

Le Cardiopatie congenite: Tecniche di studio



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Tecniche di Imaging delle Cardiopatie congenite mediante MRI

Adulti vs Pediatrici

ADULT CMR

TISSUE CHARACTERIZATION

INDUCIBLE ISCHEMIA TESTING

FUNCTIONAL ASSESSMENT

ANATOMIC ASSESSMENT



CHD CMR

FUNCTIONAL ASSESSMENT

ANATOMIC ASSESSMENT

TISSUE CHARACTERIZATION

INDUCIBLE ISCHEMIA TESTING

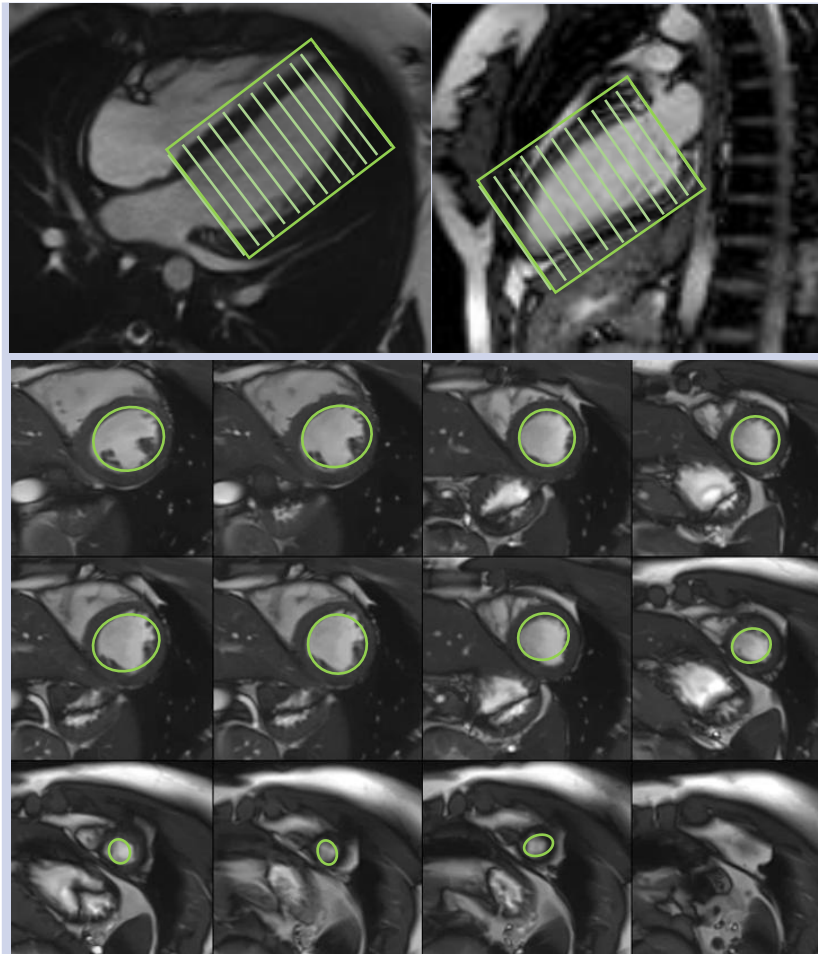


Potenziale della RM Cardiaca

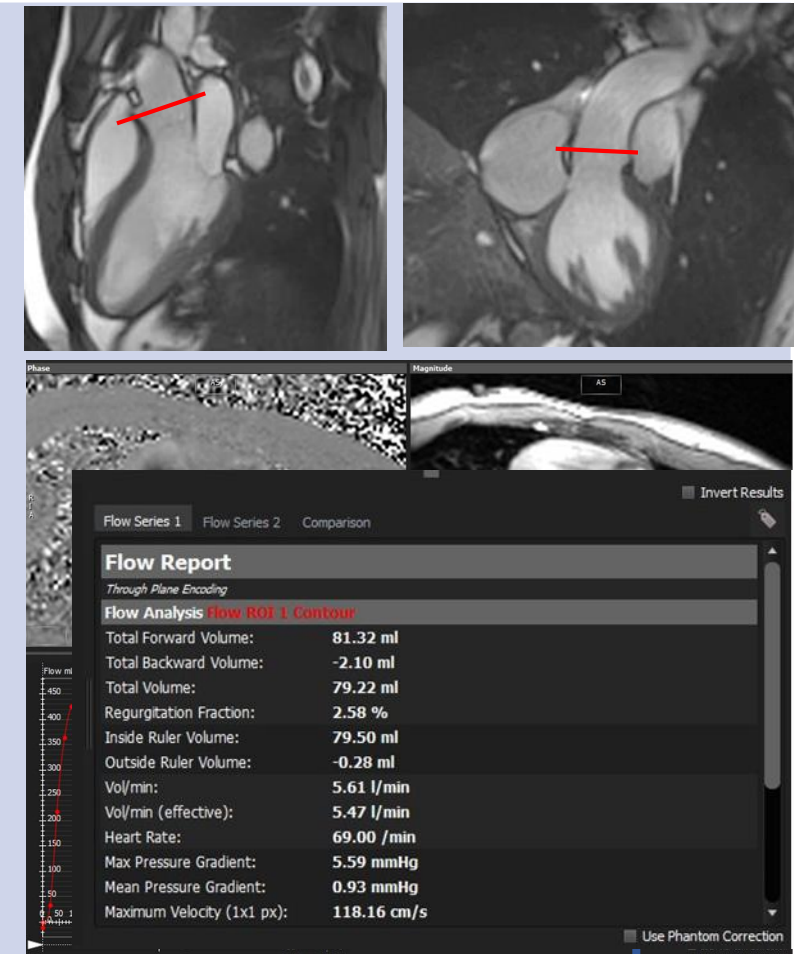
HIGH SPATIAL RESOLUTION IMAGING



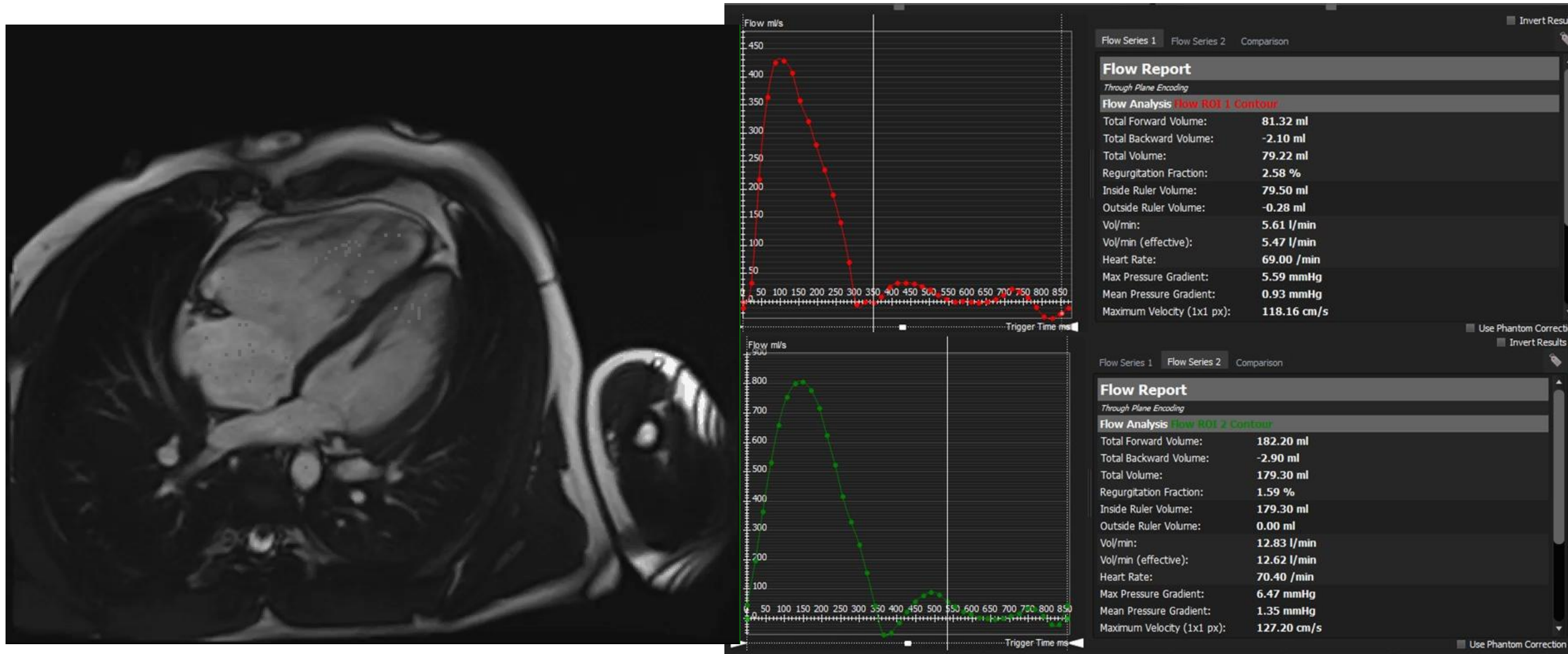
MYOCARDIAL FUNCTION ASSESSMENT REGARDLESS VENTRICLE MORPHOLOGY



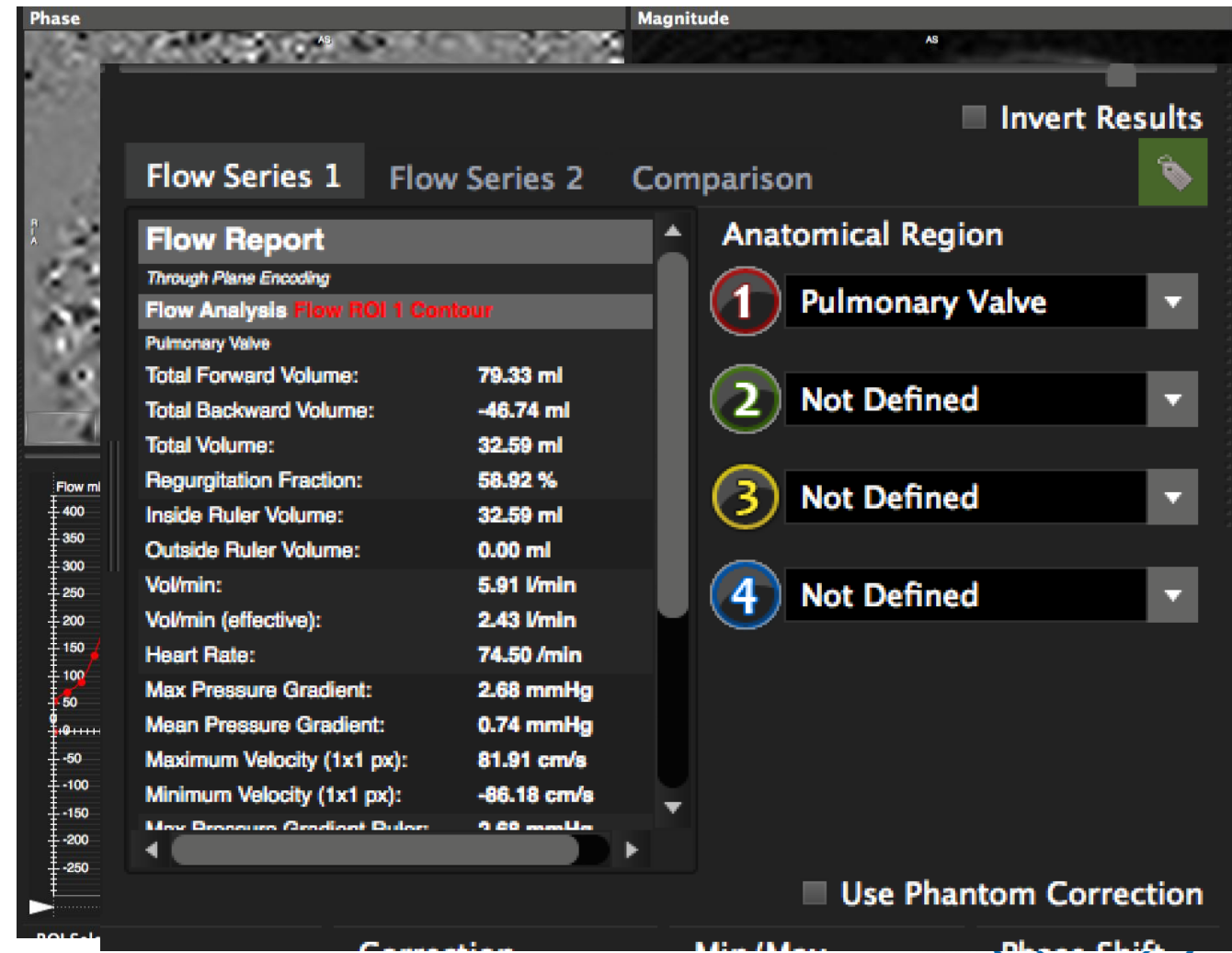
FLOW QUANTIFICATION



Volumi e Frazione del sinistro

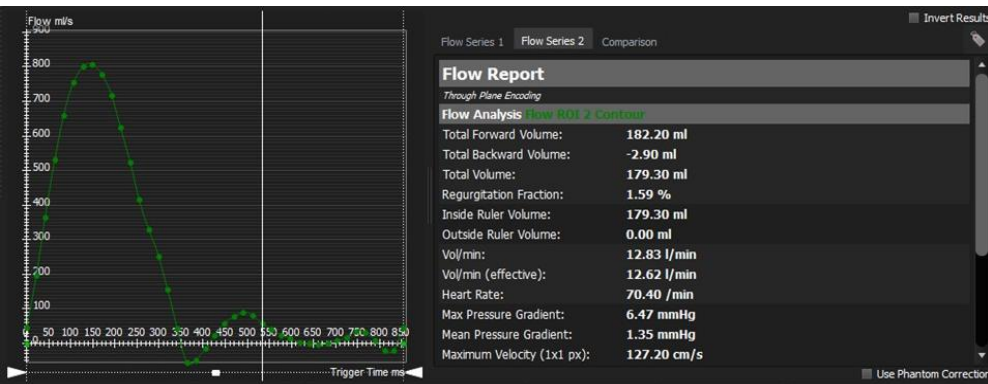


Volumi e Frazione del destro



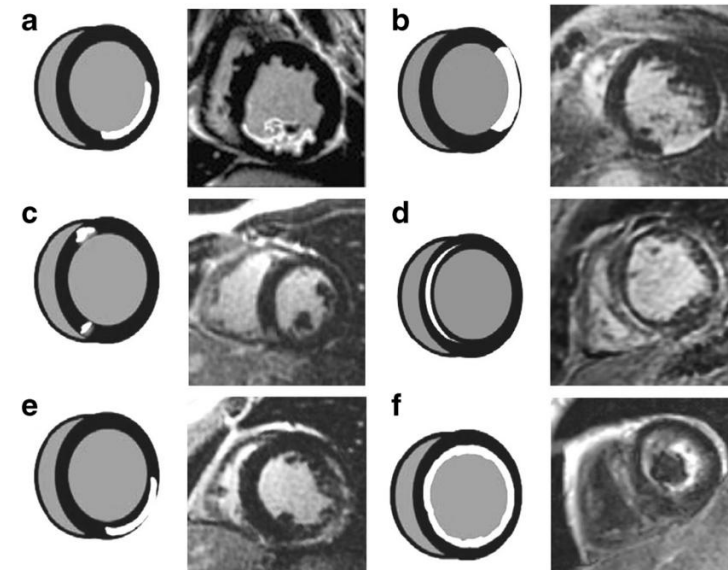
Pediatria:

Elevata precisione
Più Valore dei Numeri



Adulto:

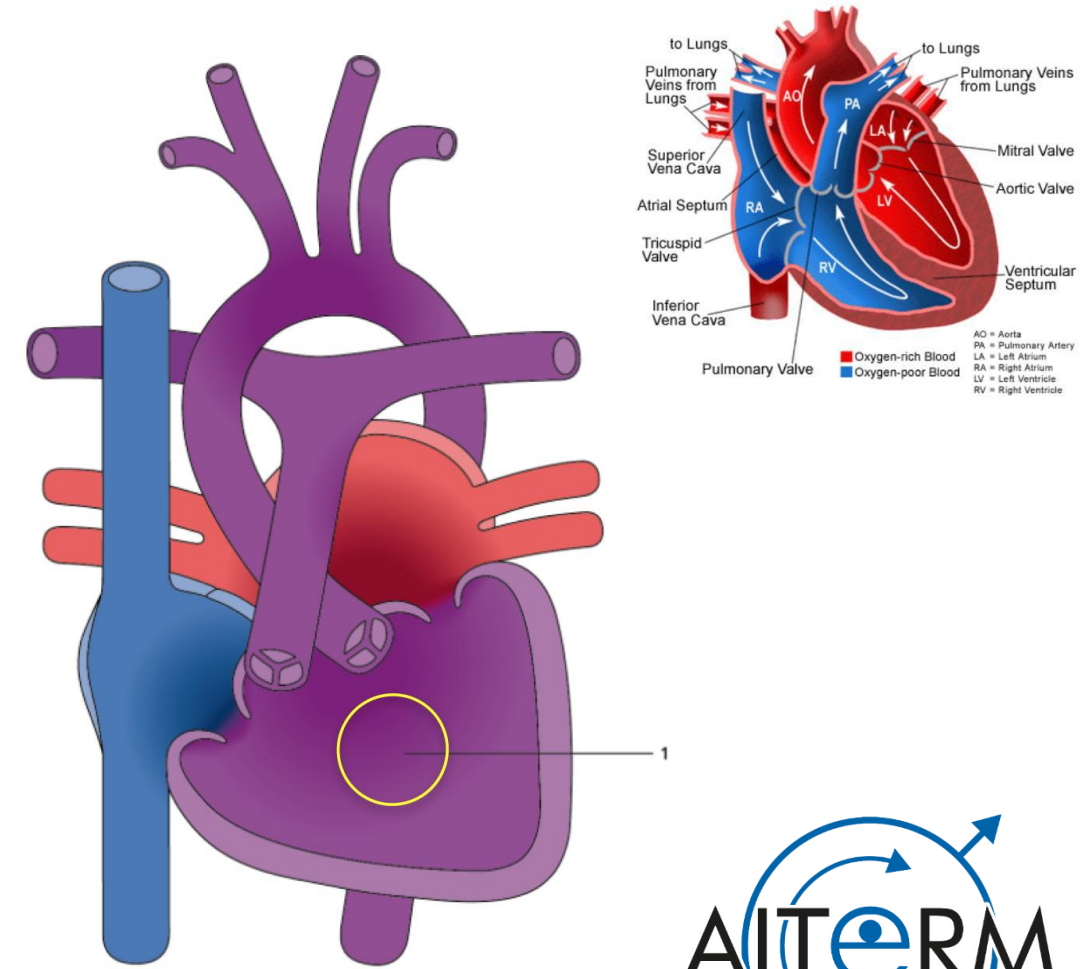
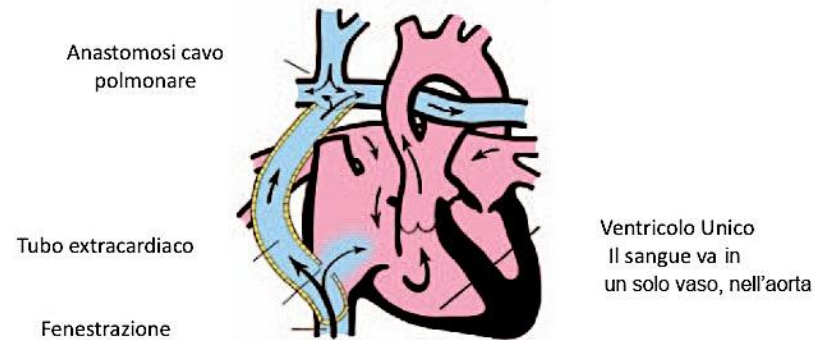
Alta Qualità Imaging
Precisione nelle modalità/Tempo di acquisizione



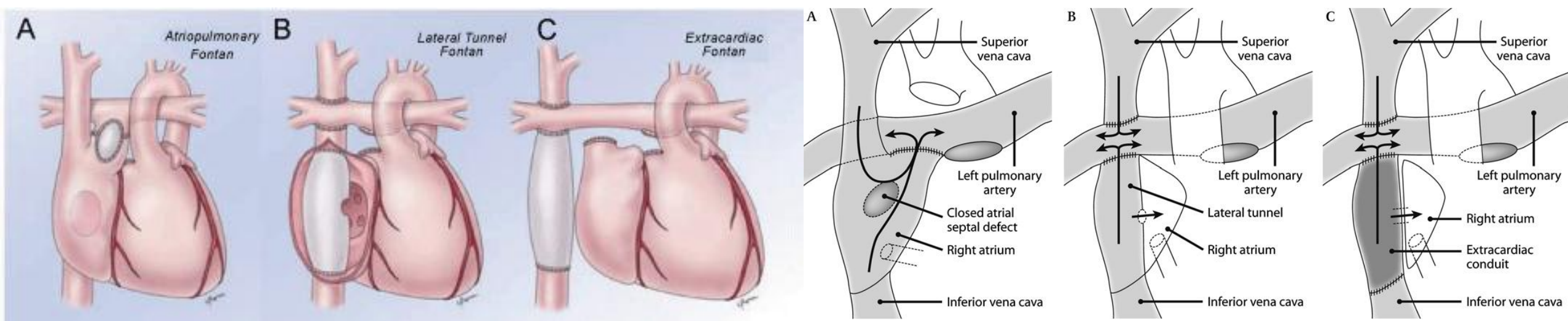
Le Cardiopatie congenite: Tecniche di studio

Cuore con fisiologia univentricolare

Con il termine di “cuore univentricolare” si definisce un insieme di cardiopatie caratterizzate dalla presenza di un ventricolo dominante sia anatomicamente che funzionalmente. In genere, si tratta di cuori che anatomicamente presentano un solo ventricolo ben sviluppato, mentre l'altro ventricolo si presenta ipoplasico o inesistente.



Le Cardiopatie congenite: Tecniche di studio



La Circolazione di Fontan

Attualmente la tecnica più utilizzata è la connessione cavo polmonare totale connettendo direttamente la vena cava superiore all'arteria polmonare destra (intervento di Glenn) e la vena cava inferiore alle polmonari con un tubo extracardiaco.

Le Cardiopatie congenite: Tecniche di studio

- Alte resistenze nelle arterie polmonari e nella TCPC
- Scarsa efficienza cardiaca
- Rischio di eventi tromboembolitici

Follow up

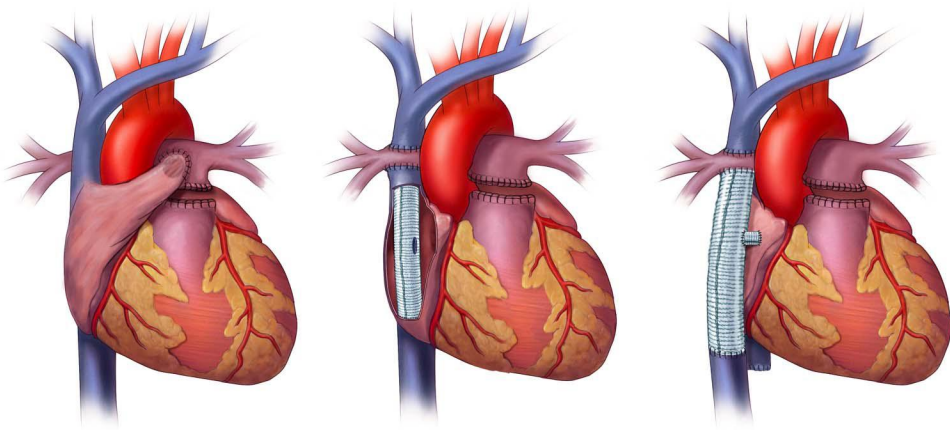
Post Operatorio

Visualizzazione della pervietà del condotto

Valutazione perfusione sistemico-Venosa

Volumi cardiaci

Valutazione Valvolari



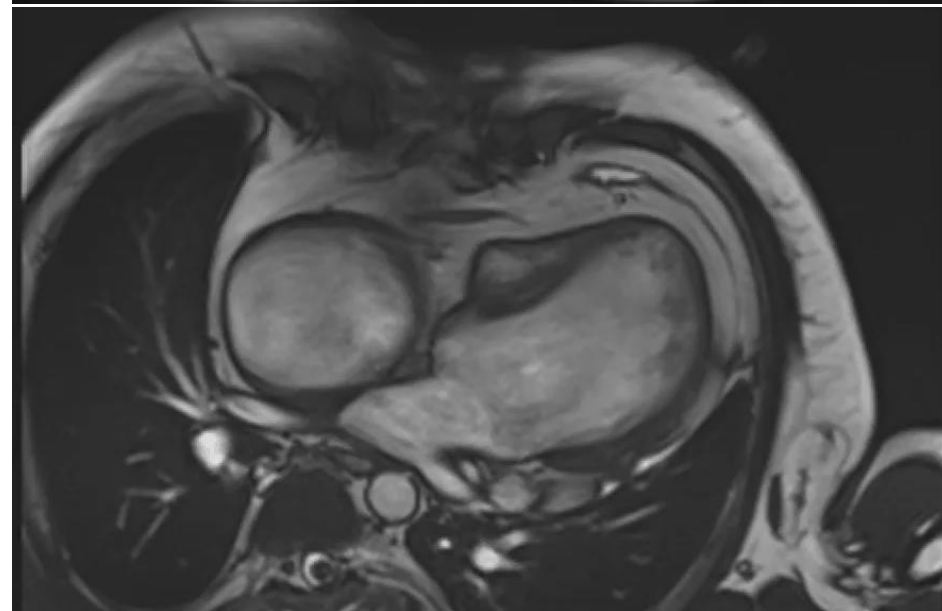
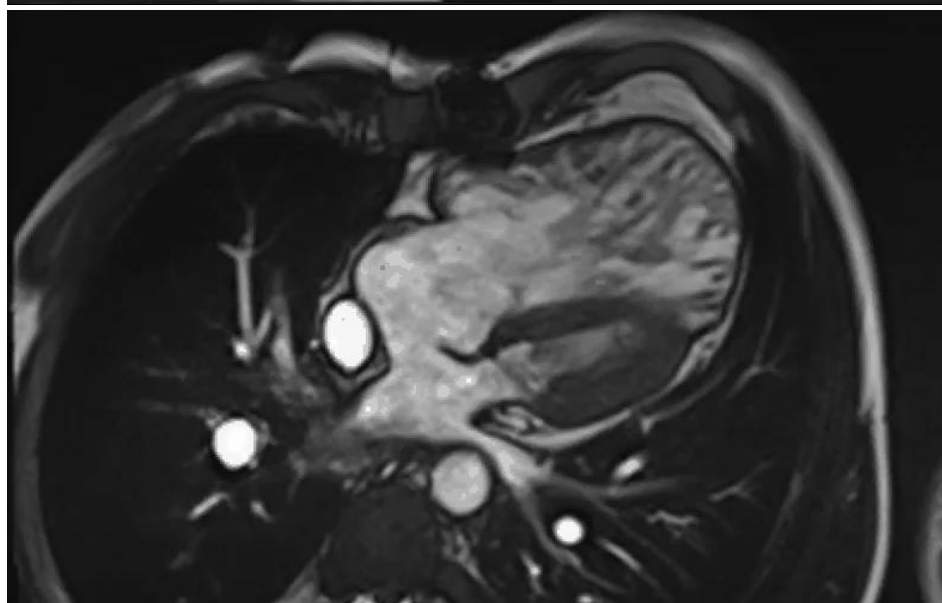
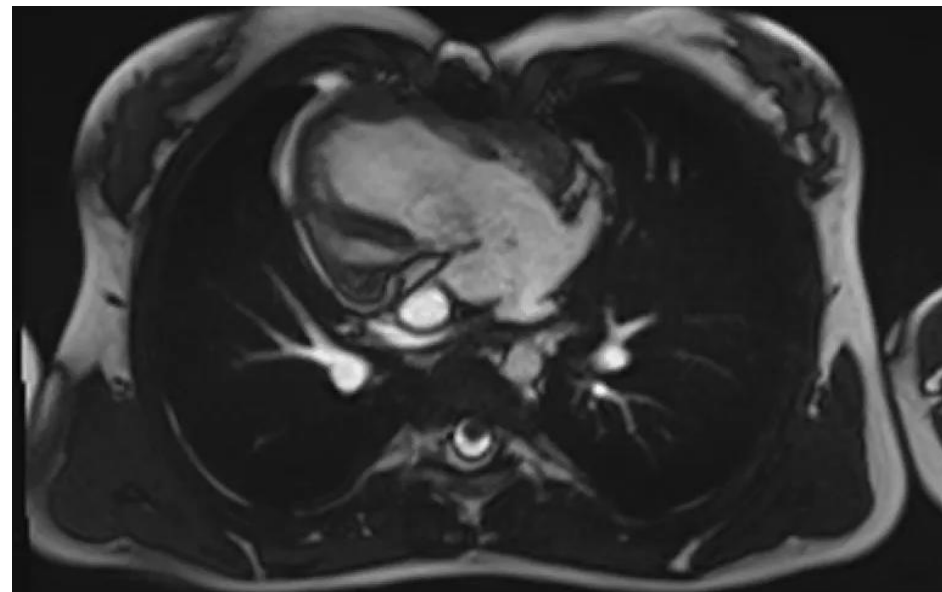
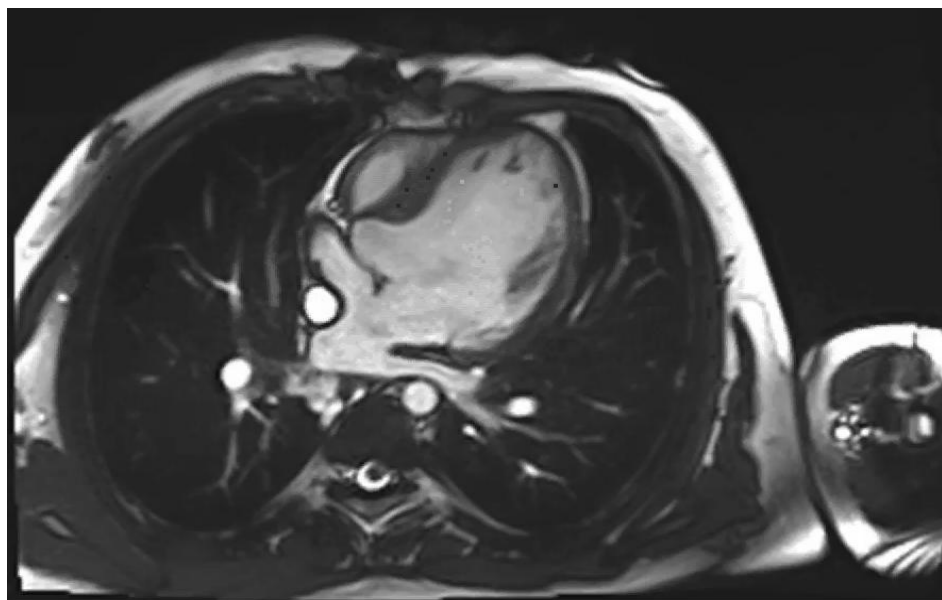
Sequenze Morfologiche:
SSFP (Cine e White Blood)
3D whole Heart

Sequenze Dinamiche e di Vitalità:
EPI FFE
EPI FFE KT
SSFP
Late Enhancement
PSIR
Late 3D

Tecniche di approccio tradizionale:

Sequenze Angio e Flussi:
CEMRA(4 fasi contrastografiche)
TIME RESOLVED
PCA TROUGHT PLANE
PCA 4d
Whole Heart (White Blood)
Whole Heart (Black Blood)

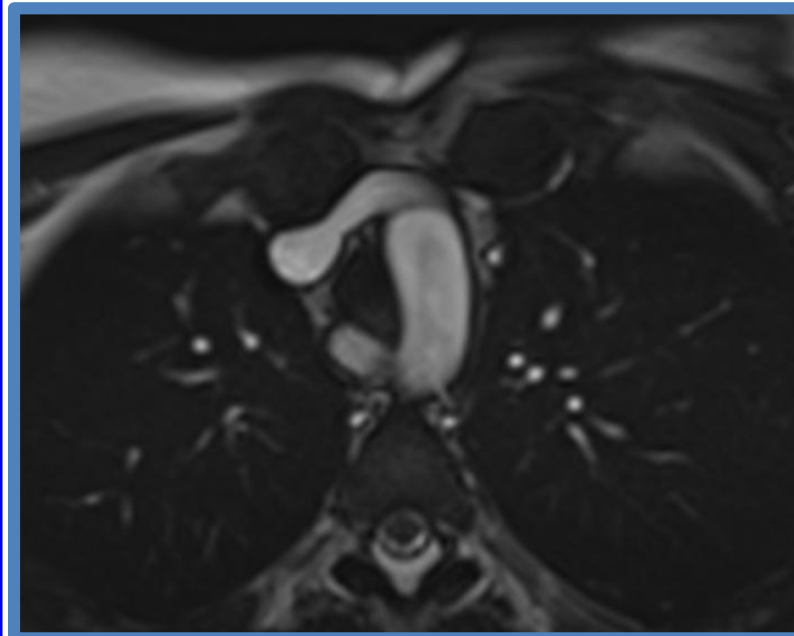
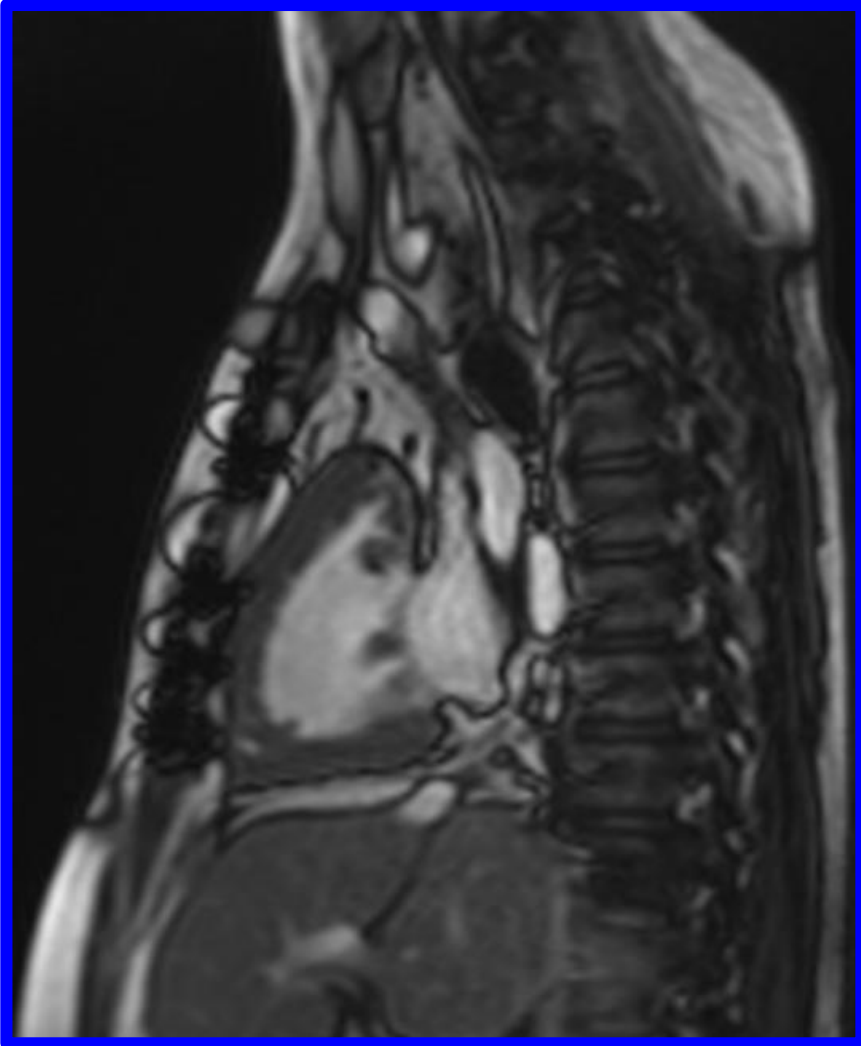
Varianti cuore univentricolare



Le Cardiopatie congenite: Tecniche di studio

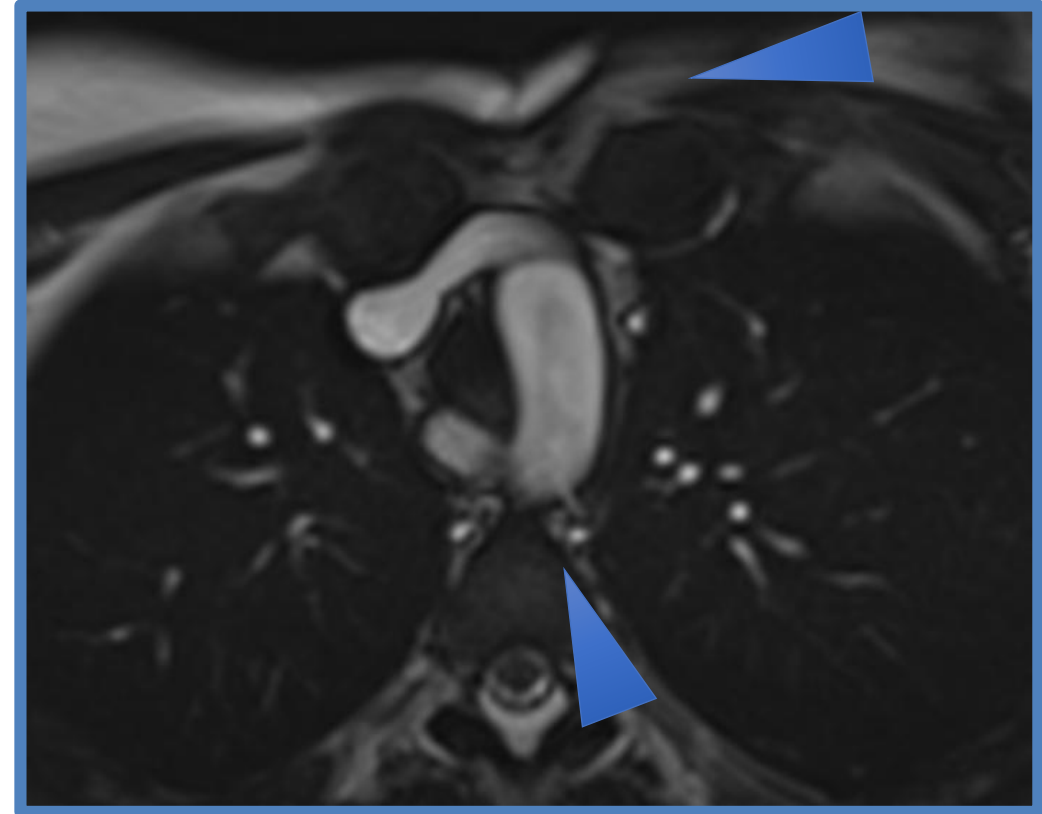
Cuore a ventricolo unico

Centraggio triplane
SSFP Singola fase
Axial Stack Black Blood
Axial Stack Cine

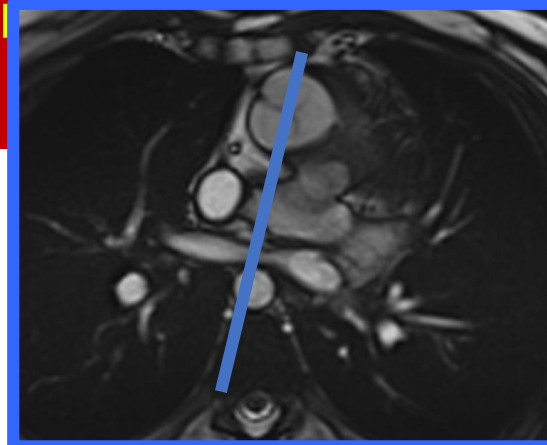


Le Cardiopatie congenite: Tecniche di studio

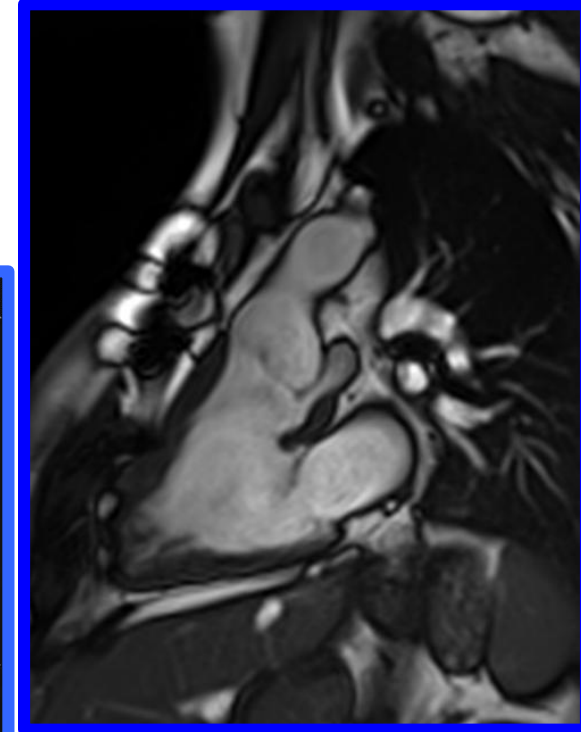
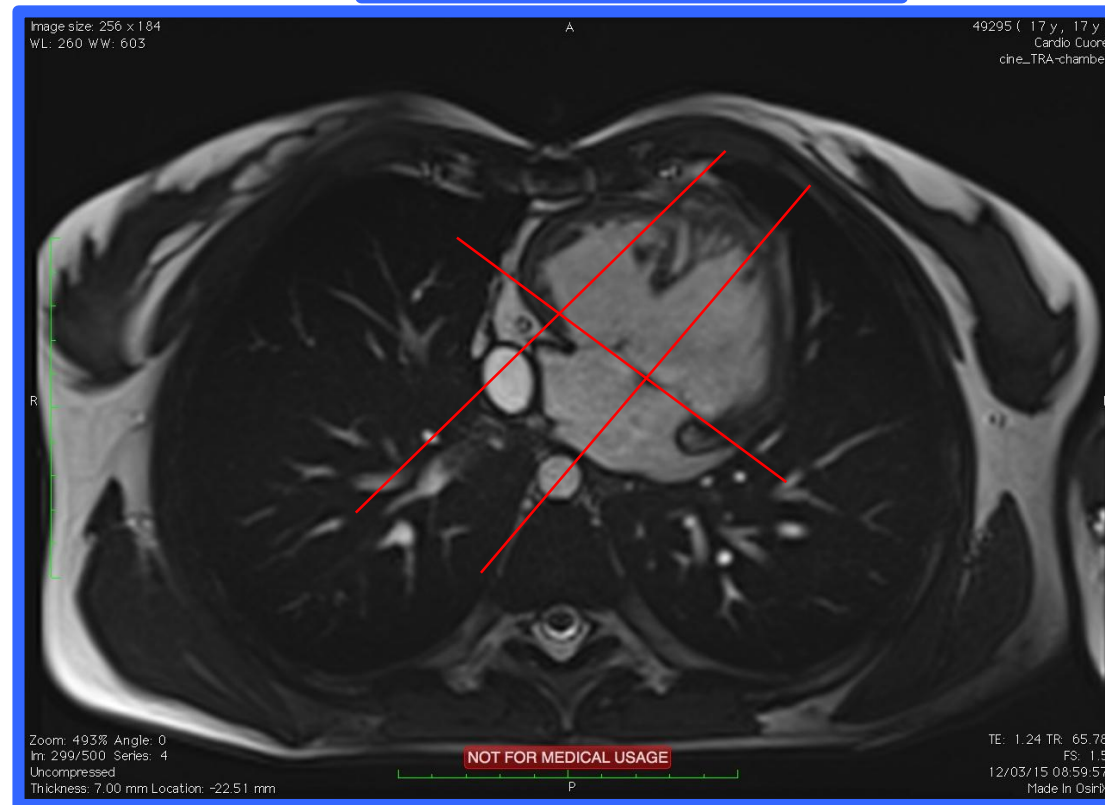
Individuare i reperi Fondamentali:
Efflusso sistemico
Efflusso venoso
Valvole
Ventricolo sx (ventricolo sistemico)



Le Cardiopatie congenite: Tecniche di imaging

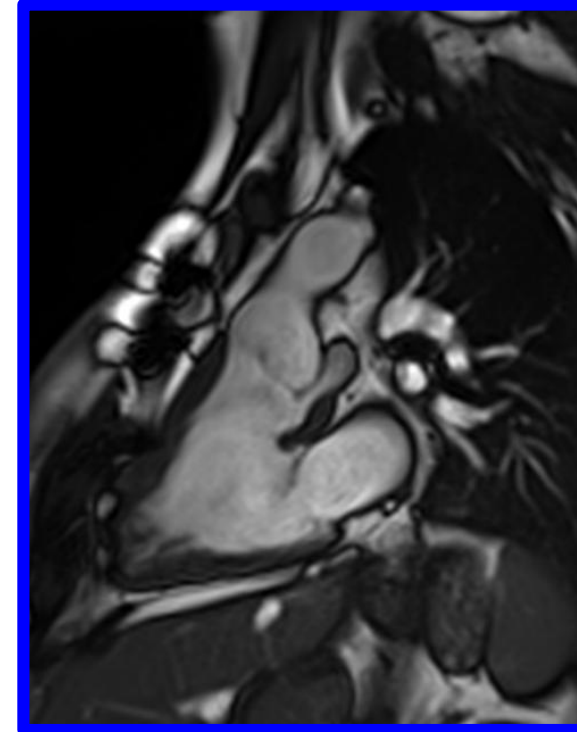
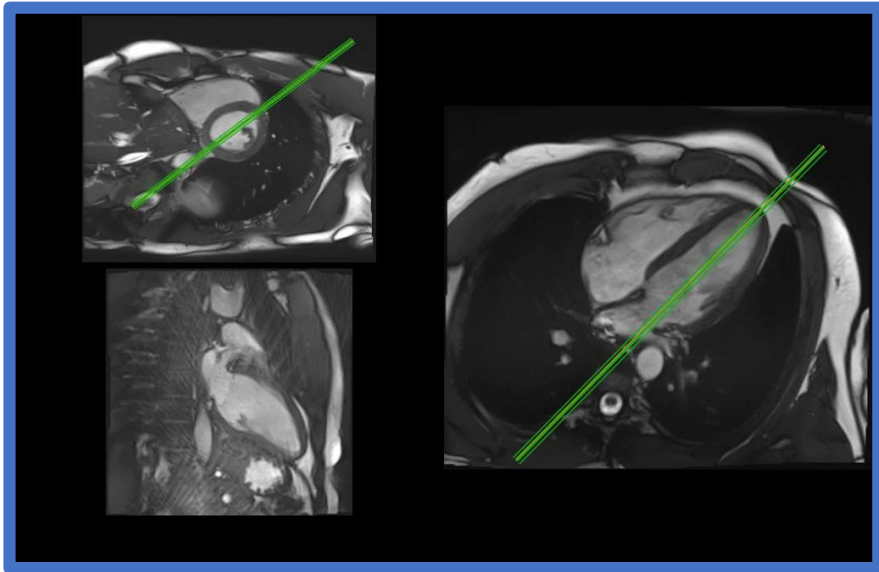


Individuare Piano Valvolare
Individuare asse lungo cardiaco
Individuare efflusso sistemico



Le Cardiopatie congenite: Tecniche di studio

Come ci si comporta in uno studio cardio-rm su un cuore che ha subito
Correzioni chirurgiche?



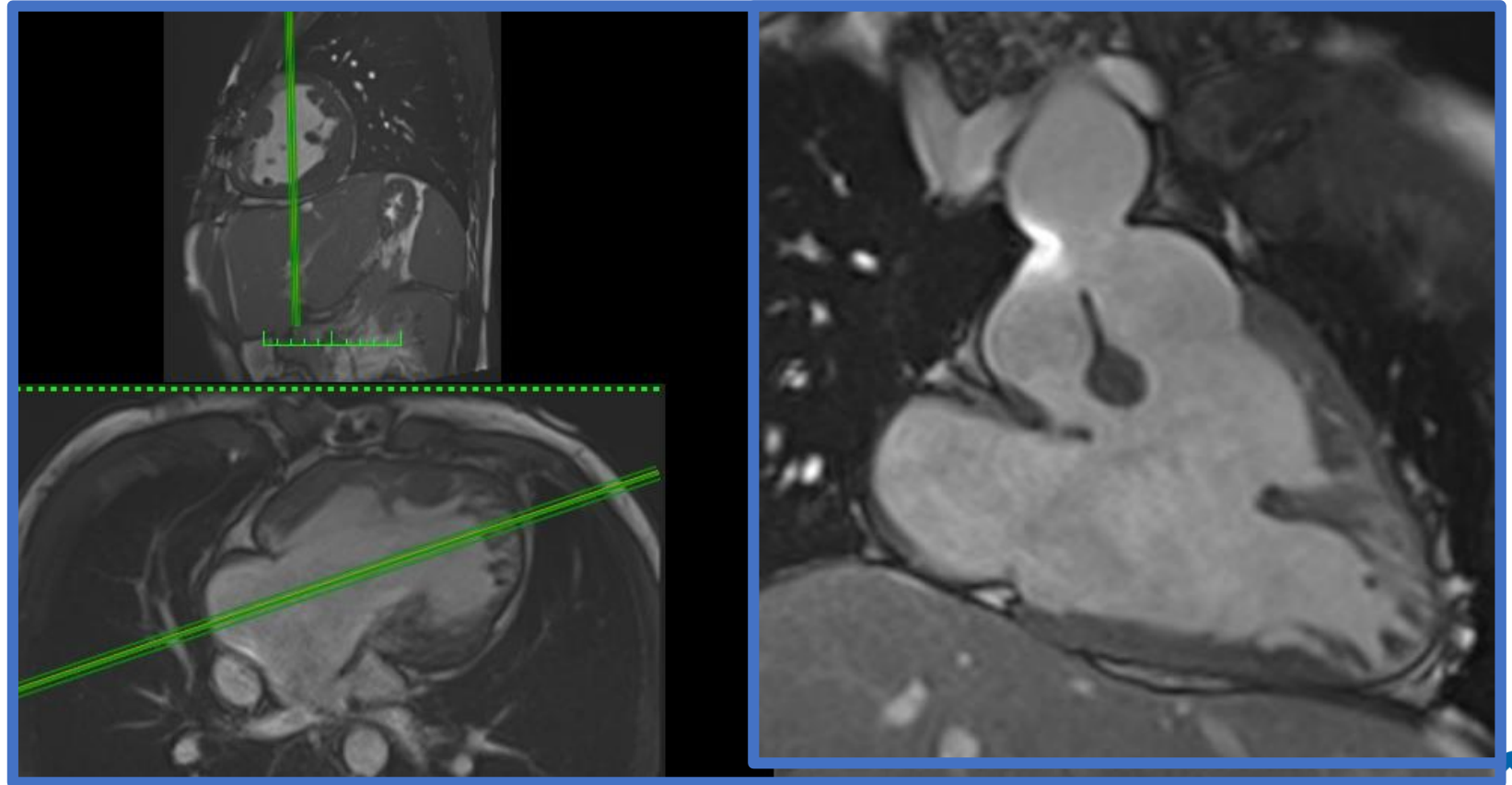
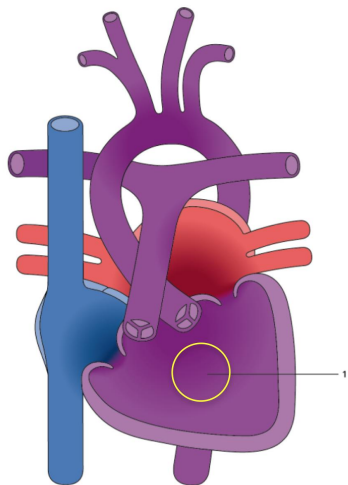
Dimenticare i quadri Anatomici conosciuti-
Conoscenza delle fasi cicliche cardiache-
Individuare efflusso sistemico-
Riconoscimento dei piani valvolari-

Le Cardiopatie congenite: Tecniche di studio

Planning 2ch_sag

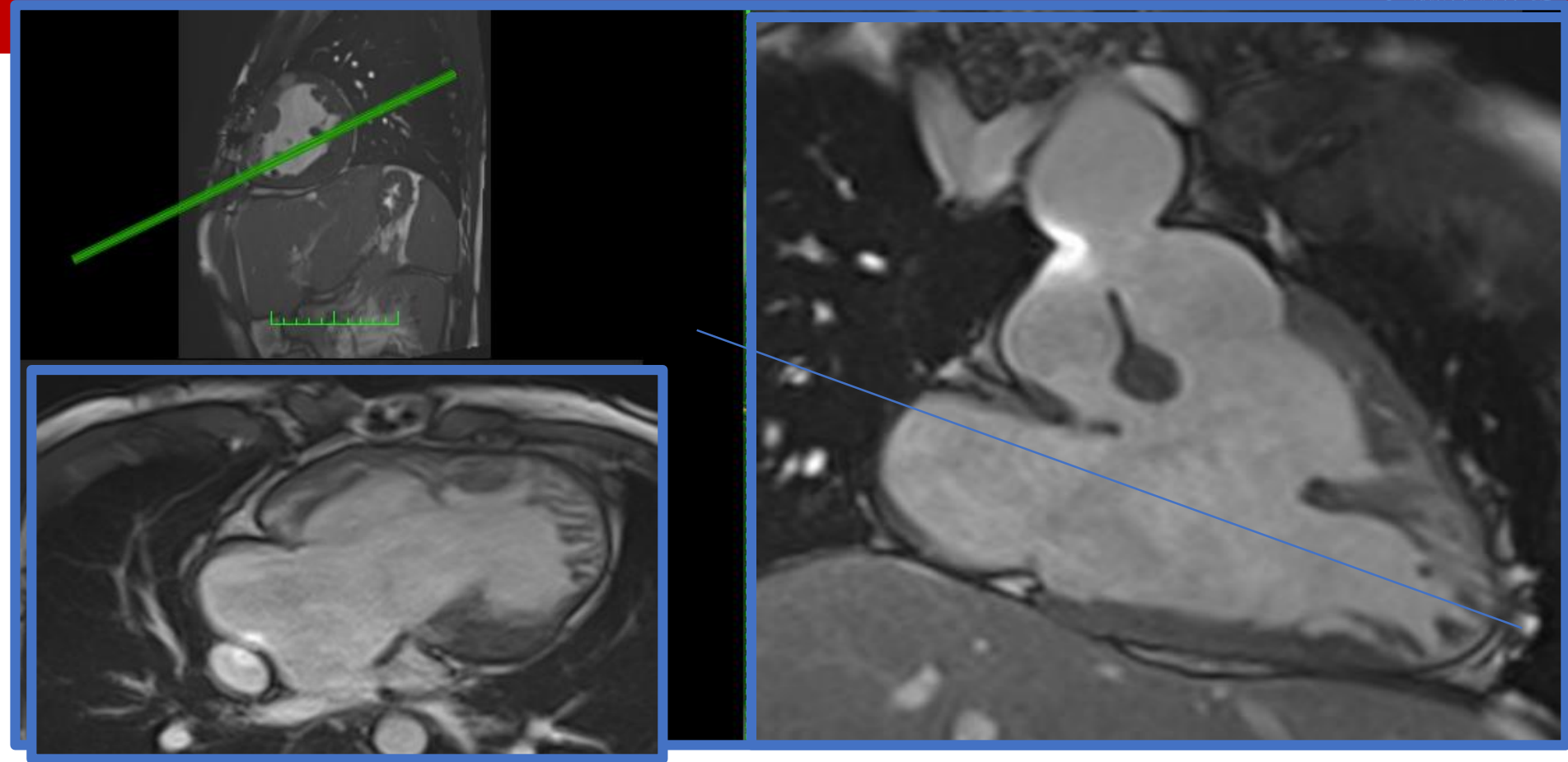
Criteri di centraggio:
Più possibile parallelo al setto

Criteri di centraggio:
Punta cuore perpendicolare valvola

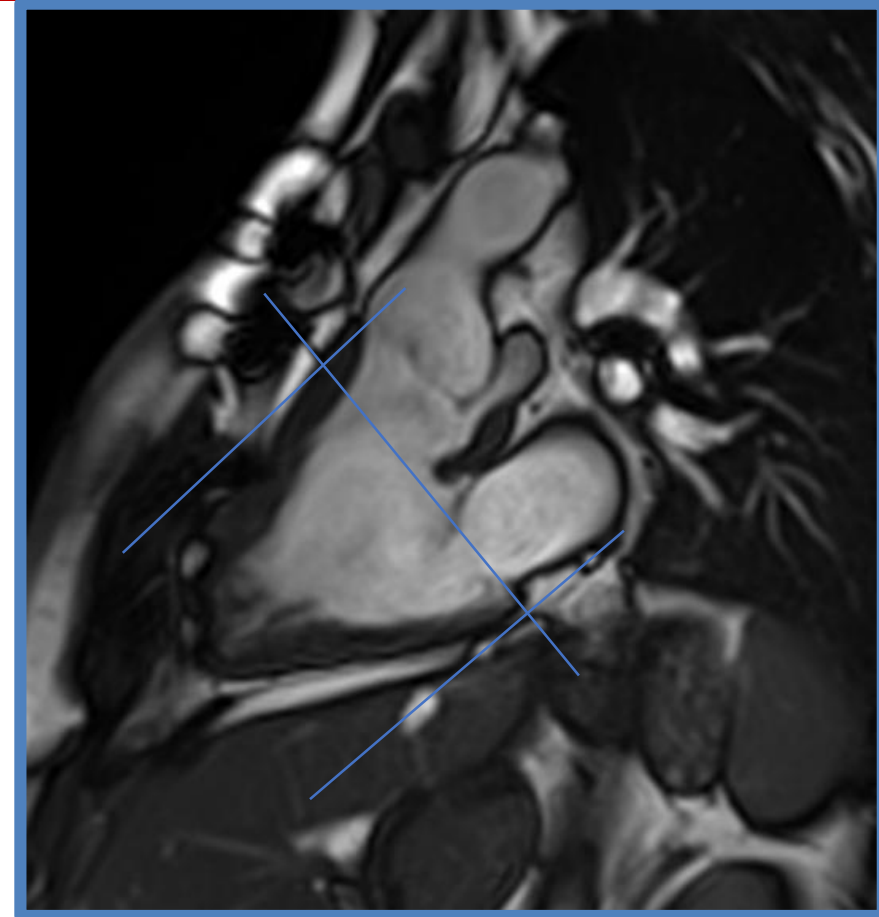
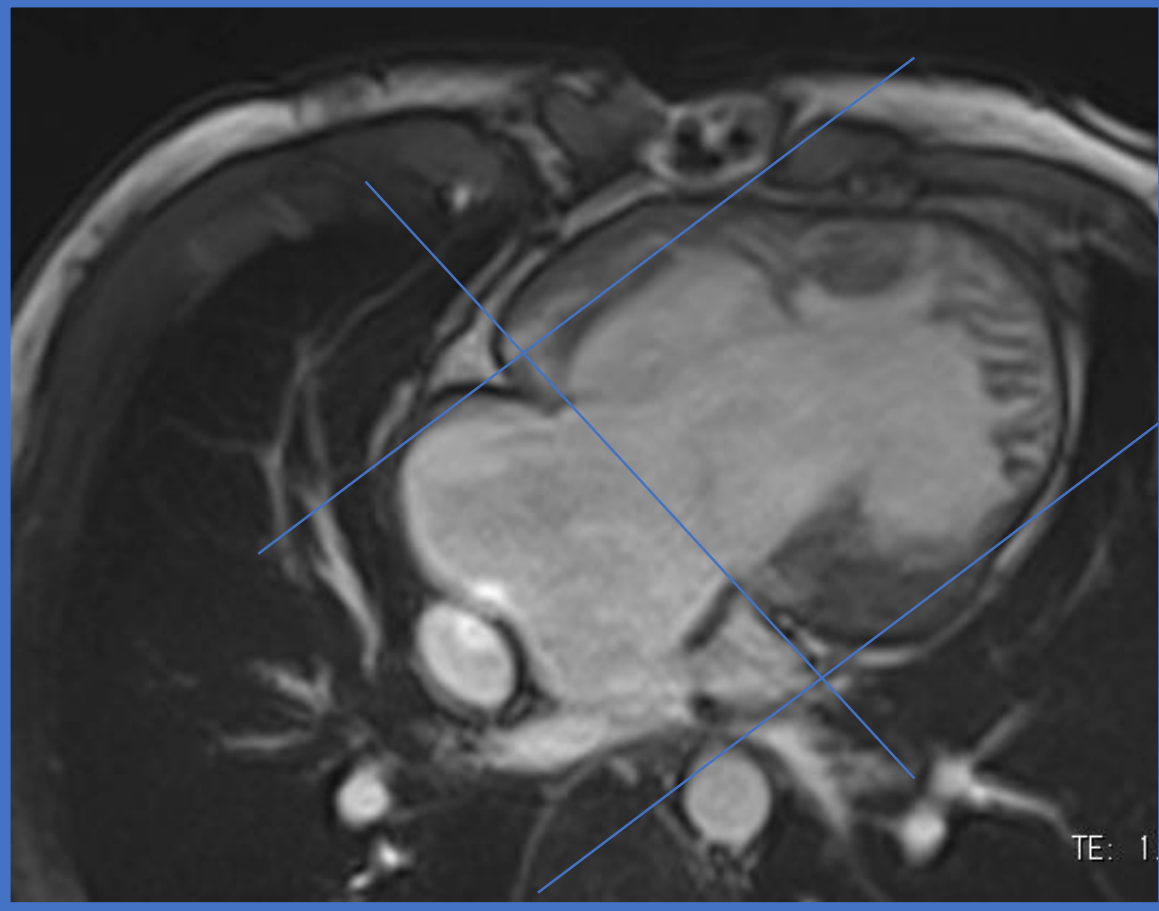


Le Cardiopatie congenite: Tecniche di studio

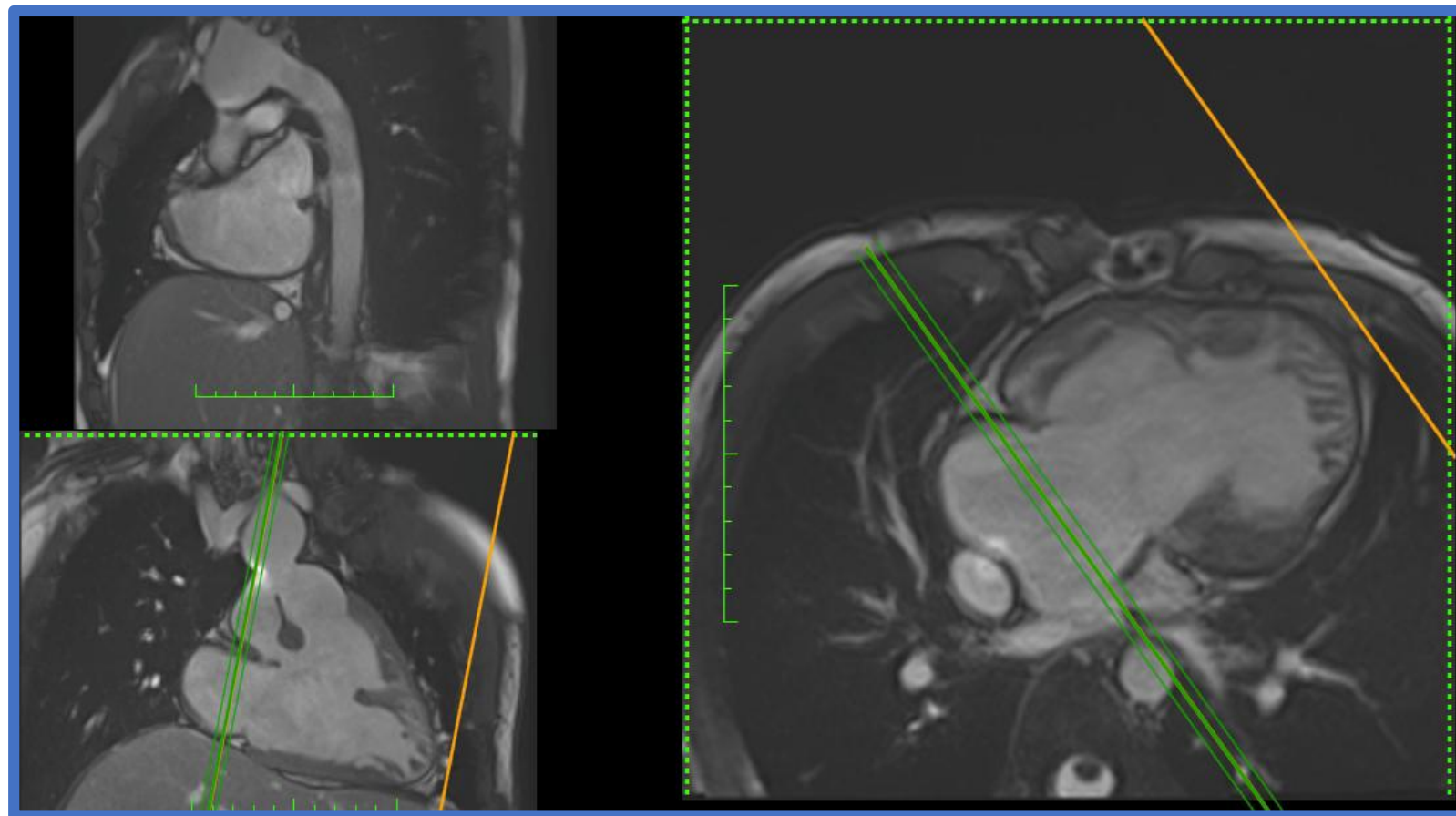
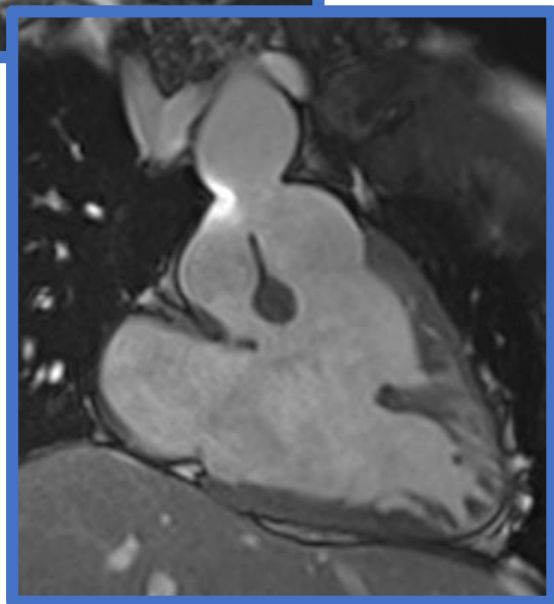
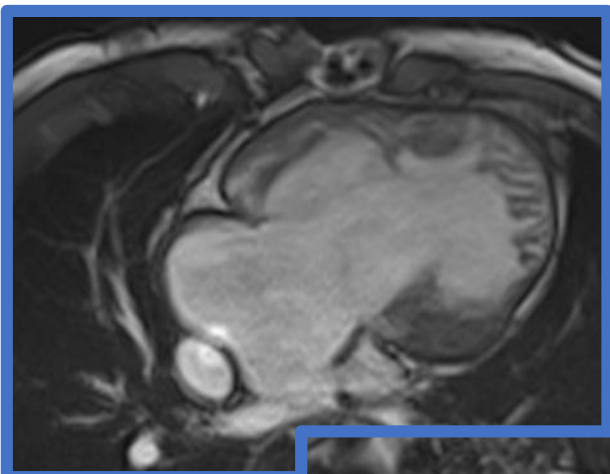
Criteri di centraggio:
Trasverso Asse Corto



Le Cardiopatie congenite: Tecniche di studio



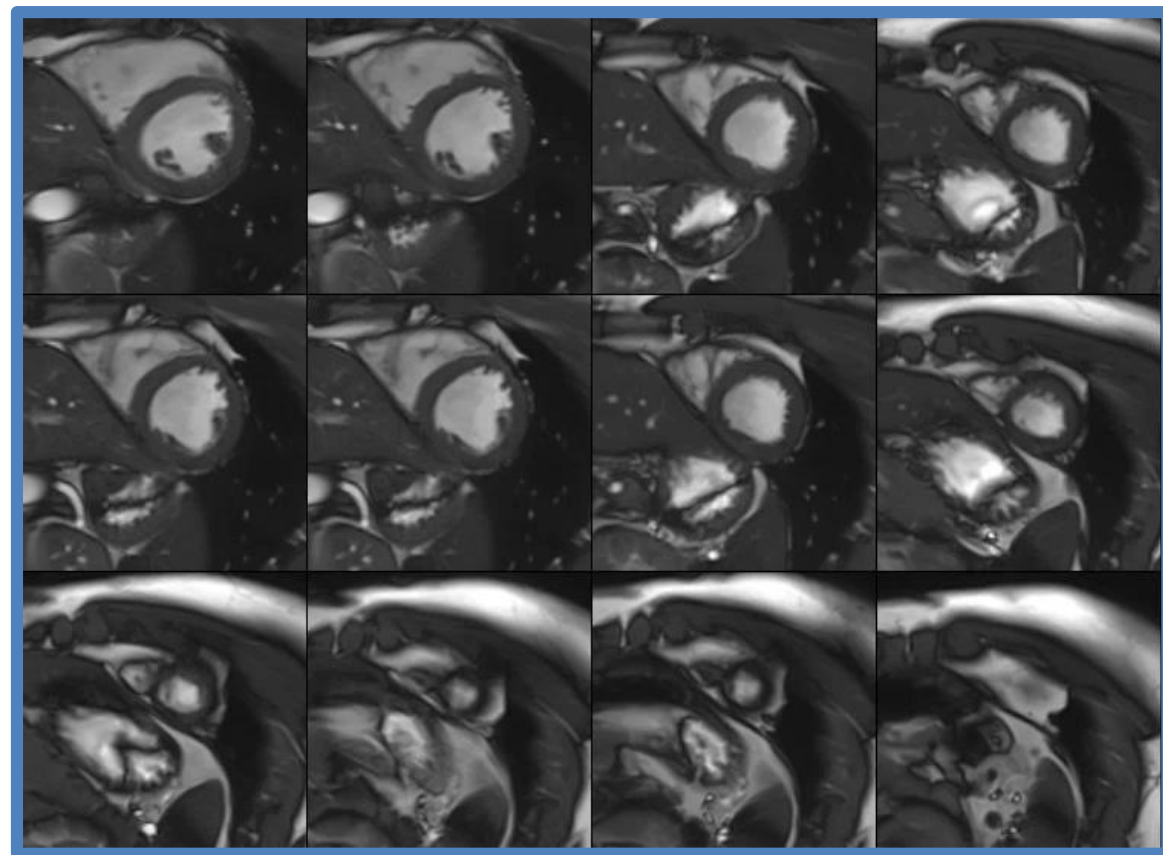
Piani Dedicati Short Axis



Utilizziamo i due piani contrapposti

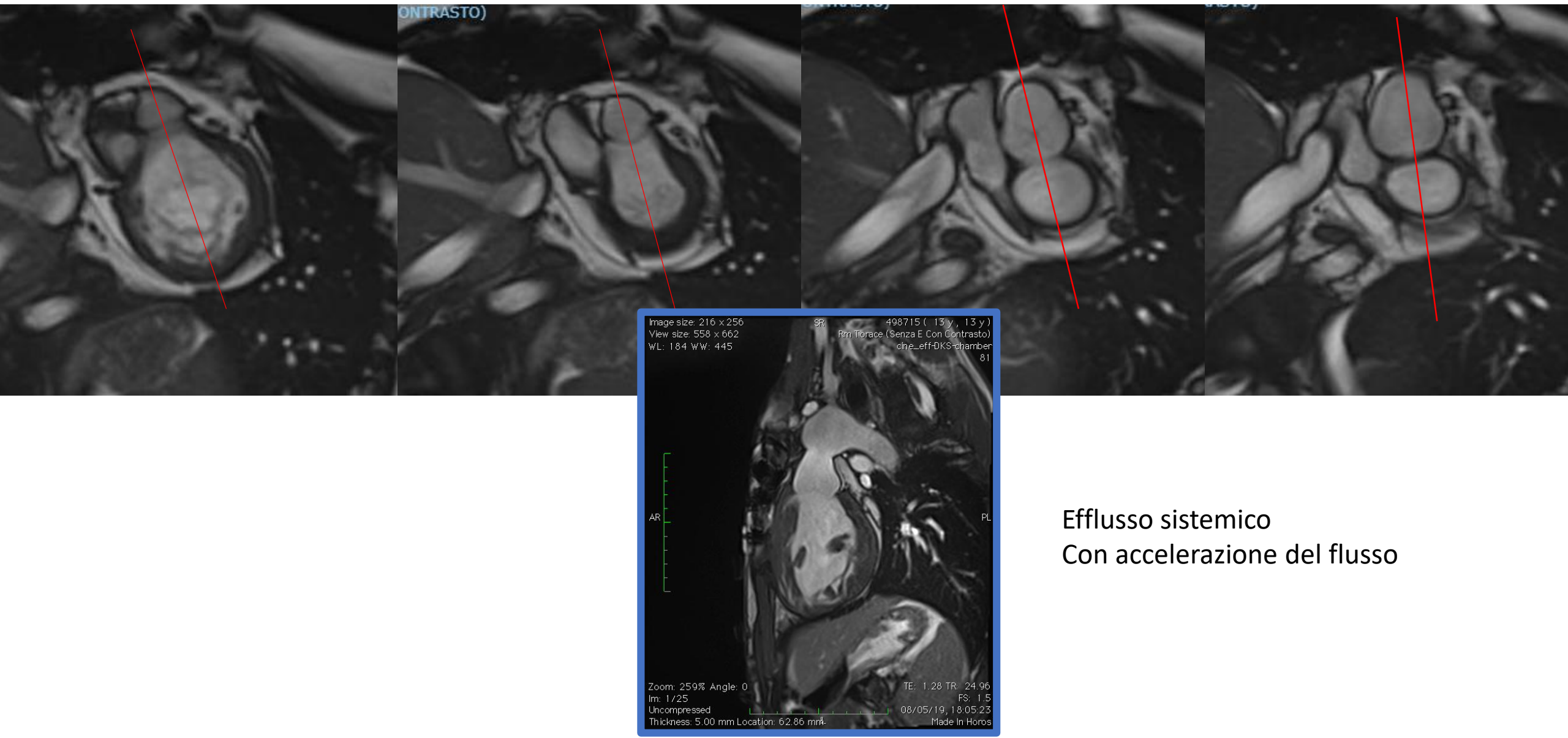


Funzione cuore univentricolare



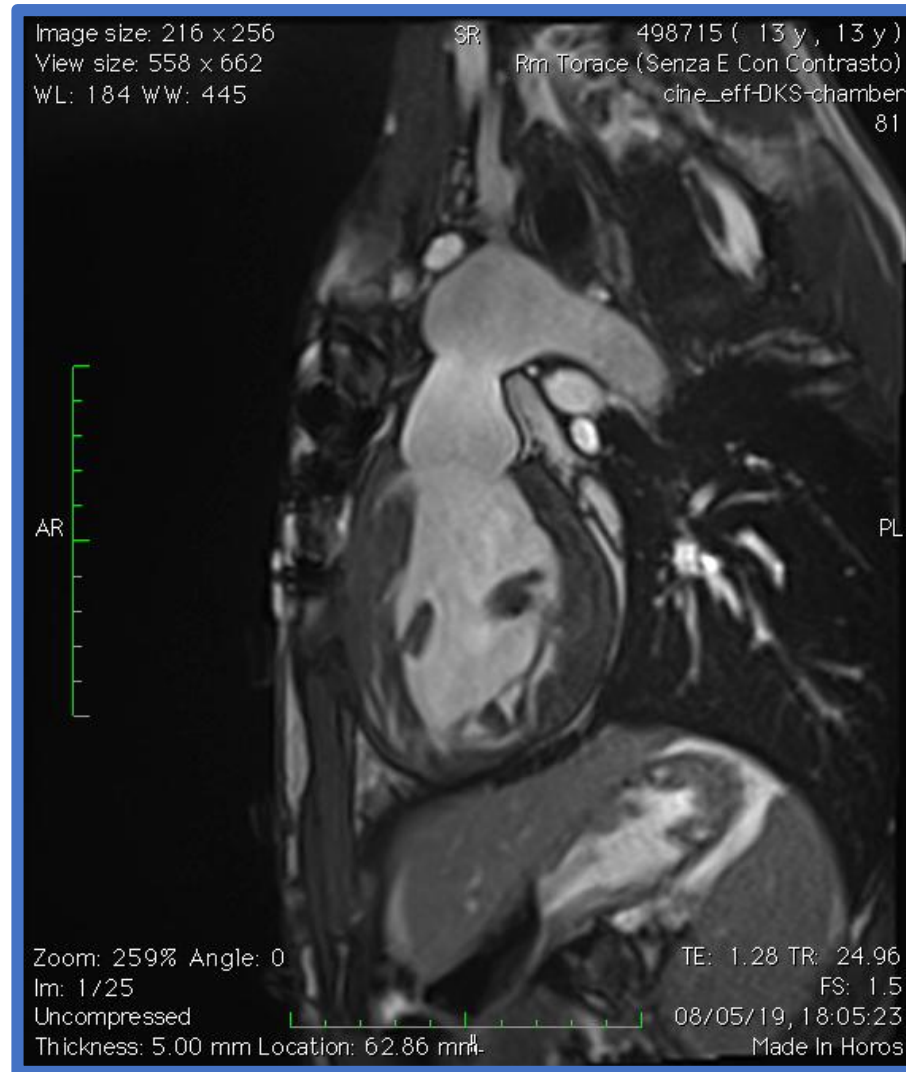
Funzione cuore normale

Efflusso Sistemico



Efflusso sistemico
Con accelerazione del flusso

3 chamber



Efflusso sistemico
Con accelerazione del flusso

SEQUENZA ANGIOGRAFICA

TWIST (Time-resolved angiography With Interleaved Stochastic Trajectories)

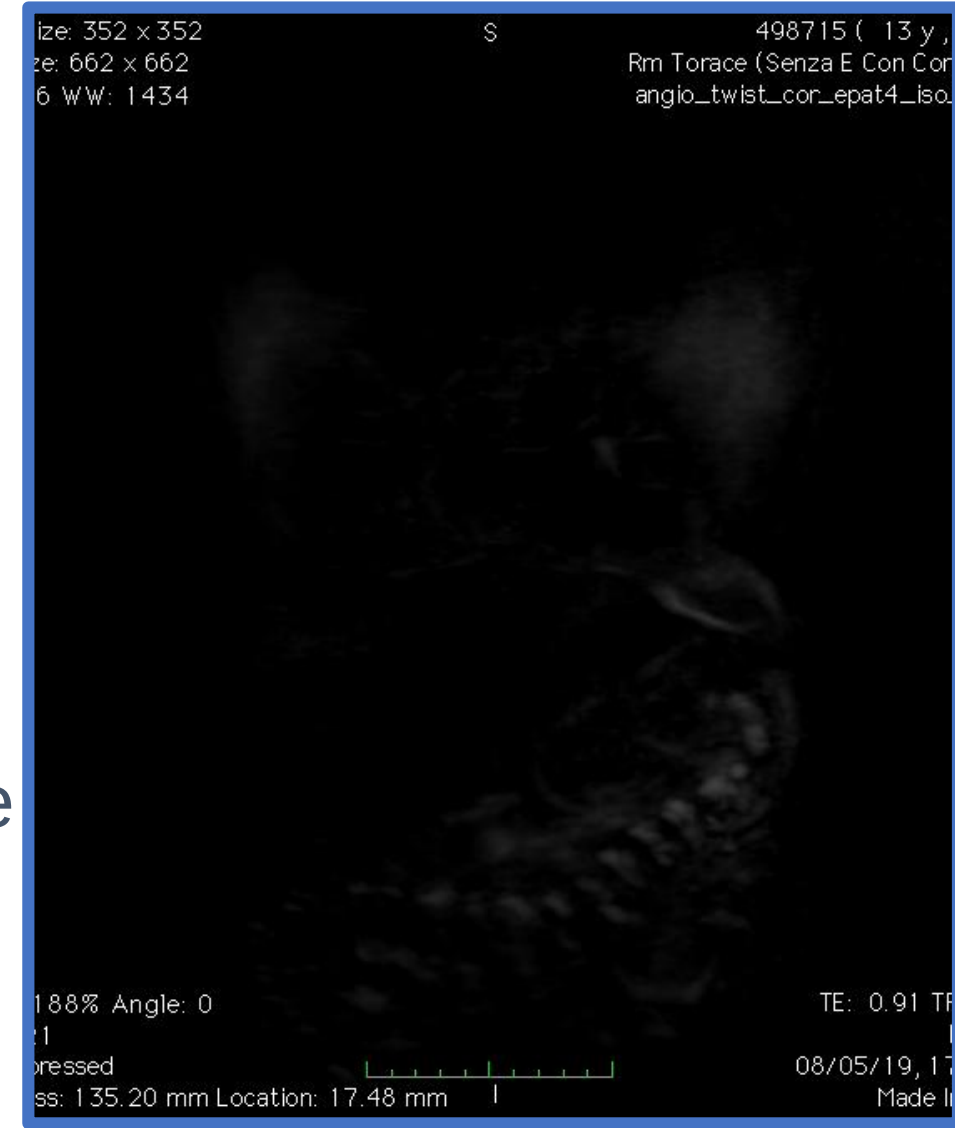
Tecnica 3D

Ad alta risoluzione temporale

Analisi del flusso ematico

Ricostruzione di mip in tutte le fasi arteriose
e di ritorno venoso-

Possibilità di scegliere e ricostruire singola fase
Temporale ed utilizzarla per planning dedicato-



3D TSE BB

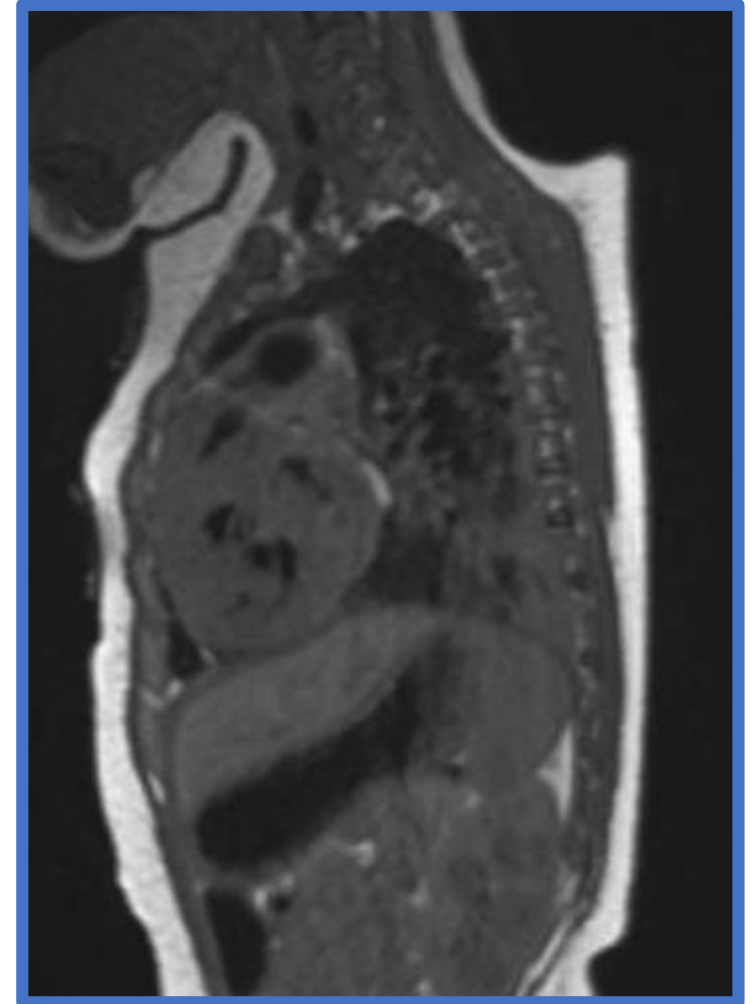
- Sequenza 3D

- Tse

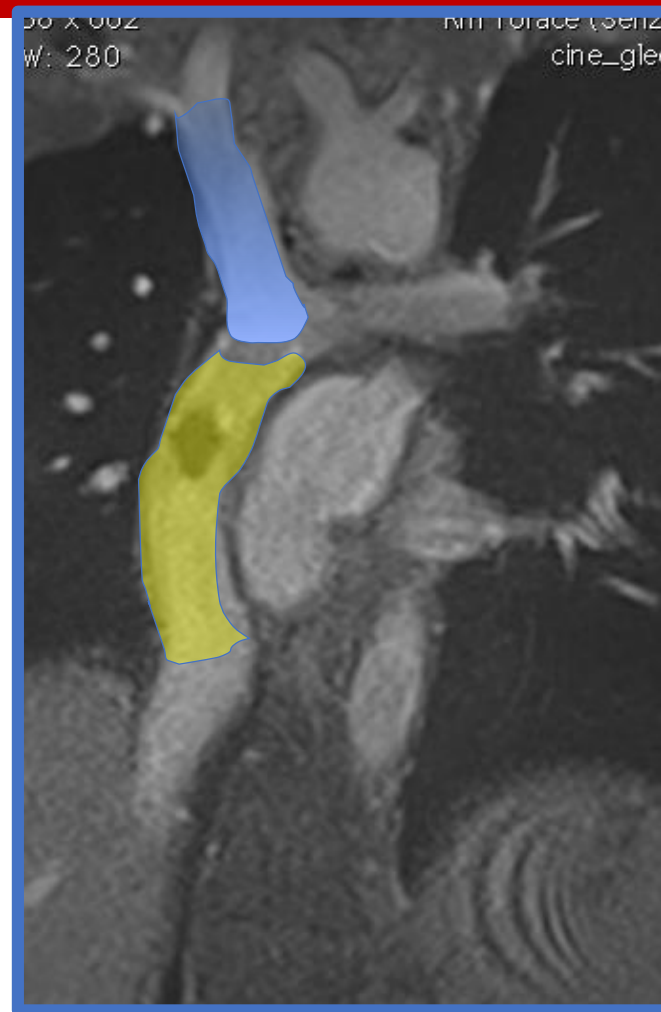
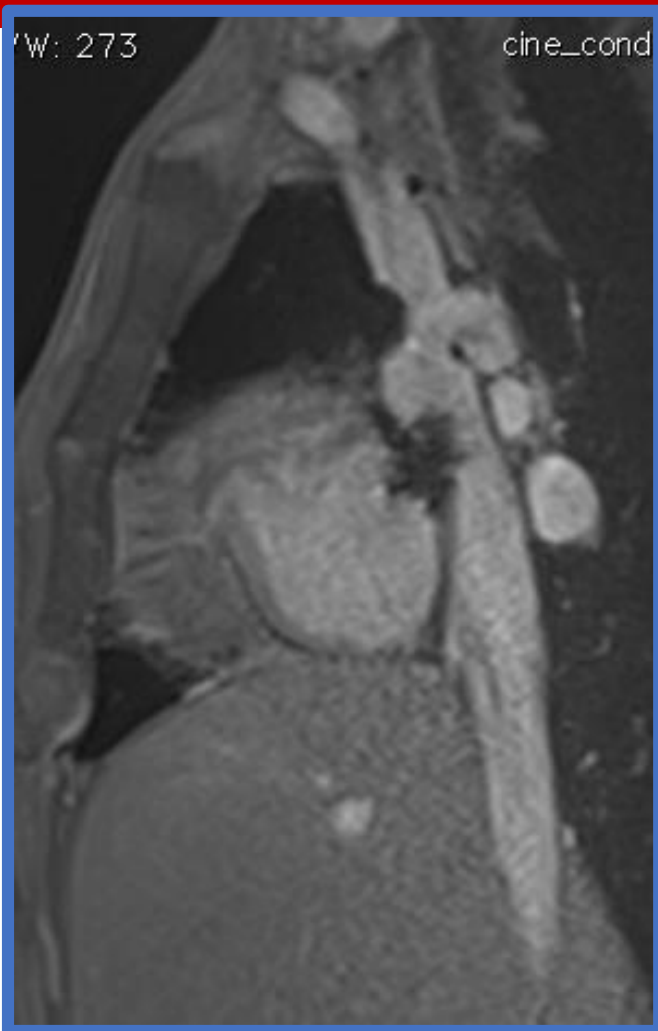
- Sangue nero

- Settata in sistole

Acquisiti i piani sugli assi lunghi
e su gli assi corti, acquisiamo
Una sequenza volumetrica isotropica
(preferibile tse Whole Heart T1)
Meno suscettibile ad accelerazioni di flusso

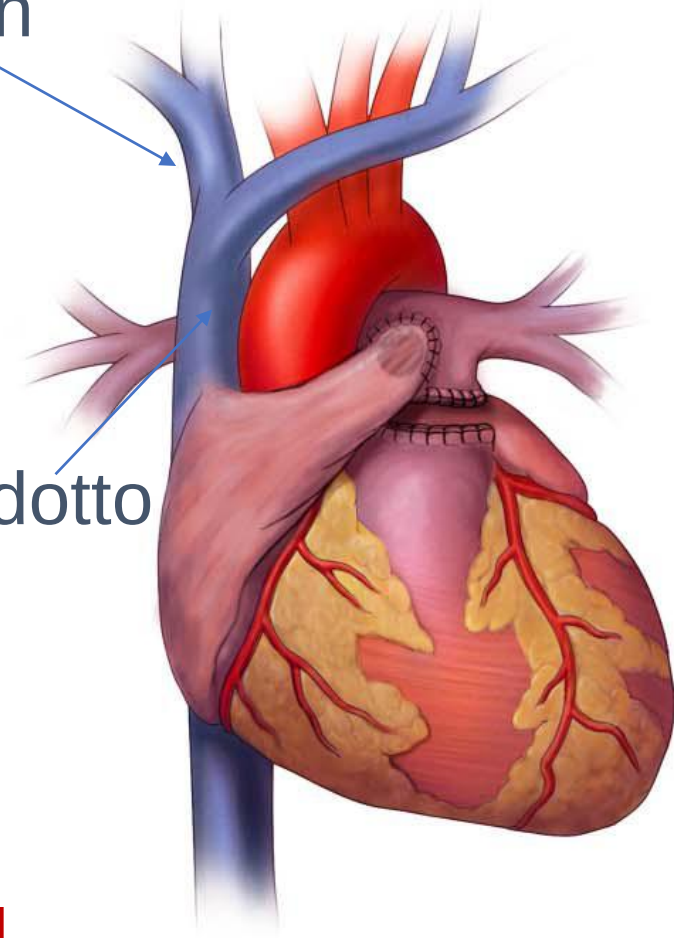


Le Cardiopatie congenite: Tecniche di studio



Glenn

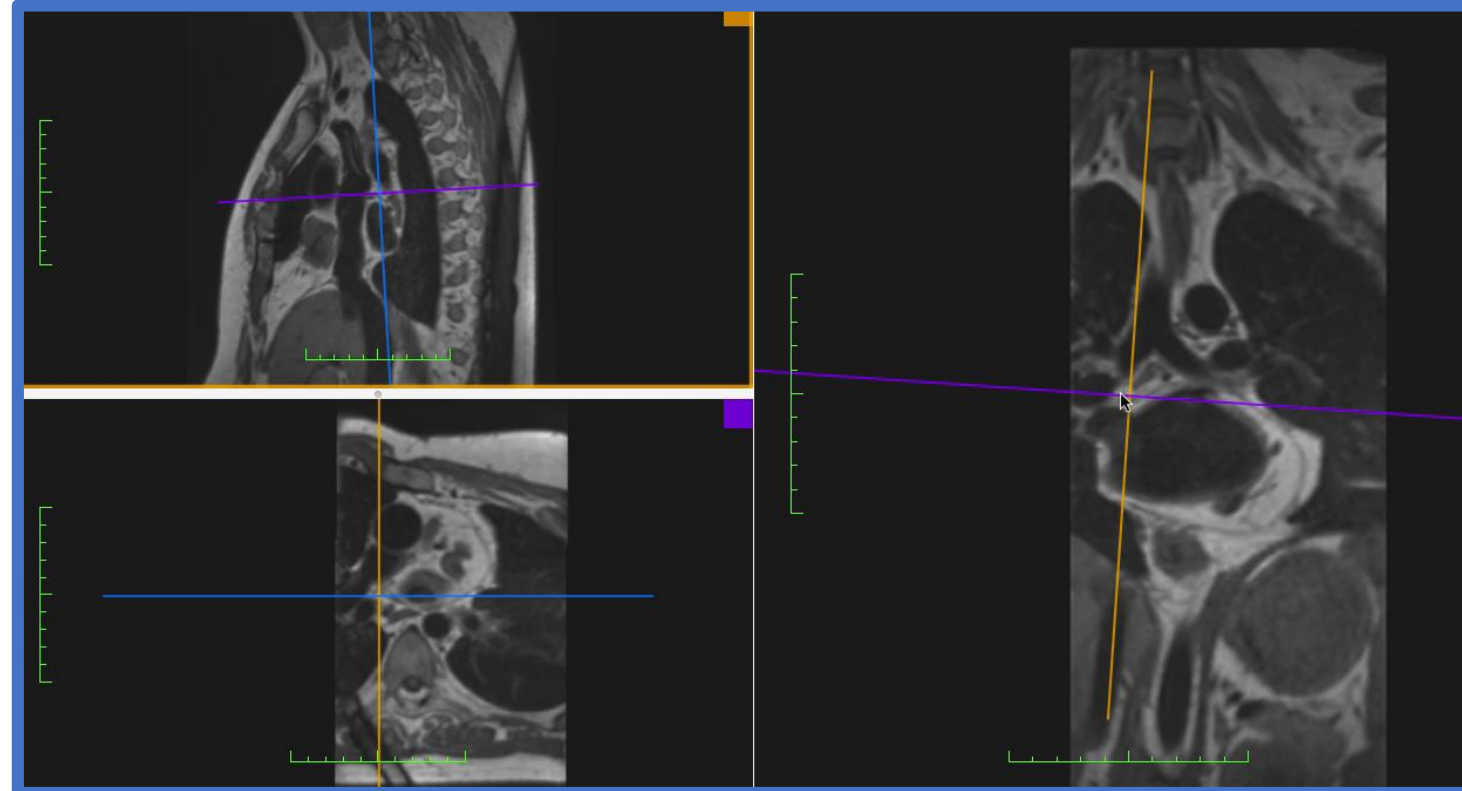
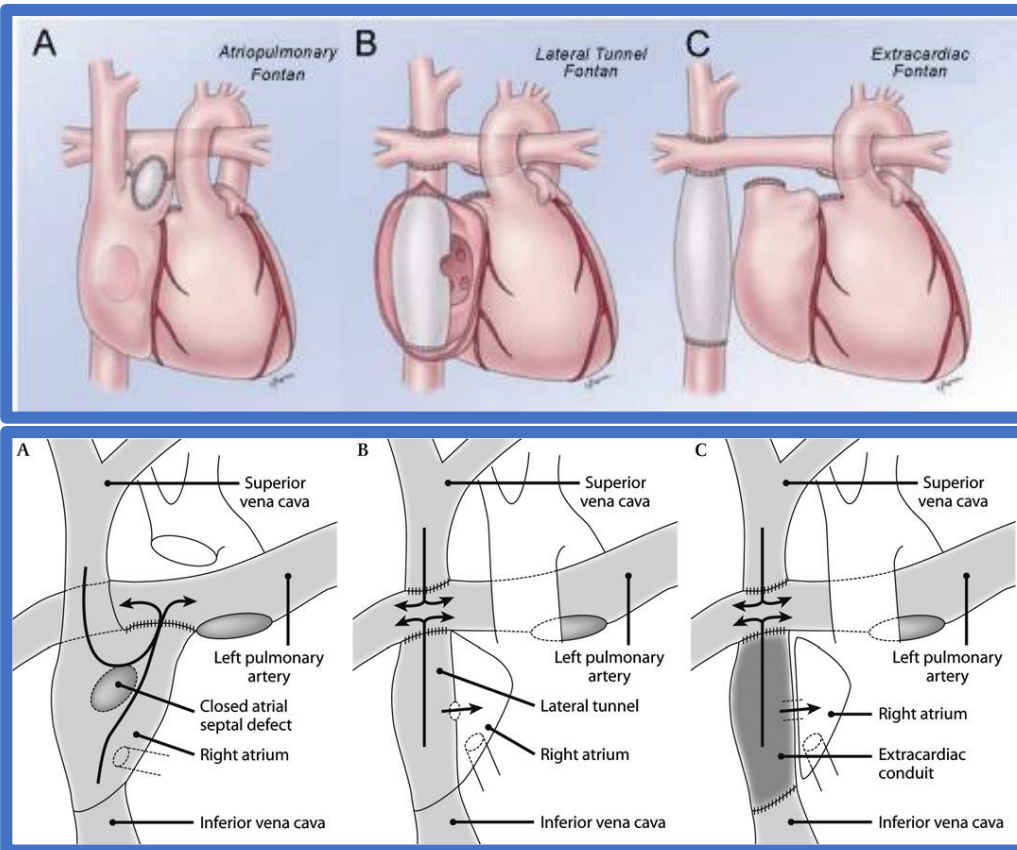
Condotto



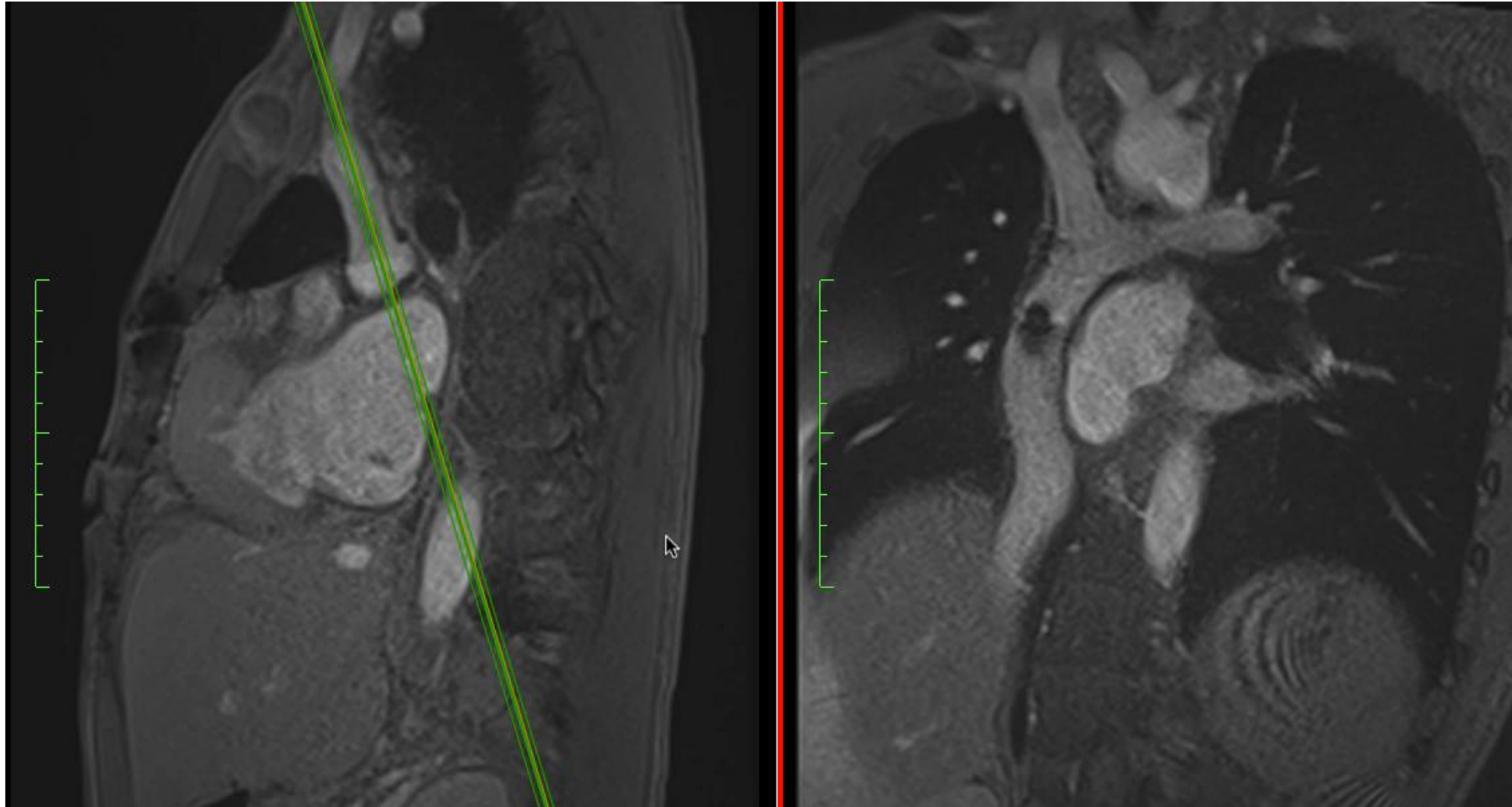
Le Cardiopatie congenite: Tecniche di studio

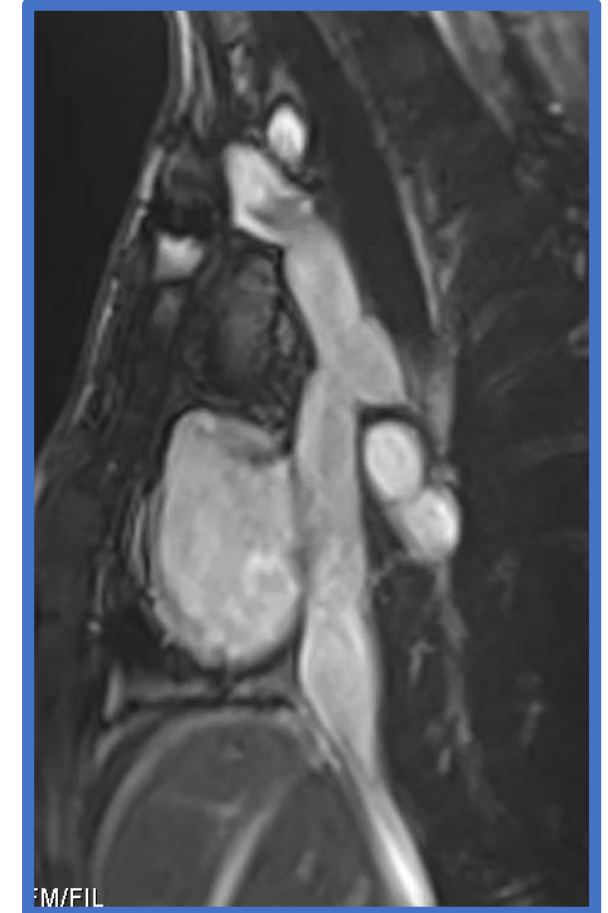
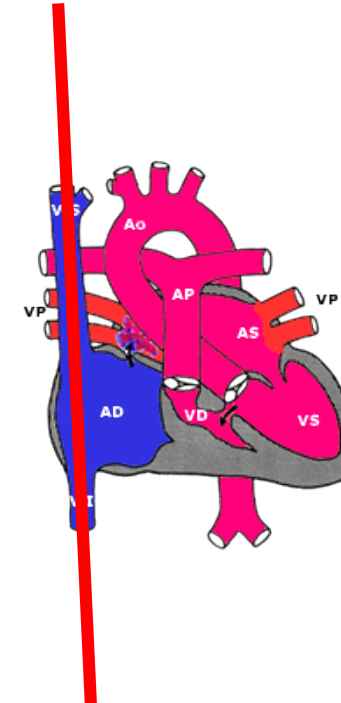
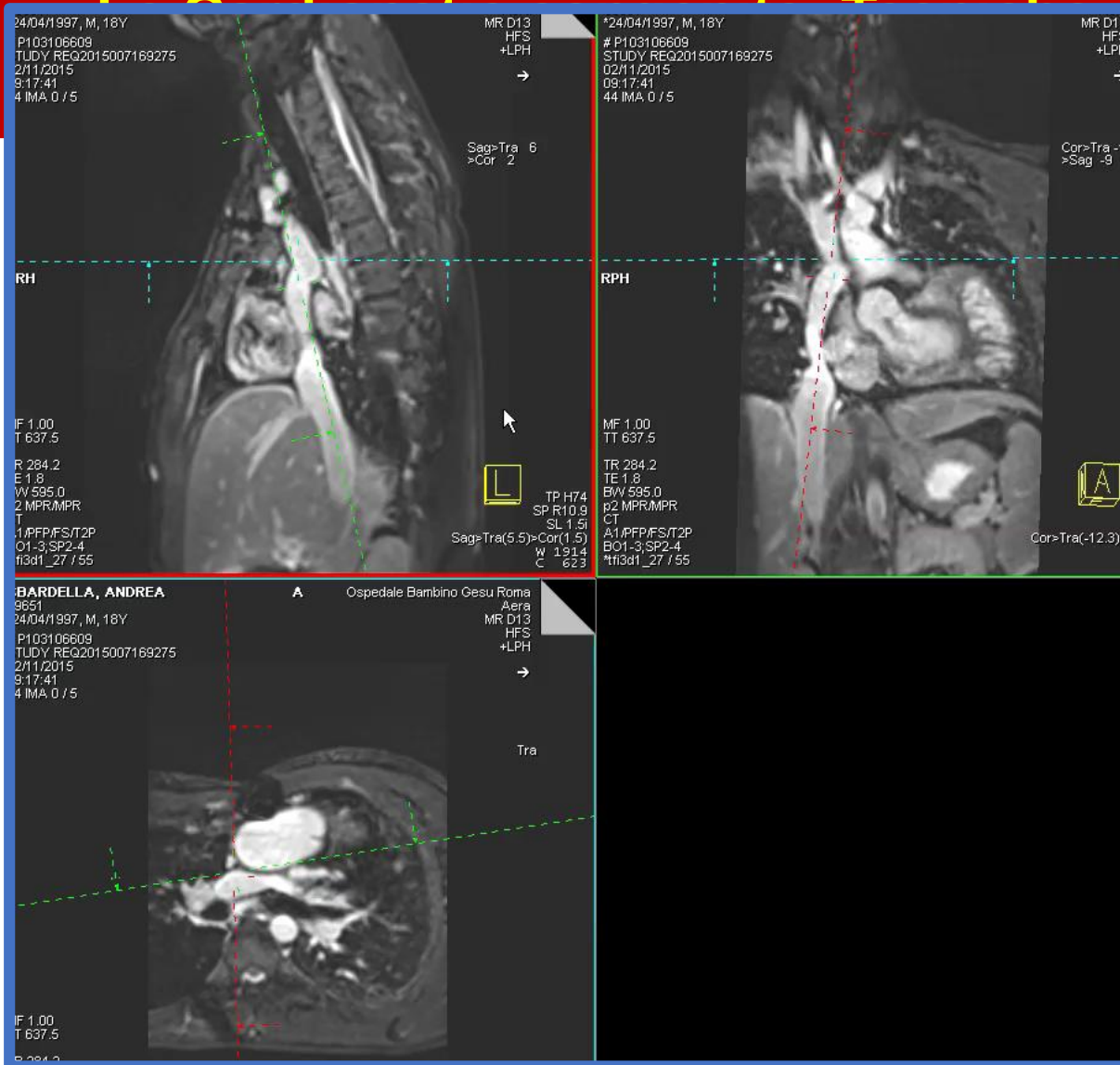
Fase conclusiva:
Planning dedicato
Visualizzazione in Cine del condotto e della Glenn

Utilizzare sequenza 3D acquisita per pianificare
Gli assi di studio dedicati alle strutture modificate
Ed impiantate chirurgicamente (Glenn e Condotto)

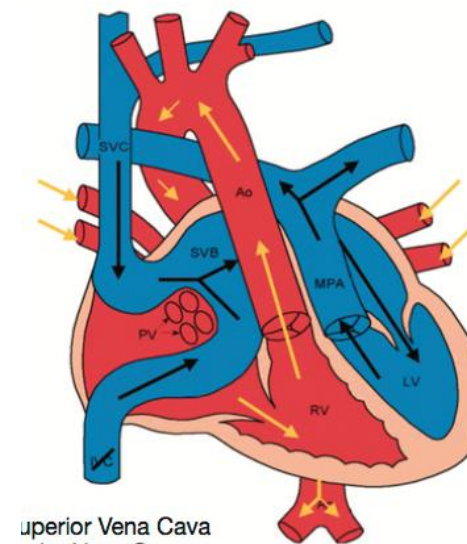
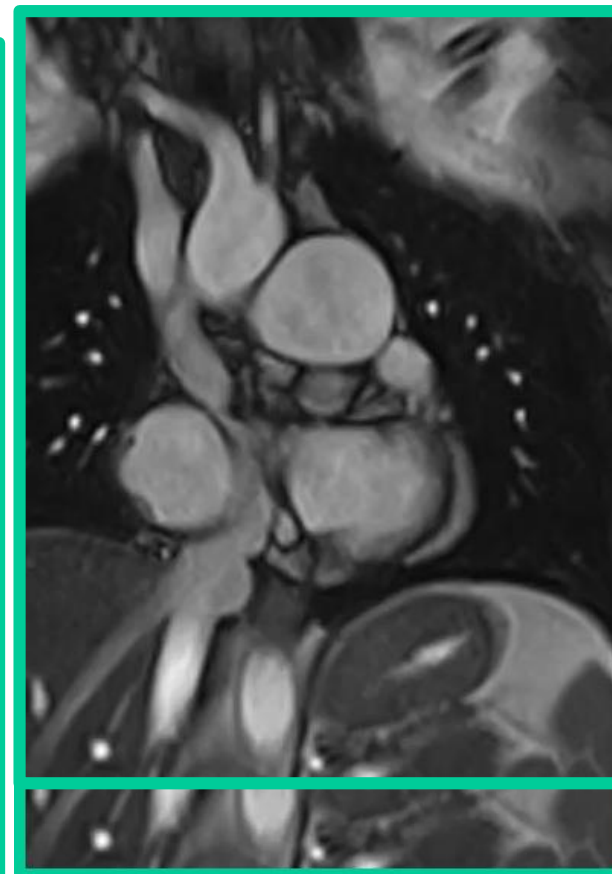
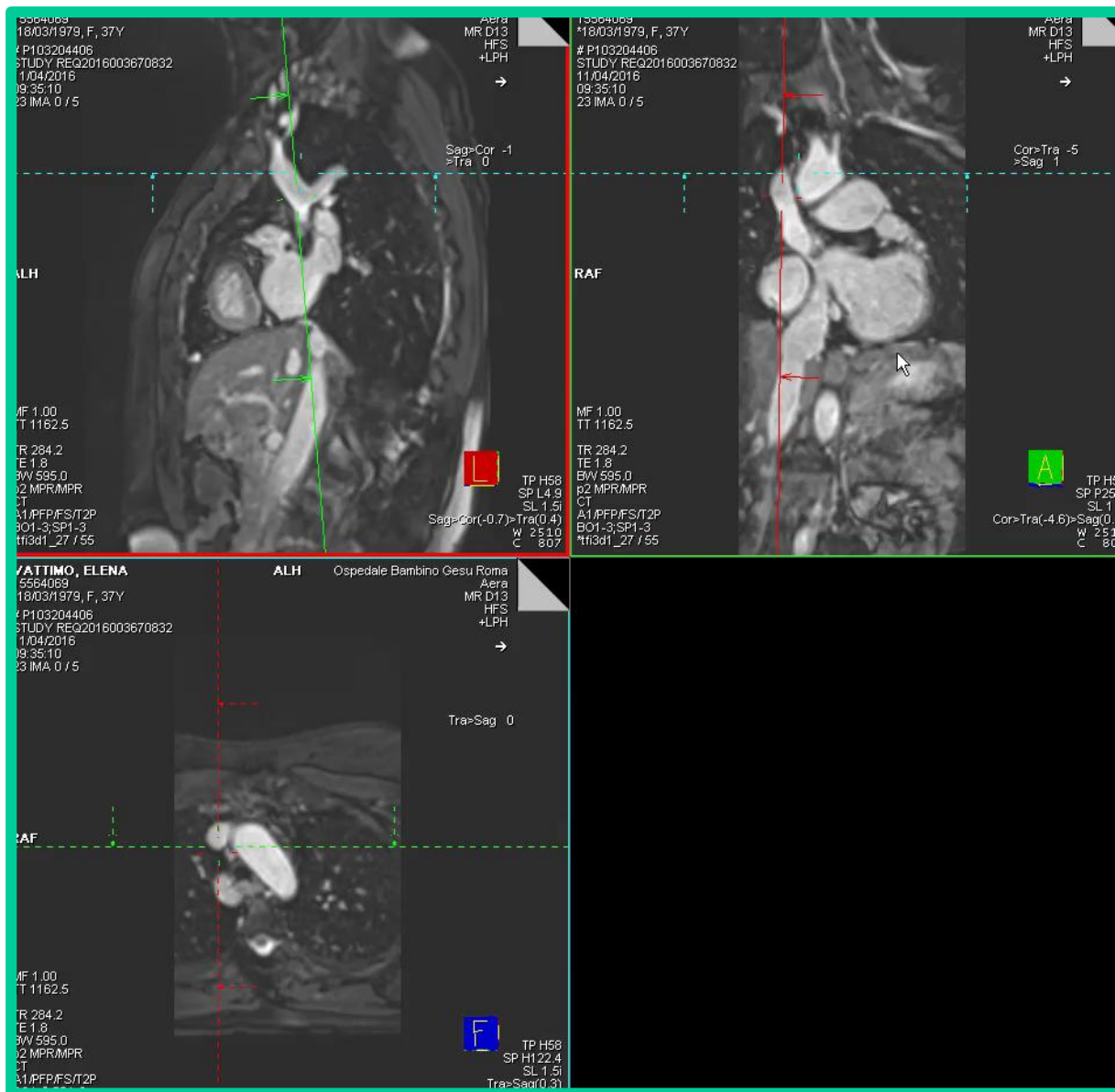


Le Cardiopatie congenite: Tecniche di studio

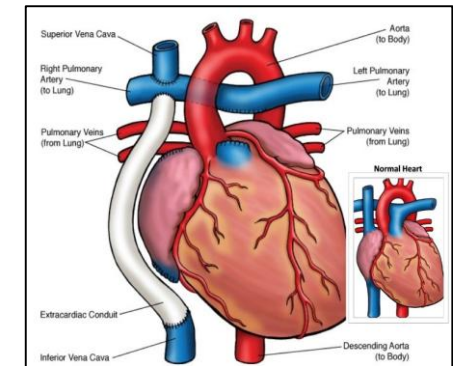
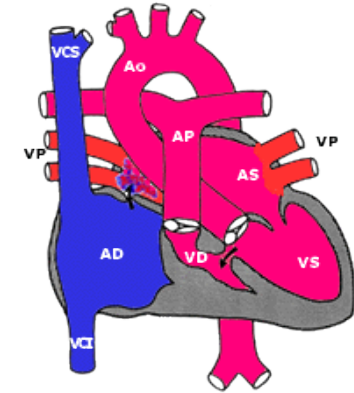
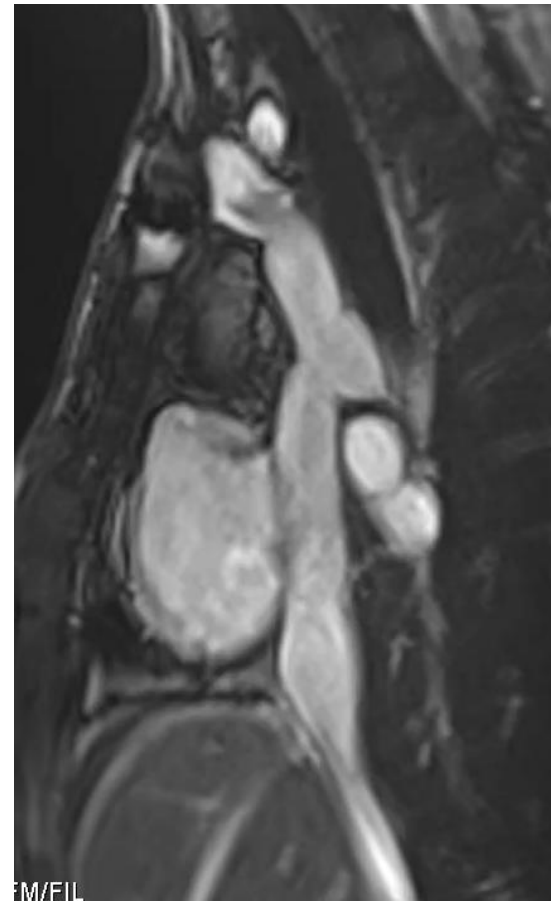
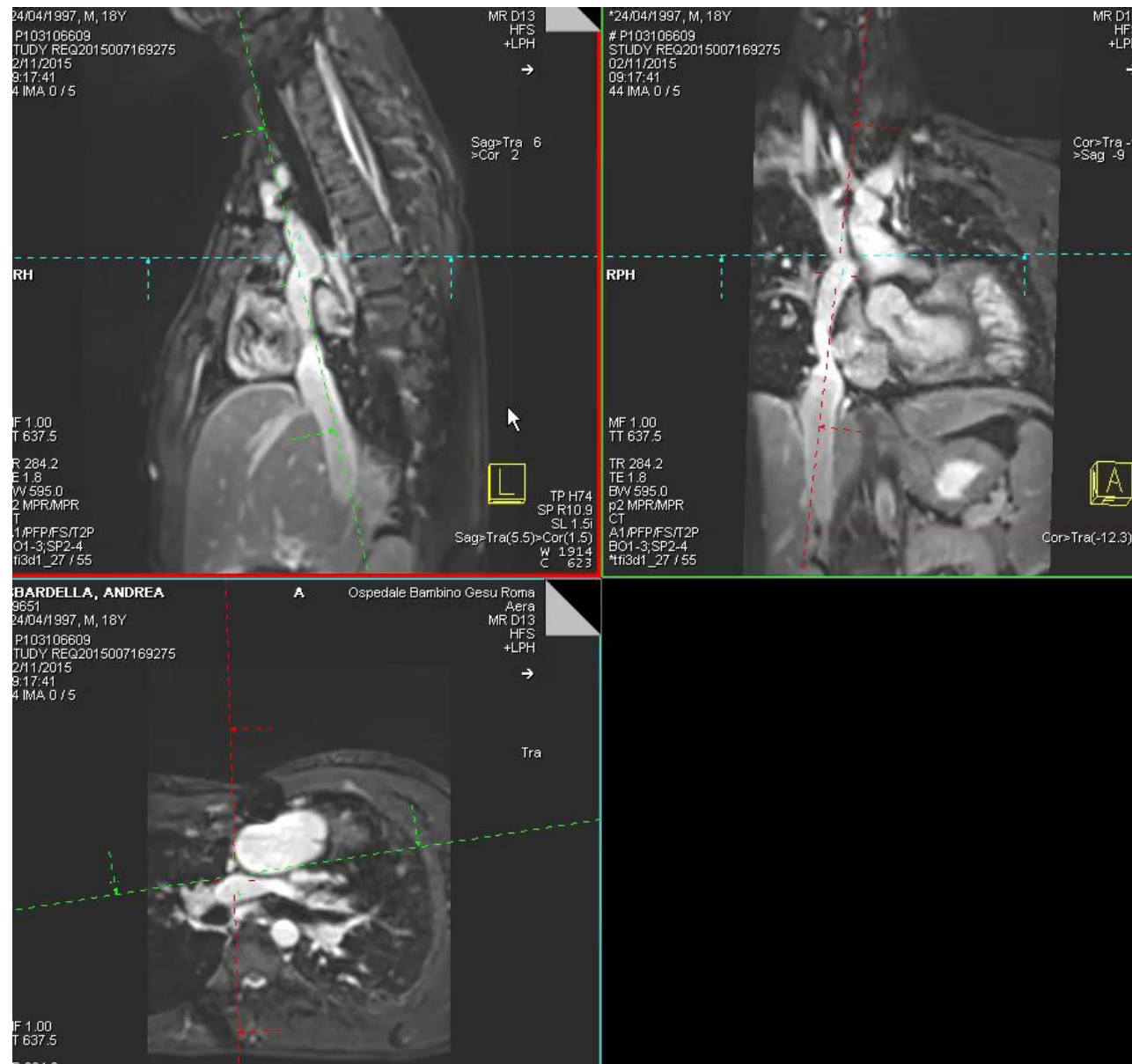




Utilizzare sequenza 3D acquisita per pianificare
Gli assi di studio dedicati alle strutture modificate
Ed impiantate chirurgicamente (Glenn e Condotto)



Variante Mustard



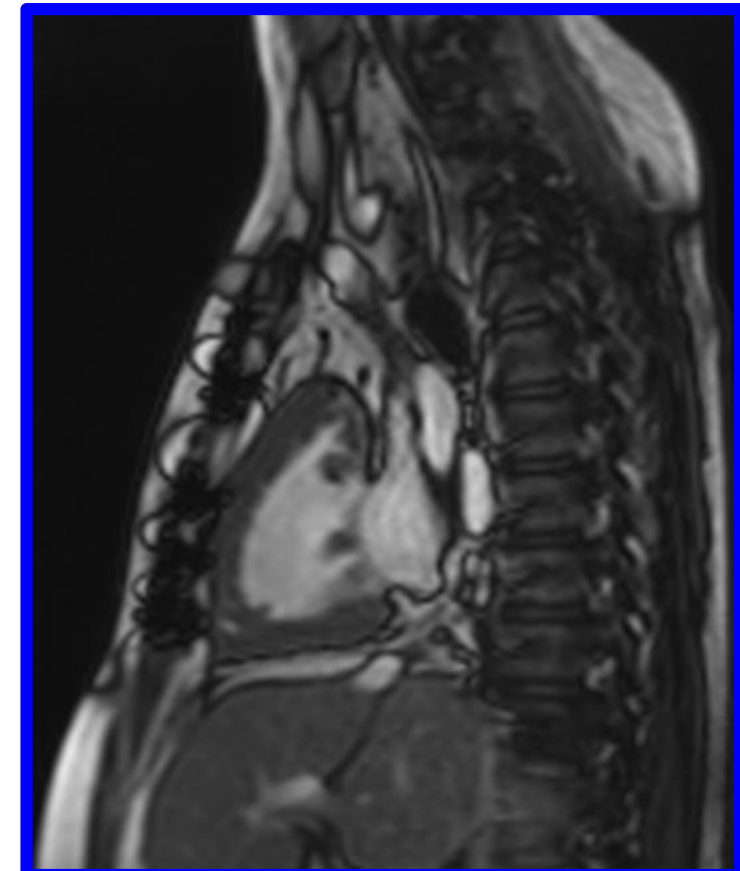
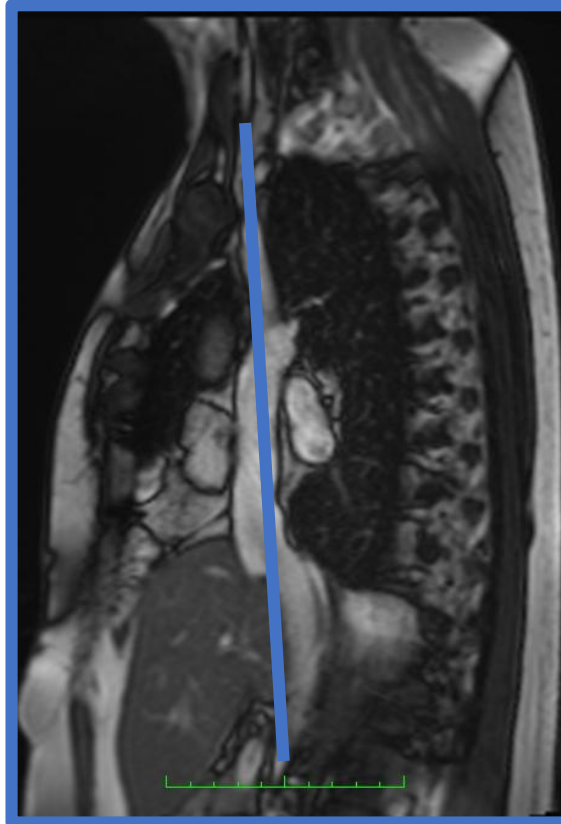
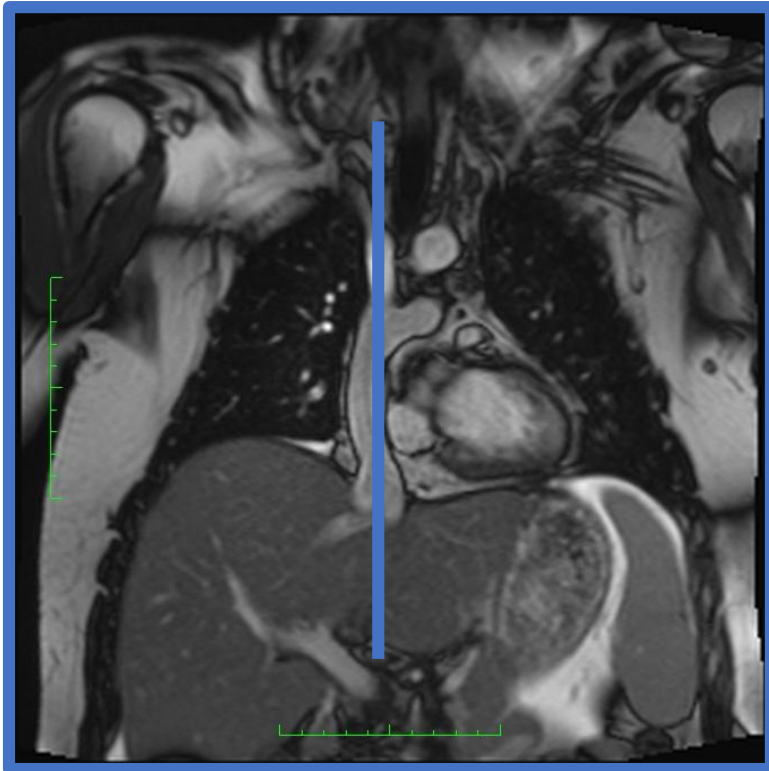
Le Cardiopatie congenite: Tecniche di studio

Fase conclusiva:

Planning dedicato

Visualizzazione in Cine del condotto e della Glenn

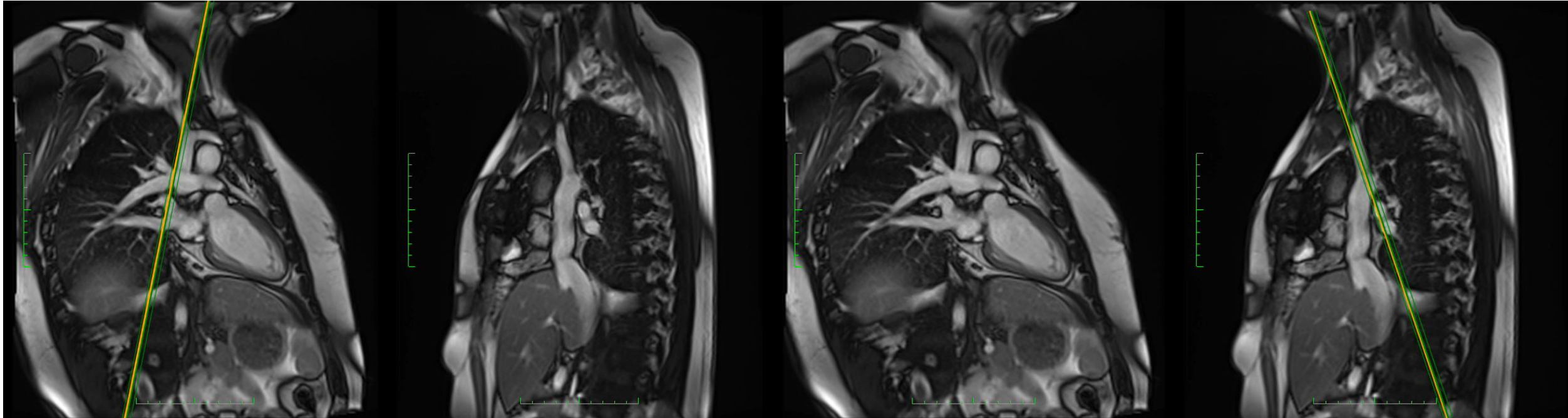
E' possibile utilizzare anche la triplane di centraggio per individuare condotto e Glenn.



Le Cardiopatie congenite: Tecniche di studio

Cine condotto

Cine controefflusso condotto

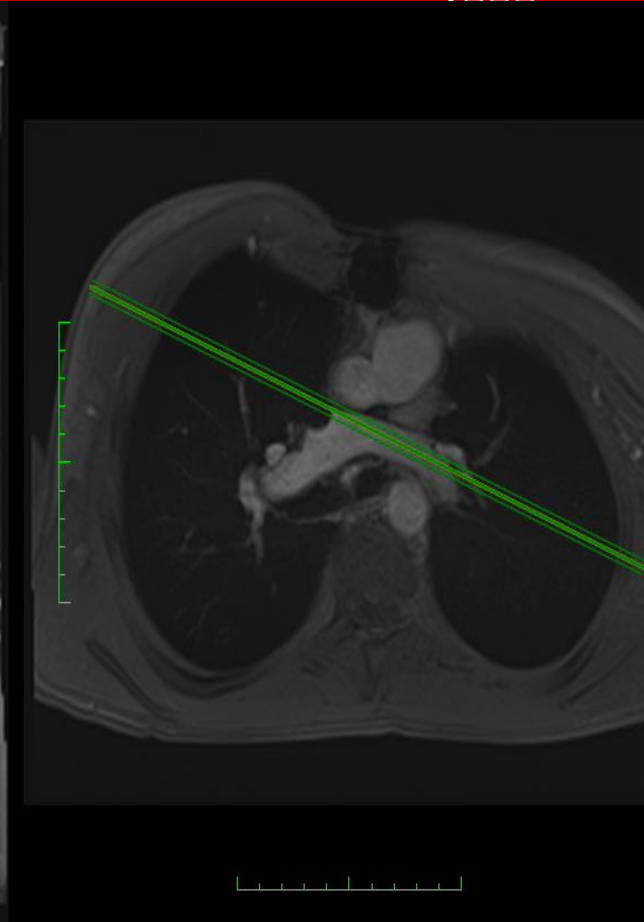
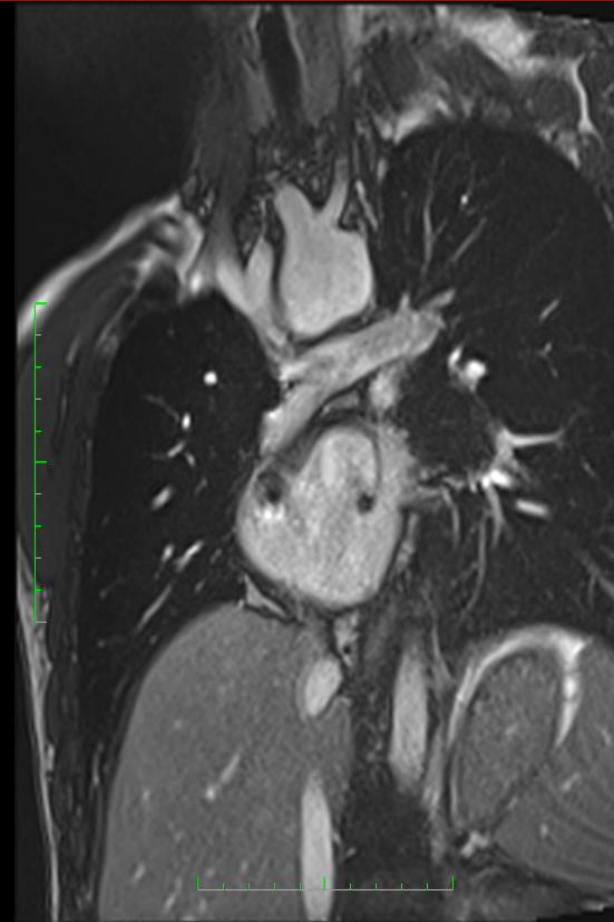
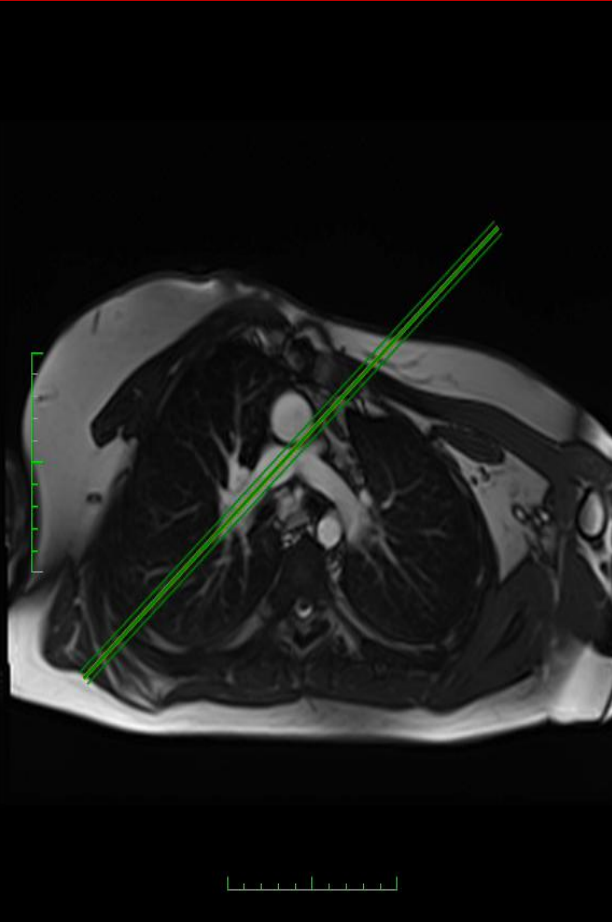


Le Cardiopatie congenite: Tecniche di studio

Cine arterie polmonari



Cine ap dx



Cine ap sn

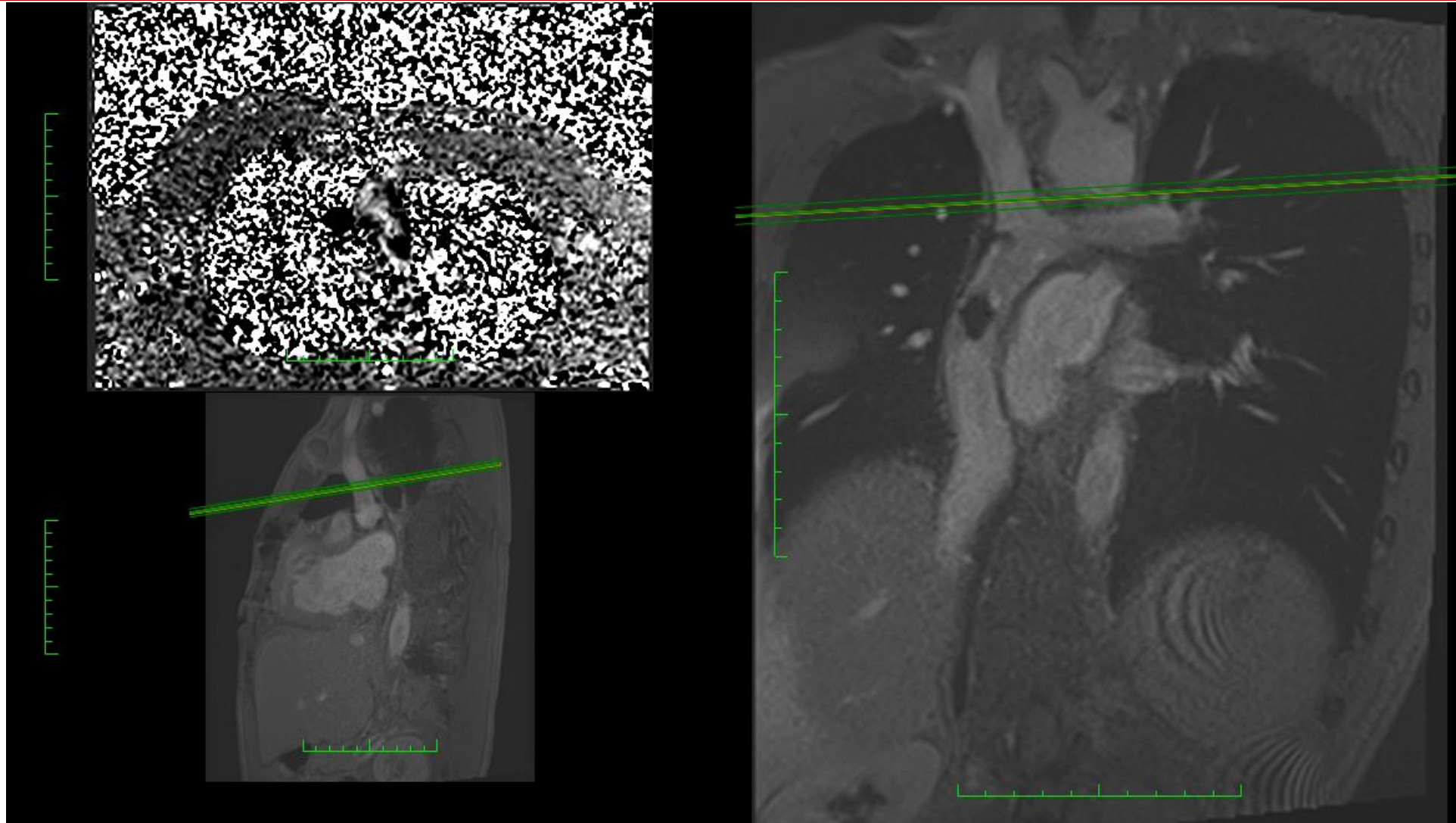
I Flussi:

- Perpendicolari al movimento del sangue
- Ricavati da sequenze cine (glenn, fontan, vasi polmonari)
- Venc diverse a seconda del vaso in esame

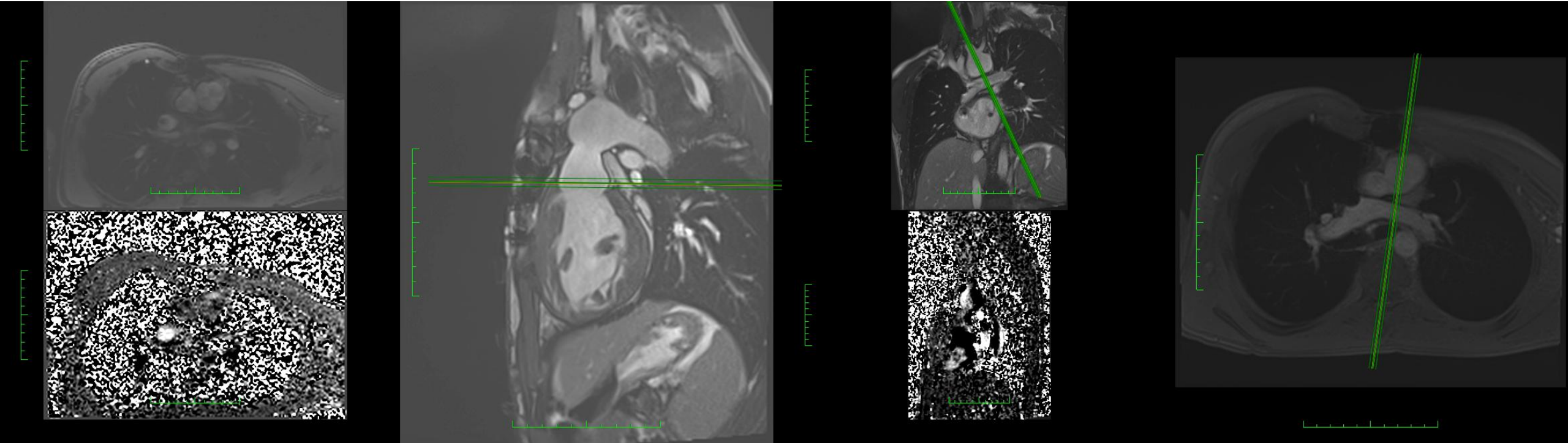
Fondamentali :

- glenn
- condotto
- arterie polmonari
- vene polmonari
- VCS
- vci
- vene polmonari

Le Cardiopatie congenite: Tecniche di studio



Le Cardiopatie congenite: Tecniche di studio I Flussi



Flow aapm

Flow apsn