Akciğer Transplantasyonu sonrası Yoğun Bakım

Evren Şentürk
İstanbul Tıp Fakültesi Anesteziyoloji Anabilim Dalı
Yoğun Bakım Bilim Dalı

Ajanda

- Tx sonrası Yoğun Bakım odak noktaları
- Komplikasyonlar ve yaklaşım
- Bizim deneyimimiz

Endikasyonlar

The Patient Who Has Undergone Lung Transplantation: Implications for Respiratory Care

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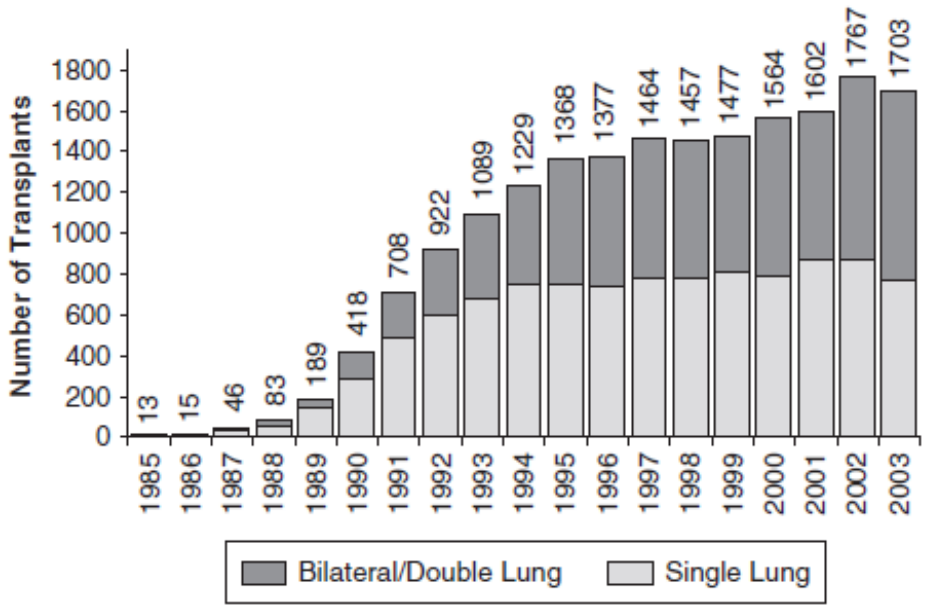
Stephanie M Levine MD and Luis F Angel MD

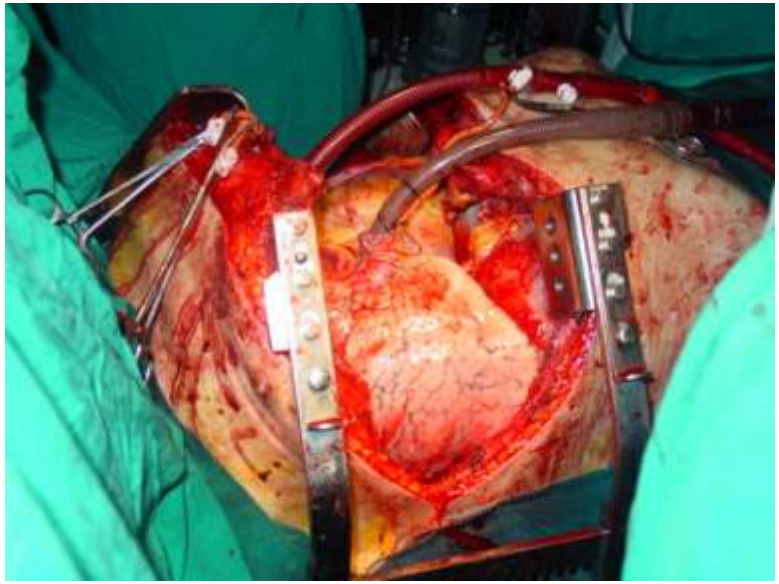
Table 1. Major Indications for Lung Transplantation by Procedure

Single-Lung Transplantation
Chronic obstructive lung disease
Pulmonary fibrosis
Alpha-1 antitrypsin deficiency
Sarcoidosis
Other
Bilateral Lung Transplantation
Cystic fibrosis
Chronic obstructive lung disease
Pulmonary fibrosis
Pulmonary hypertension
Bronchiectasis
Other



Sağ kalım

- 1 yıl %76
- 2 yıl %68
- 3 yıl %60
- 5 yıl %49



Hosenpud JD, Bennett LE, Keck BM, et al. The Registry of the International Society for Heart and Lung Transplantation: sixteenth official report, 1999. J Heart Lung Transplant **1999; 18:611–26.**].

ELSEVIER

Dramatic Improvement in Survival After Lung Transplantation Over Time: A Single Center Experience

V. Costache, O. Chavanon, C. St Raymond, C. Sessa, M. Durand, J. Duret, V. Bach, P. Porcu, R. Hacini, A. Aubert, P. Chaffanjon, E. Cochet, P.-Y. Brichon, B. Coltey, C. Cracowski, D. Bertrand, C. Schwebel, D. Barnoud, E. Brambilla, S. Lantuéjoul, G. Ferretti, I. Pin, D. Blin, C. Pison, and the Grenoble Lung Transplantation Group

Table 1. Characteristics of Donors and Recipients Before and After 2001

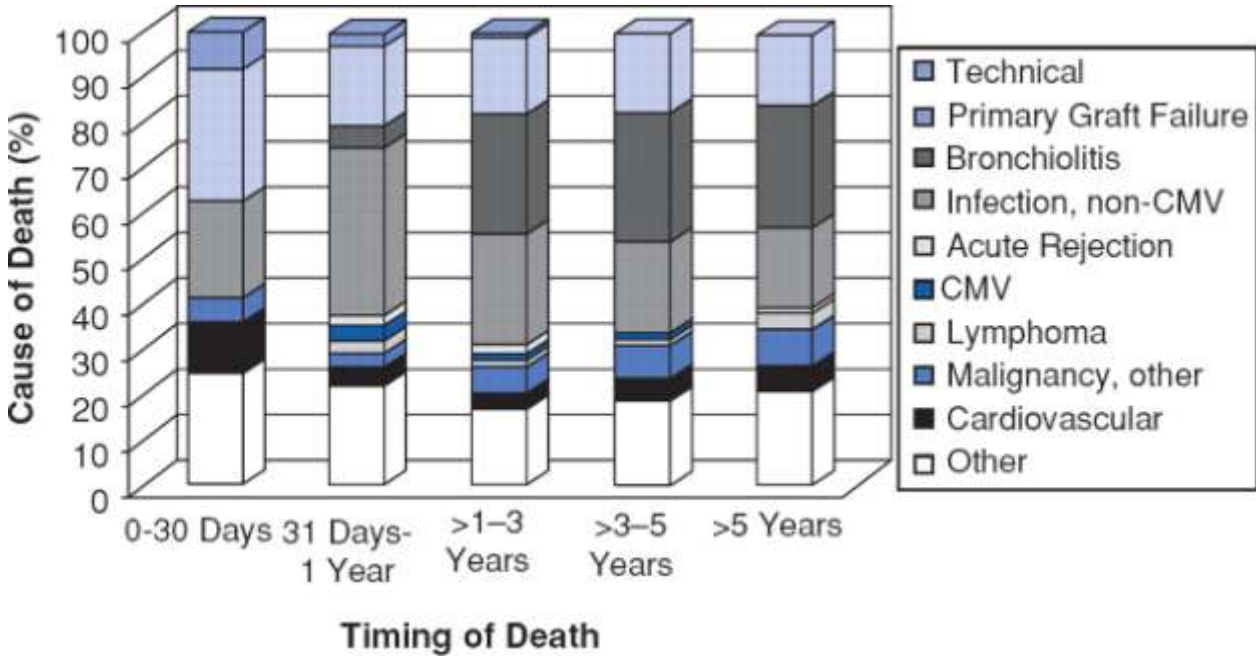
Variable	Before 2001	After 2001	*P*
Recipients (n)	70	53	
Age (y)	44 ± 14	45 ± 15	NS
Diagnosis: COPD, CF, ILD, PH, %	[illegible]	[illegible]	NS
Body mass index, all patients, kg/m²	21.3 ± 4.6	21.1 ± 4.6	NS
Body mass index, CF patients, n, kg/m²	15, 16.8 ± 2.7	17, 18.9 ± 3.2	.06
Noninvasive ventilation prior to LT	35	64	.004
Pulmonary rehabilitation prior to LT, %	10	75	<.0001
Donors			
Age (y)	[illegible]	41 ± 16	<.0001
Cause of death trauma (%)	51	21	.002
Ventilation (h)	41 ± 36	39 ± 32	NS
PaO_2/FiO_2	460 ± 101	452 ± 92	NS
Pneumoplegia, extracellular type (%)	49	100	<.0001
Cold ischemia time (min)	294 ± 92	350 ± 81	.0007
Procedures			
Waiting time, median (min, max) (d)	100 (0–1049)	100 (4–862)	NS
Single, double, heart-lung transplantation (%)	26, 66, 7	25, 74, 1	NS
CPB (%)	72	53	.04
Blood transfusion, median (min, max) (mL)	1535 (0–[illegible])	400 (0–1800)	.0002

➢ Başarı nedeni

- ➢ Preoperatif pulmoner rehabiltasyon
- ➢ Gelişen cerrahi teknik ve organ koruma ve kan ihtiyacında ↓
- ➢ İmmünsupresif tedavi ve antibiyotik protokolleri
- ➢ İncelikli ve bilgili postoperatif bakım

Mortalite nedenleri;

- Erken postoperatif teknik komplikasyonlar ve primer graft yetersizliği
- 1 ay-1yıl arası enfeksiyon
- 1 yıl sonrası bronşiolitis obliterans



- *Adapted from Trulock EP, Edwards LB, Taylor DO, et al. Registry of the International Society for Heart and Lung Transplantation: Twenty-second official adult lung and heart-lung transplant report—2005. J Heart Lung Transplant 2005; 24:956.)*

Postoperatif bakımın odak noktaları

- **Yapay solunum desteği**
- **Hemodinamik yönetim**
- İmmunsupresyon
- Enfeksiyondan korunma ve tespiti
- Erken rejeksiyonun tespiti
- Pulmoner temizlik
- Fizik tedavi ve rehabilitasyon
- Beslenme

Postoperatif mekanik ventilasyon

- Basınç destekli ventilasyon
- Plato basıncı < 35mmHg
- KOAH ve tek akc Tx ise düşük PEEP
- Hava hapsini önlemek için ekspiratuar hold manevrası
- Pulmoner HT inhaler nitrik oksit (NO)
- 48 saatte weaning ($FiO_2 \downarrow$)
- Ekstübasyon öncesi bronkoskopi
- Drenler

Hiperkapni

- Kronik hiperkapnik hastalarda solunum merkezinin uyarılması için
- $PaCO_2$ düzeylerinin preop düzeyler ile normokapni arasında tutulması
- Birkaç gün süre

Non invazif mekanik ventilasyon

Noninvasive Ventilation in Postoperative Care of Lung Transplant Recipients

P. Feltracco, E. Serra, S. Barbieri, M. Milevoj, M. Furnari, S. Rizzi, F. Rea, G. Marulli, and C. Ori

- √ Hava yolu hasarı ve enfeksiyondan koruma
- √ Greft fonksiyonu iyi ancak solunum eforu yeterli olmayan olgularda
- √ Frenik sinir disfonksiyonunda
- √ Kas gücü yeterli olmayan olgularda
- √ Nazokomiyal pnömoni önlenmesinde
- ➢ Sekresyon retansiyonunda uygun değil

Hemodinamik takip

- Pulmoner Hipertansiyon

  İnhale NO/ inhale PG

- Sistemik hipotansiyon

  kan ürünü ve vazopressörler

- Supraventriküler taşiaritmiler

  Ca kanal blokeri, Beta-bloker, Amidaron

(Wiedemann HP. Comparison of two fluid management strategies in acute lung injury. N Engl J Med. 2006;15)

Postoperatif sıvı tedavisi

- Akciğer ödeminden korumak için
- Negatif bilanço ilk 48 saat
- Kan, kolloid ve diüretik tedavisi
- Dopamin 3 µgr/kg/dk ??
- Renal hasar dikkat---immünsüpresif tedavi

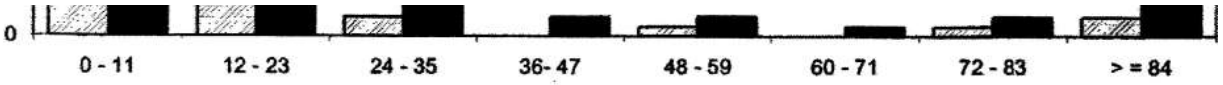
High central venous pressure is associated with prolonged mechanical ventilation and increased mortality after lung transplantation

D. V. Pilcher, MBBS, MRCP[a]

TABLE 4. Comparison of outcomes between patients with CVPs of 7 mm Hg or less and patients with CVPs of greater than 7 mm Hg

	CVP ≤7 mm Hg (n = 56)	CVP >7 mm Hg (n = 62)	*P* value
Prolonged mechanical ventilation	4% (n = 2)	40% (n = 25)	<.001
Duration of ICU stay (d)	3 (2-3)	5 (3-7)	<.001
Duration of hospital stay: survivors (d)	19 (16-25)	27 (16-46)	.02
ICU mortality	0% (n = 0)	8% (n = 5)	.02
Hospital mortality	4% (n = 2)	13% (n = 8)	.09

Prevalence data are presented as a percentage of the total in each group. Continuous variables are presented as medians (interquartile ranges). *CVP*, Central venous pressure; *ICU*, intensive care unit.



	CVP ≤ 7mmHg (n=56)	CVP > 7mmHg (n=62)
Percentage ventilated < 24 hours	89%	48%
Percentage ventilated < 48 hours	93%	61%
Percentage ventilated < 72 hours	95%	66%
Percentage ventilated ≥ 72 hours	5%	34%

Figure 1. Histogram of ventilation hours.

pressure; *CF*, cystic fibrosis; *COPD*, chronic obstructive pulmonary disease; *PPH*, primary pulmonary hypertension; *ILD*, interstitial lung disease; *CPB*, cardiopulmonary bypass.

Kanama

- Sağ kalp yetersizliği ve karaciğer yetersizliği
- Kronik antikoagülasyon

Postoperatif fizyoterapi

- Postural drenaj, göğüs fizyoterapisi
- Bronkodilatatör tedavi
- Erken mobilizasyon, entübe olsa dahi…
- Erken trakeostomi
- Hasta konforu, oral hijyen ve sekresyonların temizlenmesi

Postoperatif analjezi

- Torakal epidural analjezi
- Triantafillou AN, Heerdt PM, Hogue CW, et al. Epidural vs intravenous morphine for postoperative pain management after lung transplantation. *Anesthesiology*. 1992;77:A858.
- Narkotikler
- NSAİİ ?? nefrotoksisite

İmmünsupresif tedavi

- **Kalsinörin inhibitörleri**

  Takrolimus, siklosporin A
- **Antimetabolitler**

  Azotiopirin, mycophenolate
- **Kortikosteroidler**
- **İndüksiyon tedavisi**

  IL-2 reseptör antagonists (daclizumab, basiliximab)

  Poliklonal ajanlar (ATGAM, thymoglobulin, OKT3)

**Keenan RJ. Clinical trial of tacrolimus versus cyclosporine in lung transplantation. Ann Thorac Surg.1995;60.585.*
**Zuckermann AH.Cyclosporin A versus tacrolimus in combination with mycophenolatemofetil and steroids as primary immunosuppression after lung transplantation J Thorac Cardiovasc Surg. 2003;125:891-900.*

Post operatif komplikasyonlar

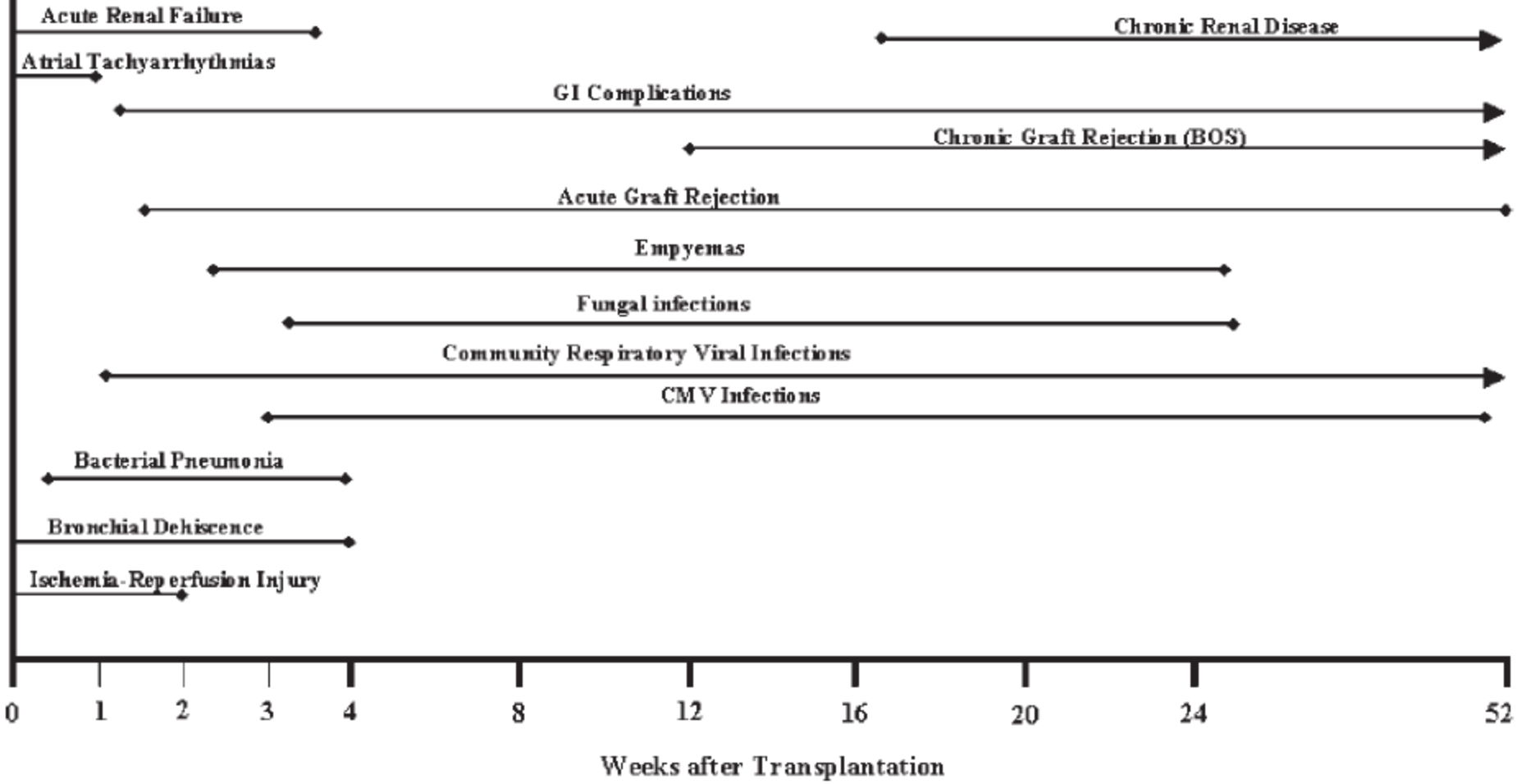


Fig 2. Timeline of complications following lung transplantation that may require intensive care unit treatment. GI = gastrointestinal; BOS = bronchiolitis obliterans syndrome; CMV = cytomegalovirus.

Lau CL, Patterson GA, Palmer SM. Critical care aspects of lung transplantation. *J Intensive Care Med.* 2004;19:83-104.

Ischemia–Reperfusion–induced Lung Injury

Marc de Perrot, Mingyao Liu, Thomas K. Waddell, and Shaf Ke Am J Respir Crit Care Med Vol 167. pp 490–511, 2003

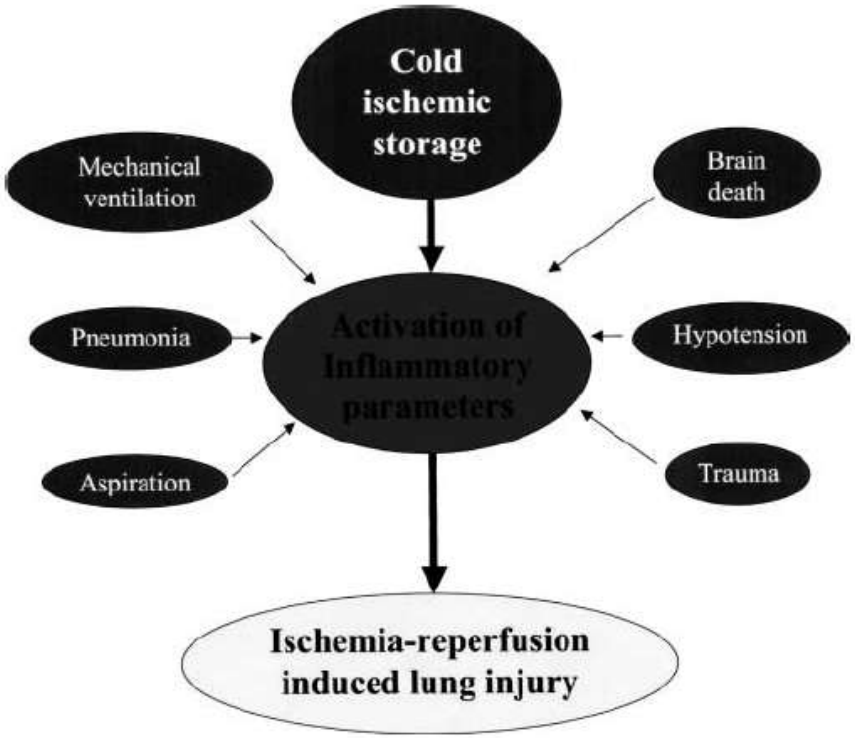


Figure 1. Ischemia–reperfusion–induced lung injury may be aggravated by a number of events occurring in the donor before lung retrieval.

TABLE 1. TERMS USED TO DESCRIBE ISCHEMIA–REPERFUSION–INDUCED LUNG INJURY

Reimplantation edema
Reimplantation response
Reperfusion injury
Reperfusion edema
Primary graft failure
Early graft dysfunction

Postoperatif komplikasyonlar

Komplikasyon:1
İsk-rep. hasarı

- ***İskemi reperfüzyon hasarı***
  - Yıkama (koruma) solüsyonu seçimi/yönetimi
  - Hiperinflasyondan kaçınma
  - Lökosit filtresi
  - ECMO
  - Diferansiyel akciğer ventilasyonu

Primer greft disfonksiyonu

Fig. 3. Anteroposterior portable chest radiograph of a 50-year-old woman with chronic obstructive pulmonary disease, taken 6 hours after a right-side single-lung transplant procedure. Note the alveolar infiltrates caused by primary graft dysfunction.

•Sağ akciğer nakli sonrası

•Primer greft disfonksiyonu

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- İlk 72 saatte ve infeksiyon elenirse
- Ciddi disfonksiyon varsa ECMO gerekebilir.

Akut rejeksiyon % 11-57

- Hipoksemi
- FEV1<%10-15
- Tanı transbronşiyal biopsi ve BAL
- Enfeksiyon ve rejeksiyon ayırıcı tanısı önemli
- Histoloji perivasküler mononükleer infiltratlar,lenfositik bronsiolit
- Tedavi yüksek doz kortikosteroid 24 saatte dramatik düzelme

Airway Complications and Management after Lung Transplantation

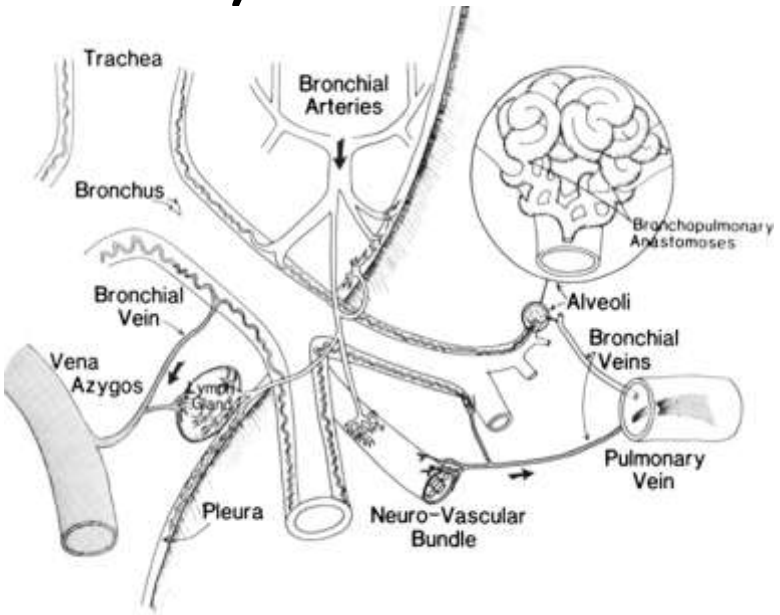
Ischemia, Dehiscence, and Stenosis

Jose Fernando Santacruz and Atul C. Mehta

Pulmonary and Critical Care Medicine, Respiratory Institute, Cleveland Clinic, Cleveland, Ohio

Komplikasyon:2
Hava yolu kompl.

- Risk faktörleri cerrahi teknik ve immün süpresif tedavi. Sıklık %1-33, mortalite %2-4
- Bronşiyal stenoz,
- Bronşiyal ayrışma,
- Granülasyon dokusu,
- Trakeomalazi,
- Bronşiyal fistül,
- Endobronşiyal enfeksiyon



Hava yolu komplikasyonları

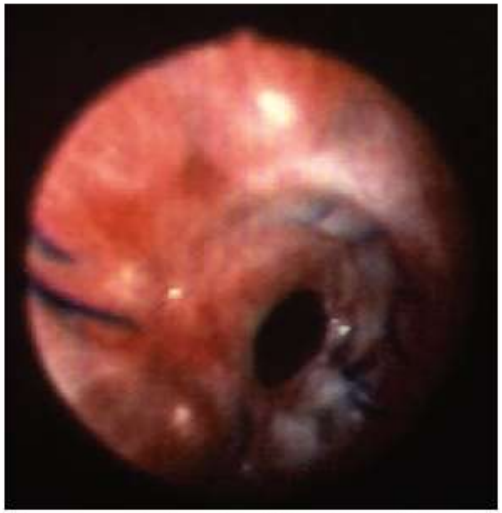


Fig. 6. Bronchoscopic view of the left main bronchial anastomosis 6 weeks following treatment for *Aspergillus* tracheobronchitis. Note the stenosis at the site of the anastomosis.

Fig. 5. Bronchoscopic view of the left main bronchial anastomosis, with an *Aspergillus* infection.

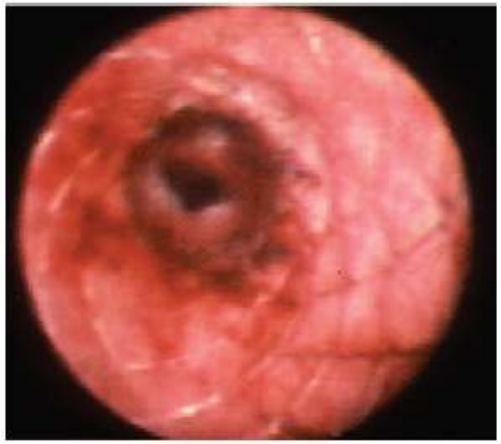


Fig. 7. Bronchoscopic view following wire-mesh stent placement for the bronchial stenosis seen in Fig. 6.

Enfeksiyon nedenleri;

Komplikasyon:3
Enfeksiyon

- İnnervasyon kusuru
- Lenfatik drenaj problemi
- İskemi nedeniyle bozulmuş mukosiliyer aktivite
- Mukus tıkaçları
- İmmünsupresif tedavi

Viral ve fungal enfeksiyonlar

- CMV
- Aspergillus
- Candida

Postoperatif komplikasyonlar

Enfeksiyon

- Gram-negatif patogenler

  Pseudomonas spp, Klebsiella, Haemophilus influenzae

- Gram-pozitif

  Staphylococcus aureus.

- Actinomyces , Mycobacterium tuberculosis,atipik mikobakteriler

Obliteratif bronşiolit

Diğer komplikasyonlar

- Obstriktif bir pulmoner fonksiyon defekti
- 5 yıl %45-50 hastada görülebilir
- Akut rejeksiyon en sık bronşiolitis obliterans nedeni
- Tipik olarak 16-20 aylarda
- Pulmoner fonksiyon testlerinde bozulma
- Tanı transbronşiyal biopsi
- Tedavi yüksek doz metilprednisolon, Antilenfositik globulin

Gastrointesinal sistem komplikasyonları

Diğer komplikasyonlar

- Gastroösefagiyal reflü ve Bronşiolitis obliterans ilişkisi

Young LR. Lung transplantation exacerbates gastroesophageal reflux disease. Chest. 2003;124:1689-93.

- Gastroparezi
- Adinamik ileus
- İntestinal obstriksiyon

kalsinörin inhibitörleri,narkotikler

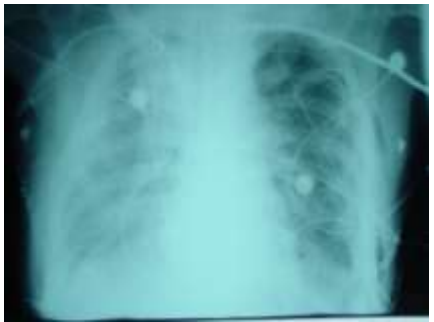
Nörolojik komplikasyonlar

Diğer komplikasyonlar

- Nöbet,
- Tremor
- Delirium
- Koma

Olgu 1

- 21 yaş E
- İdiopatik pulmoner fibrosiz
- Bilateral akc trans. Baypas uygulanarak
- K+ ↑ AFlutter hemofiltrasyon
- Karaciğer enzim ↑
- İskemik hepatit ve akut tubuler nekroz
- Pulmoner hipertansiyon inhaler prostaglandin
- 13 gün survi



Olgu 2

- 44 yaş E
- İdiyopatik pulmoner fibrosiz
- Bilateral akc trans, baypass
- Perop masif transfüzyon
- Postoperatif ciddi hemodinamik destek
- Postoperatif pulmoner venden kanama reoperasyon
- Pnömoni
- Renal yetersiz
- 11 gün survi

Olgu 3

- 34 yaş, E İntertisyel fibrozis
- Bilateral akc transplantasyonu,Baypass
- Postop vazopressör tedavi, hipotansiyon
- 2.gün exitus
- Ciddi hipoksi, metabolik asidoz.

ITF postoperatif protokolümüz

A) İmmünsupresif tedavi

- Siklosporin /Takrolimus
- Mycophenolate mofetil /Azothioprin
- Metilprednizolon 3x125mg, 2mg/kg idame

B)Enfeksiyon tedavisi

- İmipenem, Vankomisin
- CMV profilaksisi Gansiklovir
- Antifungal Varikanazol
- Amfoterisin 3x 10 mg inhalasyon

C) Heparin

…TEŞEKKÜRLER

Generic Name (Trade)	Mechanism of Action	Serious/Acute Toxicities
Cyclosporin (Neoral) (alternatives: Gengraf, SanCya, Sandimmune)	T-lymphocyte inhibitor via suppressed IL-2 production	Nephrotoxicity, hypertension, tremors, confusion, seizures, hyperkalemia, hemolytic uremic syndrome
Tacrolimus (Prograf)	T-lymphocyte inhibitor via suppressed IL-2 production	Nephrotoxicity, hypertension, tremors, confusion, seizures, hyperkalemia, hemolytic uremic syndrome
Azathioprine (Imuran)	Inhibits lymphocyte proliferation via inhibition of nucleotide synthesis	Bone marrow suppression, hepatotoxicity
Sirolimus (Rapamune)	Blocks IL-2-mediated T-cell activation	Hyperlipidemia, bone marrow suppression, hypertension, bronchiolitis obliterans organizing pneumonia
Mycophenolate (Cellcept)	Inhibits B- and T-lymphocyte proliferation	Nephrotoxicity, hypotension or hypertension, leucopenia, thrombocytopenia, fever, hepatotoxicity, hypokalemia or hyperkalemia, tremor
Prednisone (Deltasone)	Removes lymphocytes from intravascular space, inhibits lymphokine-mediated amplification of macrophages and lymphocytes	Hyperglycemia, hypokalemia, fluid retention, impaired wound healing, psychosis, promoting gastric ulceration
Methylprednisolone (Solu-medrol)	Removes lymphocytes from intravascular space, inhibits lymphokine-mediated amplification of macrophages and lymphocytes	Hyperglycemia, hypokalemia, fluid retention, impaired wound healing, psychosis, promoting gastric ulceration
Basiliximab (Simulect)	IL-2 receptor antagonist (chimeric monoclonal antibody)	Anaphylaxis, vomiting, fever, hyperglycemia, edema, bronchospasm, tachycardia, hypotension or hypertension, renal dysfunction
Daclizumab (Zenapax)	IL-2 receptor antagonist (human monoclonal antibody)	Anaphylaxis, vomiting, fever, hyperglycemia, edema, bronchospasm, tachycardia, hypotension or hypertension, renal dysfunction
Lymphocyte immune globulin-antithymocyte globulin (ATGAM, RATG)	Reduces number and alters function of circulating T-lymphocytes (equine or rabbit polyclonal antibody)	Hypersensitivity, thrombocytopenia, renal dysfunction, hemolysis, serum sickness, pulmonary edema, toxic epidermal necrolysis, seizures
Muromonab-CD3 (OKT3)	Inhibits T-cell proliferation and differentiation (murine monoclonal antibody)	Hypersensitivity, "cytokine release syndrome," renal dysfunction, encephalopathy, seizures, meningitis

IL = interleukin.