

Lung Transplantation: Everything You Need to Know and Shouldn't Be Afraid to Ask



Stuart C. Sweet MD, PhD
Pediatric Lung Transplant Program



Overview

- Why I would / would not want a lung transplant?
- When do I need to be evaluated?
- What happens next?
- What should I worry about after transplant?
- Future directions

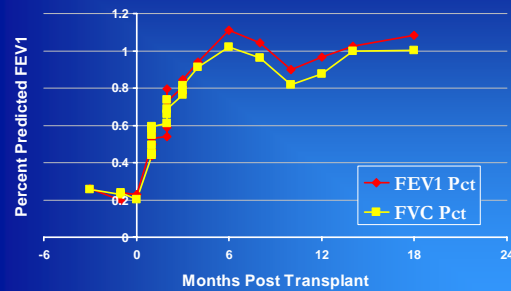


Overview

- Why I would / would not want a lung transplant?
 - Pros
 - Cons
 - Commitment
- When do I need to be evaluated?
- What happens next?
- What should I worry about after transplant?
- Future directions



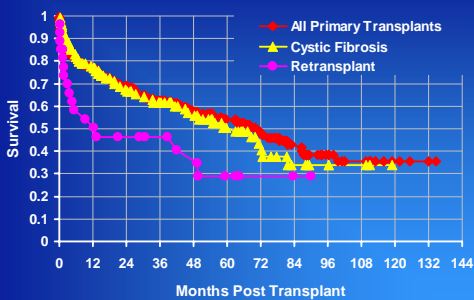
Pros: Better Lung Function (FEV₁)



Source: SLCH Transplant Program Data as of Feb 2002



Cons - Survival



Source: SLCH Transplant Program Data as of 11.01



Commitment



Overview

- Why I would / would not want a lung transplant?
- When do I need to be evaluated?
 - Criteria and Contraindications
 - Considerations in PCD
- What happens next?
- What happens after transplant?
- Future directions

When to get evaluated?

- EARLY!
- Although new allocation system will improve access to organs for the sickest patients, identifying a transplant center and arranging evaluation takes time.

Lung Transplant Indications

- Untreatable end-stage obstructive or restrictive pulmonary parenchymal or pulmonary vascular disease
- Low probability of recurrence of lung disease
- No other significant medical diseases
- Substantial limitation of daily activity
- Ambulatory with rehabilitation potential
- **Satisfactory psychosocial profile and emotional support system**

Disease Specific Criteria

- Cystic Fibrosis
 - $FEV_1 < 30\%$ predicted or rapid progressive decline
 - RA ABG with $pCO_2 > 50$ or $pO_2 < 55$
 - Young female patients particularly at risk
 - Pan-resistant *P. Aeruginosa* colonization a relative contraindication
 - Pan-resistant *B. Cepacia* colonization an absolute contraindication

Hurdles

- Infections with difficult to treat organisms
- Corticosteroids
 - Attempt to minimize dose prior to transplant
- **Nutrition**
 - **Ideally between 70% and 130% of IBW**
- Invasive Ventilation
- Psychosocial Issues – relative contraindications
 - Major psychoaffective disorder
 - **Poor adherence (must have ability to follow complex medical regimen)**

Considerations in PCD

- Published literature about transplantation for PCD relatively limited. No reported lung transplants in pediatric age group
- Approximately 250 transplants reported for bronchiectasis. There may be PCD patients in this population.
- Situs Issues – less critical in bilateral sequential transplant

Overview

- Why I would / would not want a lung transplant?
- When do I need to be evaluated?
- What happens next?
 - Evaluation
 - Listing
 - Waiting...
- What happens after transplant?
- Future directions

Lung Transplant Evaluation

- PFT's
 - Spirometry
 - Lung Volumes
 - DLCO
 - ABG
- Studies
 - CXR
 - Chest CT
 - 6 Minute Walk Test
 - Consider VQ Scan
 - Consider ECHO/Cath
- Laboratory
 - Baseline Laboratories
 - Renal Function
 - Liver Function
 - Cholesterol
 - Serologies
 - CMV, EBV
 - VZV, HIV, Hepatitis
 - Sputum Culture
- Psychosocial Evaluation
- **Your Education!**

"The List"

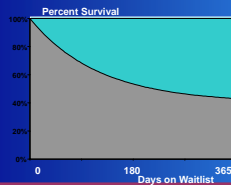
- How are lungs allocated?
 - Allocation system changed in May, 2005 from waiting time to "Transplant Benefit" based system for patients 12 and older
 - Recipients must have compatible blood type and meet size criteria
- What is "inactive"?
 - Patients listed for transplant but who are not ready are changed to inactive status
- Can you move me up the list?

New Lung Allocation System

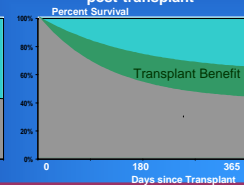
- Key Concept:
 - **TRANSPLANT BENEFIT**
 - Difference between candidate's post-transplant survival and waitlist urgency.
- **OR, in other words...**
 - Expected extra days of life over the coming year if that candidate receives a transplant rather than remaining on the waitlist

New Lung Allocation System

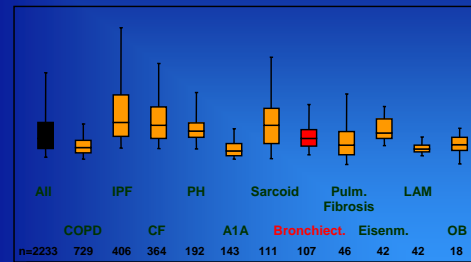
Waitlist Urgency Measure
Shaded area under curve = Expected number of days lived without a transplant during an additional year on the waitlist



Post-Transplant Survival Measure
Shaded area under curve = Expected number of days lived during the first year post-transplant



Allocation Scores* by Diagnosis



* Calculated as PT-2*WL

Waiting...

- Critical time between listing and transplant
 - Work hard to keep the lungs you have
 - Optimize nutritional status
 - G-Tube
 - Physical therapy
 - Maintain and increase endurance
- Periodic reevaluation

Overview

- Why I would / would not want a lung transplant?
- When do I need to be evaluated?
- What happens next?
- What happens after transplant?
 - Reevaluations
 - Three phases of care / complications
 - Anticipated challenges
- Future directions

After Transplant...



Routine follow up post lung transplant

- Stay in St. Louis for the first 3 months post transplant
- Return to St. Louis every 3 months the first year, and then every 6 months thereafter
- Although it requires a major commitment on the part of patient and family, we believe that it is a critical factor for success
- Adherence

Routine follow up evaluation

- Clinic visit
- Laboratory Evaluation
- Pulmonary Function Testing
- Nutrition Assessment
- Physical Therapy Evaluation
 - six minute walk test
- Chest CT Scan
- Ventilation Perfusion Scan
- Bronchoscopy with Transbronchial Biopsy
- Bone Densitometry

Complications – Overview

- 3 Phases of Transplant:
 - Immediate (first week)
 - Early (1 week to 3 months)
 - Late (after 3 months)
- 4 Major Complication Categories
 - Immunologic (rejection)
 - Infectious
 - Surgical
 - Other

Immediate Complications

- Hyperacute Rejection
 - Rarely seen
- Early Graft Dysfunction
 - Aka “reimplantation response”, “ischemia/reperfusion injury”
- Infection
- Surgical Complications
 - Bleeding
 - Anastomosis Breakdown
 - Vascular complications

Early Complications

- Acute Rejection
- Infection
- Surgical Complications
- Other

Early Complications

- Infection
 - Bacterial
 - Common organisms
 - Pseudomonas (CF Patients)
 - Fungal
 - Aspergillus
 - Candida
 - Viruses
 - CMV
 - Adenovirus
 - Opportunistic infections: PCP, etc

CMV Pneumonitis

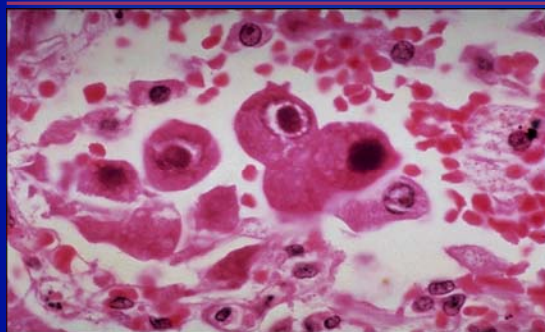
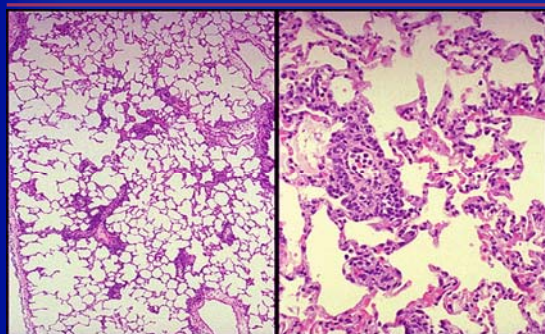


Photo: Yousem, S. 3rd Banff Conference on Allograft Pathology

Early Complications – Rejection

- Acute Rejection – Symptoms / Findings
 - Cough, respiratory difficulty
 - Fever
 - Elevated WBC
 - Decreased FEV1
 - Perihilar Infiltrates
 - Pleural Effusions
- Treatment (grade A2 or greater):
 - Pulsed Steroids
 - Cytolytic therapy (ATG, RATG, OKT3)

Grade A2 Acute Rejection



Photos: Yousem, S. 3rd Banff Conference on Allograft Pathology

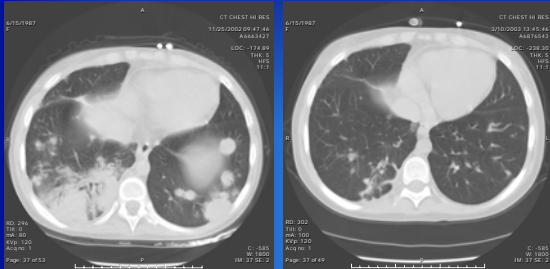
Late Complications

- Infection...
- Rejection...
- Malignancy
 - Post Transplant Lymphoproliferative Disease (PTLD)
 - Other malignancies
- Renal Failure
- Diabetes
- Bronchiolitis Obliterans (OB)

Late Complications

- Infection...
- Rejection...
- Malignancy
 - Post Transplant Lymphoproliferative Disease (PTLD)
 - Other malignancies
- Renal Failure
- Diabetes
- Bronchiolitis Obliterans (OB)

PTLD



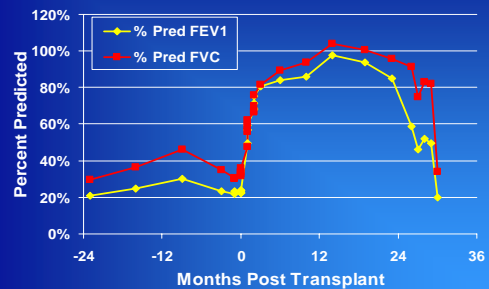
Late Complications

- Infection...
- Rejection...
- Malignancy
 - Post Transplant Lymphoproliferative Disease (PTLD)
 - Other malignancies
- Renal Failure
- Diabetes
- Bronchiolitis Obliterans (OB)

Late Complications

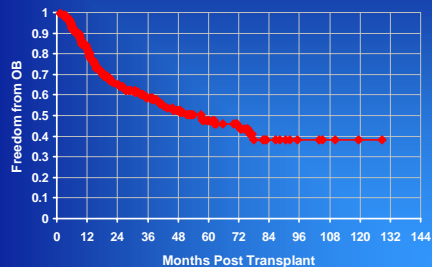
- Infection...
- Rejection...
- Malignancy
 - Post Transplant Lymphoproliferative Disease (PTLD)
 - Other malignancies
- Renal Failure
- Diabetes
- Bronchiolitis Obliterans (OB)

OB - Clinical Presentation



OB in Lung Transplantation

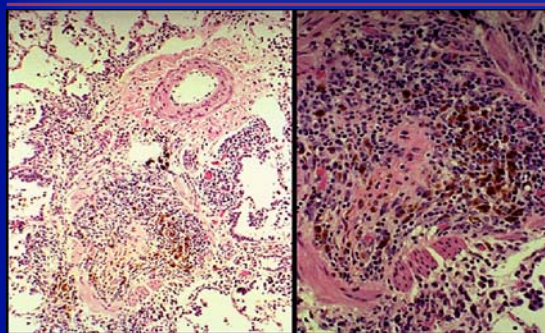
- Most common late complication of lung transplant



Source: SLCH Transplant Program Data as of May 2001



OB - Histology



Photos: Yousem, S. 3rd Banff Conference on Allograft Pathology



Challenges

- Can never stop being vigilant about your lungs
- Side effects catch up to you...
 - Bones
 - Kidneys
- Growing Pains
 - Adolescence...



Overview

- Why I would / would not want a lung transplant?
- When do I need to be evaluated?
- What happens next?
- What should I worry about after transplant?
- Future directions



Future Challenges

- Donor Supply
 - Increase awareness (talk to your family about organ donation!)
 - Expand pool of acceptable donors (non-beating heart donors)
 - Expand use of living donor transplantation (recent high-profile challenges)
 - Xenotransplantation (controversial, not ready for prime time yet...)



Future Directions

- Immunosuppression
 - New non-specific therapies
 - IL-2 receptor antagonists (Daclizumab, Basiliximab)
 - Rapamycin, RAD
 - Continue to explore strategies for specific tolerance



Summary

- The promise of lung transplantation...
Is only the tip of the iceberg
- Success depends on:
 - Commitment to care that begins long before evaluation
 - Making yourself the best possible candidate
 - Taking care of your gift
- Make a commitment to organ donation!

