CT of congenital heart disease

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MR vs CT in CHD

	MR	CT
Spatial resolution	0.9x1.1x1.2-2.4	0.4x0.4x0.4
Risks	sedation	Radiation
Possible Cx	Immediate desaturation Cyanotic spell Respiratory acidosis Bradycardia, etc	Possible cancer after 10-20 years
Examination time	About 45 min	5-15s
Scheduling	Weeks to months	Hours to days
cost	Expensive	cheaper

Pediatric radiology 2008:438-451

CT > Echo

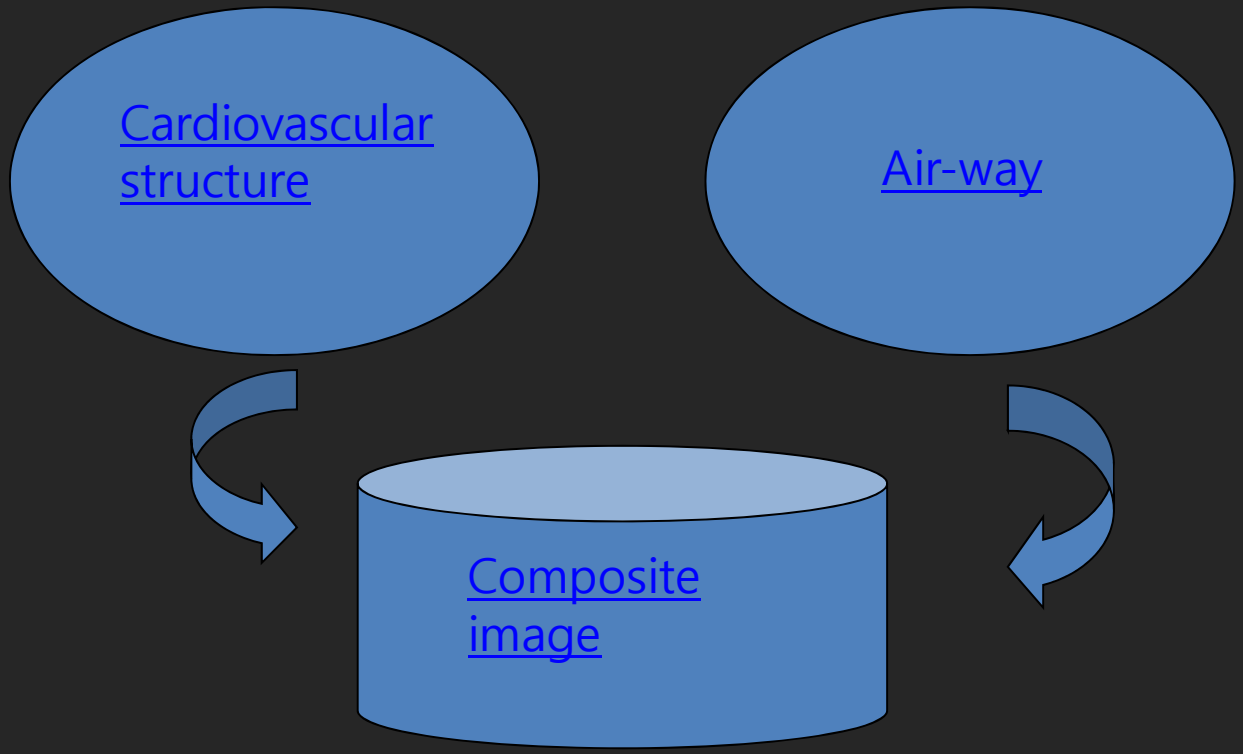
- Great vessels: Aorta , pulmonary artery and vein
- Adult CHD
- Post-surgical F/U- residual stenosis, defect
- Central airway problem: trachea, proximal bronchus
- Intra-cardiac abnormality ?

소아심장과 선생님께서

- Aorta가 좀 가는것 같은데 어때요?
- Pulmonary artery course가 좀 이상한데요? size는 괜찮나요?
- Pulmonary vein의 drain은 어디로 되나요?
- Air way 눌린데는 없나요? Lung은 요?
- BCPS (BT shunt), Fontan pathyway 는 patent 하나요?

Extracardiac anomaly

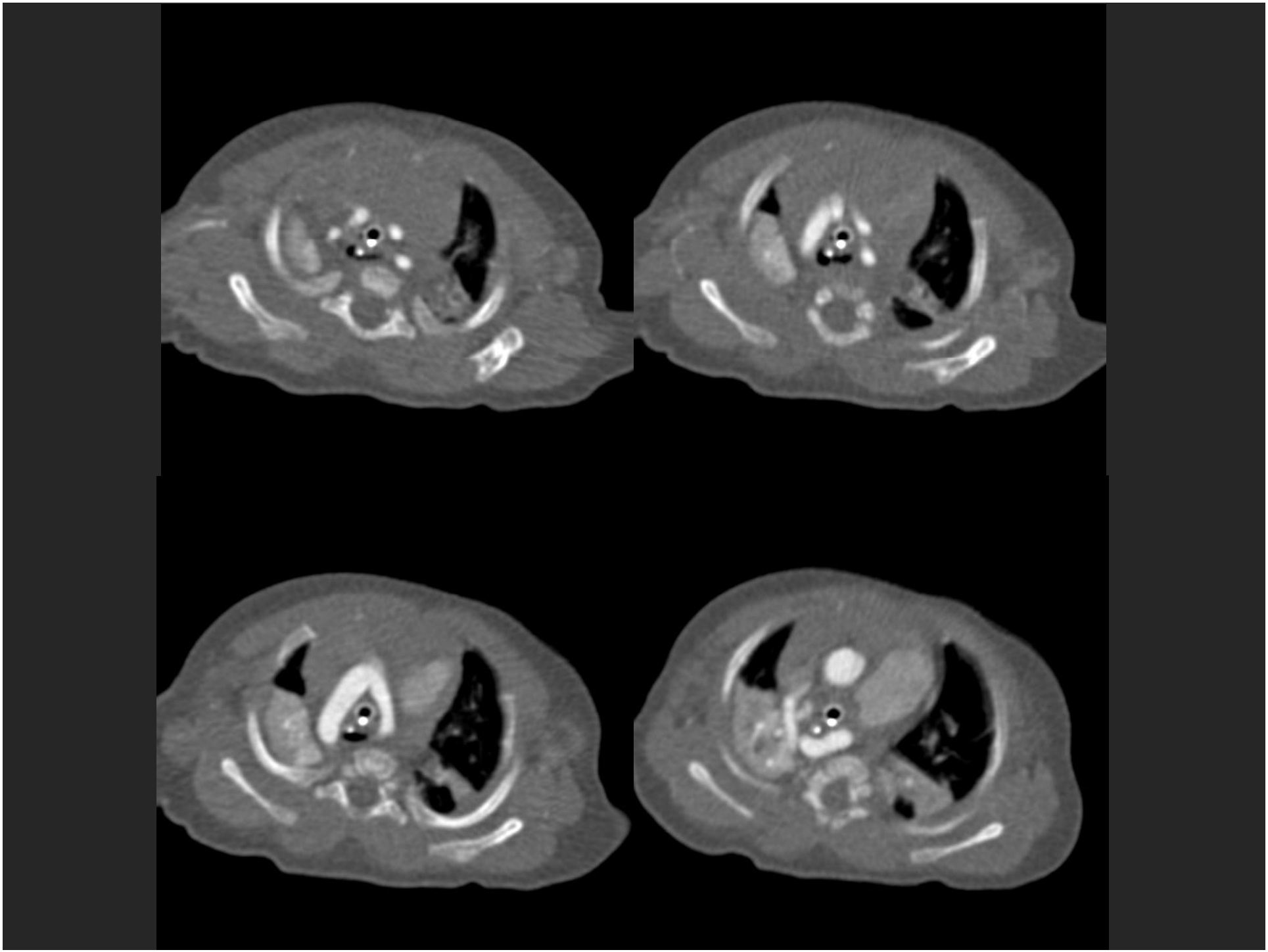
- Arch anomaly
- Pulmonary artery abnormality (ex. Sling)
- Abnormal Pulmonary vein drain (ex. TAPVC)
- Airway problem

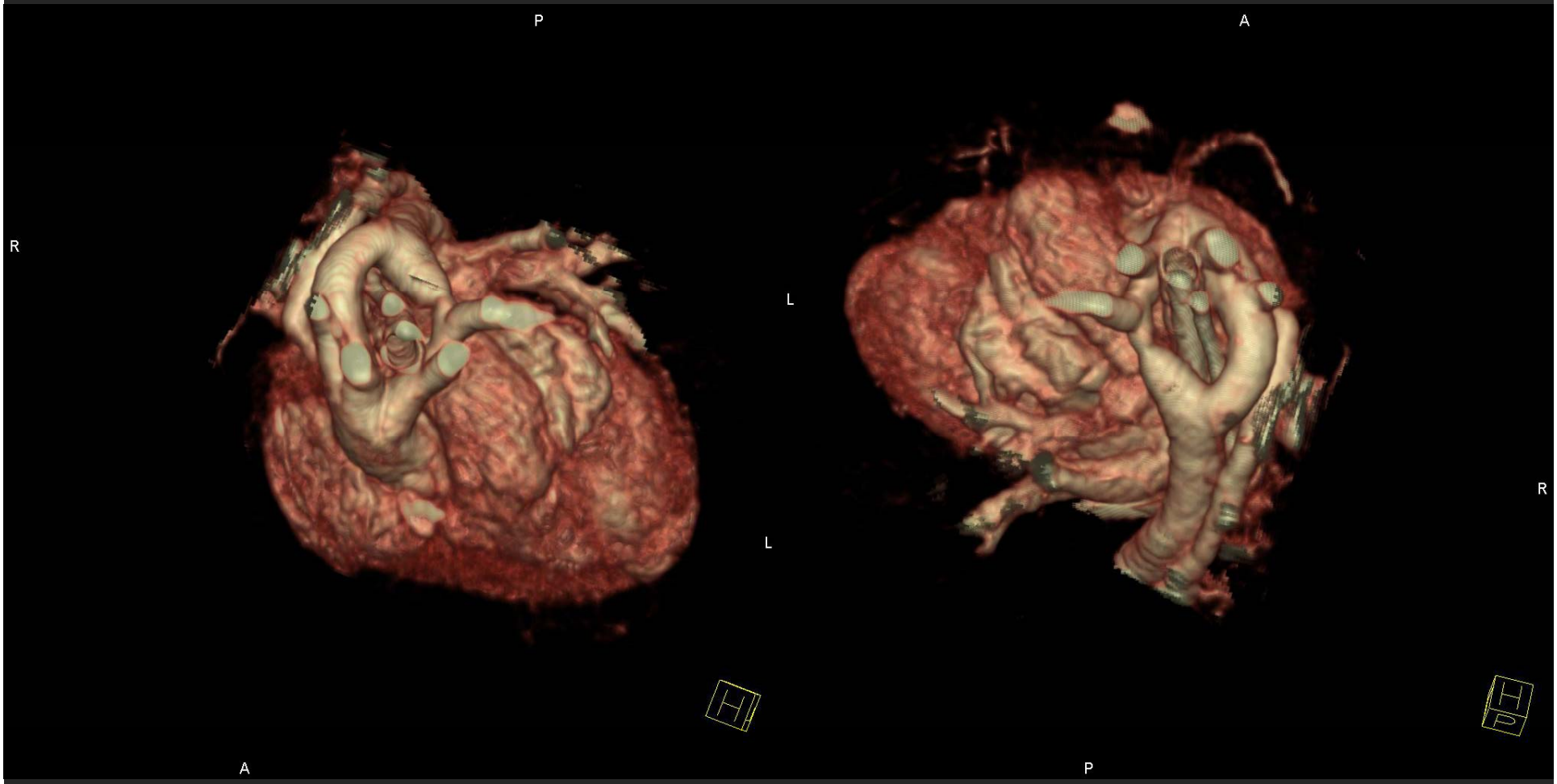


Pediatric radiology 2006 :219-223

Aortic arch anomaly

- A. left aortic arch with aberrant right subclavian artery
- B. right aortic arch with aberrant left subclavian artery
- C. right aortic arch with left descending aorta (circumflex retroesophageal aortic arch)
- D. double aortic arch
- E. persistent fifth aortic arch
- F. isolation of subclavian artery from aorta

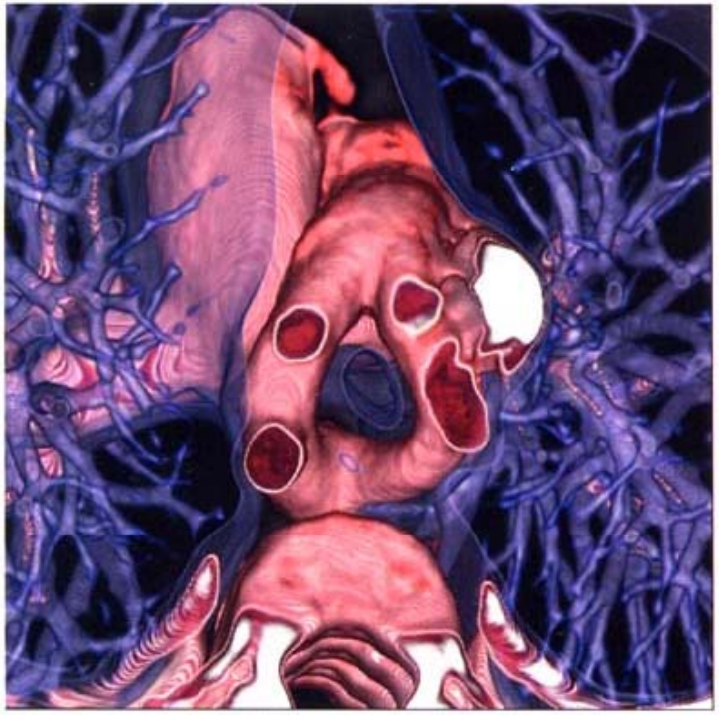


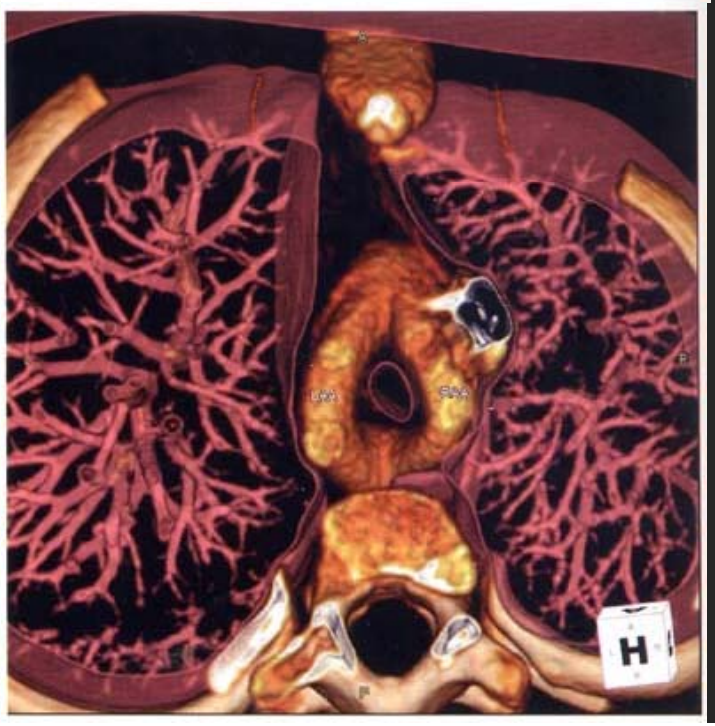


Double aortic arch

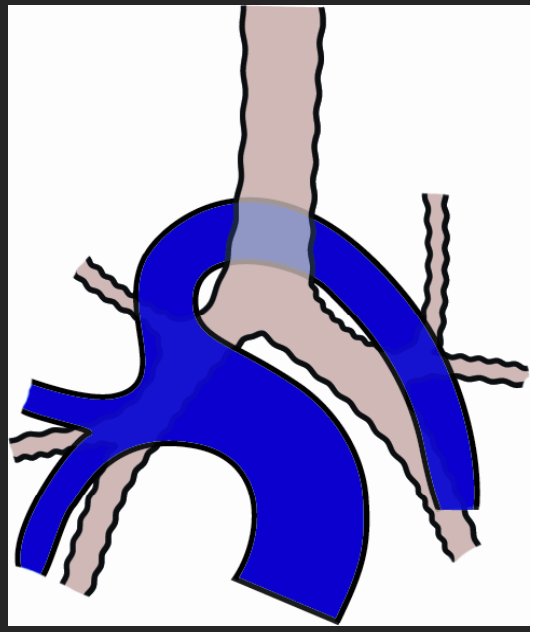

A
L
LPA
RPA
P
H
P

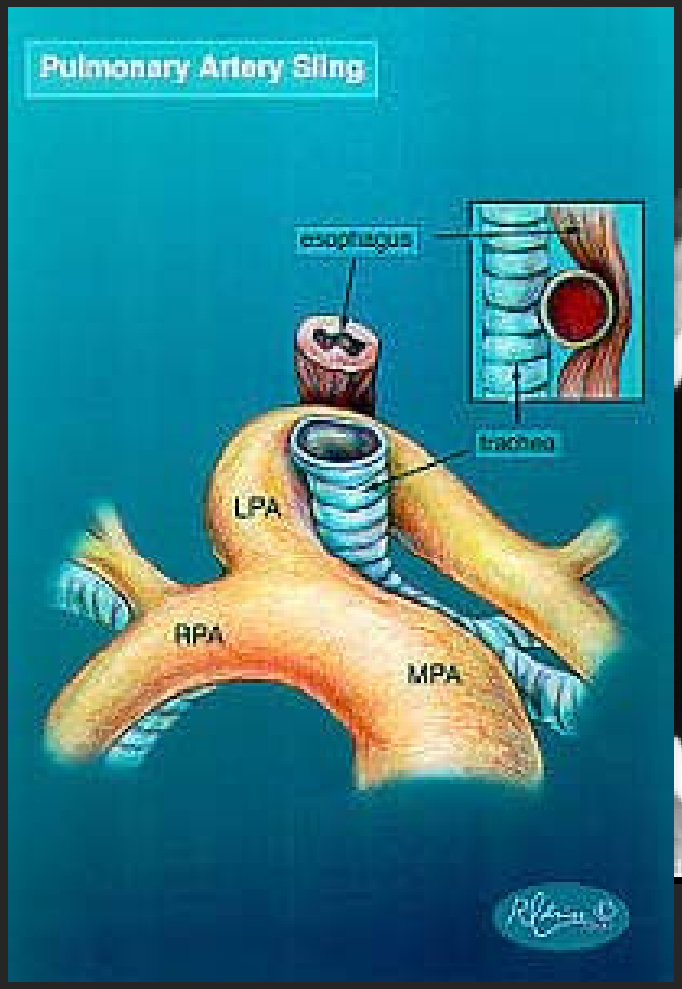

H
RPA
LPA
P

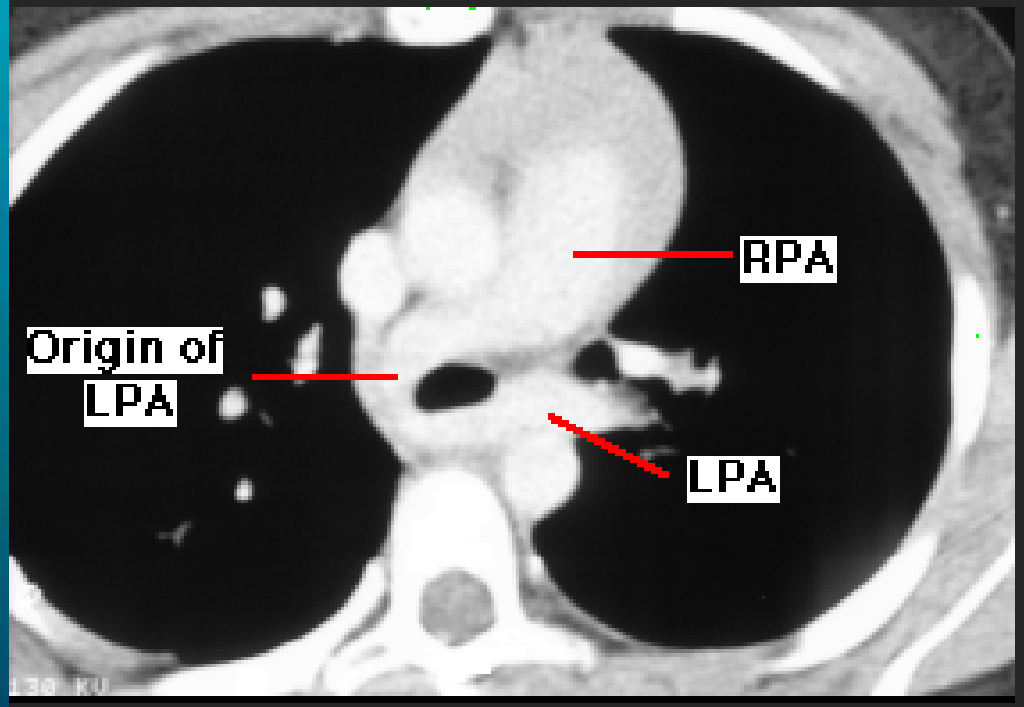



LPA
RPA
H

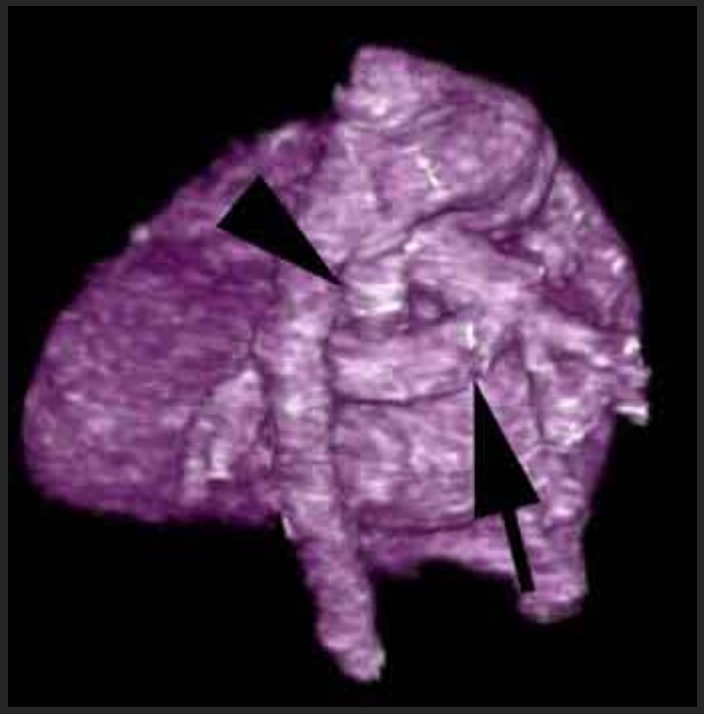
- **Lt. pulmonary artery sling**
  - Anomalous or aberrant left pulmonary artery originate from posterior aspect of right pulmonary artery
  - In classic form, wrap around junction of trachea and right mainstem bronchus to pass in front of esophagus
  - Compression of the lower trachea leads to respiratory symptoms of wheezing and stridor
  - Bronchial compression causes air trapping, pneumonia, and atelectasis

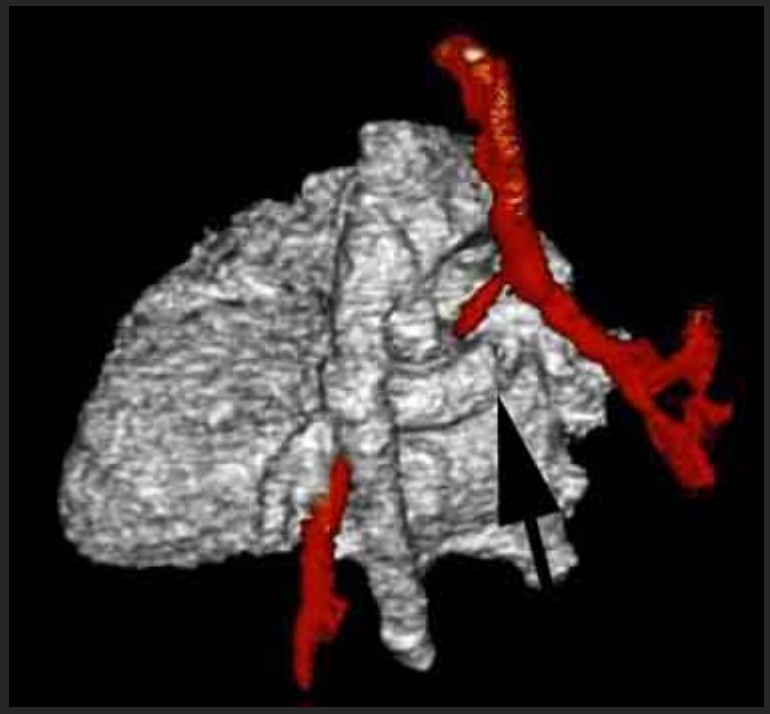



Pulmonary Artery Sling
esophagus
trachea
LPA
RPA
MPA


RPA
Origin of
LPA
LPA

Subcarinal sling

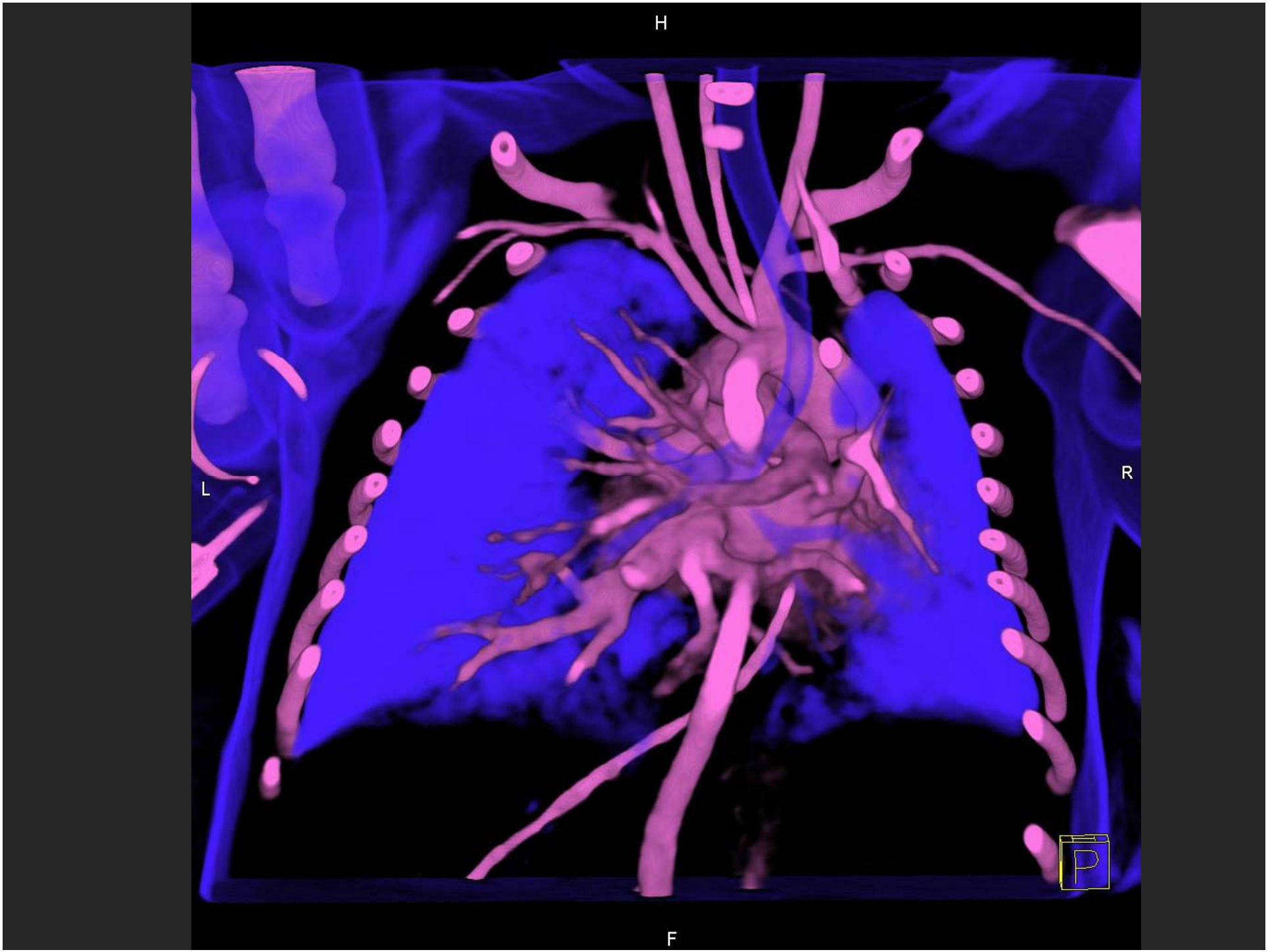




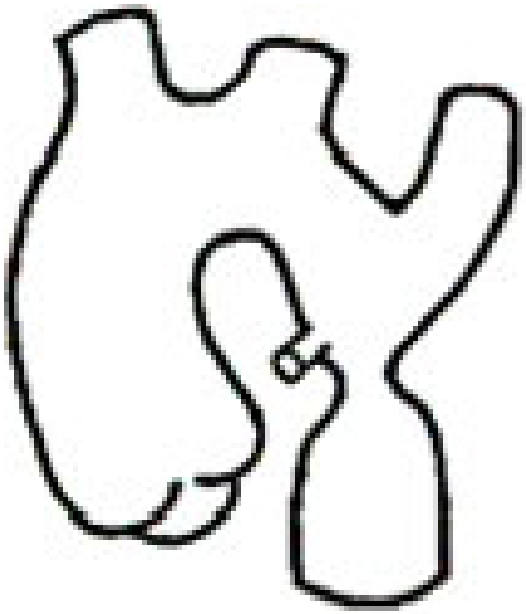
Airway anomalies

- Tracheal bronchus
- Bridging bronchus
- Cardiac bronchus
- TEF
- Congenital tracheal stenosis
- Bronchial atresia
- Atrial isomerism


Lt.


H
L
R
P
F

Coarctation of the aorta



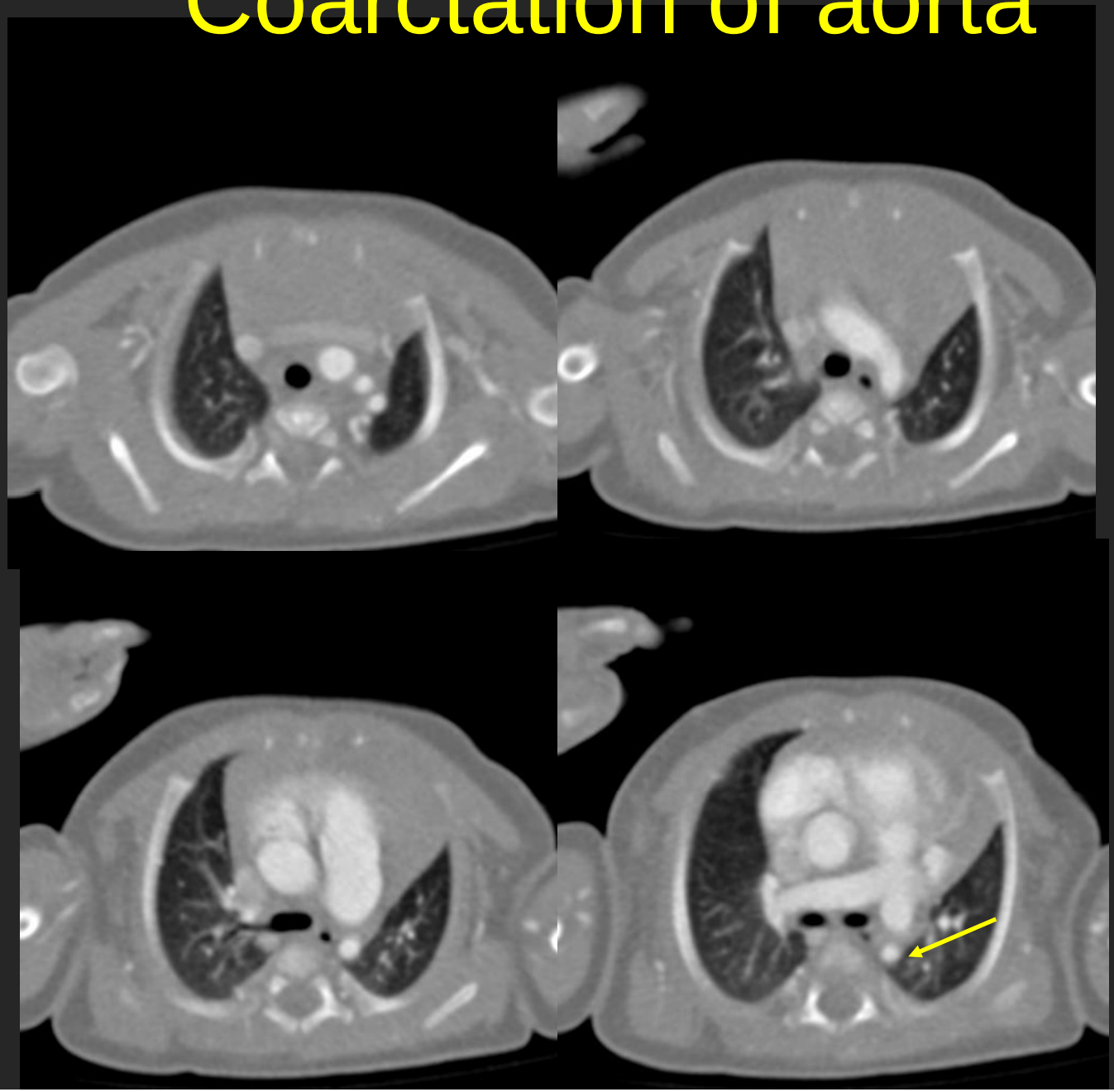
Juxtaductal type

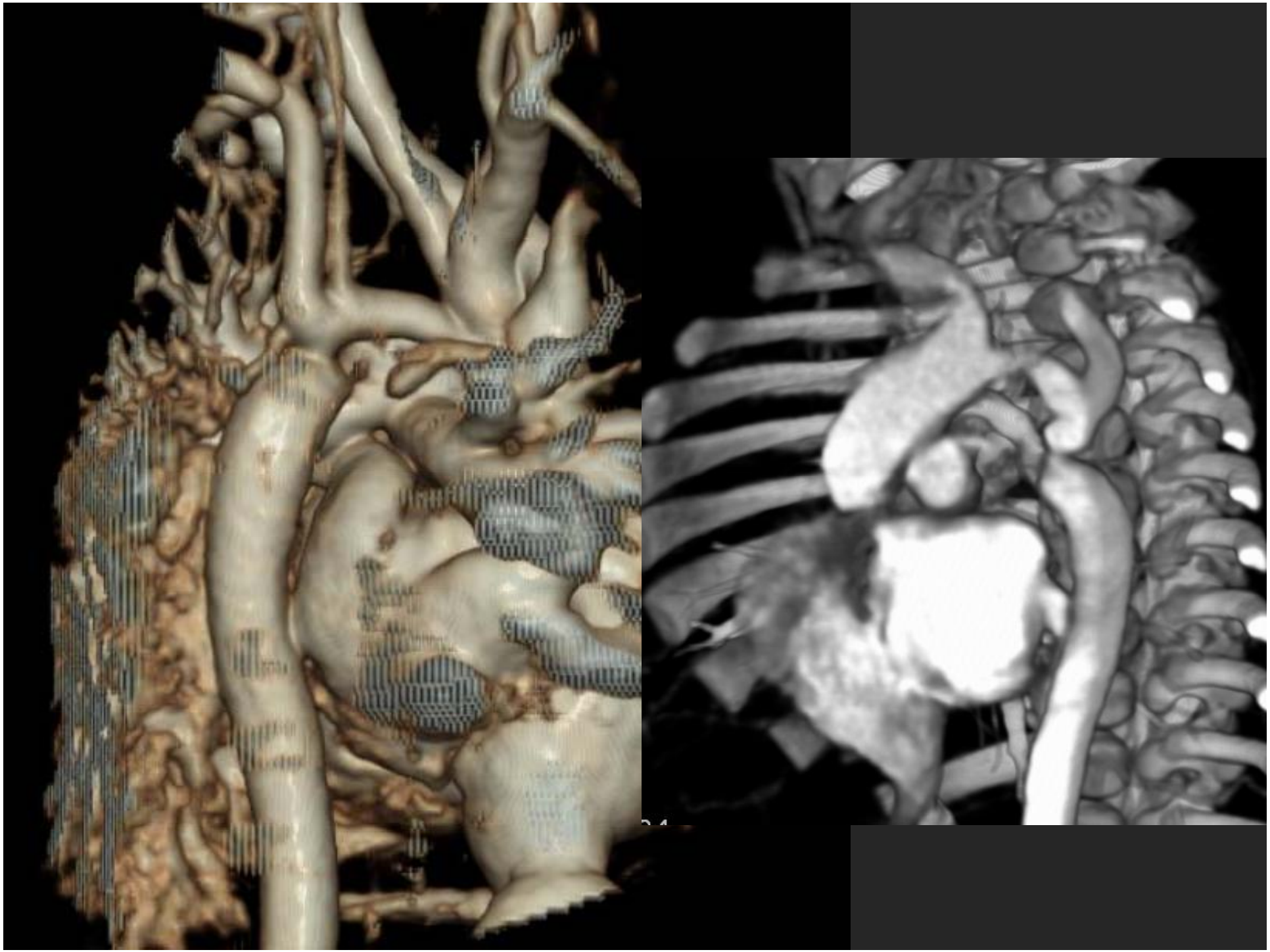
=postductal type

tubular hypoplasia

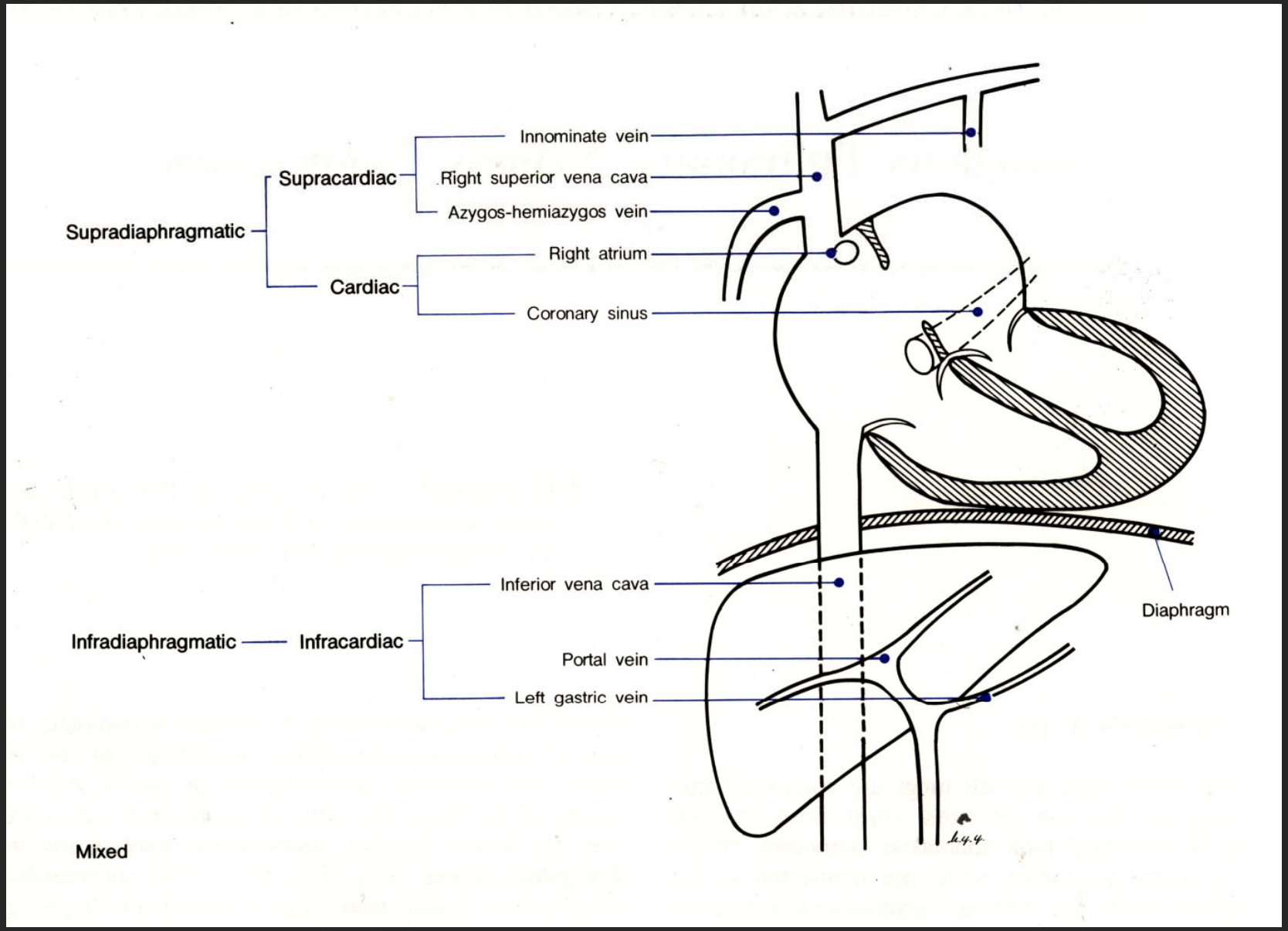
=preductal type

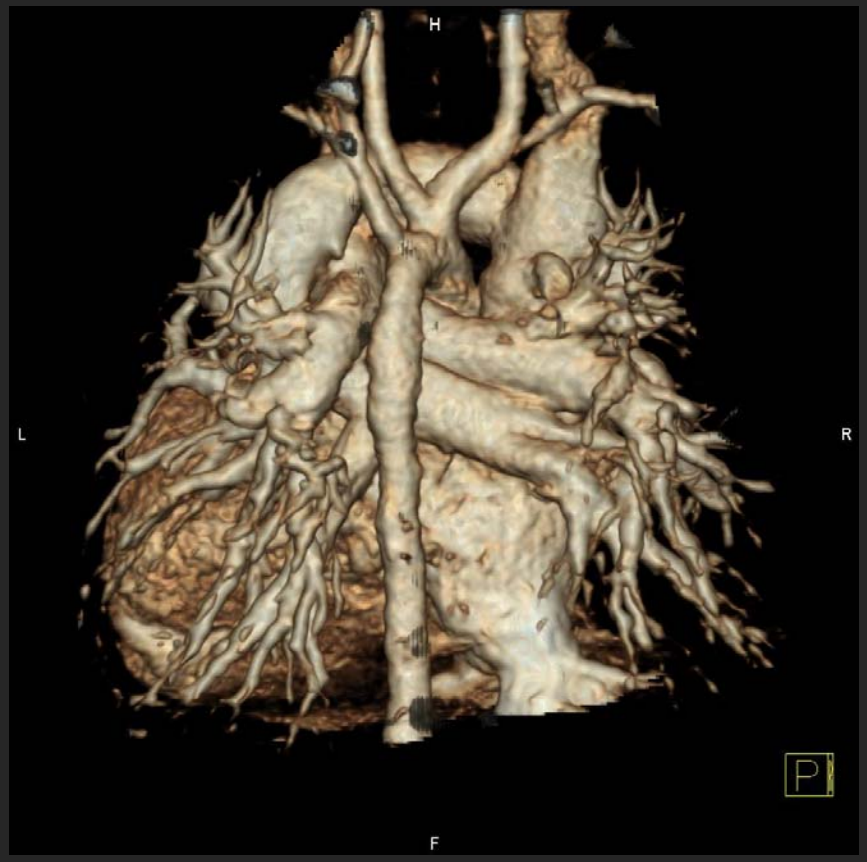
Coarctation of aorta

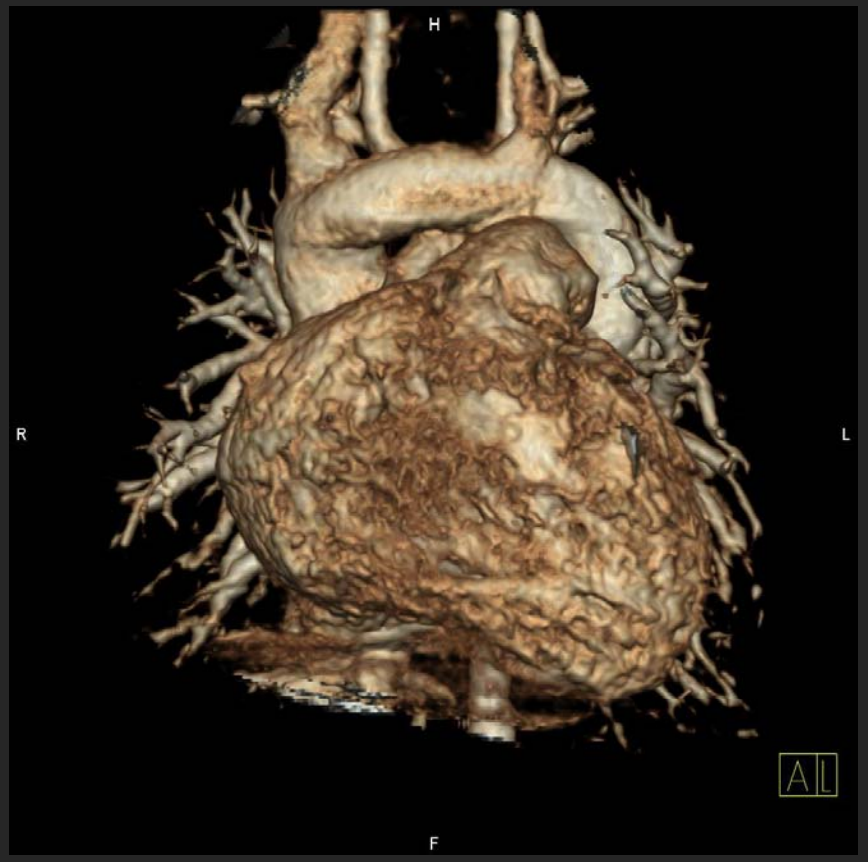


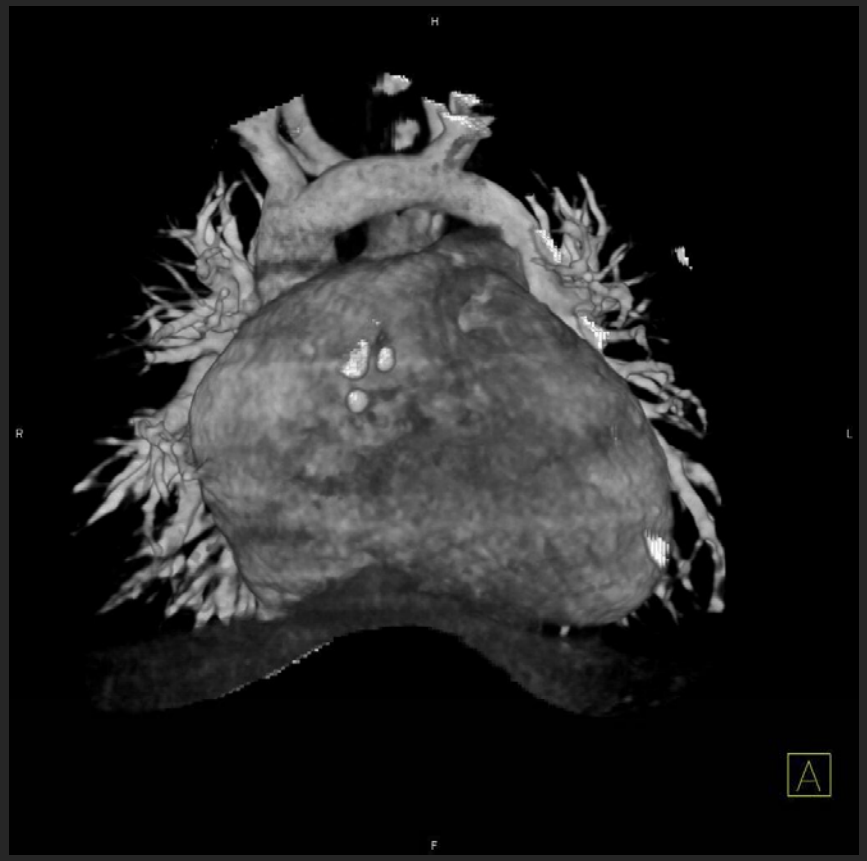


TAPVC


Innominate vein
Supracardiac
Right superior vena cava
Azygos-hemiazygos vein
Supradiaphragmatic
Right atrium
Cardiac
Coronary sinus
Inferior vena cava
Diaphragm
Infradiaphragmatic
Infracardiac
Portal vein
Left gastric vein
Mixed

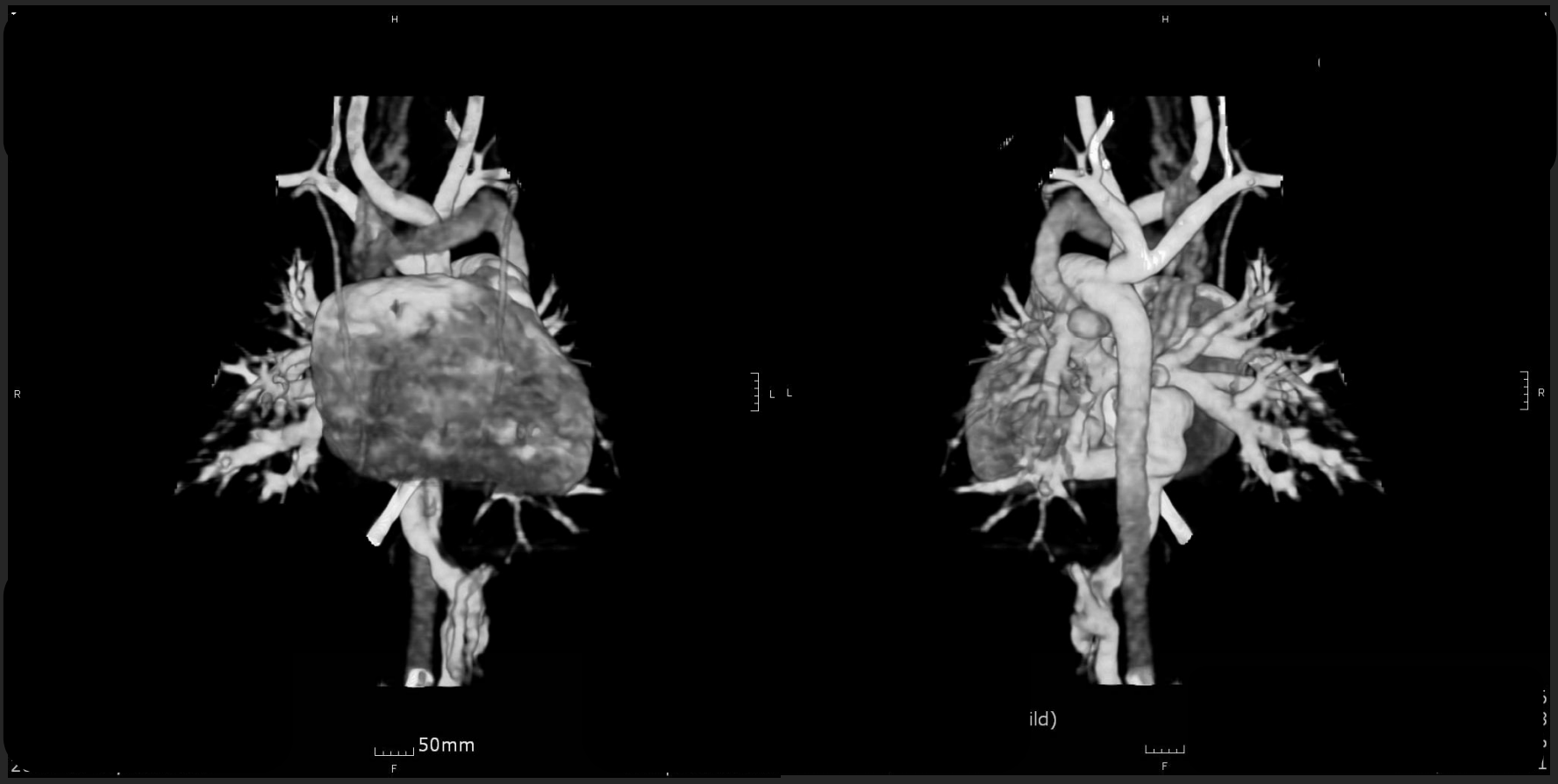

H
L
R
P
F


H
R
L
AL
F


H
R
L
A
F


H
L
R
P
F

TAPVC



TAPVC

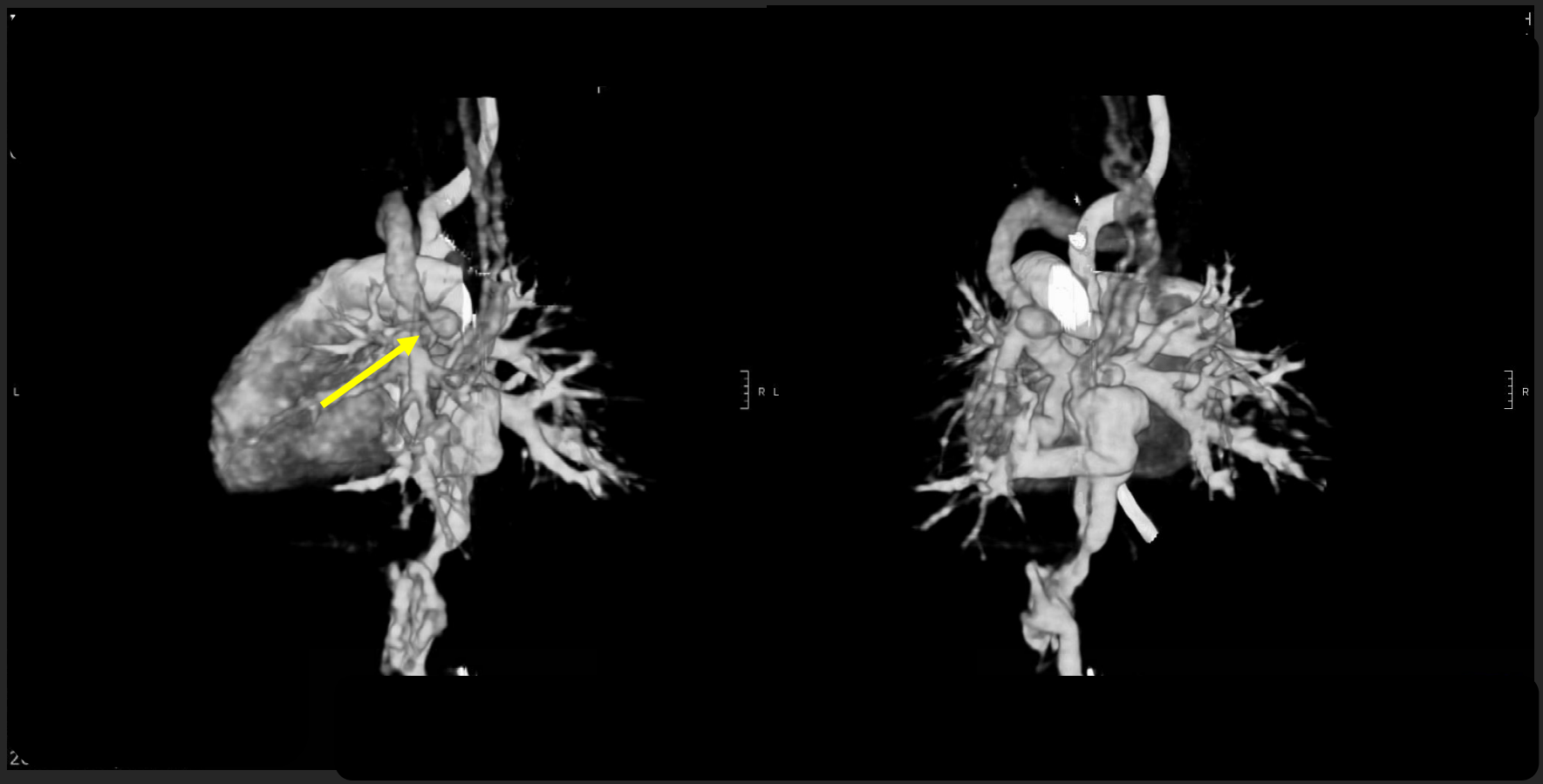
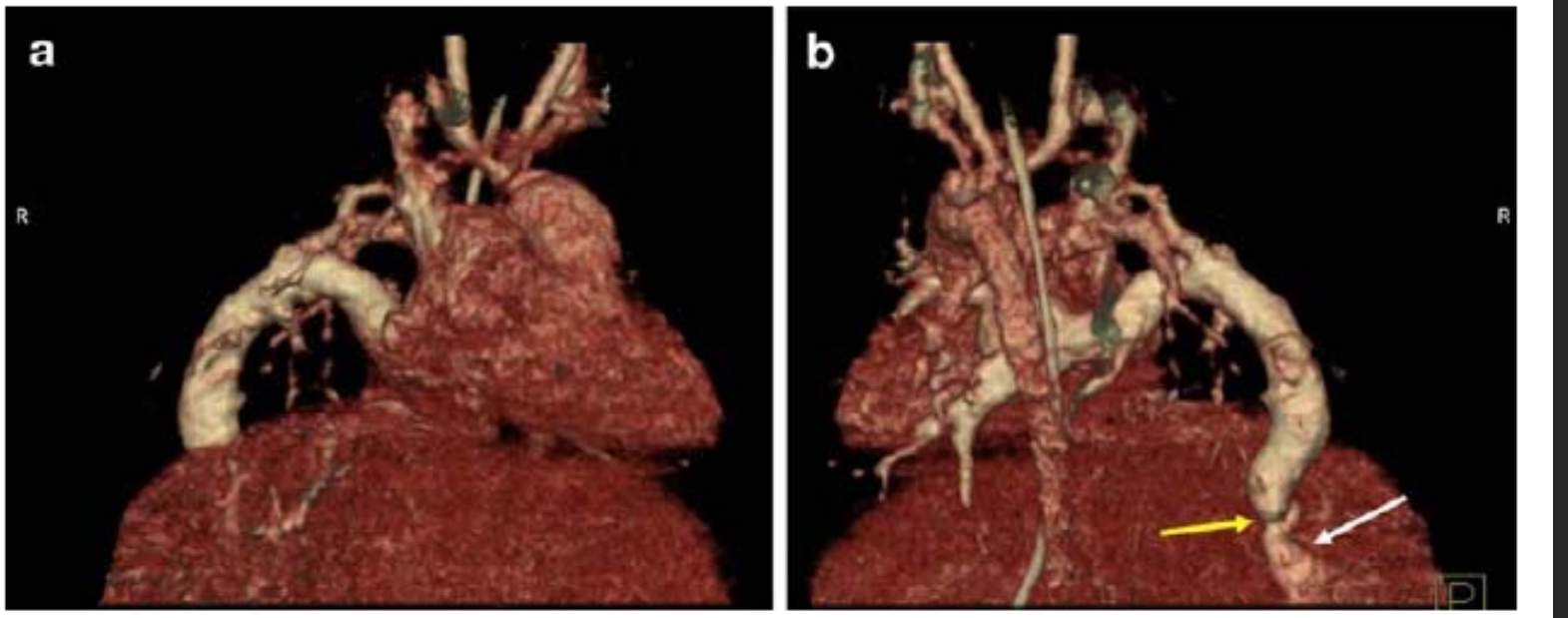


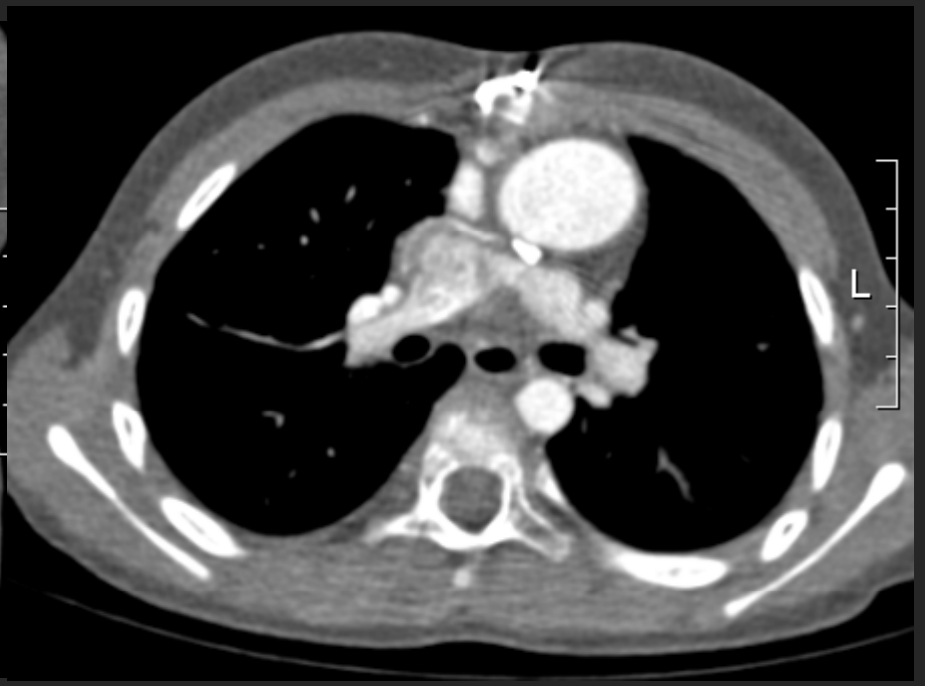
Table 1 Comparison of echocardiography and MDCT in evaluation of TAPVC

Finding	Echocardiography	MDCT	Surgery	*P* value
Drainage site of the common pulmonary vein	20	23	23	0.233
Stenosis of the vertical vein	4	7	7	0.192
Atypical vessel into the systemic vein in the case of vertical vein stenosis	0	1	1	1



Pediatric radiology 2009 :950-954

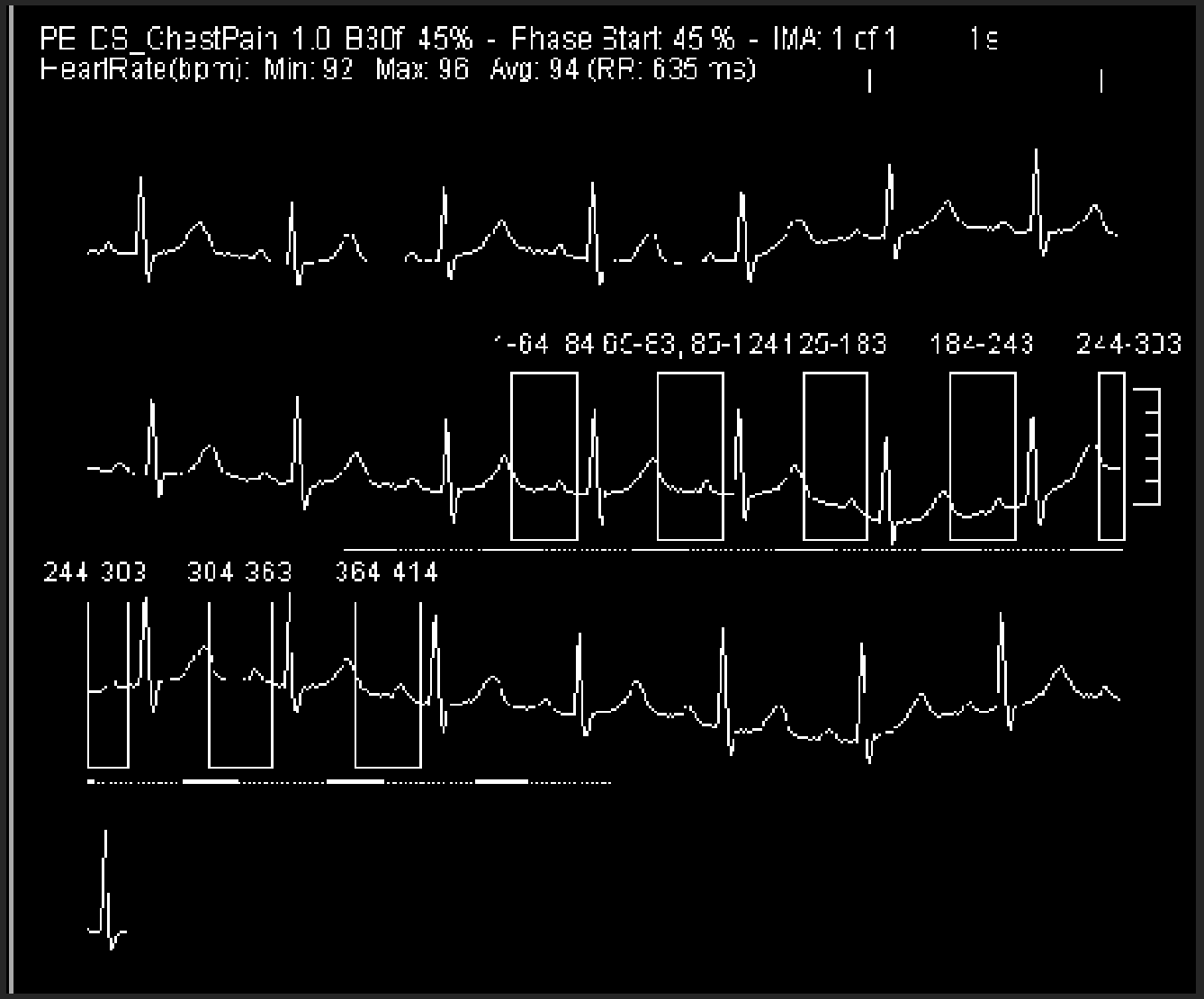
S/P TCPC



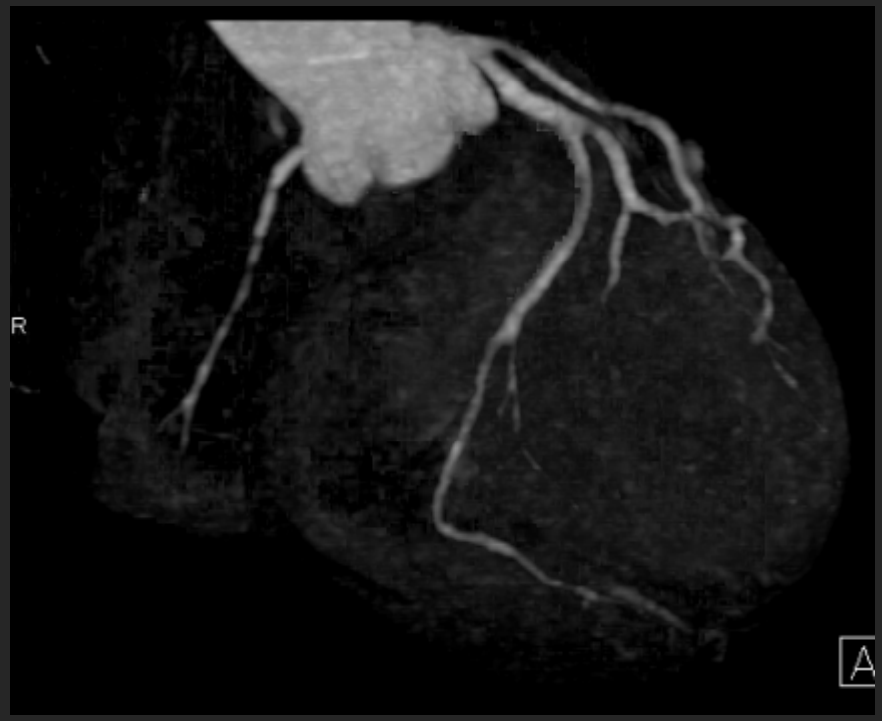
ECG synchronization

- Retrospective ECG gated spiral scan
- Prospective ECG-Triggered sequential scan
- Combo CT scan
- -> Non ECG spiral scan + prospective ECG-triggered sequential scan

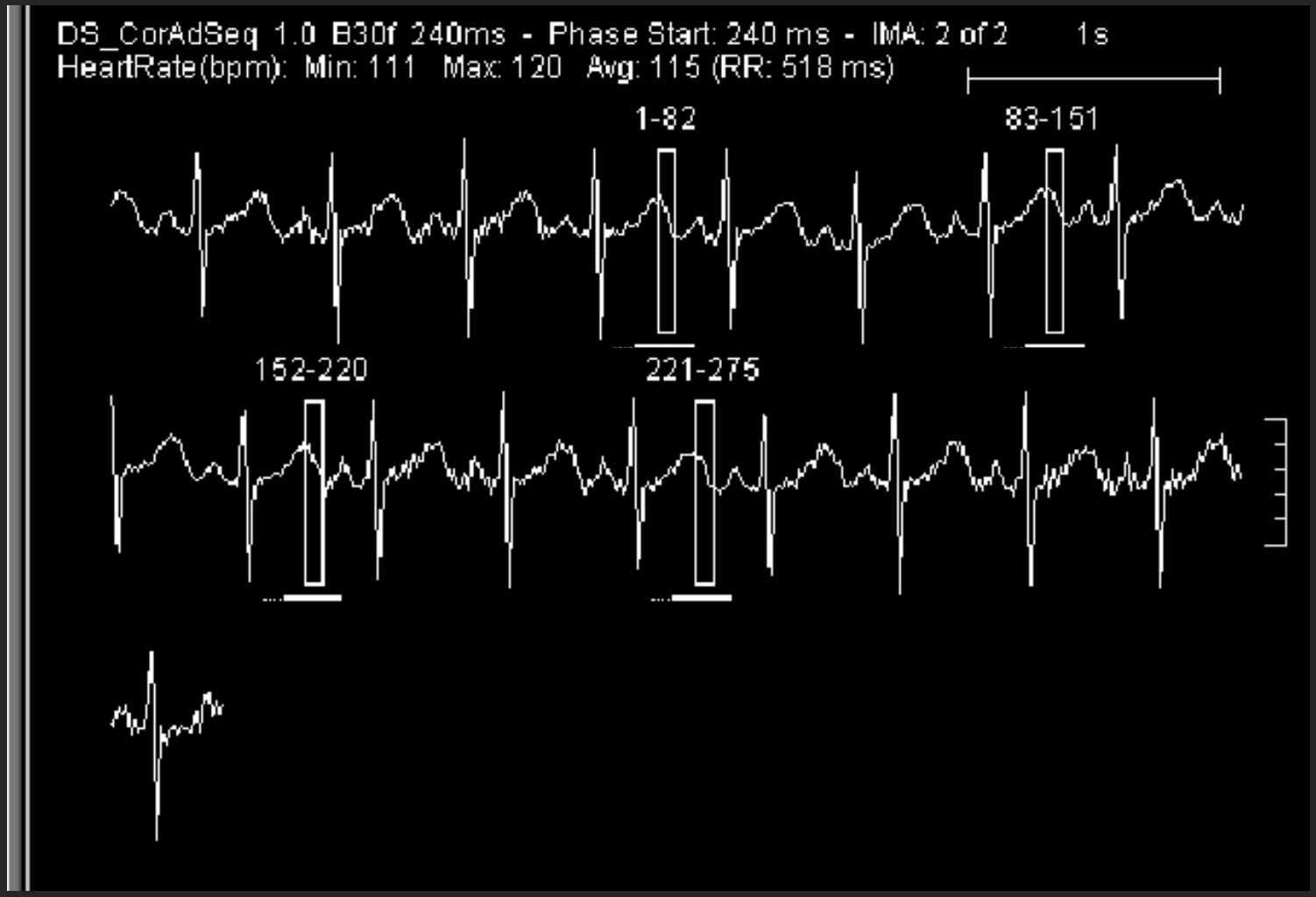
Retrospective ECG gated spiral scan

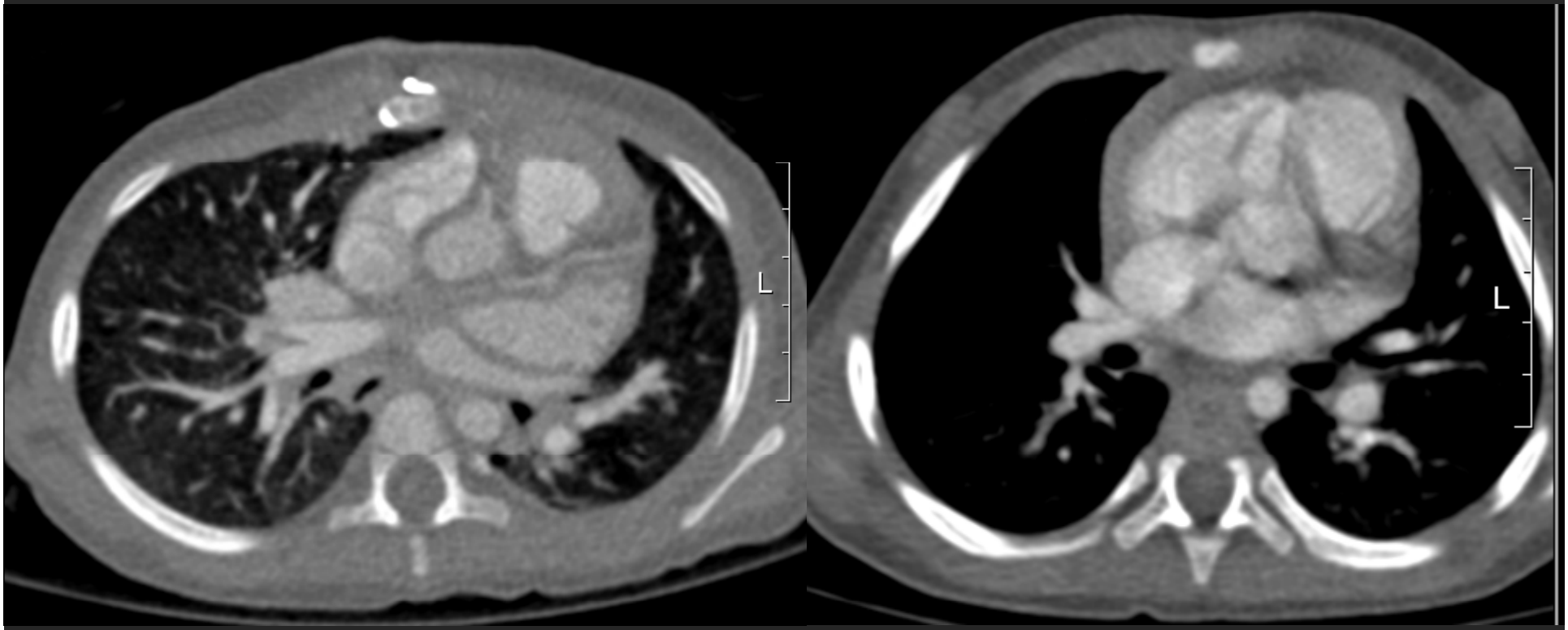


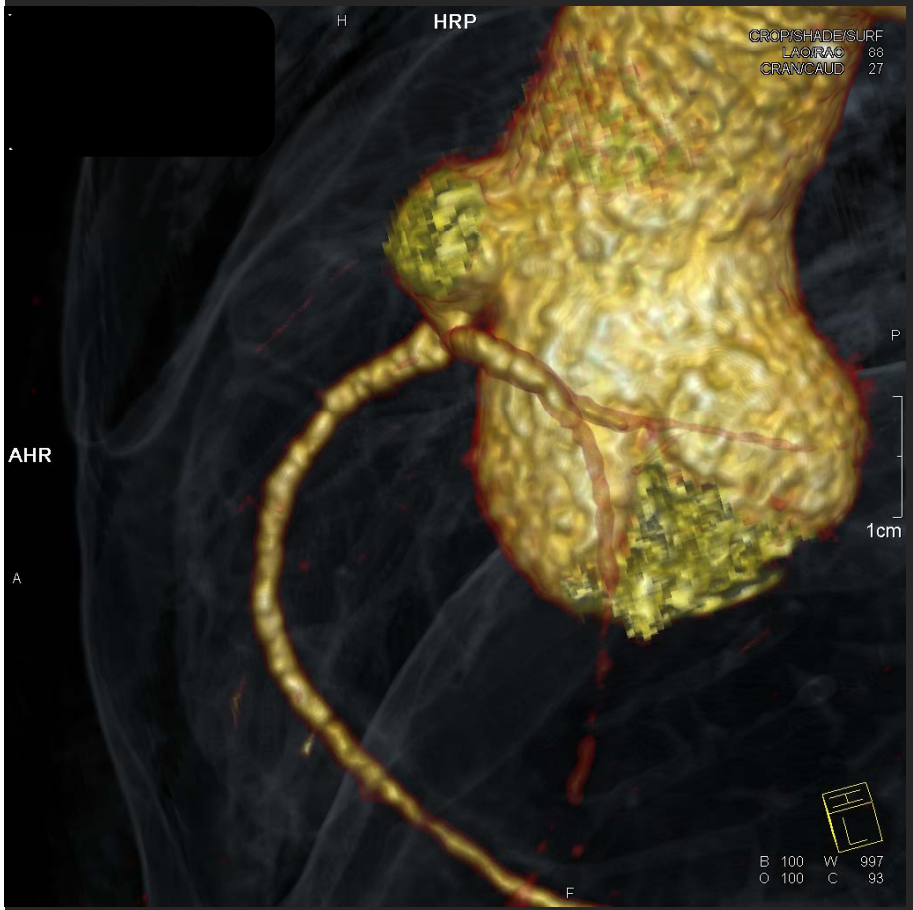
S/P CoA correction

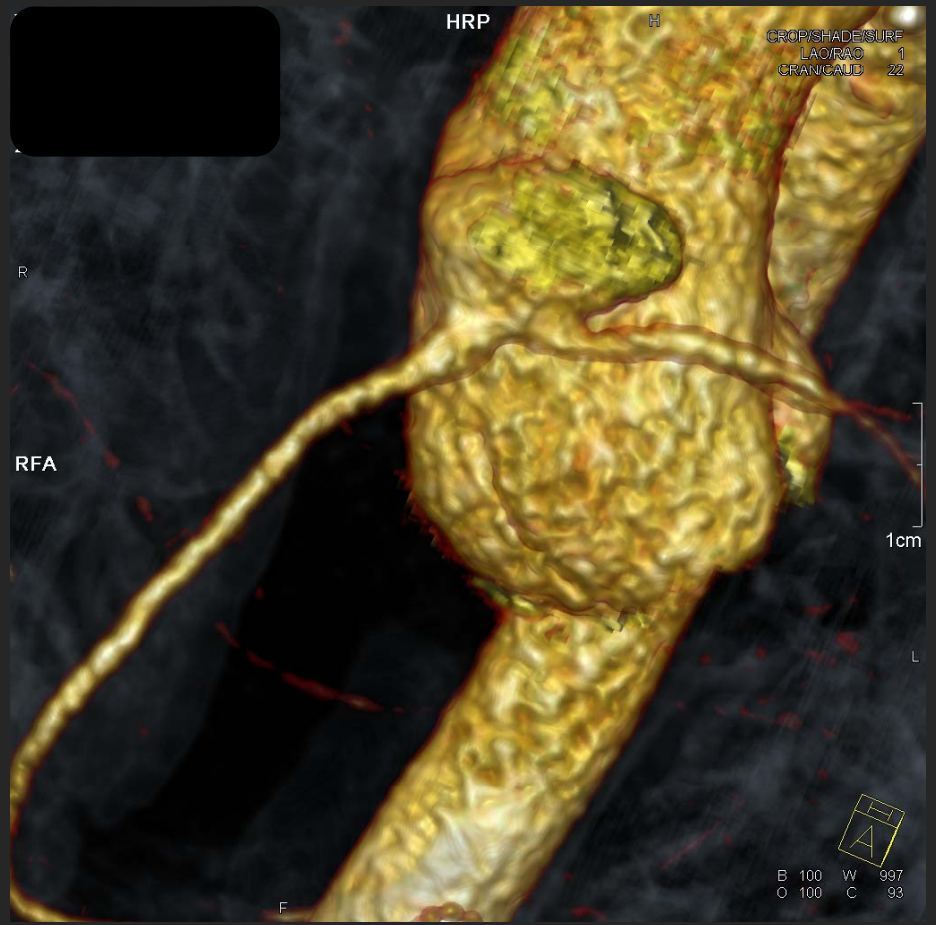


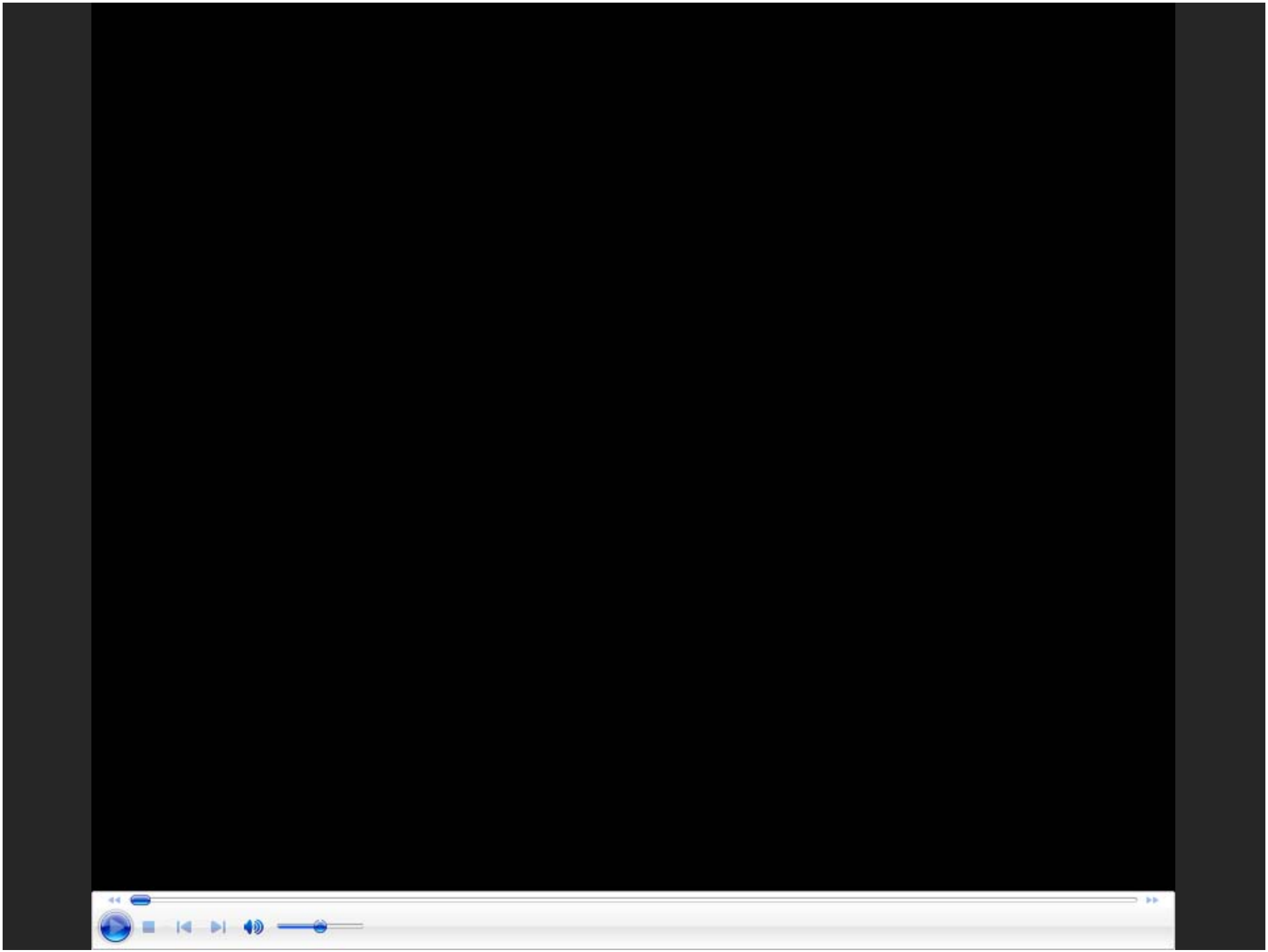
Prospective ECG-Triggered sequential scan

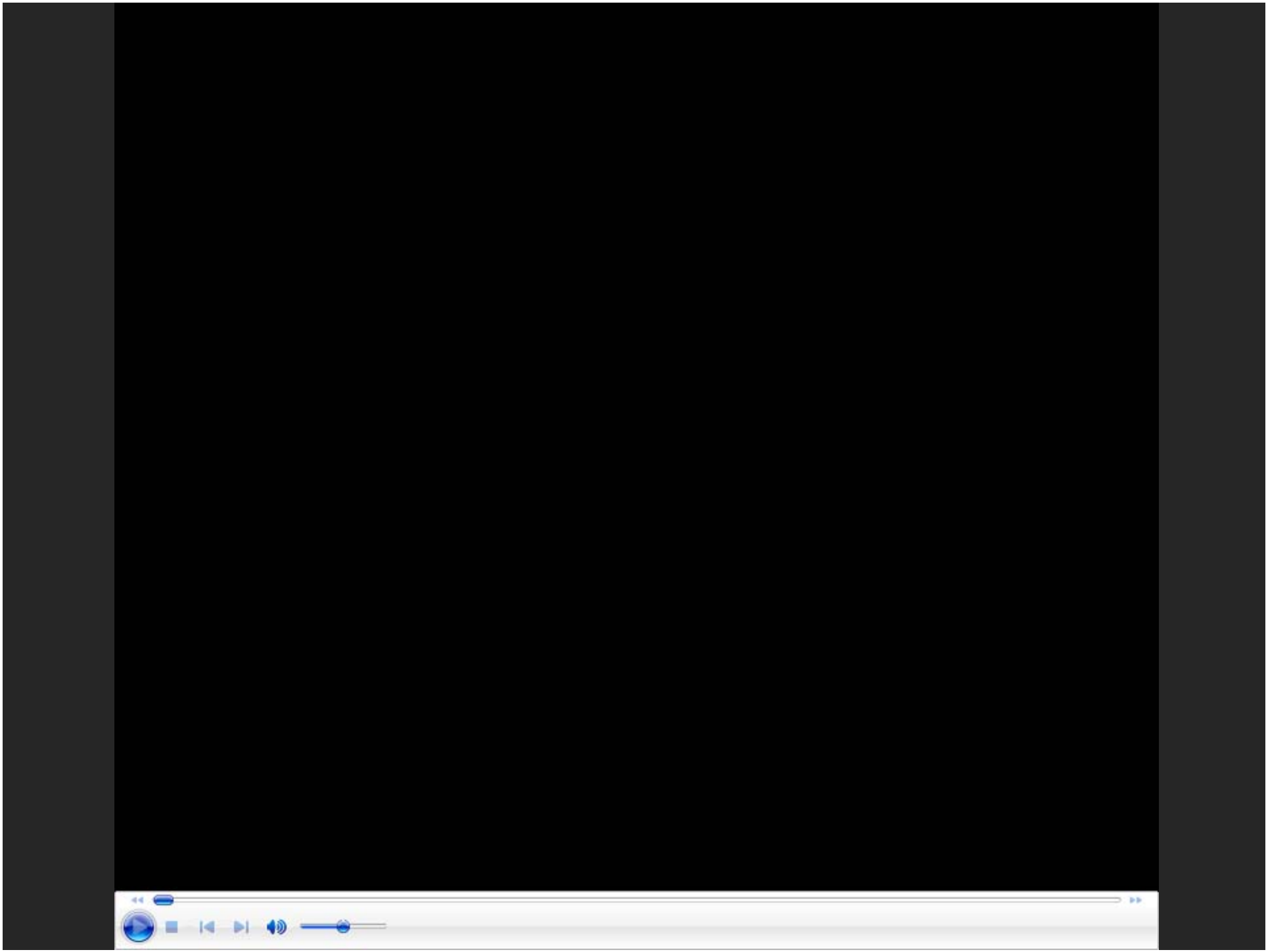



L
L

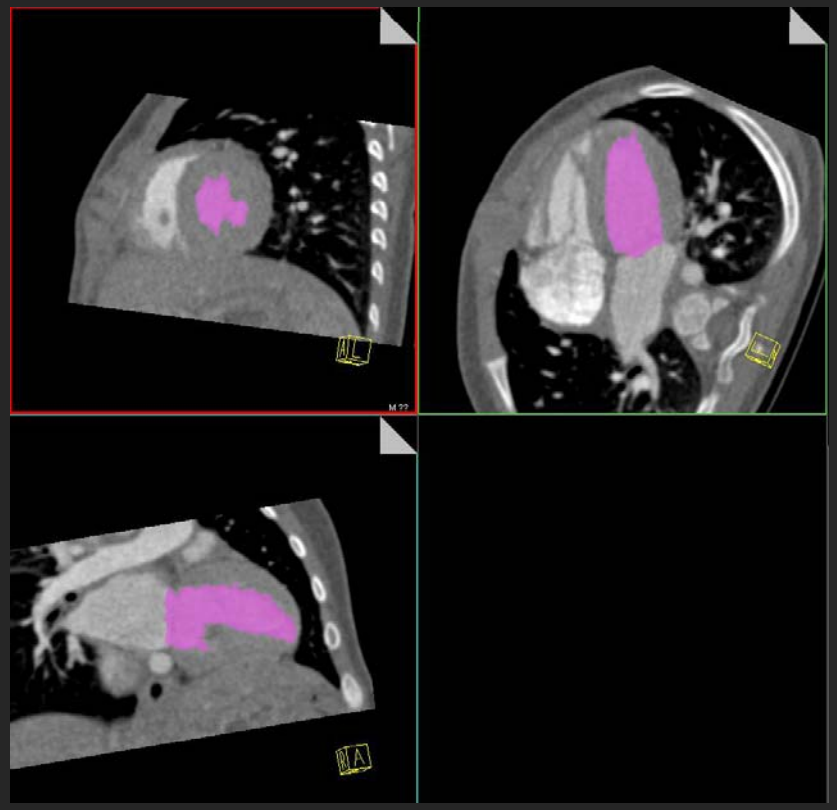

H
HRP
CROP/SHADE/SURF
LAO/RAO 88
CRAN/CAUD 27
P
AHR
1cm
A
B 100 W 997
O 100 C 93
F

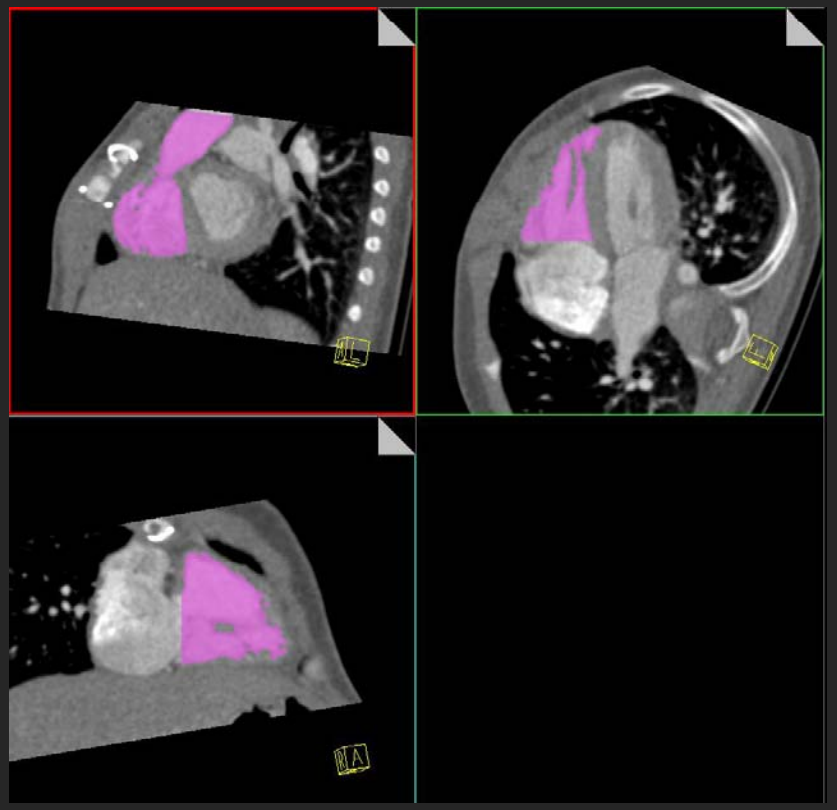

HRP
H
CROP/SHADE/SURF
LAO/RAO 1
CRAN/CAUD 22
R
RFA
1cm
L
A
B 100 W 997
O 100 C 93
F





LV and RV function





IV injection

- Concentration and amount of iodinated contrast agent
- Empiric vs bolus tracking vs test injection
- Bi-phasic (100%-saline) vs Tri-phase (100%-50%-saline)
- Site-arm, leg, umblical
- S/P BCS, TCPS etc

Radiation dose

- Optimal kVp and mAs-> depending on body weight
- Tube current modulation
  - ECG correlation and attenuation correlation
- Optimal ECG Pulsing
- Cardiac filter
- 3 D noise reduction kernel

New boron

- Non-ECG gating in Single 128 MDCT
- -> 0.13- 0.5 mSv
- ECG gating (prospective)-> in dual 128 MDCT
- -> 0.68-1.3 mSv

Conclusion

- MDCT can provide accurate morphologic as well as functional data at now although MDCT have several limitation
- Radiologist and clinician should familiarize advantage and disadvantage of MDCT