

AN OVERVIEW OF LUNG TRANSPLANTATION

Essay

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SUMMARY

Lung transplantation is emerged as life saving procedure for patients with end stage pulmonary disease. The procedure has evolved over the past 44 years with changes in the surgical techniques and immuno-suppressive regimens as the introduction of cyclosporin A in 1980s.

The most common indication for lung transplantation is chronic obstructive pulmonary disease followed by idiopathic pulmonary fibrosis, cystic fibrosis which considered third most common indication and pulmonary arterial hypertension.

Reported cumulative world experience exceeds 13,000 lung transplants with 76.4% 1- year and 42.6% 5- year overall survival. Patients with PAH, idiopathic pulmonary fibrosis, and sarcoidosis have higher early mortality rates than those with other diagnoses. Patients with cystic fibrosis have 1-, 5-, and 10 year survival rates of 78%, 52%, and 37% while those recipients with PAH have survival rates of 64%, 44%, and 20%, respectively. As noted, patients with PAH have the highest early hazard of all diagnoses. This can be explained by the complexity of the operation, the requirement for cardiopulmonary bypass,

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

وَأَنْزَلَ اللَّهُ
عَلَيْكَ الْكِتَابَ
وَالْحِكْمَةَ
وَ عَلَّمَكَ مَا لَمْ

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List of Abbreviations

<i>ABGs</i>	<i>Arterial blood gases</i>
<i>BMI</i>	<i>Body mass index</i>
<i>BOS</i>	<i>Bronchiolitis obliterans syndrome</i>
<i>BPD</i>	<i>Bronchopulmonary dysplasia</i>
<i>C</i>	<i>Centigrade</i>
<i>CBC</i>	<i>Complete blood count</i>
<i>CF</i>	<i>Cystic fibrosis</i>
<i>CMV</i>	<i>Cytomegalovirus</i>
<i>COPD</i>	<i>Chronic obstructive pulmonary disease</i>
<i>CPB</i>	<i>Cardiopulmonary bypass</i>
<i>CPK</i>	<i>Creatinine phosphokinase</i>
<i>CT</i>	<i>Computerized tomography</i>
<i>D</i>	<i>Day</i>
<i>DLCO</i>	<i>Diffusing capacity of lung carbon monoxide</i>
<i>ECG</i>	<i>Electrocardiogram</i>
<i>F</i>	<i>Fahrenheit</i>
<i>FEF</i>	<i>Forced expiratory flow</i>
<i>FEV1</i>	<i>Forced expiratory volume in the first second</i>
<i>FFP</i>	<i>Fresh frozen plasma</i>
<i>FiO₂</i>	<i>Fraction of inspired oxygen</i>
<i>FVC</i>	<i>Forced vital capacity</i>
<i>g</i>	<i>Gram</i>
<i>G5%</i>	<i>Glucose 5%</i>
<i>GER</i>	<i>Gastroesophageal reflux</i>
<i>h</i>	<i>Hour</i>

<i>HBV</i>	<i>Hepatitis B virus</i>
<i>HCV</i>	<i>Hepatitis C virus</i>
<i>HEF</i>	<i>Maximal expiratory flow</i>
<i>HIV</i>	<i>Human imunodefeciency virus</i>
<i>HLA</i>	<i>Human leucocytic antigen</i>
<i>HSV</i>	<i>Herpes simplex virus</i>
<i>ICU</i>	<i>Intensive care unit</i>
<i>IgG</i>	<i>Immunoglobulin G</i>
<i>IIP</i>	<i>Idiopathic interstitial pneumonia</i>
<i>IL-2</i>	<i>Interlukin 2</i>
<i>IPAH</i>	<i>Idiopathic pulmonary arterial hypertension</i>
<i>IPF</i>	<i>Idiopathic pulmonary fibrosis</i>
<i>ISHLT</i>	<i>International society for heart and lung transplantation</i>
<i>IV</i>	<i>Intravenous</i>
<i>Kg</i>	<i>Kilogram</i>
<i>LAM</i>	<i>Lymphangioleiomyomatosis</i>
<i>LAS</i>	<i>Lung allocation score</i>
<i>LCH</i>	<i>Pulmonary langerhans cell histiocytosis</i>
<i>LT</i>	<i>Lung transplantation</i>
<i>M²</i>	<i>Meter square</i>
<i>Mg</i>	<i>Milligram</i>
<i>Min</i>	<i>Minute</i>
<i>ML</i>	<i>Milliliter</i>
<i>mmHg</i>	<i>Millimeers of mercury</i>

<i>ng</i>	<i>Nanogram</i>
<i>NYHD</i>	<i>New York Heart Association</i>
<i>OB</i>	<i>Obliterative bronchiolitis</i>
<i>PaCO₂</i>	<i>Pressure of carbon dioxide in arterial blood</i>
<i>PAH</i>	<i>Pulmonary arterial hypertension</i>
<i>PaO₂</i>	<i>Oxygen pressure in arterial blood</i>
<i>PCW</i>	<i>Pulmonary capillary wedge pressure</i>
<i>PGE1</i>	<i>Prostaglandins E1</i>
<i>PLTs</i>	<i>Platelets</i>
<i>PPH</i>	<i>Primary pulmonary hypertension</i>
<i>PRBCs</i>	<i>Packed red blood cells</i>
<i>PSA</i>	<i>Prostate specific antigen</i>
<i>PT</i>	<i>Prothrombin time</i>
<i>PTLD</i>	<i>Posttransplantation lymphoproliferative disorder</i>
<i>QUALY</i>	<i>Quality-adjusted life-year</i>
<i>SLT</i>	<i>Single lung transplantation</i>
<i>UNOS</i>	<i>United Network for Organ Sharing</i>
<i>UW</i>	<i>University of Wisconsin</i>
<i>VIP</i>	<i>Usual interstitial pneumonia</i>
<i>WBCs</i>	<i>White blood cells</i>
<i>Mm</i>	<i>Micro-meter</i>

INTRODUCTION

The birth and evolution of thoracic organ transplantation have occurred over the past 60 years. With the development of operative techniques, organ preservation techniques and immuno-suppressive regimens, Lung transplantation is emerged as life saving procedure for patients with end stage pulmonary diseases (*Hosenpud et al., 2001*).

In 1963 James Hardy at the University of Mississippi performed the first human lung transplantation for 58 years old patient presented with a squamous cell carcinoma at the left hilum. Joel Cooper at the University of Toronto achieved success in 1983 in the transplantation of a single lung. The procedure had evolved over the past 44 years with the changes in the surgical techniques and the immunosuppressive regimens (*Bowdish et al., 2004*).

The most common indications for lung transplantation is chronic obstructive pulmonary disease followed by idiopathic pulmonary fibrosis also known as usual interstitial fibrosis and cystic fibrosis which considered third most common indication (*Orens et al., 2006*).

There is Cadaver lung transplantation which involves the surgical replacement of the lungs of a patients with the healthy lungs of a brain dead donor, single or bilateral sequential lung transplantation may be performed dependent upon the recipient's clinical status. Most double lung transplantation are no longer performed enbloc, instead each lung is transplanted separately in the same surgery (*Yung, 2007*).

There is living donor lung transplantation which is the transplantation of either right or left lower lung lobe from one or two healthy donors to replace one or both lungs of patients with end stage lung disease. Living donor lobar lung transplantation is relatively a new procedure (*Lynch et al., 2006*).

AIM OF THE WORK

To review the benefits, risks, possible complications of lung transplantation and future view of lung transplantation from data collected from different centers.

ANATOMY OF RESPIRATORY SYSTEM

Humans breathe to live, and this action is dependent on air getting into the small air sacs that make up the lungs, the main organ of respiratory system. The lungs are located within the chest cavity behind the ribs and make up the primary organ in the respiratory system, comprising the majority of the lower respiratory system (*Shier et al., 2002*).

The respiratory system is divided into two parts that work together during respiration.

1- Upper respiratory tract

The nose is made up of bone, cartilage, and muscle. The nasal cavity is lined with a mucous membrane that contains hair-like structures called cilia. The pharynx is located behind the tongue and serves as a passageway for air from the nasal cavity and food from the oral cavity (*Shier et al., 2002*).

2- Lower respiratory tract

Trachea

The trachea extends from the larynx, which fixes it through the hyoid bone to the skull, down to its bifurcation

in the mediastinum at the level of the fifth thoracic vertebra. At its lower end the trachea divides into the right and left main bronchi. The ridge between the bronchi seen through the bronchoscope is the carina. The trachea, main bronchi and lower lobe bronchi are outside the lung substance. All other bronchi are situated within the lung, and as they enter it they take with them an invagination of the visceral pleura, forming a peribronchial sheath separated from the bronchi by a potential space (*Proctor et al., 1977*).

The lower airways are known as bronchi down to the smallest divisions containing cartilage. Thereafter they become bronchioles, the final branch of this type being the terminal bronchiole. Subsequent divisions contain increasing numbers of alveoli in their walls and are called respiratory bronchioles; these give off the alveolar ducts and the air sacs and alveoli. The ultimate lung unit from each terminal bronchiole is called the acinus (*Horsfield et al., 1981*).

Human lung anatomy

The lungs consist of two sets of lobes: three lobes make up the right lung and two lobes make up the left lung. The left lung is smaller in order to accommodate the heart, which is situated under the left lung and behind the rib