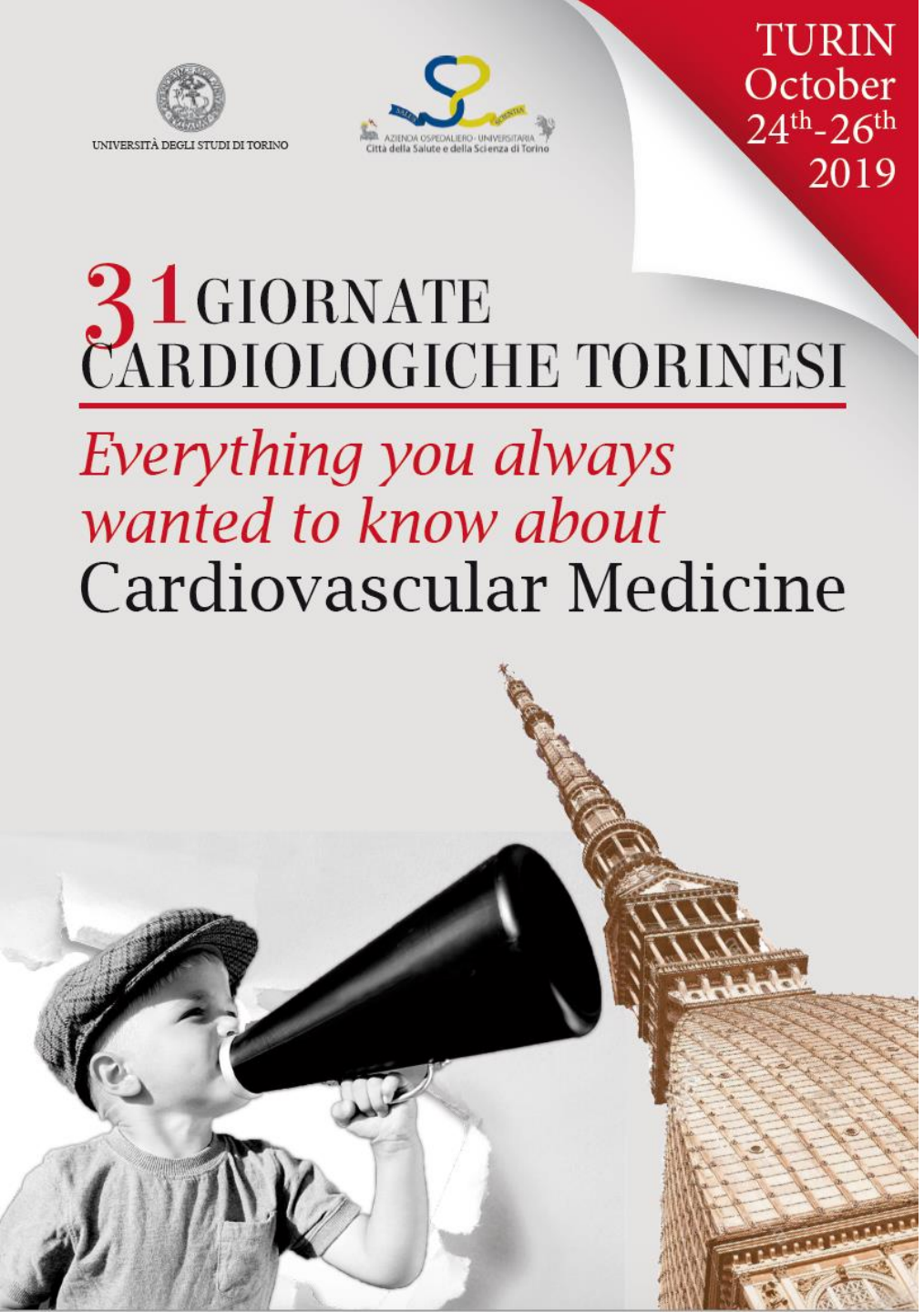


CARDIAC SURGERY DIVISION
Heart and Lung Transplant Programme
University of Turin
Città della Salute e della Scienza Hospital
Prof. Mauro Rinaldi

LUNG TRANSPLANTATION
WHEN? HOW? WHERE?

Massimo Boffini

LUNG TRANSPLANTATION

Transplantation is now a generally **accepted therapy** for the management of a wide range of severe lung disorders

Evidence supporting improved **quality of life** and **survival benefit** for transplant recipients

A consensus document for the selection of lung transplant candidates: 2014—An update from the Pulmonary Transplantation Council of the International Society for Heart and Lung Transplantation

TIMING OF LISTING

- NYHA Functional Class III or IV despite a trial of at least 3 months of combination therapy including prostanoids.
- Cardiac index of <2 liters/min/m^2.
- Mean right atrial pressure of >15 mm Hg.
- 6-minute walk test of <350 m.
- Development of significant hemoptysis, pericardial effusion, or signs of progressive right heart failure (renal insufficiency, increasing bilirubin, brain natriuretic peptide, or recurrent ascites).[1,61,62]

J Heart Lung Transplant 2015;34:1–15

PUSHING THE LIMITS

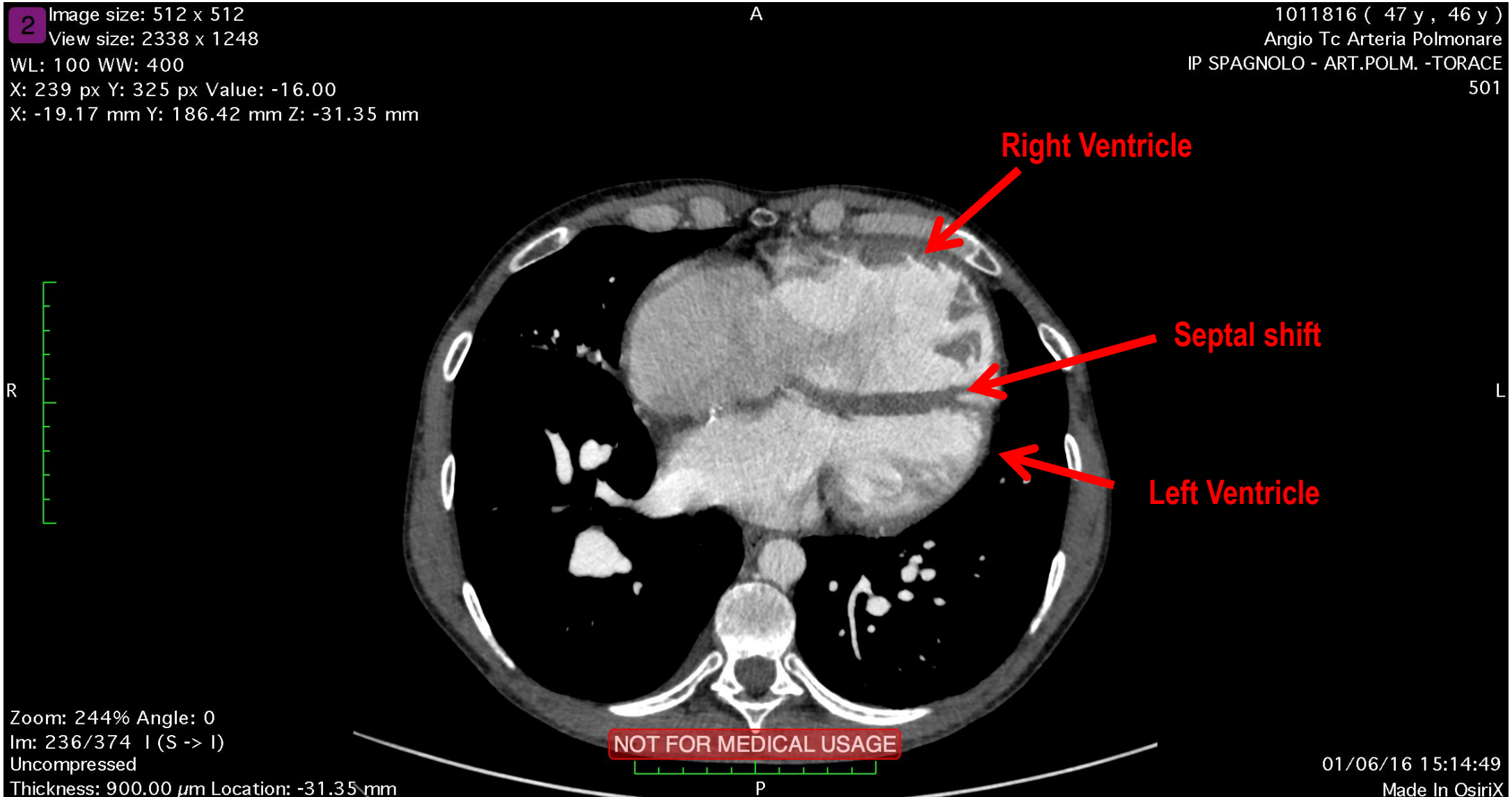
AF M, 48 y-old (1969), B group, 49 Kg x 180 cm

1979	ASD O Secundum 10 y-old
1993	**ASD closure (sternotomy)**
2002	PH center (PA 98/42/63 IC 2.6)
2003	sildenafil
2007	ambrisentan (PA 104/24/53, IC 3.9)
2012	FA, Giant PA, LCMS compression: BMS of LM
2014	SOB NYHA III
2016	mPA 47, CI 3,2, 6MWT 465m: Indication to URGENT transplant LISTING

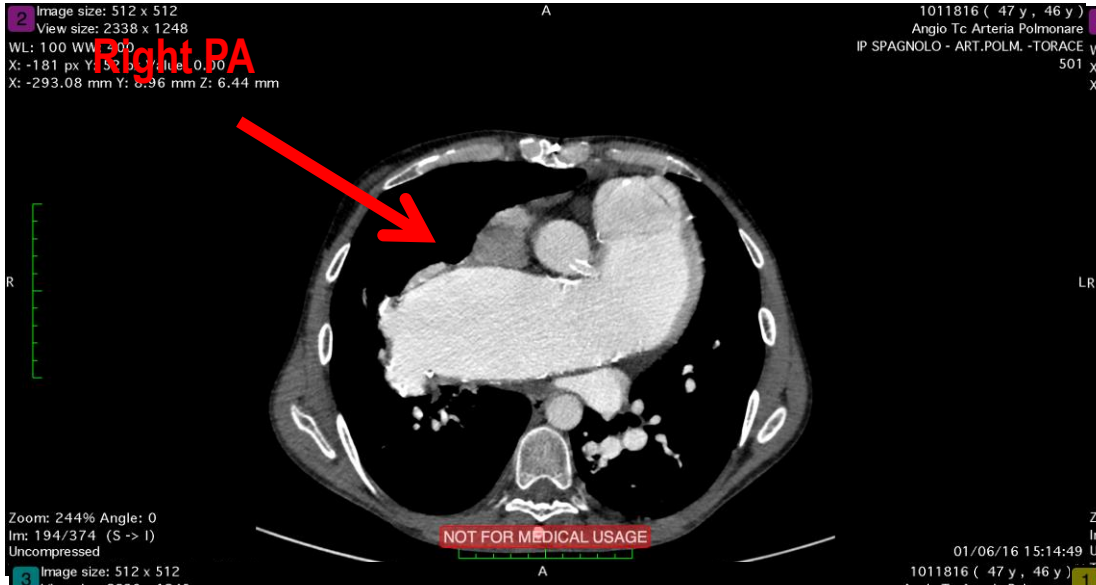
CHEST X-RAY

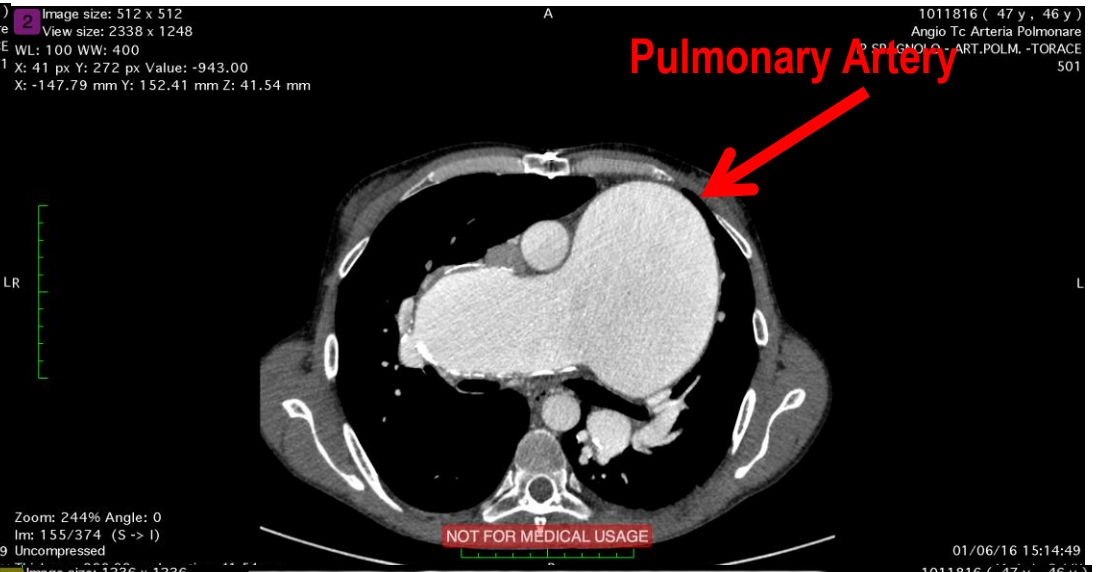

2
Image size: 512 x 409
View size: 2338 x 1248
WL: -143 WW: 1660
X: -29 px Y: 218 px Value: 0.00
X: -278.96 mm Y: 141.70 mm Z: -46.81 mm
S
1011816 (47 y , 46 y)
Angio Tc Arteria Polmonare
401
R
L
Zoom: 305% Angle: 0
Im: 1/3
Uncompressed
Thickness: 625.00 µm Location: 141.70 mm
NOT FOR MEDICAL USAGE
I
01/06/16 15:10:39
Made In OsiriX

LUNG CT SCAN


2
Image size: 512 x 512
View size: 2338 x 1248
WL: 100 WW: 400
X: 239 px Y: 325 px Value: -16.00
X: -19.17 mm Y: 186.42 mm Z: -31.35 mm
A
1011816 (47 y , 46 y)
Angio Tc Arteria Polmonare
IP SPAGNOLO - ART.POLM. -TORACE
501
Right Ventricle
Septal shift
Left Ventricle
R
L
NOT FOR MEDICAL USAGE
P
Zoom: 244% Angle: 0
Im: 236/374 I (S -> I)
Uncompressed
Thickness: 900.00 μm Location: -31.35 mm
01/06/16 15:14:49
Made In OsiriX

LUNG CT SCAN


Right PA
NOT FOR MEDICAL USAGE


Pulmonary Artery
NOT FOR MEDICAL USAGE


Left PA
NOT FOR MEDICAL USAGE


LM stent
NOT FOR MEDICAL USAGE

PULMONARY HYPERTENSION

TYPES OF TRANSPLANT

- **HEART AND LUNG TX**
  - **DOMINO-TX**
- **LUNG TRANSPLANT**

HEART AND LUNG TRANSPLANTATION

IN THE PAST

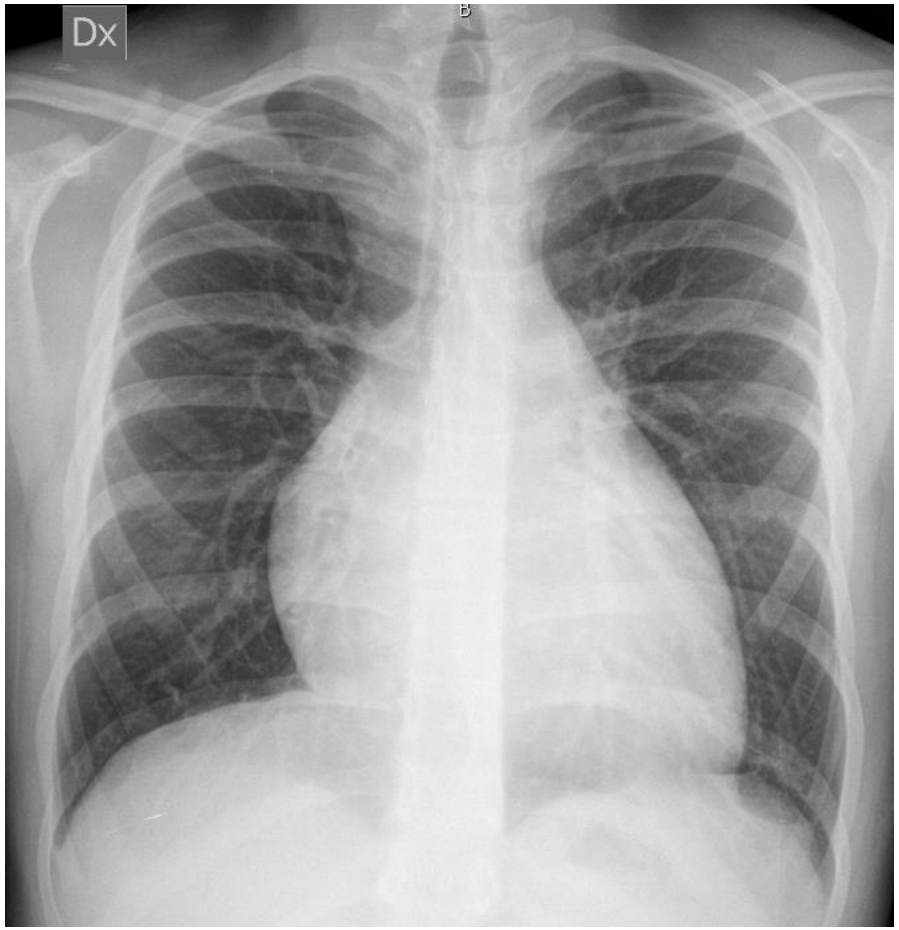
CONCERNS about **RV dysfunction**

NOWADAYS

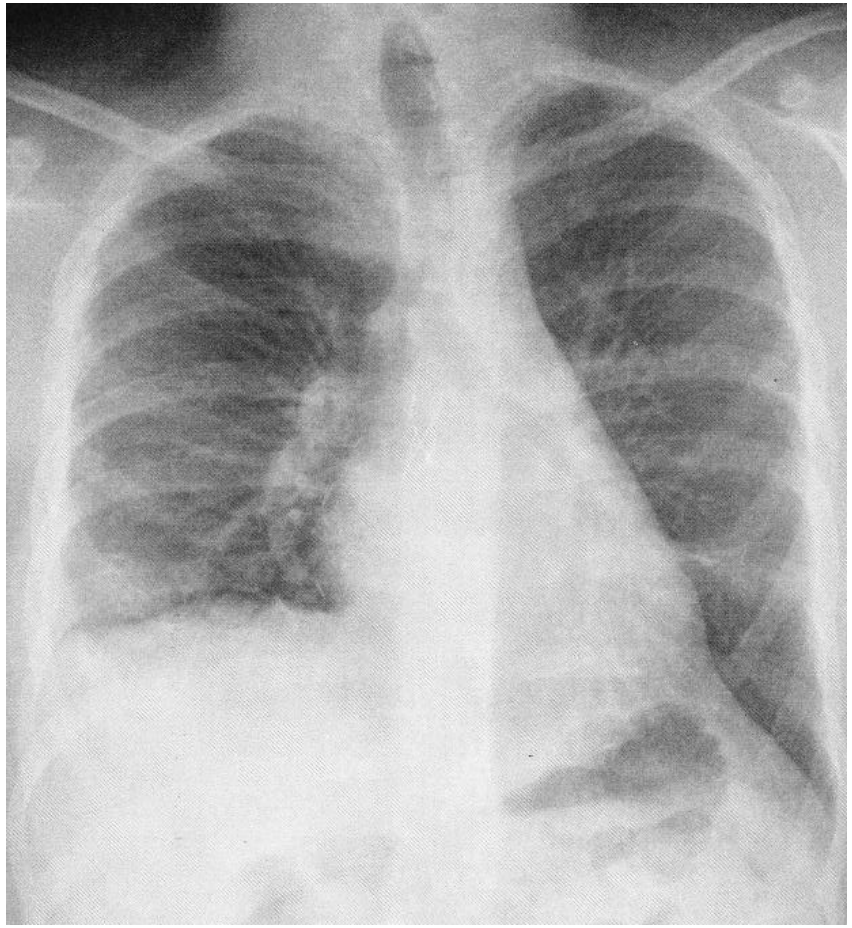
only in case of **severe LV dysfunction**

systolic or **DYASTOLIC LV dysfunction**

POST-LTX
RIGHT VENTRICLE REMODELING



PRE-TRAPLANT



SIX MONTHS AFTER TX

INDICATIONS

HEART AND LUNG TRANSPLANTATION

- **EISENMENGER SYNDROME due to congenital heart disease not amenable for conservative correction**
- **PRIMARY PH with severe LV dysfunction**
- **LUNG DISEASE with end-stage cardiac disease**

DOMINO TRANSPLANTATION

Yacoub M: 1987

PPH recipient: HLTx

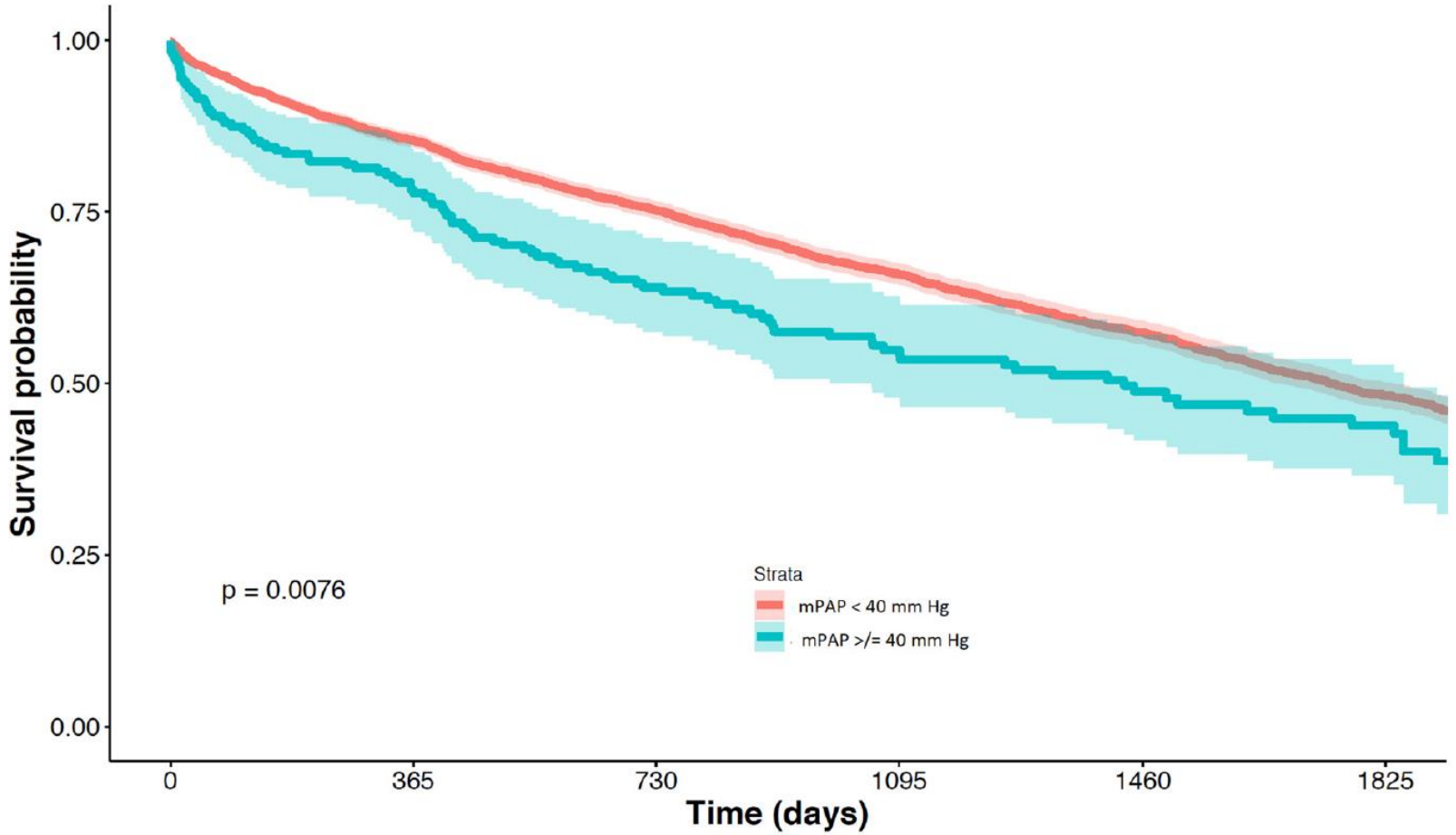
Use the heart of the recipient of a H-L Tx suffering from PH as a graft for a recipient with end-stage heart disease with secondary pulmonary hypertension due to heart disease

SINGLE LUNG TRANSPLANTATION

PULMONARY HYPERTENSION

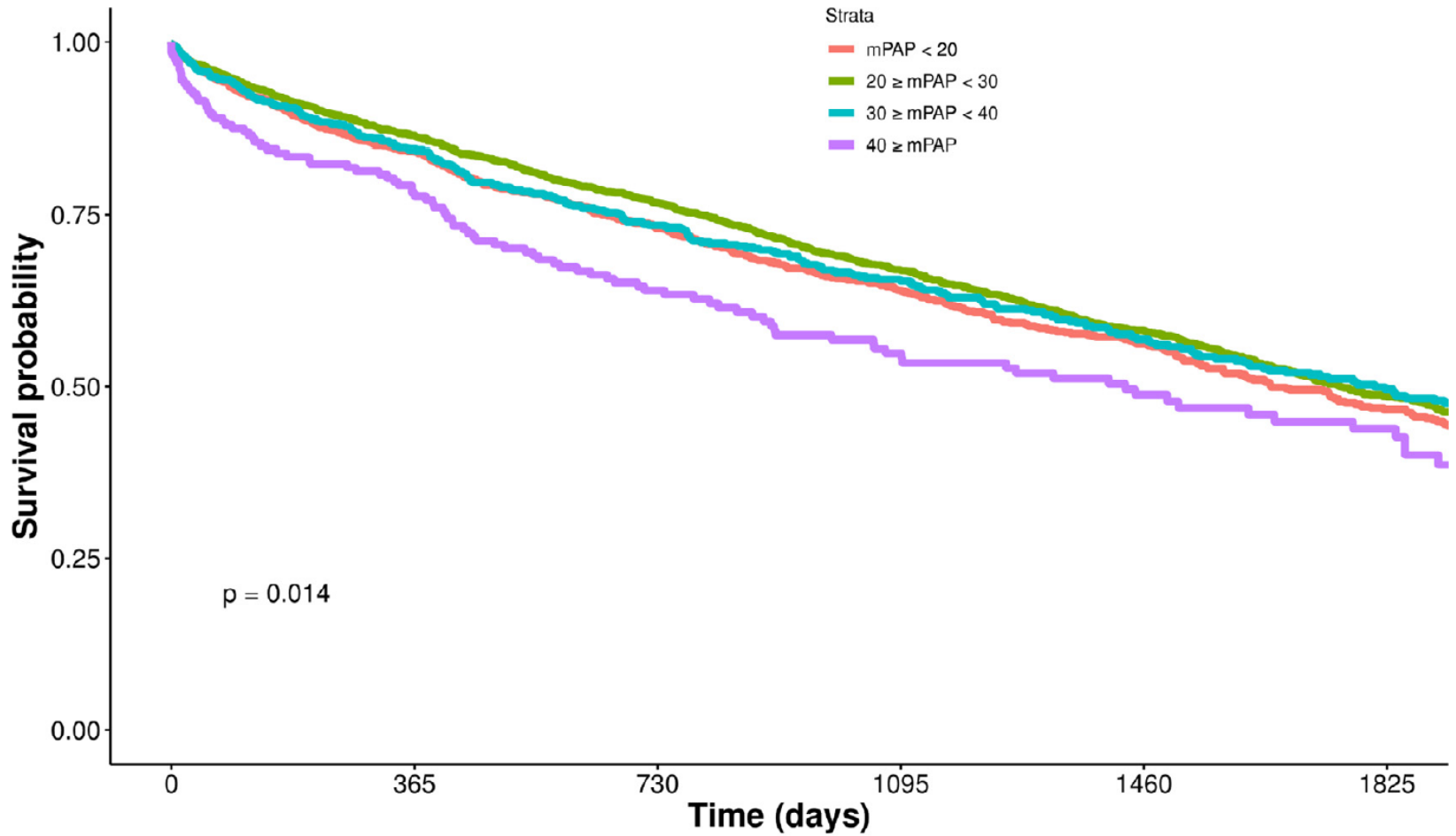
- Optimization of donors' pool
- Potential reduction of waiting list time and mortality
- More difficult clinical management
- High risk of V/O mismatch (IRI and BOS)
- Emergency strategy only

Single lung transplantation in patients with severe secondary pulmonary hypertension



J Heart Lung Transplant 2019;38:939–948

Single lung transplantation in patients with severe secondary pulmonary hypertension



J Heart Lung Transplant 2019;38:939–948

BILATERAL LUNG TRANSPLANTATION

PULMONARY HYPERTENSION

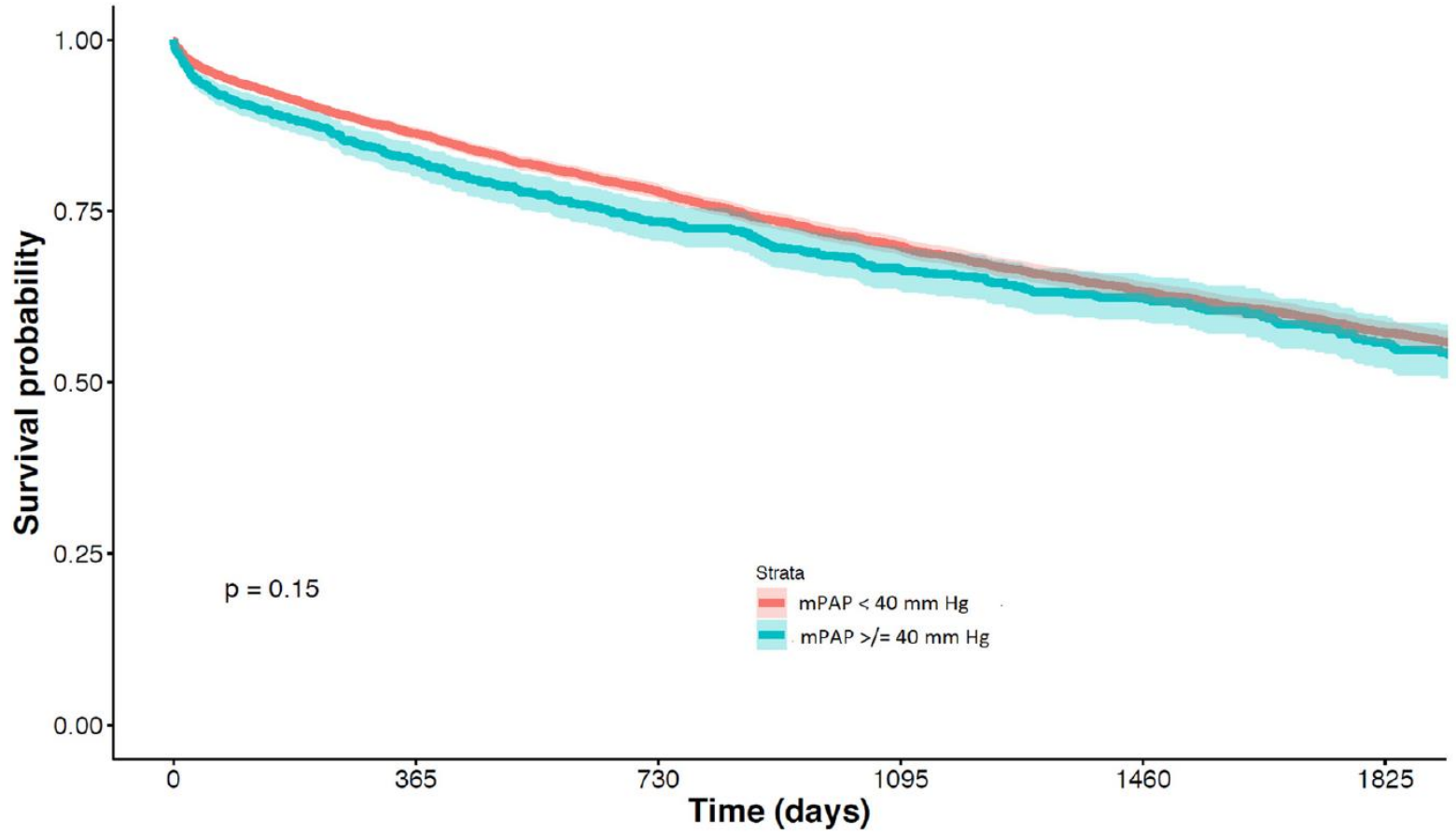
Lower risk of IRI / PGD

Absence of V/O mismatch

Two grafts for one patient

BILATERAL LUNG TRANSPLANTATION

PULMONARY HYPERTENSION DUE TO PARECHYMAL DISEASE

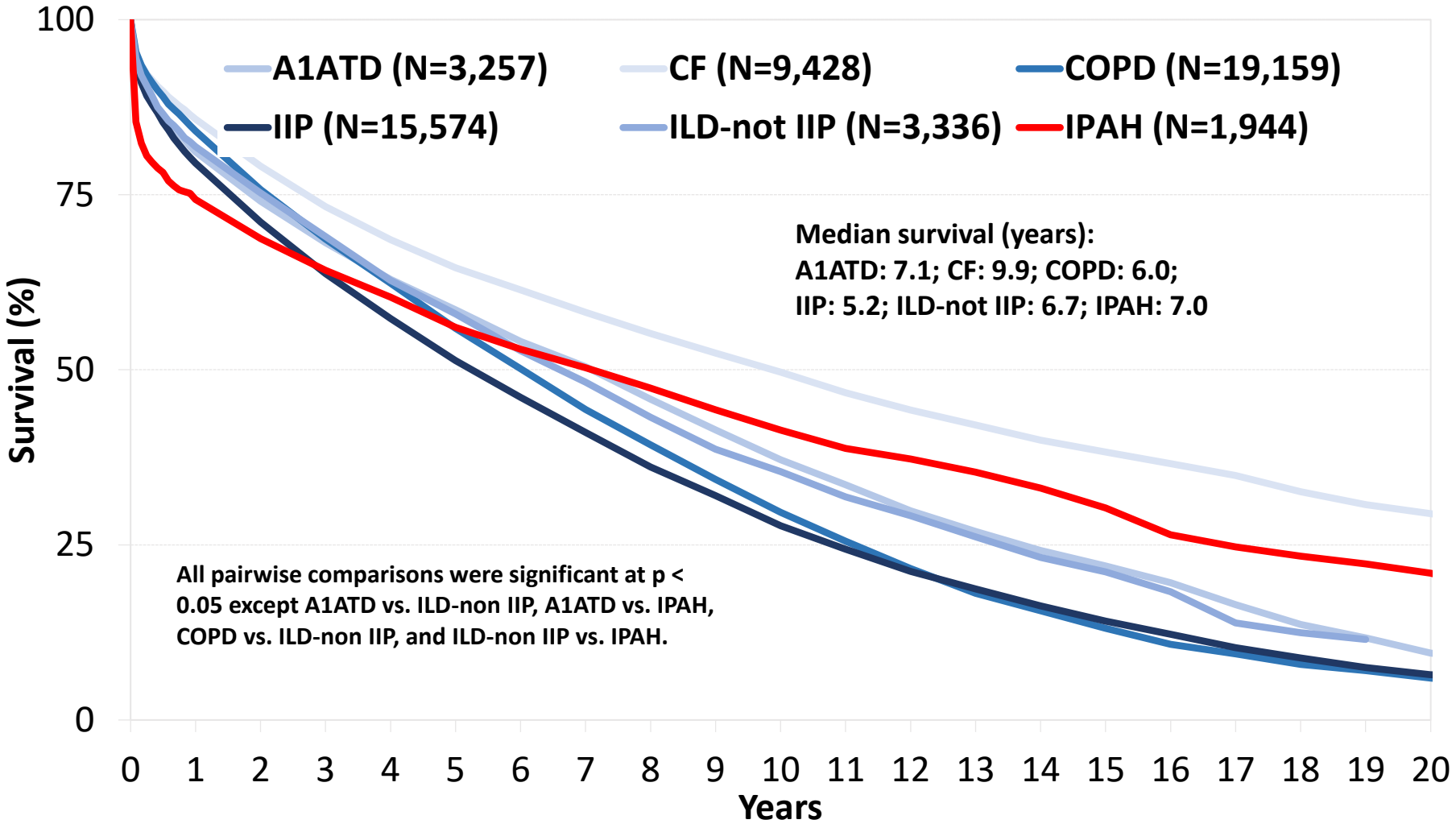


J Heart Lung Transplant 2019;38:939–948

Adult Lung Transplants

Kaplan-Meier Survival by Major Diagnosis

(Transplants: January 1992 – June 2017)

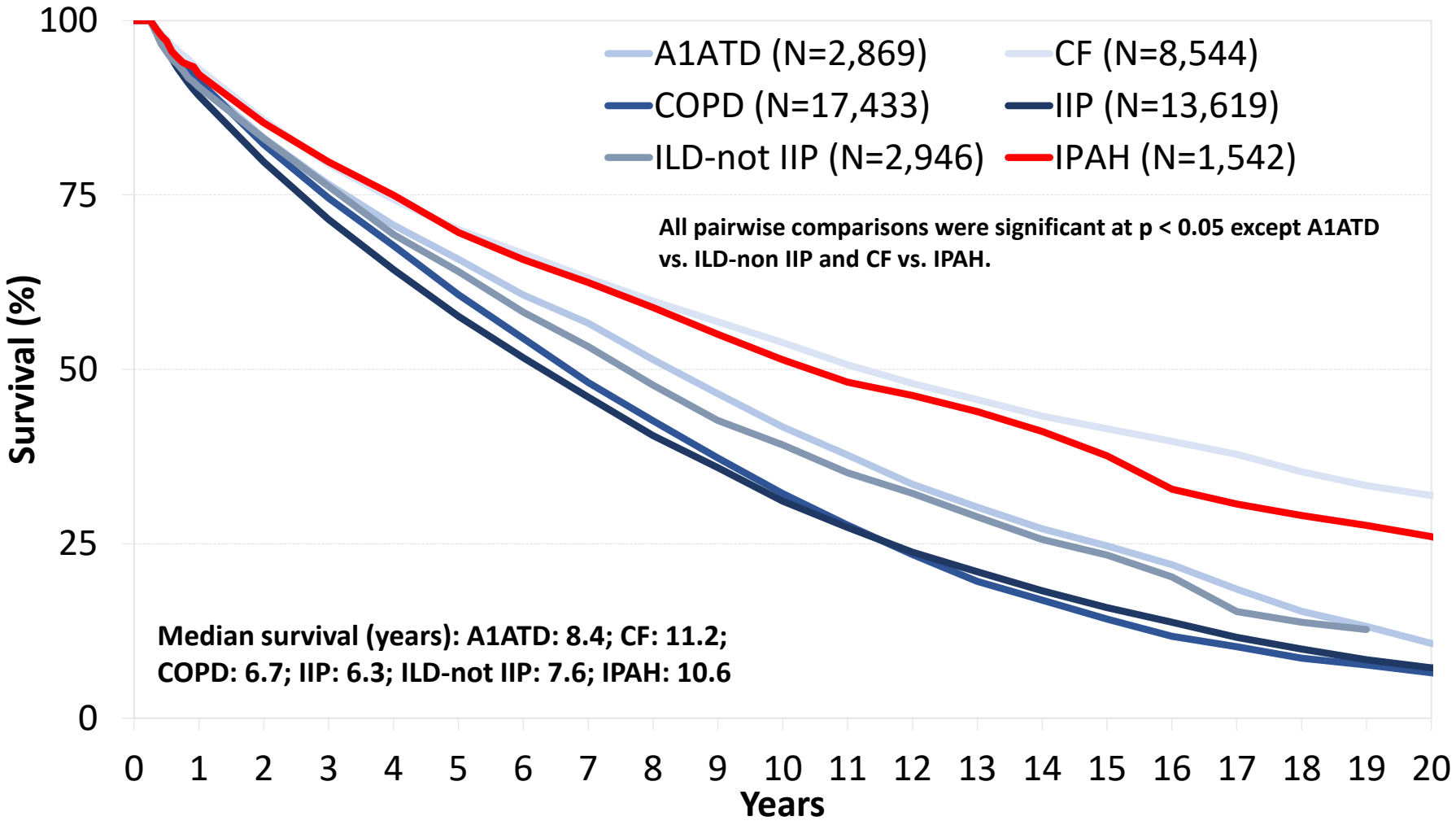


ISHLT • INTERNATIONAL SOCIETY FOR HEART AND LUNG TRANSPLANTATION

2019

Adult Lung Transplants

Kaplan-Meier Survival by Major Diagnosis Conditional on Survival to 3 Months (Transplants: January 1992 – June 2017)



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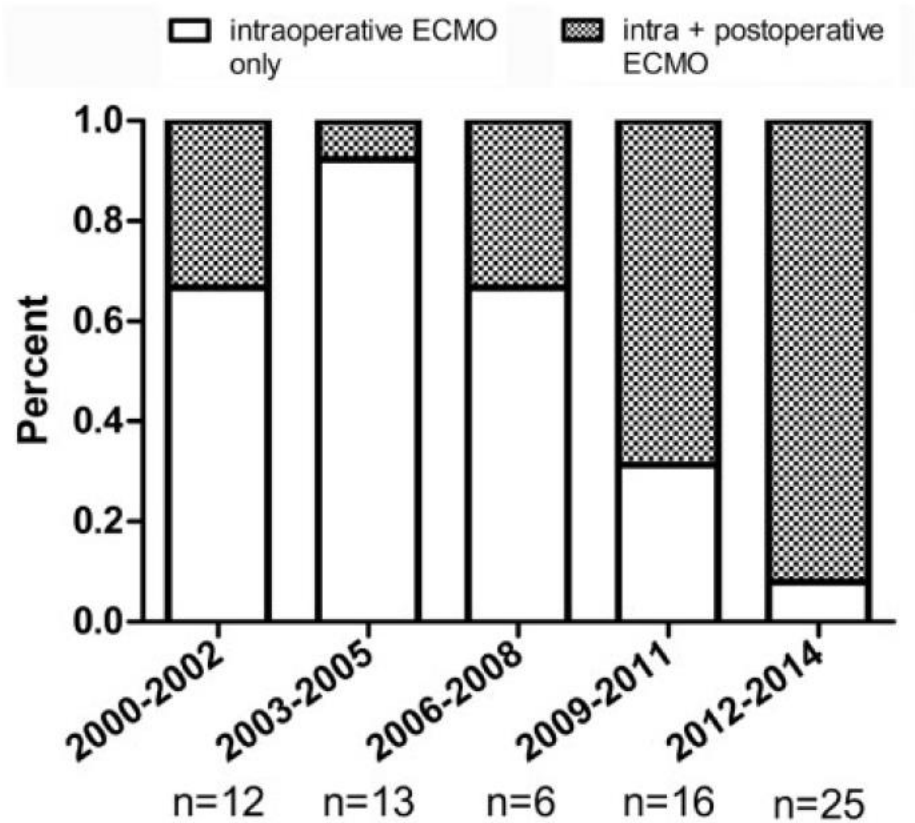
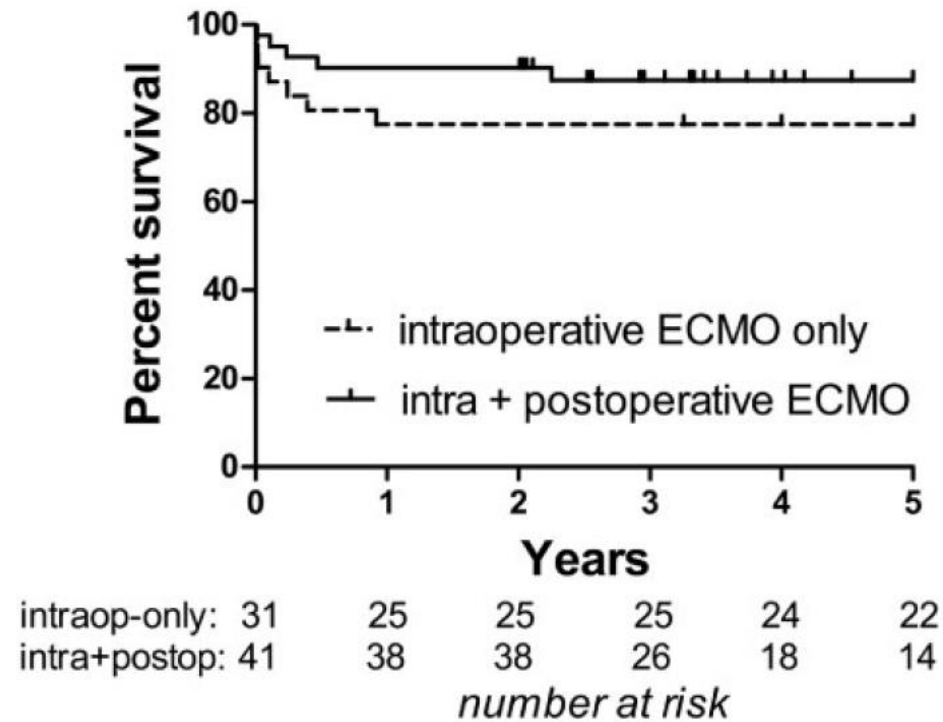
Lung transplantation for idiopathic pulmonary arterial hypertension on intraoperative and postoperatively prolonged extracorporeal membrane oxygenation provides optimally controlled reperfusion and excellent outcome





European Journal of Cardio-Thoracic Surgery 53 (2018) 178–185

Lung transplantation for idiopathic pulmonary arterial hypertension on intraoperative and postoperatively prolonged extracorporeal membrane oxygenation provides optimally controlled reperfusion and excellent outcome

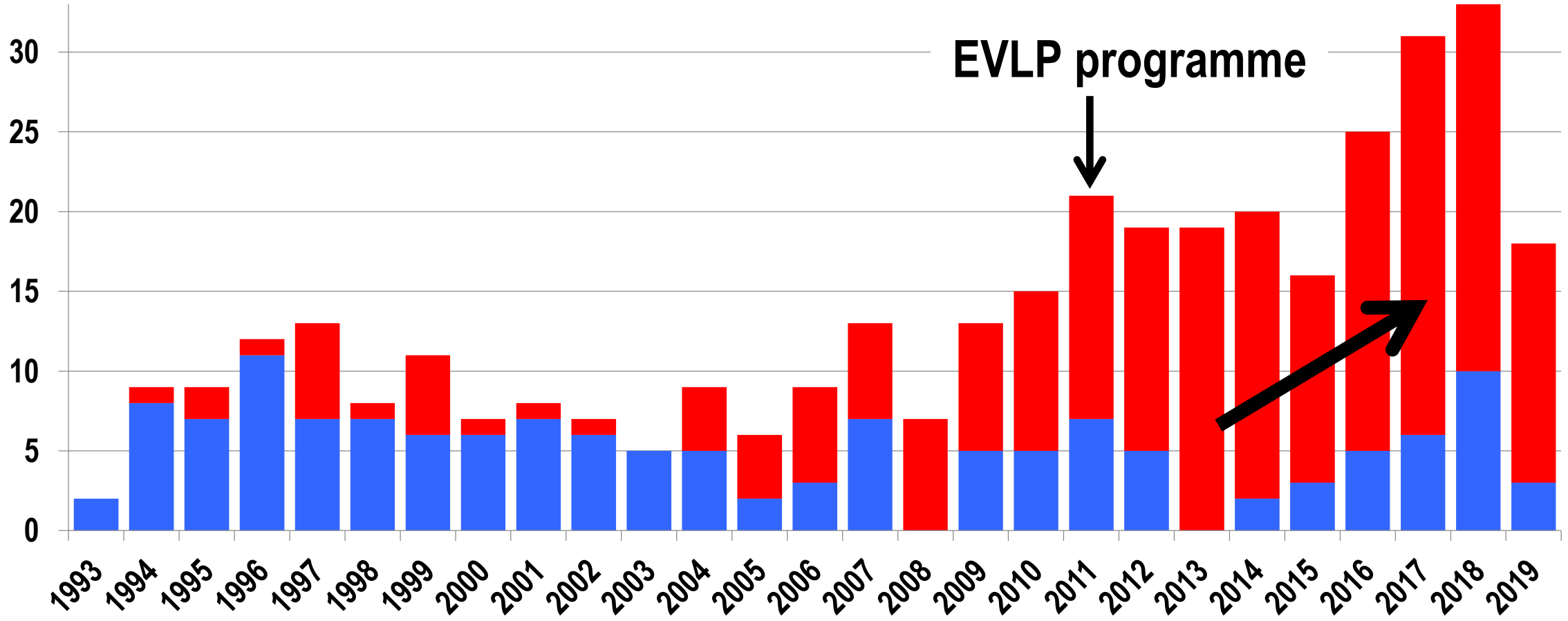
Table 3: Complications related to ECMO

n (%)	17 (41.4)
Rethoracotomy for bleeding	7 (17.1)
ECMO-related	
Infection at cannulation site in groin	1 (2.4)
Thrombosis of leg cannula	2 (4.9)
Possibly ECMO-related	
Symptomatic transitory psychotic syndrome	4 (9.7)
Radiological signs of subarachnoidal bleeding[a]	2 (4.9)
Hypoxic brain damage	1 (2.4)

European Journal of Cardio-Thoracic Surgery 53 (2018) 178–185

TURIN LUNG TRANSPLANT PROGRAMME

From January 1993 to August 2019: 365 Lung Transplants

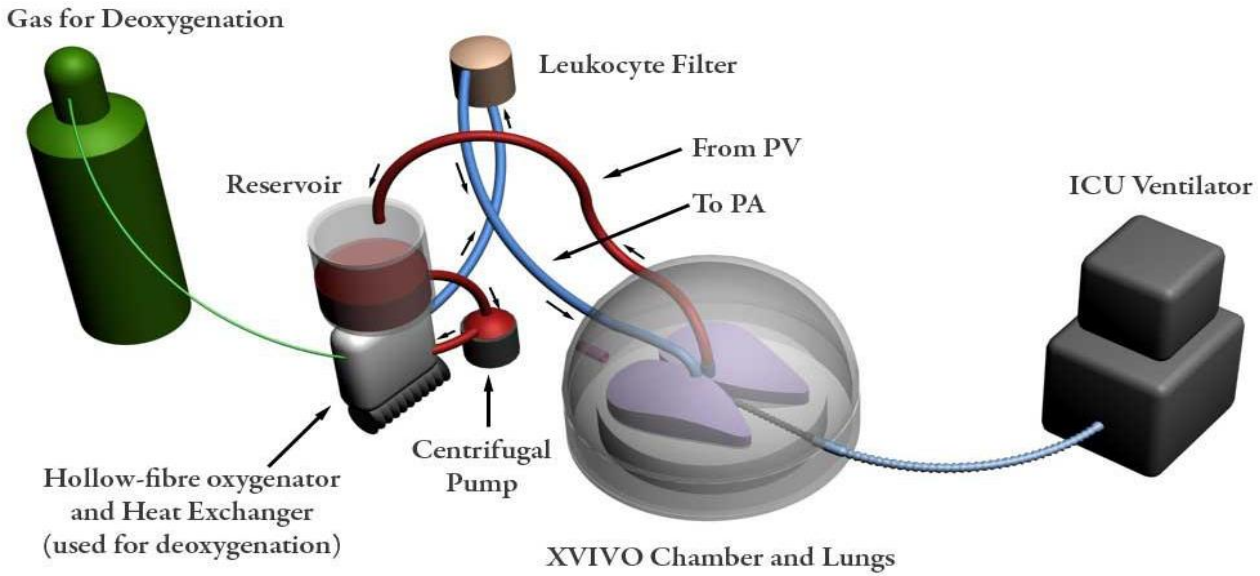


The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

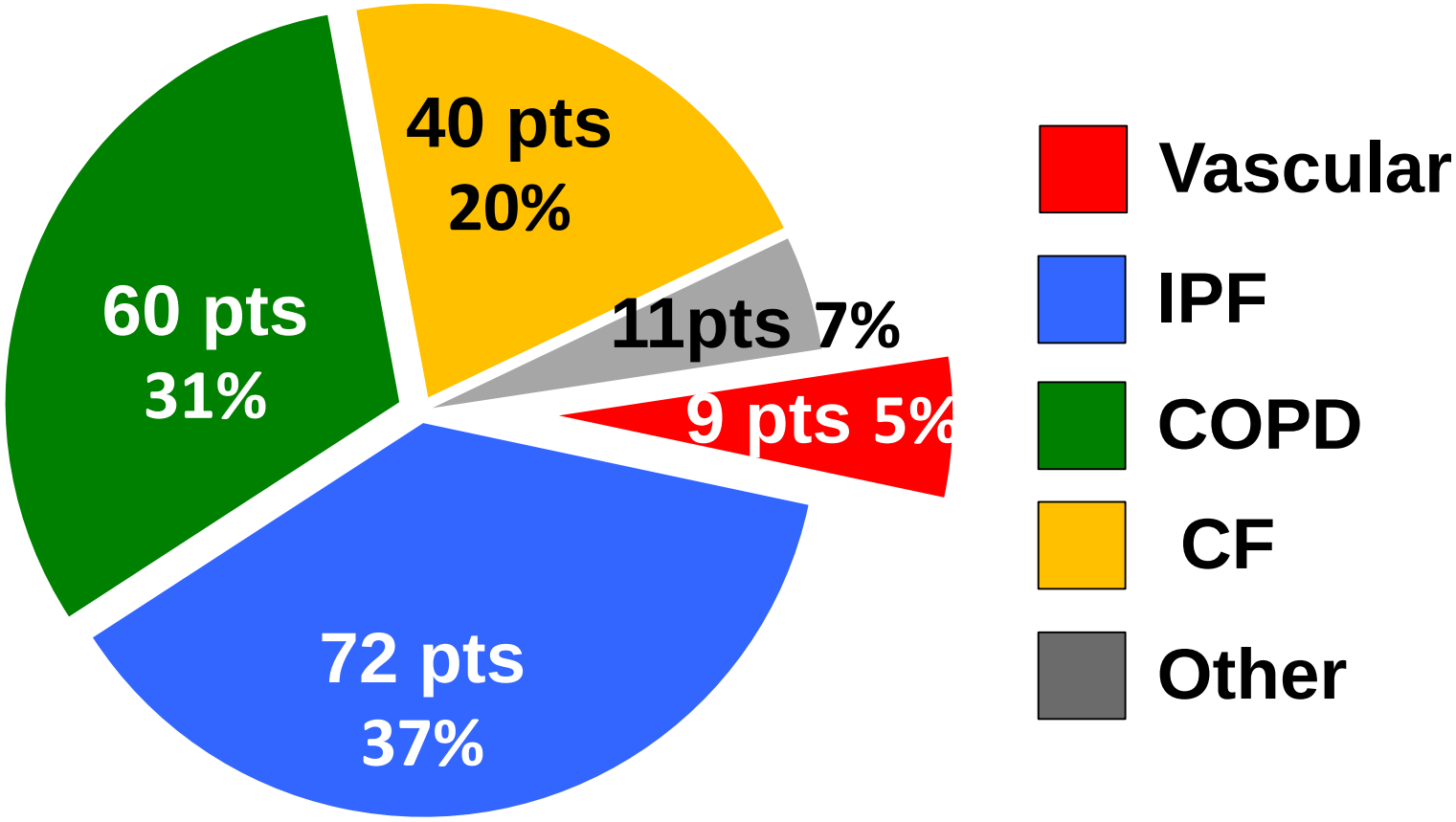
Normothermic Ex Vivo Lung Perfusion in Clinical Lung Transplantation

Marcelo Cypel, M.D., Jonathan C. Yeung, M.D., Mingyao Liu, M.D., Masaki Anraku, M.D., Fengshi Chen, M.D., Ph.D., Wojtek Karolak, M.D., Masaaki Sato, M.D., Ph.D., Jane Laratta, R.N., Sassan Azad, C.R.A., Mindy Madonik, C.C.P., Chung-Wai Chow, M.D., Cecilia Chaparro, M.D., Michael Hutcheon, M.D., Lianne G. Singer, M.D., Arthur S. Slutsky, M.D., Kazuhiro Yasufuku, M.D., Ph.D., Marc de Perrot, M.D., Andrew F. Pierre, M.D., Thomas K. Waddell, M.D., Ph.D., and Shaf Keshavjee, M.D.



TURIN LUNG TRANSPLANT PROGRAMME

From January 2008 to June 2018: 195 Lung Transplants



TURIN LUNG TRANSPLANT PROGRAMME

From January 2008 to June 2018: 195 Lung Transplants

Age at transplant	49 ± 15 (11-69) years
Male sex	123 (62%) pts
Waiting time on the waiting list	256 ± 329 (1-2402) days
Mechanical ventilation before transplant	18 (9%) pts
ECMO before transplant	14 (7%) pts
Urgent LTx	23 (12%) pts
Ex vivo lung perfusion	**32 (16%) pts**
Bilateral lung transplantion	**157 (80%) pts**
Mean ischemic time	376 ± 184 (376-1380) min

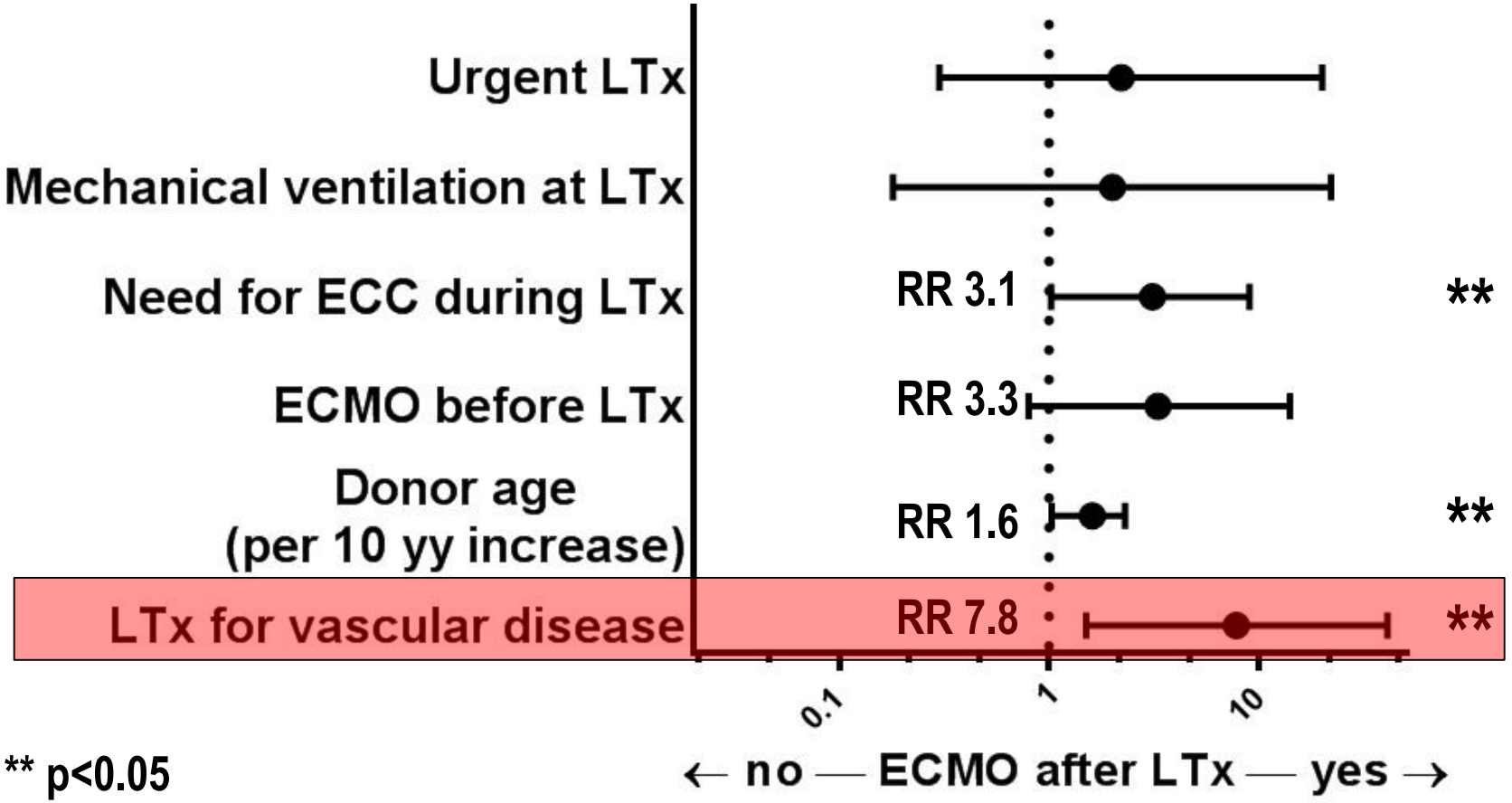
TURIN LUNG TRANSPLANT PROGRAMME

	ECMO after LTx (n=25)	No ECMO after LTx (n=170)	p value
sPAP	**51 ± 20 mmHg**	**39 ± 13 mmHg**	**< 0.01**
mPAP	**36 ± 16 mmHg**	**25 ± 9 mmHg**	**< 0.01**
Need for CPB during transplant	17 (68%) pts	43 (25%) pts	< 0.01
Mechanical ventilation before TX	6 (24%) pts	12 (7%) pts	< 0.01
ECMO before transplant	6 (24%) pts	8 (5%) pts	< 0.01
Urgent LTx	7 (28%) pts	16 (9%) pts	< 0.01
Donor age	49 ± 10 years	43 ± 14 years	< 0.01

TURIN LUNG TRANSPLANT PROGRAMME

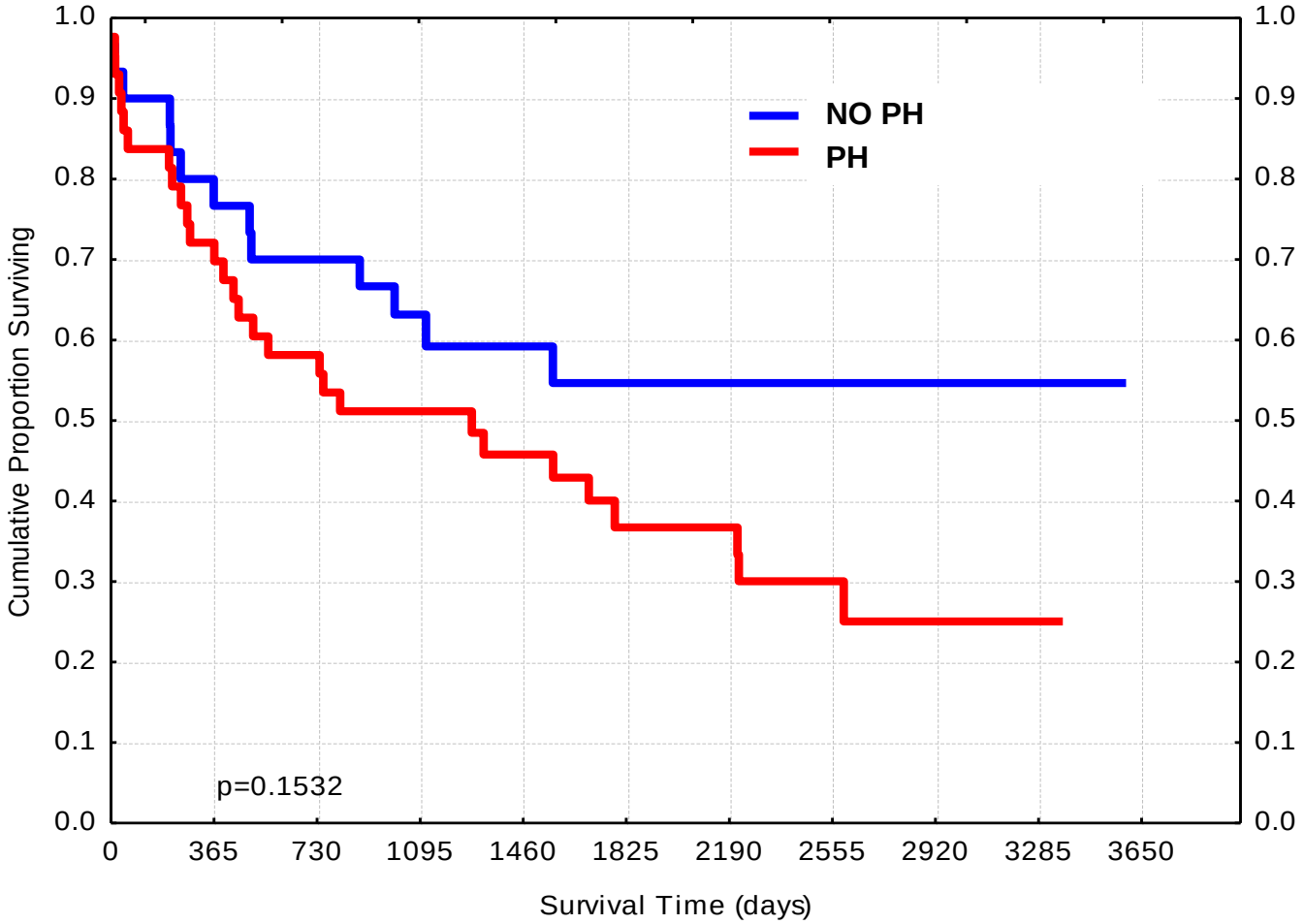
	ECMO after LTx (n=25)	No ECMO after LTx (n=170)	p
Number of transfused RBC units*	5 [IQR 2 - 11]	1 [IQR 0 - 3]	**< 0.01**
Length of ICU stay*	28 days [IQR 9 - 43.5]	6 days [IQR 3 - 15]	**< 0.01**
Length of mechanical ventilation*	8.2 days [IQR 3.0 - 24.5]	1 day [IQR 0.8 -3]	**< 0.01**
In-hospital mortality	11 (44%)	13 (7.6%)	**< 0.01**

TURIN LUNG TRANSPLANT PROGRAMME



** p<0.05

LONG TERM SURVIVAL OF LUNG TRANSPLANTED PTS WITH OR WITHOUT PH



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