

# **Cases of Percutaneous Treatment for Pulmonary Hypertension**

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# Case 1

- 51 yr / M

- **Chief Complaints**

Dyspnea on exertion (onset: 3 years ago)

- **Present Illness**

Previous healthy

WHO functional class III

Cough / Sputum (+/+; minimal)

Edema / Orthopnea (-/-)

- **Past Medical History**

Pulmonary tuberculosis (-)

- **Family History**

Not significant

- **Social History**

Occupation: granite stonemason (for 30 yrs)

Residence: 전북 익산시 함열읍, 아파트 거주

Smoking: never smoker

Drinking (-)

Exposure to biomass smoke: unknown

- **Review of Systems**

Not significant

- **Physical Examination**

Vesicular breath sound without crackle and wheezing

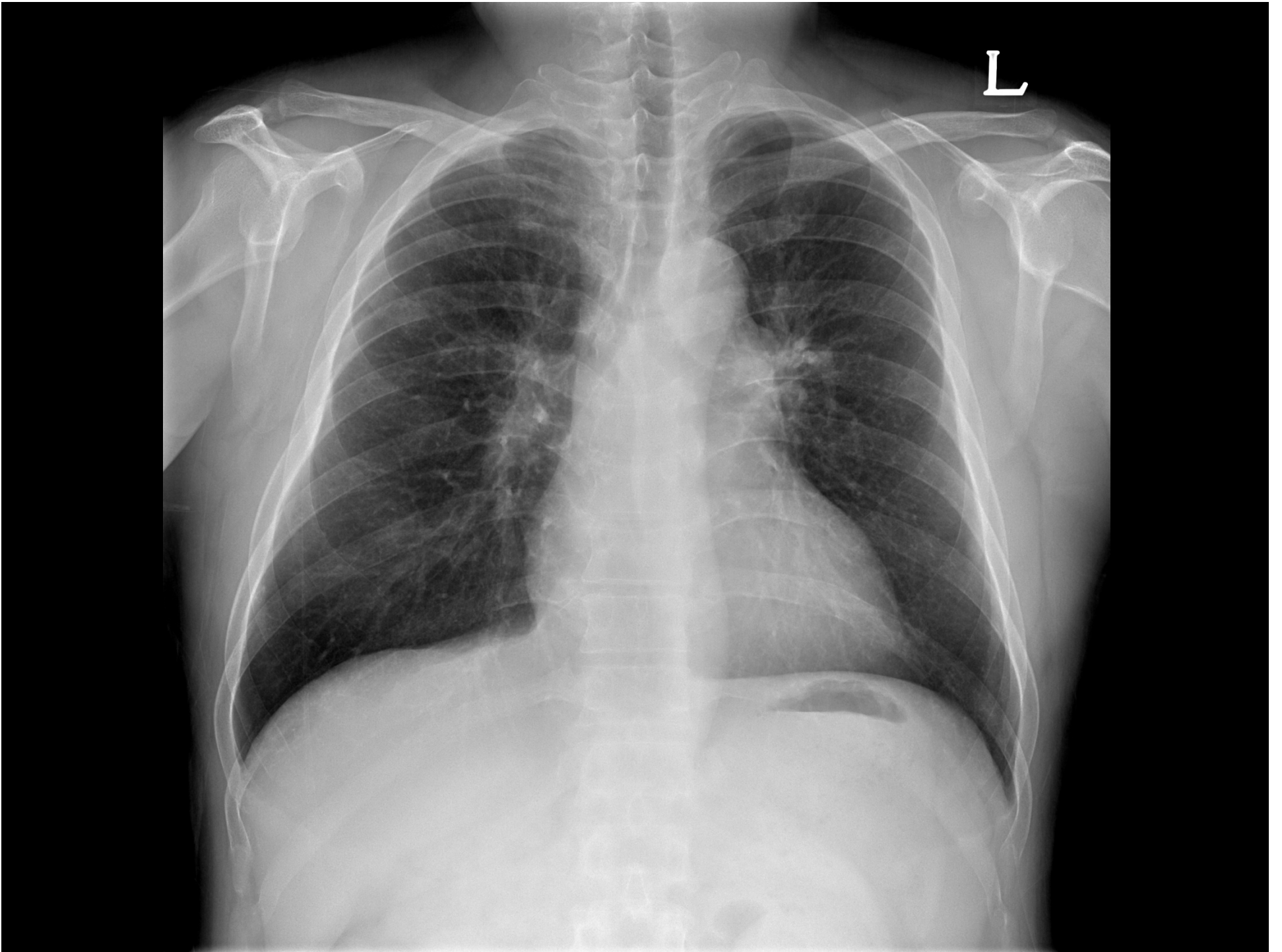
Gr 2 pansystolic murmur at Lt. lower parasternal border

- **Laboratory Data**

Not significant

- D-dimer 0.23  $\mu\text{g/mL}$  FEU

- BNP 29  $\text{pg/mL}$



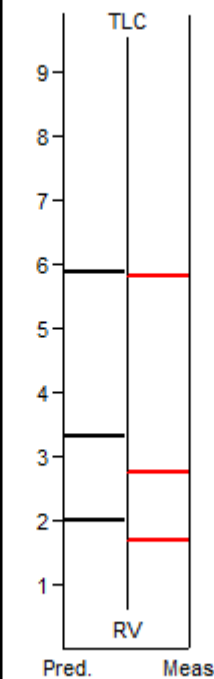
# Pulmonary Function Test

## SPIROMETRY

(S2002)

	(S2001)			Bronchodilator		
	Pred.	Meas.	%Pred.	Meas.	%Pred.	%Chg.
FVC	4.29	4.11	96	4.08	95	-1
FEV <sub>1</sub>	3.36	2.62	78	2.65	79	1
FEV <sub>1</sub> /FVC	79	64	81	65		
FEF <sub>25-75%</sub>	3.22	1.45	45	1.62	50	12
PEF	7.45	7.26	97	7.61	102	5
FEF <sub>25%</sub>		4.17		4.18		0
FEF <sub>50%</sub>	3.67	1.96	53	2.03	55	4
FEF <sub>75%</sub>	1.37	0.56	41	0.58	42	3
FET <sub>100%</sub>		9.62		11.23		17
FVC	3.93	3.89	99	3.73	95	-4
FIV <sub>1</sub>		3.64				
PIF		5.81		6.22		7
FEF/FIF <sub>50</sub>	<1.00	0.37		0.34		-7

Pleth.  N2



## LUNG VOLUMES

(S2015)

	Pred	Meas.	%Pred.
TLC	5.87	5.81	99
VC	3.93	4.11	105
FRC	3.32	2.74	83
ERV	1.31	1.04	79
RV	2.01	1.70	84
(S2012) (S2013)			
%CVVC	19		
N <sub>2</sub> delta			
(S2021)			
Raw	1.67		
sRaw	4.79		
(S2043)			
MIP	115		
MEP	215		

## DIFFUSING CAPACITY

	Pred.	Meas.	%Pred.
DL	22.6	20.6	91
VA(TLC)		5.16	
DL/VA	4.33	3.99	92
Corrected	22.6	20.6	91
Hb	Date		
	g/dl		

# Echocardiography

## Left Ventricle D-shaped LV

LVIDs	<b>30</b> mm	LVIDd	<b>48</b> mm	LA	<b>34</b> mm	Aorta	<b>33</b> mm
LVPWs	<b>15</b> mm	LVPWd	<b>9</b> mm	ESV	<b>34</b> ml	EDV	<b>87</b> ml
IVSs	<b>14</b> mm	IVSd	<b>9</b> mm	LVEF	<b>61</b> %	LV Mass	<b>148.6</b> g
P.E. (ant)	mm	P.E. (post)	mm	LV Mass Index	<b>85.6</b> g/m <sup>2</sup>		

## Right Ventricle decreased contractility (Ts=9.6 cm/sec)

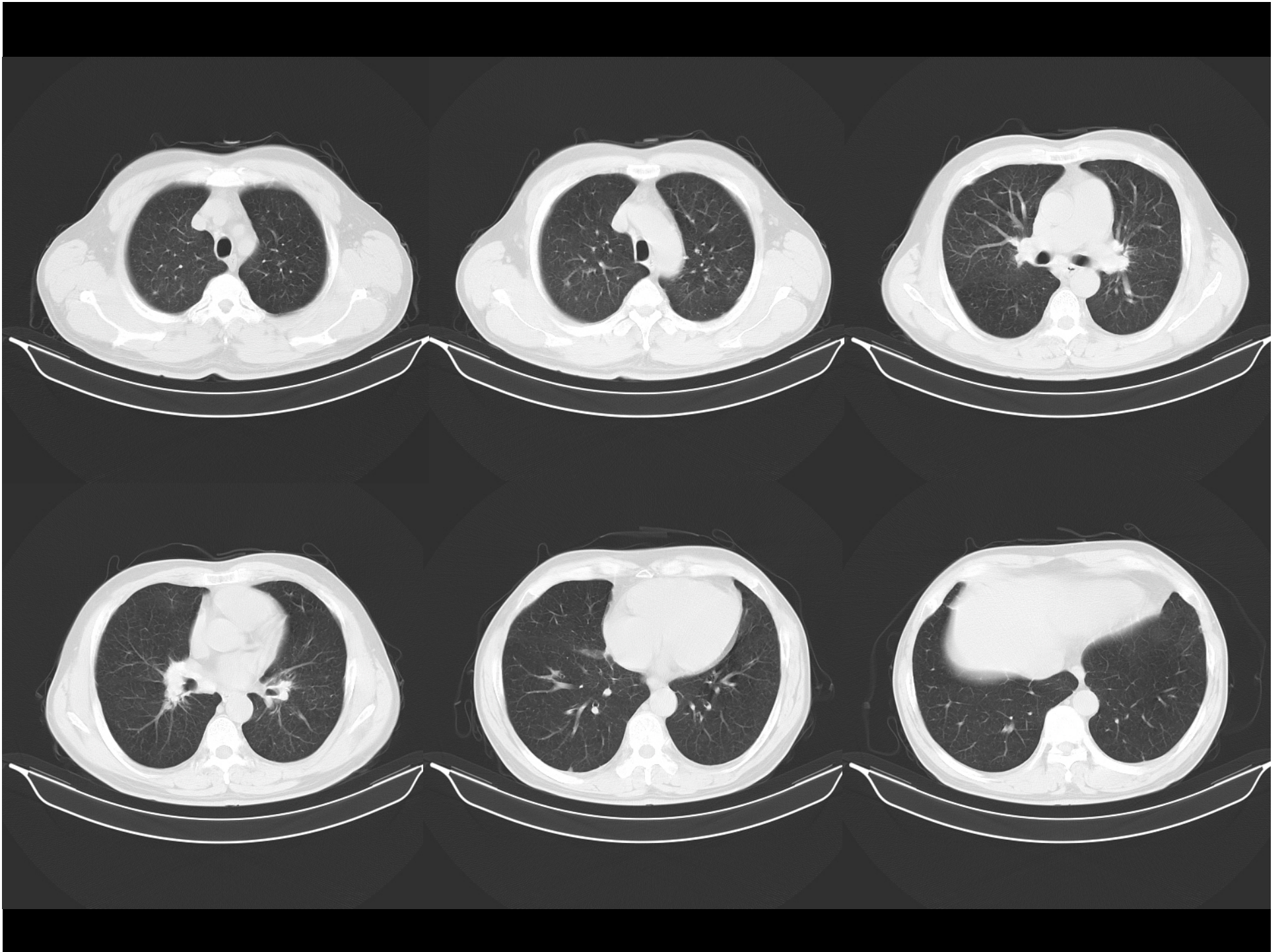
RVIDs	mm	RVIDd	<b>40</b> mm
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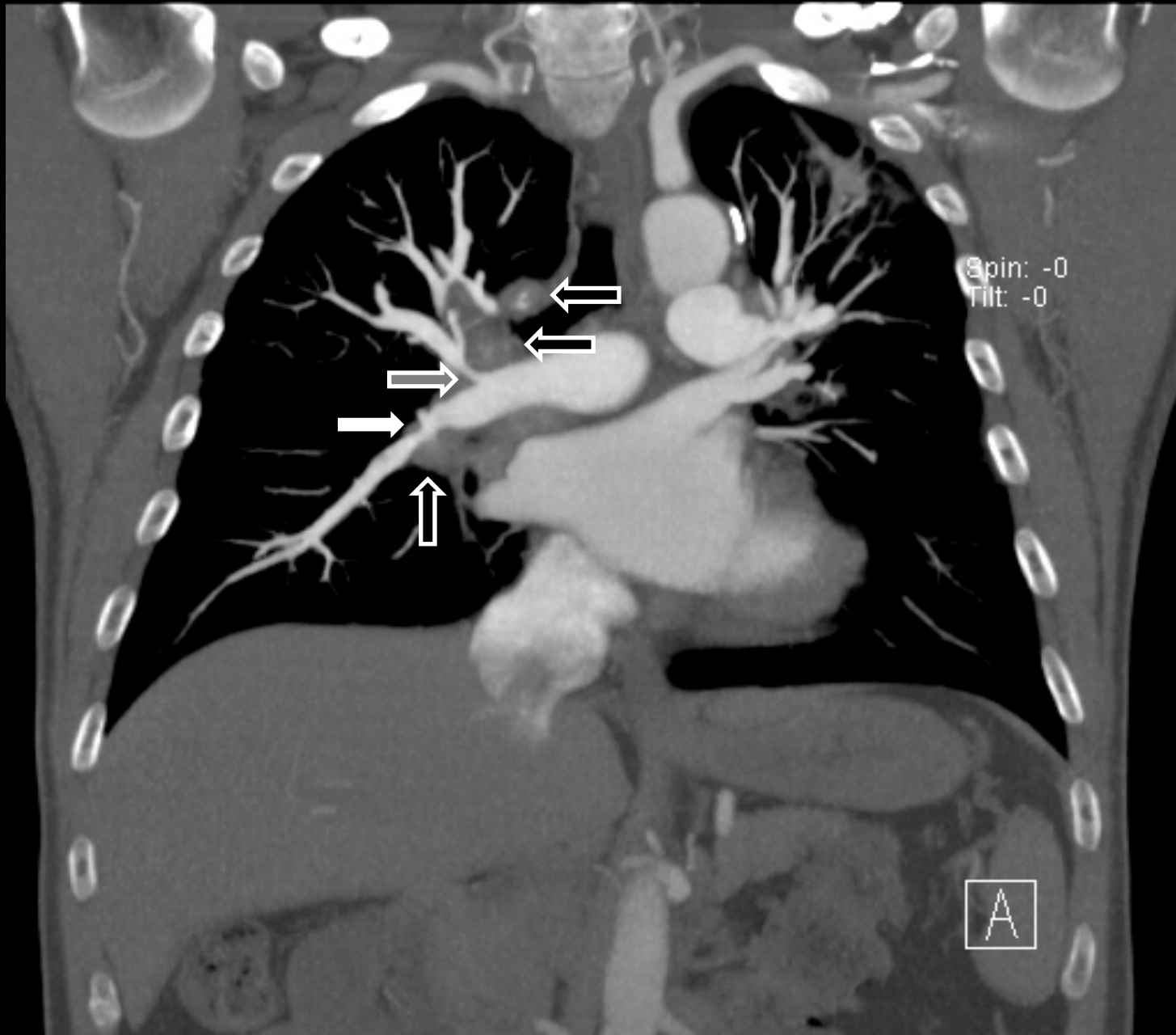
## Tricuspid Valve mild tethering

TR grade	<b>3</b>	TR jet area	<b>10</b> cm <sup>2</sup>	Peak TR Vel	<b>4.1</b> m/s
PGsys(RV-RA)	<b>67</b> mmHg	Peak E Vel	cm/s	Peak A Vel	cm/s

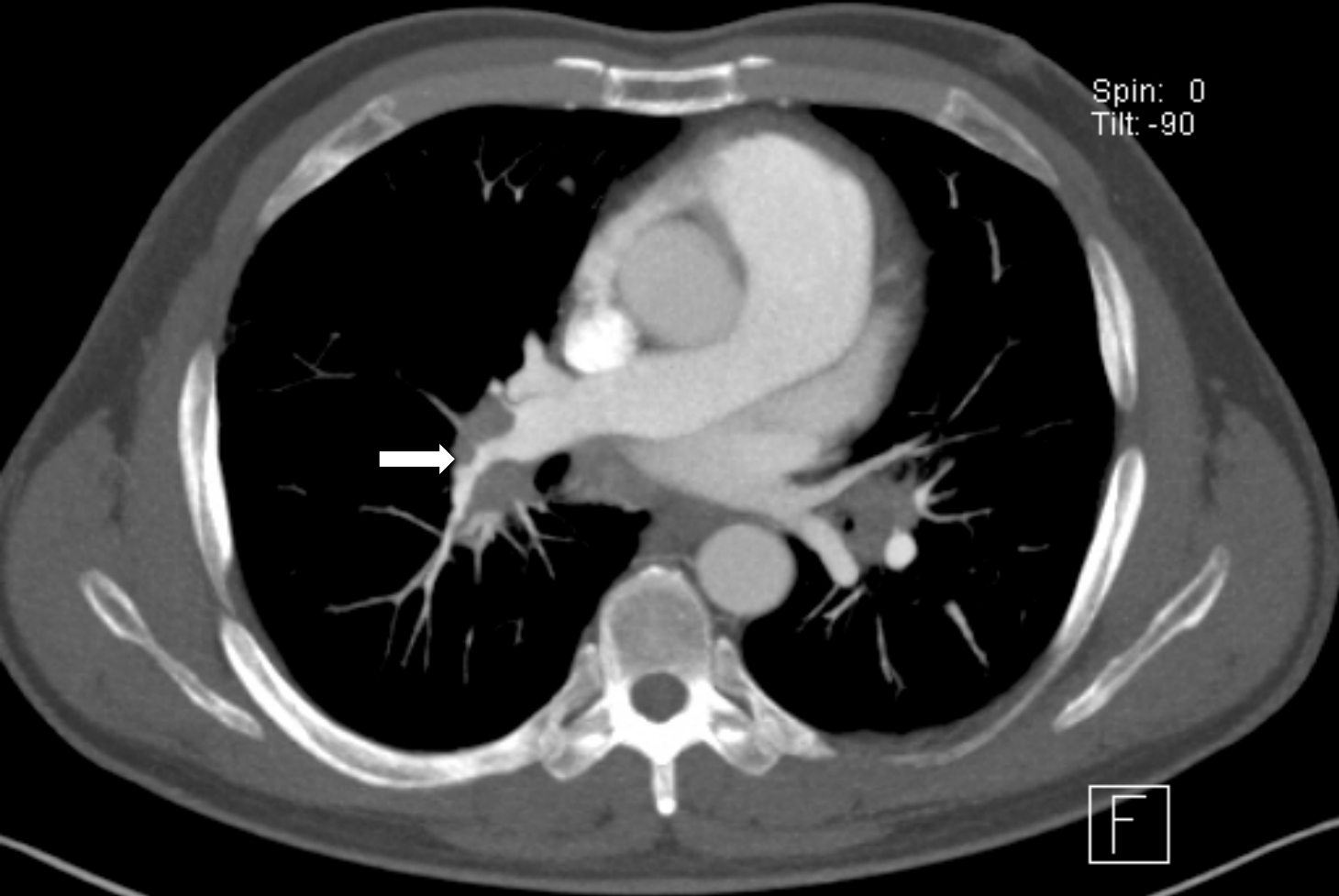
## Pulmonic Valve Normal

PR grade	<b>1</b>	PR Peak Vel	<b>2.6</b> m/s	PR ED Vel	<b>1.5</b> m/s
Peak Vel	m/s	PG(max/mean)	/ mmHg	Pul vein flow S/D	/ cm/s

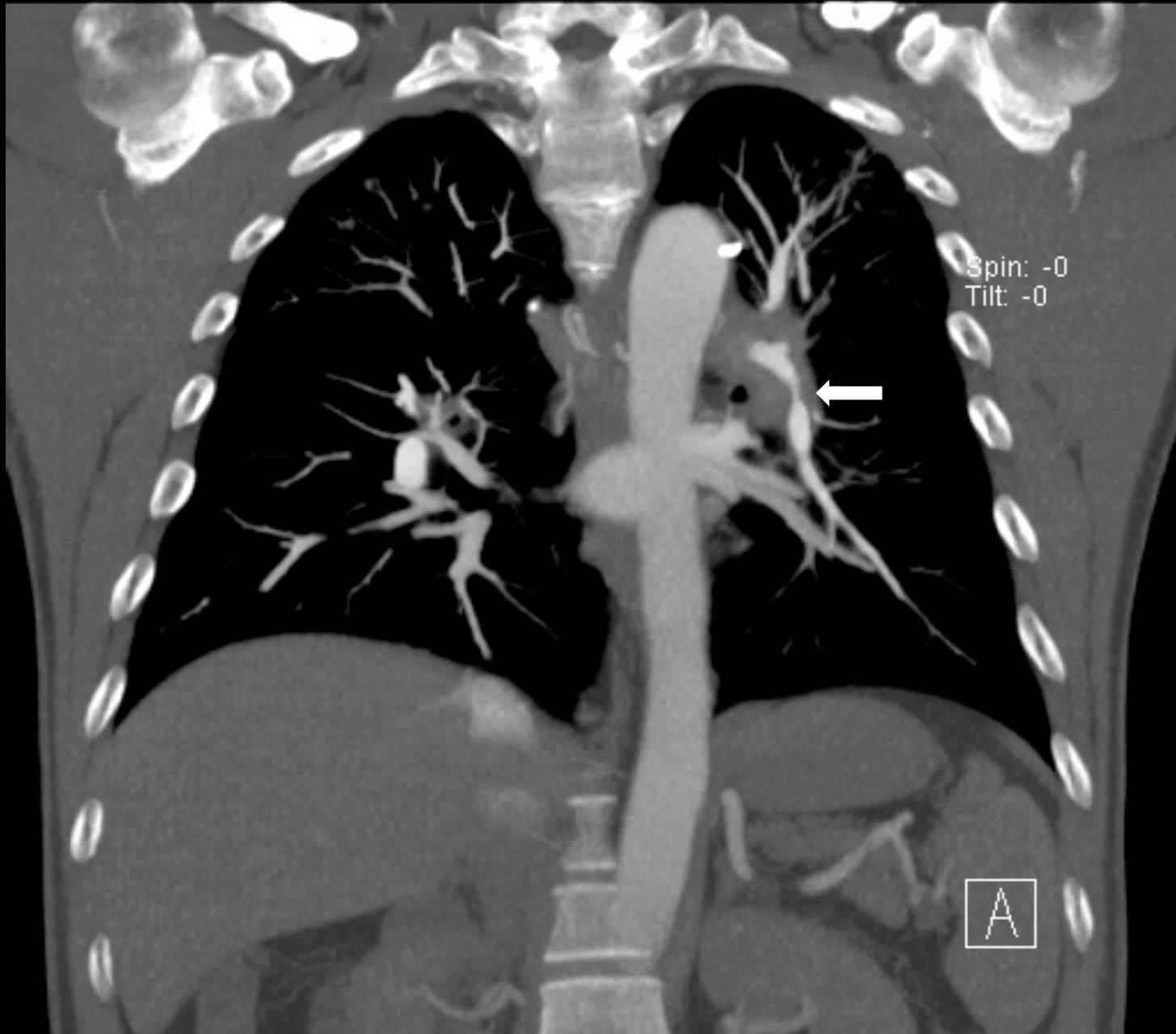




Spin: 0  
Tilt: -90



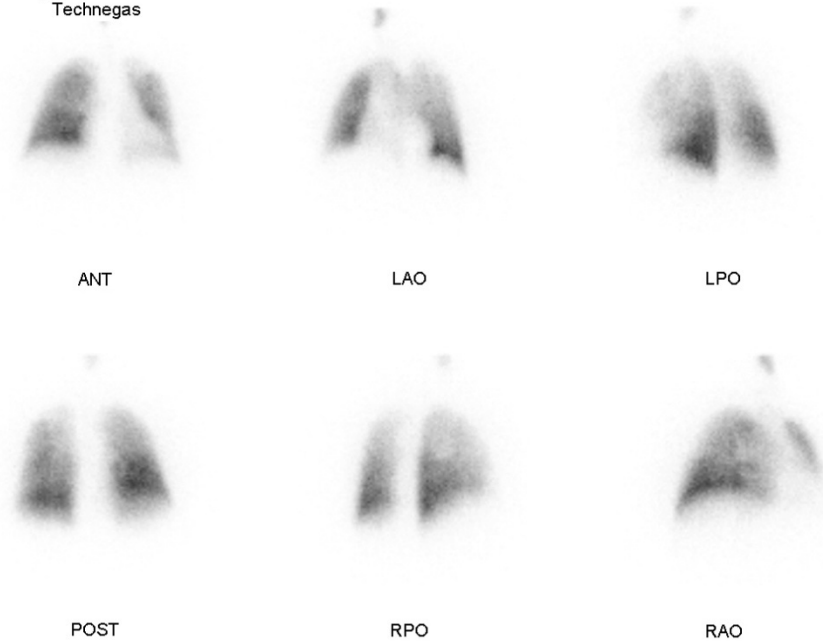
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# V/Q Scan

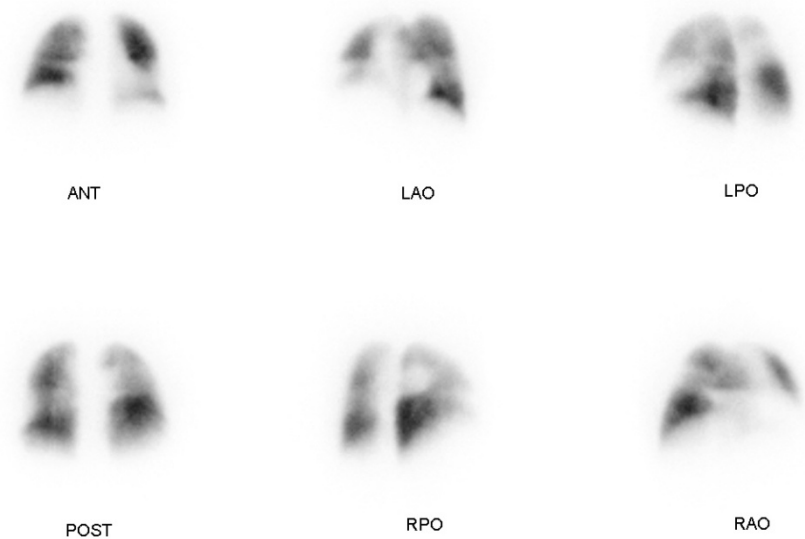
## Inhalation

Lung Inhalation Scan  
Technegas



## Perfusion

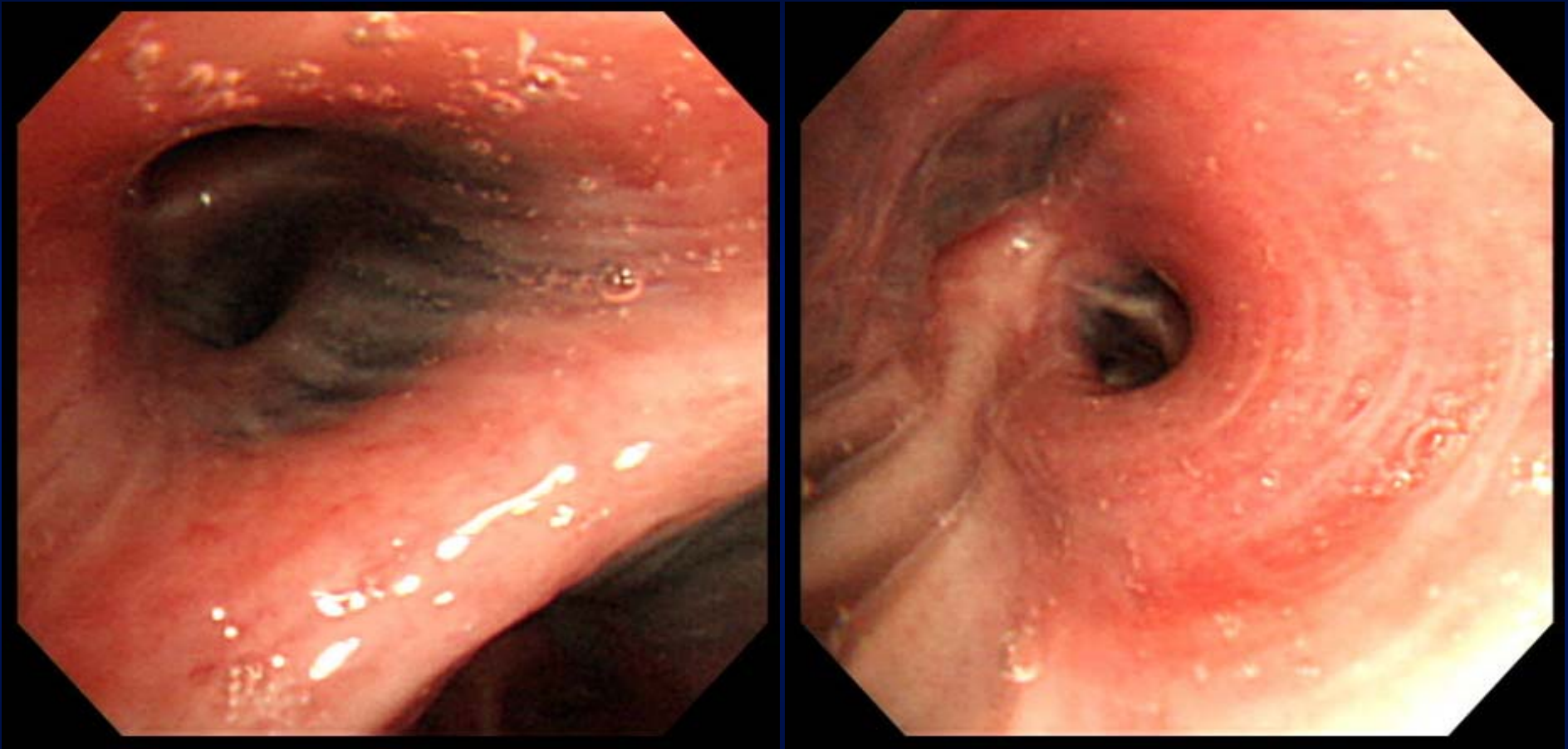
Lung Perfusion Scan  
99mTc-MAA



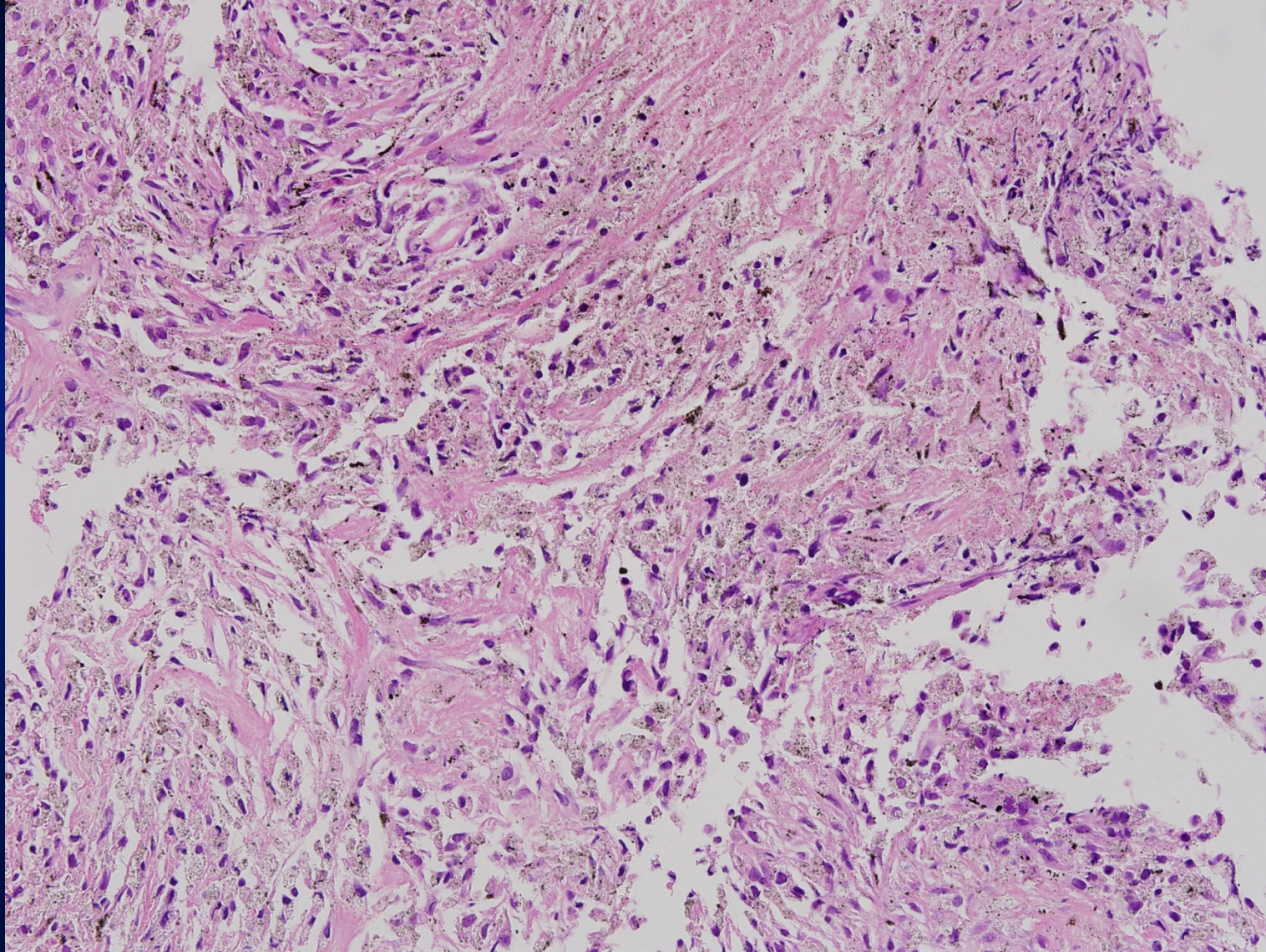
# Right Heart Catheterization

- RA pressure: 11/8 (9) mmHg
- RV pressure: 54/8 (13) mmHg
- Main PA pressure: 54/20 (32) mmHg
- PCW pressure: 16/9 (11) mmHg
  
- Cardiac output: 4.23 L/min
- PVR: 4.96 Wood units

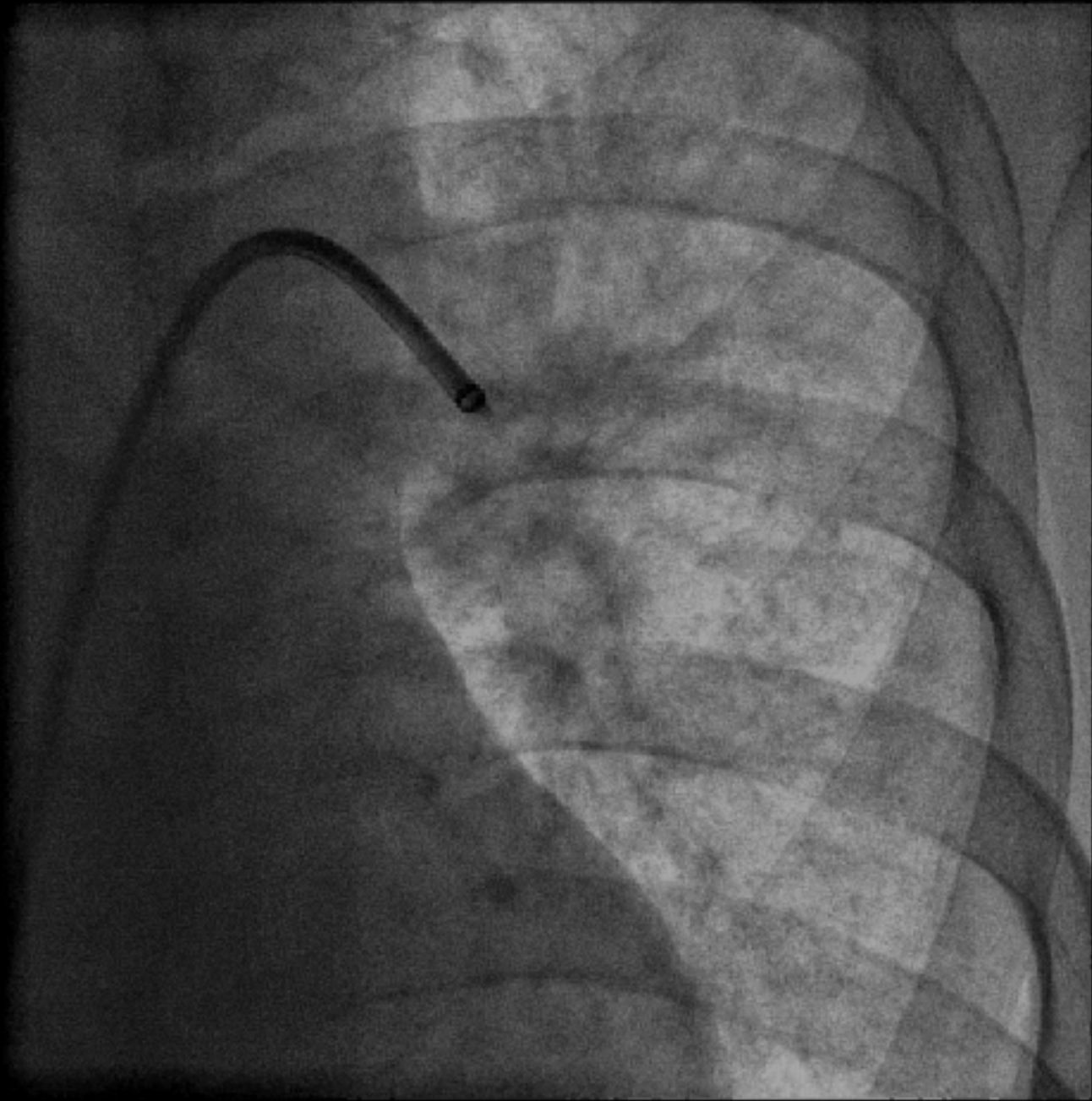
# Bronchoscopy

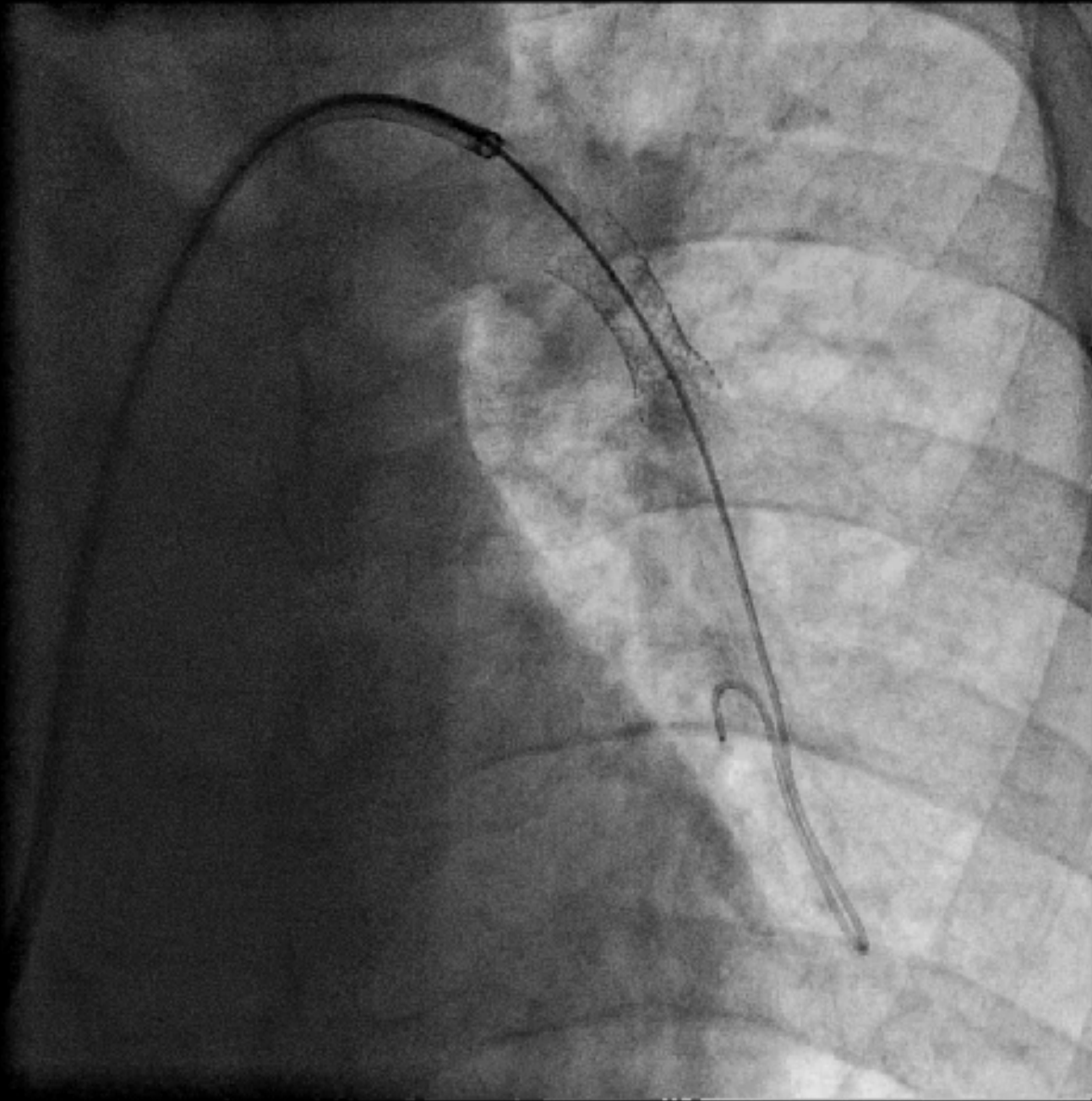


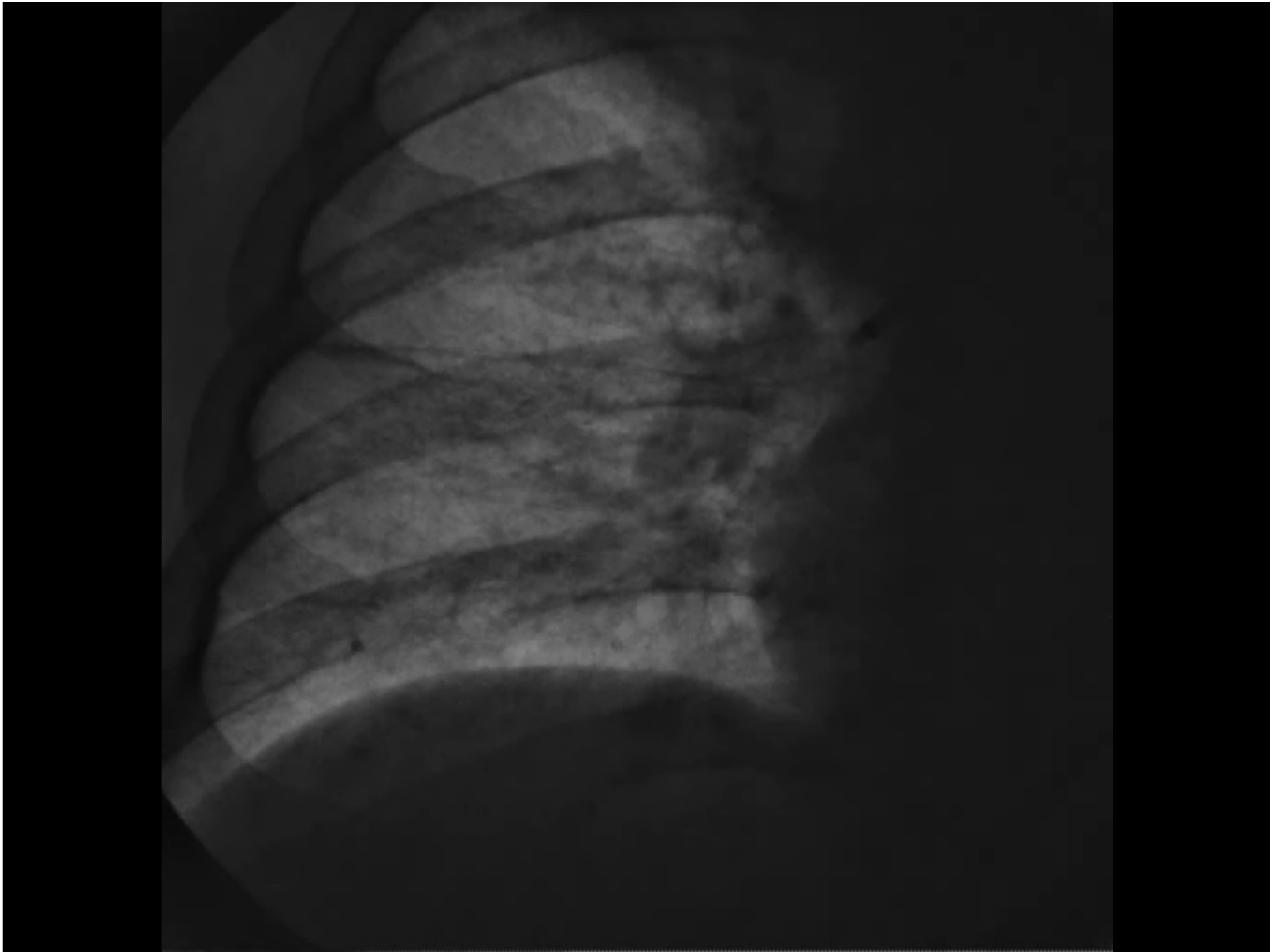
# EBUS-TBNA (#7, #11L)

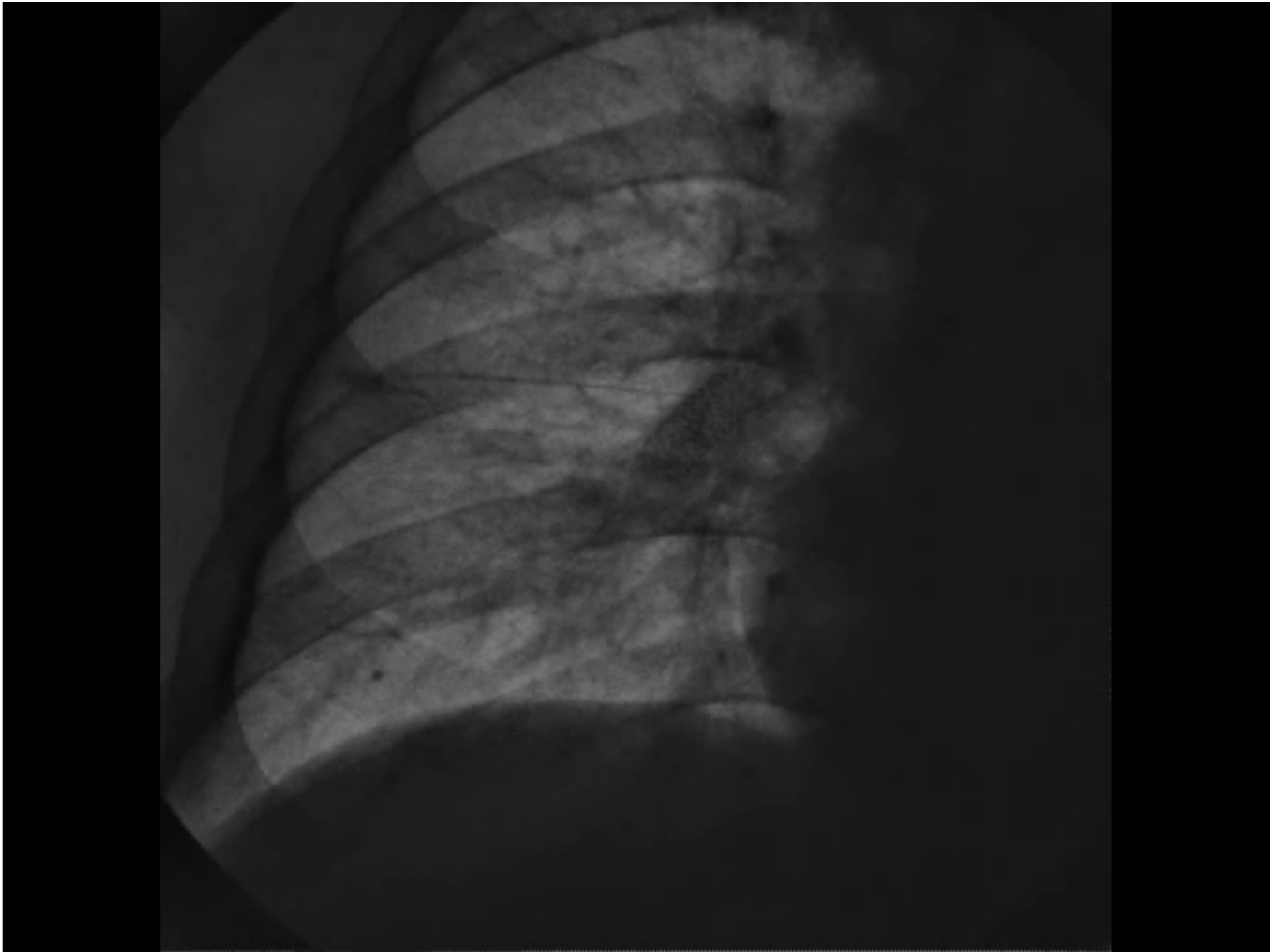


# Treatment









# Outcomes (Immediate)

- Pressure measured during stenting

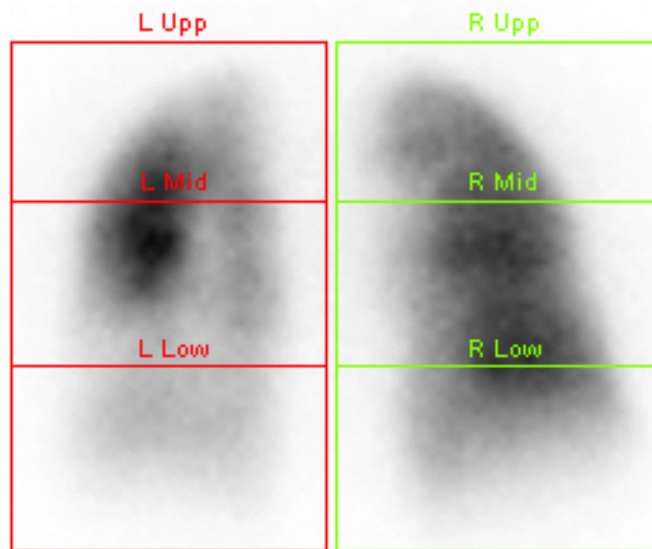
Location	Pre-stenting pressure	Post-stenting pressure
RA	8/6 (5)	
RV	60/8 (10)	
Proximal Lt. PA	62/16 (32)	48/11 (25)
Distal Lt. PA	19/8 (12)	31/11 (19)
Proximal Rt. PA	53/19 (33)	53/15 (29)
Distal Rt. PA	13/7 (10)	29/13 (21)

# Outcomes (6 weeks later)

	WHO Fc	6 MWD	TR Vmax
<b>Pre-stenting</b>	III	520 m (94%)	4.1 m/s
<b>Post-stenting</b>	I	538 m (93%)	3.5 m/s

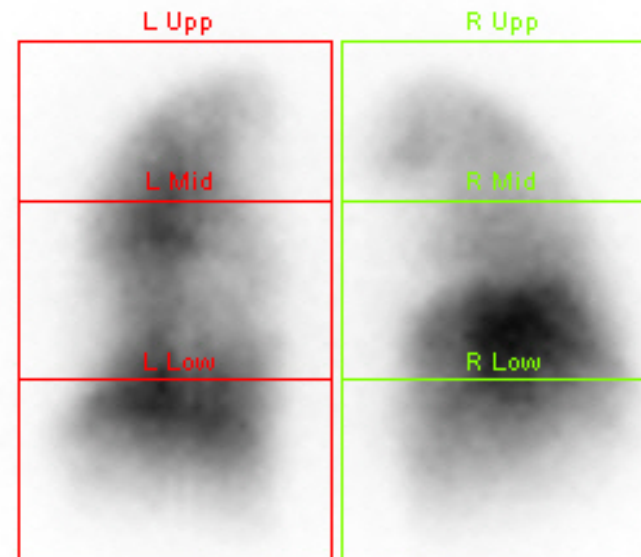
# Perfusion Scan

## Pre-stenting



(% Ratios)	Left	Right
Upper	14.48	17.57
Middle	20.08	32.04
Lower	4.96	10.88
<hr/>		
Total	39.51	60.49

## Post-stenting



(% Ratios)	Left	Right
Upper	13.97	11.56
Middle	21.96	32.21
Lower	11.61	8.69
<hr/>		
Total	47.54	52.46

# Case 2

- 80 yr / F

- **Chief Complaints**

Dyspnea on exertion (onset: 2 years ago)

- **Present Illness**

2 months ago, generalized edema

2 weeks ago, DOE aggravation

WHO functional class II → III

## ■ **Past Medical History**

HTN (21 YA)

major depressive disorder (19 YA)

somatoform disorder (13 YA)

anthracofibrosis (11 YA)

Pulmonary tuberculosis (-)

## ■ **Social History**

Occupation: housewife

Residence: 서울시 강동구 성내1동, 아파트 거주

Smoking: never smoker

Drinking (-)

Exposure to biomass smoke: unknown

- **Pulmonary function test**

Mild obstructive pattern

combined with mild restrictive pattern

- **Echocardiography**

LV EF: 60%

TR Vmax: 3.5 m/sec

- **Right heart catheterization**

main PA pressure: 45/29 (35) mmHg

PCW pressure: 9 mmHg

Cardiac output 4.10 L/min

PVR: 6.34 Wood units



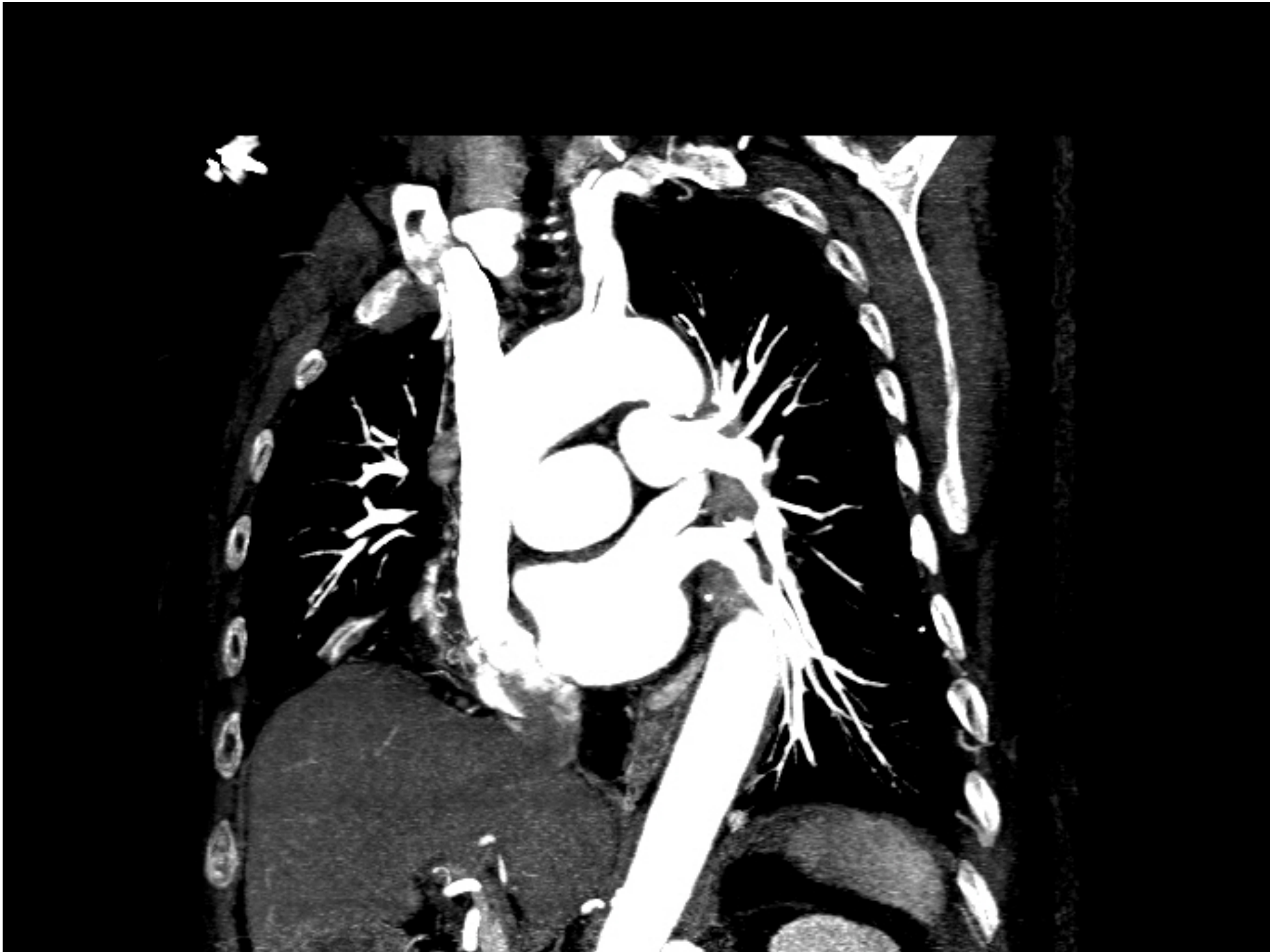
Spin: 0  
Tilt: -90

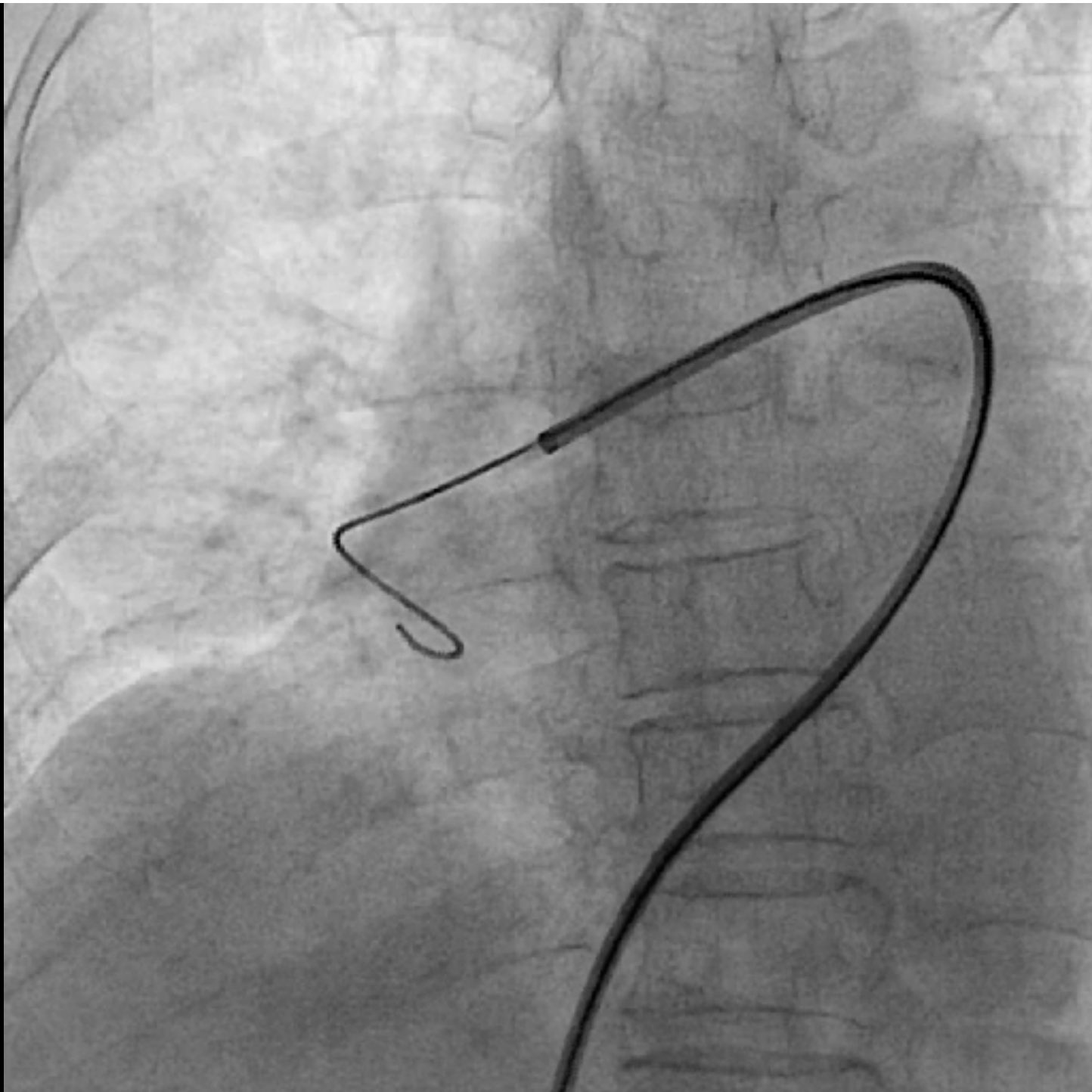
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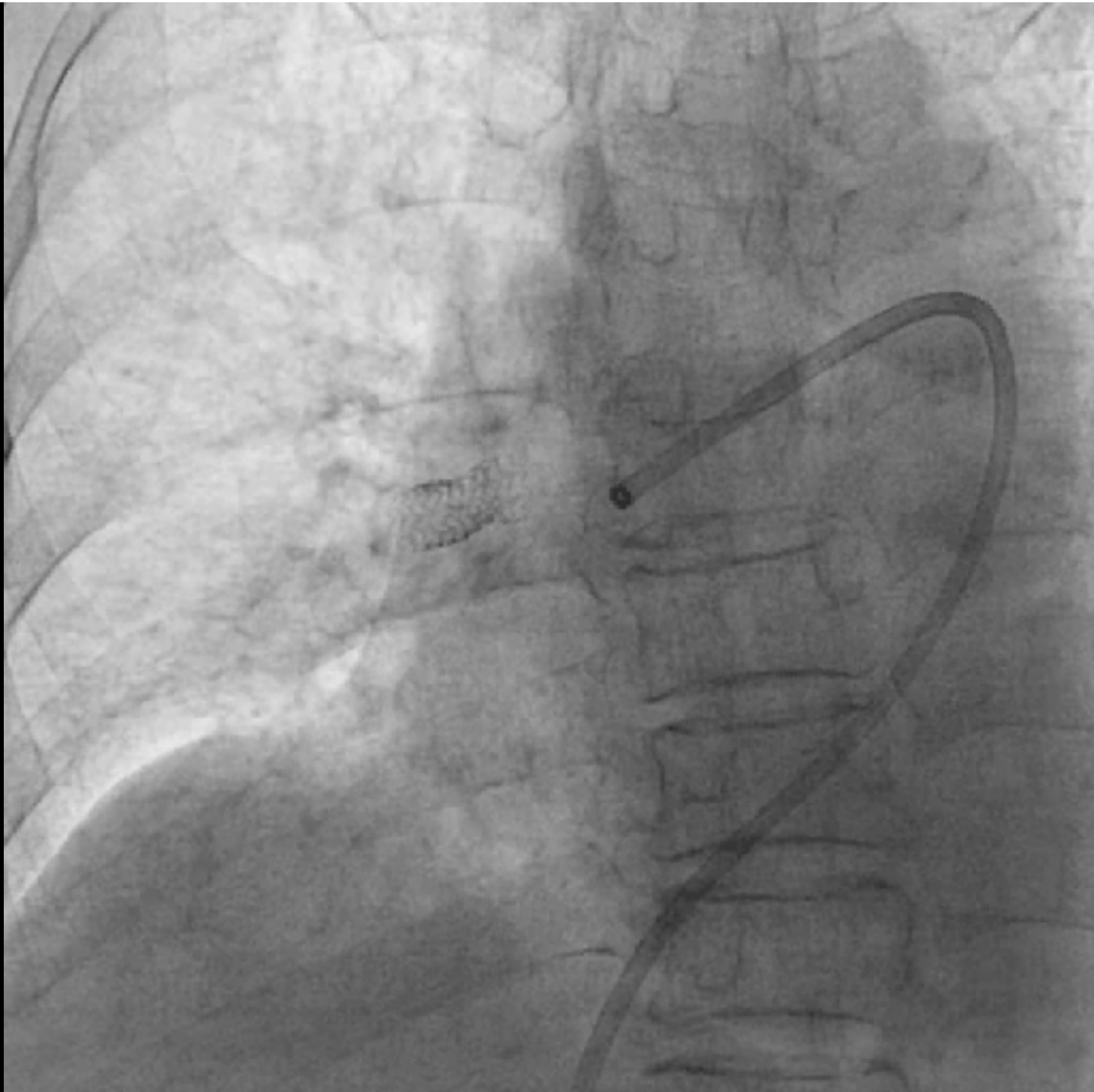


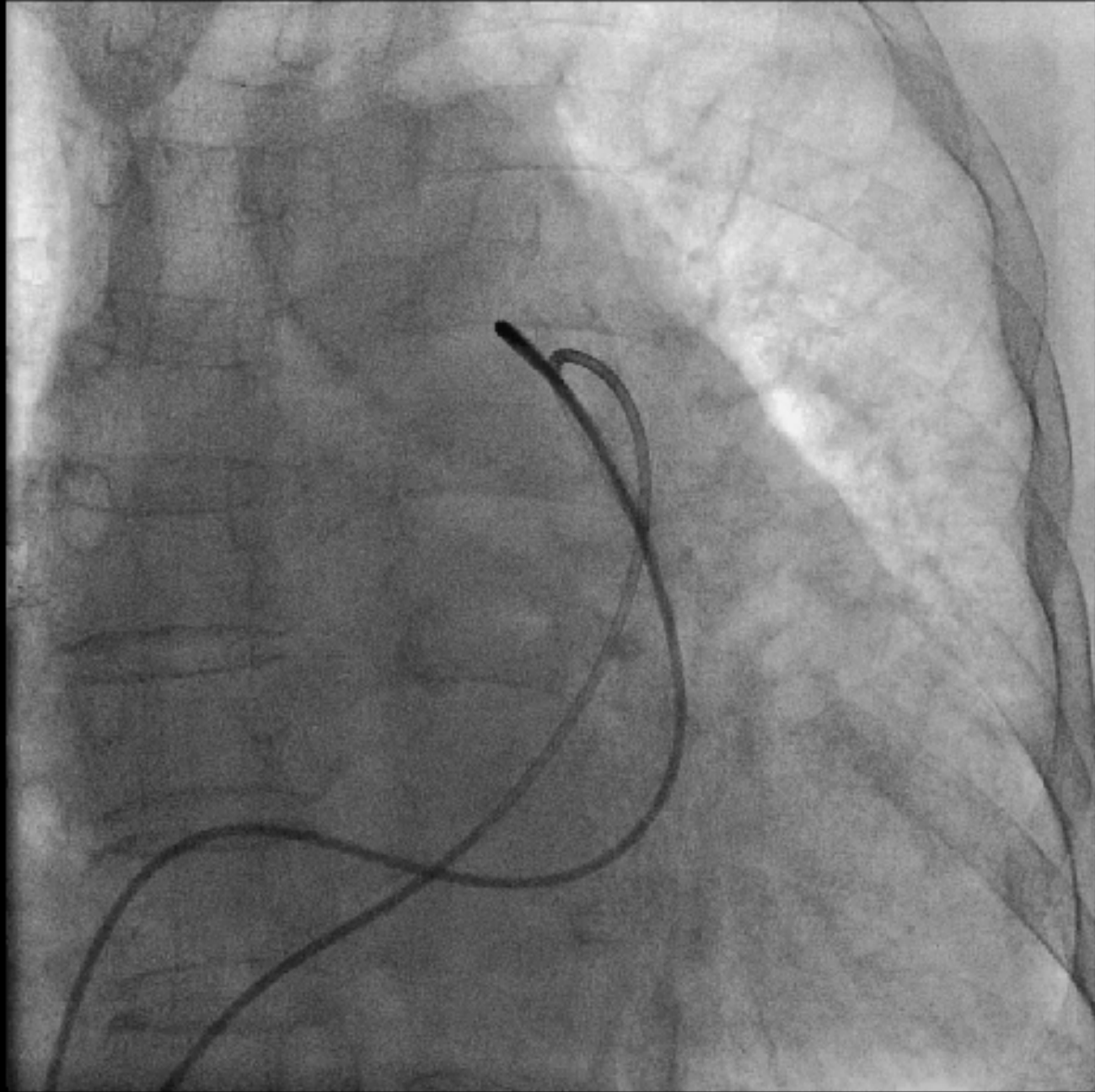
Spin: 0  
Tilt: -90

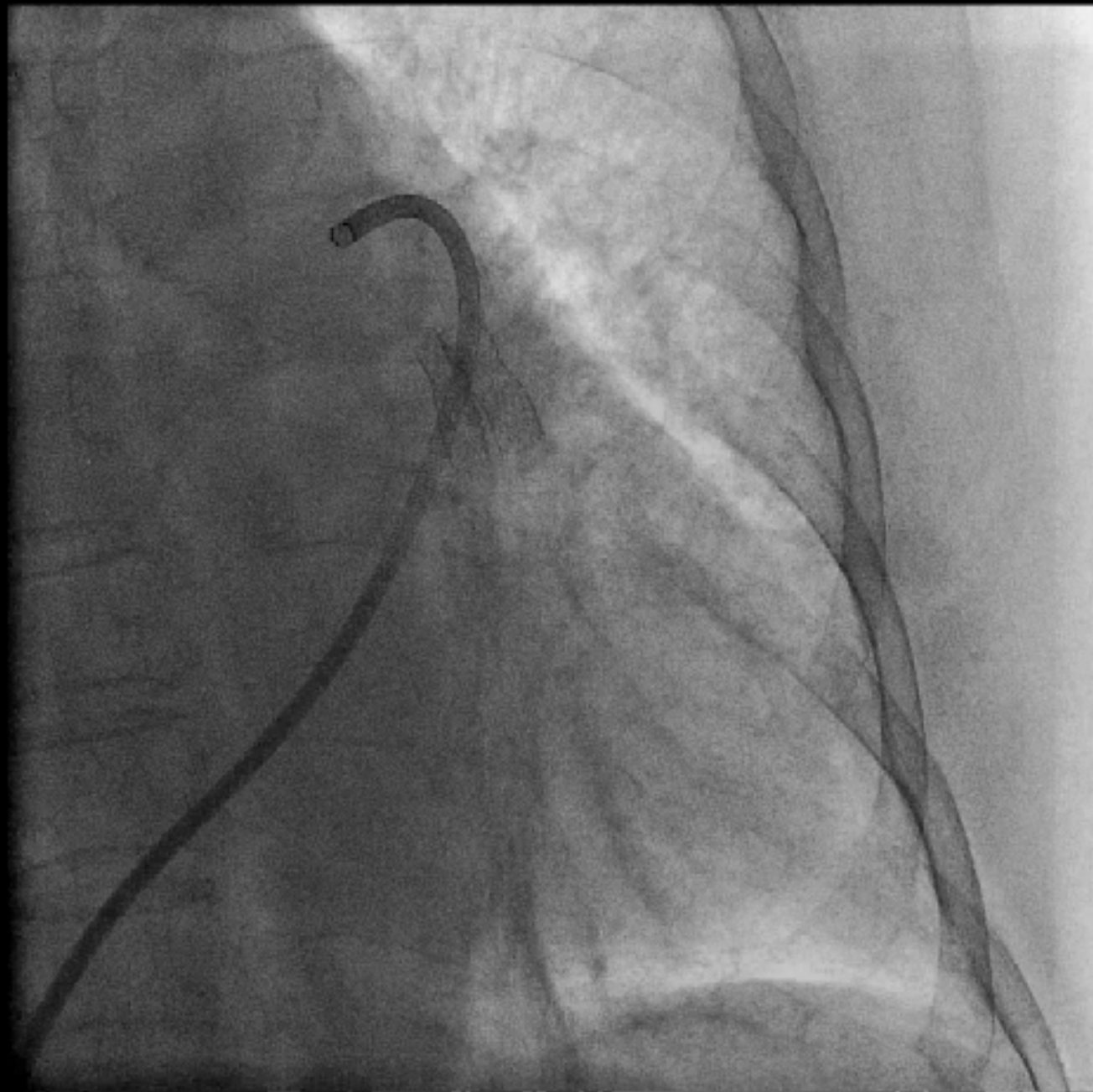
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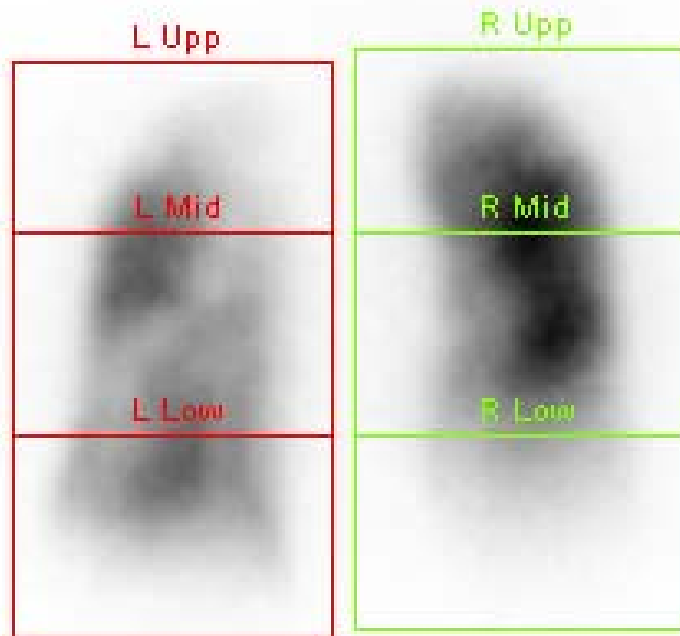


# Outcomes (4 weeks later)

	WHO Fc	6 MWD	TR Vmax
<b>Pre-stenting</b>	III	145 m (89%)	3.5 m/s
<b>Post-stenting</b>	II	165 m (92%)	2.4 m/s

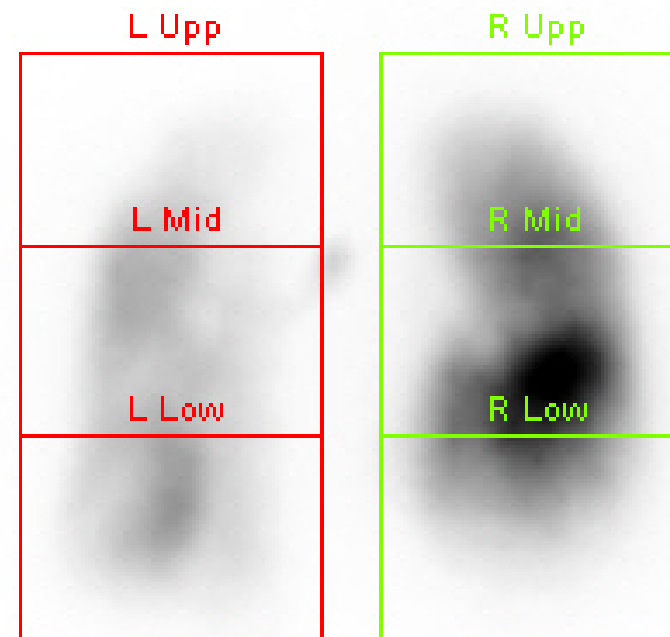
# Perfusion Scan

## Pre-stenting



(% Ratios)	Left	Right
Upper	9.16	24.67
Middle	19.43	32.89
Lower	9.51	4.34
Total	38.10	61.90

## Post-stenting



(% Ratios)	Left	Right
Upper	6.19	18.07
Middle	13.42	42.57
Lower	8.71	11.04
Total	28.32	71.68

# Case 3

- **68 yr / F**

- **Chief Complaints**

Dyspnea on exertion (onset: 3 years ago)

- **Present Illness**

Wax-and-wane for 3 years

Aggravated with URI

WHO functional class II ~ III

## ■ Past Medical History

DM (14 YA)

HTN (14 YA)

Coronary artery disease (8 YA)

Anthraco-fibrosis (3 YA)

Pulmonary tuberculosis (-)

## ■ Social History

Occupation: housewife

Residence: 서울 강동구 길2동, 빌라 거주

Smoking: never smoker

Drinking (-)

Exposure to biomass smoke: unknown

- **Pulmonary function test**

Within normal limits

- **Echocardiography**

LV EF: 67%

RV: slightly decreased contractility

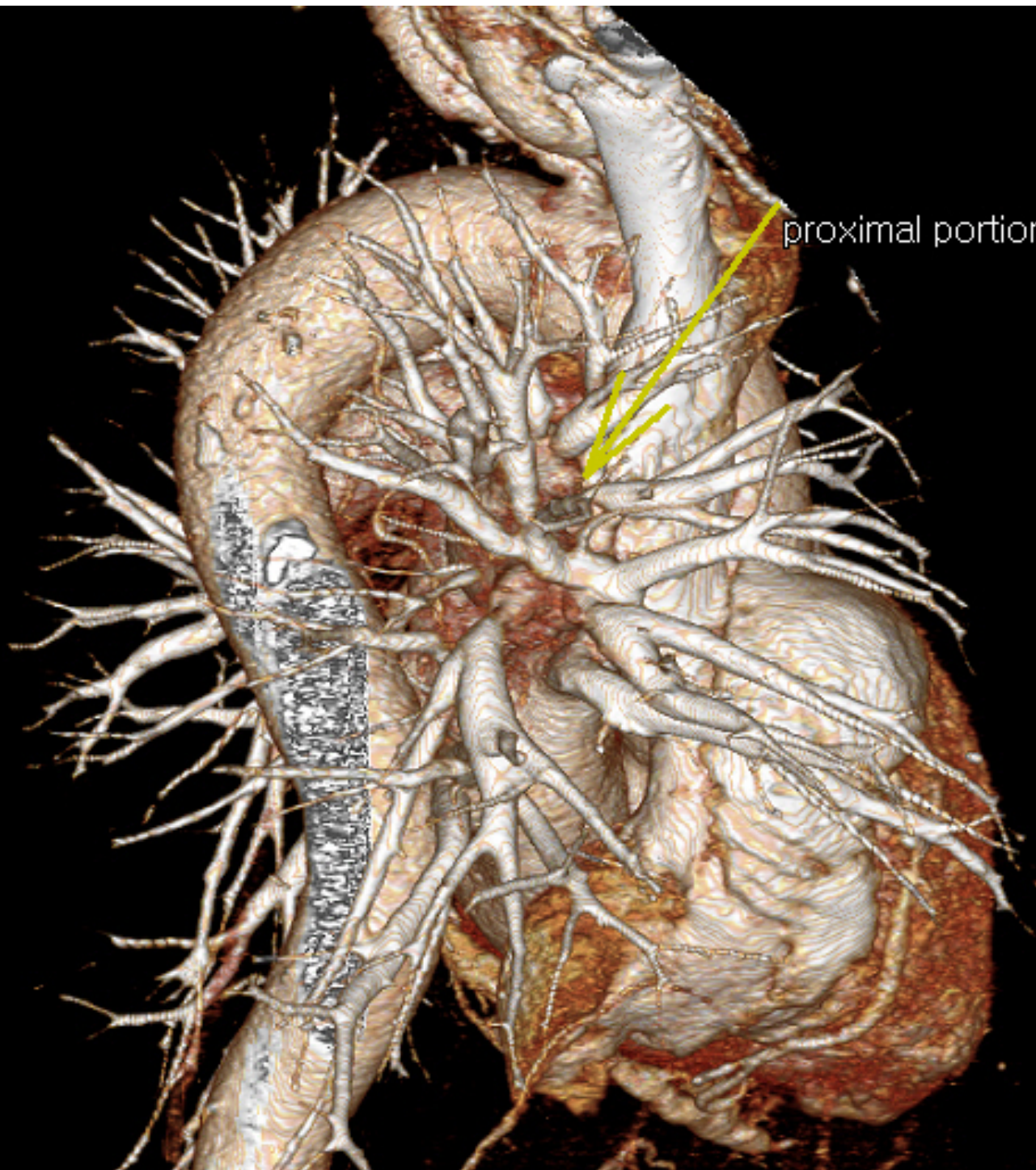
TR Vmax: 3.9 m/sec

- **Right heart catheterization**

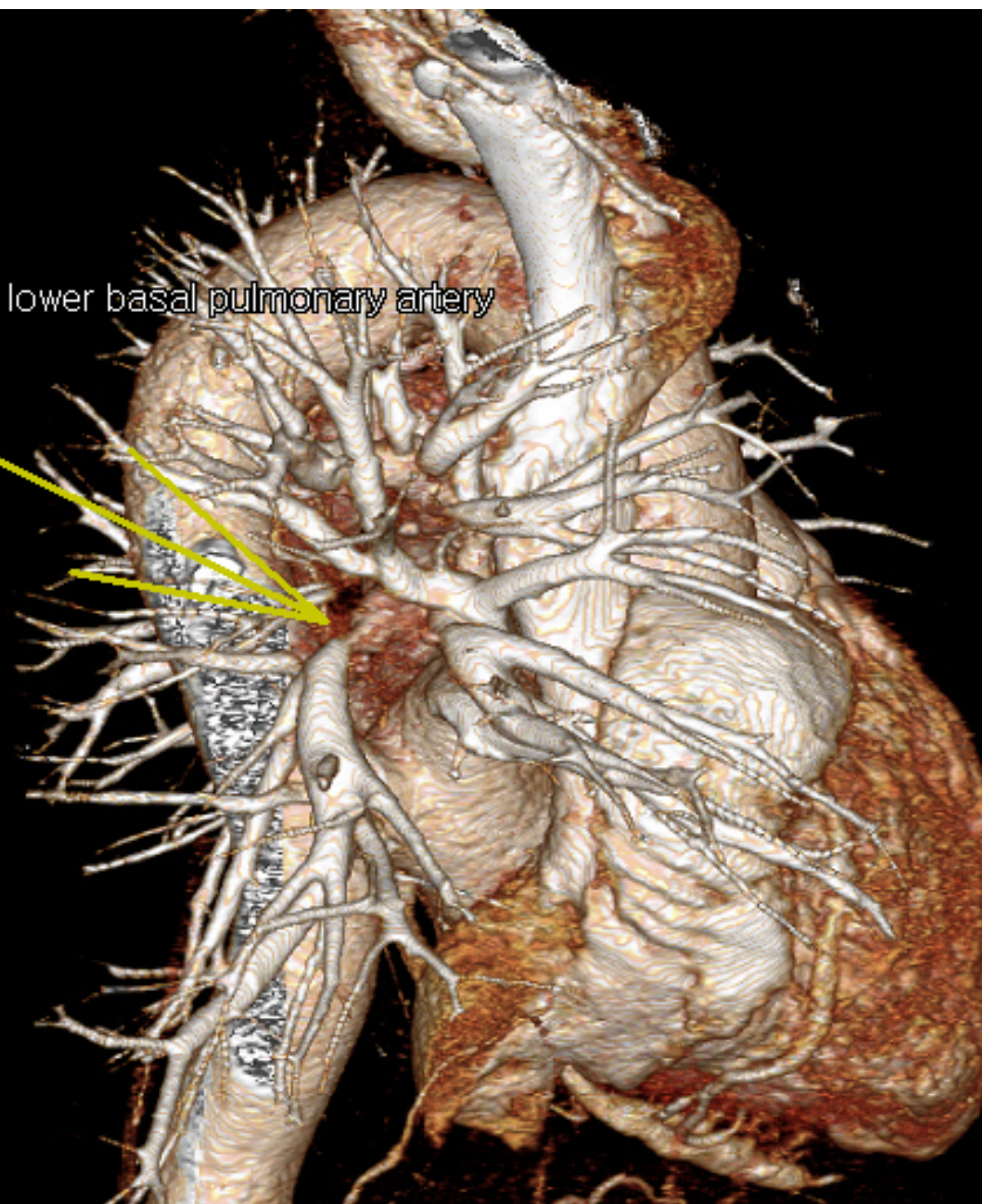
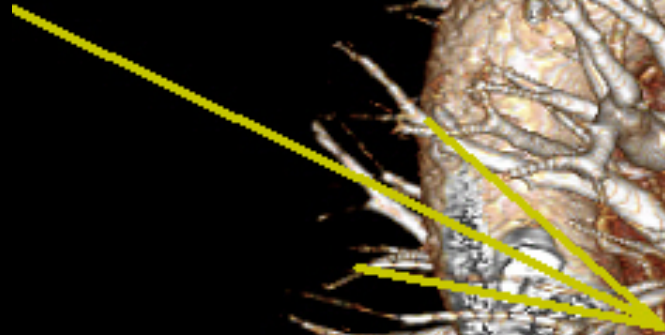
main PA pressure: 55/12 (29) mmHg

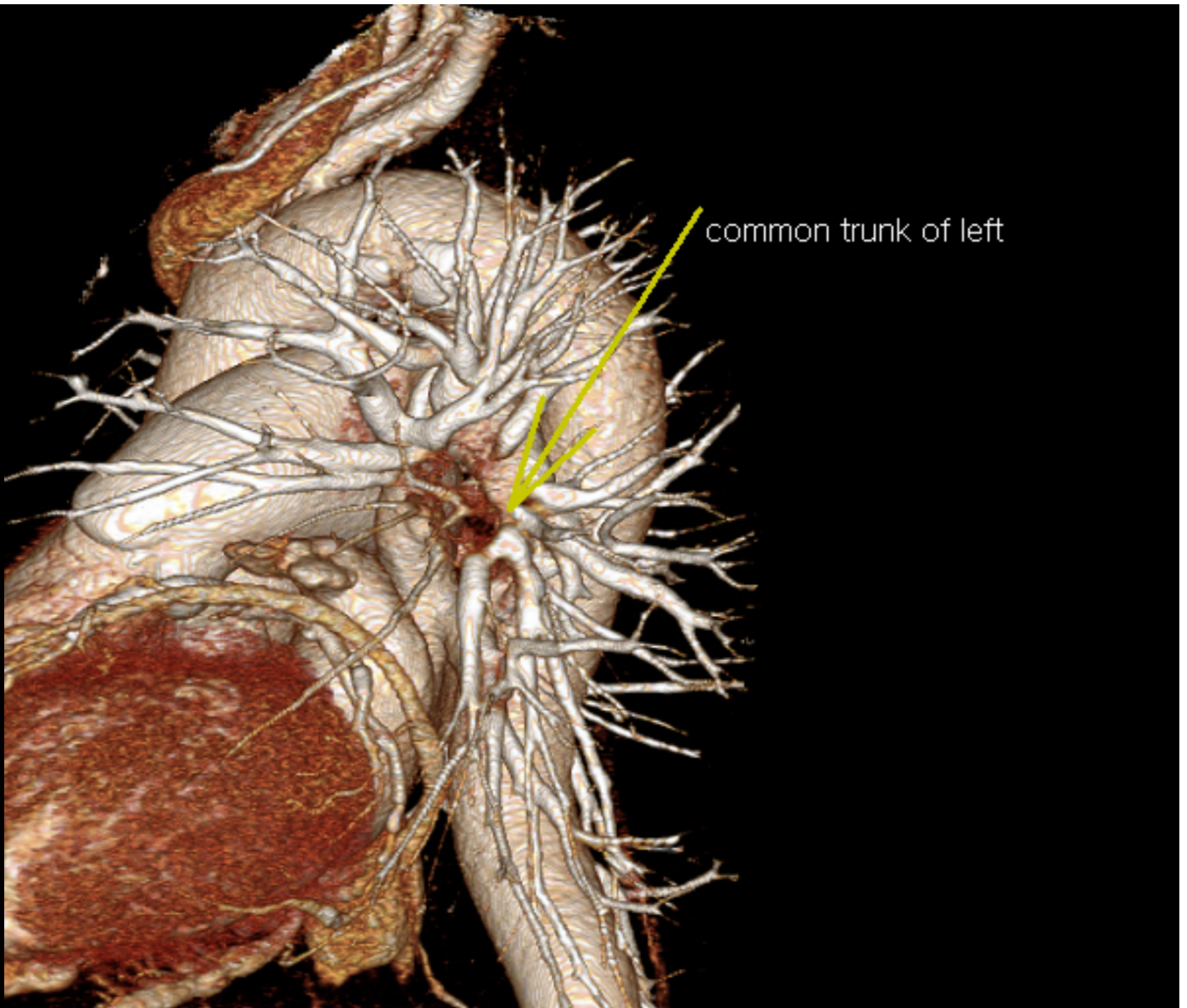
PCW pressure: 7 mmHg

proximal portion c

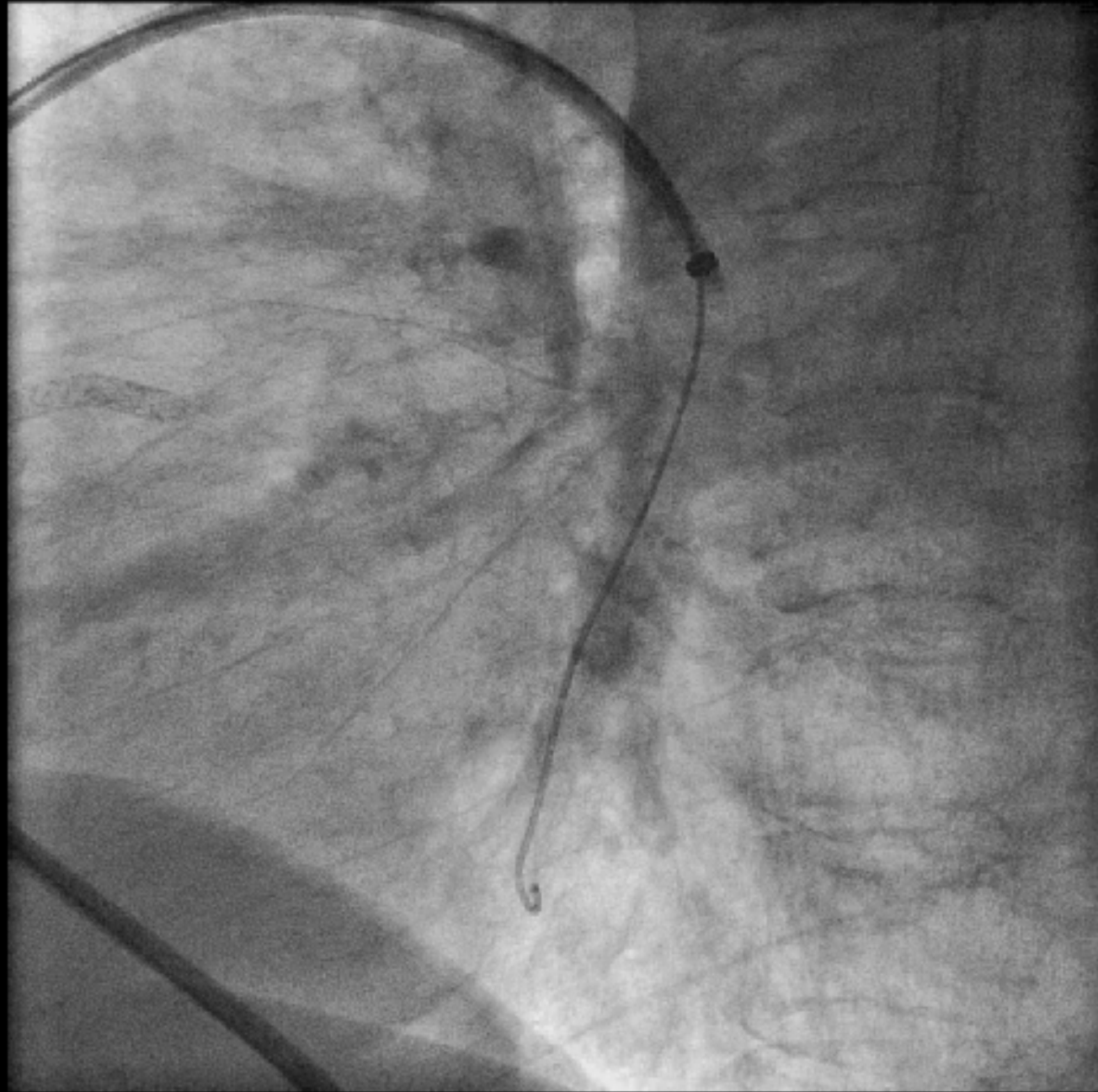


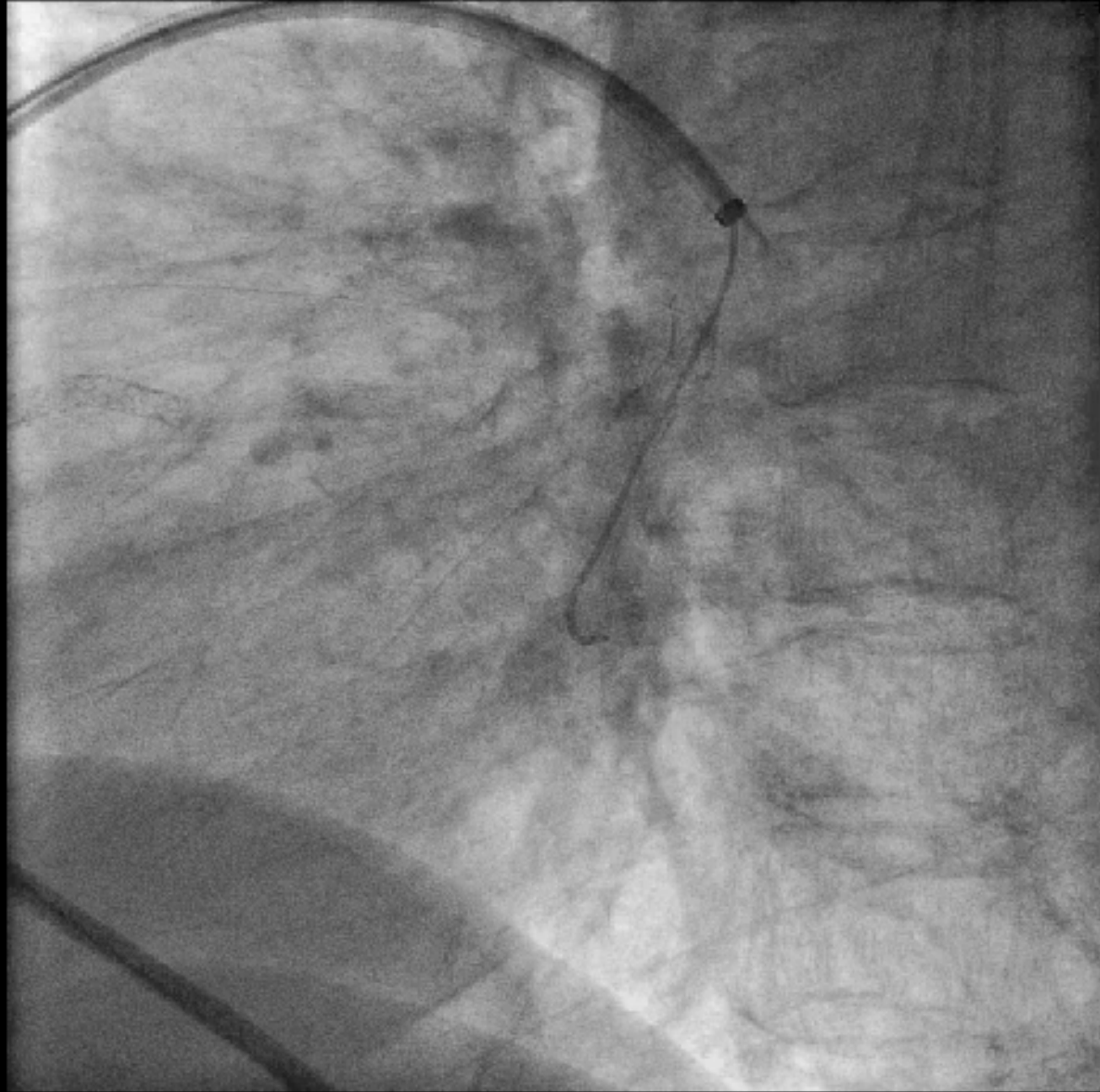
trunk of right lower basal pulmonary artery

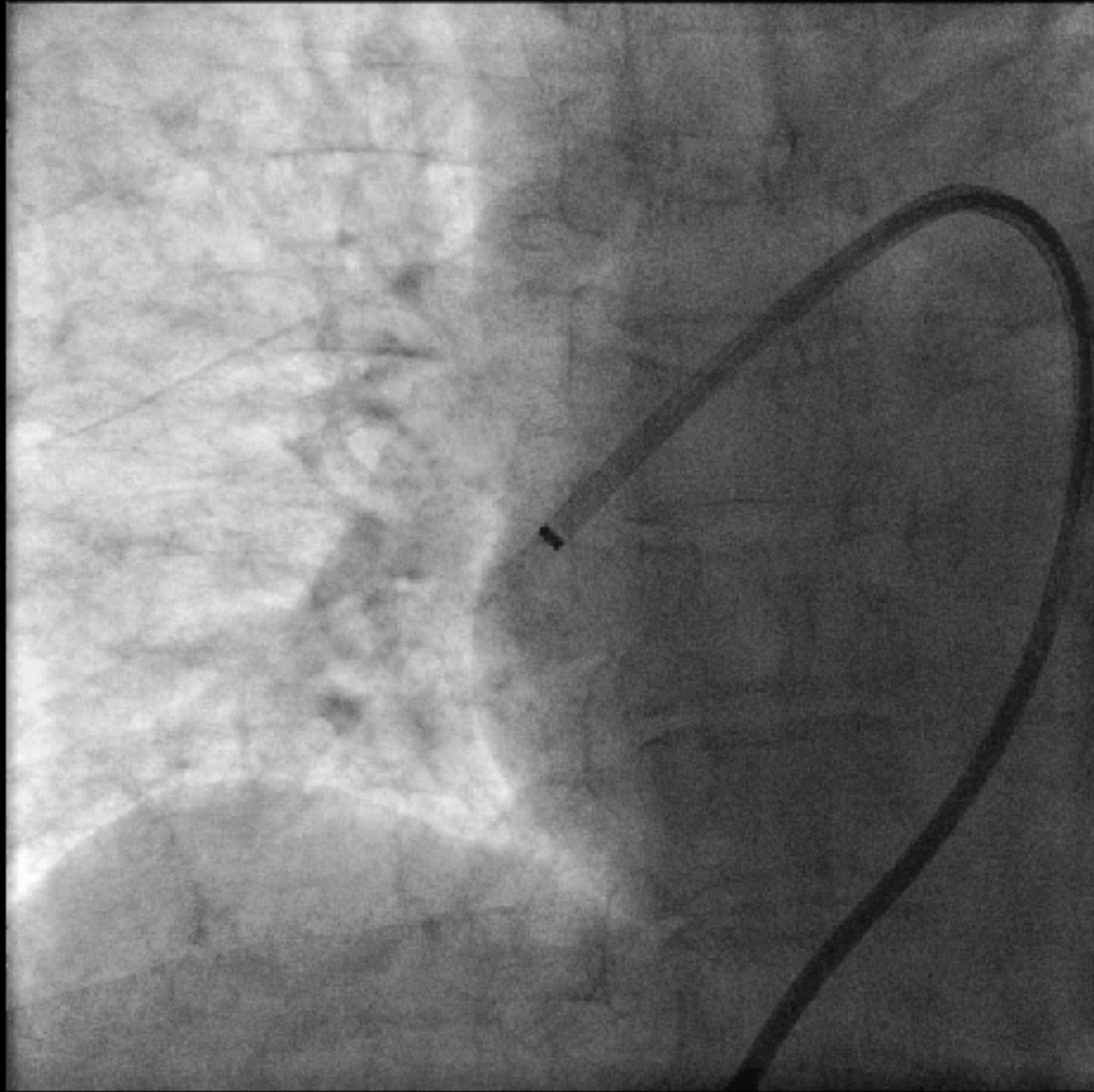


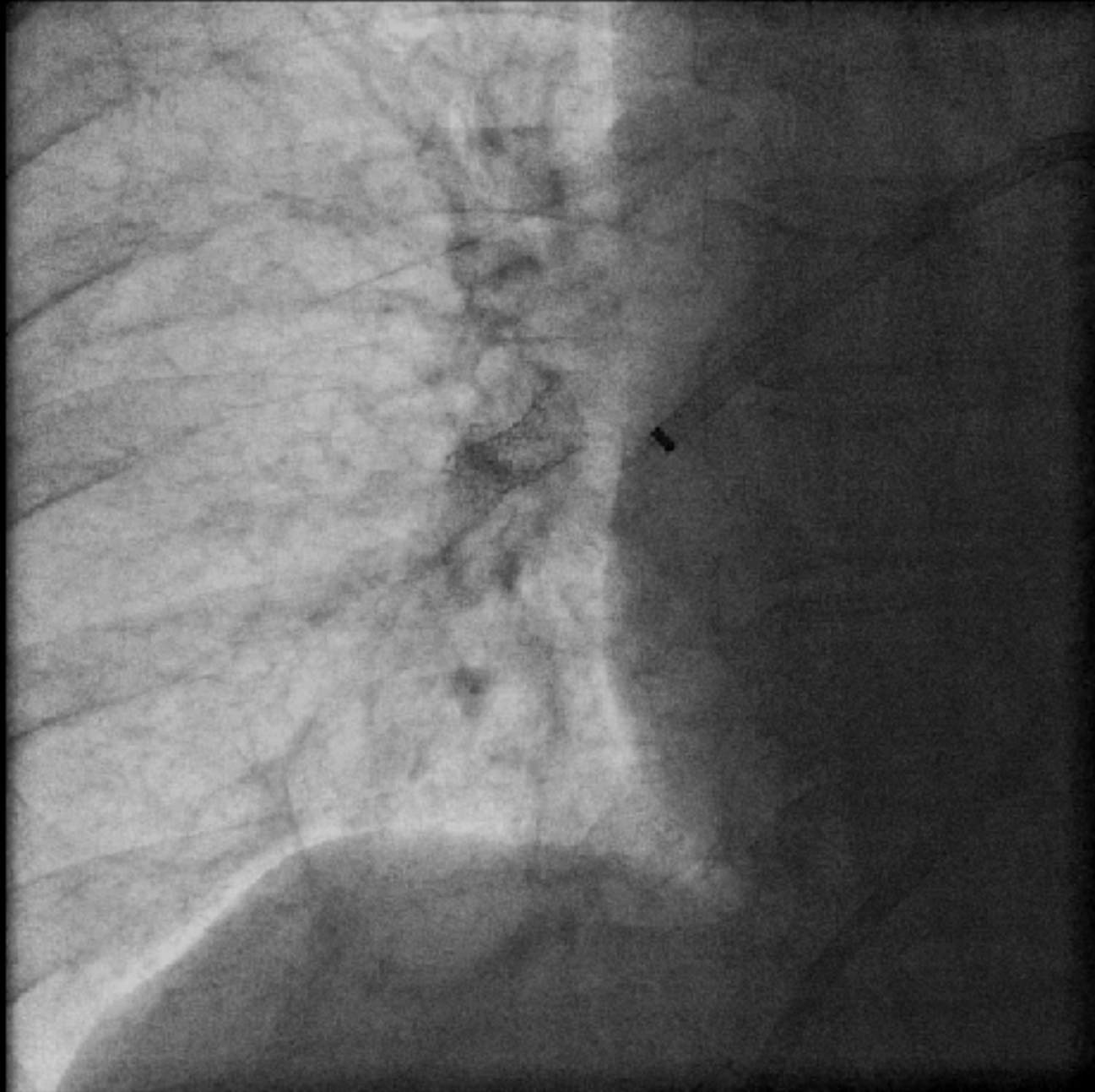


common trunk of left







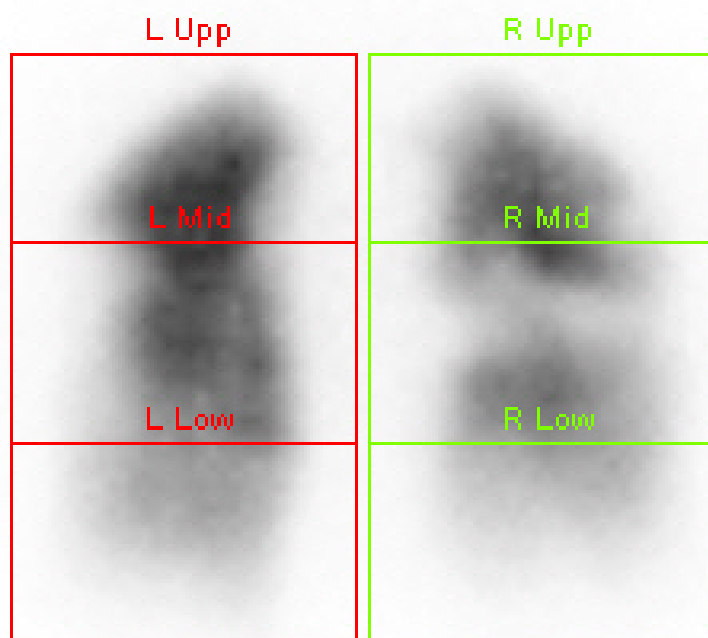


# Outcomes (2 weeks later)

	WHO Fc	6 MWD	TR Vmax
<b>Pre-stenting</b>	III	365 m (90%)	3.9 m/s
<b>Post-stenting</b>	I	384 m (93%)	3.1 m/s (improved RV)

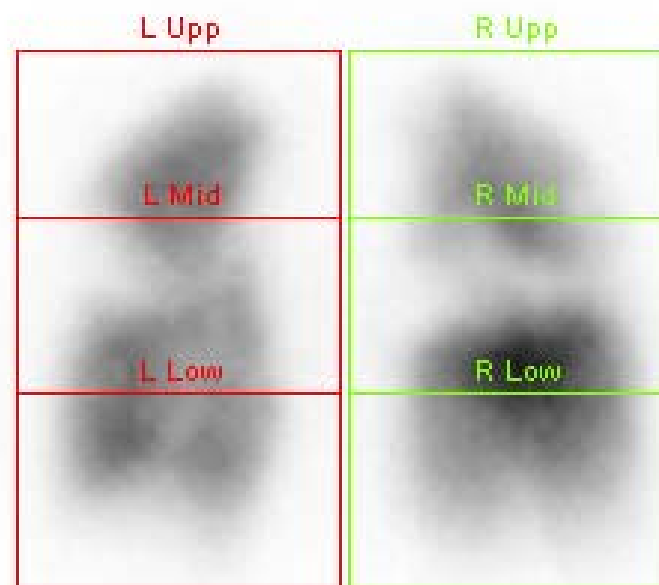
# Perfusion Scan

## Pre-stenting



(% Ratios)	Left	Right
Upper	20.69	18.42
Middle	20.16	25.98
Lower	7.60	7.14
Total	48.45	51.55

## Post-stenting



(% Ratios)	Left	Right
Upper	14.40	13.11
Middle	16.84	28.61
Lower	12.49	14.55
Total	43.74	56.26

# Overall Outcomes

Case	Dyspnea (WHO Fc)		Exercise tolerance (6MWD)		Echocardiography (ePASP)		Perfusion scan
	Pre	Post	Pre	Post	Pre	Post	
<b>1</b>	III	I	520 m (94%)	538 m (93%)	77 mmHg	59 mmHg	Improved in BLL
<b>2</b>	III	II	145 m (89%)	165 m (92%)	59 mmHg	33 mmHg	Improved in RLL
<b>3</b>	III	I	365 m (90%)	384 m (93%)	71 mmHg	48 mmHg (improved RV)	Improved in BLL