- Hospitalization due to respiratory decline, pneumothorax, or acute exacerbation.

Consensus Document for Lung Transplant Candidate Selection, JHL T 2015

IPF & Lung Transplantation

- Largest proportion of patients awaiting lung transplants.
- Waitlist time has decreased.
- Higher waitlist mortality (14 – 67%).
- High LAS associated with decreased one year survival.
- Number of transplants for IPF has increased.
- Median survival 4.5 years.
- Lower survival compared to other ESLD.
- Increasing numbers of BLT.

Improved BLT vs SLT may be result of selection bias.

Kistler et al; BMC Pulmonary Medicine 2014

Organ Allocation

- Lung allocation score (LAS) introduced May 2005
- Allocate organs to decrease waiting list mortality while improving posttransplant survival.
- Switched from a time-based accrual system to a needs-based allocation system based on disease severity and estimated survival time.

Egan et al. 2006

Pre Transplant Work up

- Blood & tissue typing
- Renal & Liver function tests
- Infectious serologies (Viral hepatitis, HIV, CMV, EBV)
- Pulmonary function tests (spirometry, lung volumes, DLCO)
- Arterial Blood gas
- Exercise performance with 6 minute walk test
- Chest radiograph
- Computed tomography (CT) scan of chest
- Cardiac evaluation: EKG, 2d-echocardiogram, right & left heart catheterization
- Ventilation/perfusion scan (V/Q scan)
- Bone densitometry
- GI Evaluation: Esophagram, Colonoscopy
- Age appropriate cancer screening (PAP smear, Mammogram)

Kistler et al, BMC Pulmonary Medicine 2014

Listing Process

- Investigations
  - Allied Professionals
  - Pulmonologist
  - Transplant Surgeon
  - Lung Transplant Selection Committee

Pre Transplant Work up

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Bridge to Transplant (BTT)

- Traditional: Mechanical Ventilation & Extra Corporeal Life Support (ECLS)
- Novel Techniques: Novalung

ECMO

- Preferred BTT in USA
- Hypercapnic +/- hypoxic respiratory failure.
- VenoVenous & VenoArterial Modalities.
- Novel bicaval dual lumen cannulas, such as the Avalon cannula.
- Patients awaiting lung transplantation can avoid intubation and continue an exercise regimen.

VVECMO with Avalon single cannula system via right internal jugular vein
Q 2: What is the leading of mortality after the first year in lung transplantation?

A. Malignancy
B. Chronic renal failure
C. Primary graft dysfunction
D. Chronic Lung Allograft Dysfunction (CLAD)
E. Acute cellular rejection
Survival After Lung Transplantation

• Despite recent advances, overall survival still lags behind other solid organ transplants
• 1st year transplant survival rates have improved
• Long term survival statistics are still underwhelming.
• Conundrum of over vs under immunosuppression
  – Exposed to the environment (virus, toxins)
  – Contains significant amount of lymphoid tissue

Conclusion

• Lung transplants continue to grow.
• Increasingly common in sicker and older patients.
• Excellent short term outcomes.
• Long term outcomes remains unchanged.

The Three Amigos !

Thank You

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