



University of *Ljubljana*  
Faculty of *Medicine*

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TOMAŽ ŠTUPNIK

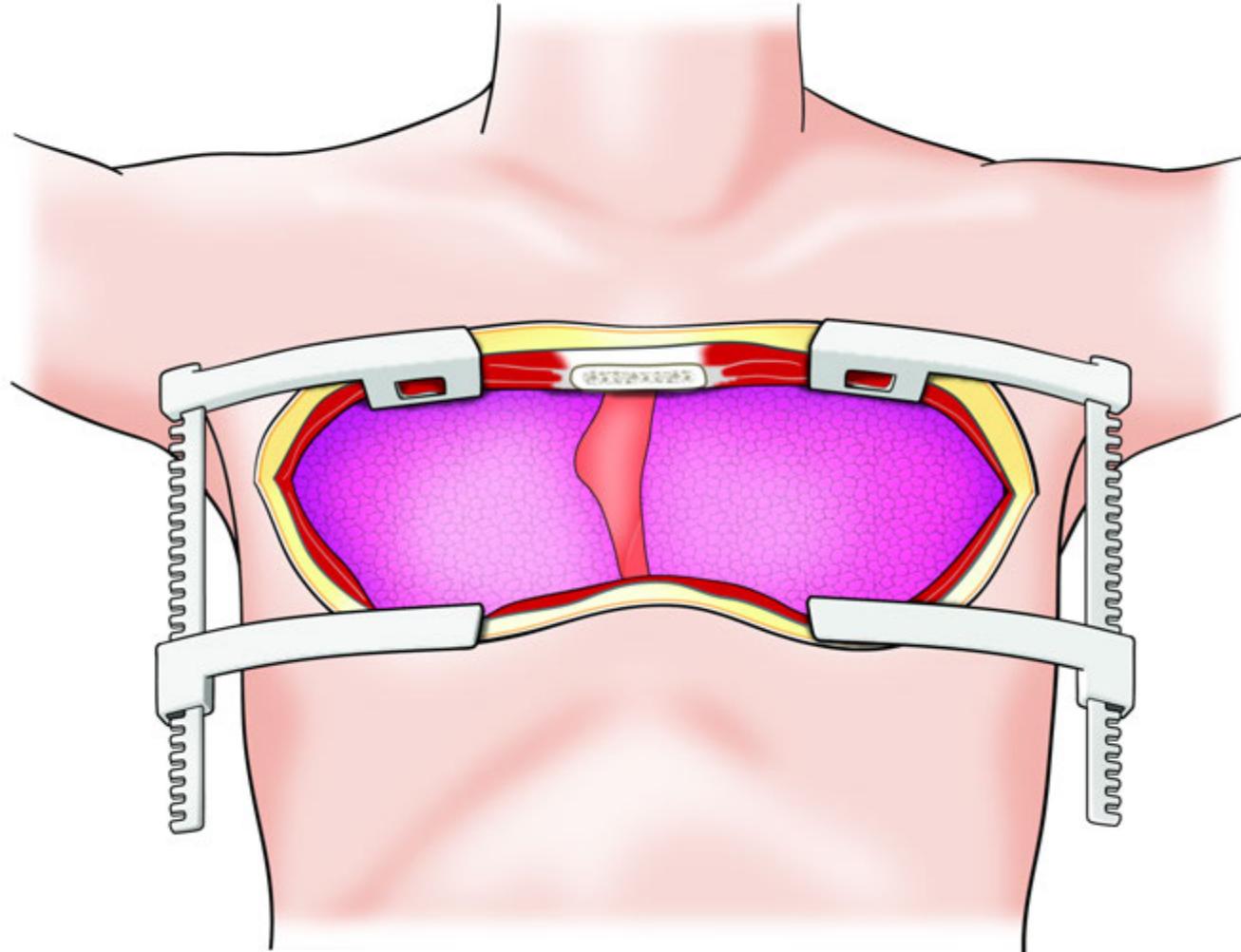
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# Kirurgija presaditve pljuč

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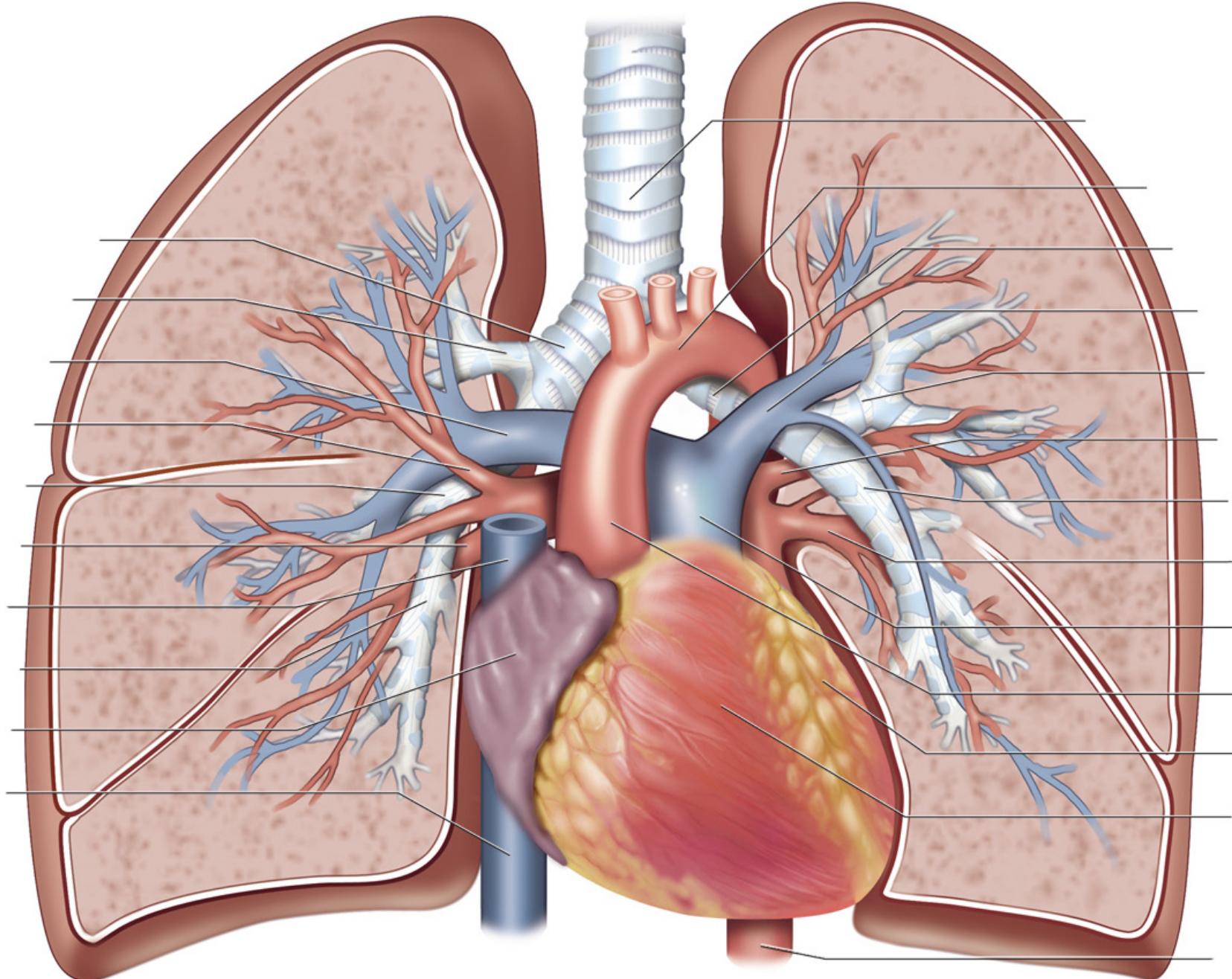
— 12. evropski teden osveščenosti o cistični fibrozi, 2020 —

# Clamshell torakotomija



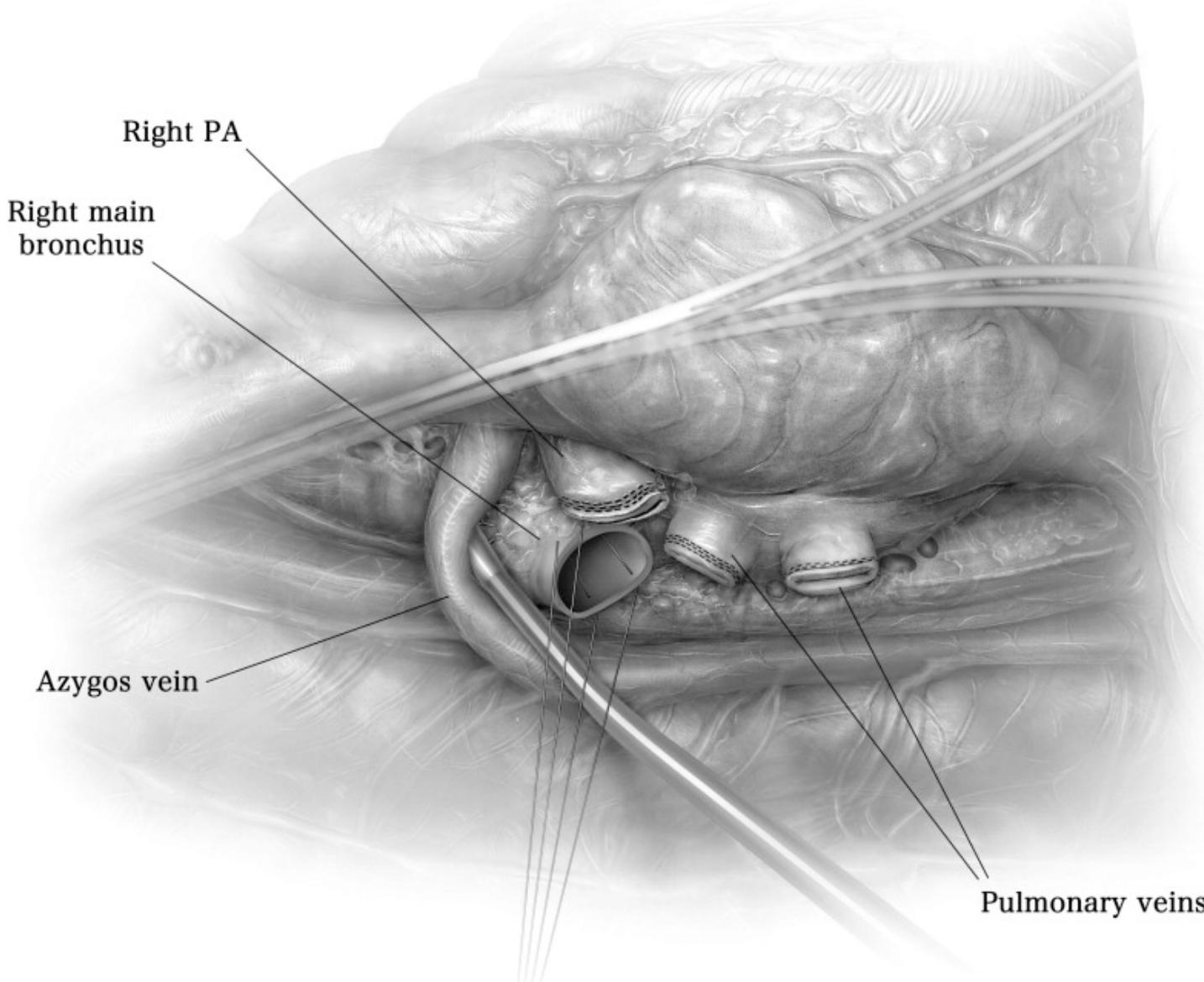
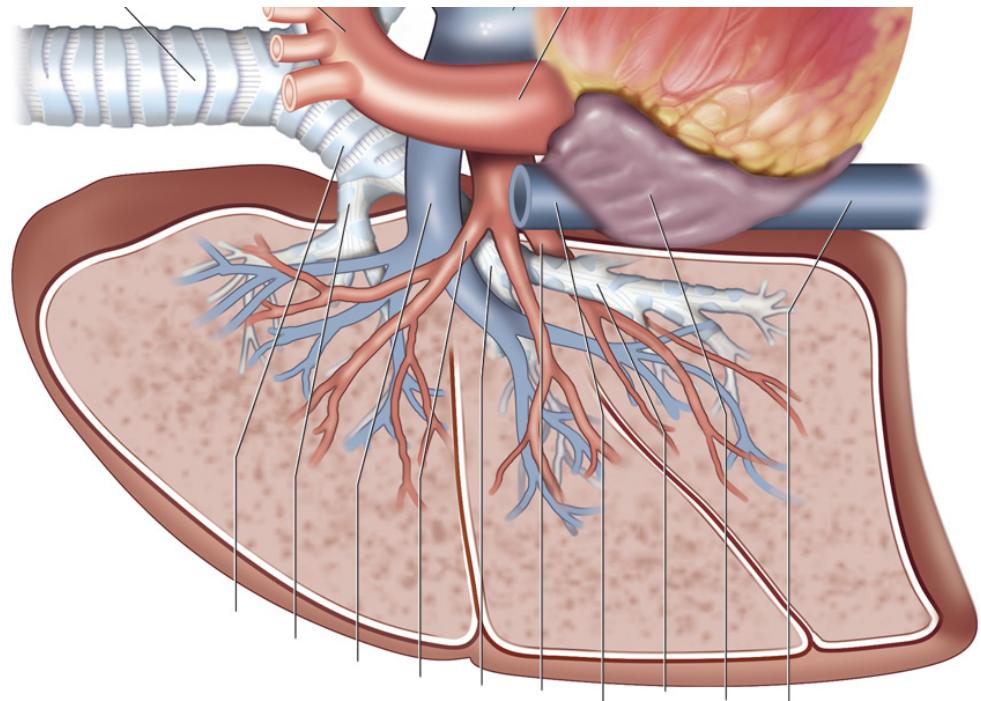
# Anatomija pljuč

- Bronhij
- Arterija
- Vena



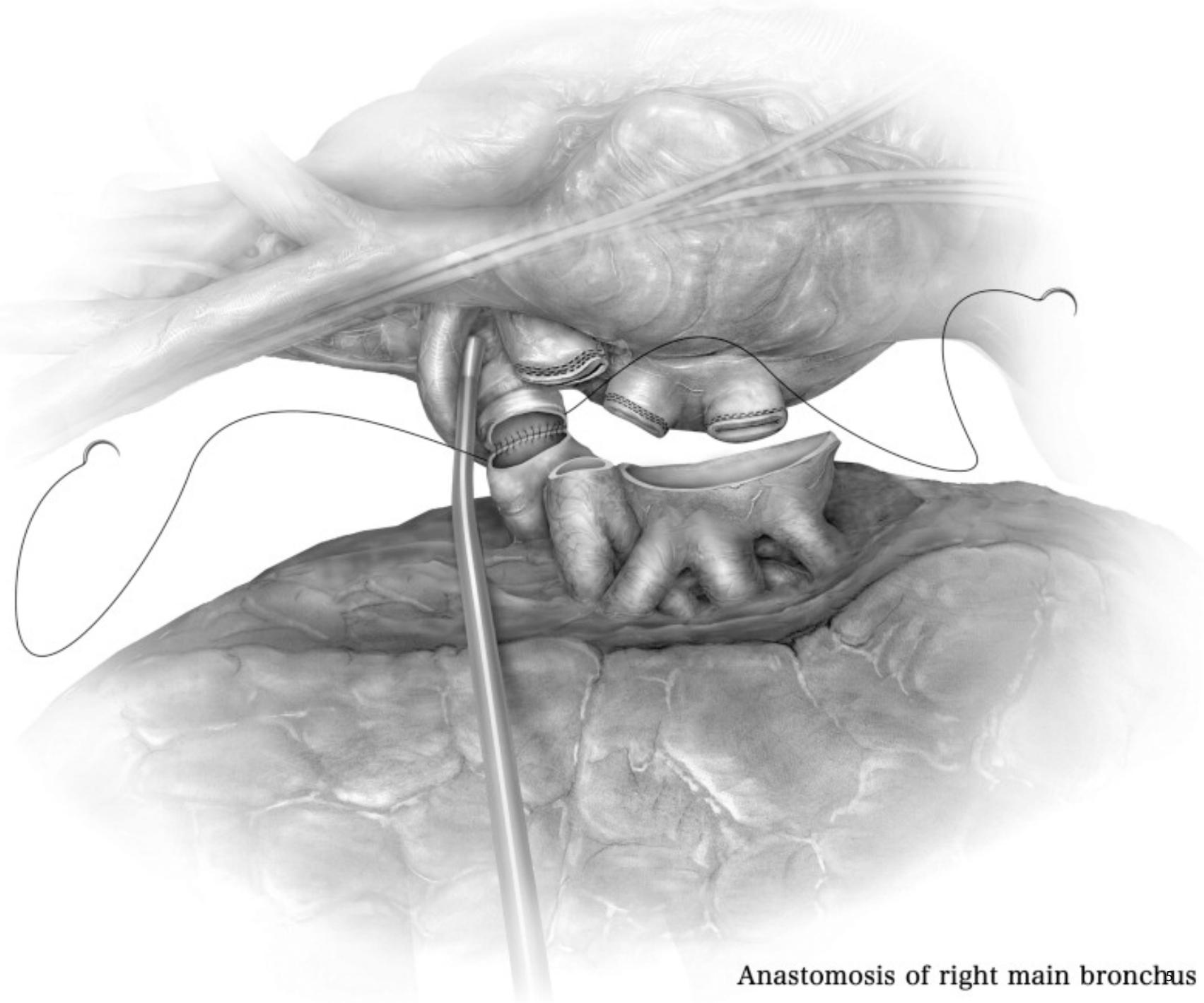
# Presaditev pljuč

- Odstranitev pljuč



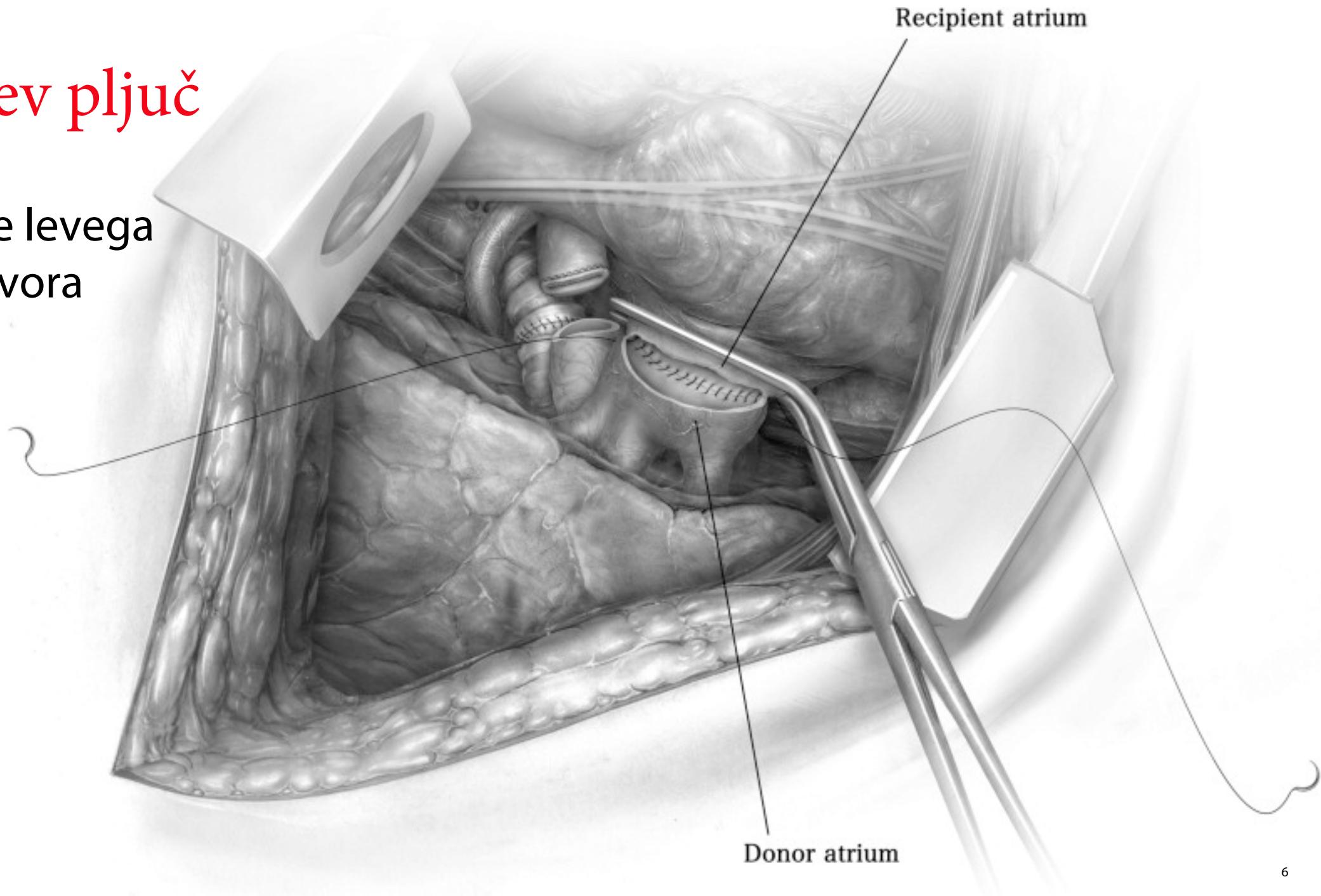
# Presaditev pljuč

- šivanje  
glavne sapnice



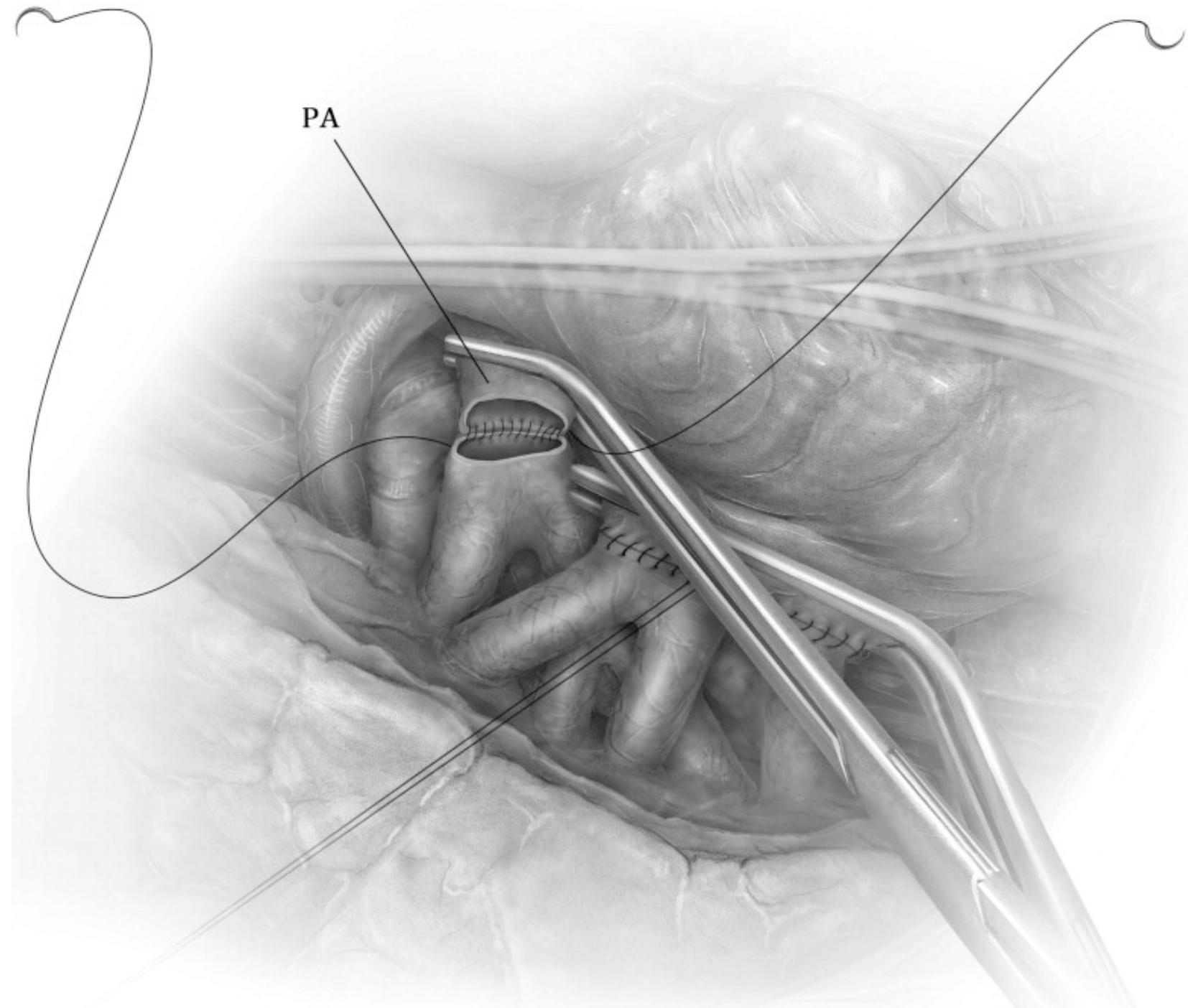
# Presaditev pljuč

- šivanje levega preddvora



# Presaditev pljuč

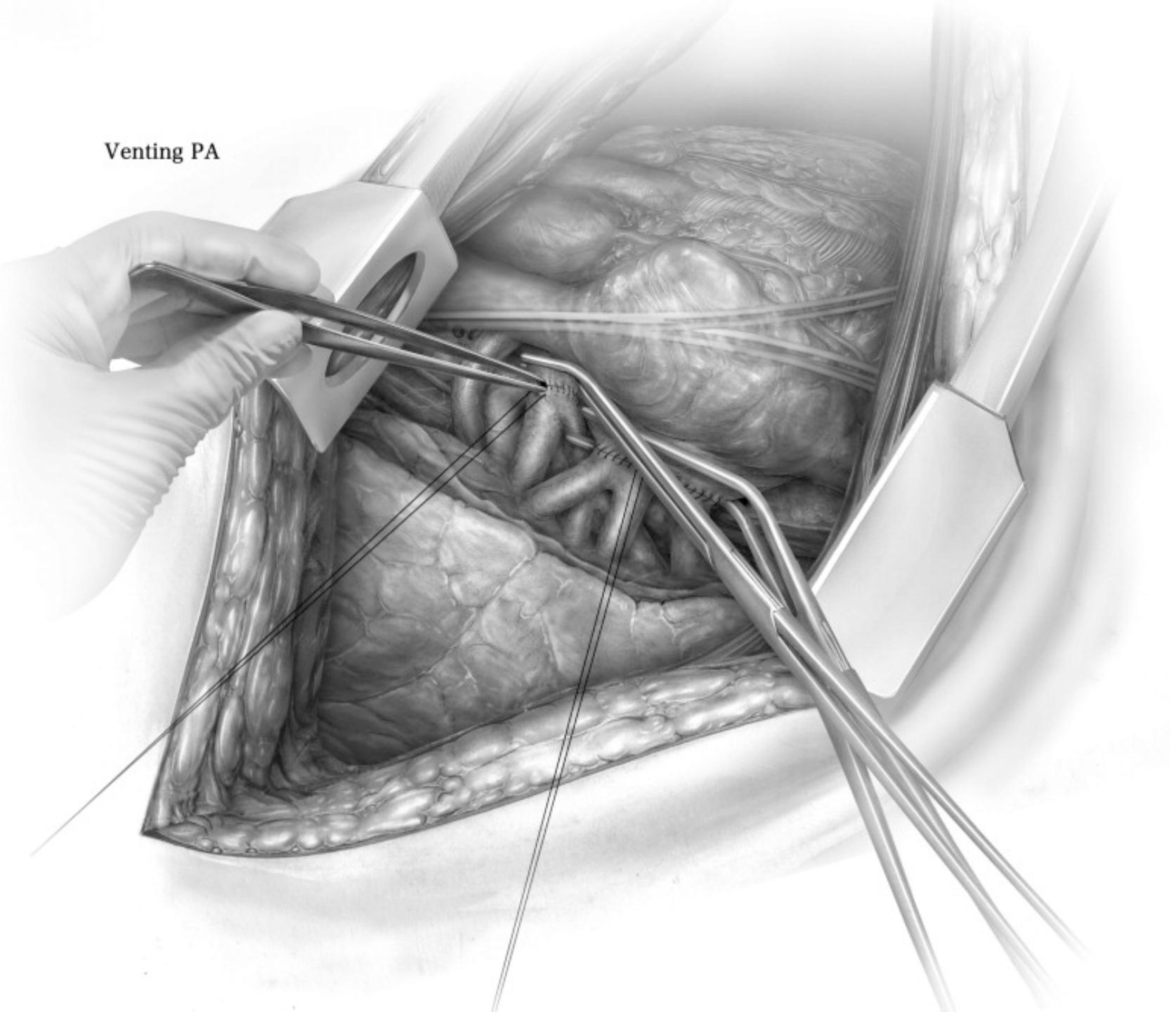
- šivanje  
pljučne arterije



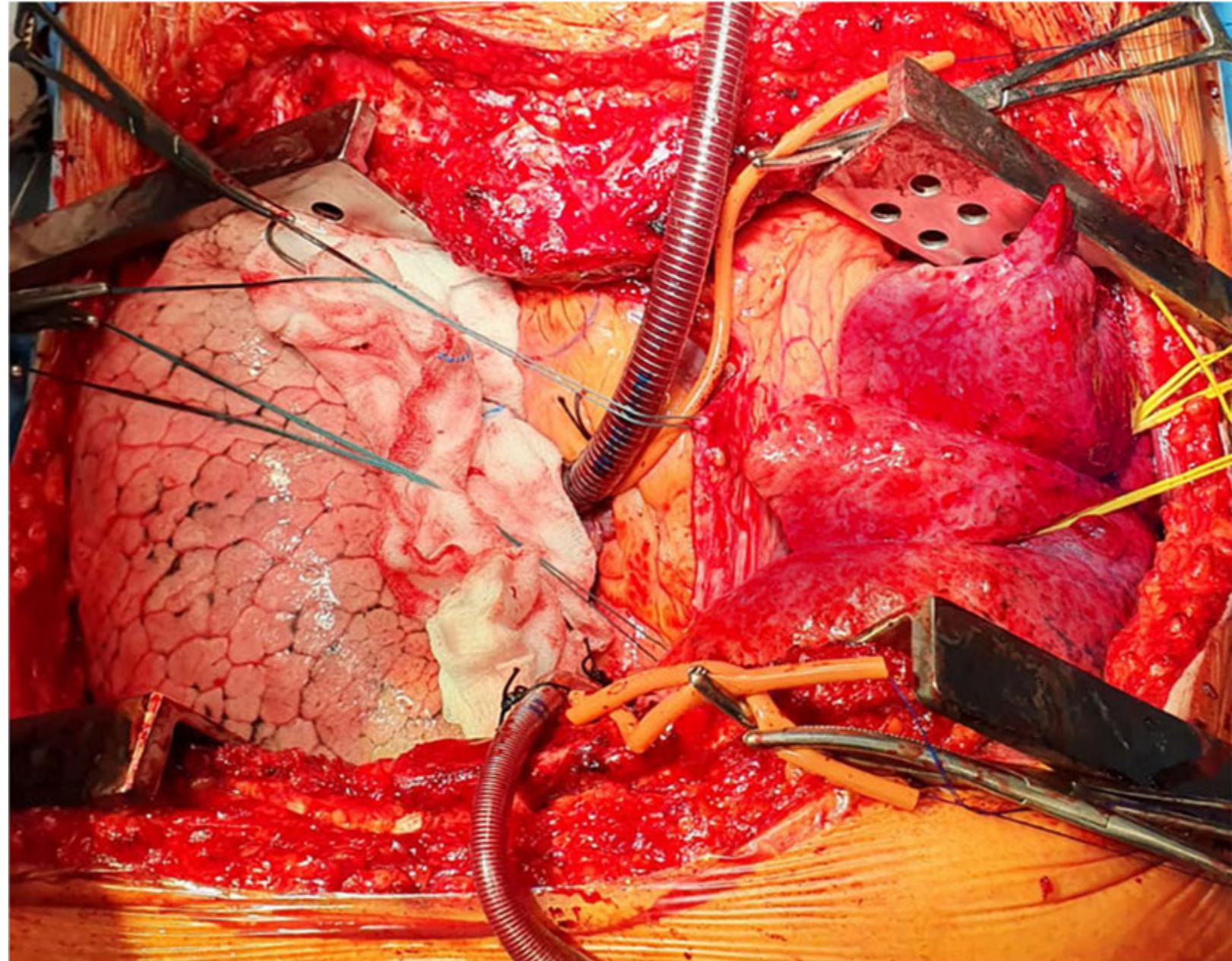
# Presaditev pljuč

Venting PA

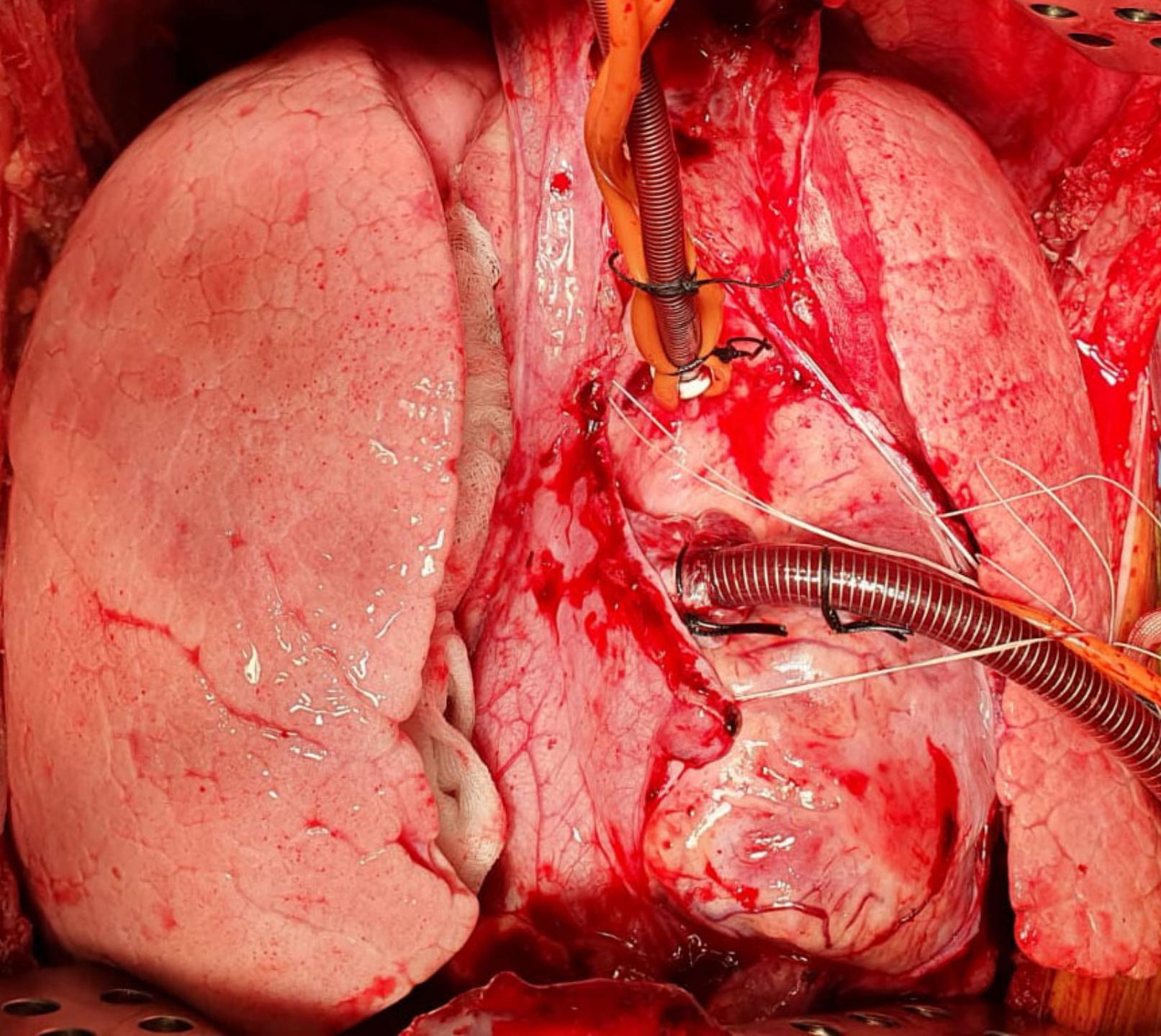
- reperfuzija



# Presaditev pljuč

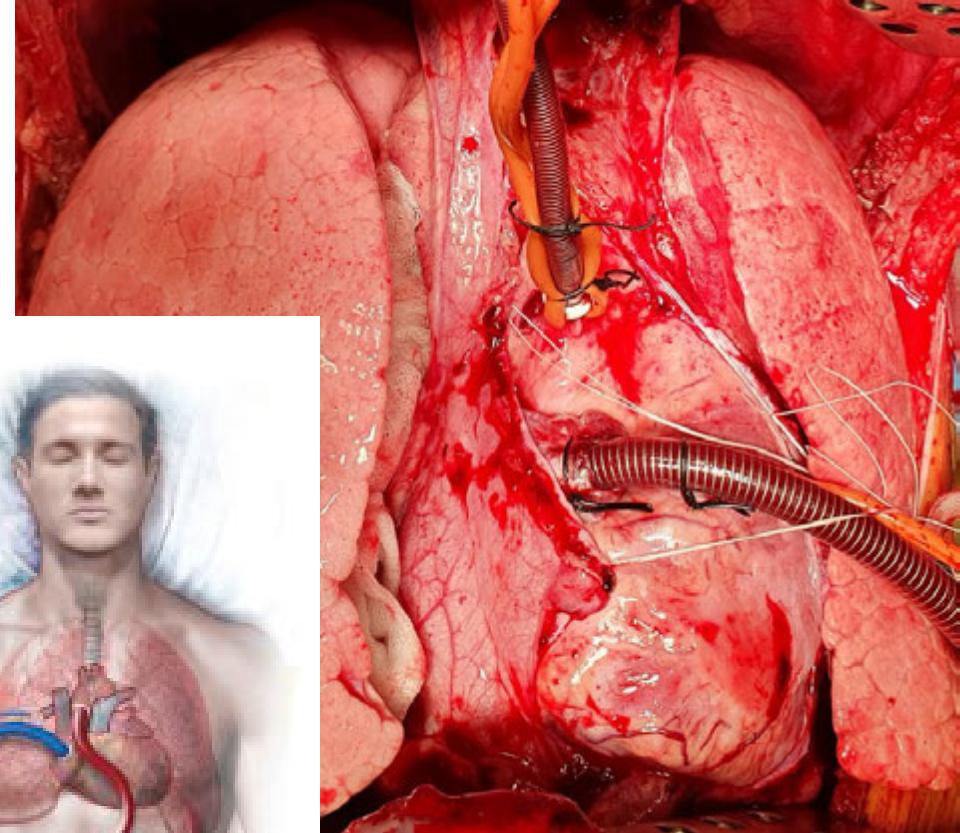
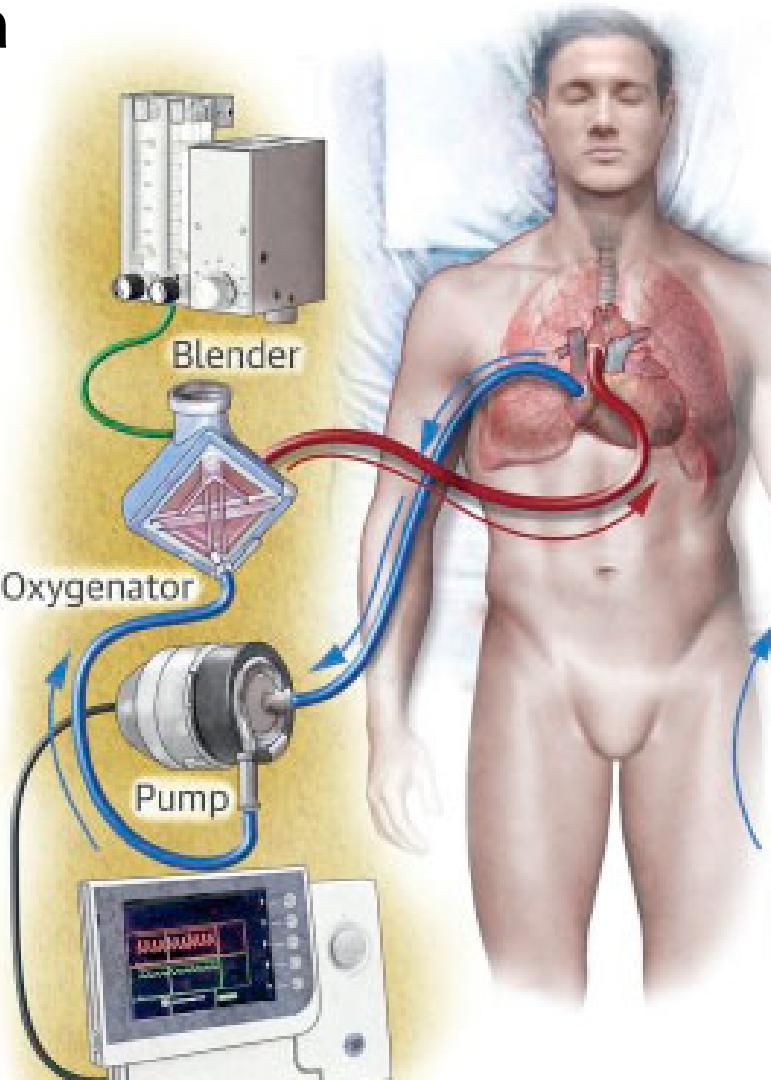


# Presaditev pljuč



# ECMO

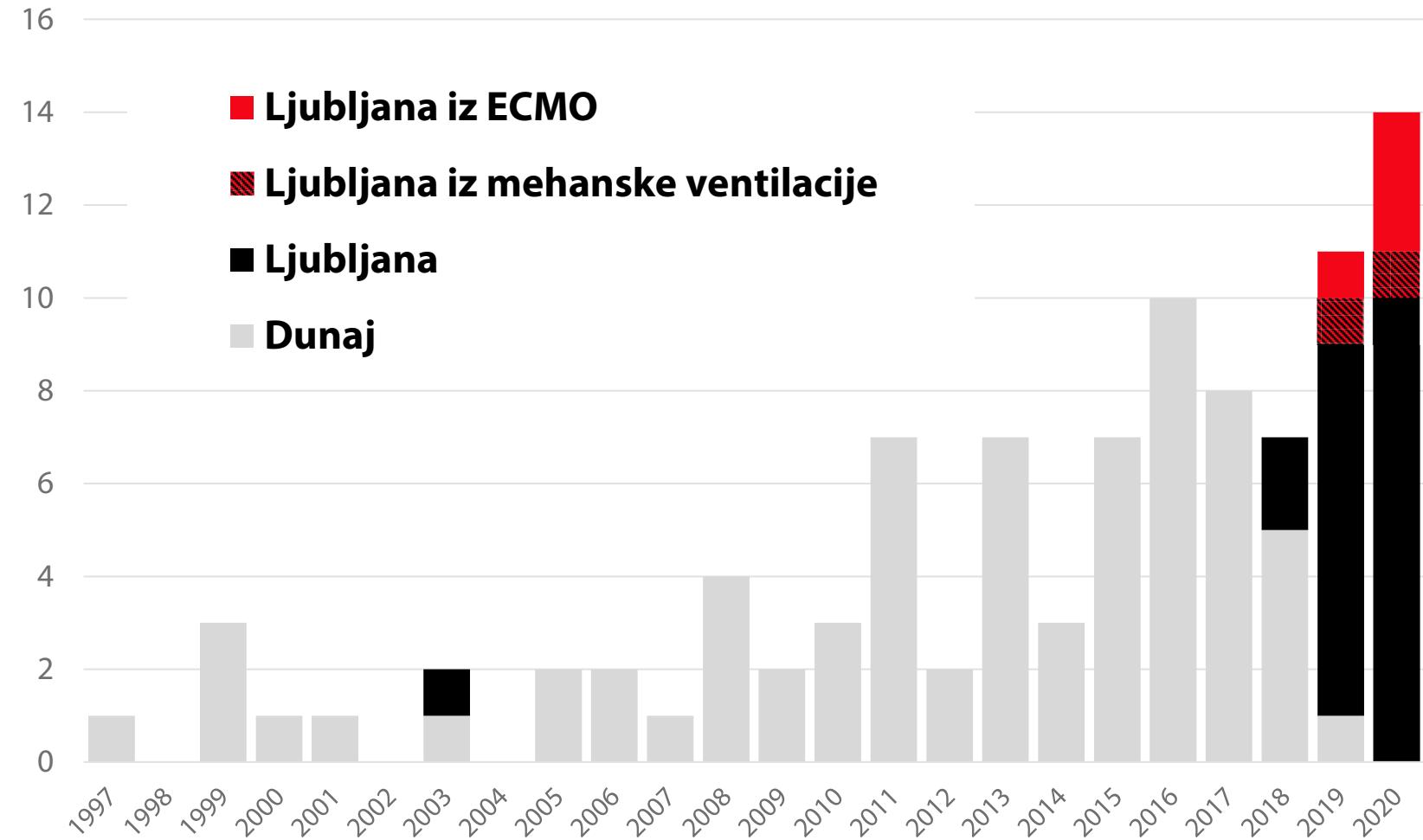
## Zunajtelesna membranska oksigenacija



# Presaditve pljuč v Sloveniji

## Čakalna lista

- 5 bolnikov



# Čakalna lista

Recipient Data		LAS Score																																																																																									
Height(cm)	<input type="text"/> ⓘ	Calculated LAS Score:	39.5366																																																																																								
Weight(kg)	<input type="text"/> ⓘ	Please note that:																																																																																									
BMI	<input type="text"/>	- If request is High LAS request (>=50) or																																																																																									
Age	<input type="text"/>	- If request is selected for random auditing,																																																																																									
Combined organ transplant	No <input type="checkbox"/> ⓘ	LAS Score will not be used for matching until approved																																																																																									
<b>Diagnosis</b>																																																																																											
* Diagnosis	Cystic fibrosis <input type="checkbox"/> ⓘ	<b>Pulmonary Artery Catheter</b>																																																																																									
<b>Co-Morbidity</b>																																																																																											
Haemoptysis with embolisation	No <input type="checkbox"/> ⓘ	PAPs (mmHg)	N/A <input checked="" type="checkbox"/> ⓘ																																																																																								
Pneumothorax with drainage	No <input type="checkbox"/> ⓘ	PAPd (mmHg)	N/A <input checked="" type="checkbox"/> ⓘ																																																																																								
Pulmonary Infection (IV antibiotic or antifungal therapy)	Yes <input type="checkbox"/> ⓘ	Calculated PAPm (mmHg)																																																																																									
<b>Diabetes</b>																																																																																											
Diabetes	No diabetes <input type="checkbox"/> ⓘ	PAPm (mmHg)	N/A <input checked="" type="checkbox"/> ⓘ																																																																																								
<b>Supplemental Oxygen</b>																																																																																											
Supplemental oxygen	At rest <input type="checkbox"/> ⓘ	Cardiac Index (CI) (l/min/m <sup>2</sup> )	N/A <input checked="" type="checkbox"/> ⓘ																																																																																								
Oxygen requirement at rest	5 unit Oxygen (l/min) <input type="text"/> ⓘ	PCWP(mmHg)	N/A <input checked="" type="checkbox"/> ⓘ																																																																																								
<b>Arterial PCO<sub>2</sub></b>																																																																																											
Current pCO <sub>2</sub>	N/A <input type="checkbox"/>	CVP (mmHg)	N/A <input checked="" type="checkbox"/> ⓘ																																																																																								
Current pCO <sub>2</sub>	7.95 unit kPa <input type="text"/> ⓘ	Medication																																																																																									
Highest/Lowest pCO <sub>2</sub>	N/A <input checked="" type="checkbox"/> ⓘ	<b>Laboratory Values</b>				Lowest pCO <sub>2</sub>	unit <input type="text"/> ⓘ	Current Creatinine	12 unit µmol/l N/A <input type="checkbox"/> ⓘ	Highest pCO <sub>2</sub>	unit <input type="text"/> ⓘ	Highest Creatinine	unit N/A <input checked="" type="checkbox"/> ⓘ	<b>Oxygen Pressure</b>				Oxygen Pressure	N/A <input type="checkbox"/>	Lowest Creatinine	unit N/A <input checked="" type="checkbox"/> ⓘ	Oxygen partial pressure (paO <sub>2</sub> )	8.2 unit kPa <input type="text"/> ⓘ	Platelets per 10 <sup>9</sup> /L	478 N/A <input type="checkbox"/> ⓘ	<b>Bicarbonate And PH</b>				Standard bicarbonate (HCO <sub>3</sub> )	42.1 unit mmol/l N/A <input type="checkbox"/> ⓘ	INR	1.18 N/A <input type="checkbox"/> ⓘ	pH	7.46 N/A <input type="checkbox"/> ⓘ	Current Bilirubine	3 unit µmol/l N/A <input type="checkbox"/> ⓘ	<b>Assisted Ventilation And Extracorporeal Support</b>				Assisted Ventilation	Non-invasive CPAP <input type="checkbox"/> ⓘ	Highest Bilirubine	unit N/A <input checked="" type="checkbox"/> ⓘ	Date of intubation	<input type="checkbox"/> ⓘ	Lowest Bilirubine	unit N/A <input checked="" type="checkbox"/> ⓘ	Extracorporeal support	not needed <input type="checkbox"/> ⓘ	CRP	107 unit N/A <input type="checkbox"/> ⓘ	Date start extracorporeal support	<input type="checkbox"/> ⓘ	<b>Level Of Assistance With Daily Activities</b>				Assistance Level	Some assistance <input type="checkbox"/> ⓘ	<b>Additional Pathologies/ Complications</b>				Clinical Frailty Scale (Rockwood)	5 <input type="checkbox"/> ⓘ	Current ICU admission	No <input type="checkbox"/> ⓘ	Current intermediate care admission	No <input type="checkbox"/> ⓘ	Exacerbations	Yes <input type="checkbox"/> ⓘ	Renal replacement therapy	No <input type="checkbox"/> ⓘ	<b>Mandatory Data (Attach Copy Of Original Report)</b>				Epicrisis	Yes <input type="checkbox"/> ⓘ	Arterial Blood Gases	Yes <input type="checkbox"/> ⓘ	Pulmonary Function Test	Yes <input type="checkbox"/> ⓘ	6-Minutes Walk Test	No <input type="checkbox"/> ⓘ	Right Heart Catheter Data	No <input type="checkbox"/> ⓘ	Lab Sheet	Yes <input type="checkbox"/> ⓘ
<b>Laboratory Values</b>																																																																																											
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# LAS

## LAS Score

Calculated LAS Score:

39.5366

Please note that:

- stopnja pljučne bolezni
- pridružene bolezni
- verjetnost, da bo presaditev uspela
- **High LAS  $\geq 50$**
- **Exceptional LAS (99)**



L AP LEZE

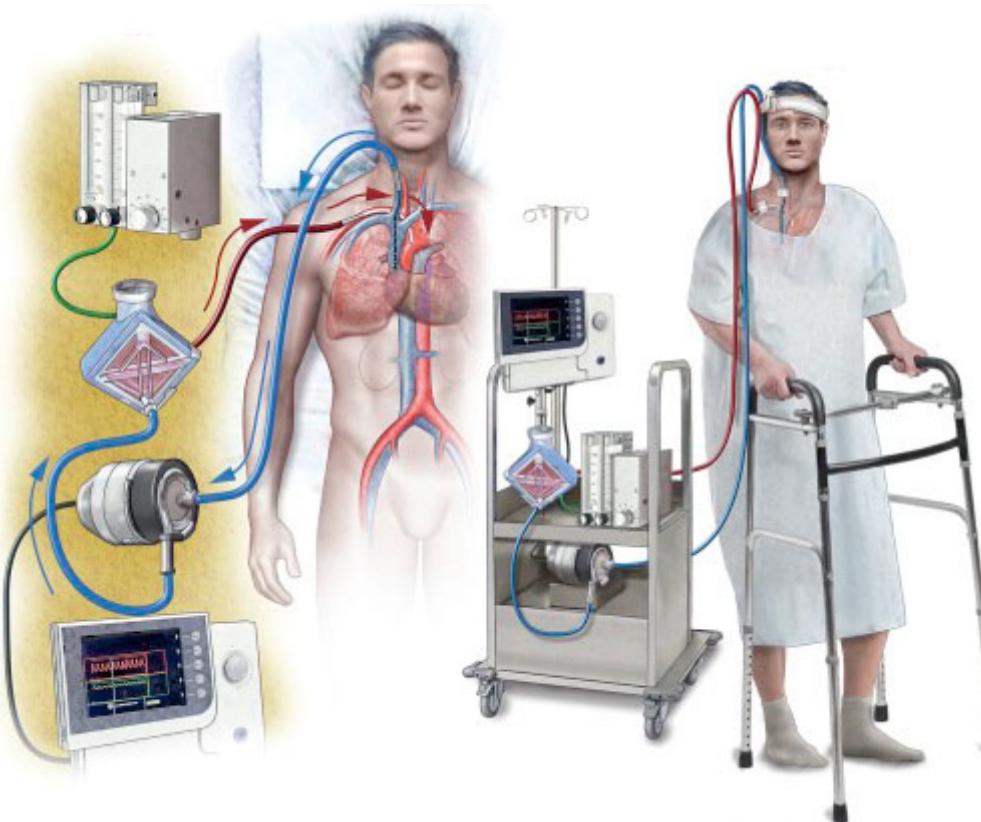
# Nujna presaditev pljuč

## Mehanska ventilacija



# Nujna presaditev pljuč

## Zunajtelesna oksigenacija



# Čakanje na organ

## Eurotransplant

- 137 milijonov prebivalcev
- Nizozemska, Nemčija, Avstриja, Belgija, Luksemburg, Hrvaška, Madžarska, Slovenija



**Eurotransplant**

## Računalniški algoritem za razporejanje pljuč



# Darovanje organov

- po predhodnjem soglasju z darovalcem
- izjava o darovanju
- soglasje svojcev

**BE READY TO SAVE LIVES, BECOME A SUPERHERO!**



**EUROPE LACKS ORGANS, TISSUES AND CELLS FOR TRANSPLANTATION**



In Europe, nearly **6 new patients are added to a waiting list every hour** and **18 die every day** waiting for a transplant.



**MORE DONORS = MORE HOPE**



One single donor can save **8 lives through organ donation** and save/improve up to **100 lives through tissue donation**.



**HELP THE THOUSANDS OF PATIENTS ON WAITING LISTS!**



**WHEN IT COMES TO ORGAN DONATION, AGE TRULY DOESN'T MATTER.**

When a potential donor dies, his or her organs and/or tissues are evaluated to determine their suitability for donation. People in their 80s and 90s have successfully donated organs, such as their liver and kidneys, to save the lives of others.

**SAY YES TO LIVING DONATION!**



You can also consider **HELPING OTHERS WHILE YOU ARE ALIVE** by registering to donate your **stem cells**, found in your **bone marrow** or **peripheral blood**, which can be used for the treatment of **blood disorders and immune diseases**. Or after your baby is born, you can donate the **umbilical cord blood** (which is also rich in stem cells) and/or the **placenta**. You may also consider helping others to fulfil their dream of becoming parents by donating your **oocytes** (women) or **sperm** (men).

**SAY YES TO ORGAN, TISSUE AND CELL DONATION!**



# Lung offer

## Koordinator transplantacij

- ključni sodelavec v procesu darovanja in presaditve organov
- organizacija ekip in transporta
- časovno usklajujejo postopke in vpletene ekipe



## Donor Report for 17

### General data

Registration date	ET Donor nr	Center	ABO Rh	Cadaver type	Age	Sex	Weight	Height	BMI	TLC
	17	AWGTP	A Pos	Heartbeating	61	M	80	180	25	7.3
Bloodgroup remarks										
NHB Category										

# Idealen darovalec pljuč

- Starost 20 – 45 let
- Nekadilec
- Odlična funkcija pljuč
- Čas hladne ishemije < 8 ur



# Ponudba pljuč

1. Velikost

2. Kakovost

3. Starost darovalca

4. Drugi zadržki

- Hepatitis
- Maligni tumorji ...

**< 60% uporabnih pljuč**

## Donor Report for 17

### General data

Registration date	ET Donor nr	Center	NBO	Bh	Cadaver type	Age	Sex	Weight	Height	BMI	TLC
	17	AWGTP	A Pos		Heartbeating	61	M	80	180	25	7.3
Bloodgroup remarks											
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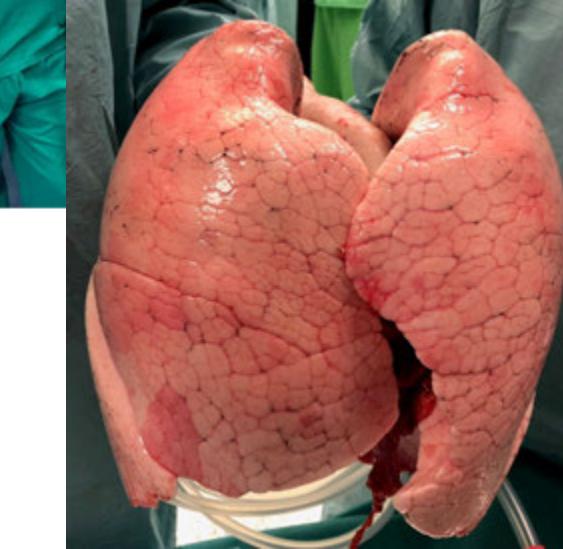
### Bloodgas & Ventilation

	Unit (Normal values)		
FiO2	100	40	% (20 - 100)
Peak pressure			cm H2O (0 - 50)
PEEP			cm H2O (0 - 10)
Ventilation frequency			min (0 - 30)
pH	7.42	7.42	(7.2 - 7.6)
PaO2	385	103	mm HG (40 - 650)
PaCO2	47	42.9	mm HG (0 - 60)
HCO3- (Bicarbonate)	26.6	27.1	mmol / l (22 - 28)
Base Excess	2.5	3.2	mmol / l (-3 - 3)
O2 Saturation	99.5	97.3	% (70 - 100)
pH at 100% O2			(7.2 - 7.6)
PaO2 at 100% O2			mm HG (40 - 650)
PaCO2 at 100% O2			mm HG (0 - 60)
HCO3- (Bicarbonate) at 100% O2			mmol / l (22 - 28)
Base Excess at 100% O2			mmol / l (-3 - 3)
O2 Saturation at 100% O2			% (70 - 100)



# Odvzem pljuč

- Izvidi: RTG, CT, Bronhoskopija
- izpiranje pljuč z ohranitveno raztopino
- odvzem napihnjenih pljuč
- Priprava na transport
  - Vreče z ohranitveno tekočino
  - Hladilne torbe z ledom



# Priprava v operacijski dvorani

1. v sapnik tubus za ločeno predihavanje levih in desnih pljuč
2. na vratu vstavi centralni venski kateter + kateter za merjenje tlaka v pljučni arteriji
3. na roki kanila za merjenje krvnega tlaka v arteriji + dodatna venska kanila
4. v požiralniku sonda za ultrazvok srca
5. urinski kateter...



# Presaditev pljuč

- 17:00 klic
- 20:00 odhod ekipe za odvzem
- 00:30 pljuča O.K.  
bolnik v operacijski  
začetek operacije
- 02:30 prihod pljuč
- 04:00 reperfuzija desnih pljuč
- 05:30 reperfuzija levih pljuč
- 07:00 bolnik v CIT

Donor v Turnhoutu (BEL): 66  
let/f/0 poz/173 cm/70 kg/  
mozganska krvavitev/TLCp  
5.63/FiO<sub>2</sub> 100%: pO<sub>2</sub> 323,  
pCO<sub>2</sub> 39/CMV IgG ?

Prejemnik: /CF/39 let/  
0 neg/161 cm/55 kg/TLCp  
5.6/TLCr 5.7/CMV IgG poz

Ekspl: Greif/Zavrl/Jasovic  
Impl: Stupnik

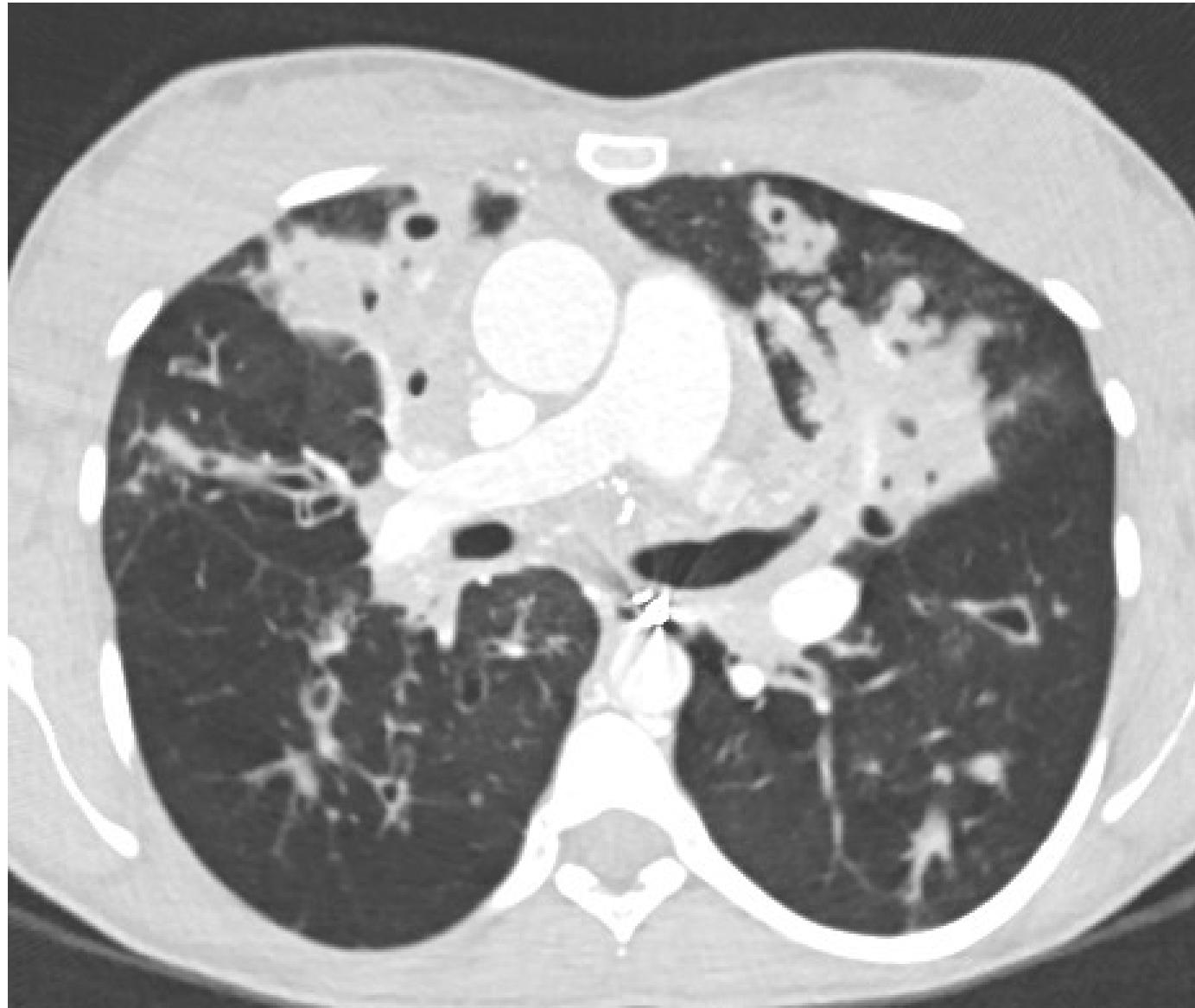
Odhod: 20:15  
Rez koze: 22:00  
OK: 00:30  
Povratek: 03:45



# Presaditev pri bolnikih s cistično fibrozo

- Kronično vnetje
  - Prirastline med pljuči in prsno steno
  - Povečane bezgavke v medpljučju
  - Razširjene bronhialne arterije

**Večja možnost krvavitve**



# Okrevanje po presaditvi pljuč

## Center za intenzivno terapijo

- 1. nadstropje UKCL
- Nekaj dni do nekaj tednov...
- Samostojno dihanje  
čimprej – prvi dan po presaditvi?
- Mobilizacija
  - ∞ cevk za infuzijo, urin drenažo...



# Okrevanje po presaditvi pljuč

## Oddelek za torakalno kirurgijo

- 3. nadstopje UKCL
- nekaj dni do nekaj tednov



# Okrevanje po presaditvi pljuč

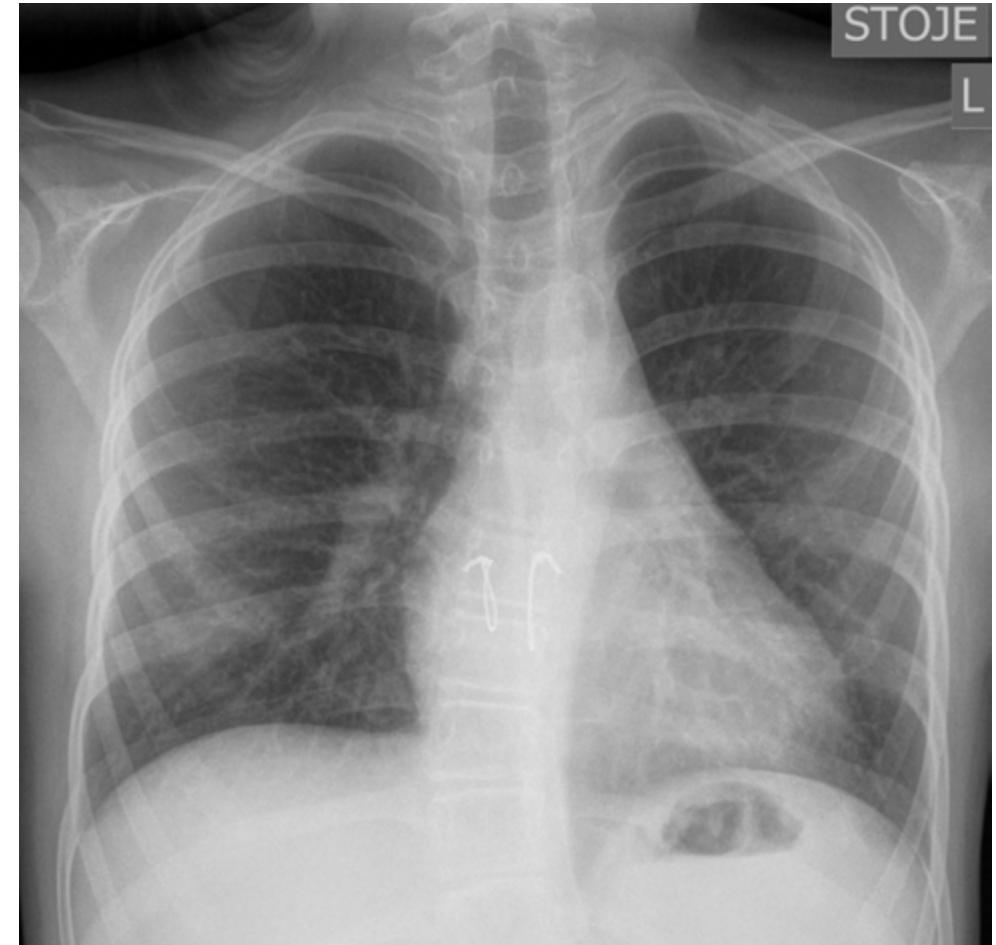
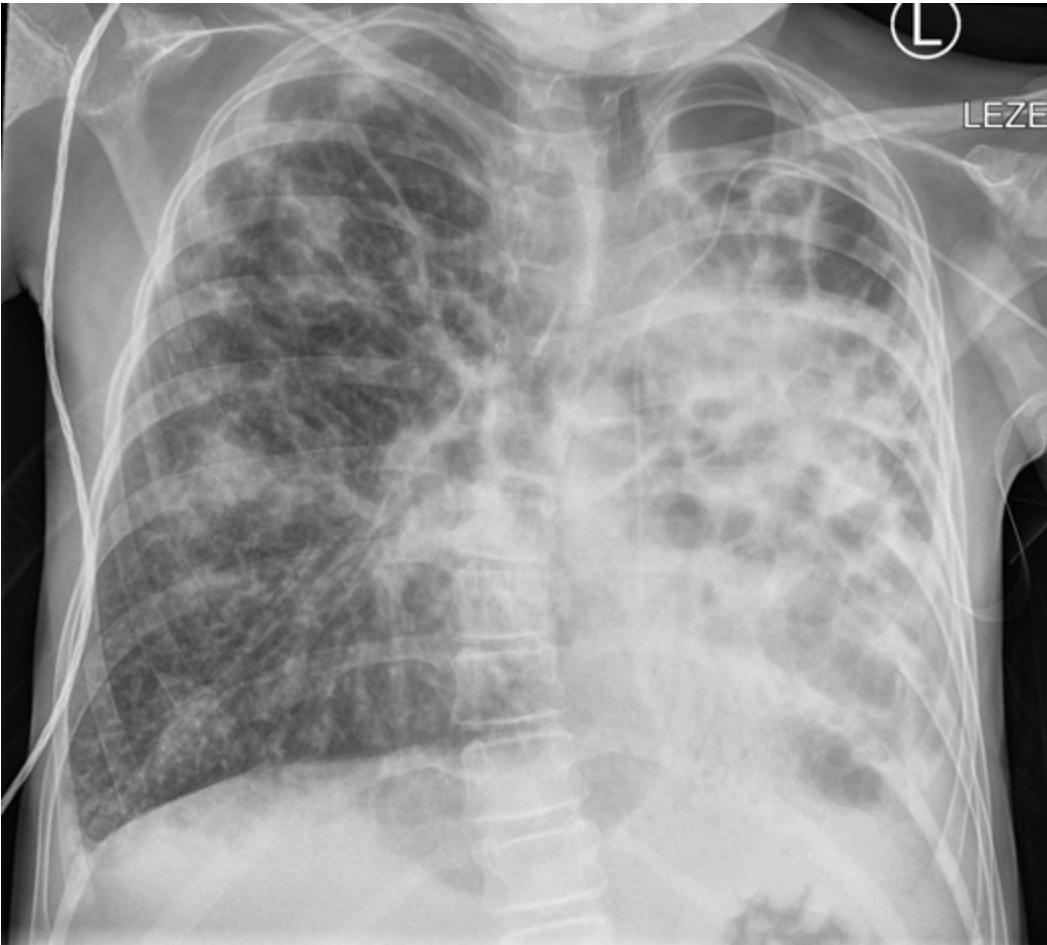
## Pulmološki oddelek

- 6. nadstopje UKCL
- do odpusta iz bolnišnice  
nekaj tednov do nekaj mesecov  
po presaditvi

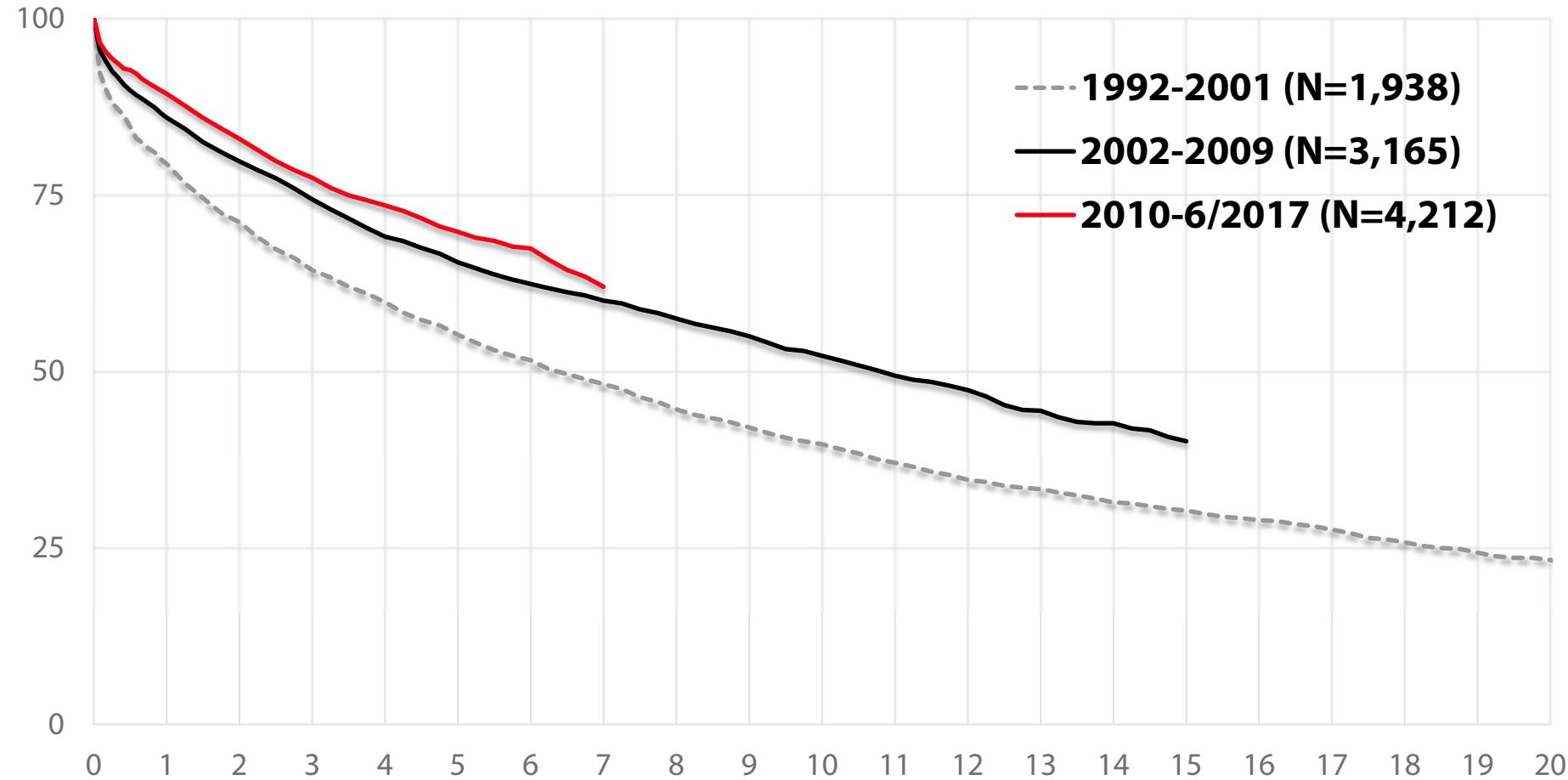
Zapleti?!



# Presaditev pri bolnikih s cistično fibrozo



# Preživetje po obdobjih (CF, obojestranska presaditev)



# Preživetje po presaditvi pljuč v UKC Ljubljana

