Lunge Transplantation Rigshospitalet

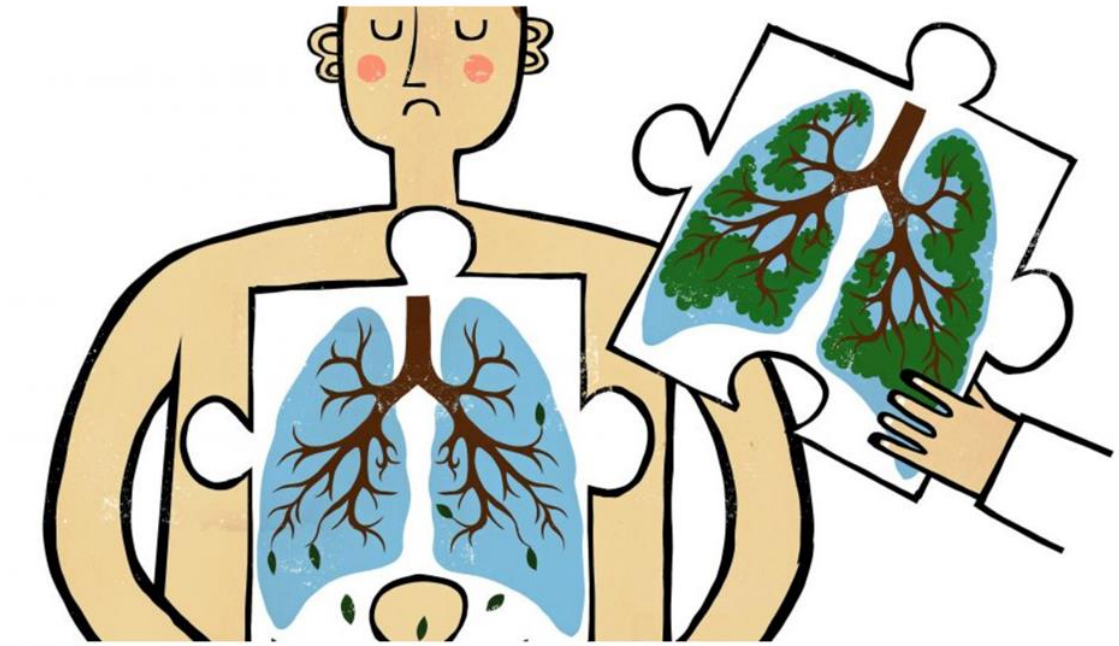


Foto: Tegning: Rasmus Juul

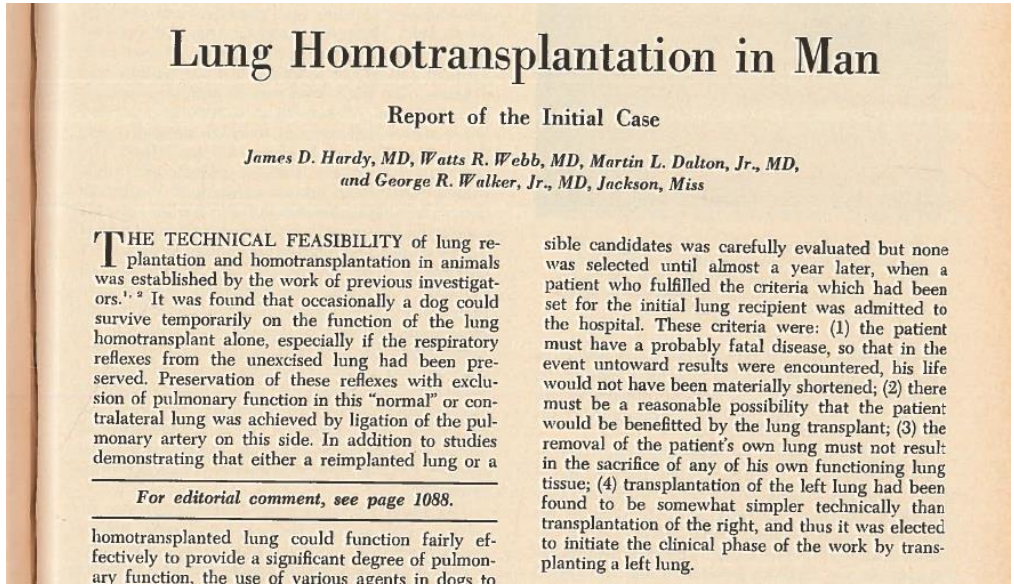
Livet er den største gave, man kan give

The first lung transplant was performed by Hardy, in 1964.

Patient died of renal failure after 3 weeks

The lung was donated after circulatory death (DCD)

Early function of the lung was excellent.



Lung Homotransplantation in Man

Report of the Initial Case

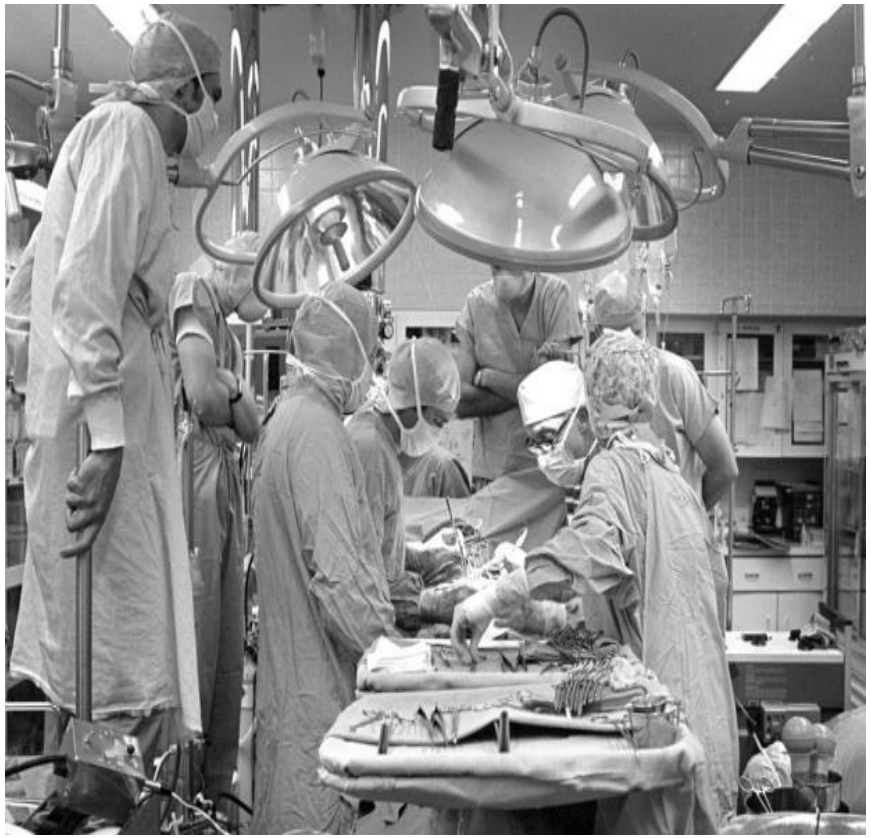
James D. Hardy, MD, Watts R. Webb, MD, Martin L. Dalton, Jr., MD, and George R. Walker, Jr., MD, Jackson, Miss

THE TECHNICAL FEASIBILITY of lung replantation and homotransplantation in animals was established by the work of previous investigators.[1, 2] It was found that occasionally a dog could survive temporarily on the function of the lung homotransplant alone, especially if the respiratory reflexes from the unexcised lung had been preserved. Preservation of these reflexes with exclusion of pulmonary function in this "normal" or contralateral lung was achieved by ligation of the pulmonary artery on this side. In addition to studies demonstrating that either a reimplanted lung or a

For editorial comment, see page 1088.

homotransplanted lung could function fairly effectively to provide a significant degree of pulmonary function, the use of various agents in dogs to

sible candidates was carefully evaluated but none was selected until almost a year later, when a patient who fulfilled the criteria which had been set for the initial lung recipient was admitted to the hospital. These criteria were: (1) the patient must have a probably fatal disease, so that in the event untoward results were encountered, his life would not have been materially shortened; (2) there must be a reasonable possibility that the patient would be benefitted by the lung transplant; (3) the removal of the patient's own lung must not result in the sacrifice of any of his own functioning lung tissue; (4) transplantation of the left lung had been found to be somewhat simpler technically than transplantation of the right, and thus it was elected to initiate the clinical phase of the work by transplanting a left lung.



© Stanford School of Medicine

The New England
Journal of Medicine

©Copyright, 1982, by the Massachusetts Medical Society

Volume 306 MARCH 11, 1982 Number 10

HEART-LUNG TRANSPLANTATION

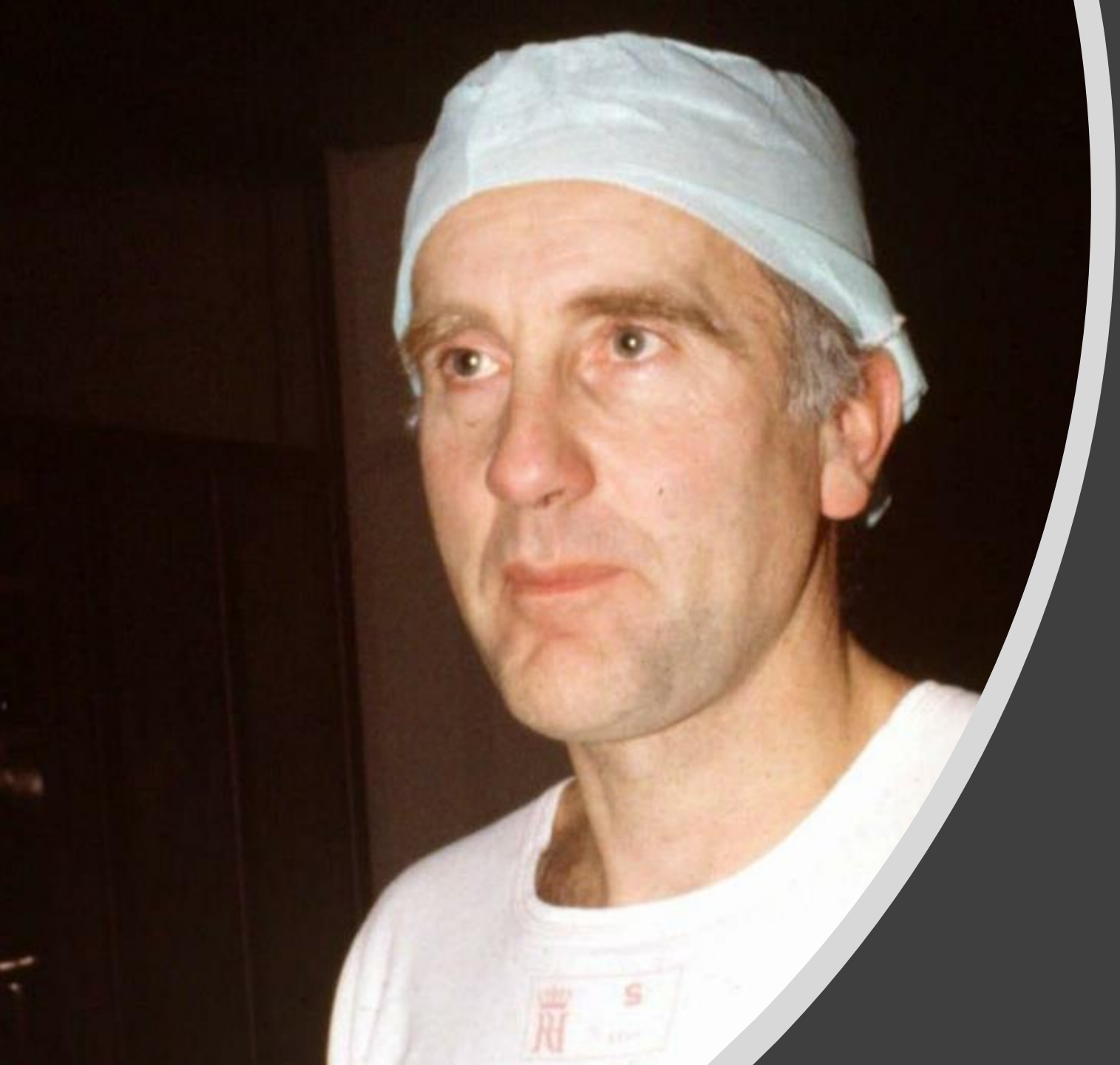
Successful Therapy for Patients with Pulmonary Vascular Disease

BRUCE A. REITZ, M.D., JOHN L. WALLWORK, M.B., CH.B., SHARON A. HUNT, M.D., JOHN L. PENNOCK, M.D., MARGARET E. BILLINGHAM, M.B., PHILIP E. OYER, M.D., PH.D., EDWARD B. STINSON, M.D., AND NORMAN E. SHUMWAY, M.D., PH.D.

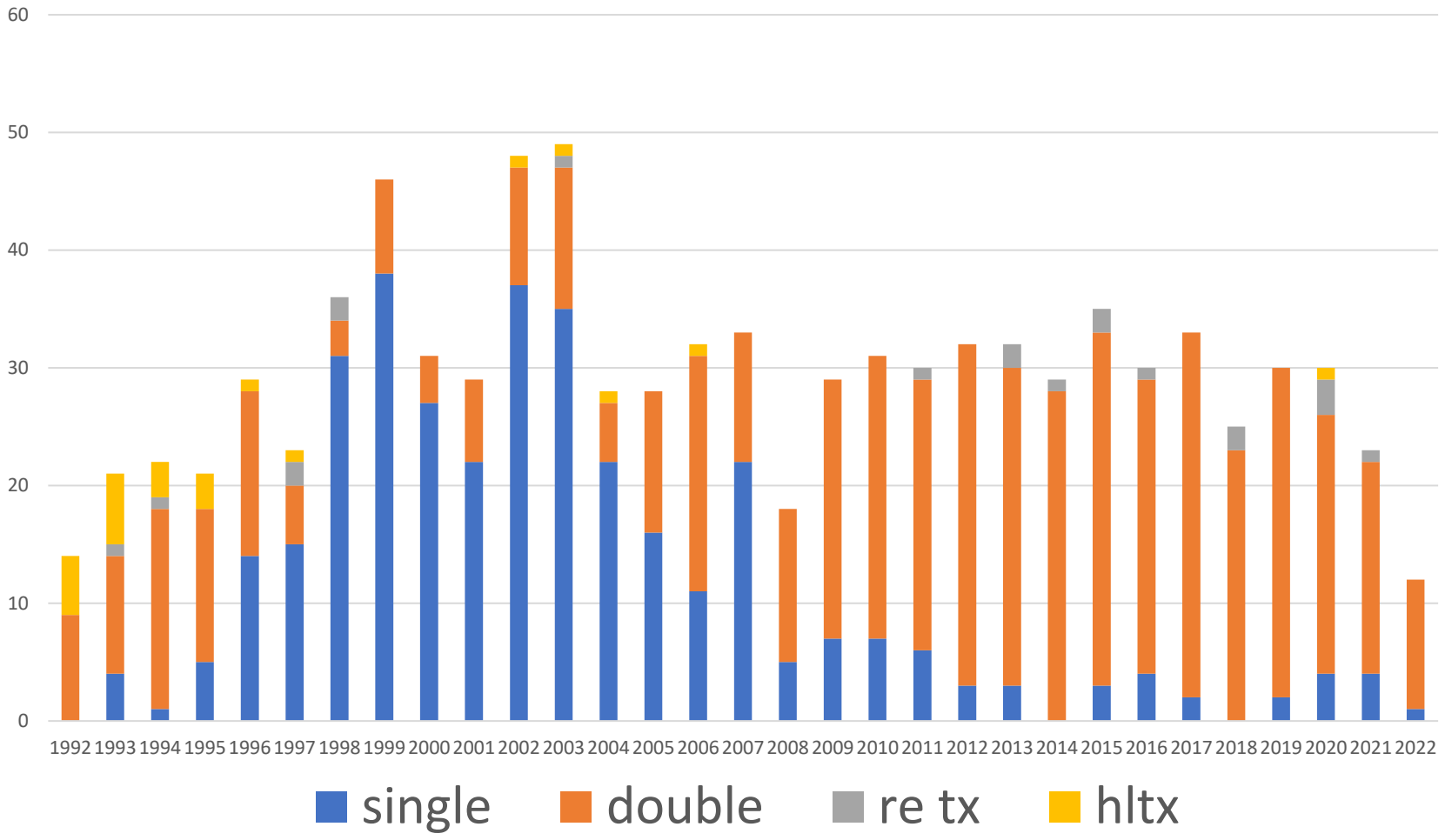
Abstract We report our initial experience with three patients who received heart-lung transplants. The primary immunosuppressive agent used was cyclosporin A, although conventional drugs were also administered.

In the first patient, a 45-year-old woman with primary pulmonary hypertension, acute rejection of the transplant was diagnosed 10 and 25 days after surgery but was treated successfully; this patient still had normal exercise tolerance 10 months later. The second patient, a 30-year-old man, underwent transplantation for Eisenmenger's syndrome due to atrial and ventricular septal defects. His graft was not rejected, and his condition was markedly improved eight months after surgery. The third patient, a 29-year-old woman with transposition of the great vessels and associated defects, died four days postoperatively of renal, hepatic, and pulmonary complications.

We attribute our success to experience with heart-lung transplantation in primates, to the use of cyclosporin A, and to the anatomic and physiologic advantages of combined heart-lung replacement. We hope that such transplants may ultimately provide an improved outlook for selected terminally ill patients with pulmonary vascular disease and certain other intractable cardiopulmonary disorders. (N Eng J Med. 1982; 306:557-64.)

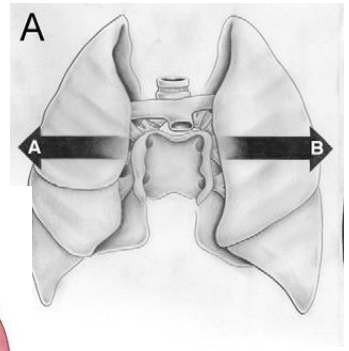


Lungetransplantation Danmark

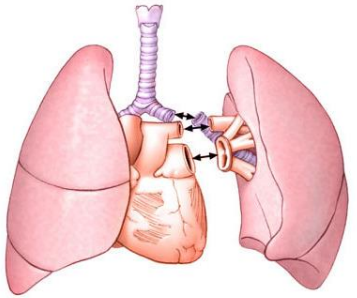

60
50
40
30
20
10
0
1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
single
double
re tx
hltx

Typer af Lunge transplantationer udført i DK

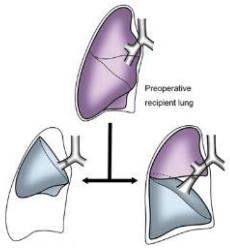
- Maj 28, 1992: Én bloc dobbelt lunge



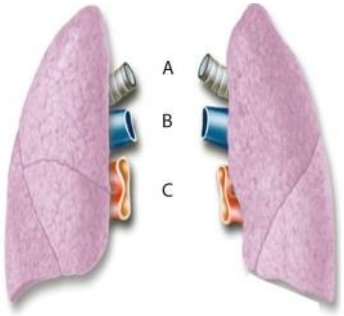
- Juni 19, 1993: Enkelt lunge



- September 21, 1993: Lunge lap fra levende donor



- Juli 23, 1998: Sekventiel dobbelt lunge



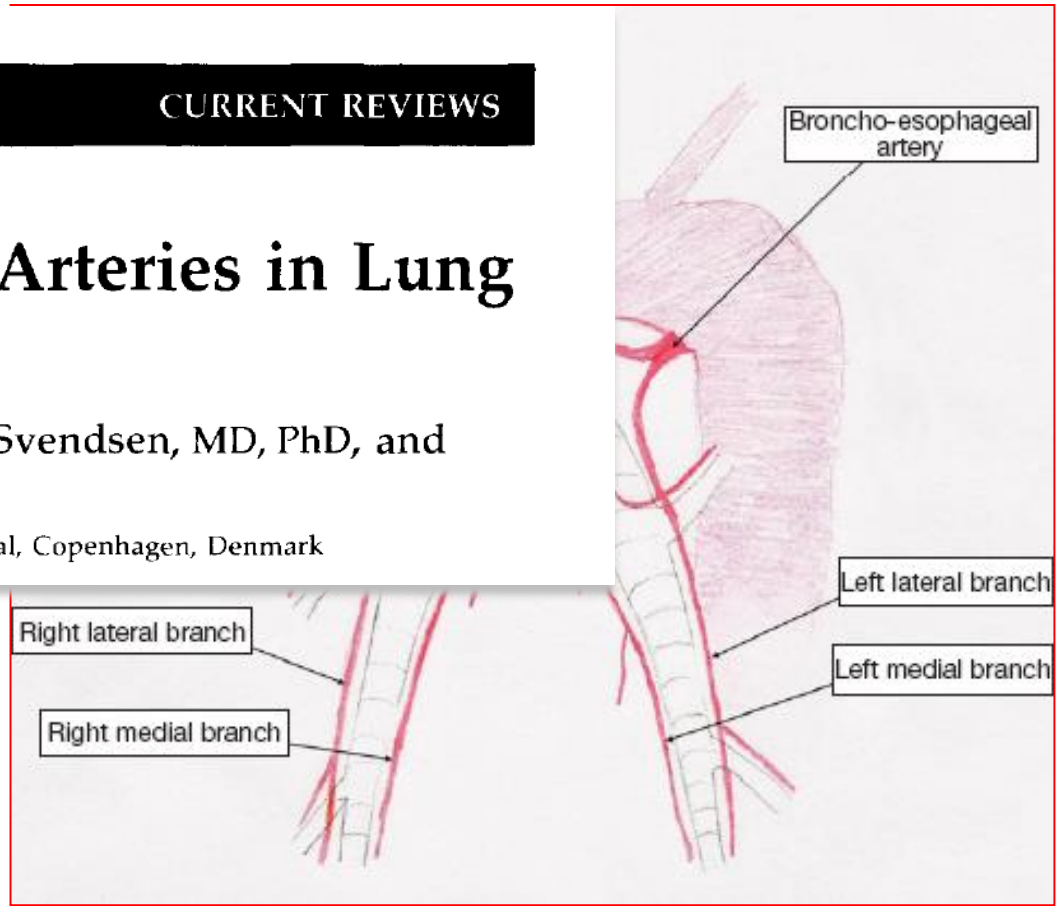
Bronkial Arterie Revaskularisering (BAR)

CURRENT REVIEWS

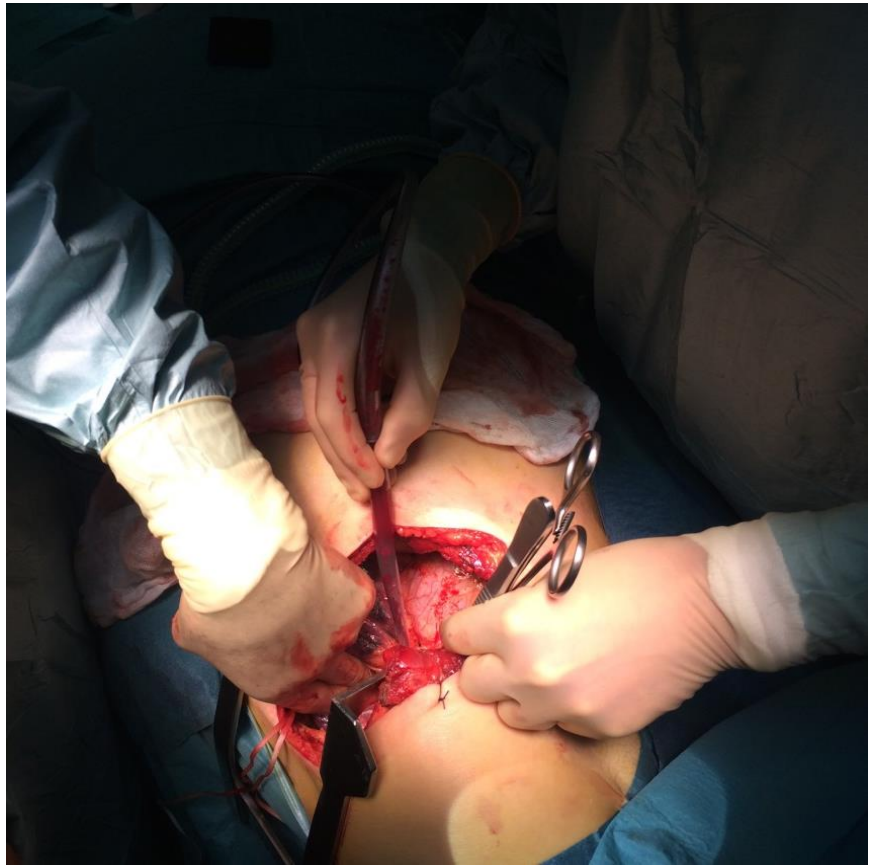
Revascularization of the Bronchial Arteries in Lung Transplantation: An Overview

Martin A. Nørgaard, MD, Peter S. Olsen, MD, PhD, Ulrik G. Svendsen, MD, PhD, and Gösta Pettersson, MD, PhD

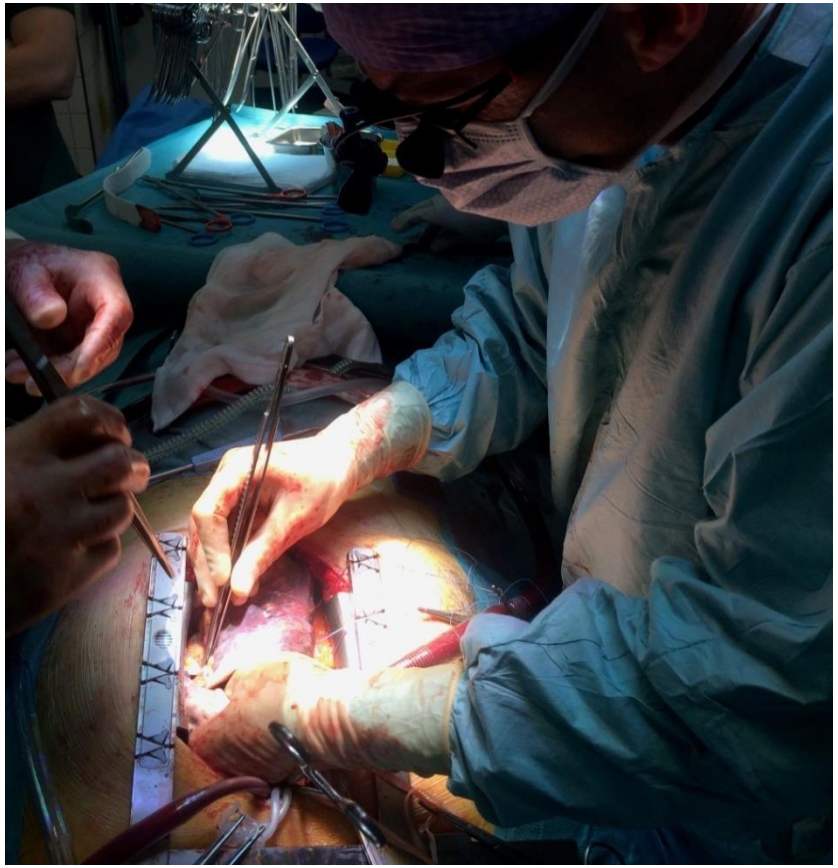
Departments of Cardiovascular Surgery and Cardiology, Copenhagen University Hospital, Copenhagen, Denmark

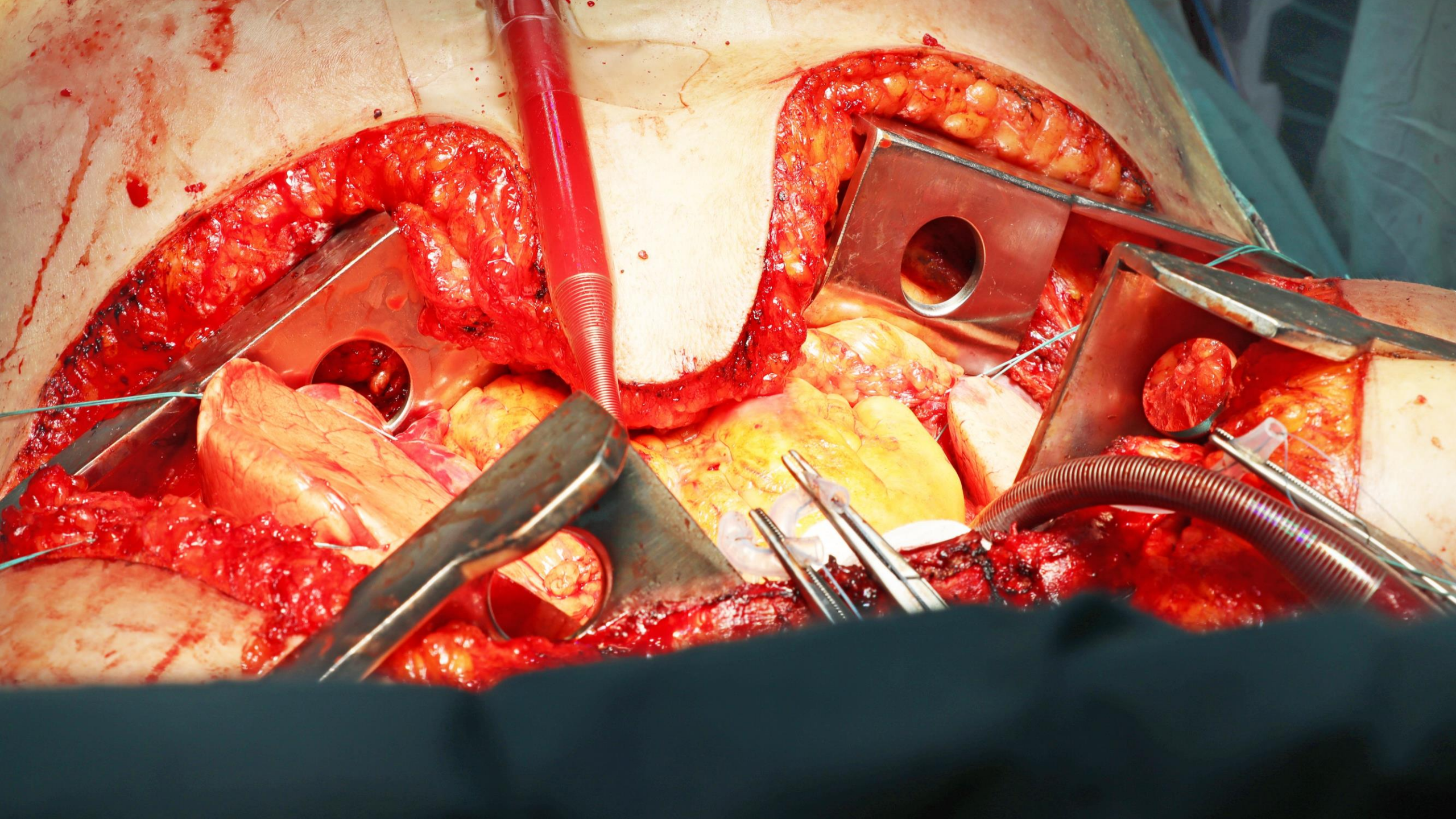


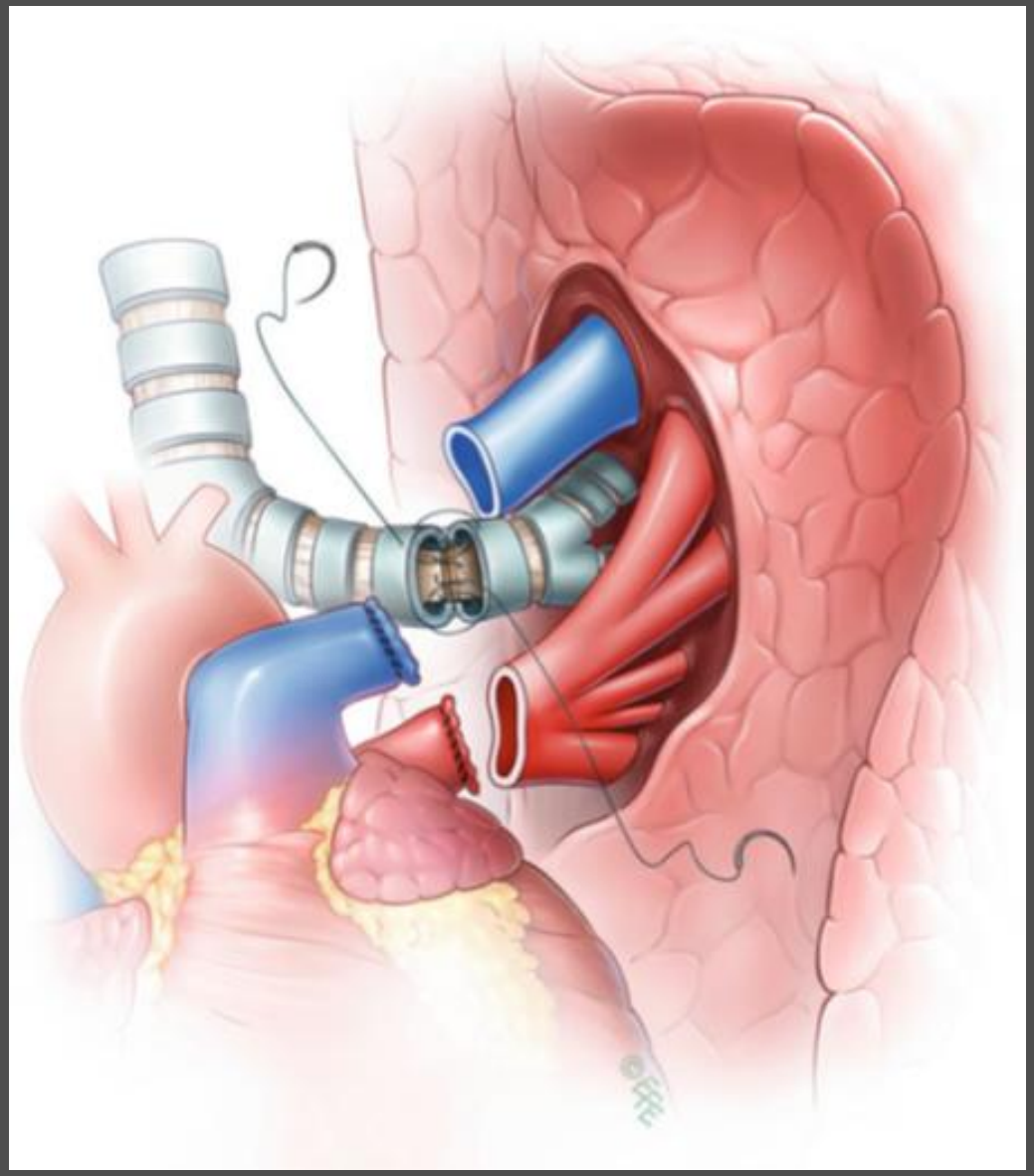
Lateral thorakotomi

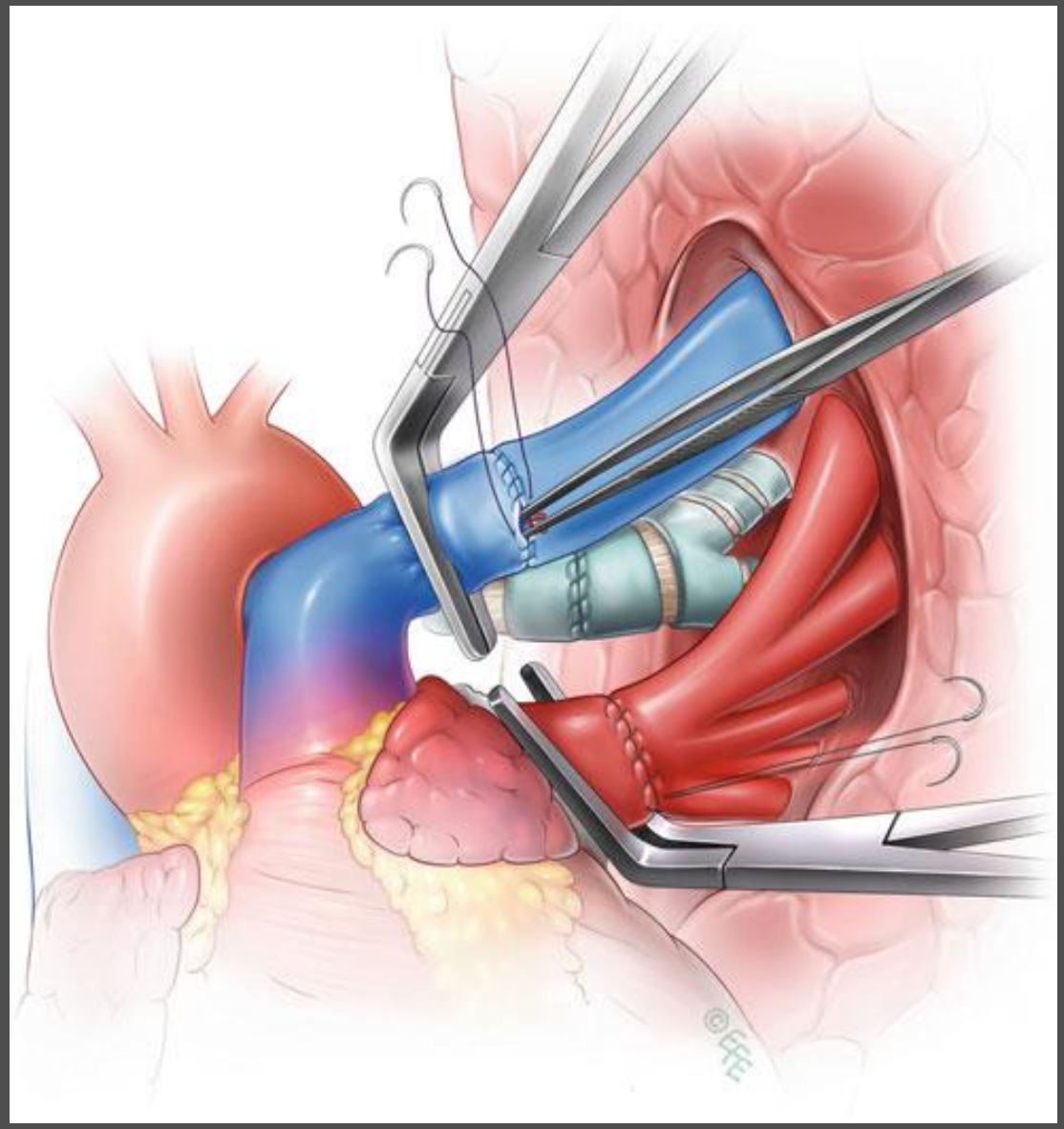


Median sternotomi

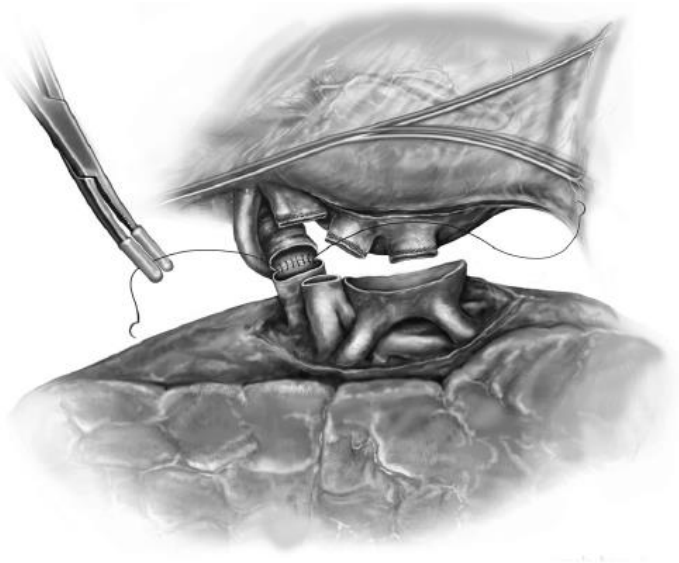


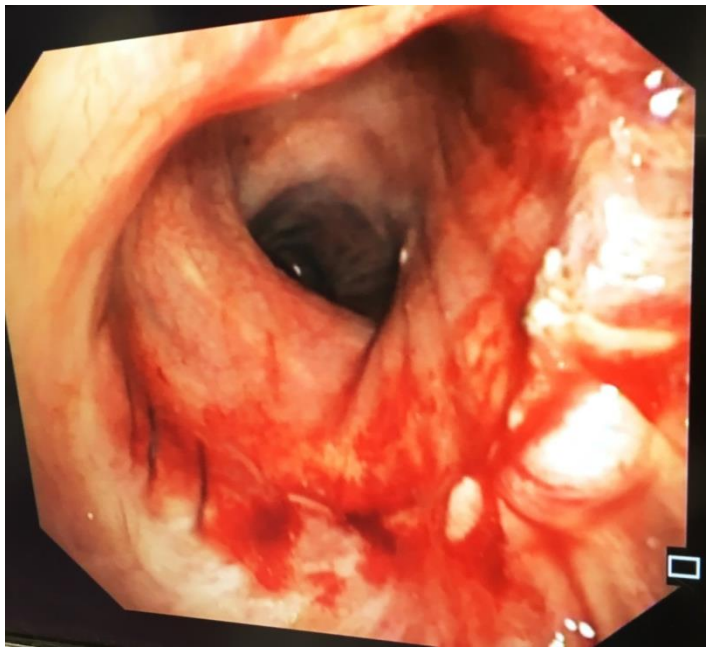




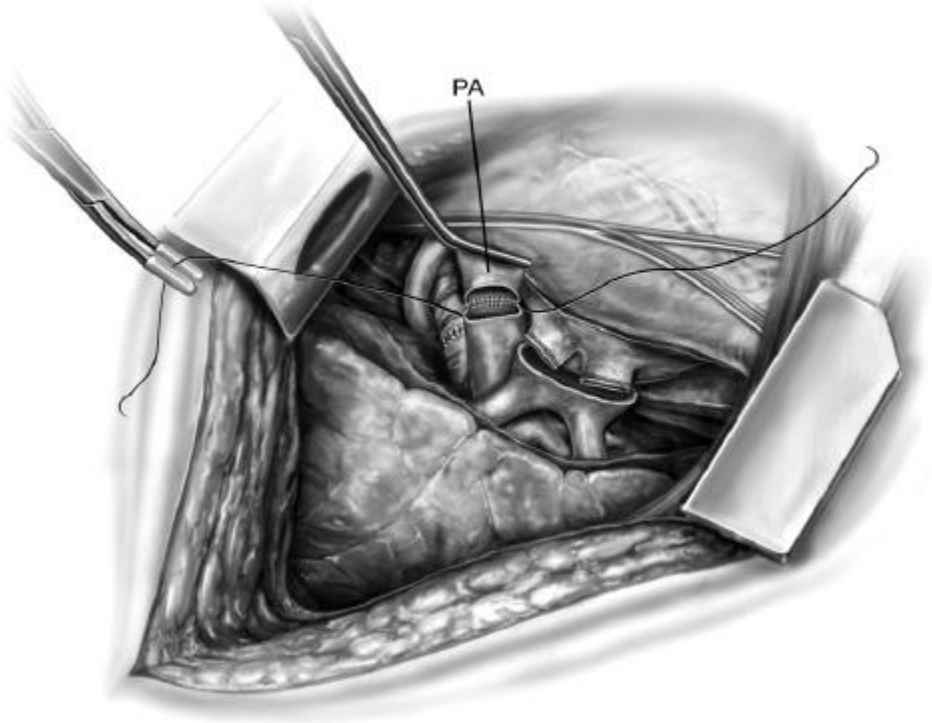


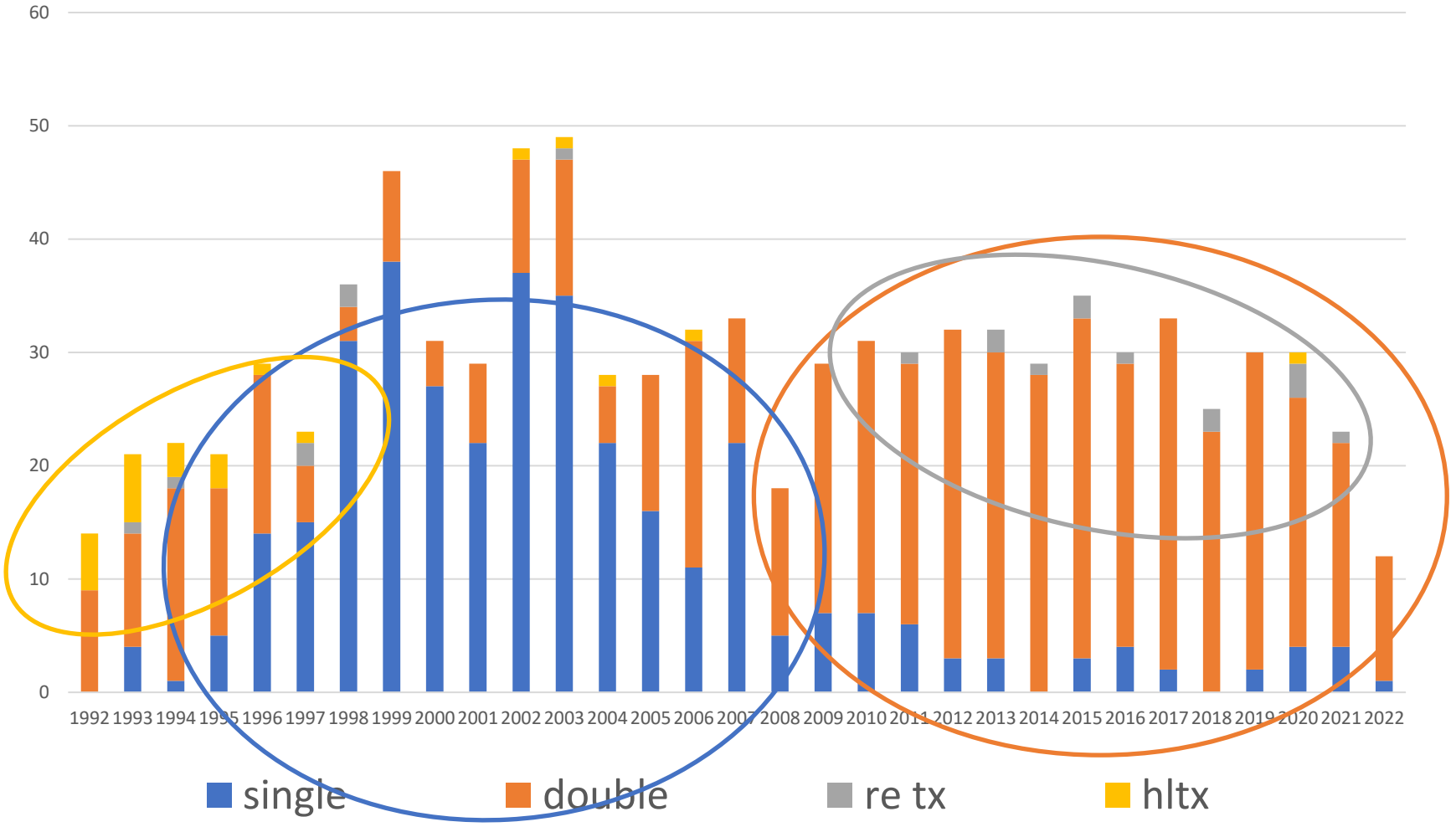
Anastomose af bronchus



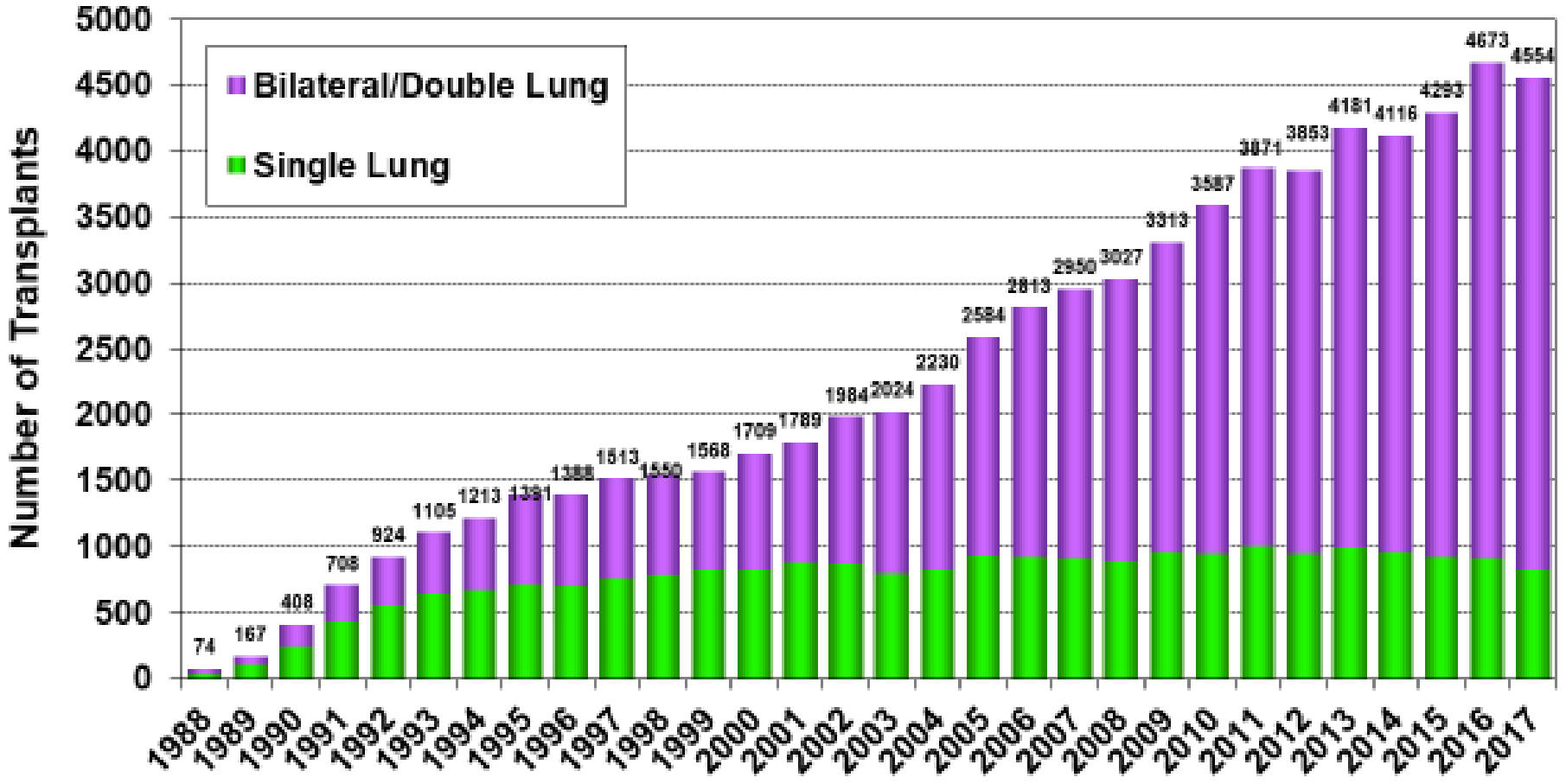


Anastomose af pulmonal arterien




60
50
40
30
20
10
0
1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
single
double
re tx
hltx

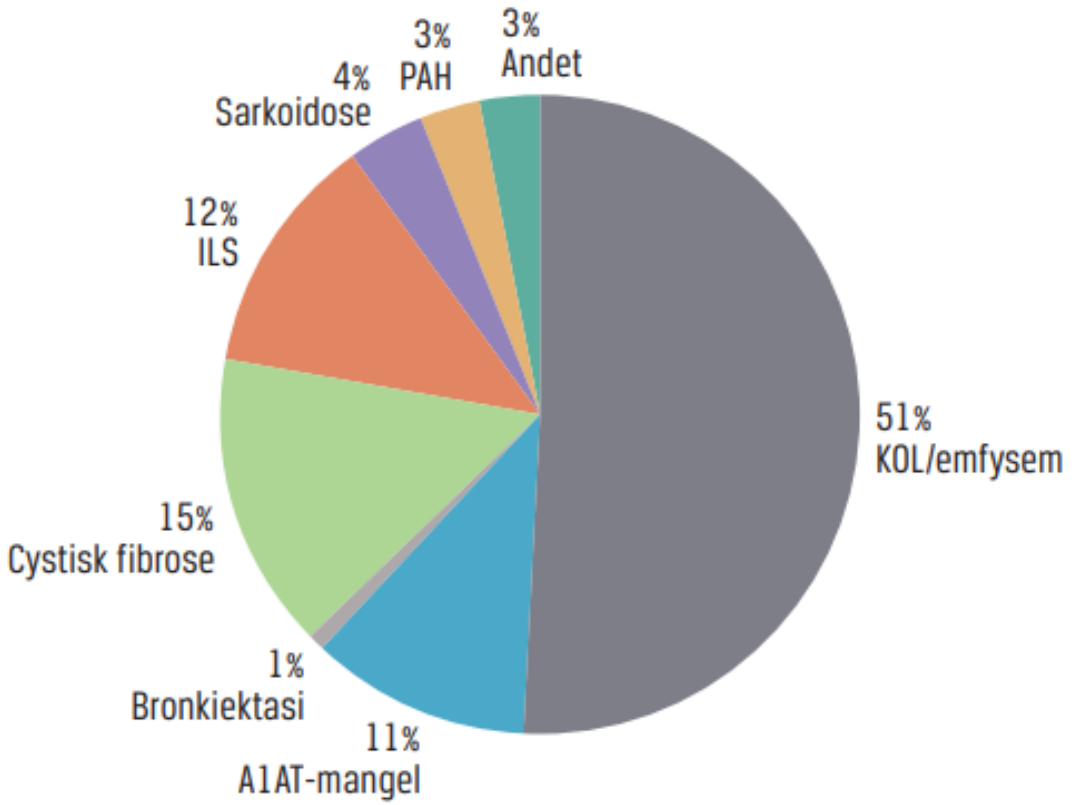
Adult and Pediatric Lung Transplants
Number of Transplants by Year and Procedure Type



NOTE: This figure includes only the lung transplants that are reported to the ISHLT Transplant Registry. As such, this should not be construed as representing changes in the number of lung transplants performed worldwide.

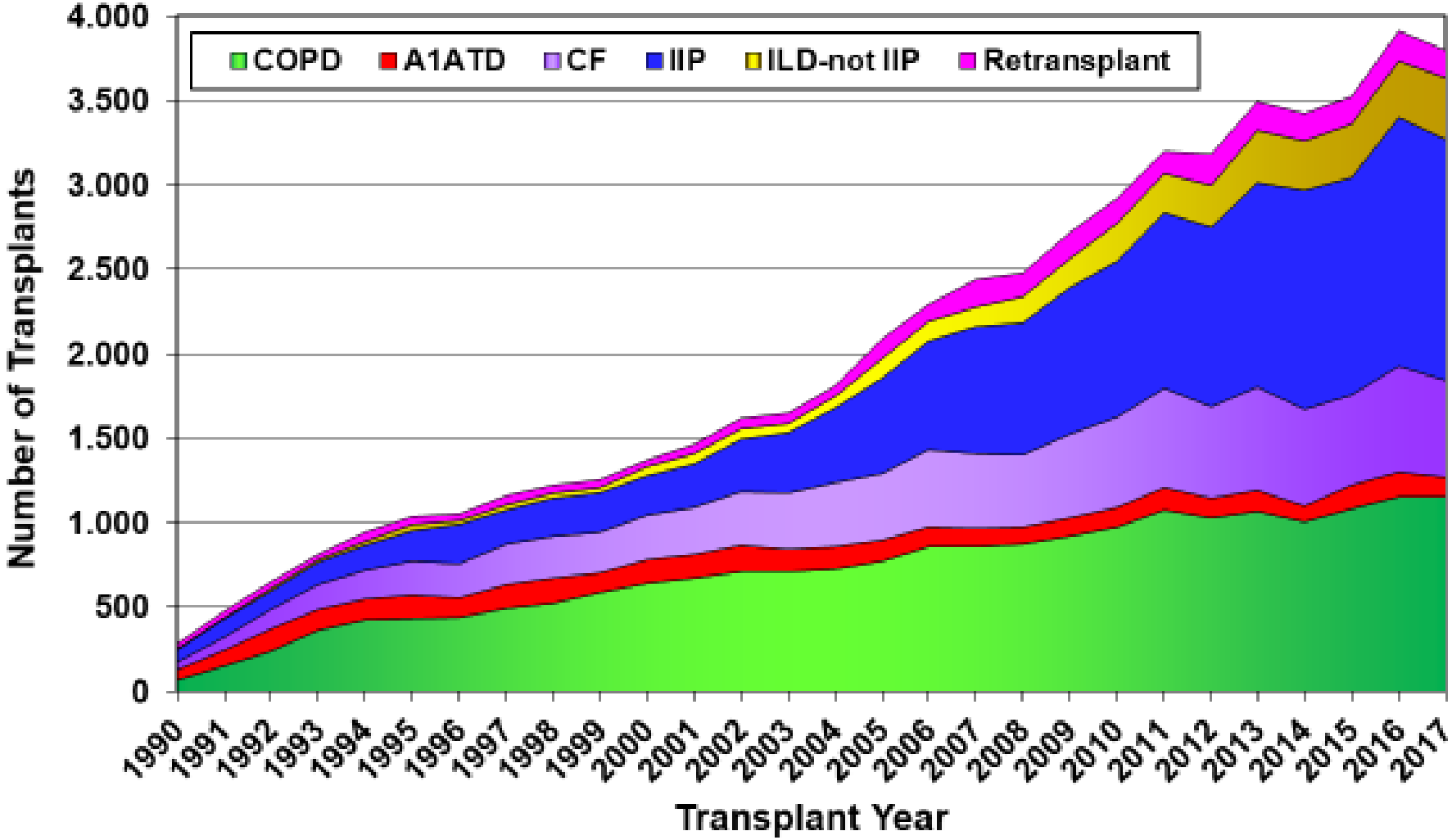
ISHLT • INTERNATIONAL SOCIETY FOR HEART AND LUNG TRANSPLANTATION
2019
JHLT. 2019 Oct; 38(10): 1015-1066

Hyppigheder af typer lungesygdom forud for lungetransplantation.



A1AT = alfa-1-antitrypsin; ILS = interstitiel lungesygdom; KOL = kronisk obstruktiv lungesygdom; PAH = pulmonal arteriel hypertension.

Adult Lung Transplants
Major Diagnoses by Year (Number)



ISHLT • INTERNATIONAL SOCIETY FOR HEART AND LUNG TRANSPLANTATION
2019
JHLT. 2019 Oct; 38(10): 1015-1066

DAGENS Medicin

LUNGER

Det er overraskende positive erfaringer, overlægerne Michael Perch og Tacjana Pressler har gjort sig i mødet r
en ny behandling kom til landet for et år siden. Udover langt bedre livskvalitet ser man hos nogle forbedret lun

Læger måber over ny behandling af cystisk fibrose

For omkring et år siden kom en ny behandling til personer med cystisk fibrose til Danmark. Ifølge læger på Rigshospitalet er de erfaringer, man siden har gjort sig med behandlingen, hidtil uset positive.

Kristian Sjøgren | 01/10/2021

En kombination af lægemidlerne Kaftrio og Kalydeco har fuldstændigt ændret livet for rigtig mange danskere med cystisk fibrose.

NYHEDER

Det er overraskende positive erfaringer, overlægerne Michael Perch og Tacjana Pressler fra Rigshospitalet har gjort sig i mødet med patienter med cystisk fibrose, siden en ny behandling kom til landet for et år siden. Udover langt bedre livskvalitet ser man hos nogle forbedret lungefunktion på op til 40 pct. Nu håber de at behandlingen også bliver godkendt til børn i alderen 6-11 år. Foto: Rigshospitalet

Overlæge glæder sig over mulig behandling til børn med cystisk fibrose

Kaftrio kan være på trapperne som behandling til børn med cystisk fibrose. Udsigten er meget positiv, siger dansk overlæge.

Kristian Sjøgren | 24/11/2021

Del: Facebook Twitter LinkedIn Email

07/10 Fund af 89 genetiske varianter for stroke åbner op for nye behandlingsmuligheder

07/10 Overlægeforeningen er bekymret for presset på radiologien

07/10 Cheflæges ønske til politikerne: Behandlingsgaranti skal være fleksibel

07/10 Yngre læge i psykiatrien: Jeg gider ikke arbejde på den måde

07/10 Praktiserende læge: Politikerne skal finde løsninger til ældre

Prøv os gratis

Få Dagens Pharma gratis i 4 uger.

Bestil her

Annonce

Job

GENOPSLAG: Engageret og udviklingsorienteret afdelingslæge til Lægemiddelstyrelsen
Lægemiddelstyrelsen | Ansøgningsfrist: 05/12/2021

Join us! And start to impact healthcare through innovation
BioMedical Design | Ansøgningsfrist: 01/02/2022

14 postdoctoral fellowships to the BRIDGE – Translational Excellence Programme
BRIDGE - Translational Excellence Programme | Ansøgningsfrist: 28/02/2022

Konferencer

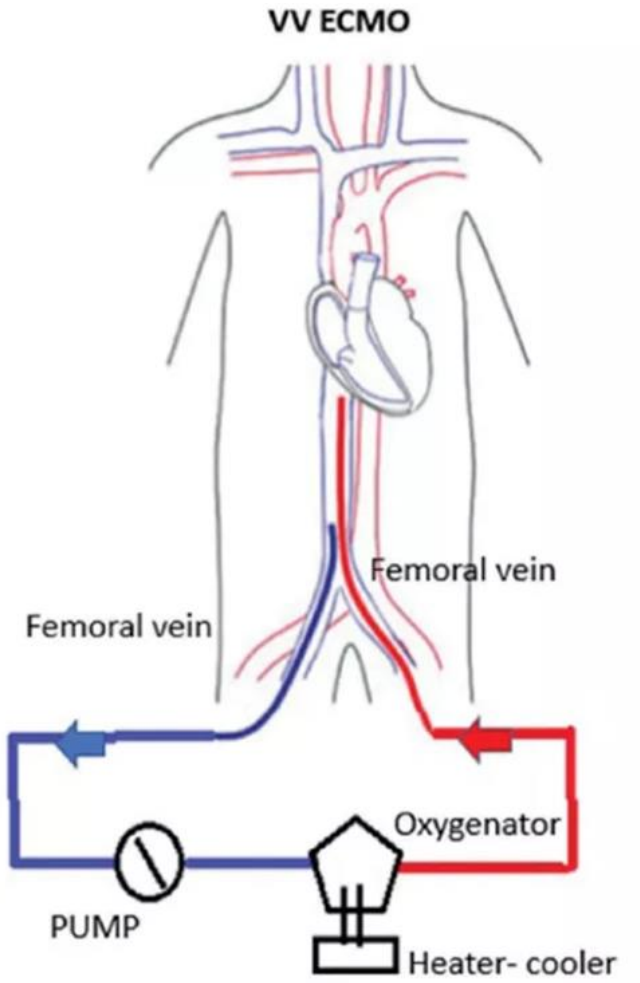
Der er opstået en fejl, feedet er sandsynligvis nede. Prøv igen senere.

BESTIL PDF/UA For anmodning om en tilgængelig PDF send venligst en e-mail til production@Med.com

Medicinrådet

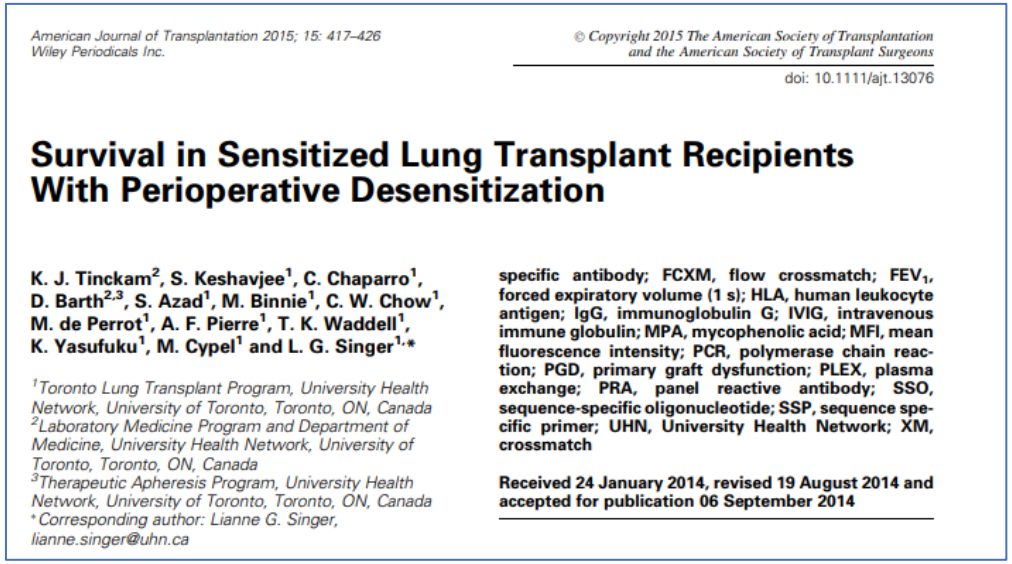
Medicinrådets protokol for vurdering af human alfa-1-antitrypsin til behandling af alvorlig alfa-1-antitrypsinmangel

Fra lungesvigt til transplantation



Toronto protokol

- Transplantation af recipienter med pre-formerede Lymfocytotoksiske antistoffer
- Transplantation mod positiv crossmatch
- Ved anvendelse af PLEX



American Journal of Transplantation 2015; 15: 417–426
Wiley Periodicals Inc.

© Copyright 2015 The American Society of Transplantation and the American Society of Transplant Surgeons

doi: 10.1111/ajt.13076

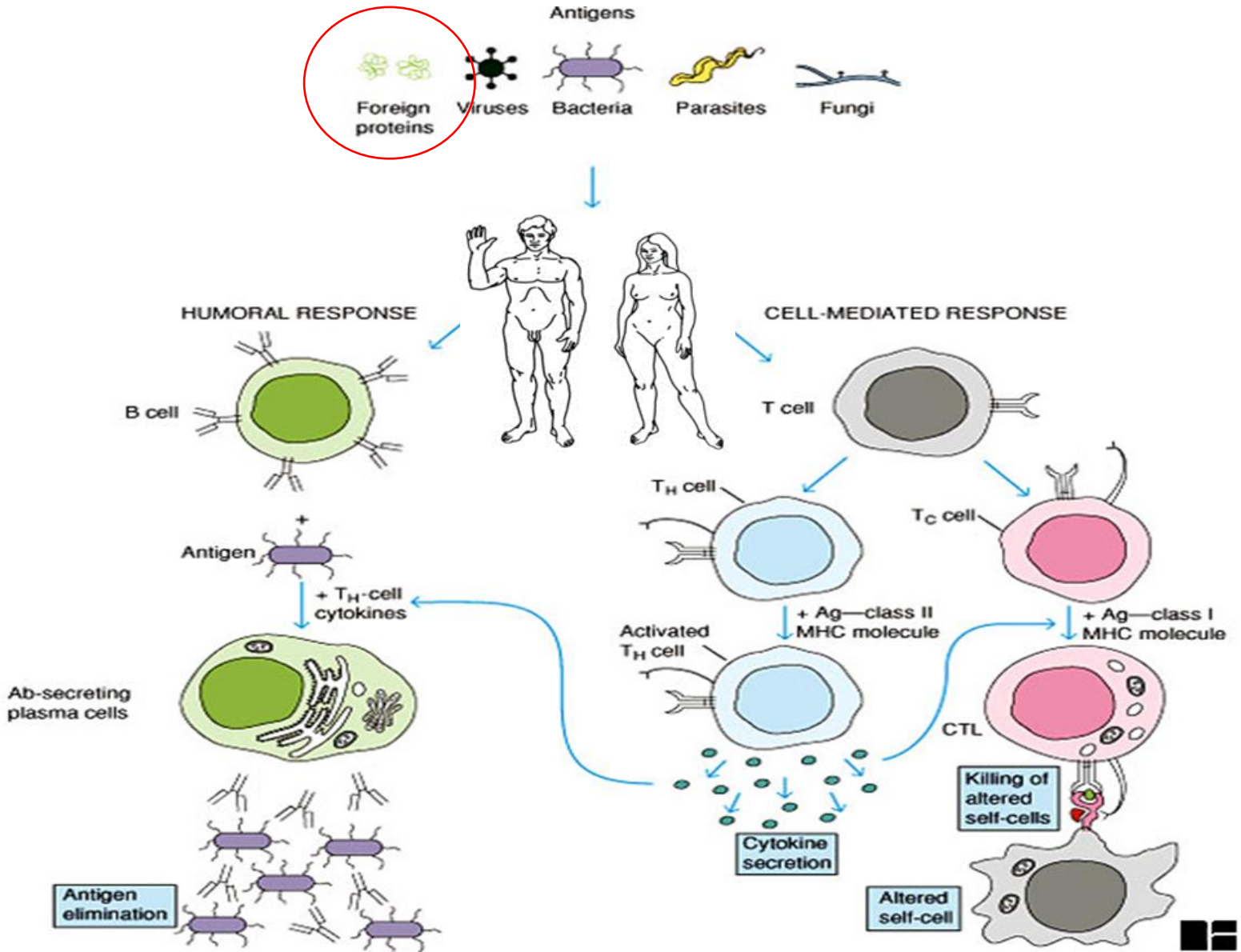
Survival in Sensitized Lung Transplant Recipients With Perioperative Desensitization

K. J. Tinckam[2], S. Keshavjee[1], C. Chaparro[1], D. Barth[2,3], S. Azad[1], M. Binnie[1], C. W. Chow[1], M. de Perrot[1], A. F. Pierre[1], T. K. Waddell[1], K. Yasufuku[1], M. Cypel[1] and L. G. Singer[1,*]

[1]Toronto Lung Transplant Program, University Health Network, University of Toronto, Toronto, ON, Canada
[2]Laboratory Medicine Program and Department of Medicine, University Health Network, University of Toronto, Toronto, ON, Canada
[3]Therapeutic Apheresis Program, University Health Network, University of Toronto, Toronto, ON, Canada
**Corresponding author: Lianne G. Singer, lianne.singer@uhn.ca*

specific antibody; FCXM, flow crossmatch; FEV_1, forced expiratory volume (1 s); HLA, human leukocyte antigen; IgG, immunoglobulin G; IVIG, intravenous immune globulin; MPA, mycophenolic acid; MFI, mean fluorescence intensity; PCR, polymerase chain reaction; PGD, primary graft dysfunction; PLEX, plasma exchange; PRA, panel reactive antibody; SSO, sequence-specific oligonucleotide; SSP, sequence specific primer; UHN, University Health Network; XM, crossmatch

Received 24 January 2014, revised 19 August 2014 and accepted for publication 06 September 2014

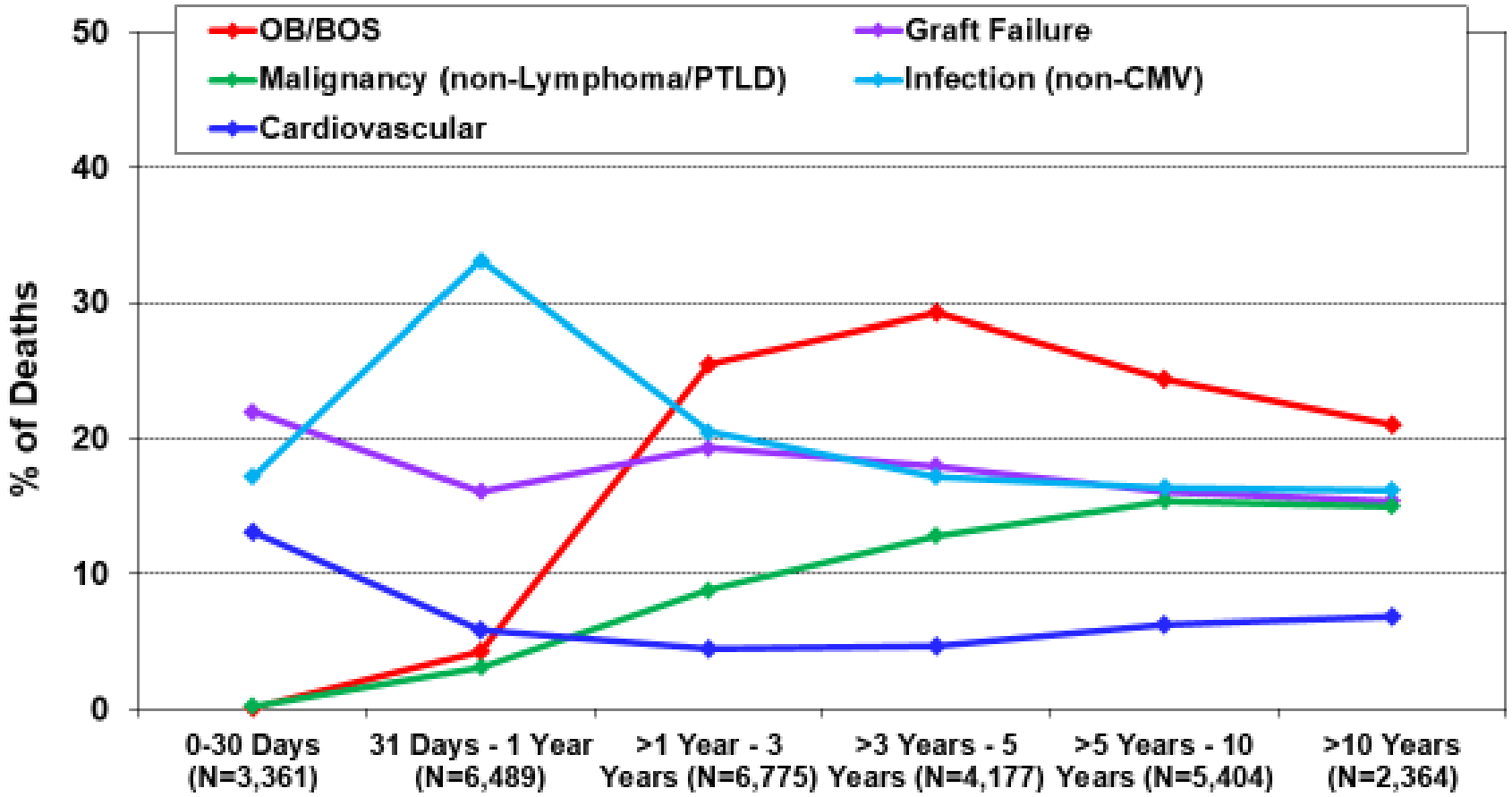

Antigens
Foreign proteins
Viruses
Bacteria
Parasites
Fungi
HUMORAL RESPONSE
CELL-MEDIATED RESPONSE
B cell
T cell
T_H cell
T_C cell
Antigen
+ T_H-cell cytokines
+ Ag—class II MHC molecule
+ Ag—class I MHC molecule
Activated T_H cell
Ab-secreting plasma cells
CTL
Killing of altered self-cells
Cytokine secretion
Antigen elimination
Altered self-cell

Infektion
CLAD
AMR
Intolerable
bivirkninger
ACR

Adult Lung Transplants

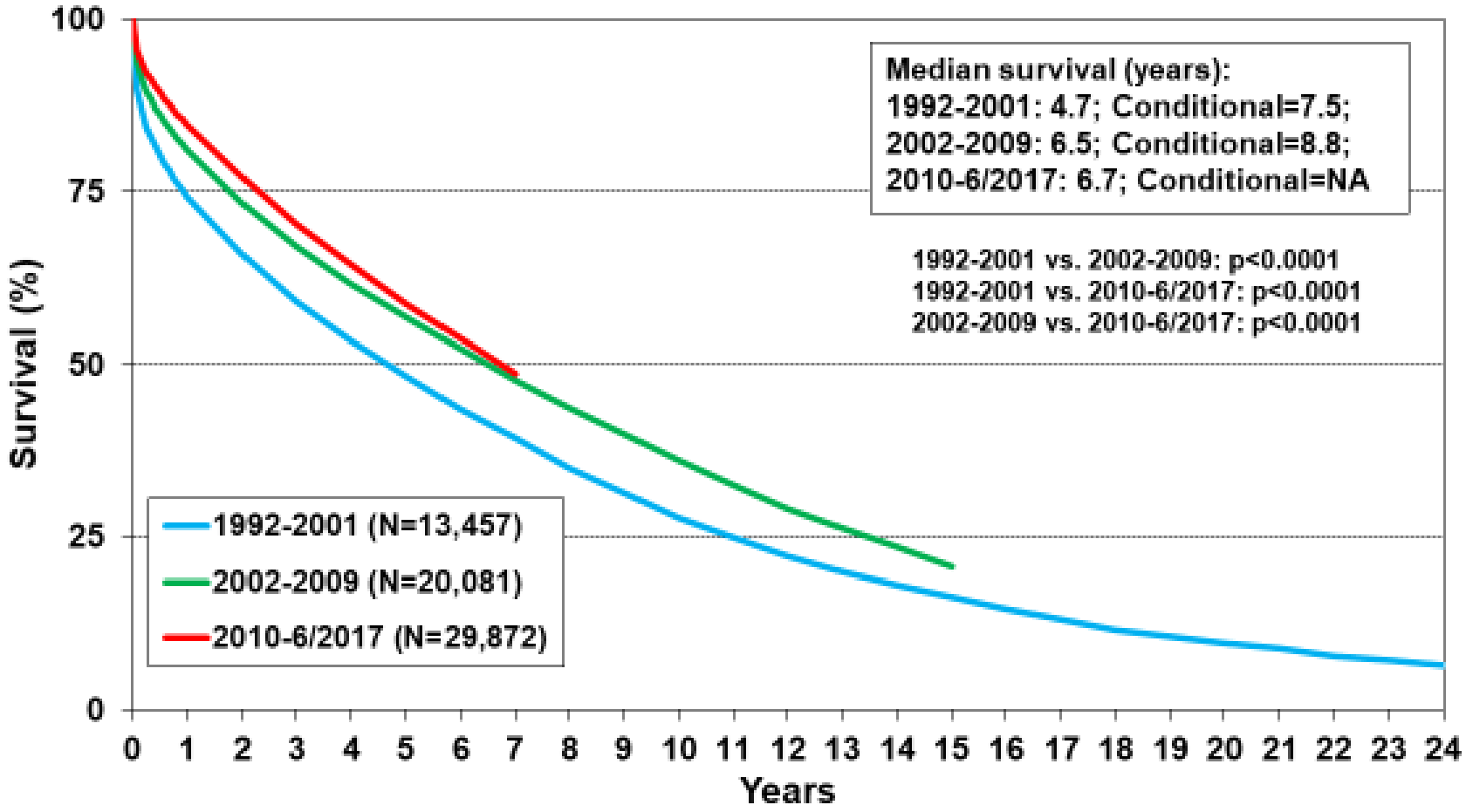
Relative Incidence of Leading Causes of Death

(Deaths: January 1995 – June 2018)



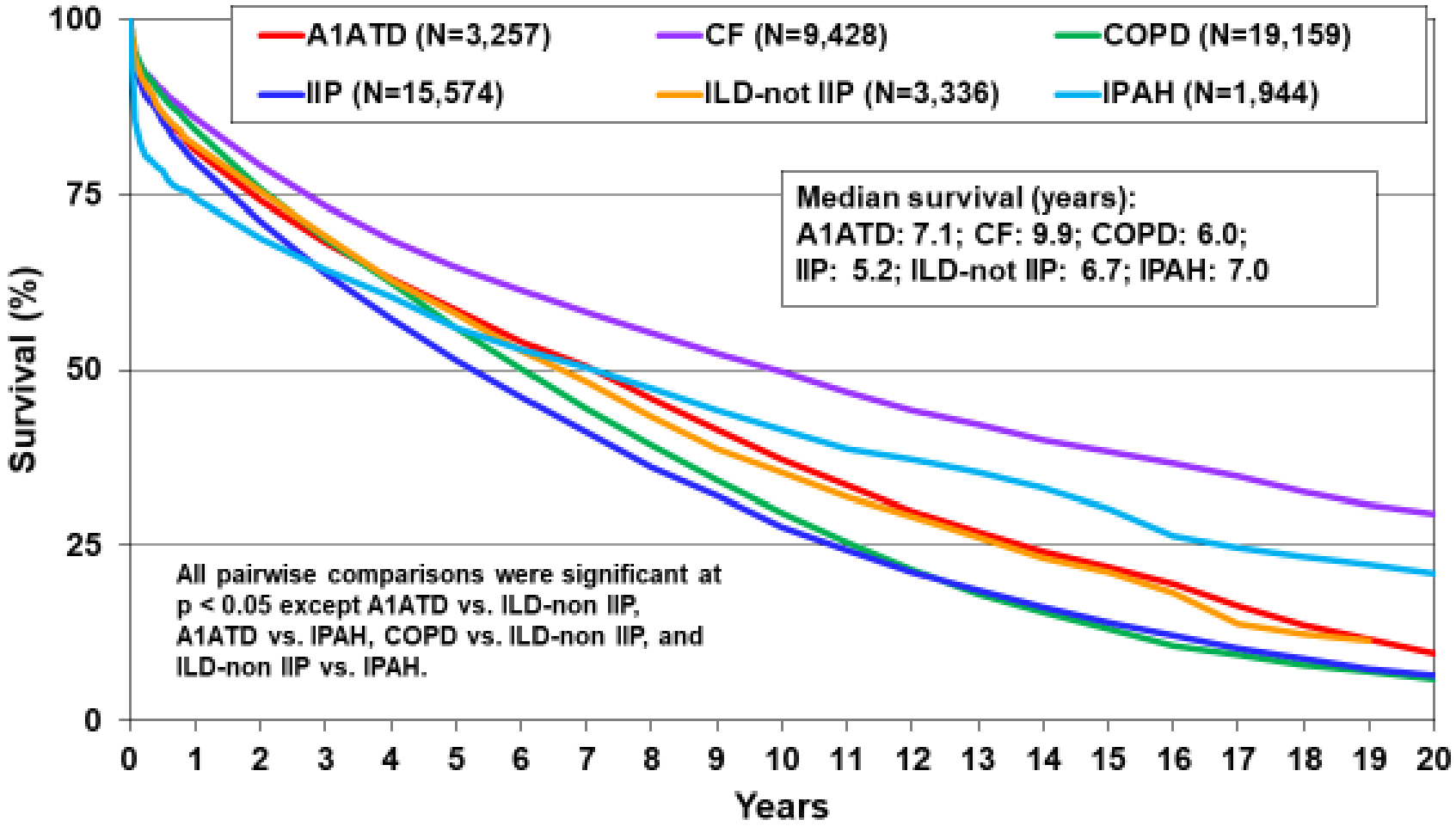
ISHLT 2019
ISHLT • INTERNATIONAL SOCIETY FOR HEART AND LUNG TRANSPLANTATION
JHLT. 2019 Oct; 38(10): 1015-1066

Adult Lung Transplants
Kaplan-Meier Survival by Era
(Transplants: January 1992 – June 2017)



ISHLT 2019
ISHLT • INTERNATIONAL SOCIETY FOR HEART AND LUNG TRANSPLANTATION
JHLT. 2019 Oct; 38(10): 1015-1066

Adult Lung Transplants
Kaplan-Meier Survival by Major Diagnosis
(Transplants: January 1992 – June 2017)



ISHLT • INTERNATIONAL SOCIETY FOR HEART AND LUNG TRANSPLANTATION
2019
JHLT. 2019 Oct; 38(10): 1015-1066

Kristeligt Dagblad

INTERVIEW | 20.10.17 KL. 00:00

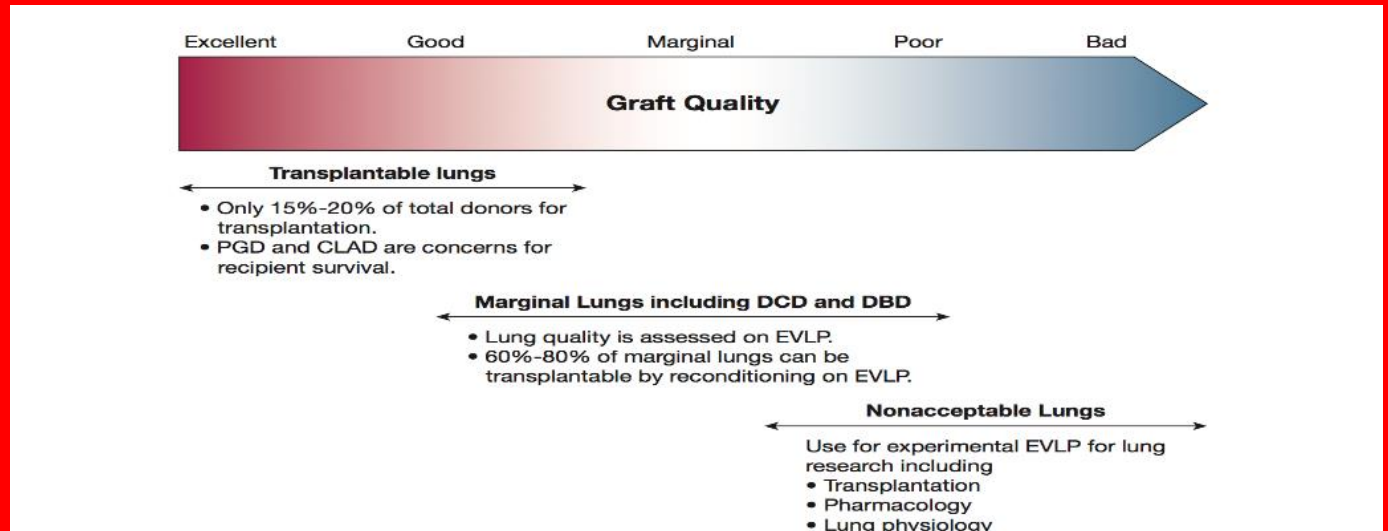
Overlæge: Vi har pligt til at bruge donor-organer med stor omhu

Generel knaphed på donor organer

Kun 15-25% of donor lunger accepters ved donations forløb af SOT

Laveste accept rate ved SOT

Undersøgelser har vist, at 40% af afviste donor lunger måske var egnede til transplantation



Opdateret 09.11.2012 Nyheder: Medico-teknik

Maskine reparerer kassable donorlunger

Thoraxkirurg Bodil Brandt kigger til lungerne for at se, om processen forløber, som den skal. Foto: Casper Seidelin

Ny maskine på Rigshospitalet reparerer lungerne så effektivt, at de bliver bedre end andre donorlunger. Foreløbig går tre danskere rundt med renoverede lunger.

0 Kommentar » Print » Send »

Ledige job

Flere annoncer »

Bornholms Hospital søger overlæge/afdelingslæge i ortopædkirurgi - Bornholm

Bornholms Hospital søger overlæge i kirurgi - Bornholm

Psykiater søges til privatklinik i Dubai - Dubai, De Forenede Arabiske Emirater

Sundhedsfaglig medarbejder - København

Vi søger en specialelæge i oto-rhino-laryngologi til vikariat - Nuuk

Klinikleder for medicinsk gastroenterologi - Aabenraa

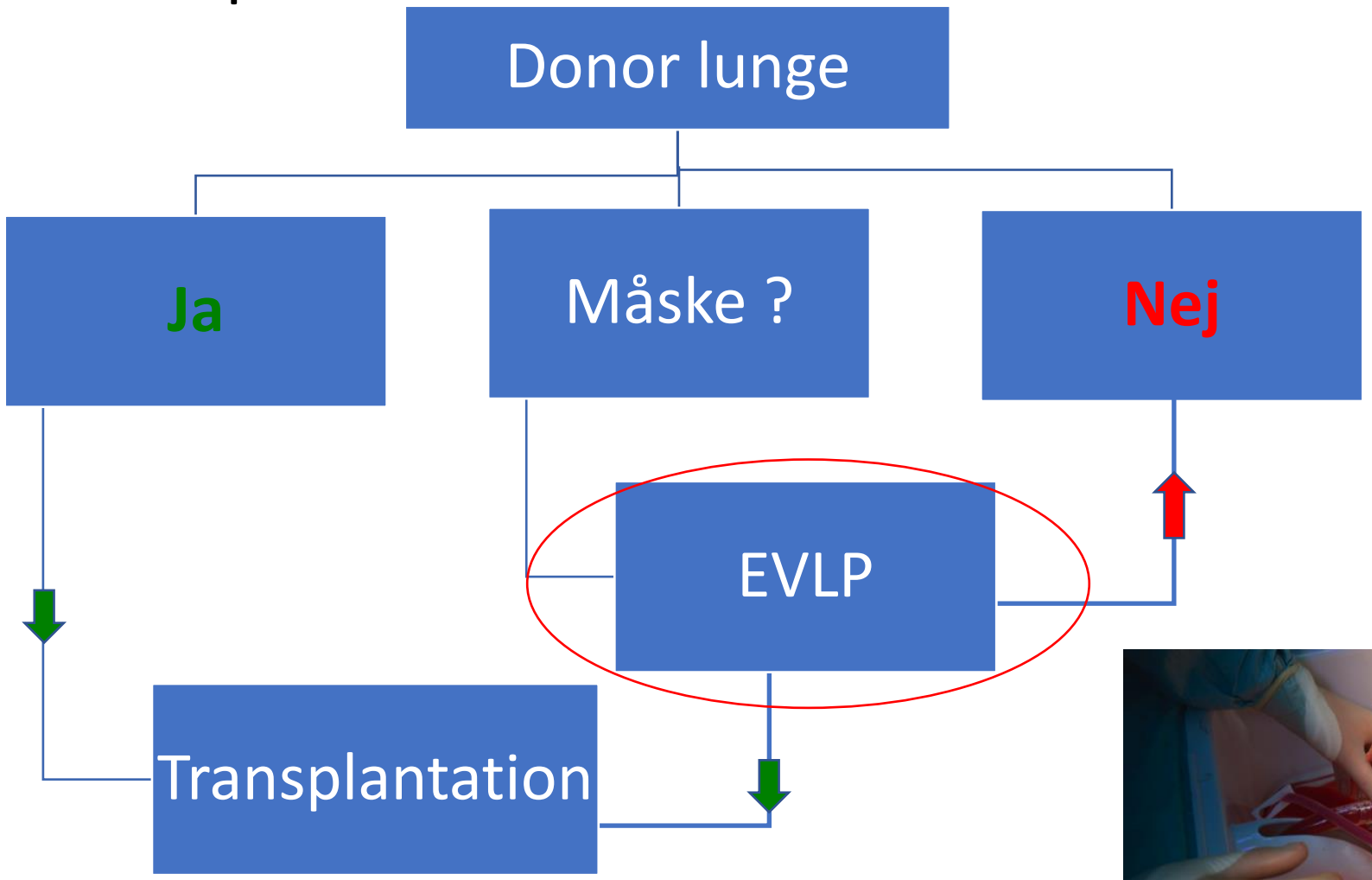
Overlæge, Diagnostisk Radiologi, Billeddiagnostisk Afdeling - Viborg

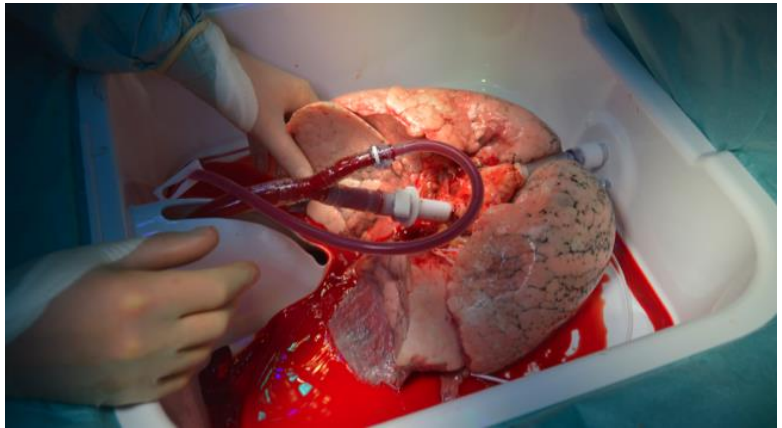
Er du vår nye psykolog/psykologspesialist? - Harstad

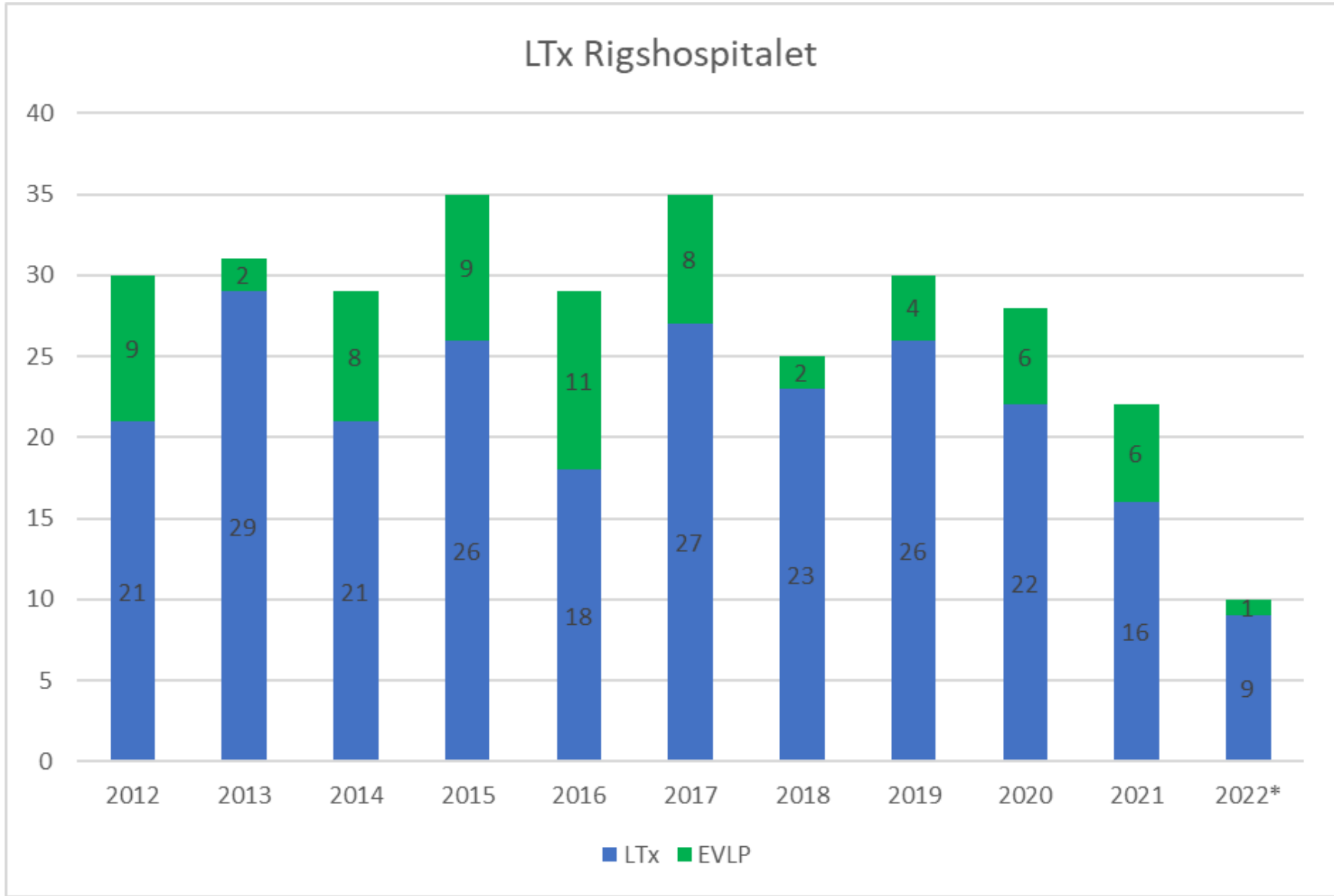
Danmarks største anæstesi- og intensivafdeling søger ledende overlæge - Odense

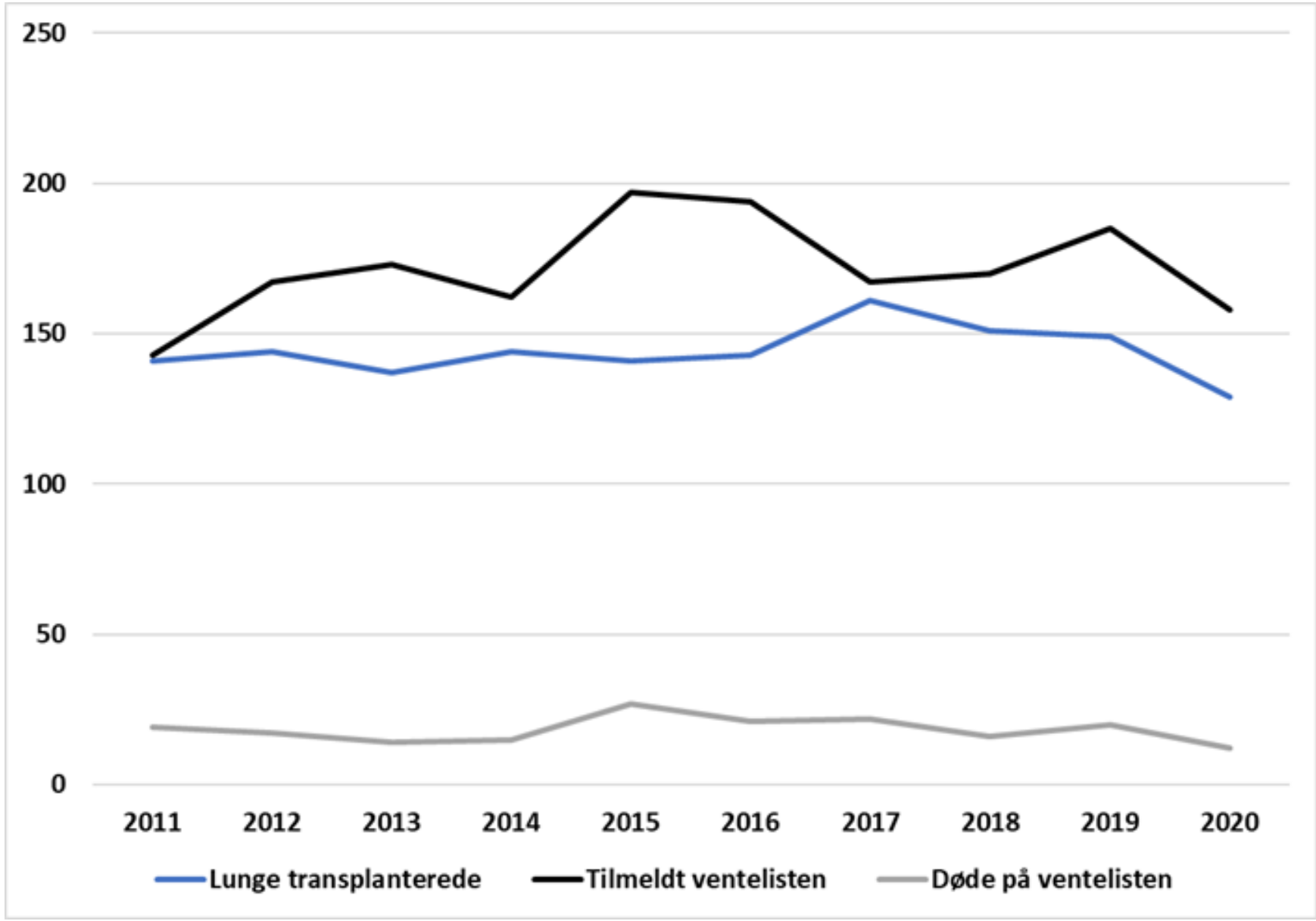
Afdelingslæge til Frømandskorpset/ Specialoperationsstyrkeelementet - Holbæk

EVLP konceptet

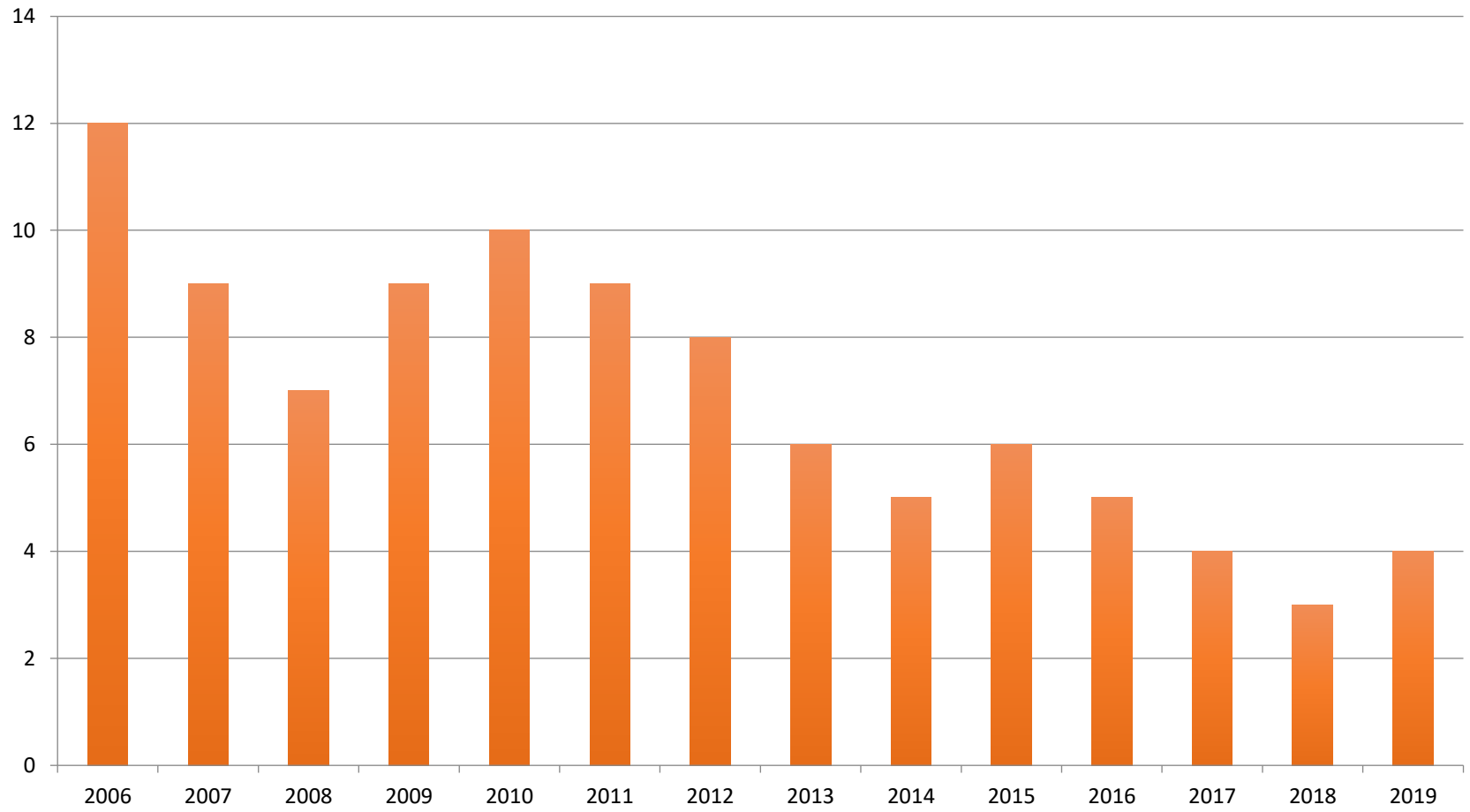





LTx Rigshospitalet
40
35
30
25
20
15
10
5
0
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022*
21
9
29
2
21
8
26
9
18
11
27
8
23
2
26
4
22
6
16
6
9
1
LTx
EVLP


250
200
150
100
50
0
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Lunge transplanterede
Tilmeldt ventelisten
Døde på ventelisten

Death on the waiting list Copenhagen / year

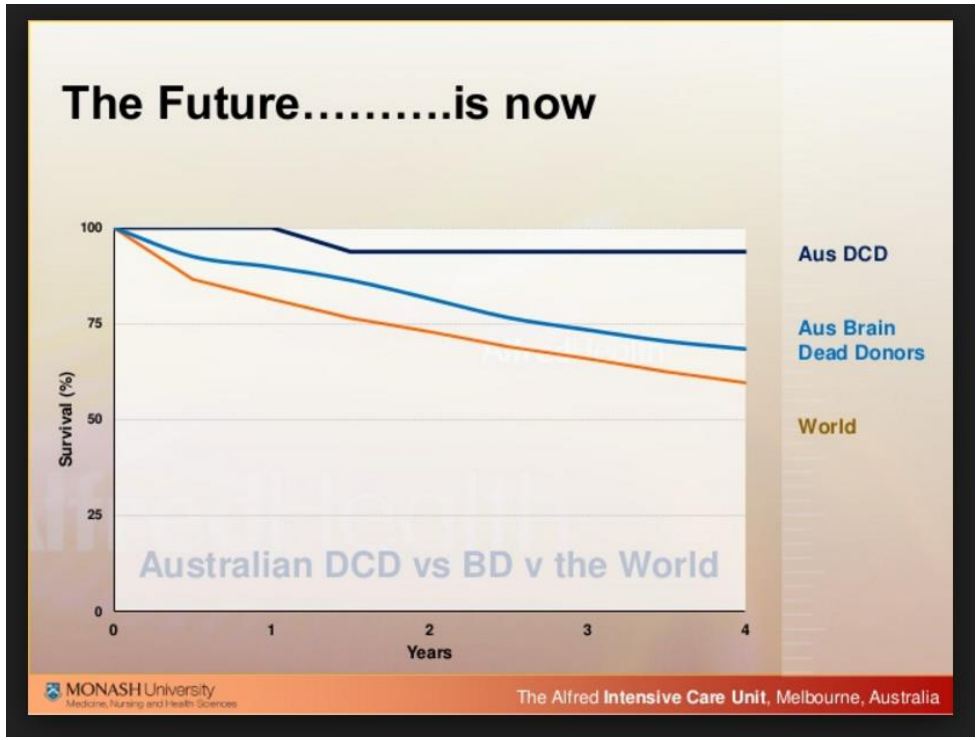


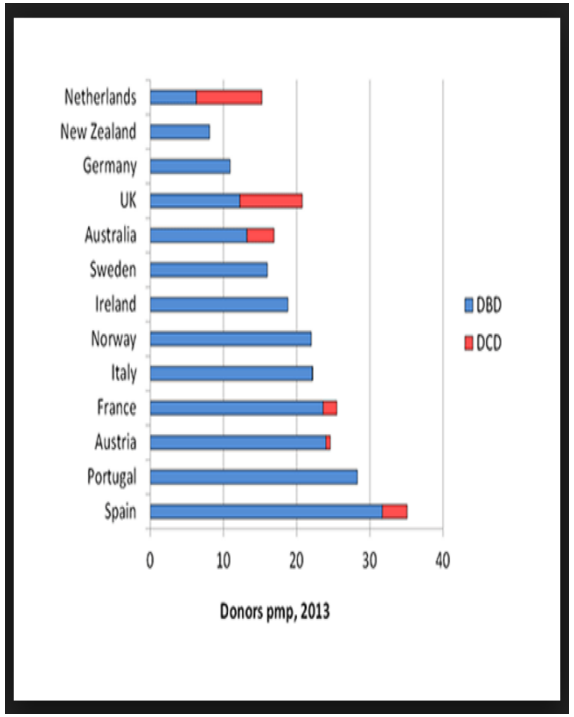
Perspektiver for EVLP

- Øge antallet af donor organer
    - Non-Heart beating donor (DCD)
- Forskning:
    - Stam Celler
    - EVLP som behandling: cytokineabsorbtion; IL-10 ; anti-biotics/viral (CMV, Hepatitis)/fungal
    - Fjernelse af blood gruppe karakteristika
    - Evolution og forståelse af transplantations immunologi
- Logistic og transplantation

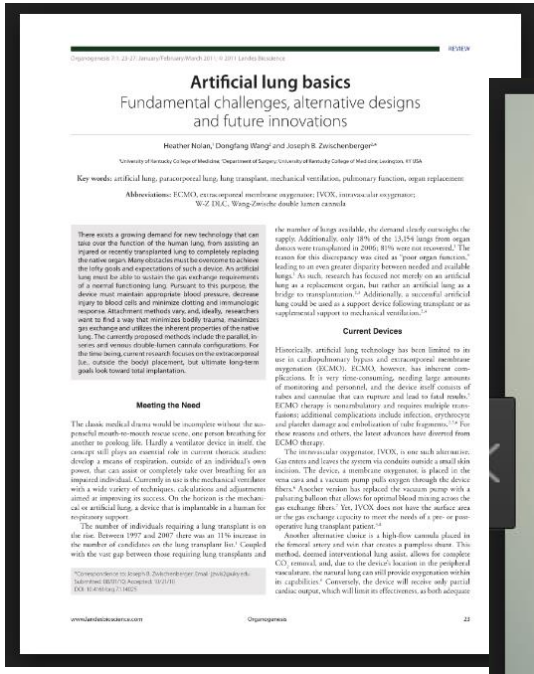

The Future of Transplantation is here…
The "Organ Repair Center"
Lung
Heart
Liver
Kidney
18
Organ
Regeneration
Laboratory
University
Health
Network

DCD –organ donation-





Kunstige Lunger



Artificial lung basics
Fundamental challenges, alternative designs and future innovations

Heather Nolan,[1] Dongfang Wang[2] and Joseph B. Zwischenberger[1,*]

[1]University of Kentucky College of Medicine, Department of Surgery; University of Kentucky College of Medicine, Lexington, KY USA

Key words: artificial lung, paracorporeal lung, lung transplant, mechanical ventilation, pulmonary function, organ replacement

Abbreviations: ECMO, extracorporeal membrane oxygenator; IVOX, intravascular oxygenator; W-Z DLC, Wang-Zwische double lumen cannula

There exists a growing demand for new technology that can take over the function of the human lung, from assisting an injured or recently transplanted lung to completely replacing the native organ. Many obstacles must be overcome to achieve the lofty goals and expectations of such a device. An artificial lung must be able to sustain the gas exchange requirements of a normal functioning lung. Pursuant to this purpose, the device must maintain appropriate blood pressure, decrease injury to blood cells and minimize clotting and immunologic response. Attachment methods vary, and, ideally, researchers want to find a way that minimizes bodily trauma, maximizes gas exchange and utilizes the inherent properties of the native lung. The currently proposed methods include the parallel, in-series and venous double-lumen cannula configurations. For the time being, current research focuses on the extracorporeal (i.e., outside the body) placement, but ultimate long-term goals look toward total implantation.

Meeting the Need

The classic medical drama would be incomplete without the mouth-to-mouth rescue scene, one person breathing for another in peeking life. Hardly a ventilator device in itself, the concept still plays an essential role in current thoracic studies: develop a means of respiration, outside of an individual's own power, that can assist or completely take over breathing for an impaired individual. Currently in use is the mechanical ventilator with a wide variety of techniques, calculations and adjustments aimed at improving its success. On the horizon is the mechanical or artificial lung, a device that is implantable in a human for respiratory support.

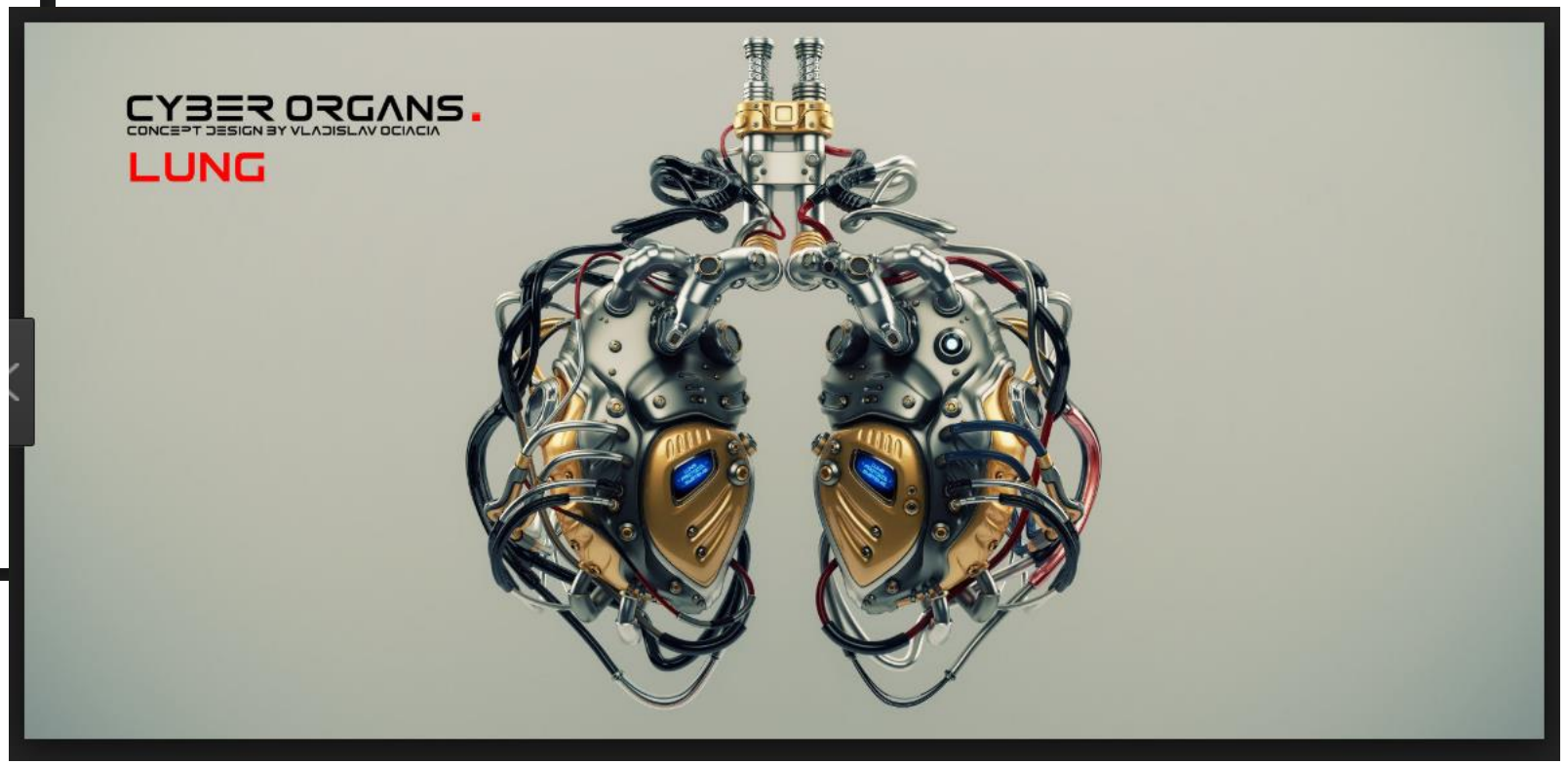
The number of individuals requiring a lung transplant is on the rise. Between 1997 and 2007 there was an 11% increase in the number of candidates on the lung transplant list.[1] Coupled with the vast gap between those requiring lung transplants and the number of lungs available, the demand greatly outweighs the supply. Additionally, only 18% of the 13,154 lungs from organ donors were transplanted in 2006; 81% were not recovered.[1] The reason for this discrepancy was cited as "poor organ function," leading to an even greater disparity between needed and available lungs.[1] As such, research has focused not merely on an artificial lung as a replacement organ, but rather an artificial lung as a bridge to transplantation.[2,3] Additionally, a successful artificial lung could be used as a support device following transplant or as supplemental support to mechanical ventilation.[2,3]

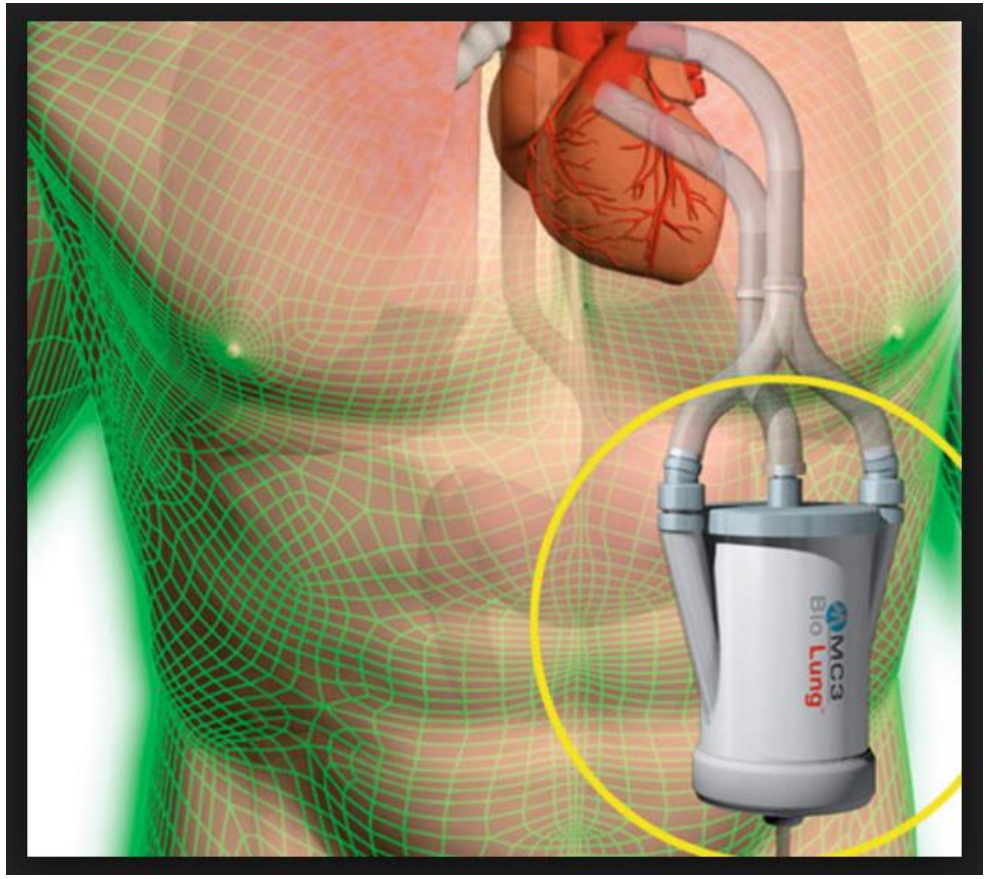
Current Devices

Historically, artificial lung technology has been limited to its use in cardiopulmonary bypass and extracorporeal membrane oxygenation (ECMO). ECMO, however, has inherent complications. It is very time-consuming, needing large amounts of monitoring and personnel, and the device itself consists of tubes and cannulae that can rupture and lead to fatal results.[1] ECMO therapy is nonambulatory and requires multiple transfusions; additional complications include infection, erythrocyte and platelet damage and embolization of tube fragments.[1,3,4] For these reasons and others, the latest advances have diverted from ECMO therapy.

The intravascular oxygenator, IVOX, is one such alternative. Gas enters and leaves the system via conduits outside a small skin incision. The device, a membrane oxygenator, is placed in the vena cava and a vacuum pump pulls oxygen through the device fibers.[4] Another version has replaced the vacuum pump with a pulsating balloon that allows for optimal blood mixing across the gas exchange fibers.[5] Yet, IVOX does not have the surface area or the gas exchange capacity to meet the needs of a pre- or post-operative lung transplant patient.[3,4]

Another alternative device is a high-flow cannula placed in the femoral artery and vein that creates a pumpless shunt. This method, deemed interventional lung assist, allows for complete CO_2 removal, and, due to the device's location in the peripheral vasculature, the natural lung can still provide oxygenation within its capabilities.[6] Conversely, the device will receive only partial cardiac output, which will limit its effectiveness, as both adequate




MC3
Bio Lung

The Guardian
International edition

Interview

Could 3D printing solve the organ transplant shortage?

By Tim Lewis

Scientists are racing to make replacement human organs with 3D printers. But while the technology's possibilities are exciting, already there are fears we could be 'playing God'

Tissue Engineering

REVIEW

Future prospects for tissue engineered lung transplantation

Decellularization and recellularization-based whole lung regeneration

Tomoshi Tsuchiya[1,*], Amogh Sivarapatna[2], Kevin Rocco[2], Atsushi Nanashima[1], Takeshi Nagayasu[1], and Laura E Niklason[2]

[1]Division of Surgical Oncology, Department of Surgery, Nagasaki University Graduate School of Biomedical Sciences, Nagasaki, Japan; [2]Departments of Anesthesia and Biomedical Engineering, Yale University, New Haven, CT USA

Keywords: lung transplantation, decellularization, recellularization, extracellular matrix, stem/progenitor cells, induced pluripotent stem cells

The shortage of donor lungs for transplantation causes a significant number of patient deaths. The availability of laboratory engineered, functional organs would be a major advance in meeting the demand for organs for transplantation. The accumulation of information on biological scaffolds and an increased understanding of stem/progenitor cell behavior has led to the idea of generating transplantable organs by decellularizing an organ and recellularizing using appropriate cells. Recellularized solid organs can perform organ-specific functions for short periods of time, which indicates the potential for the clinical use of engineered solid organs in the future.

The present review provides an overview of progress and recent knowledge about decellularization and recellularization-based approaches for generating tissue engineered lungs. Methods to improve decellularization, maturation of recellularized lung, candidate species for transplantation and future prospects of lung bioengineering are also discussed.

Introduction

Lung transplantation is the last option for the treatment of terminal lung disorders such as chronic obstructive pulmonary disorder (COPD), which is the third leading cause of death in the United States.[1,2] More than 2000 lung transplants are performed annually in the United States.[3] Whereas lung transplantation is recognized as an established therapy that improves survival and provides an improved quality of life for transplant recipients,[4] there are several hurdles that make the transplantation of donor lungs a challenging endeavor.

One critical issue is the condition of the donor lungs. Donor lungs often suffer edema, atelectasis, or pneumonia originating from donor systemic problems or preoperative systemic control.[5] The long ischemic time also causes donor lung damage, which directly correlates with primary graft failure.[6] The disadvantage of a lung transplant is the need for lifelong administration of immunosuppression drugs in the recipient, which increases the risks of infections and cancer.[7] The problem, however, is the acute shortage of transplantable lungs. In 2011, there were 2280 patients waiting for lung transplantation in the US alone with the average waiting time of 1.5 years and mortality for patients on the wait list is 15.7 per 100 wait-list years.[8] In Japan, the situation is worse, with average waiting time in Japan is about 2 y and 9 mo and corresponding mortality is 43 per 100 wait-list years.[9] The shortage of lungs greatly exceeds the supply. Further, a patient's waiting time for a suitable organ results in the deterioration of the patient's condition and increases operative risk. To address such unresolved problems, lung transplantation is a necessary but currently imperfect treatment for lung failure.

In order to address the problem of organ shortage, several approaches for making transplantable lungs have been attempted, including: biomaterial improvement, three-dimensional (3D) cell cultures, and ex vivo bioengineering. With progress of regenerative medicine and the development of stem cell advances, investigators have also begun to explore the idea of using decellularized native scaffolds for recellularization to generate transplantable bioengineered lungs (Fig. 1).[10,11]

This review describes the recent development of decellularization and recellularization strategies for generating functional lungs for transplantation. We will begin by discussing the concepts of decellularization and recellularization, followed by the current status of the cell replacement approach for whole lung regeneration, including the use of stem cells and studies of extracellular matrix (ECM) scaffolds. Finally, we address other important aspects of lung bioengineering such as protocols for organ maturation, the choice of species, operation procedures and the prospect of clinical application of recellularized lung transplantation.

*Correspondence to: Tomoshi Tsuchiya; Email: tomoshi@nagasaki-u.ac.jp

Submitted: 11/29/2013; Revised: 01/13/2014; Accepted: 01/13/2014;
Published Online: 01/31/2014; http://dx.doi.org/10.4161/org.27846

stribute.

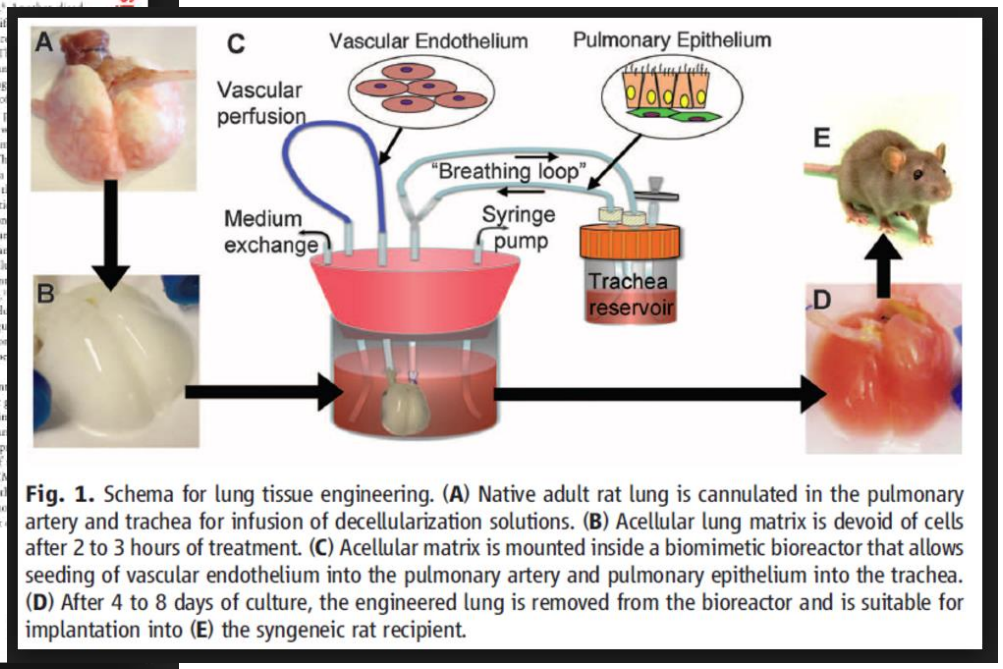


Fig. 1. Schema for lung tissue engineering. (**A**) Native adult rat lung is cannulated in the pulmonary artery and trachea for infusion of decellularization solutions. (**B**) Acellular lung matrix is devoid of cells after 2 to 3 hours of treatment. (**C**) Acellular matrix is mounted inside a biomimetic bioreactor that allows seeding of vascular endothelium into the pulmonary artery and pulmonary epithelium into the trachea. (**D**) After 4 to 8 days of culture, the engineered lung is removed from the bioreactor and is suitable for implantation into (**E**) the syngeneic rat recipient.

Science

Current Issue | First release papers | Archive | About | Submit manuscript

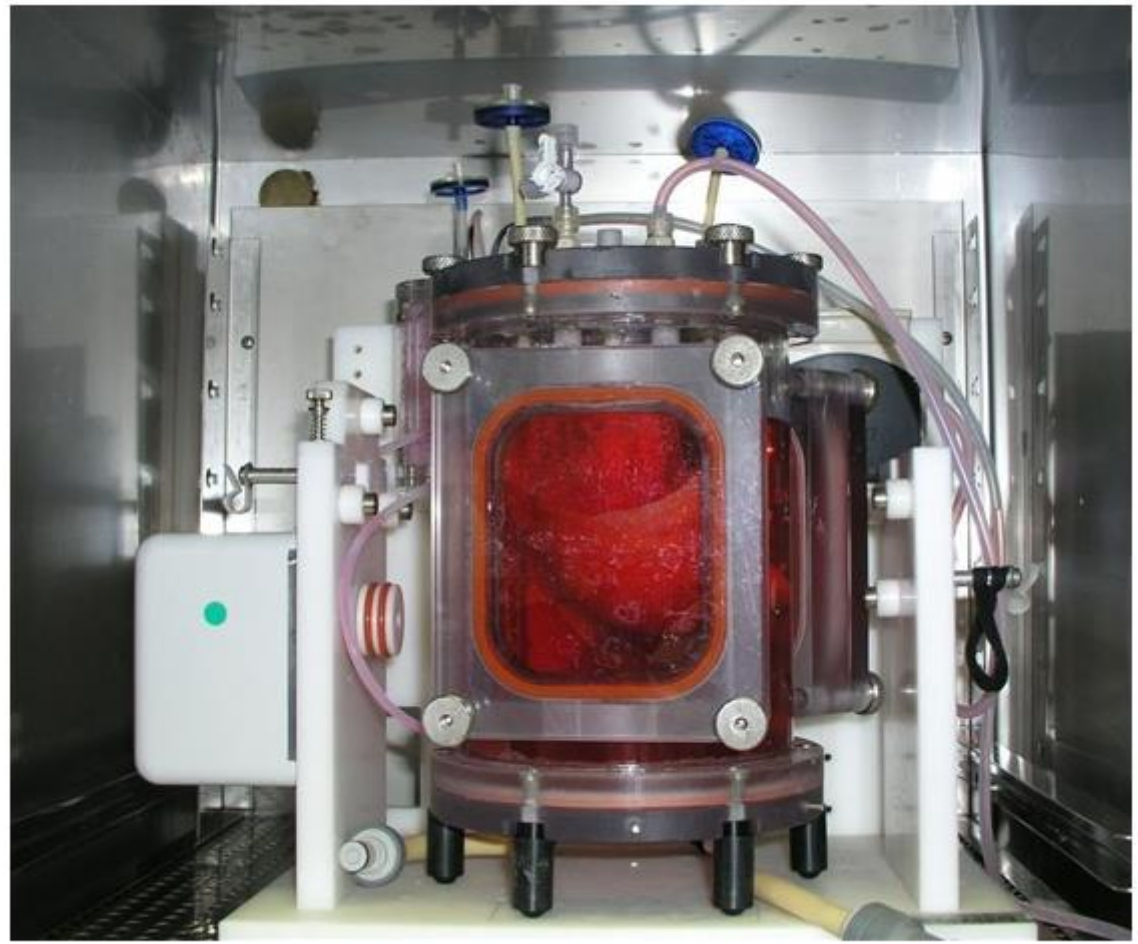
HOME > SCIENCE > VOL. 329, NO. 5991 > TISSUE-ENGINEERED LUNGS FOR IN VIVO IMPLANTATION

RESEARCH ARTICLE

Tissue-Engineered Lungs for in Vivo Implantation

THOMAS H. PETERSEN, ELIZABETH A. CALLE, LIPING ZHAO, EUN JUNG LEE, LIQIONG GUI, MICHASAM B. RAREDON, KSENIYA GAVRILOV, TAI YI, ZHEN W. ZHUANG, [...], AND LAURA E. NIKLASON +2 authors Authors Info & Affiliations

SCIENCE • 24 Jun 2010 • Vol 329, Issue 5991 • pp. 538-541 • DOI: 10.1126/science.1189345




Main Lung Jar

SCIENCE TRANSLATIONAL MEDICINE | RESEARCH ARTICLE

TISSUE ENGINEERING

Production and transplantation of bioengineered lung into a large-animal model

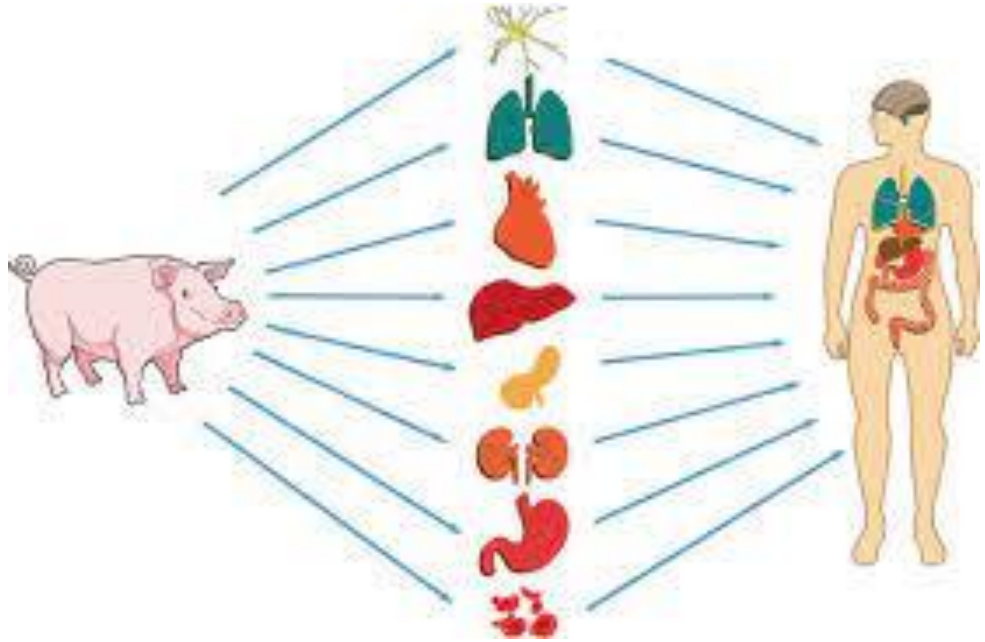
Joan E. Nichols[1]*, Saverio La Francesca[2], Jean A. Niles[1], Stephanie P. Vega[3], Lissenya B. Argueta[4], Luba Frank[5], David C. Christiani[6,7], Richard B. Pyles[8], Blanca E. Himes[9], Ruyang Zhang[7], Su Li[7], Jason Sakamoto[10], Jessica Rhudy[10], Greg Hendricks[11], Filippo Begarani[10], Xuewu Liu[10], Igor Patrikeev[12], Rahul Pal[12], Emiliya Usheva[13], Grace Vargas[12], Aaron Miller[8], Lee Woodson[14], Adam Wacher[14], Maria Grimaldo[1], Daniil Weaver[1], Ron Mlcak[15], Joaquin Cortiella[14]*

Copyright © 2018 The Authors, some rights reserved; exclusive licensee American Association for the Advancement of Science. No claim to original U.S. Government Works

Xenotransplantation: Are pigs the future of organ transplants?

13 March

GETTY IMAGES



Afsluttende bemærkninger

Transplantation kan være en fantastisk behandling

Transplantation kræver en hold indsats

Transplantation kræver gaven af organ donation

- så husk at tage stilling !

Tak for jeres opmærksomhed