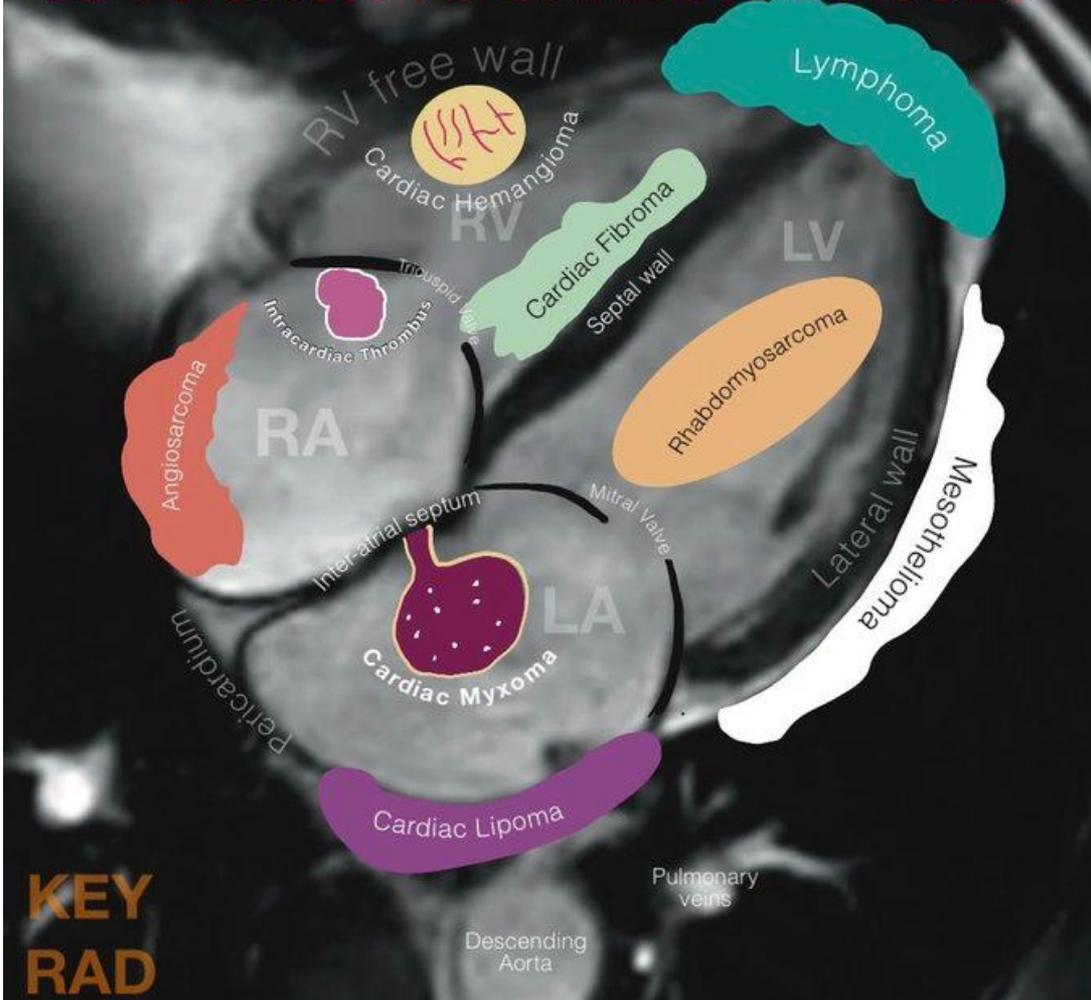


APPROACH TO CARDIAC MASSES



CARDIAC MASSES

Dr Eva Nyktari
Cardiologist CMR Unit Consultant
Onassis Cardiothoracic Center

Objectives

- To understand differential diagnosis of cardiac masses including non neoplastic masses and anatomic variants
- Imaging: Basic CMR protocol
- Example cases
- Quiz cases

Cardiac Tumours and Masses

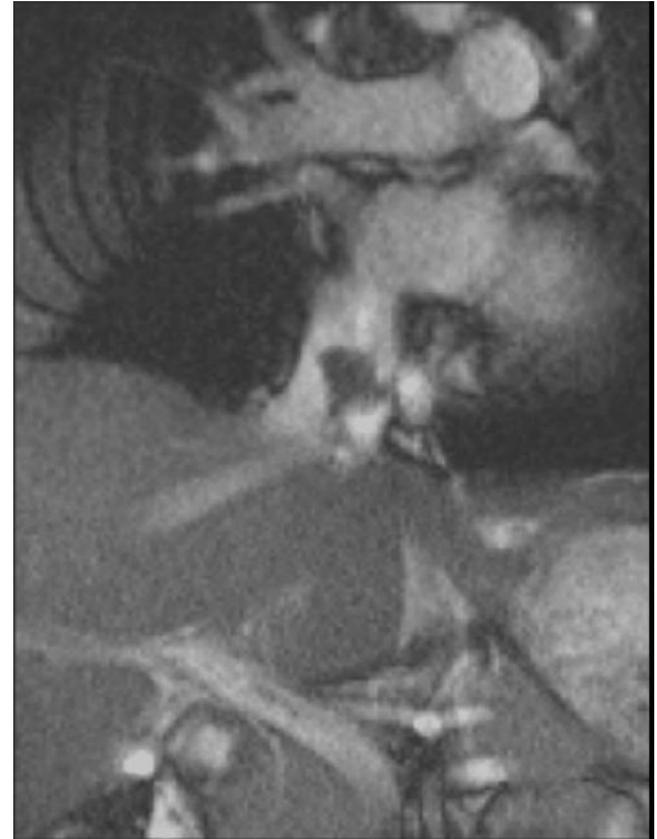
Cardiac tumours are rare (0.002-0.03%)

Metastases are 20-40 times more frequent than primary tumours ²

secondary/primary ratio of 20:1

Up to 90% of primary neoplastic tumors are benign and may originate from the pericardium or myocardium

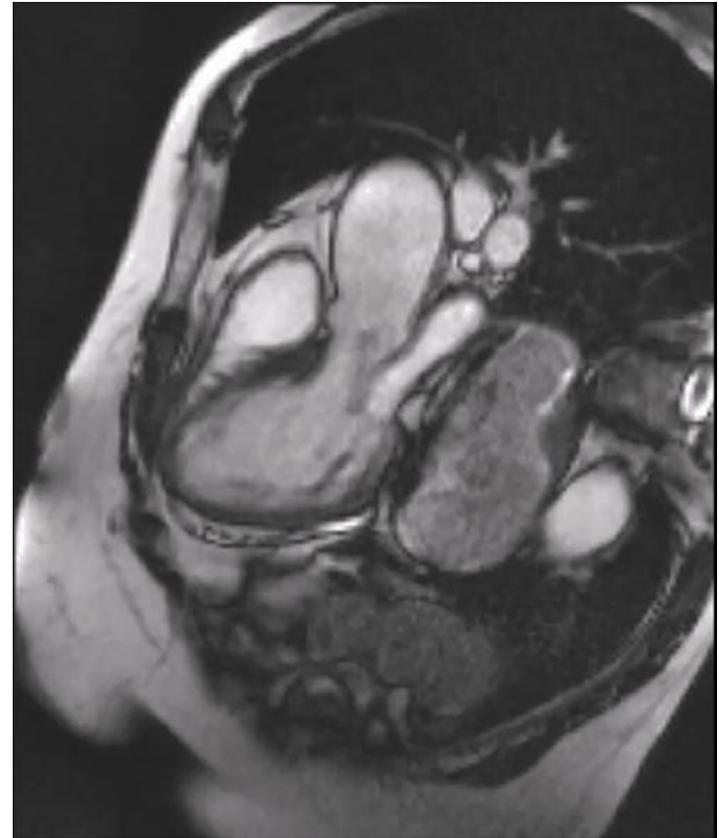
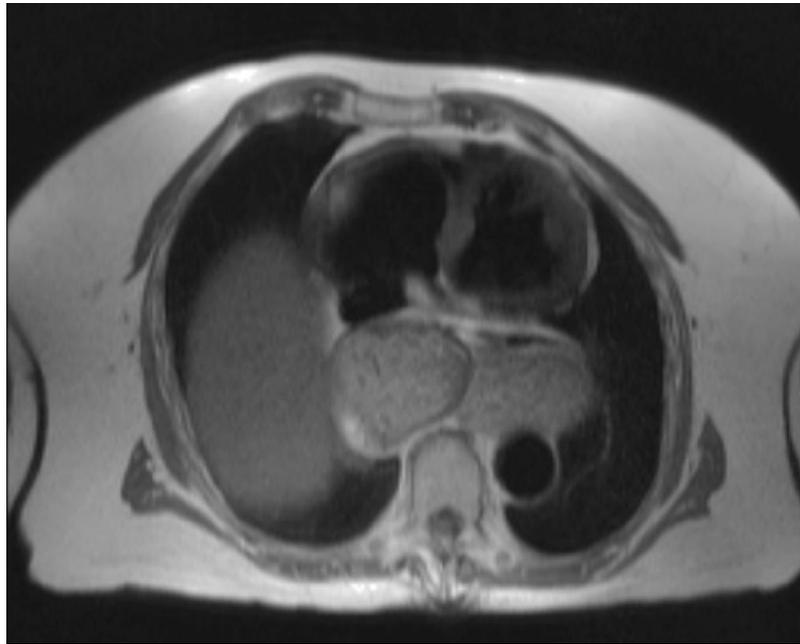
Mimickers are much more common



1. Lam Ky et al, Arch Lab Pathol Med 1993 / Sutsch et al, Schweiz Med Wochenschr 1991

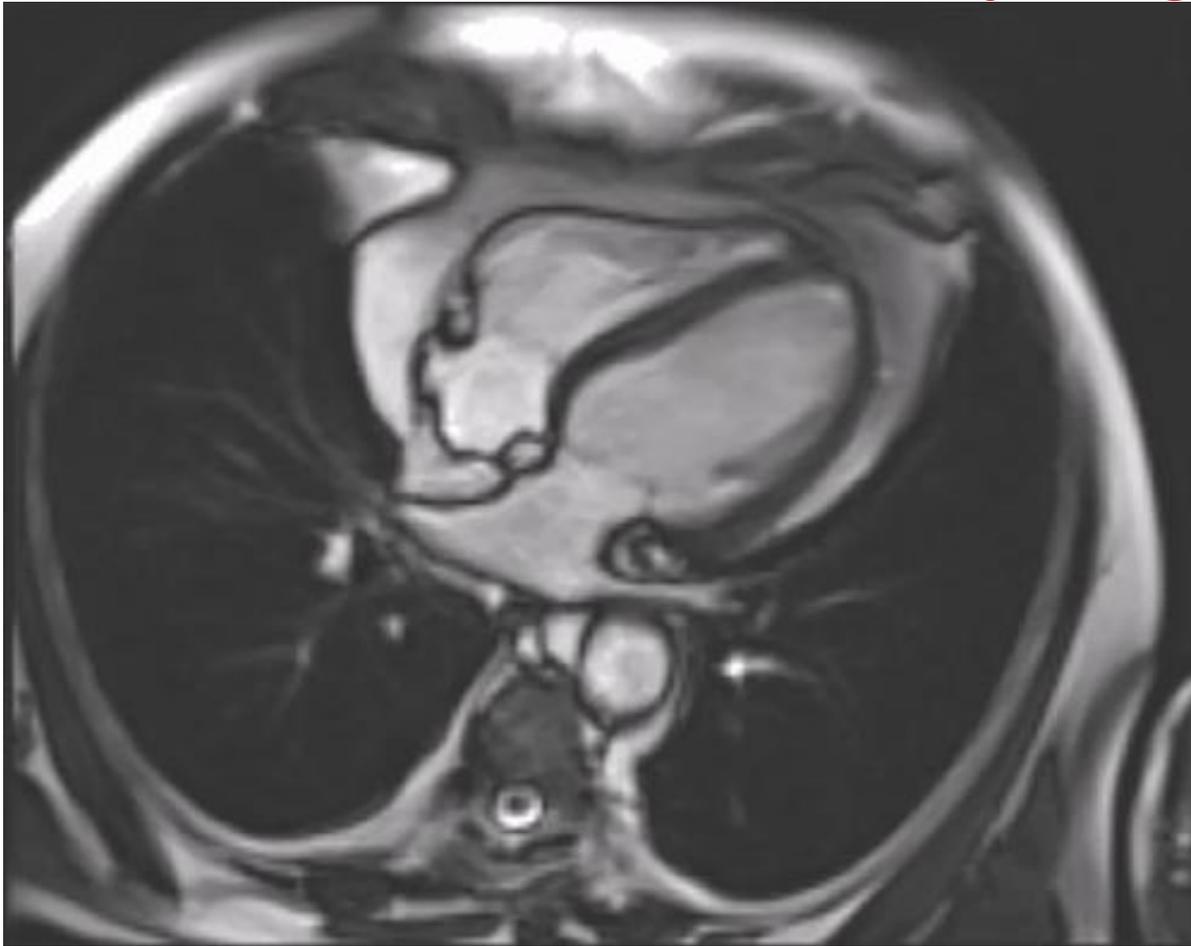
2. Bruce, Heart 2011 / Butany et al, Lancet Oncol 2005

Most mass queries are actually negative



Hiatus hernia mimicking left atrial mass

Most mass queries are actually negative



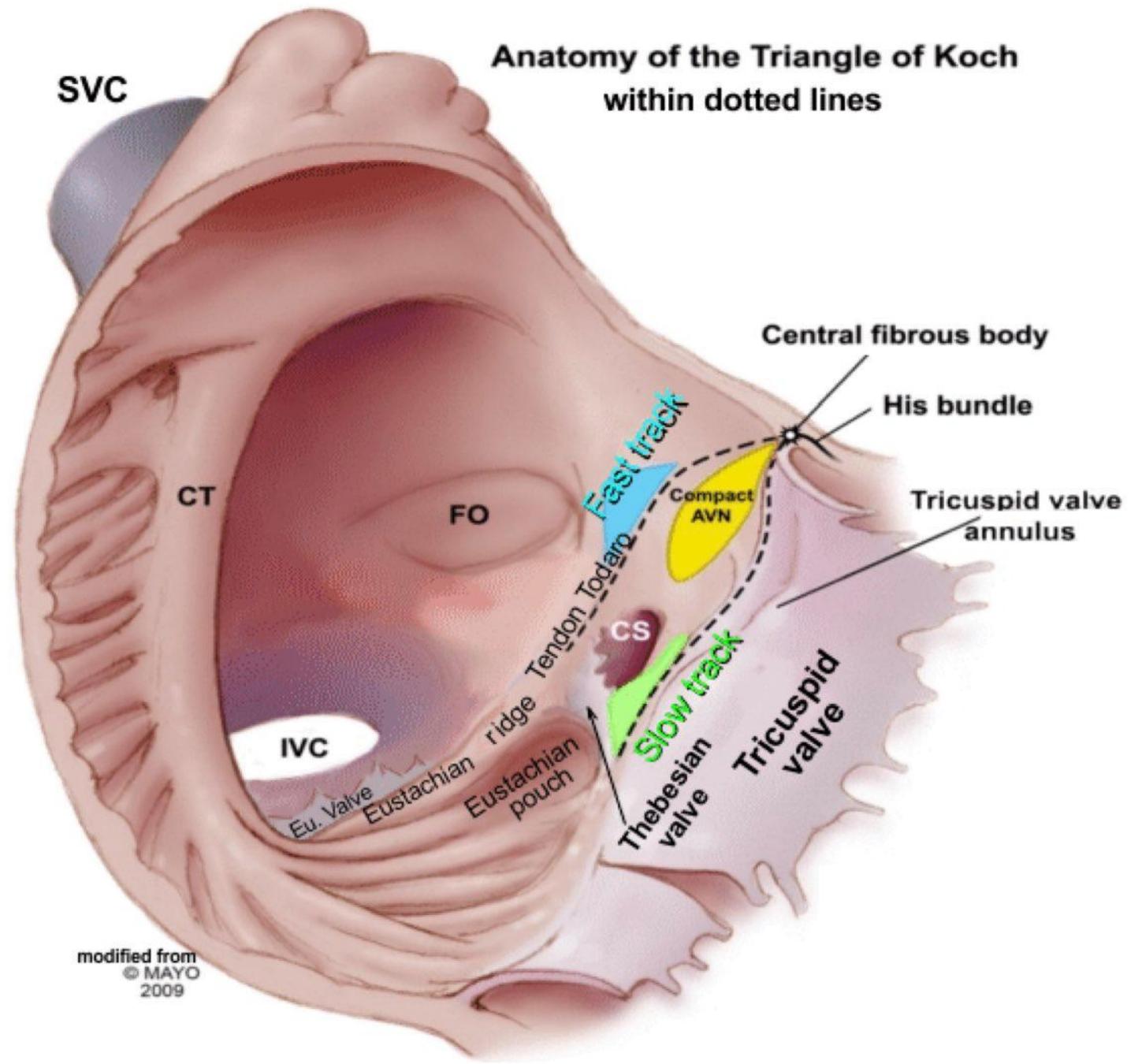
Lipomatous hypertrophy mimicking pericardial or interatrial septal mass

i.

SVC

Anatomy of the Triangle of Koch within dotted lines

ii.



modified from
© MAYO
2009

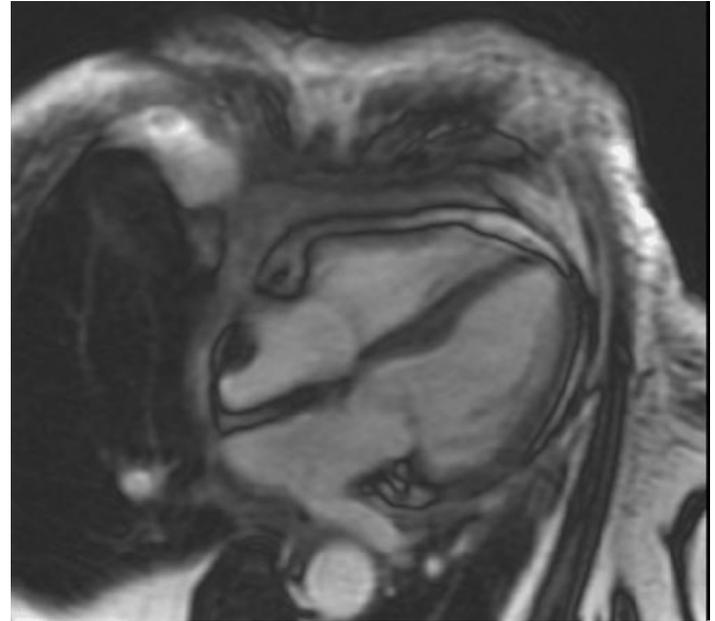
A

A

Cardiac Tumours and Masses

Anatomical variants

- Crista terminalis
- Eustachian valve
- Chiari network
- LA appendage ridge
- False tendon in the LV
- Ventricular trabeculations
- Dilated coronary sinus

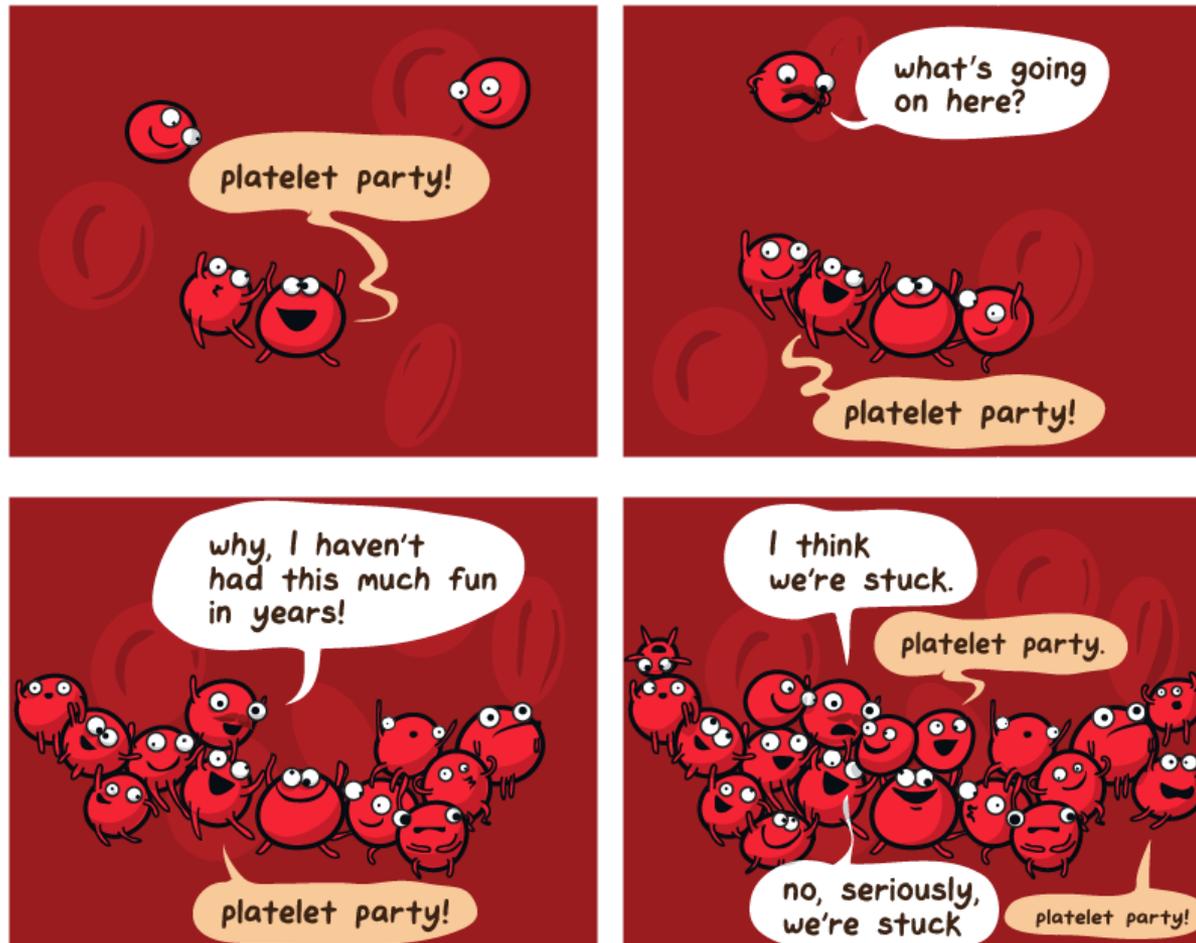


Other mimickers

- Post-op changes
- Imaging artefacts

Cardiac Tumours and Masses

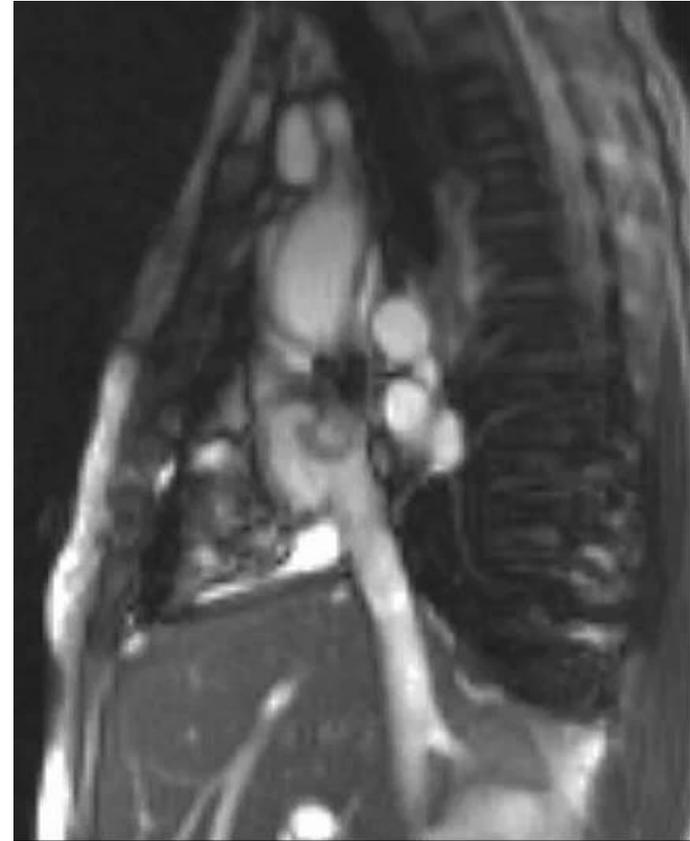
Thrombi are the most common intracardiac masses



Cardiac Tumours and Masses

Thrombi

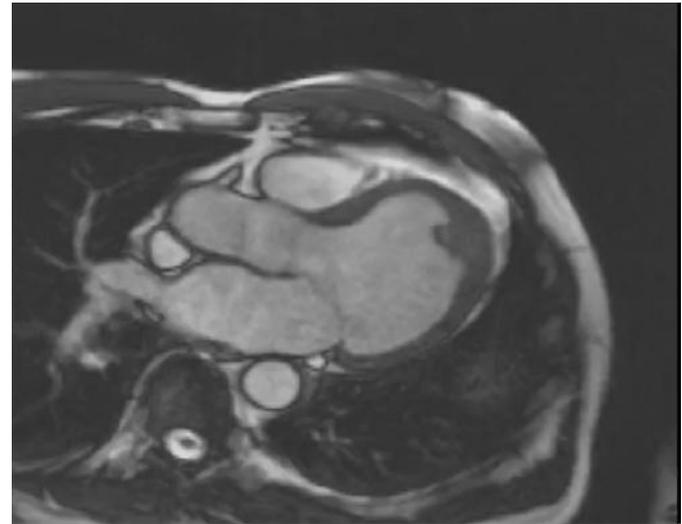
- Central catheters
- Atrial fibrillation
- Infarction
- DVT
- Valvular prostheses



Cardiac Tumours and Masses

Other non-neoplastic masses

- Endomyocardial fibrosis/Loeffler
- Vegetation
- Hydatid cyst
- Tuberculoma
- Aspergilloma
- Calcified amorphous tumor
- Dystrophic calcification of the mitral annulus
- Cardiac varices



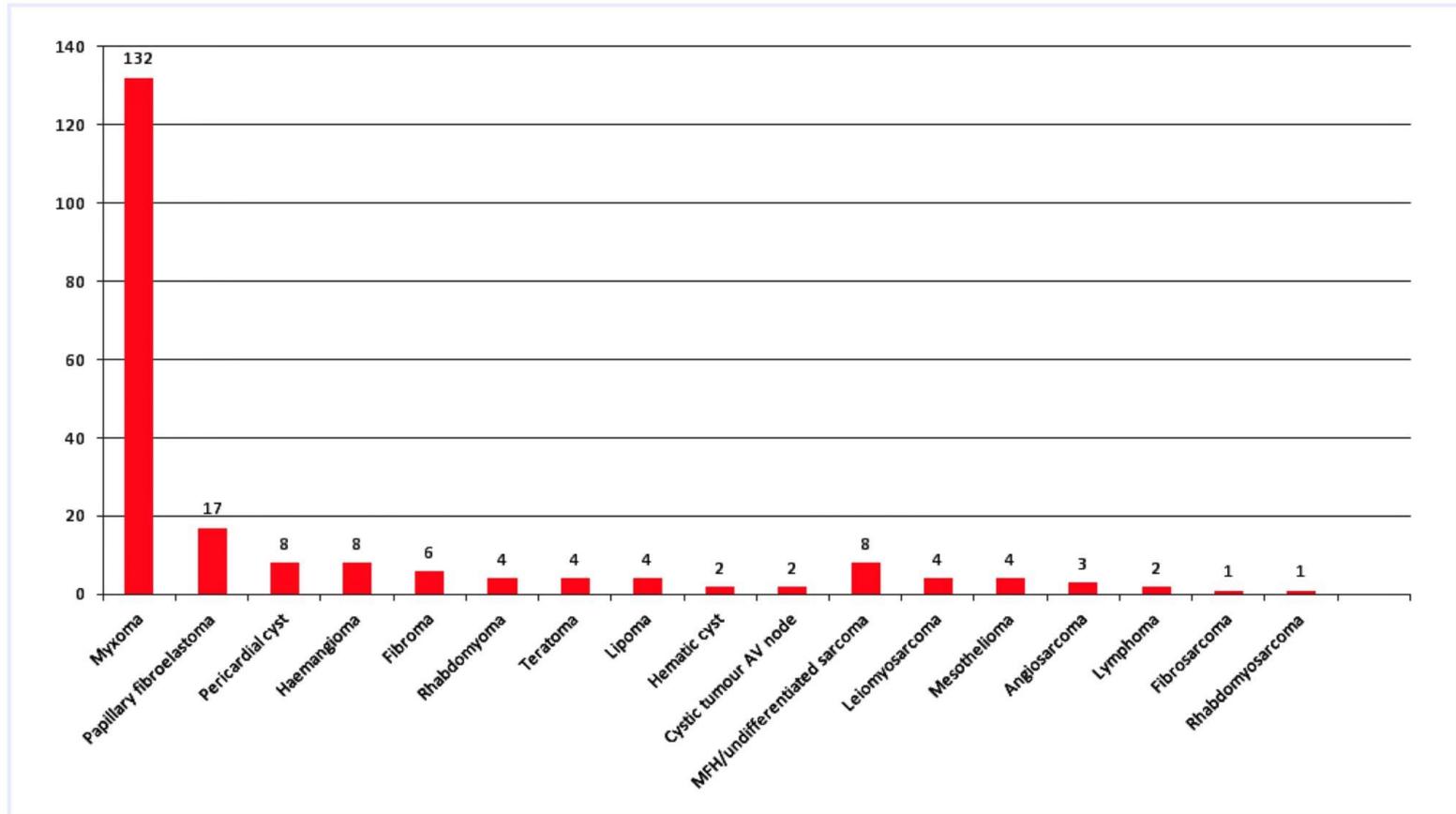
Primary Cardiac Tumours



Approximate Relative Incidences of Primary Cardiac Tumors

Tumor	Incidence
Benign	
Myxoma	30%
Lipoma	10%
Fibroelastoma	10%
Rhabdomyoma	8%
Fibroma	4%
Hemangioma	3%
Teratoma	3%
Other	5%
Total	70%–75%
Malignant	
Angiosarcoma	9%
Rhabdomyosarcoma	6%
Mesothelioma	4%
Fibrosarcoma	3%
Lymphoma	2%
Other sarcomas	3%
Teratoma	<1%
Other	<1%
Total	25%–30%

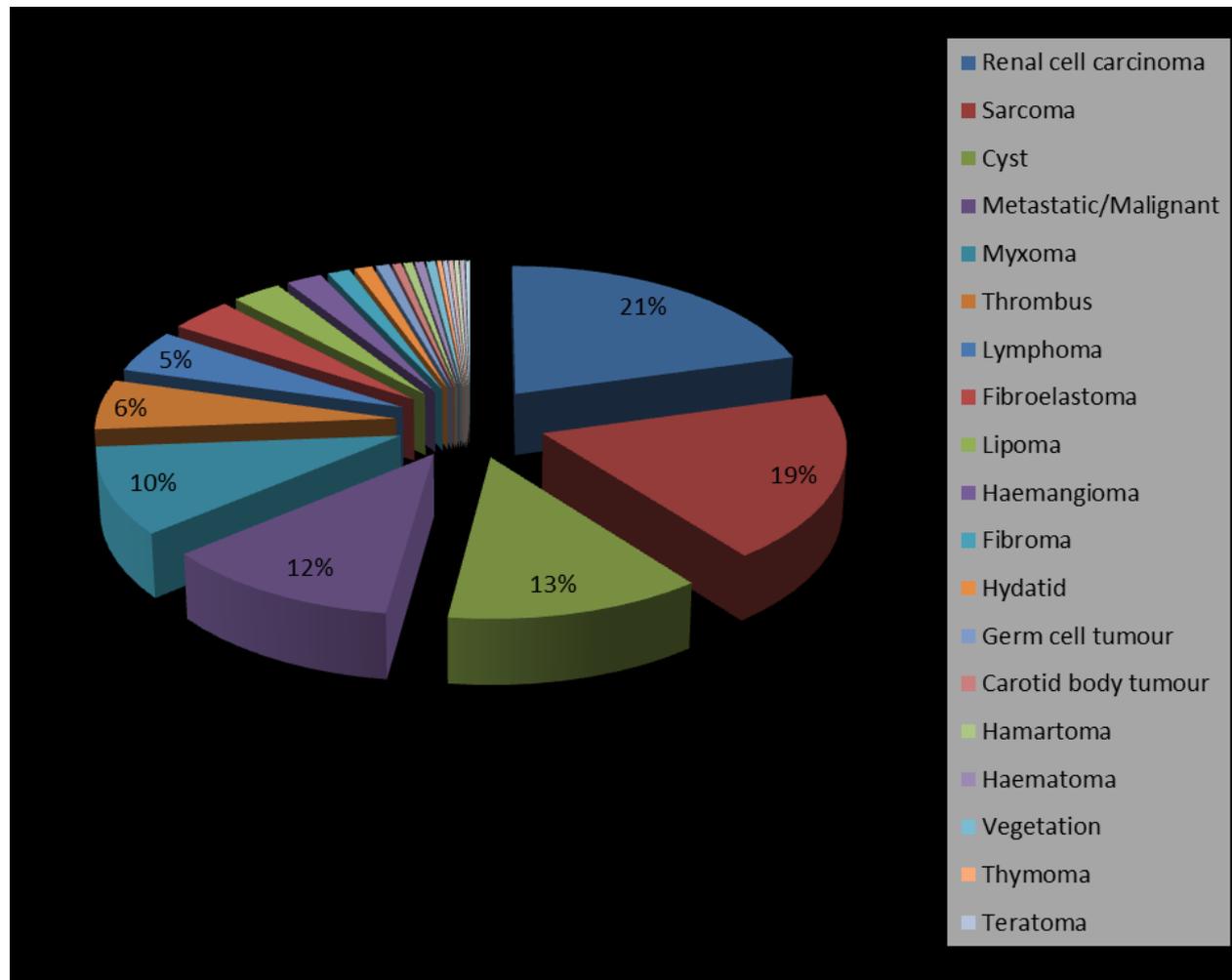
Cardiac Tumours and Masses



- 34 years (1970-2004), 210 cases of primary tumours
- Only histopathology analysis, non CMR specific imaging

RBH CMR experience

~400 cardiac masses since 2000



Presentation-non specific

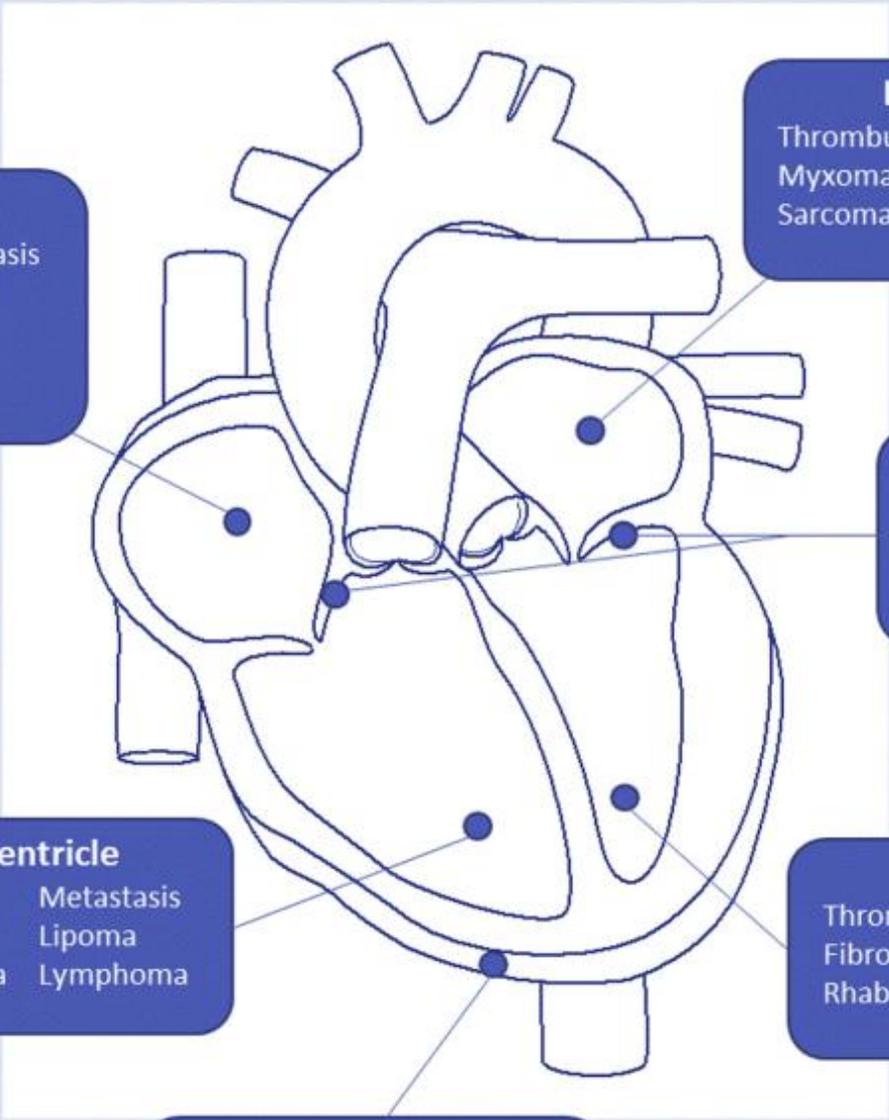
- **Asymptomatic**
- **Heart Failure:** Due to obstruction of outflow tract or cavity filling or dysfunction due to myocardial involvement
- **Arrhythmias:** More often occur with intramural involvement; SVT's with atrial masses, PVC/VT/VF with ventricular myocardial involvement and conduction problems with AV node involvement
- **Emboli:** Right and left sided phenomena
- **Systemic:** Constitutional (fever, arthralgias, weight loss, fatigue) and paraneoplastic syndromes

Imaging techniques



Clinical Setting
VALUABLE

1. Age of the patient at time of presentation
2. Epidemiologic likelihood and clinical probability
3. Location of tumor
4. Non invasive tissue characterization CMR imaging



Right Atrium
Thrombus Metastasis
Myxoma Lipoma
Lymphoma
(Angio-) Sarcoma

Left Atrium
Thrombus Metastasis
Myxoma Lipoma
Sarcoma

Valves
Thrombus
Vegetation
Fibroelastoma

Right Ventricle
Thrombus Metastasis
Fibroma Lipoma
Rhabdomyoma Lymphoma

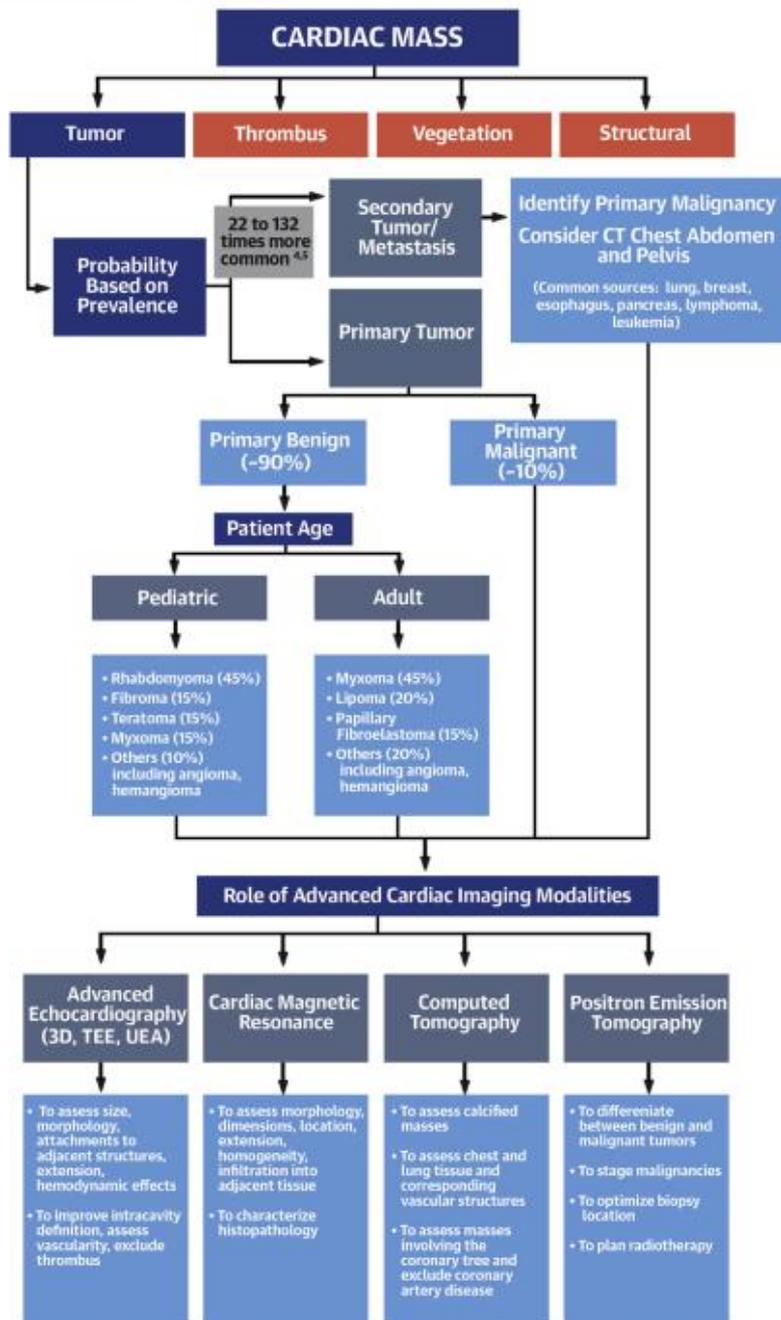
Left Ventricle
Thrombus Metastasis
Fibroma Lipoma
Rhabdomyoma Lymphoma

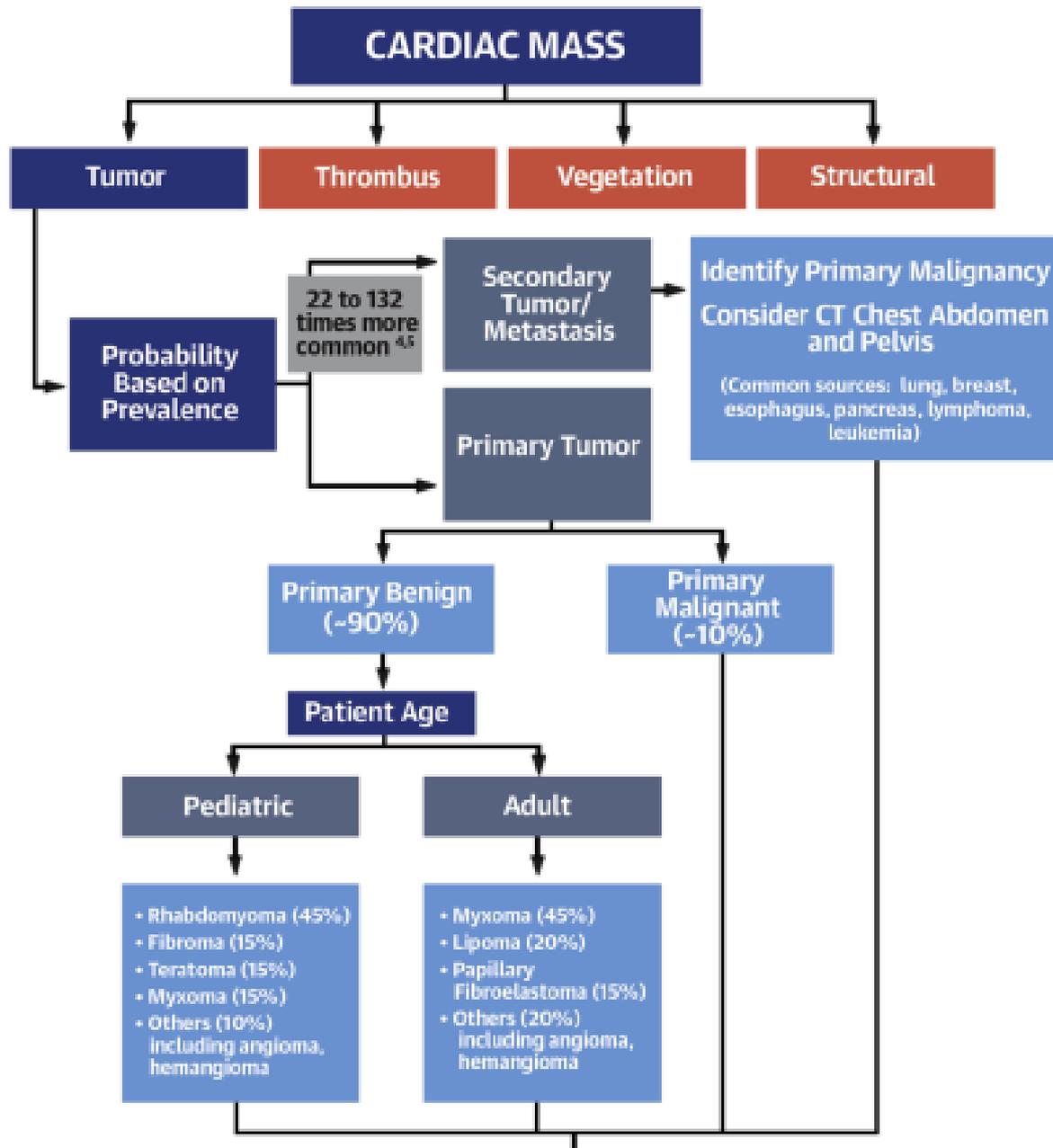
Pericardium
Thrombus Metastasis
Liposarcoma Lipoma
Lymphoma

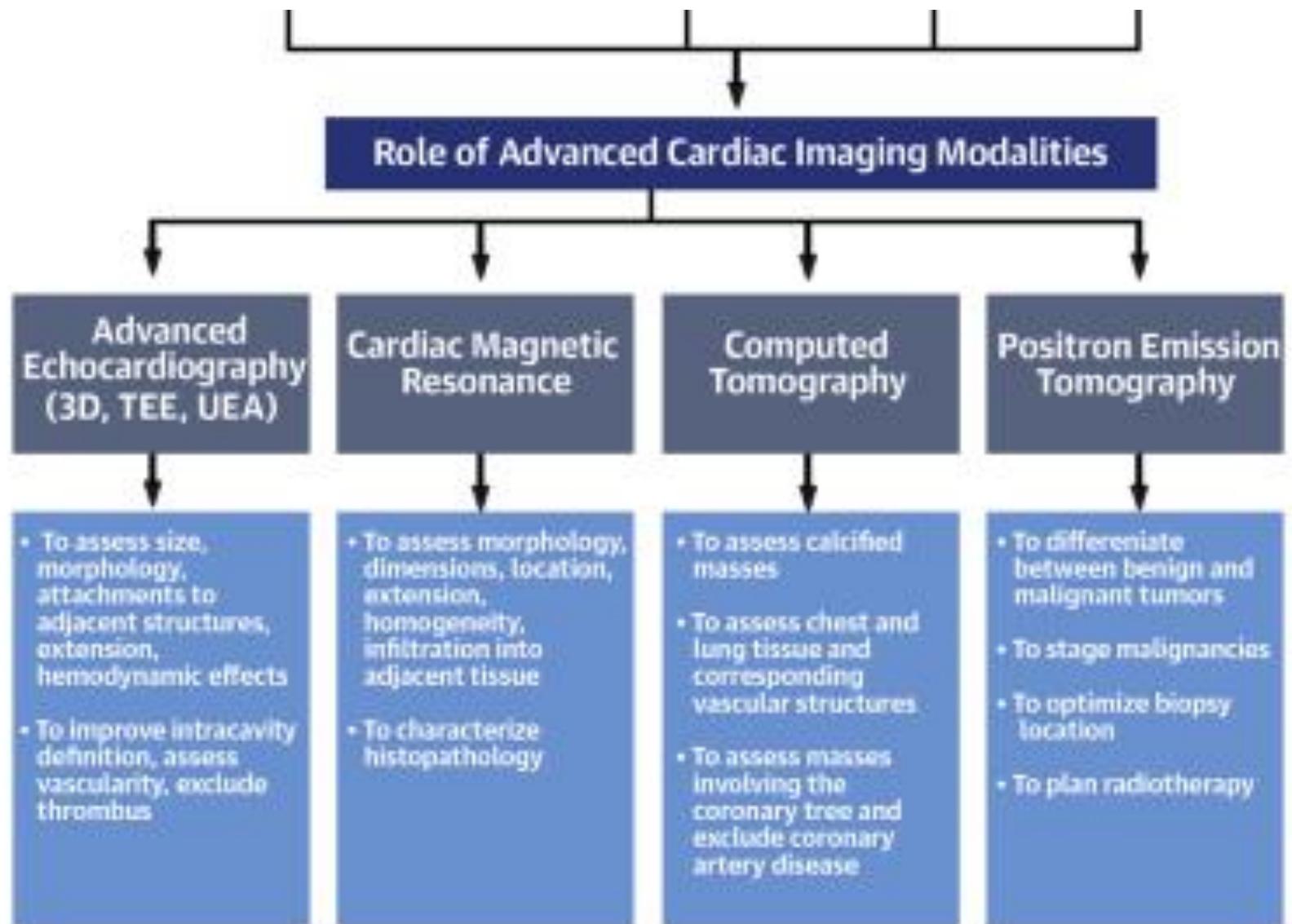
STATE-OF-THE-ART REVIEW

Cardiac Tumors



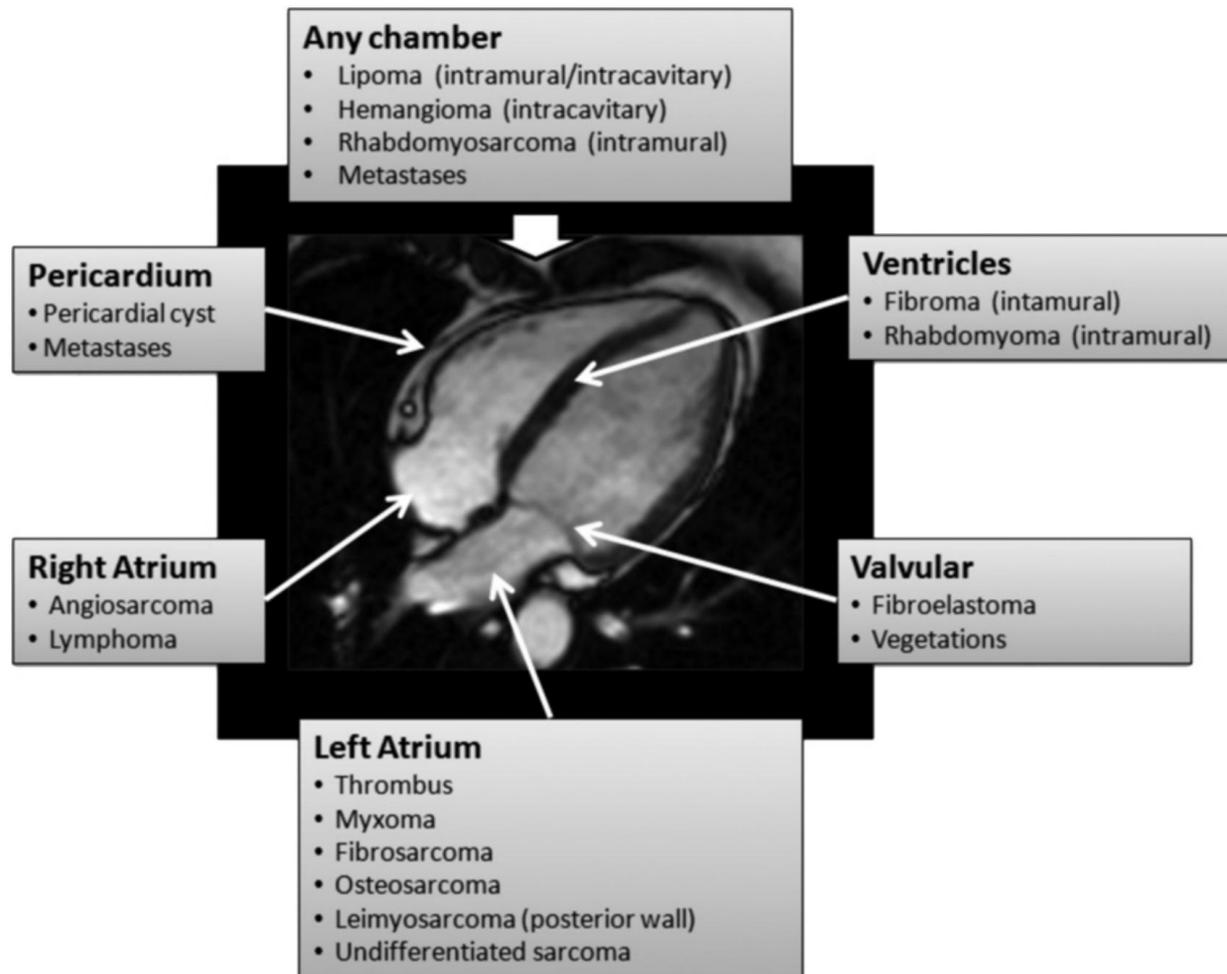






What do we need to know?

- Location
- Size
- Signal characteristics
- Motion
- Relation with adjacent structures
- Compression
- Obstruction



CMR

- ✓ High temporal resolution
- ✓ Tissue characterization
- ✓ Paracardiac structures
- ✓ Malignancy prediction⁶

Limitations

- ECG gating
- Breath holding
- Pacemakers, ICD

Tumor Characteristics

- Large size—especially if >5 cm
- Irregular, ill-defined borders
- Direct invasion through tissue planes
- Most cardiac tumors involving the right heart are suspicious for malignancy
- Pericardial or pleural involvement—effusions and nodular masses
- Multiple lesions

Tissue Characteristics

- Tissue heterogeneity on T1- and T2-weighted images (hemorrhage and necrosis within mass)
- Hemorrhagic pericardial effusion (high signal intensity on T1-weighted images)
- Contrast enhancement
- High T1-weighted with low T2-weighted signal intensity is suggestive of metastatic malignant melanoma

Assessment by CMR

Anatomy

Direct invasion through tissue planes

Paracardiac structures

Compression/obstruction

Tissue characterisation

Tumor Characteristics

Large size—especially if >5 cm

Irregular, ill-defined borders

Direct invasion through tissue planes

Most cardiac tumors involving the right heart are suspicious for malignancy

Pericardial or pleural involvement—effusions and nodular masses

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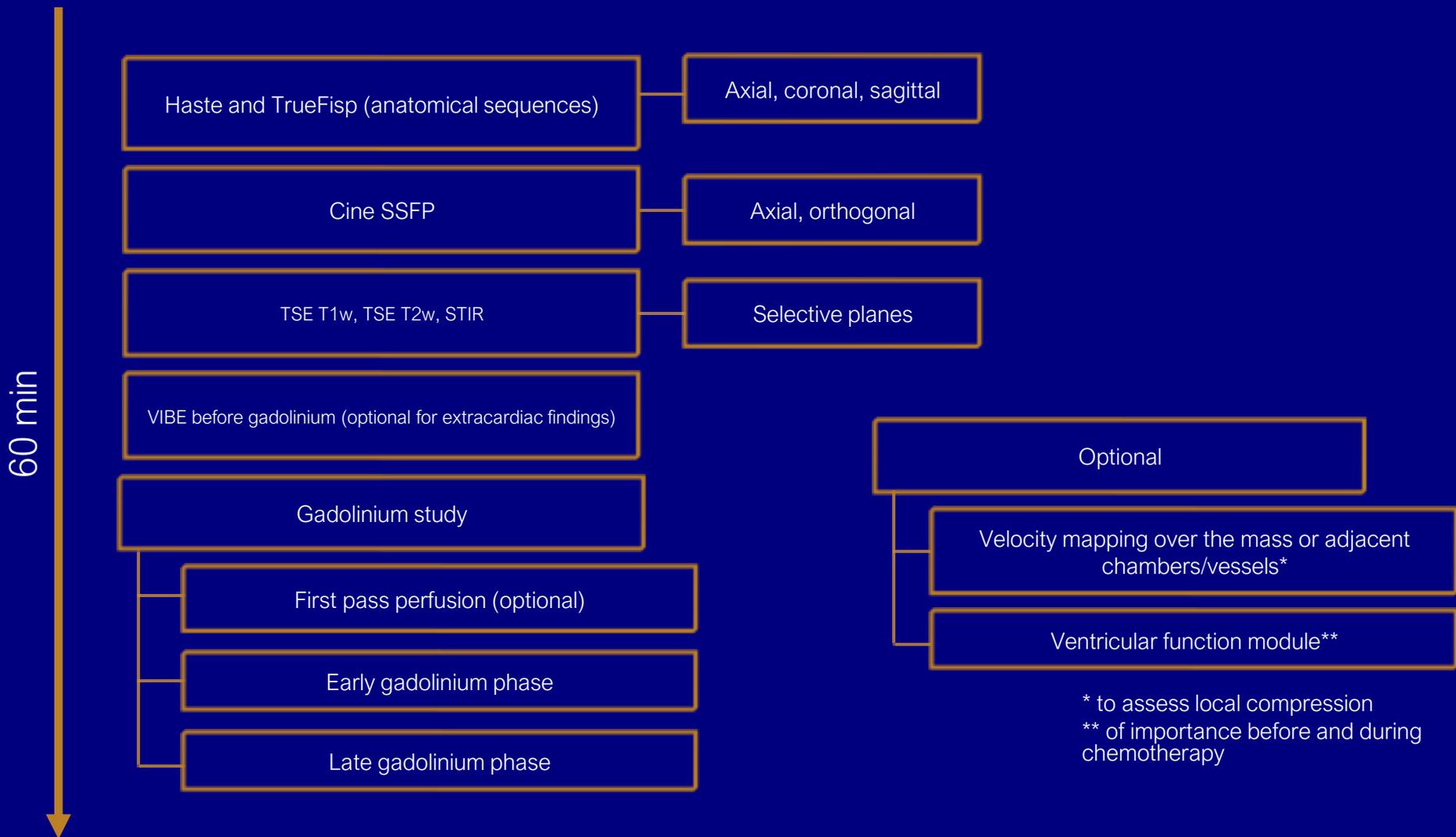
There are many cardiac masses...

Table 5
Main CMR imaging characteristics of cardiac masses

	T1-weighted TSE	T2-weighted TSE	Gradient Echo Images	Enhancement After Administration of Gd-DTPA
Myxoma	Intermediate varying SI, calcified areas: hypointense and hemorrhage: increased SI	Low SI, especially in iron containing myxomas	Very low SI compared to the surrounding blood pool	Hyperintense
Lipoma/Lipomatous hypertrophy	Brightest SI similar to subcutaneous fat, using fat presaturation technique: reduced SI	Intermediate SI paralleling to subcutaneous fat	Nonspecific	Nonspecific
Fibroma	Intermediate to slightly hyperintense SI compared to myocardium, when calcification (hypointense) and hemorrhage (hyperintense) are present: heterogeneous	Decrease in SI compared to TI	Nonspecific	Slight and heterogeneous
Rhabdomyoma	Heterogeneous, with lower SI than myocardium	Strongly increased SI	Very low compared to myocardium	Nonspecific
Thrombus	Intermediate SI	Intermediate SI. Due to low flowing blood in the tumor vessels), higher than myocardium	Nonspecific	Significant increase in SI, heterogeneous.
Intravenous leiomyomatosis	Similar to myocardium	Similar to myocardium	Nonspecific	Nonspecific
Pericardial cysts (simple fluid) (proteinaceous fluid)	Lowest SI, flow void	Highest SI	Nonspecific	Signal enhancement, visualization of intracystic septae
Angiosarcoma	Low SI, but higher than in normal fluid, no flow void	High SI	Nonspecific	Strong
Lymphoma	Central hyperintense spot (blood vessels, hemorrhage or necrosis), surrounded by intermediate SI regions.	No change	Nonspecific	Heterogeneous with less enhancing central regions
Liposarcoma	Isointense to hypointense to cardiac muscle	Isointense to myocardium	Nonspecific	Not published
Leiomyosarcoma	Bright SI equal to subcutaneous fat, but heterogeneous: decrease in SI, when fat presaturation is used	Not published	Not published	Not published
Thrombus	High SI, slightly higher than liver parenchyma, but not as high as subcutaneous fat	Not published	Not published	Not published
Fresh	Homogeneous, commonly connected with proteinaceous pericardial effusion	Not published	Not published	Not published
Chronic (Older than 2weeks)	Intermediate, often slightly higher SI than myocardium, slightly higher than blood	Surrounding slowly flowing blood becomes higher SI than thrombus, contrast between thrombus and myocardium is further accentuated	Thrombus has the lowest SI	No signal enhancement, unless the thrombus is organized.
	High SI (oxyhemoglobin)	Decreased SI		
	Higher SI (deoxyhemoglobin)			

but the approach is always the same!

CMR protocol



Clinical relevance of T1 and T2 weighting

To image a particular tissue or pathology with the best contrast, we need to use a TR and TE that gives the appropriate weighting

T1 oxygenated blood = 1000ms
T1 deoxygenated blood = 1000ms
T1 myocardium = 900ms
T1 fat = 240ms
T1 water = 3000ms

T2 oxygenated blood = 220ms
T2 deoxygenated blood = 35ms
T2 myocardium = 50ms
T2 fat = 85ms
T2 water = 3000ms

Clinical relevance of T1 and T2 weighting

- MR signal (high or low) depends on:
 - Longitudinal magnetization (M_z) before the RF-pulse
 - Transverse magnetization (M_{xy}) after the RF-pulse
- Long T1 tissues recover slowly, so M_z is suppressed and signal is low
- Long T2 tissues dephase slowly, so M_{xy} is maintained and signal is high

Tissue characterization

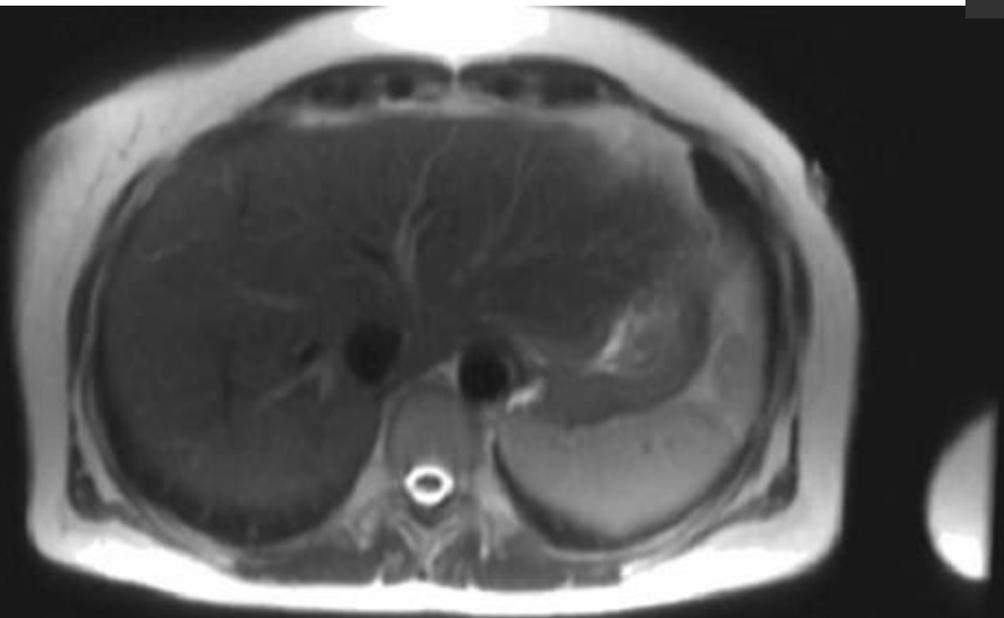
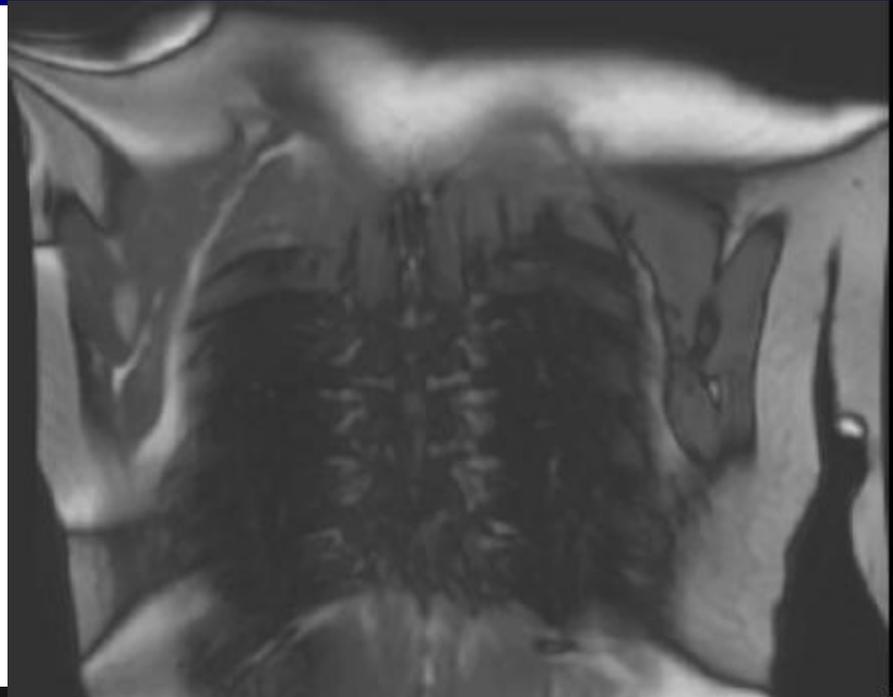
MR Imaging Tissue Characteristics of Common Cardiac Masses

Cardiac Mass	T1-weighted Imaging*	T2-weighted Imaging*	After Contrast Enhancement (LGE Imaging)
Pseudotumor			
Thrombus	Low (high if recent)	Low (high if recent)	No uptake [†]
Pericardial cyst	Low	High	No uptake
Benign			
Myxoma	Isointense	High	Heterogeneous
Lipoma	High [‡]	High [‡]	No uptake
Fibroma	Isointense	Low	Hyperenhancement [§]
Rhabdomyoma	Isointense	Isointense/high	No/minimal uptake
Malignant			
Angiosarcoma	Heterogenous	Heterogeneous	Heterogeneous
Rhabdomyosarcoma	Isointense	Hyperintense	Homogeneous
Undifferentiated sarcoma	Isointense	Hyperintense	Heterogeneous/variable
Lymphoma	Isointense	Isointense	No/minimal uptake
Metastasis	Low	High	Heterogeneous

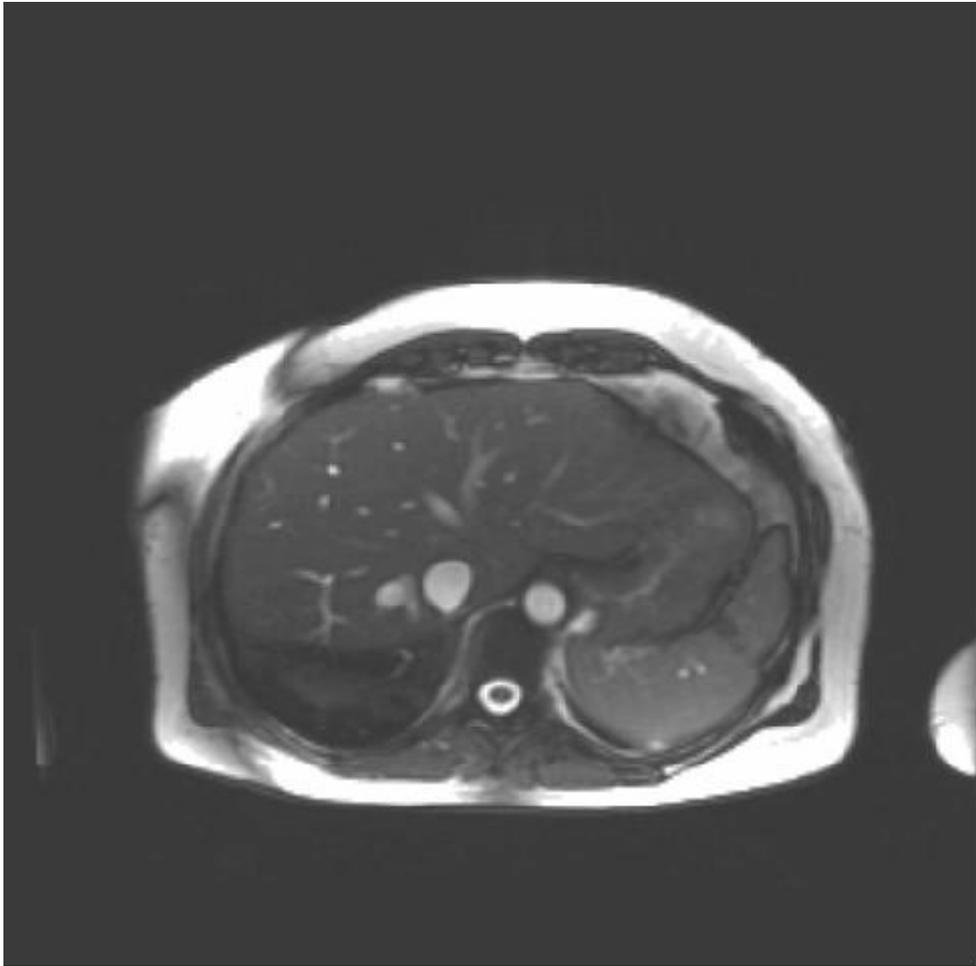
Case reviews

quiz will follow

Myxoma?



Myxoma?



SSFP cine techniques, myxomas appear hyperintense relative to the myocardium but hypointense relative to the blood pool

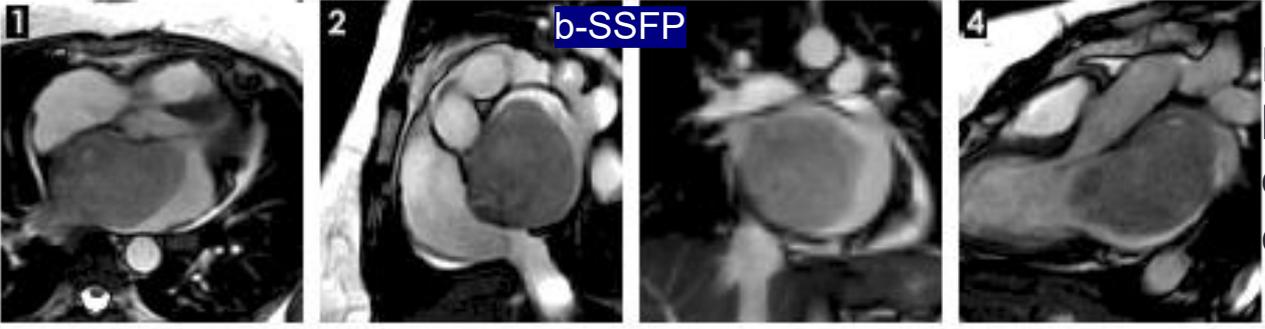
- Isointense on T1W images
- higher signal intensity on T2W weighted images owing to the high extracellular water content

- Acute hemorrhage within myxomas =hypointense on both T1W and T2W images
- Older regions =hyperintense as the hemoglobin →methemoglobin

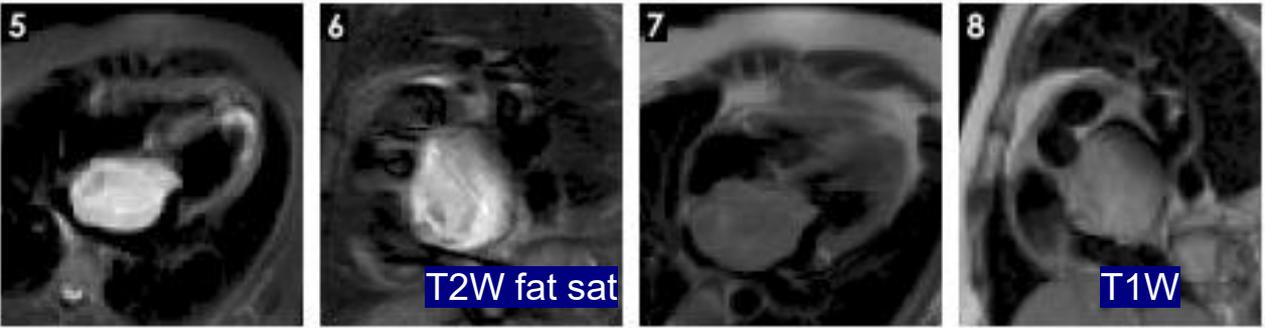
Myxoma?



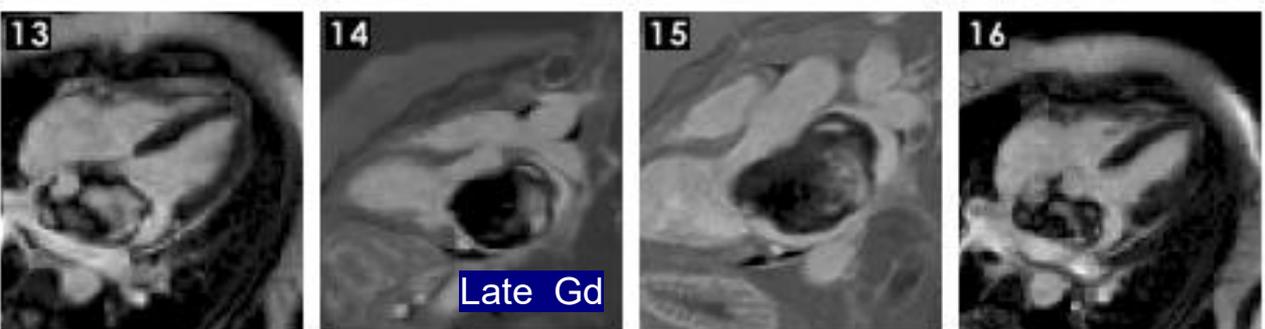
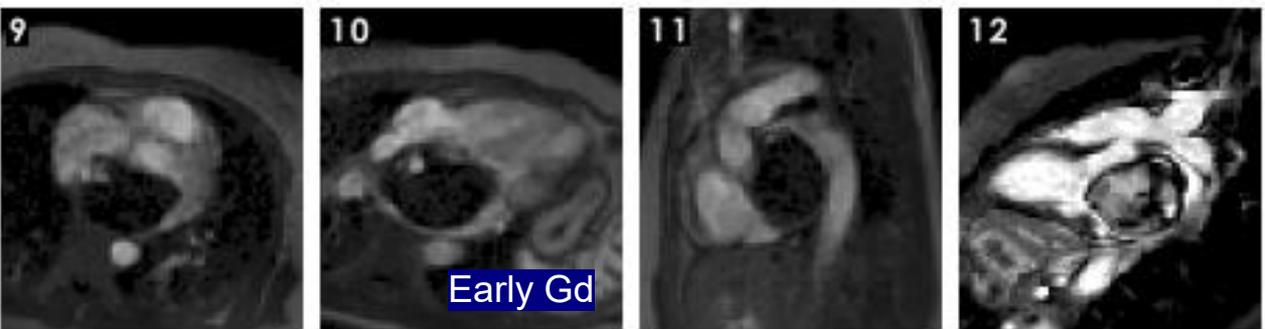
SSFP cine techniques, myxomas appear hyperintense relative to the myocardium but hypointense relative to the blood pool

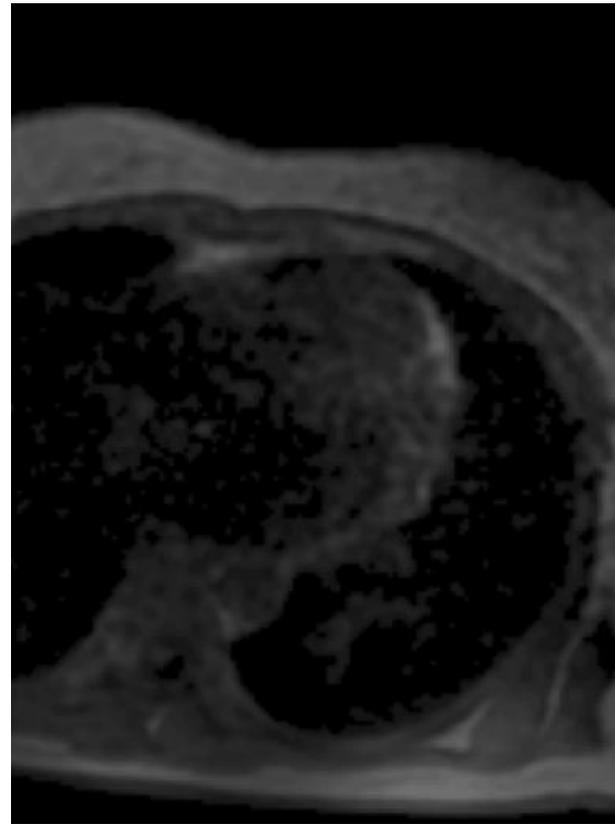
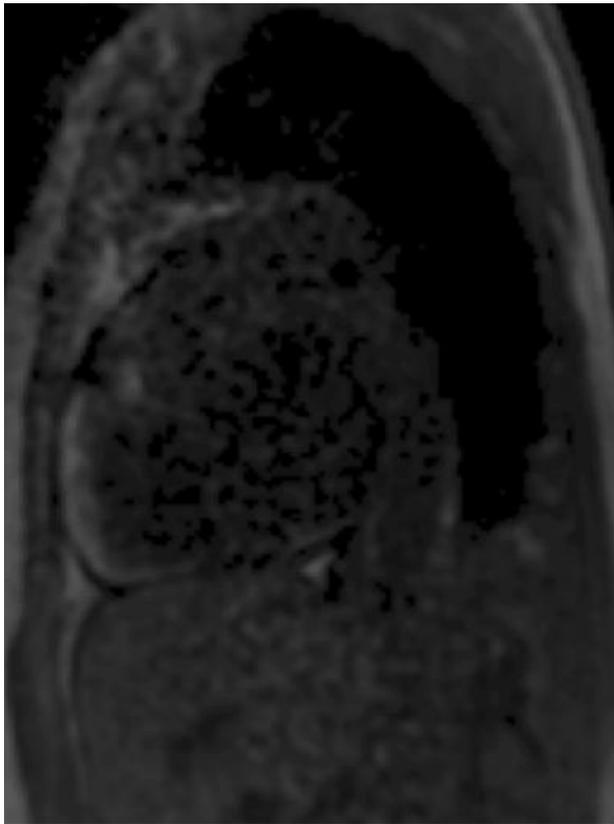
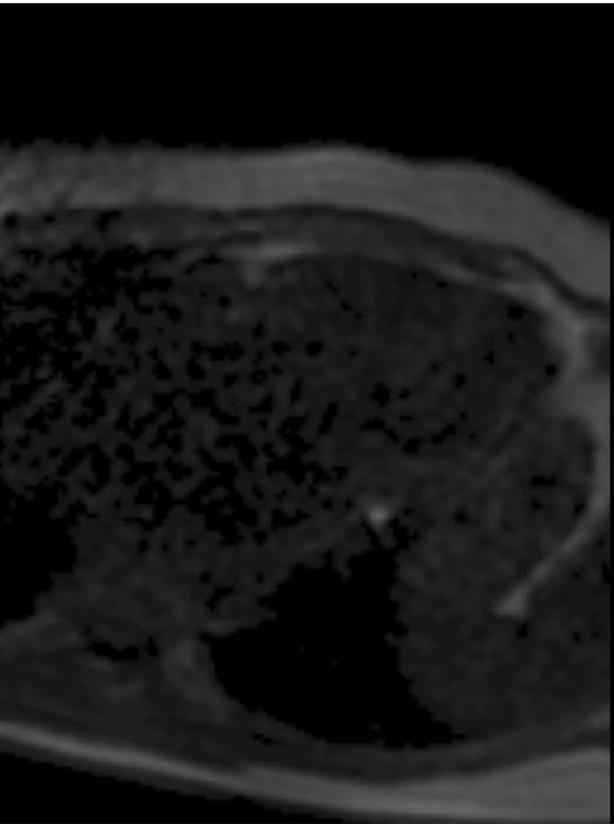


Dark due to the presence of haemosiderin and signal dropout due to the high iron content



Heterogeneous
 Myxomatous: ↑ T2, ↓ T1
 Fibrous : ↓ T1 ↓ T2
 Haemorrhage
 - Old : ↑
 - New: ↓





MR Imaging Tissue Characteristics of Common Cardiac Masses

Cardiac Mass	T1-weighted Imaging*	T2-weighted Imaging*	After Contrast Enhancement (LGE Imaging)
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Malignant			
Angiosarcoma	Heterogenous	Heterogeneous	Heterogeneous
Rhabdomyosarcoma	Isointense	Hyperintense	Homogeneous
Undifferentiated sarcoma	Isointense	Hyperintense	Heterogeneous/variable
Lymphoma	Isointense	Isointense	No/minimal uptake
Metastasis	Low	High	Heterogeneous

OUT OF THE BOX

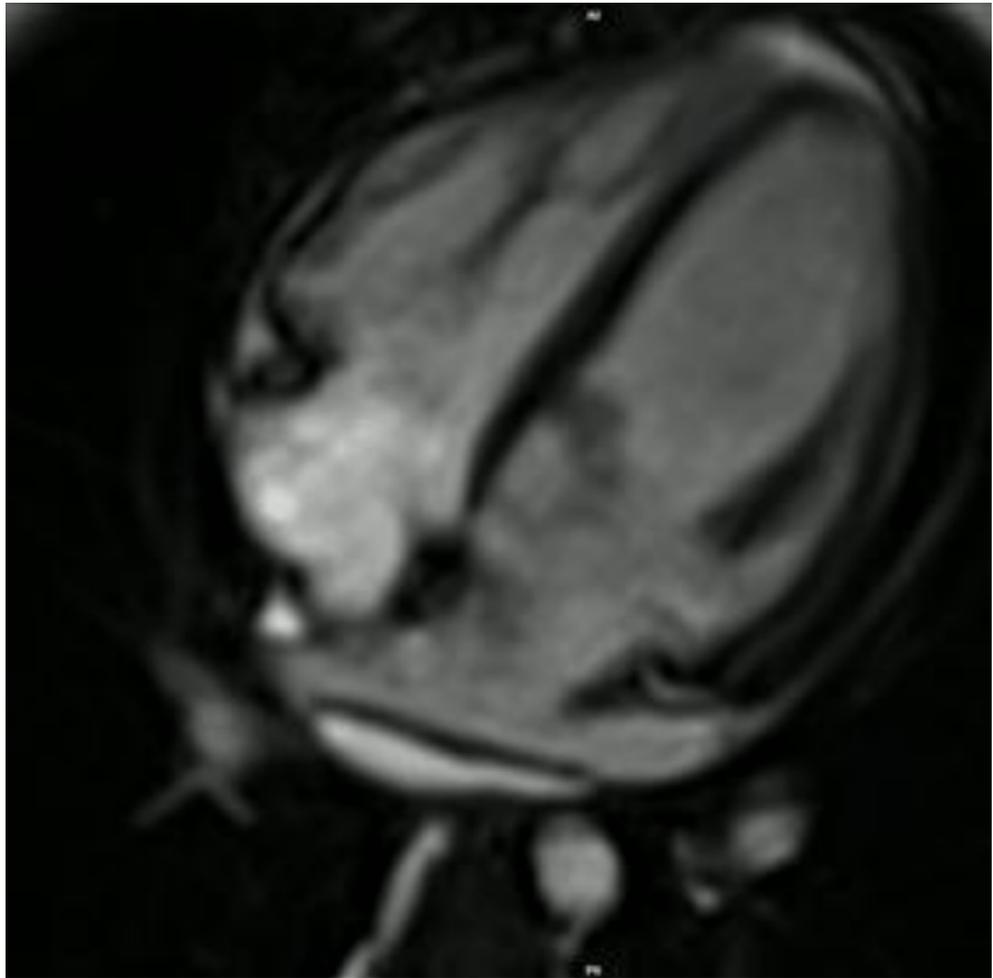
Cardiac Mass

Asymptomatic child, normal ECG

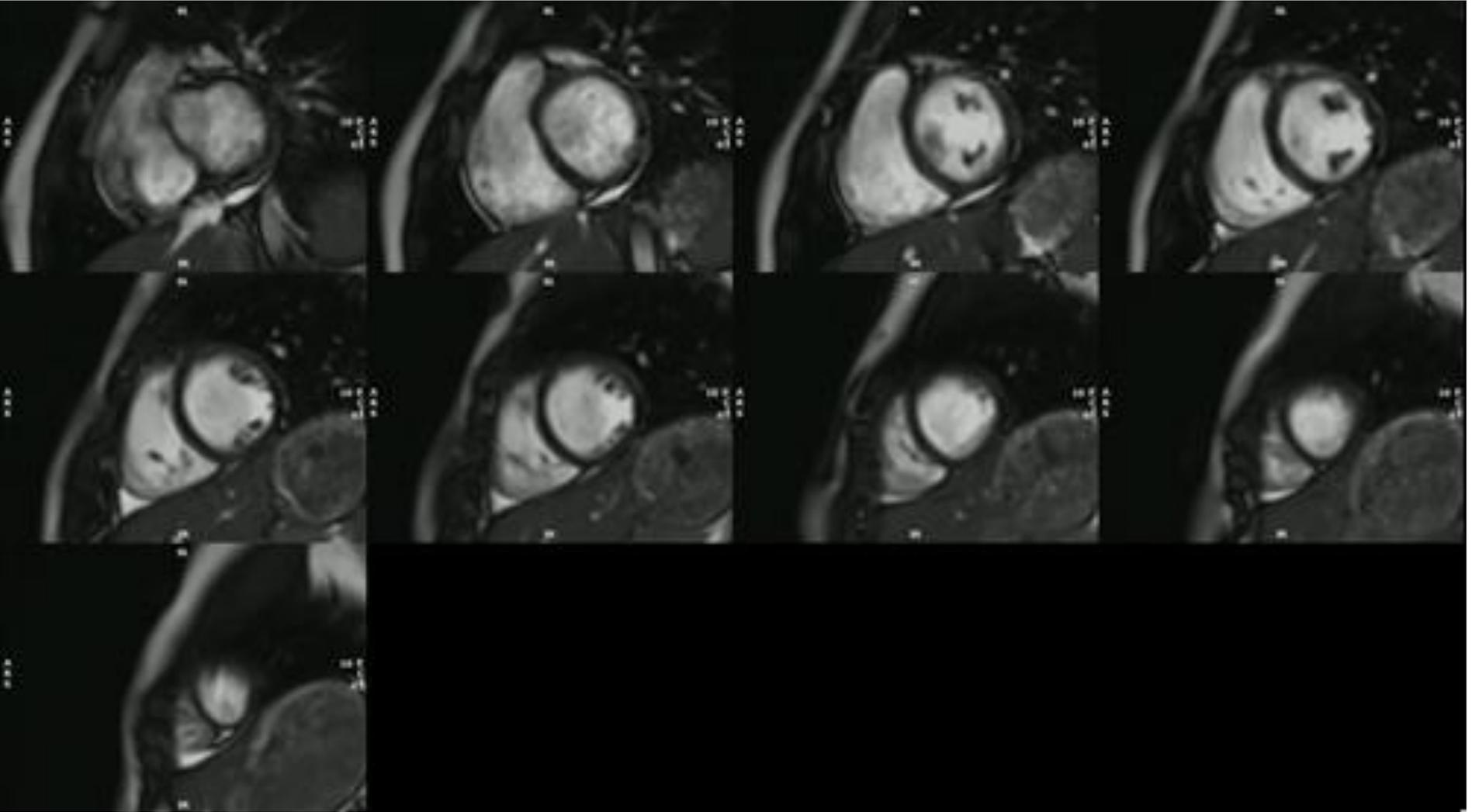
Screening for participation in athletic activities at school

Previous history of pneumonia last year

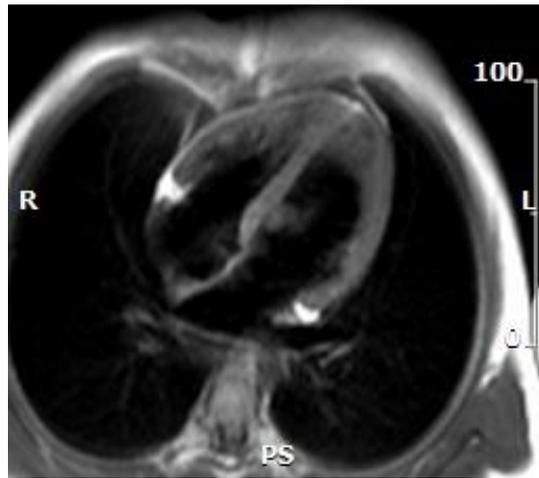
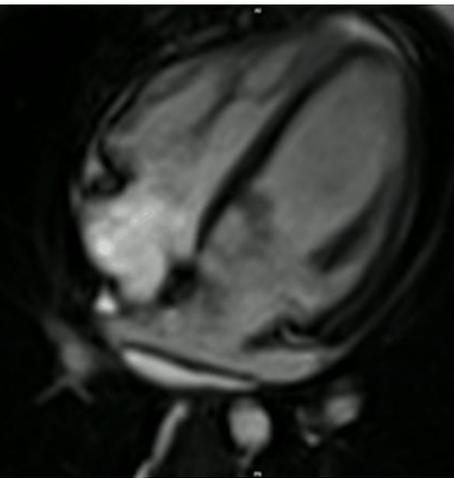
SCD father a year ago



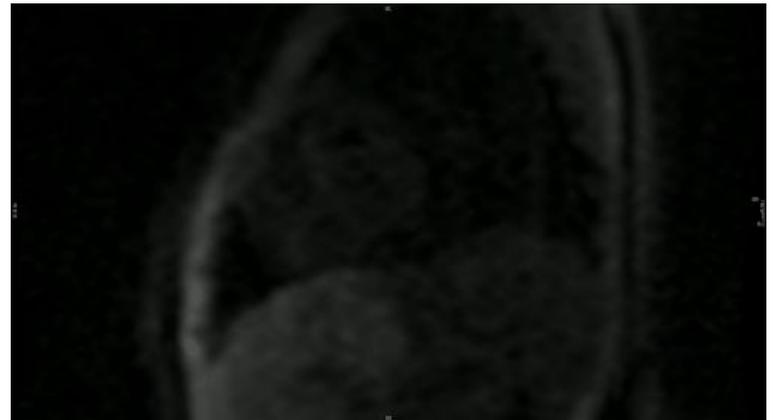
Highly Mobile intra-cavitary penduculated lobular mass originating from the basal septum (15x6mm)
There is a linear stalk



T1 TSE iso-intense



No first pass perfusion

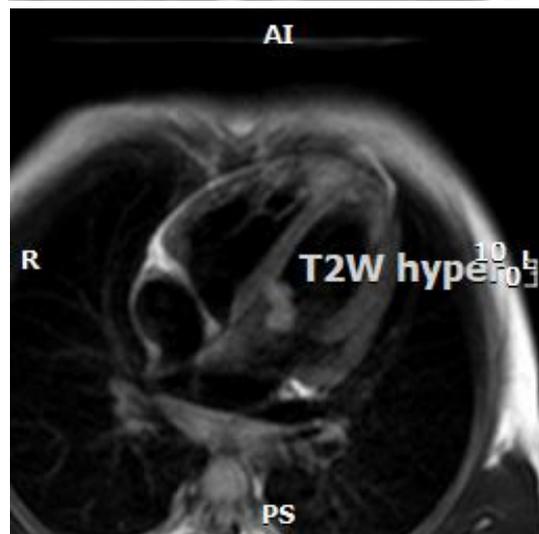


AI



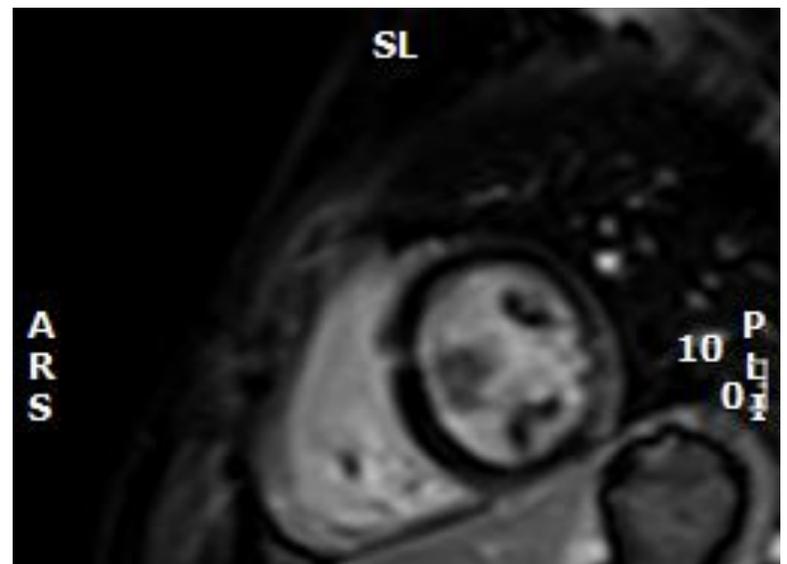
STIR with fat sat hyper-intense

AI



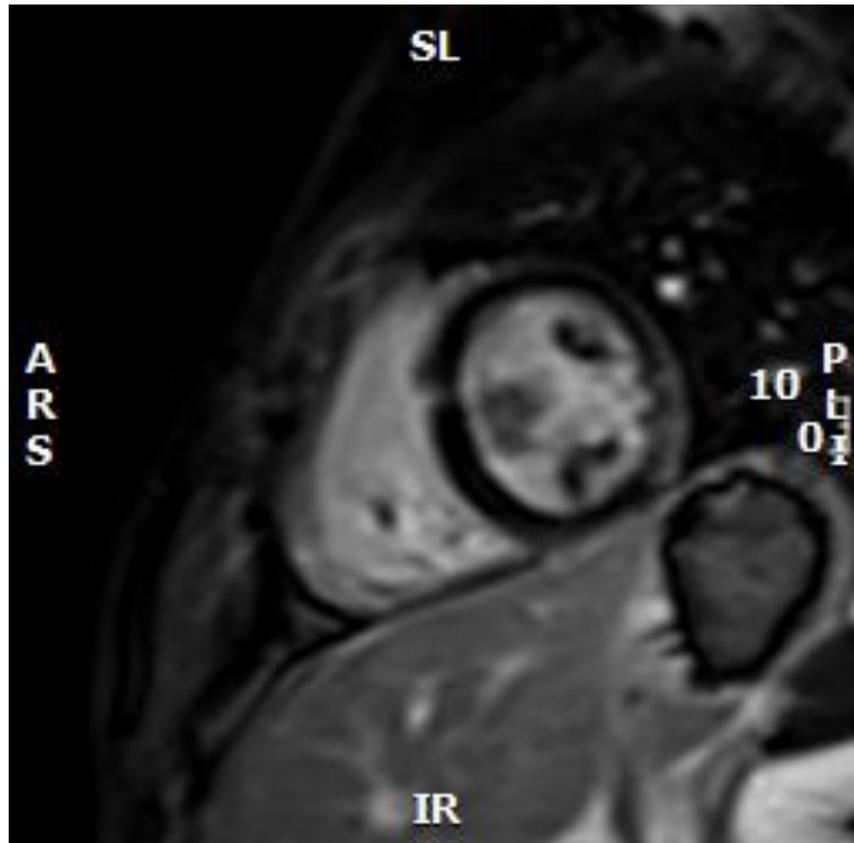
T2 no fat sat hyper-intense

SL



LGE spot of enhancement at the -centre: probably tiny feeding vessel

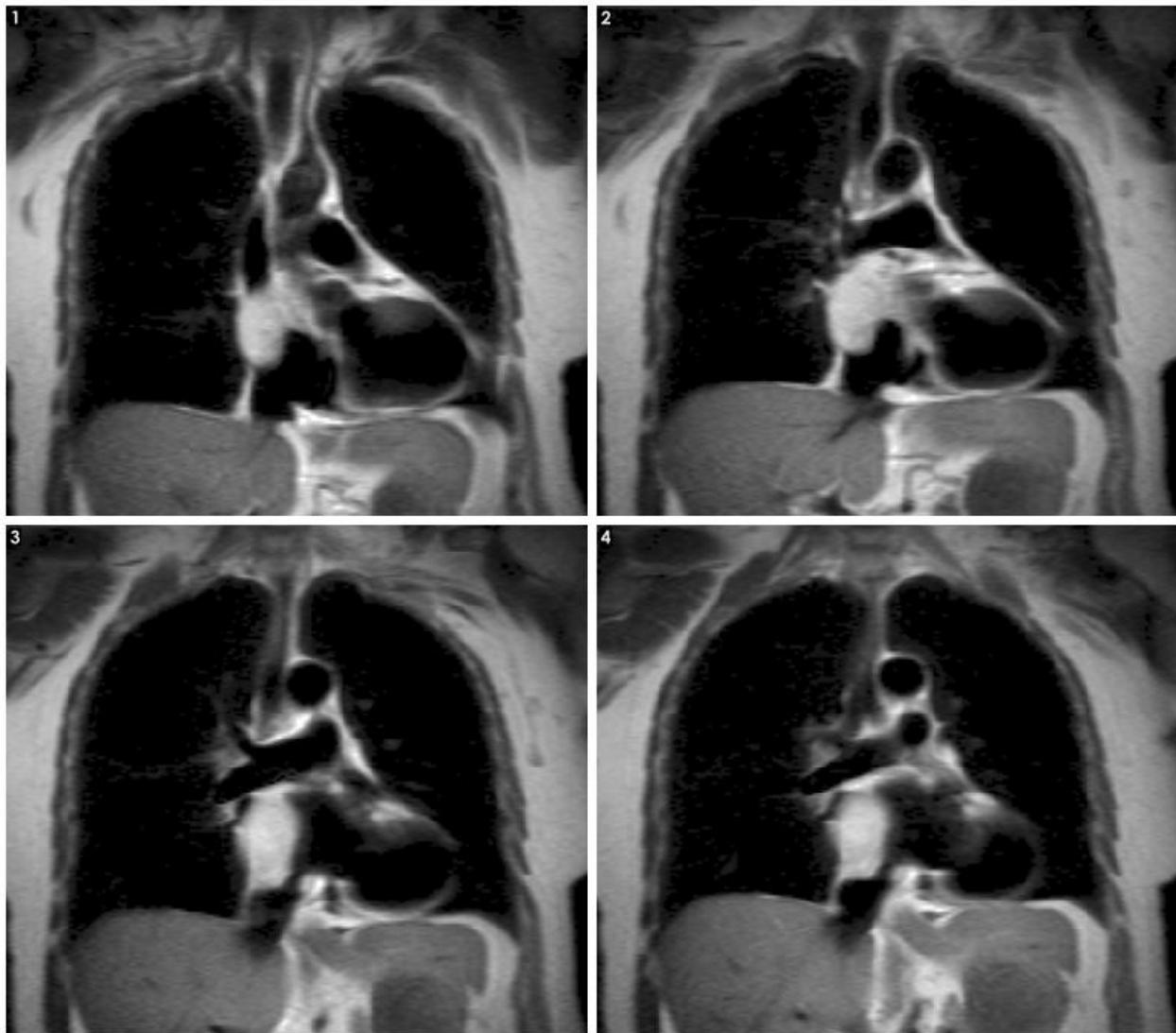
LGE spot of enhancement at the –centre: probably tiny feeding vessel



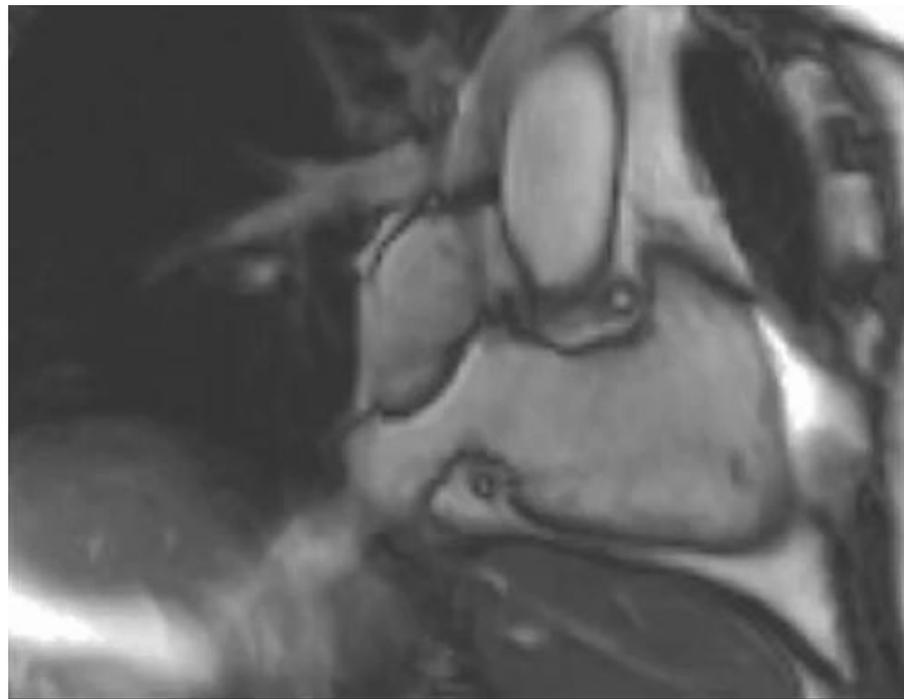
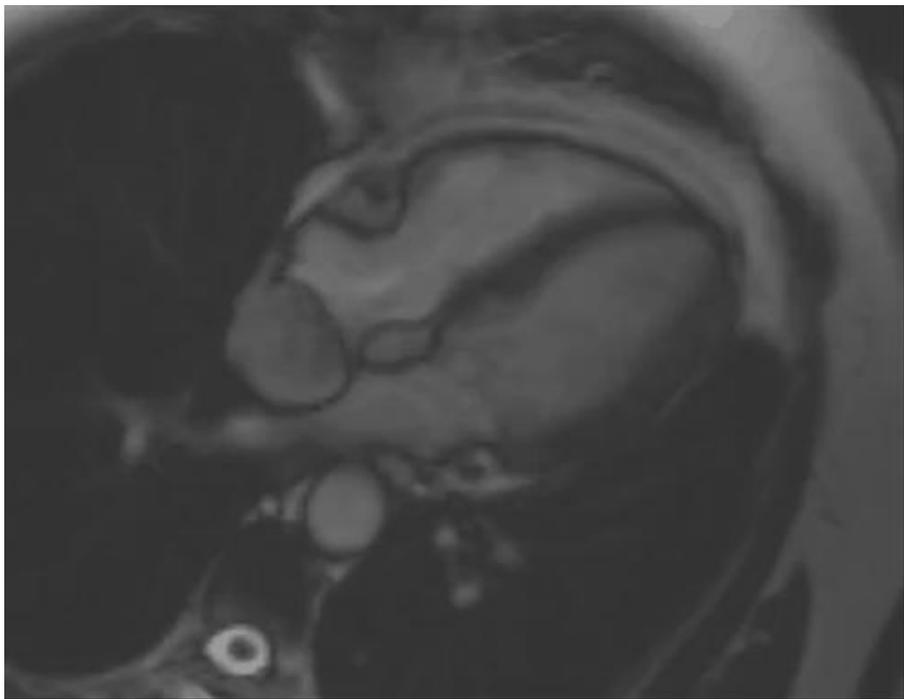
B-SSFP	Iso-intense	
T1 W	Iso-intense	
T2 W	Slightly hyper-intense	Oedematous/microhaemorrhage
First pass perfusion	No vascularity	
LGE	No LGE apart from a tiny central spot	Probable tiny feeding vessel

Although age and location are extremely unusual for myxoma, tissue characteristics may be compatible with such a diagnosis. We would be grateful for the histology documentation

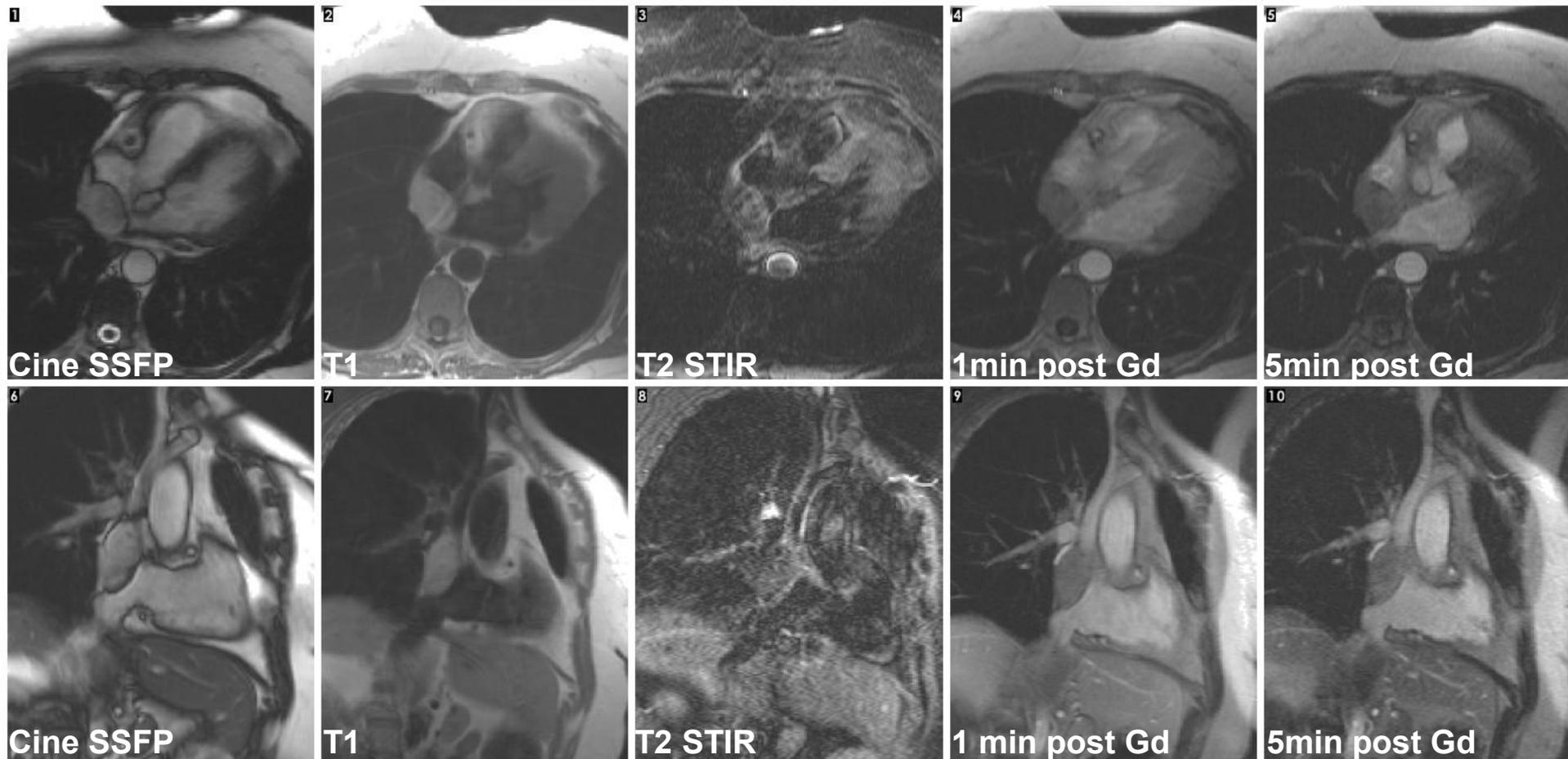
Lipoma



Lipoma



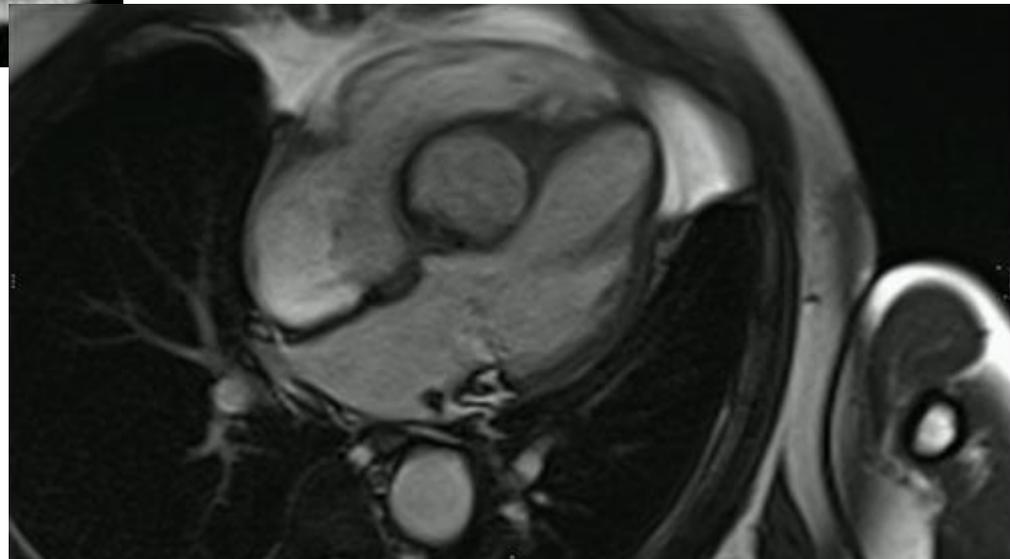
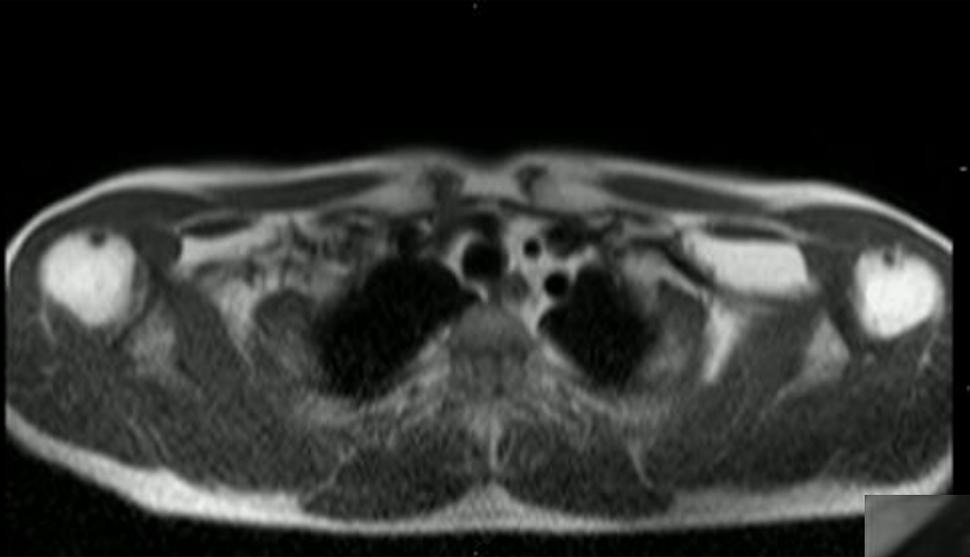
Lipoma

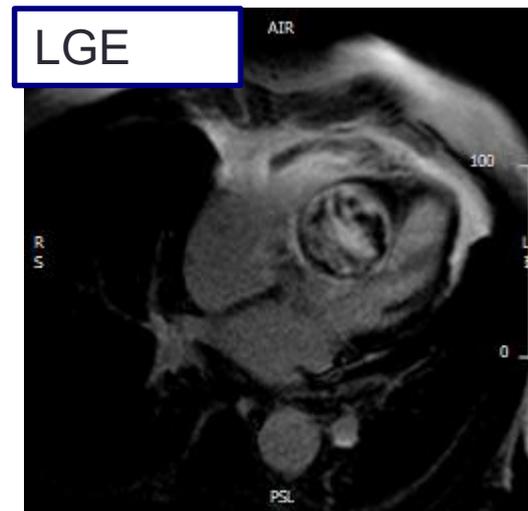
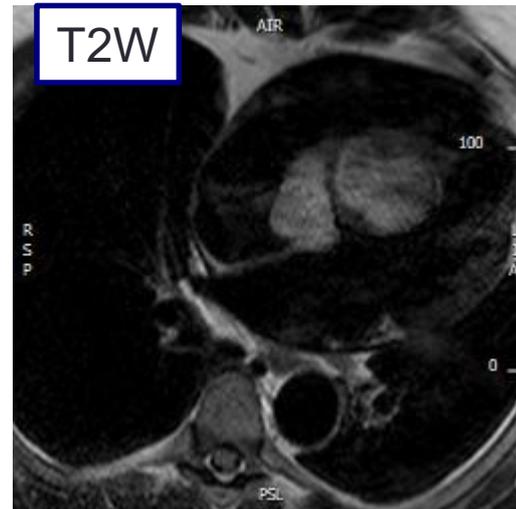
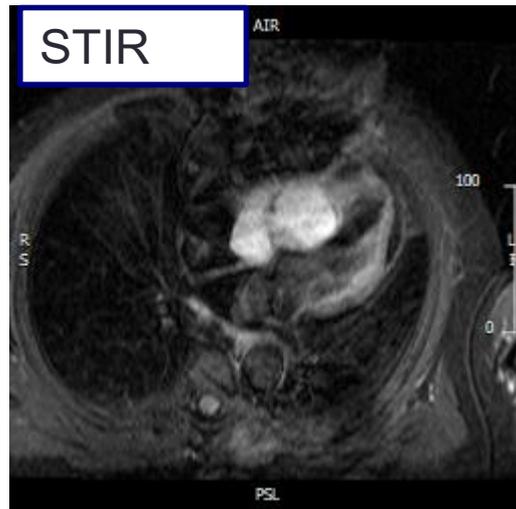
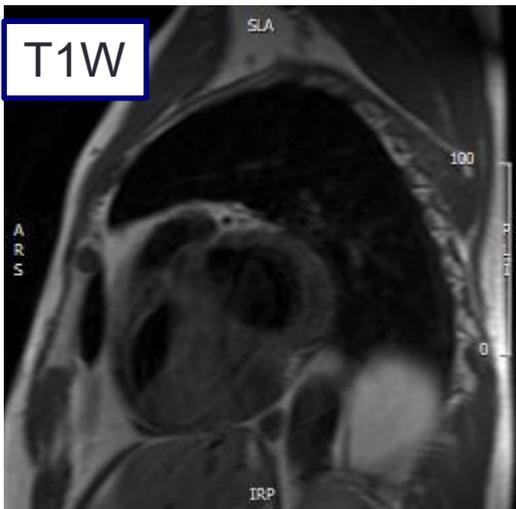


MR Imaging Tissue Characteristics of Common Cardiac Masses

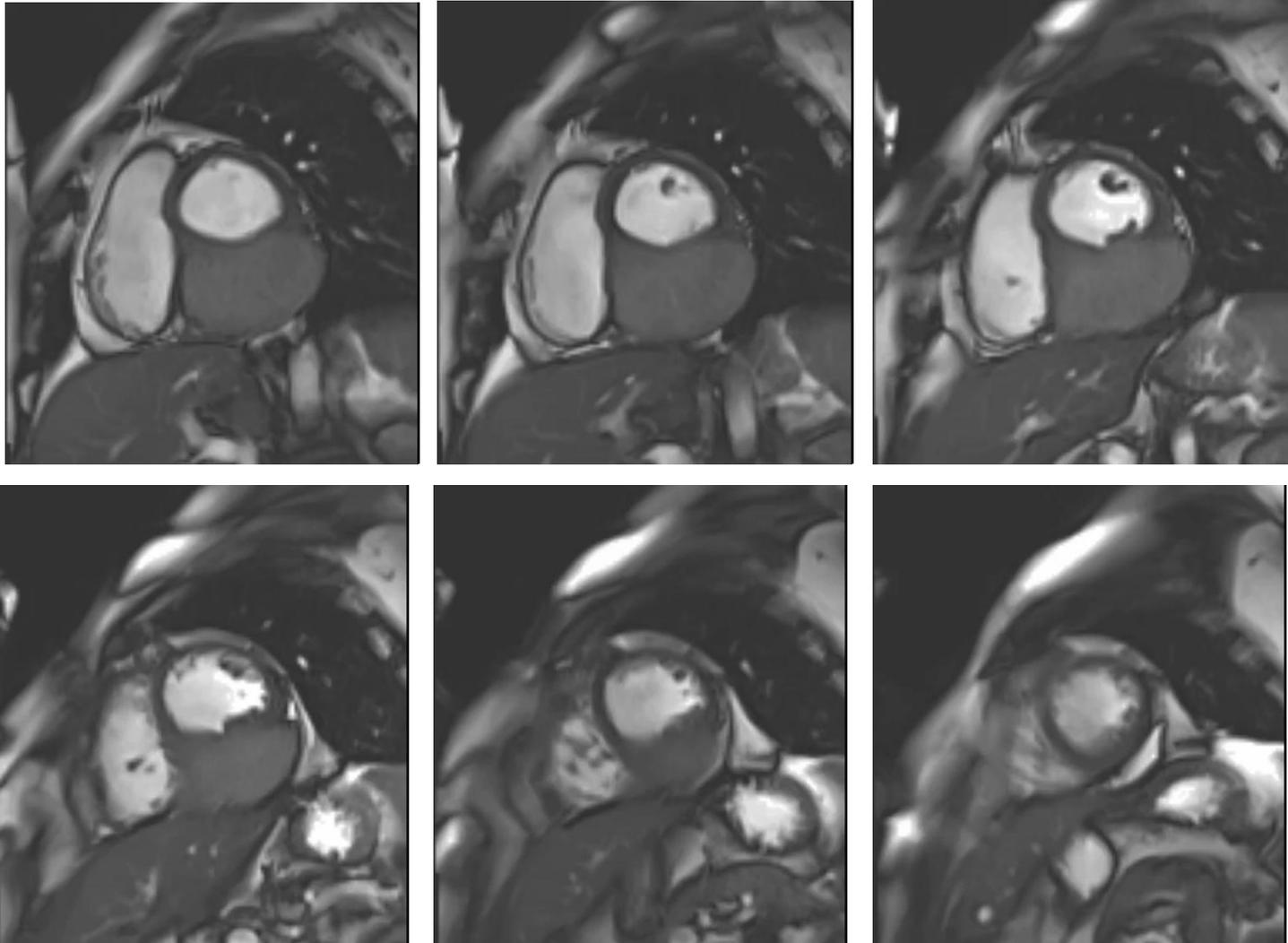
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Malignant			
Angiosarcoma	Heterogenous	Heterogeneous	Heterogeneous
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Undifferentiated sarcoma	Isointense	Hyperintense	Heterogeneous/variable
Lymphoma	Isointense	Isointense	No/minimal uptake
Metastasis	Low	High	Heterogeneous

Liposarcoma

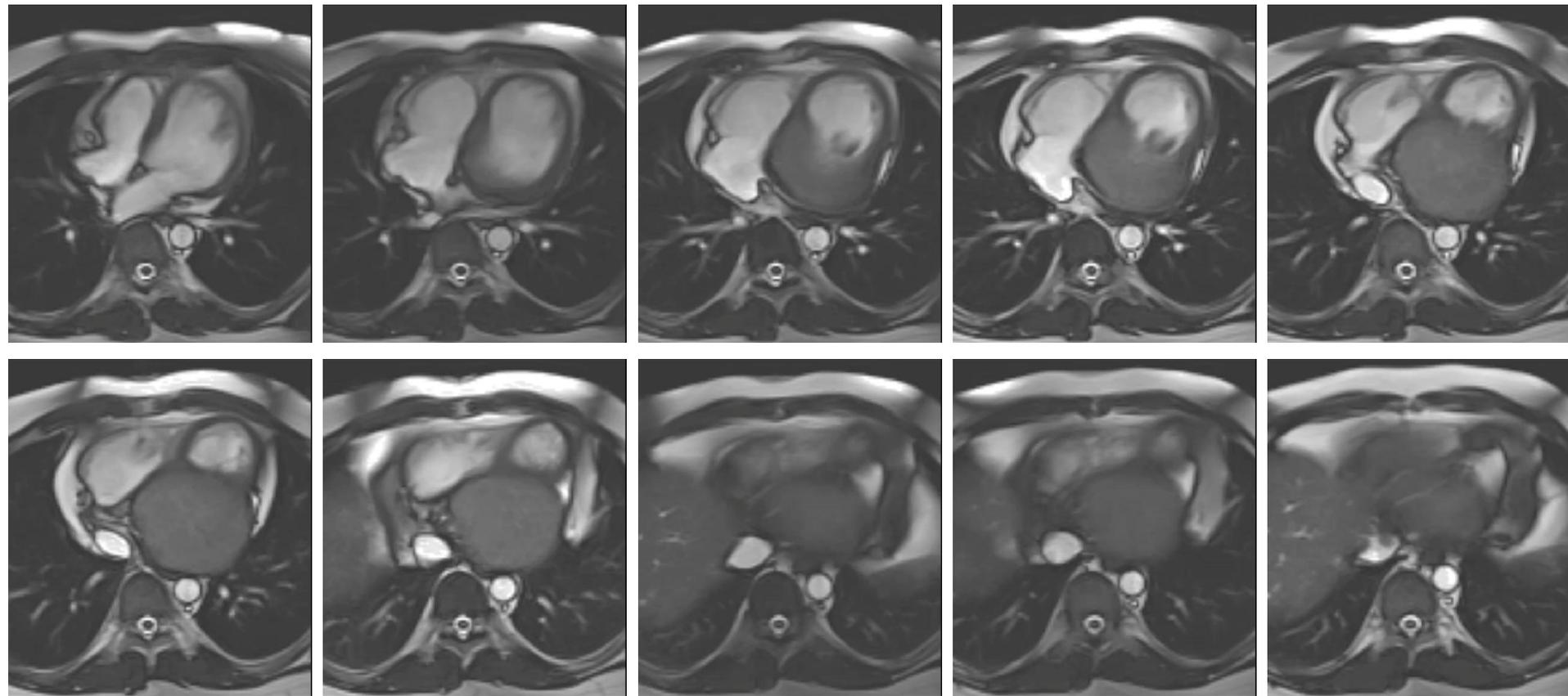




Haemangioma



Haemangioma



hyperintense

Haemangioma

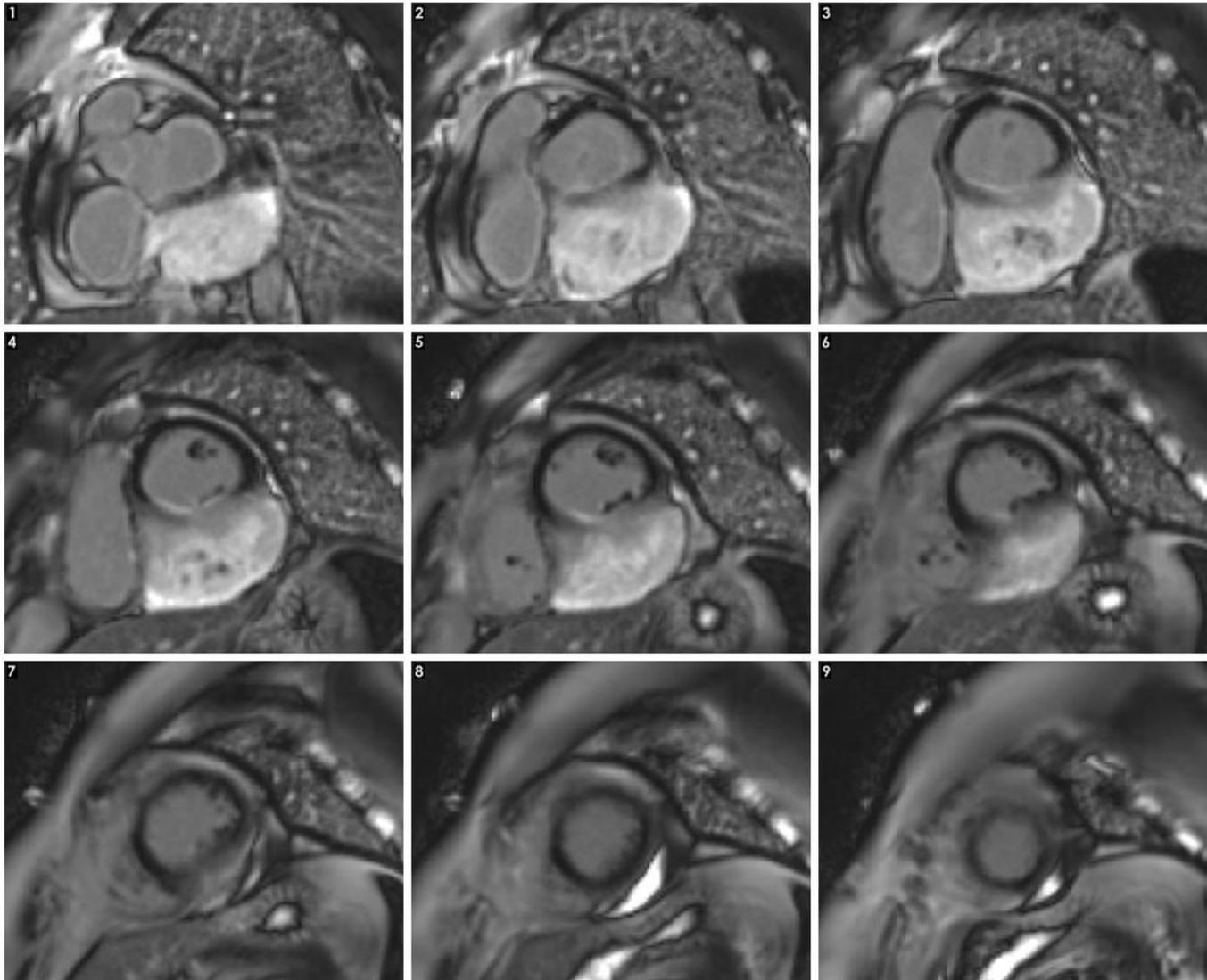
Iso/hypo



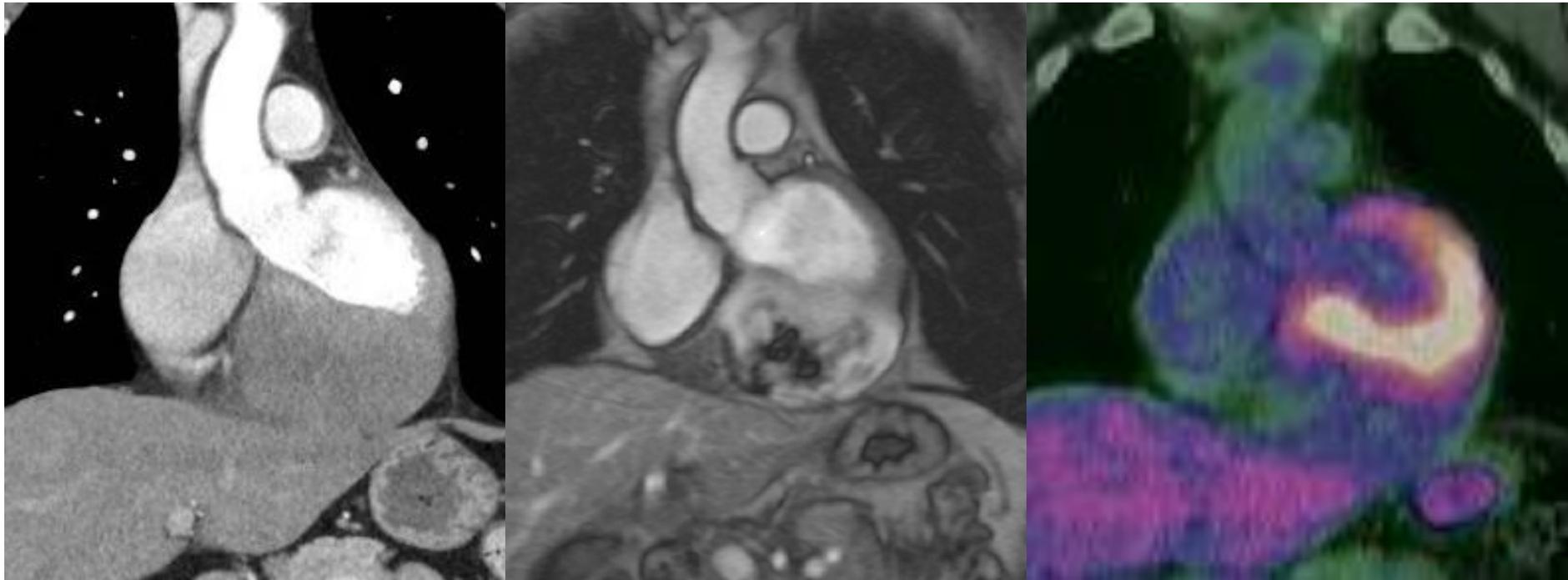
Hyper
heterogeneous



Haemangioma

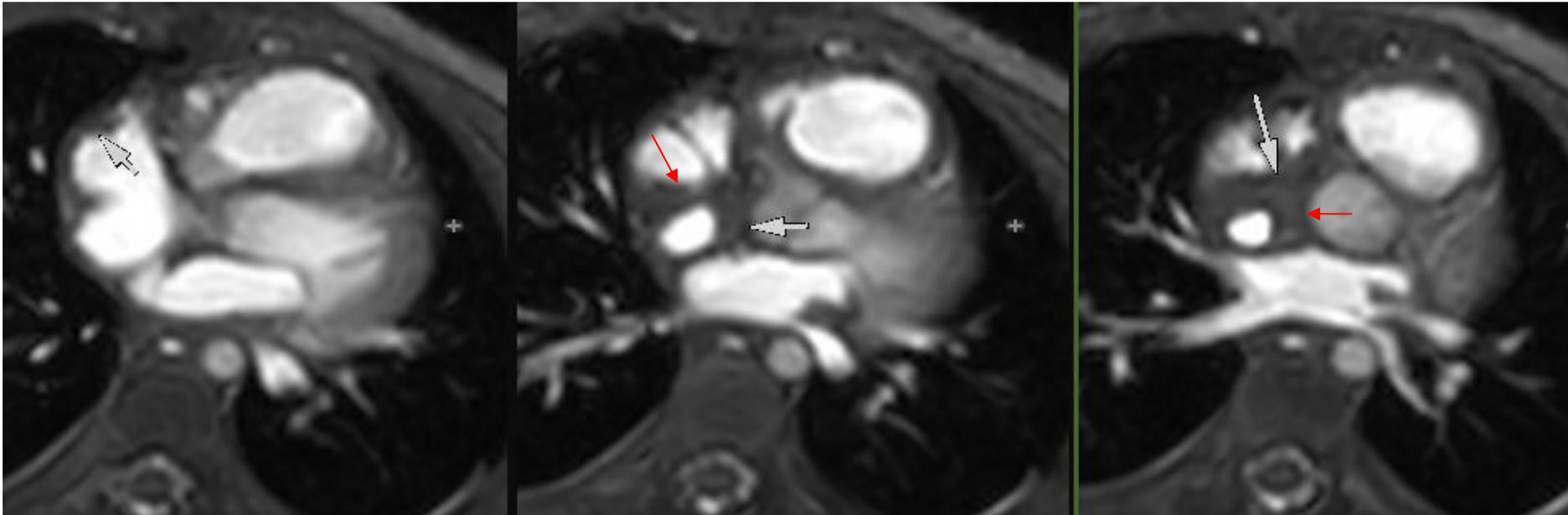


Hemangioma



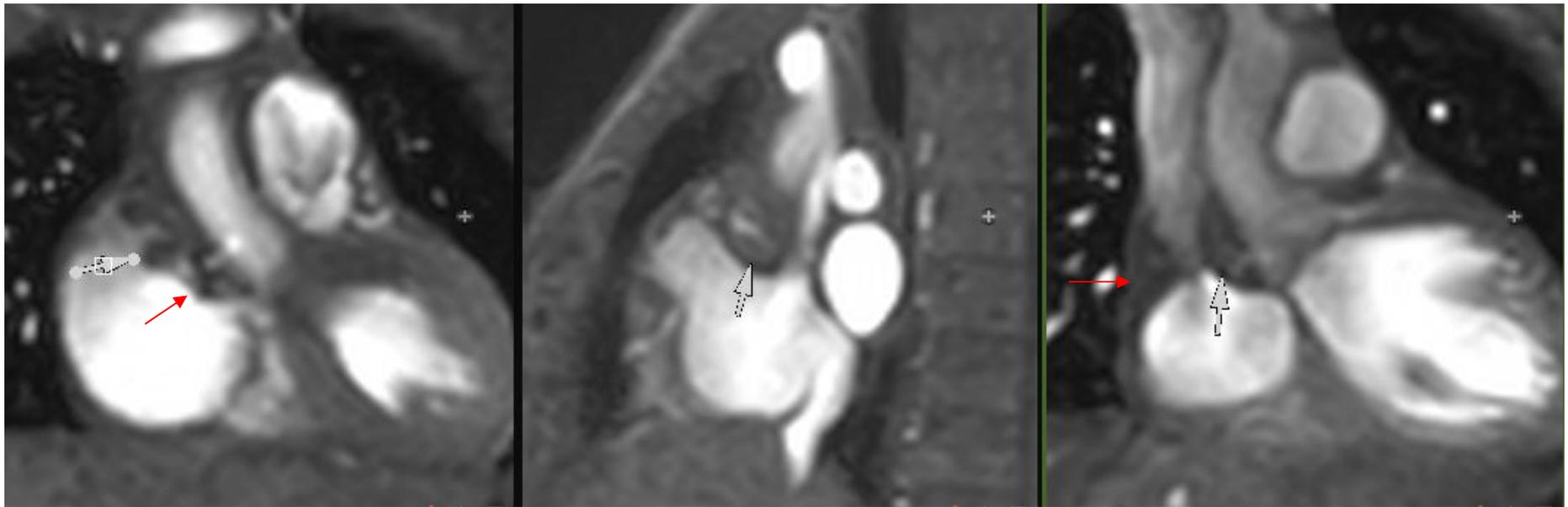
OUT of the BOX

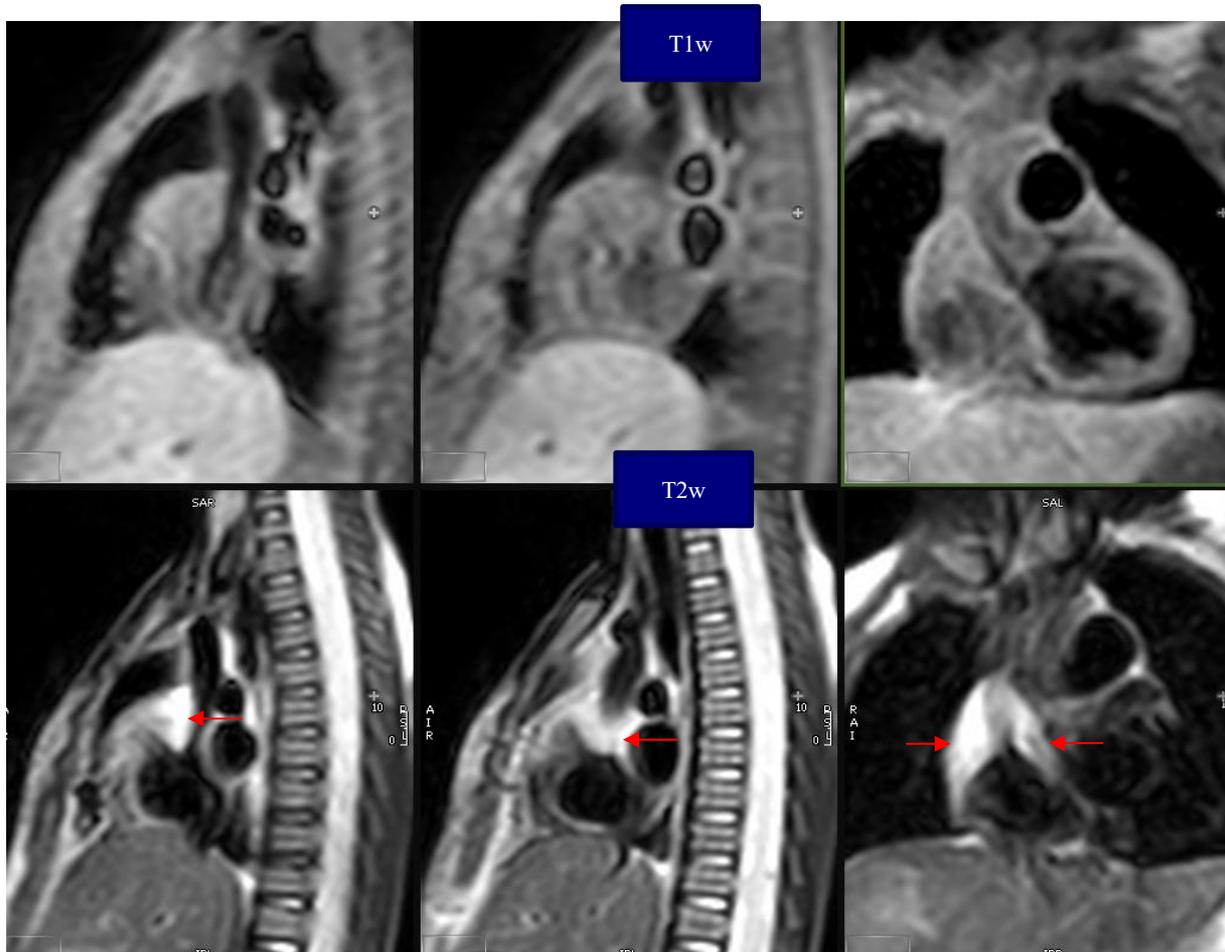
Cine Images, transaxial

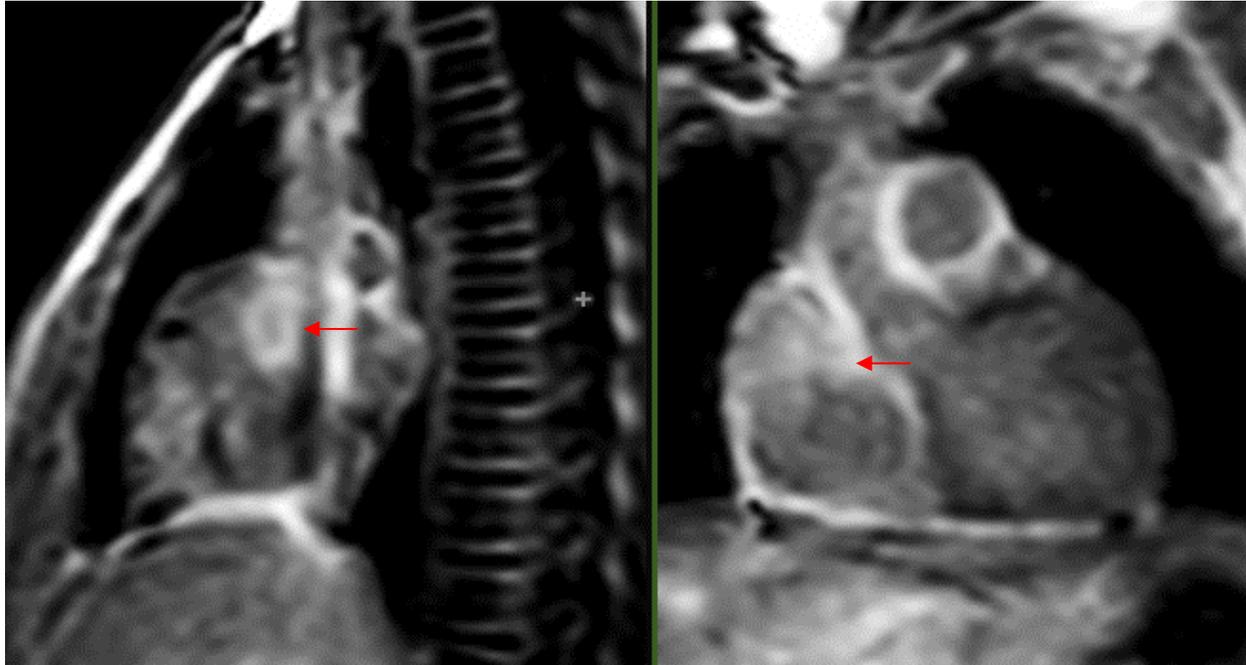


2y/o girl who presented with massive pericardial effusion but only mild tachycardia, echo showed mass at the origin of the SVC. Pericardial fenestration was surgically created but not biopsy was performed.

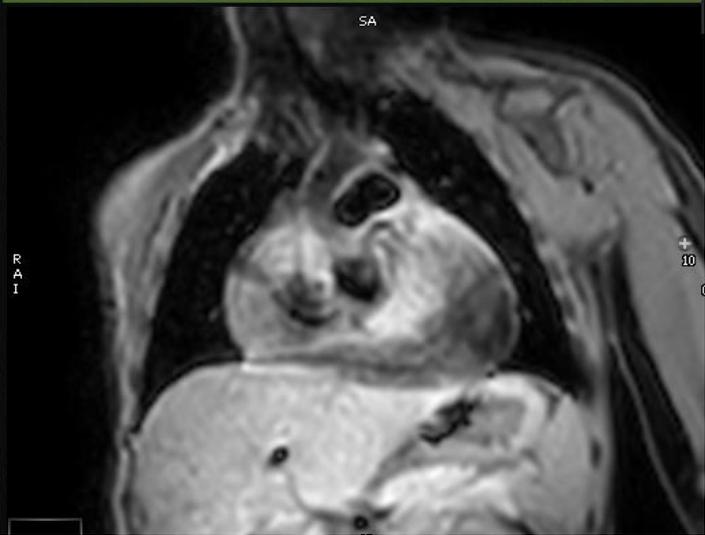
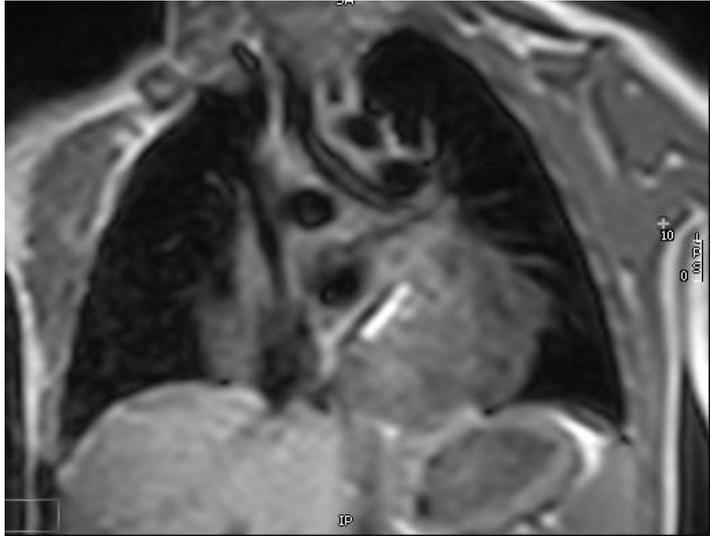
Cine Images







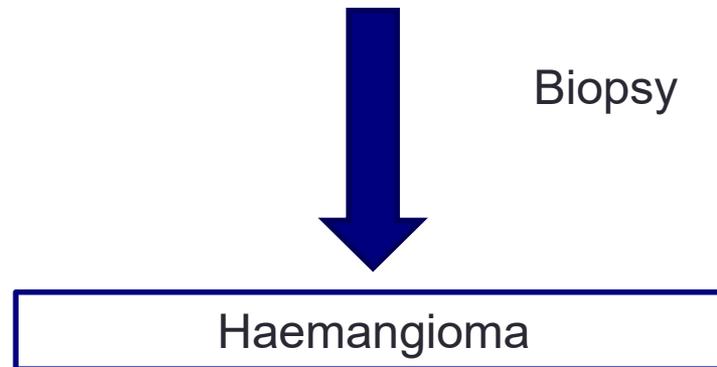
LGE



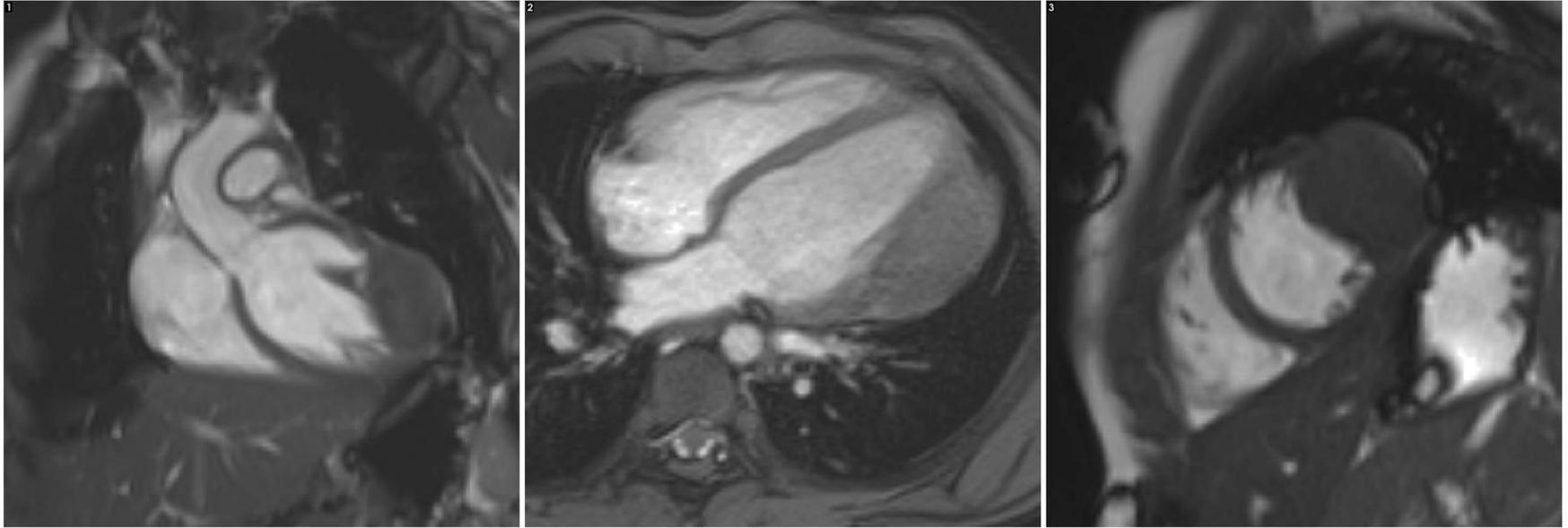
T1w with
and without
fat
suppression

Expert opinion

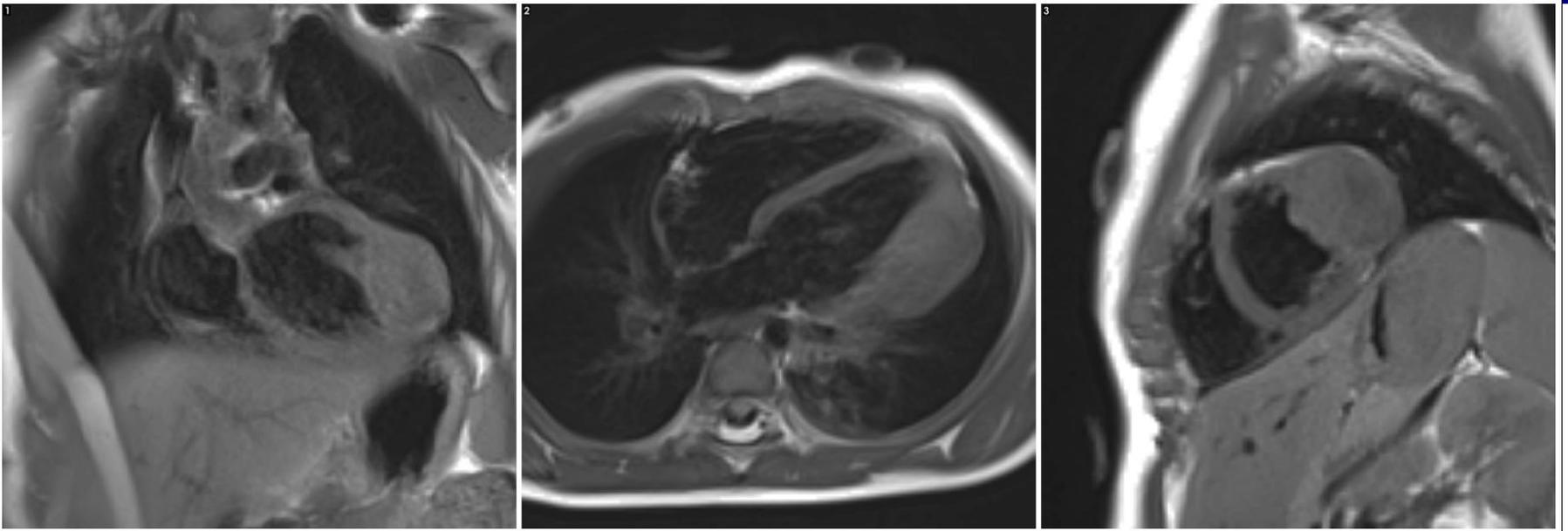
1. Primary cardiac lymphoma (non-Hodgkins)
2. Inflammatory process such as IgG4-related cardiovascular disease
3. Very unusual haemangioma or unusual fistula.



FIBROMA (MOST COMMON IN CHILDREN)

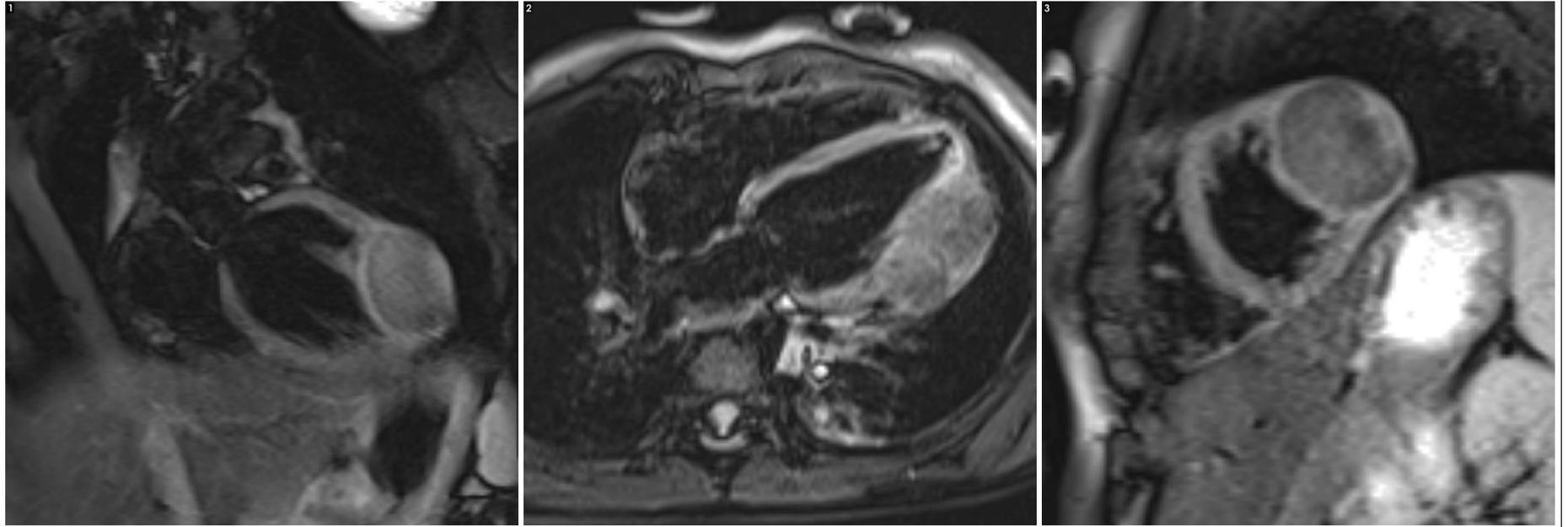


bSSFP cines: sharply demarcated



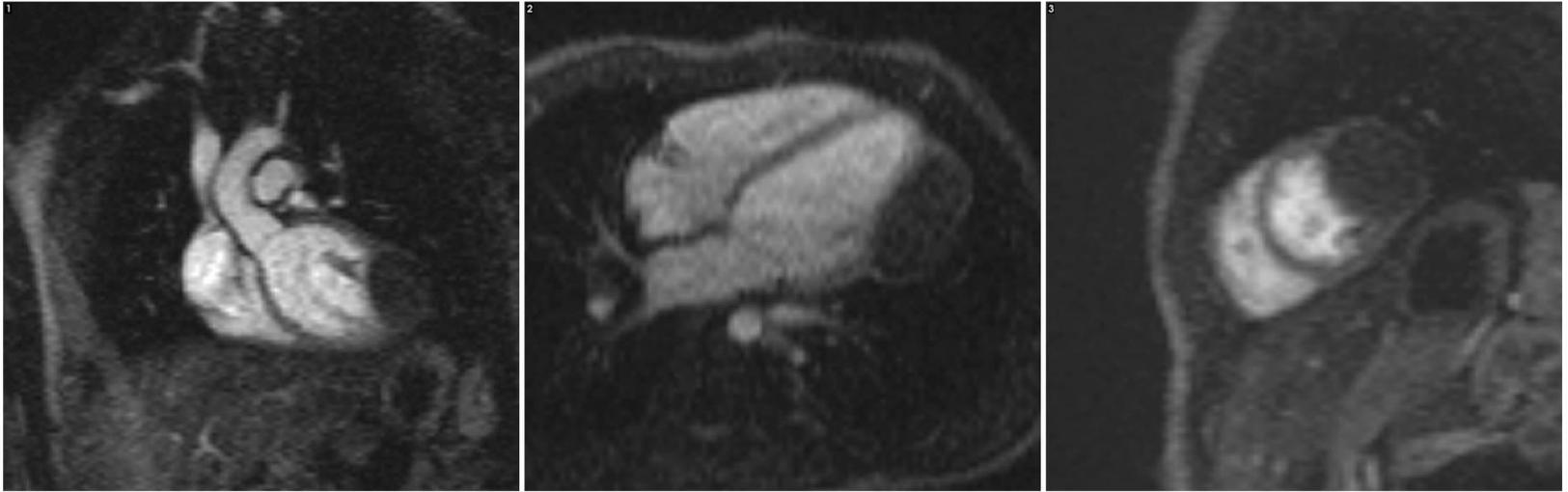
- T 1 weighted images

uniformly low signal intensity compared with adjacent myocardium on both T1 and T2-weighted imaging due to their dense fibrous composition

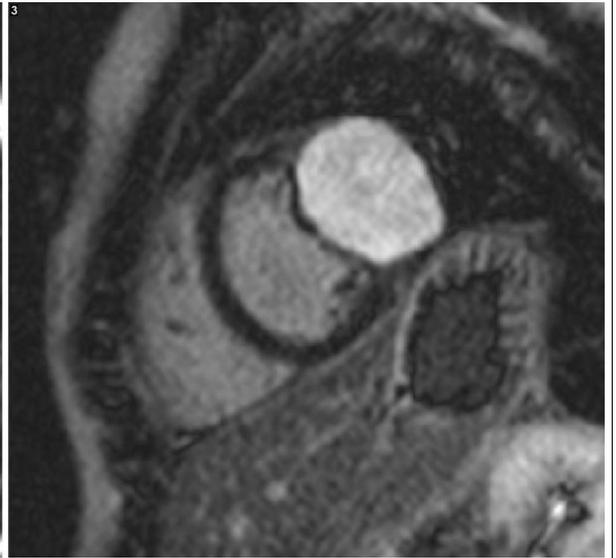


- **T2 weighted images**

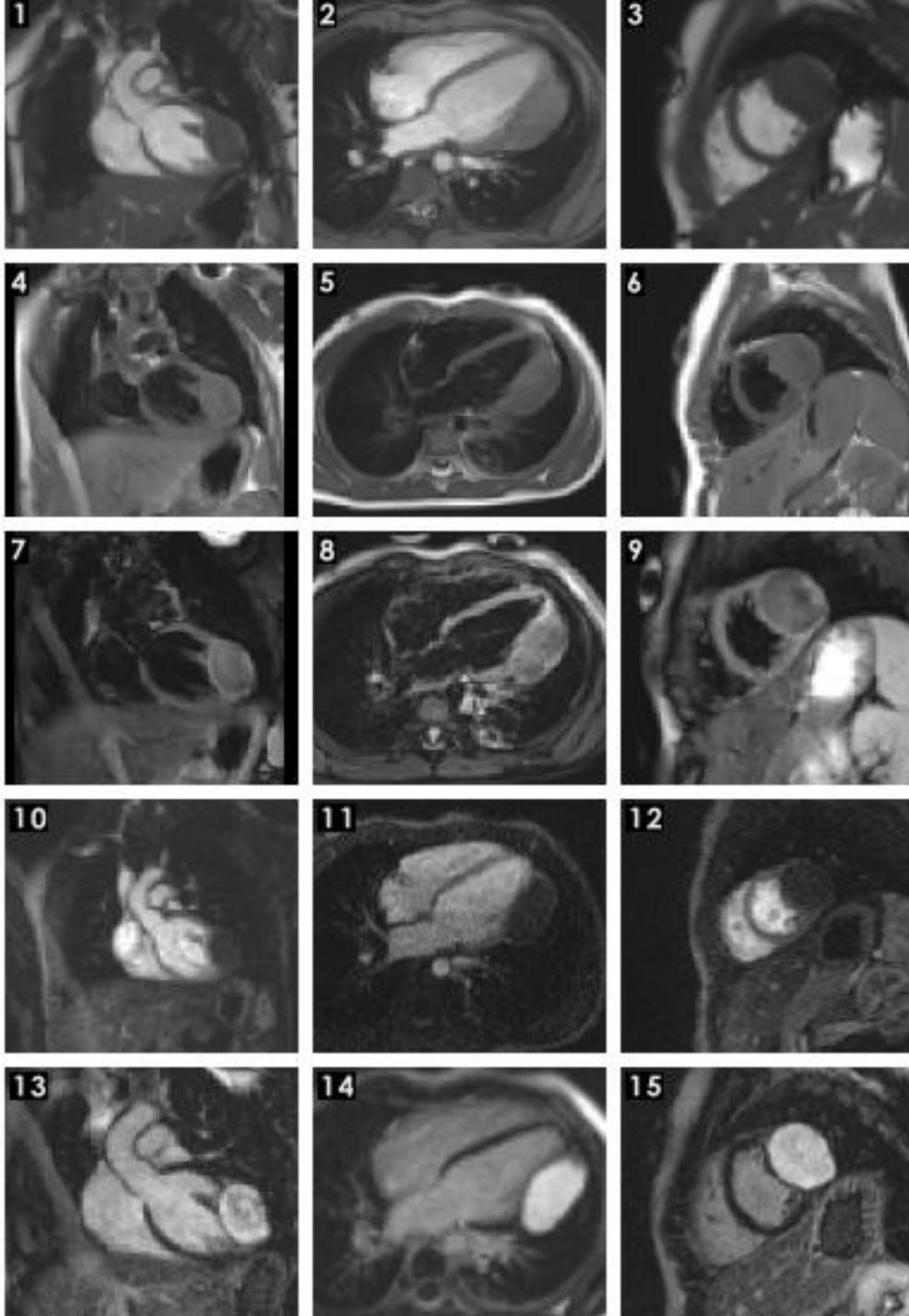
uniformly low signal intensity compared with adjacent myocardium on both T1 and T2-weighted imaging due to their dense fibrous composition



- Rest-Perfusion



- LGE

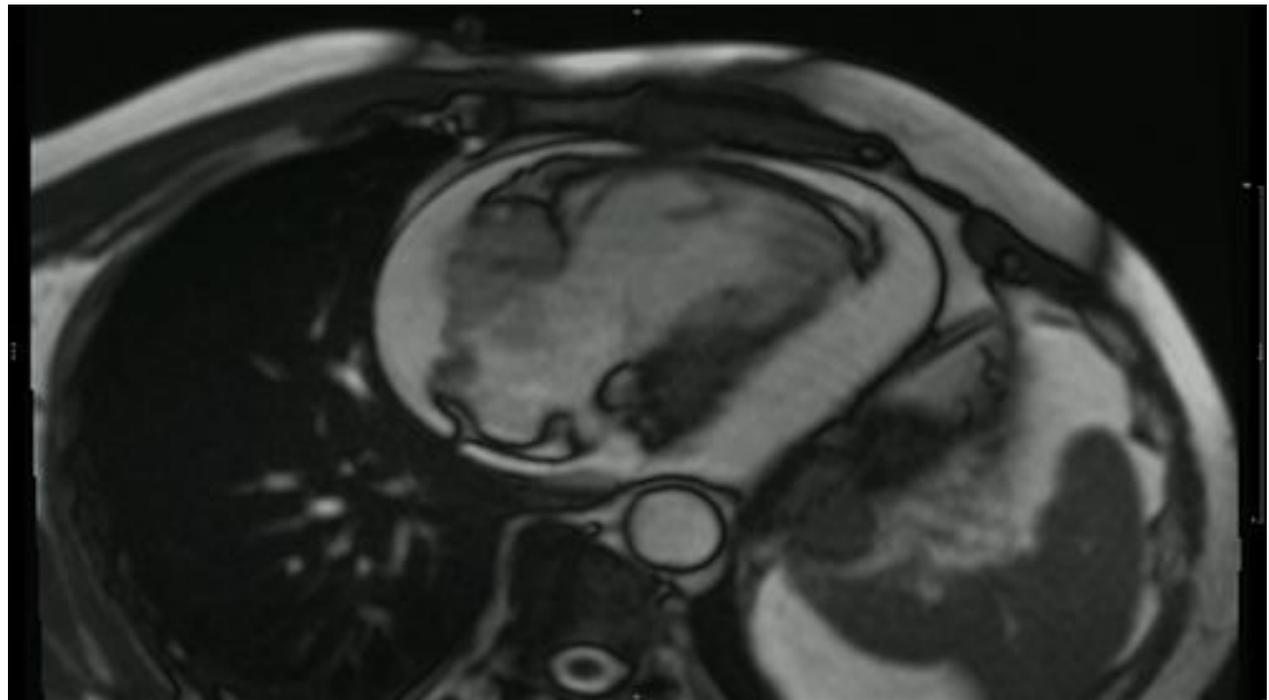
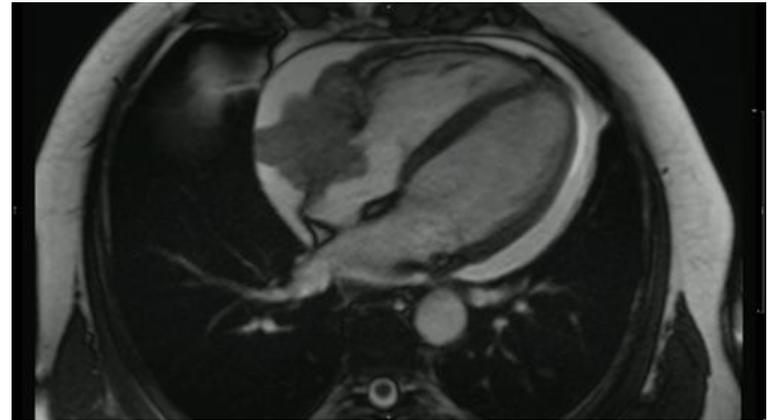


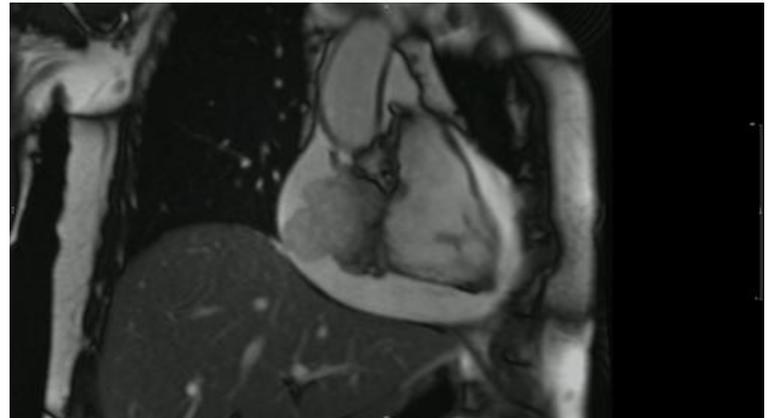
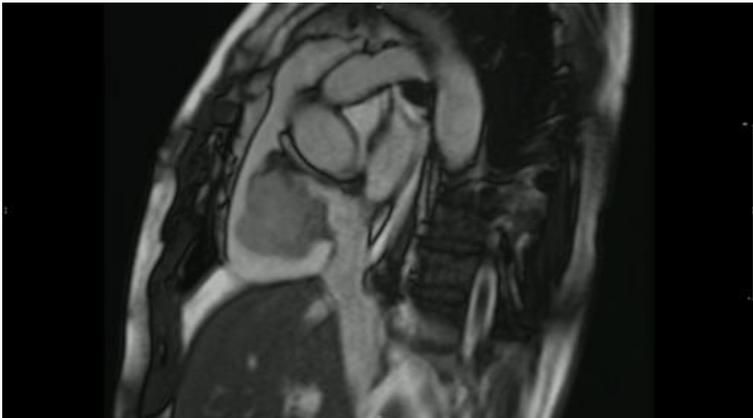
MR Imaging Tissue Characteristics of Common Cardiac Masses

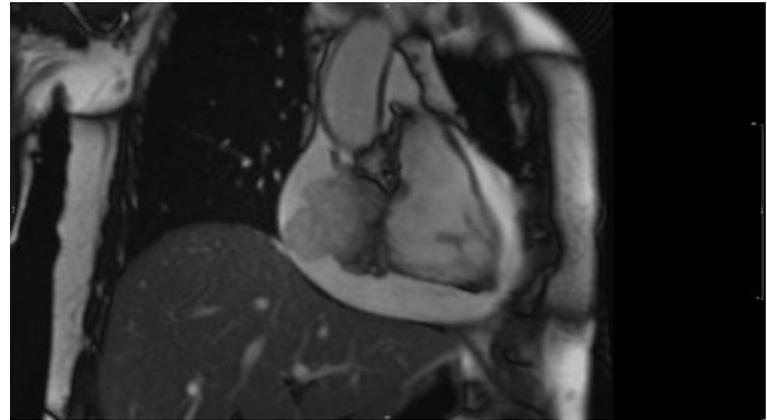
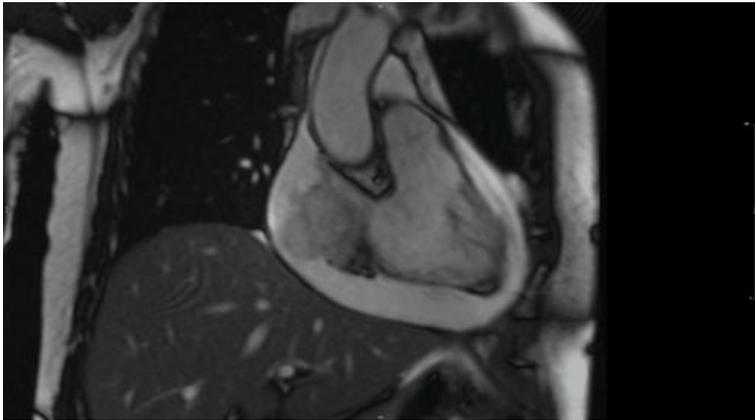
Cardiac Mass	T1-weighted Imaging*	T2-weighted Imaging*	After Contrast Enhancement (LGE Imaging)
Pseudotumor			
Thrombus	Low (high if recent)	Low (high if recent)	No uptake [†]
Pericardial cyst	Low	High	No uptake
Benign			
Myxoma	Isointense	High	Heterogeneous
Lipoma	High [‡]	High [‡]	No uptake
Fibroma	Isointense	Low	Hyperenhancement [§]
Rhabdomyoma	Isointense	Isointense/high	No/minimal uptake
Malignant			
Angiosarcoma	Heterogenous	Heterogeneous	Heterogeneous
Rhabdomyosarcoma	Isointense	Hyperintense	Homogeneous
Undifferentiated sarcoma	Isointense	Hyperintense	Heterogeneous/variable
Lymphoma	Isointense	Isointense	No/minimal uptake
Metastasis	Low	High	Heterogeneous

Angiosarcoma

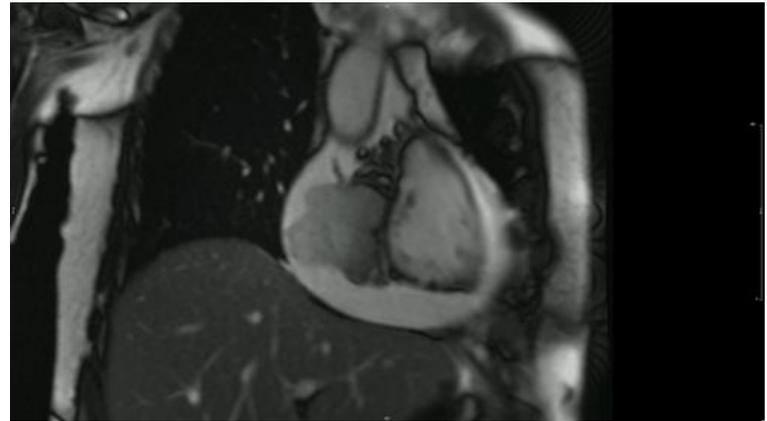
68yo completely asymptomatic

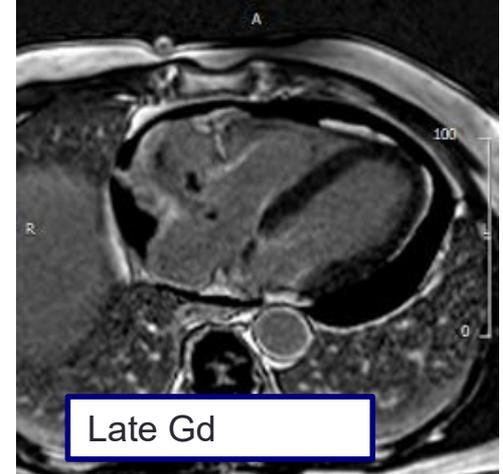
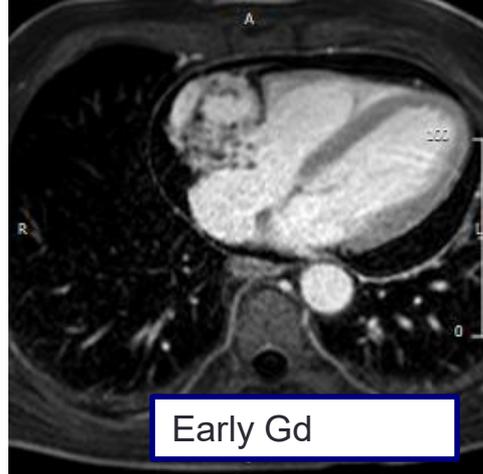
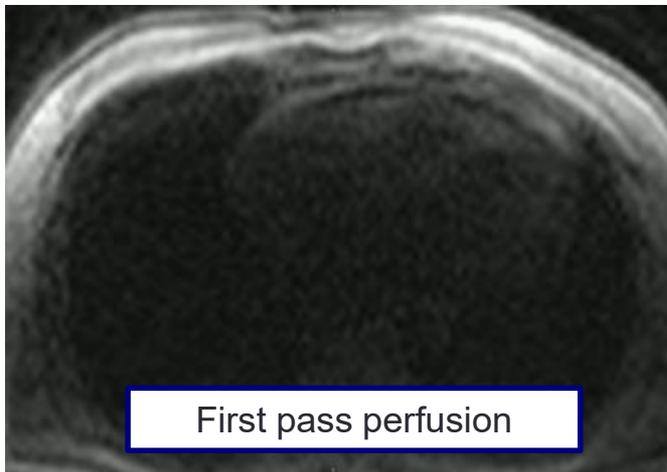
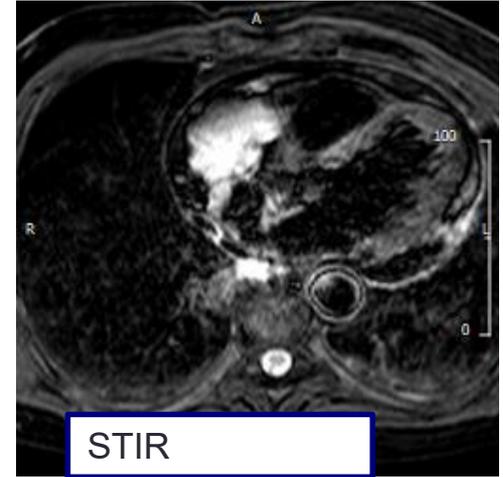
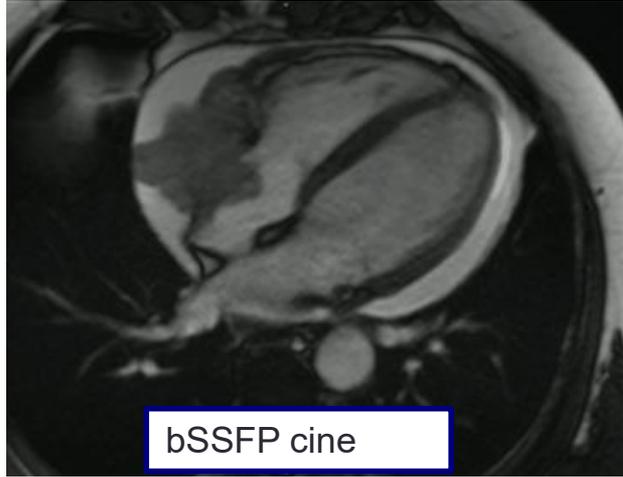






Mass, RV inflow-outflow view stack
Large part of the mass is
intrapericardial

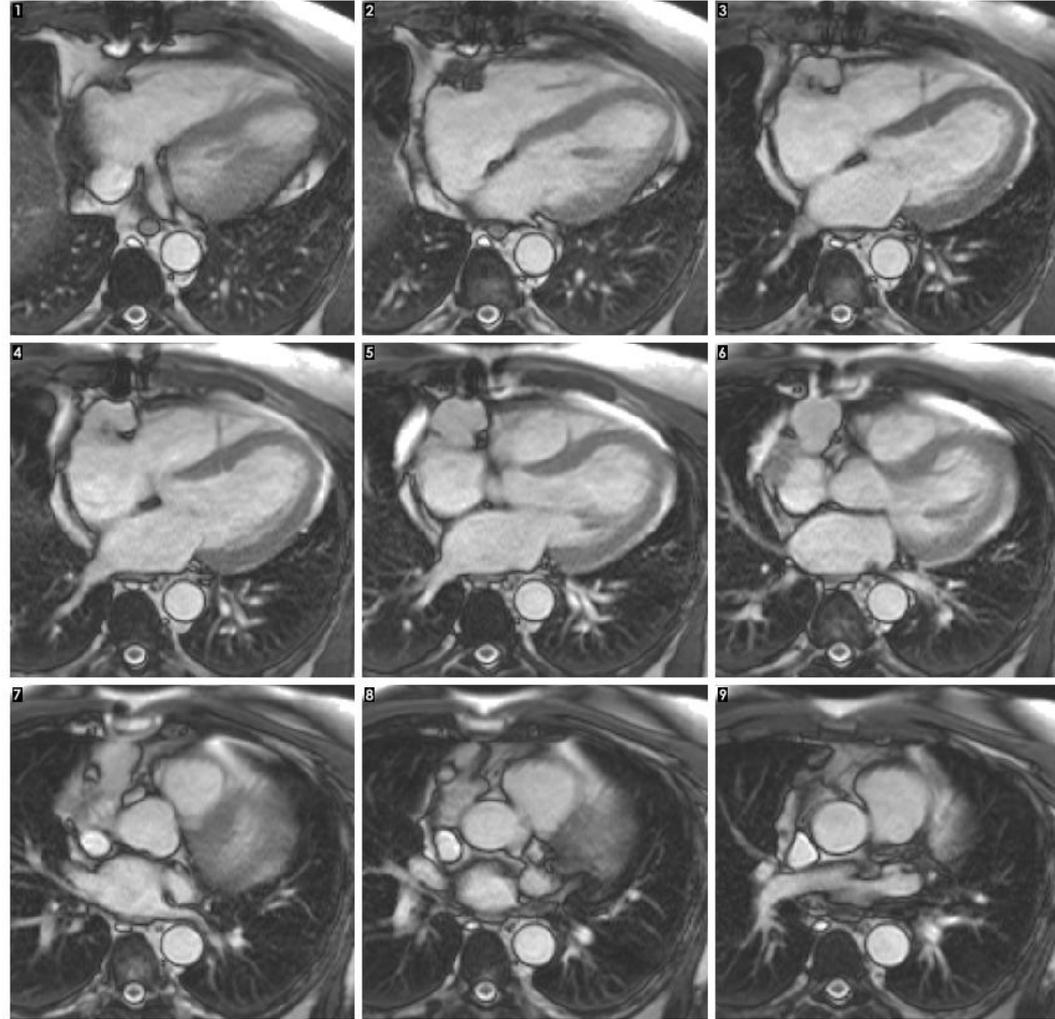




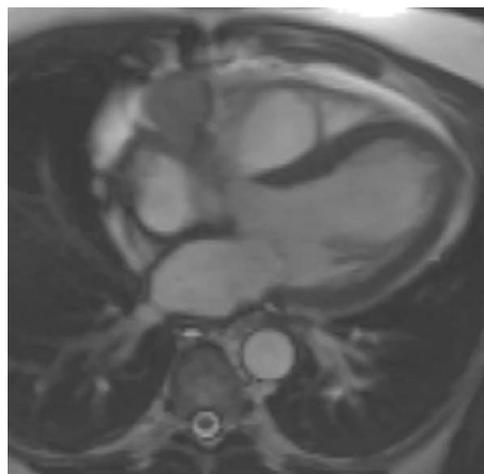
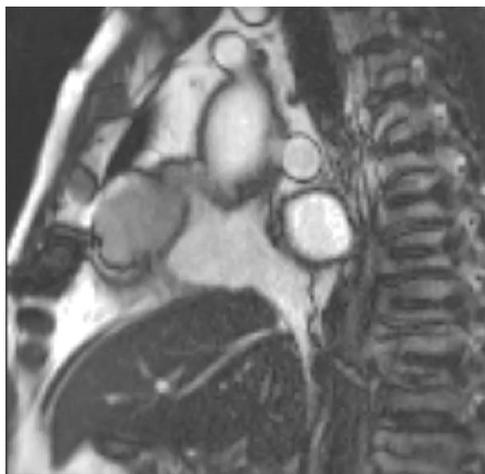
Angiosarcoma

b-SSFP cines:

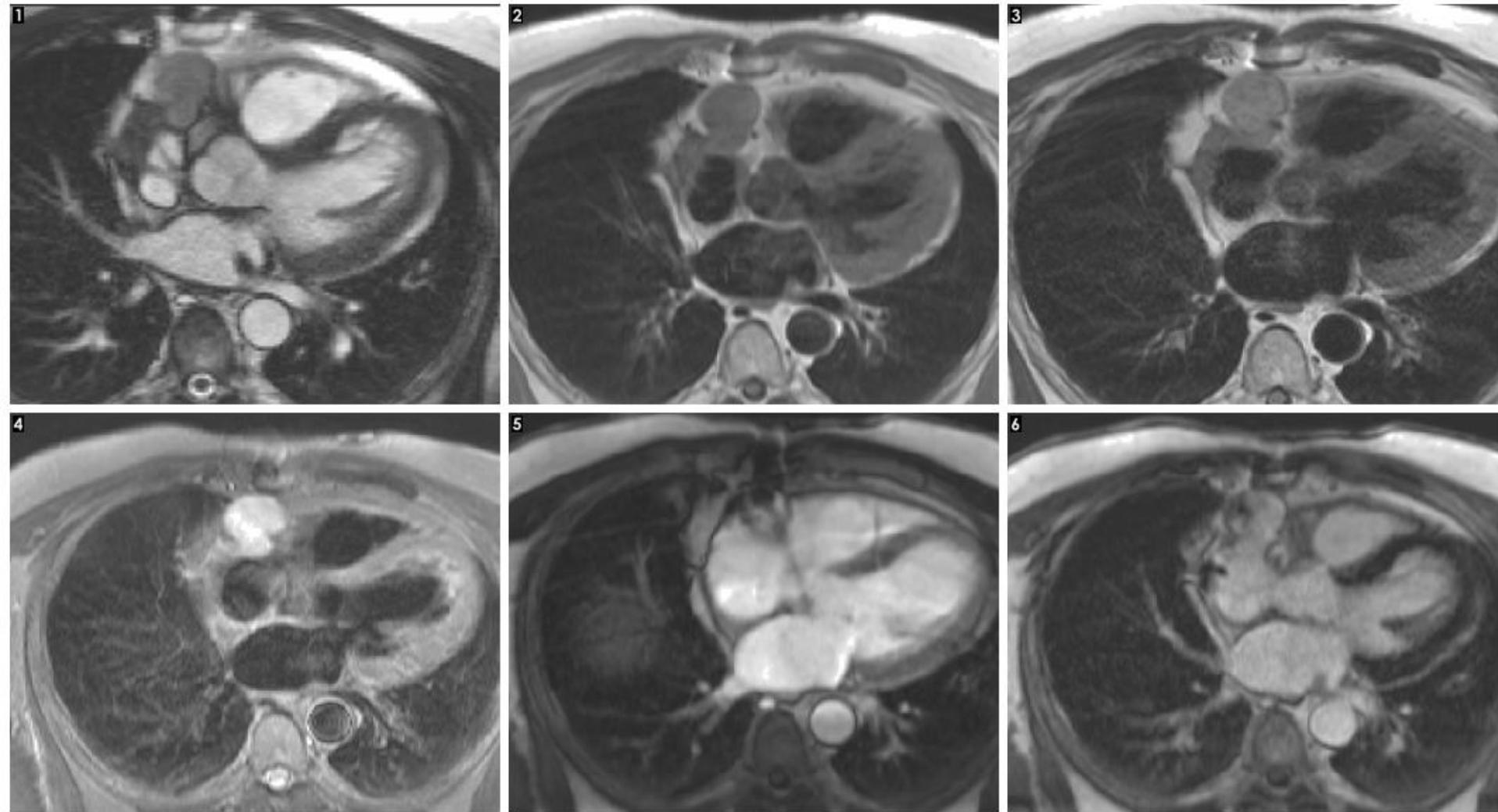
- predominantly hyperintense relative to myocardium
- areas of high and low signal intensity within the mass corresponding to hemorrhage and necrosis, respectively



Angiosarcoma



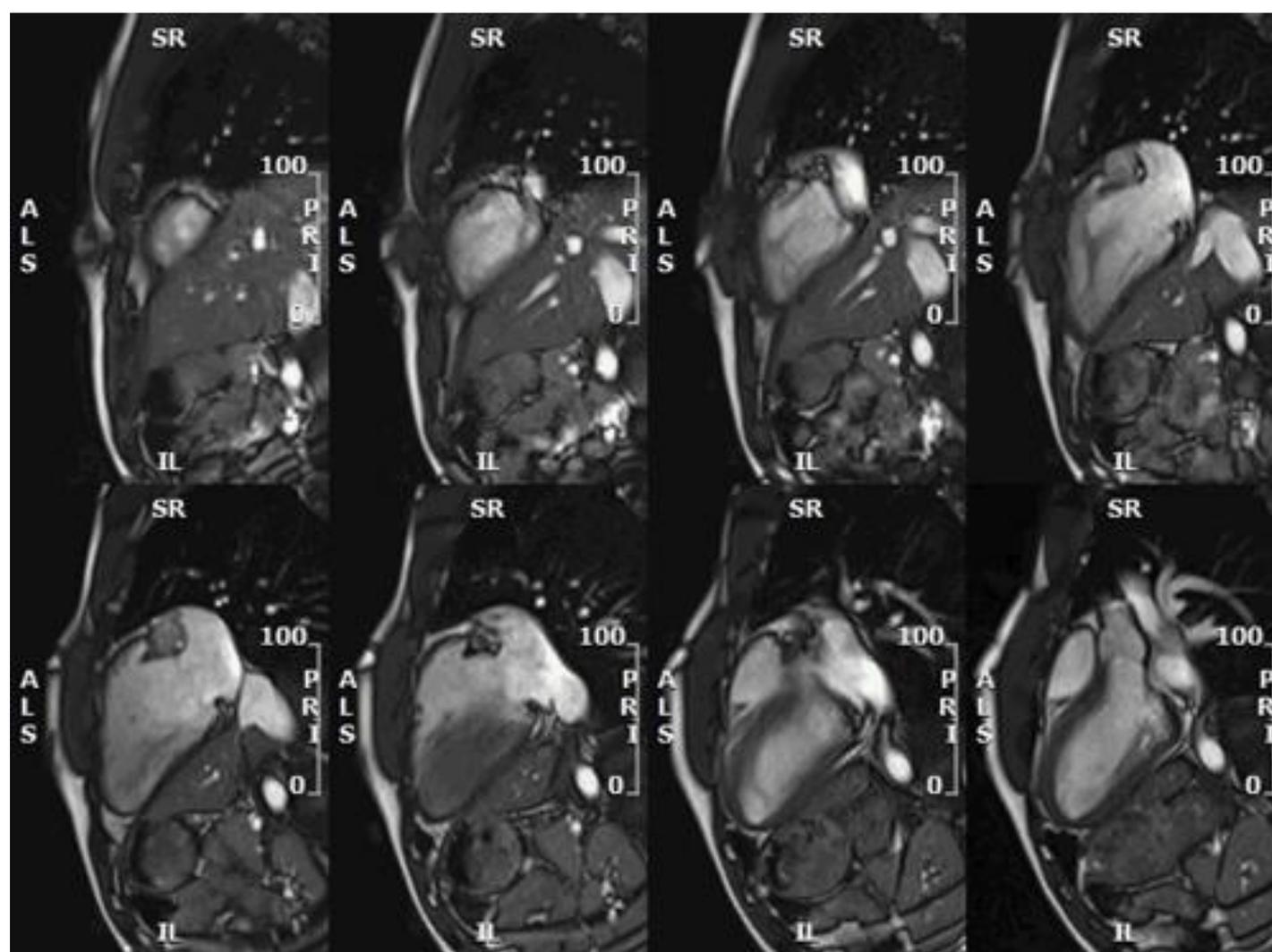
Angiosarcoma



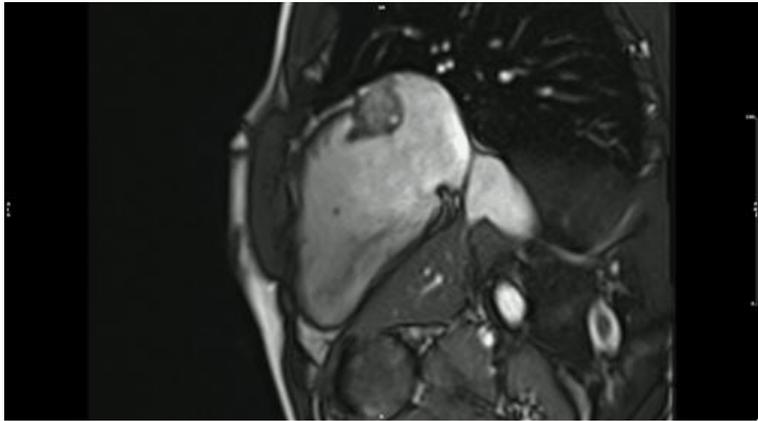
OUT OF THE BOX case

Asymptomatic (?) 16yo athlete post Covid 19
Pre-athletic screening

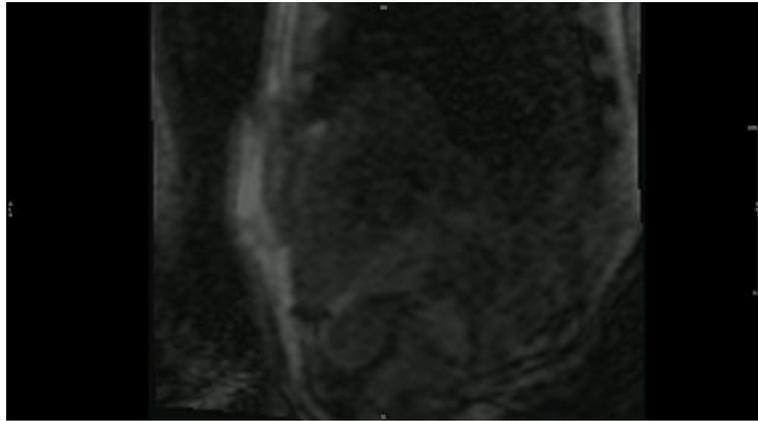
OUT OF THE BOX case



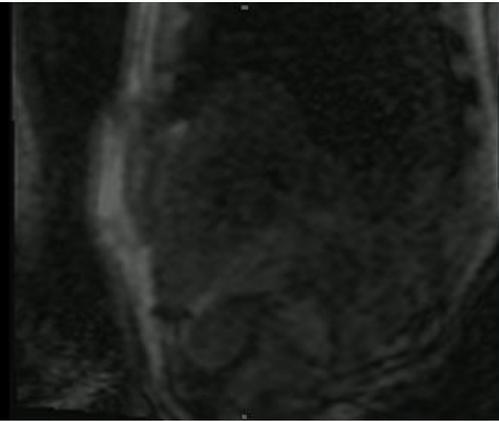
Asymptomatic (?) 16yo athlete post Covid 19
Pre-athletic screening



T1W

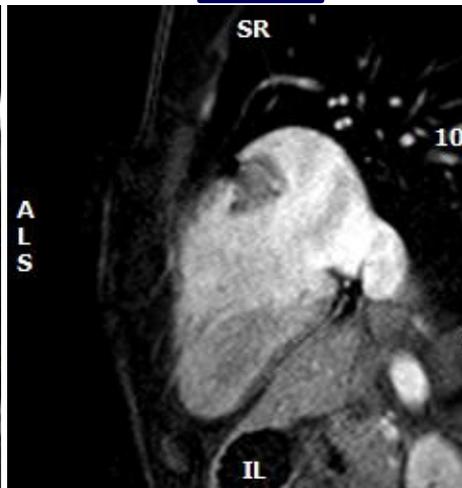
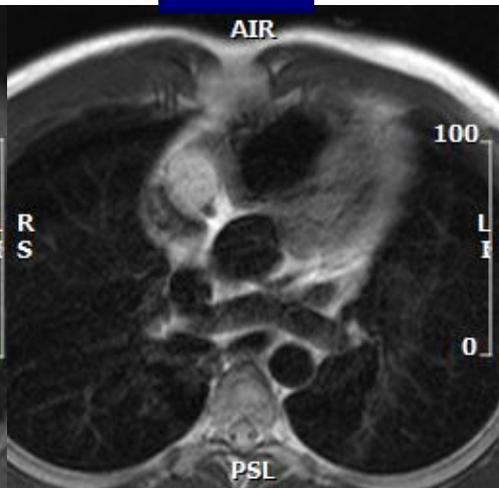
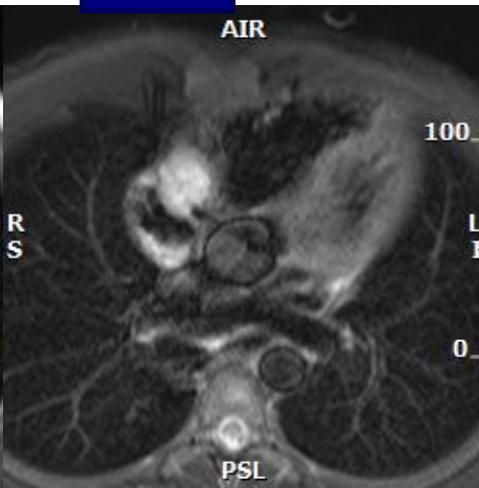
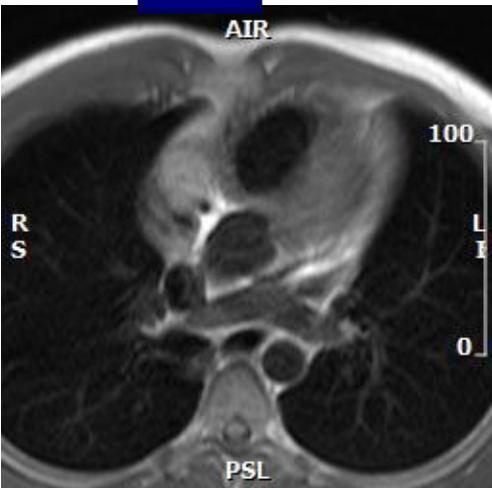


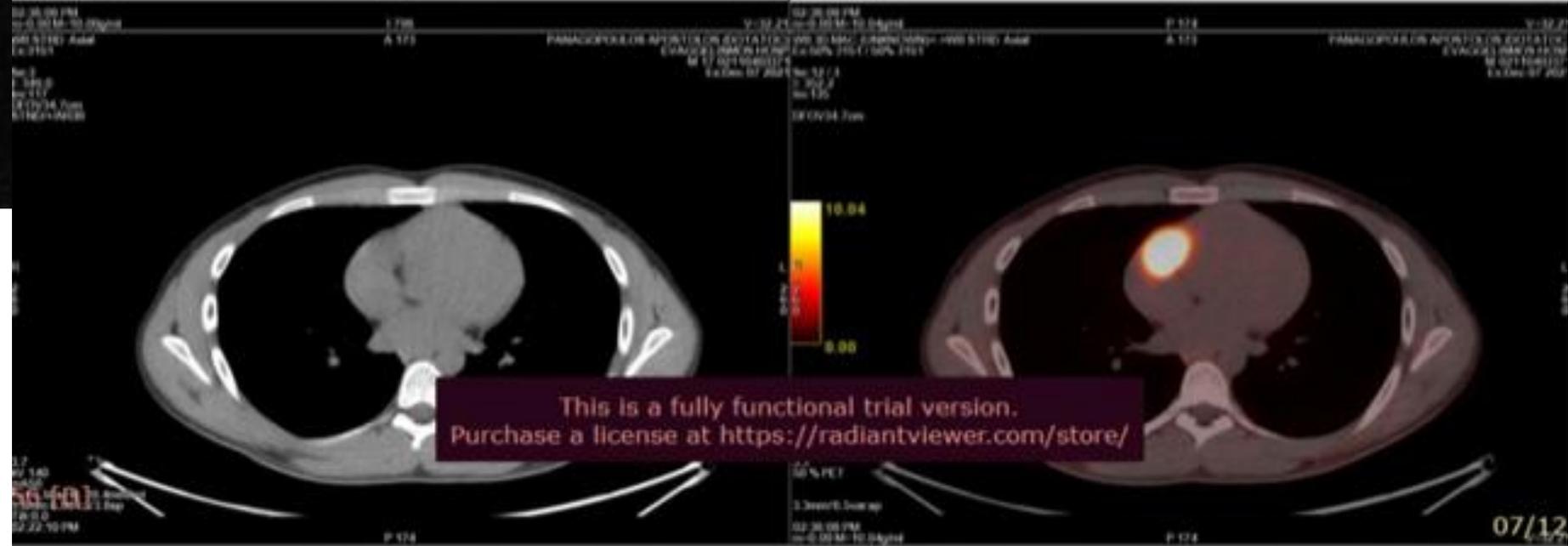
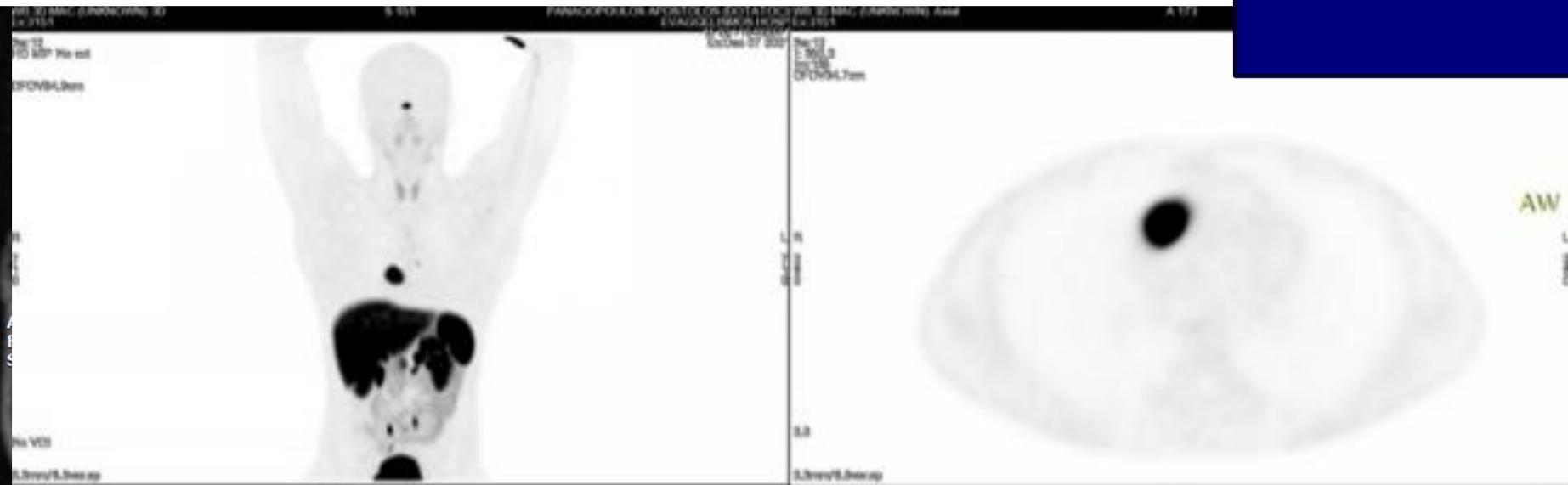
STIR



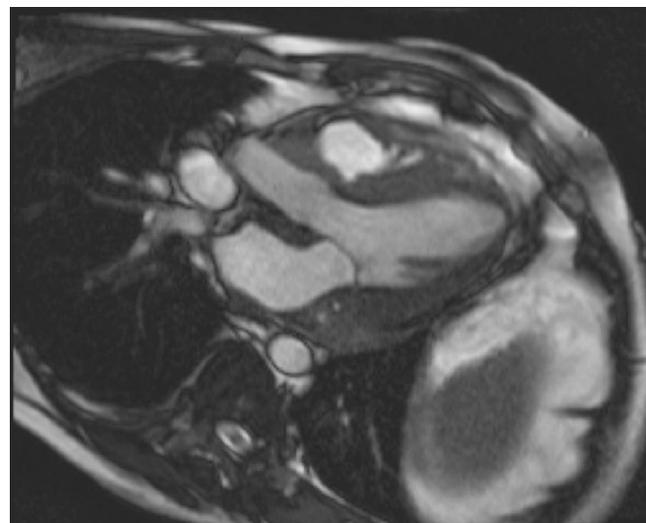
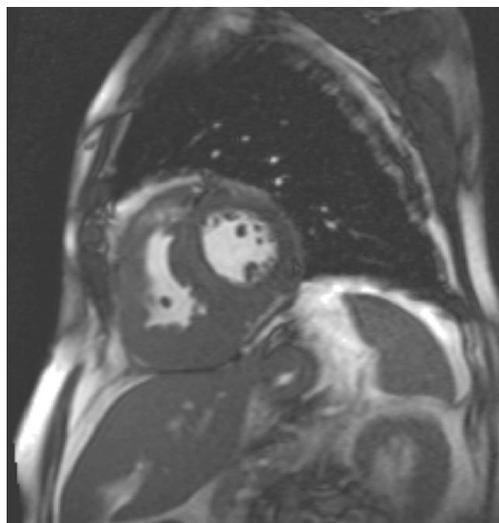
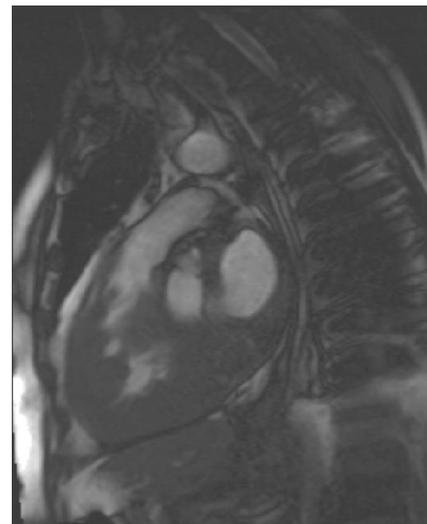
T2W

EGE

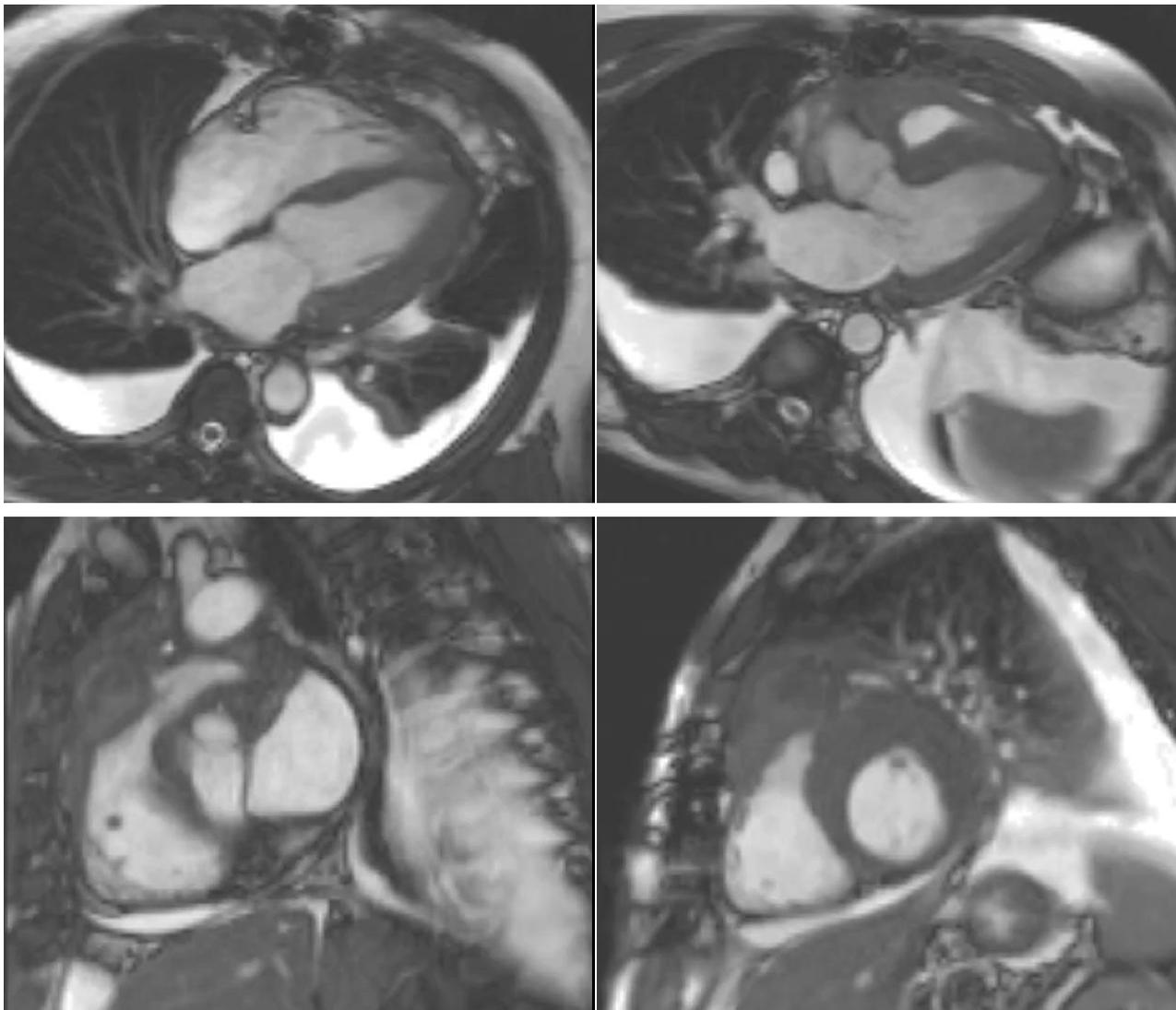




Lymphoma

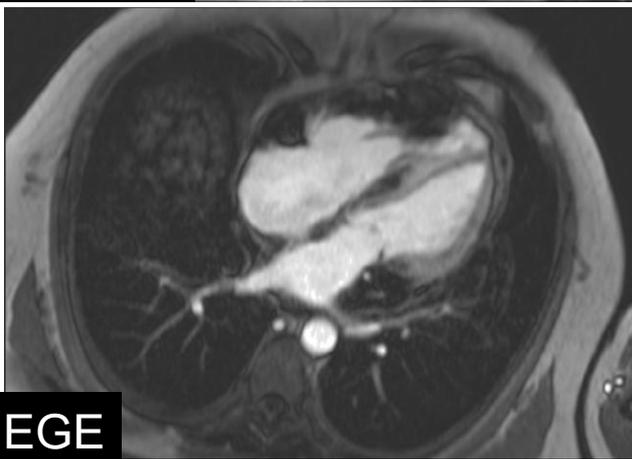
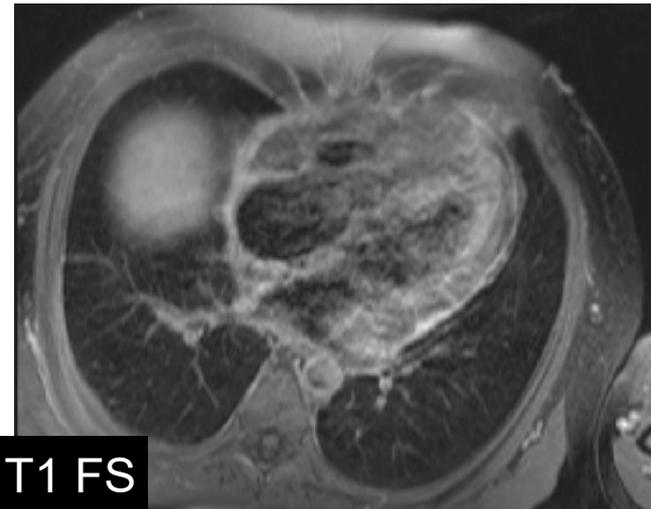
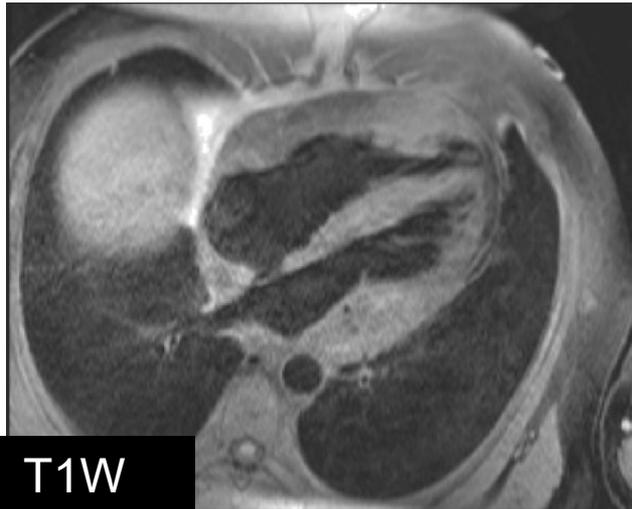


Lymphoma?



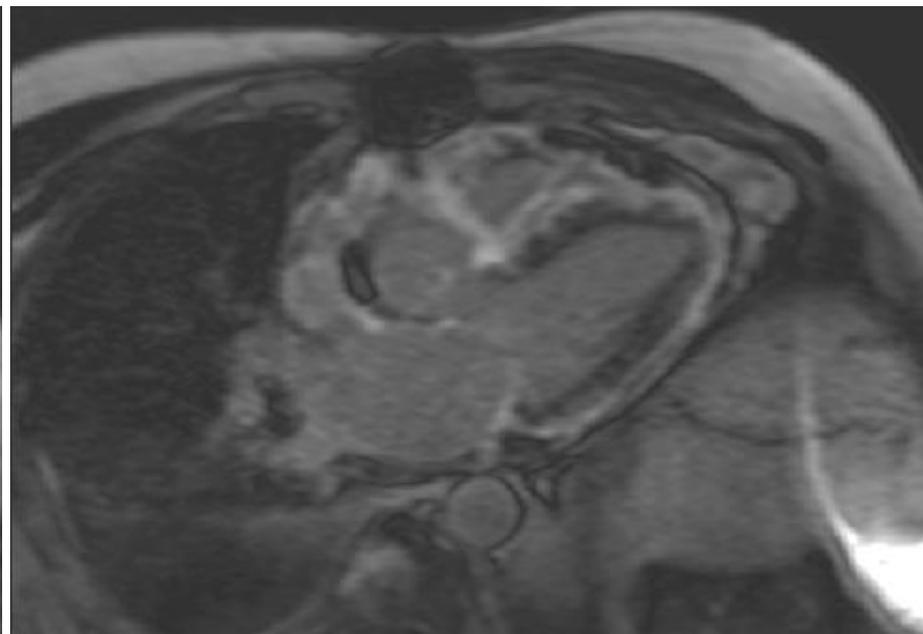
Lymphoma

Isointense on T1-weighted images
heterogeneously hyperintense on T2-weighted images



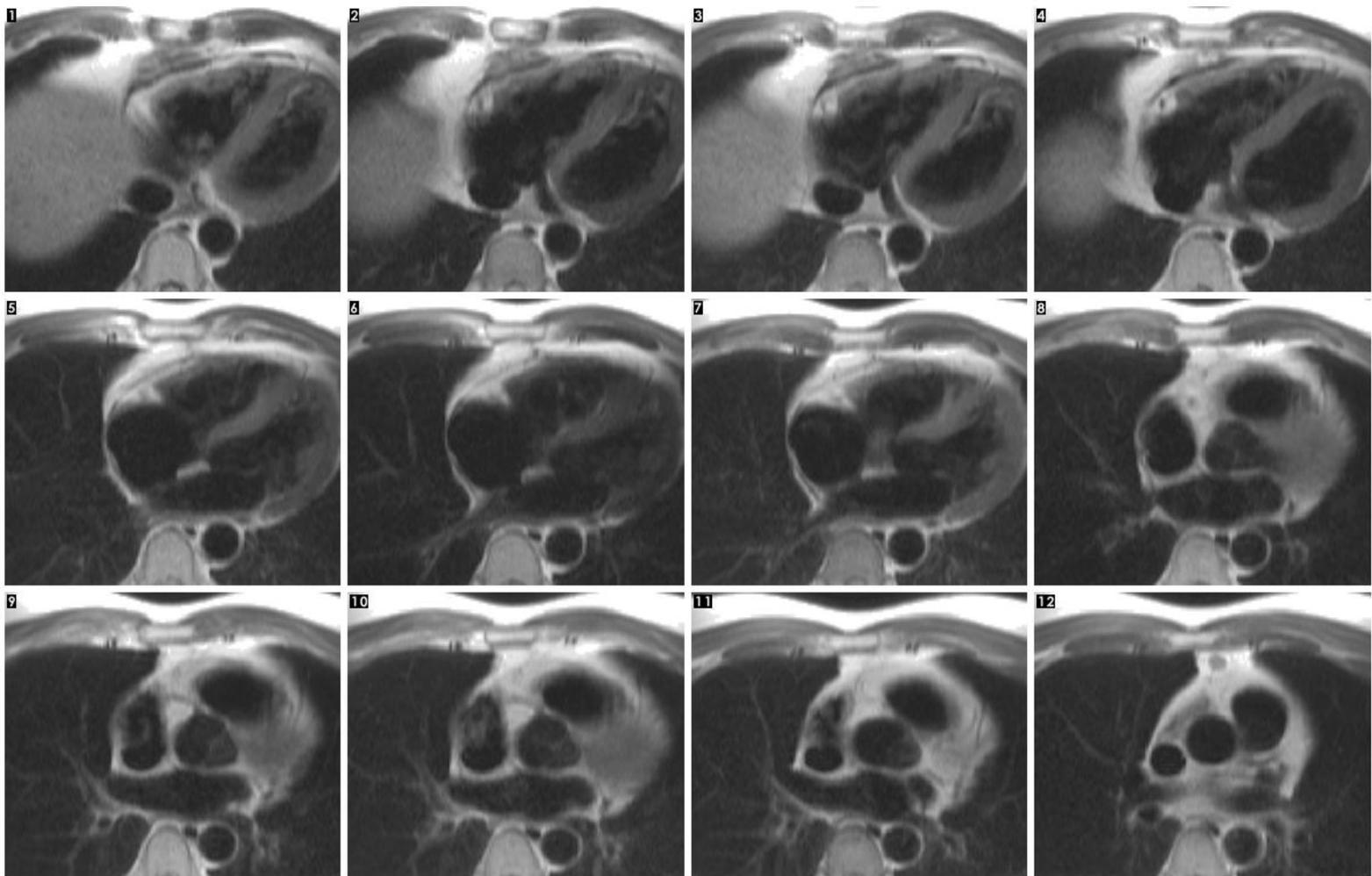
Heterogeneous enhancement LGE with areas of low signal in the center of the lesion compared to the periphery

Lymphoma?

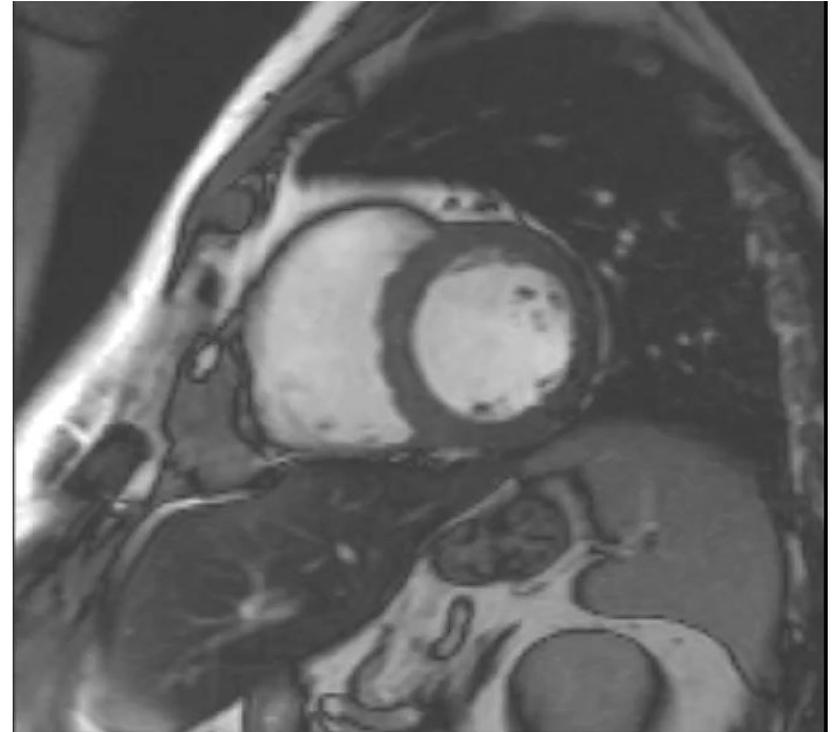
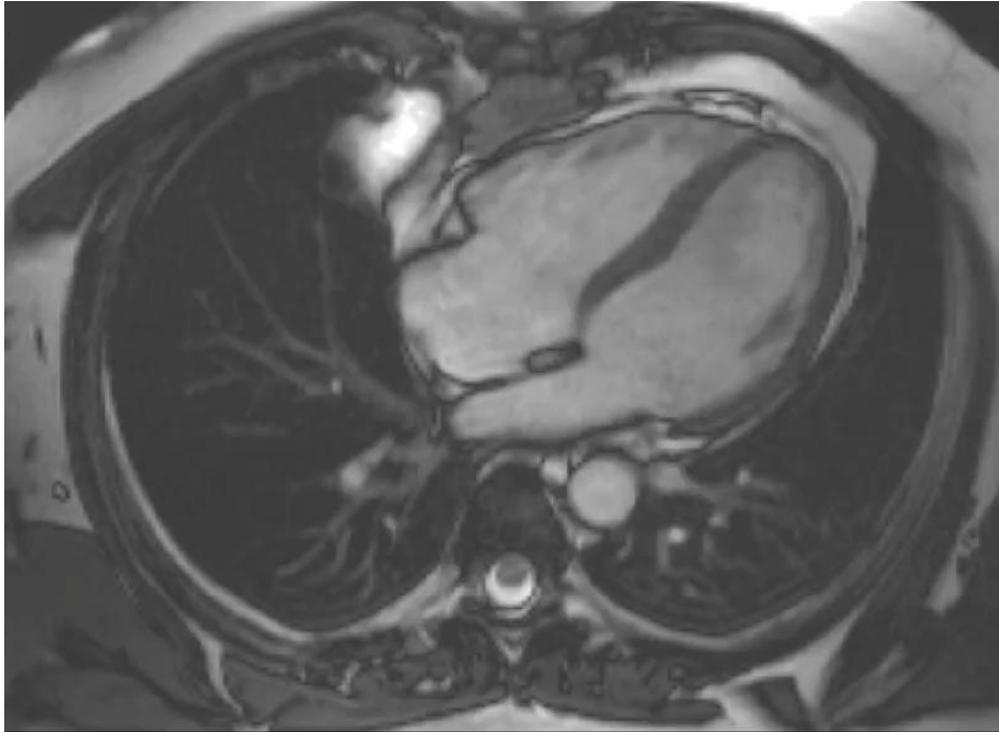


Metastatic

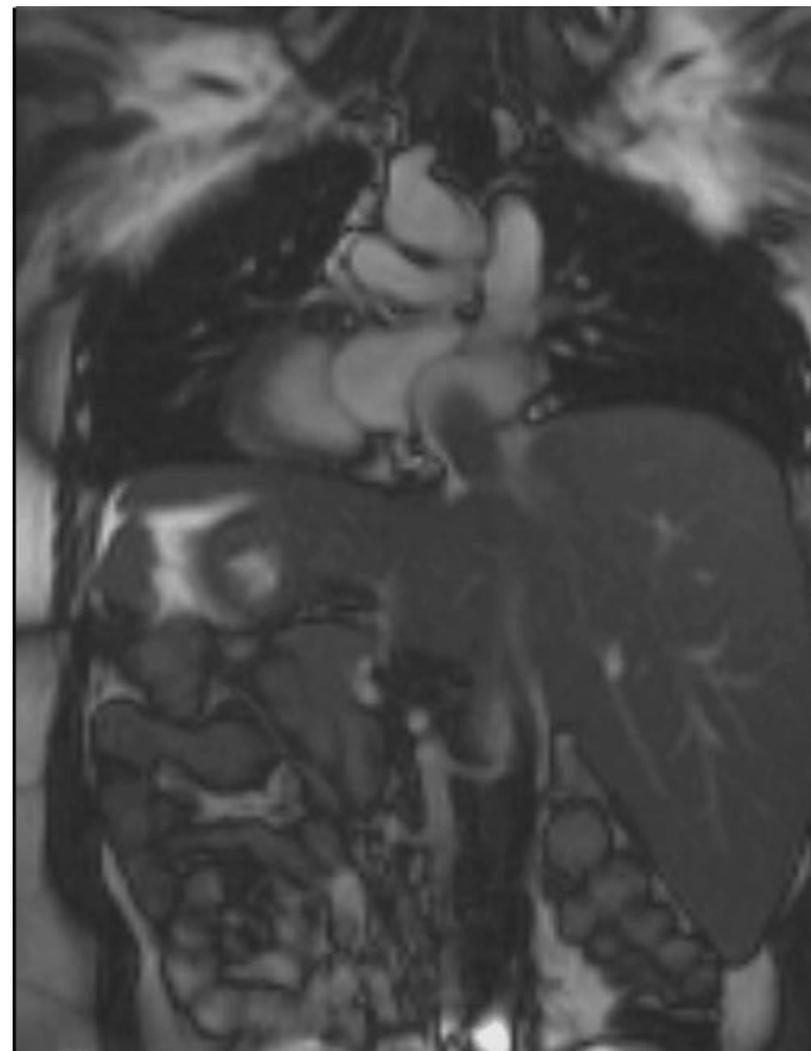
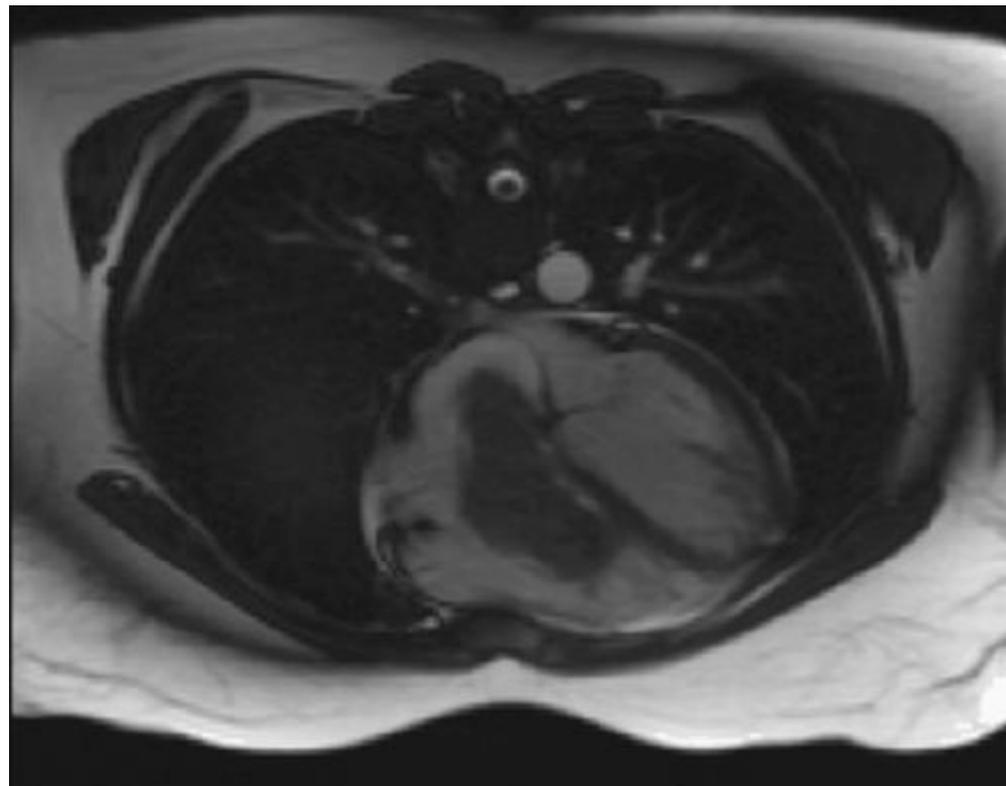
Male, 56y. Colorectal carcinoma.



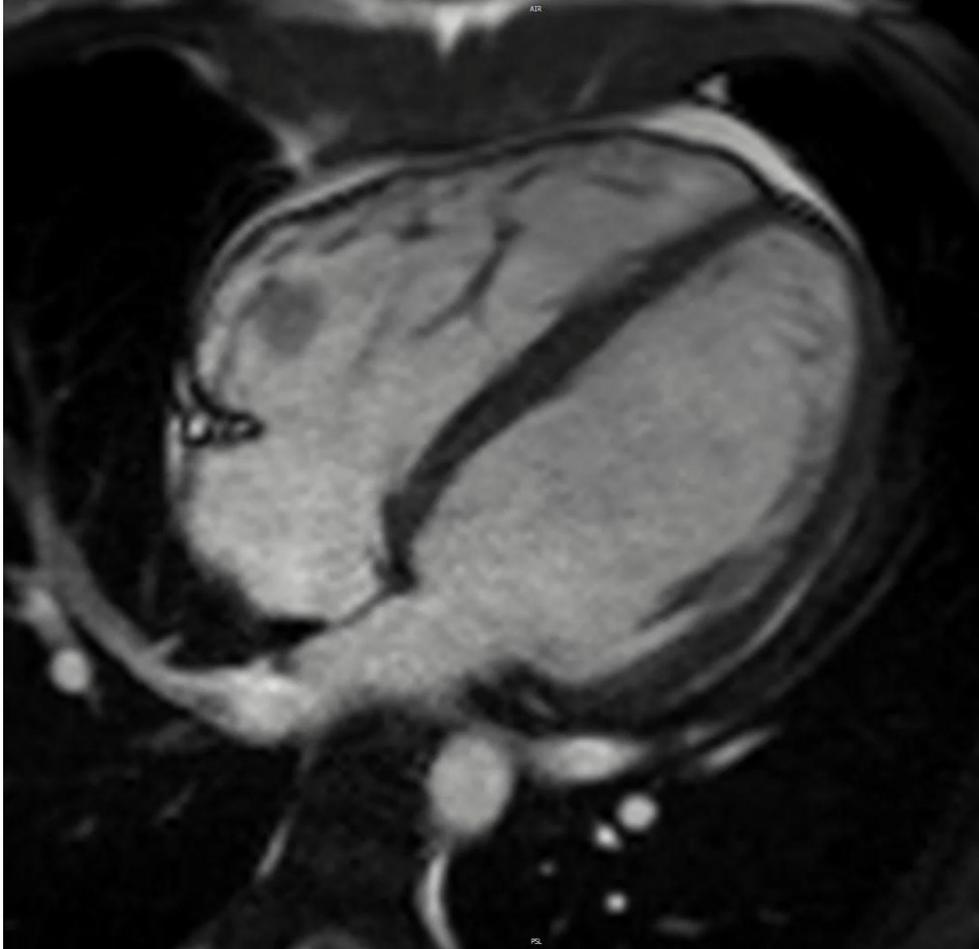
Metastatic



Metastatic

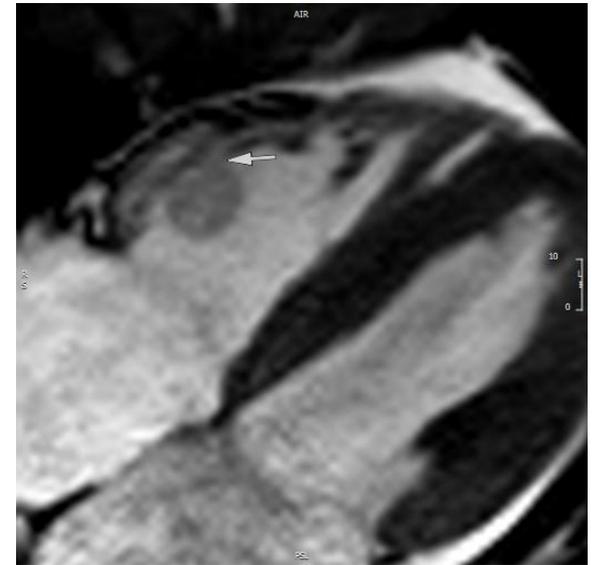
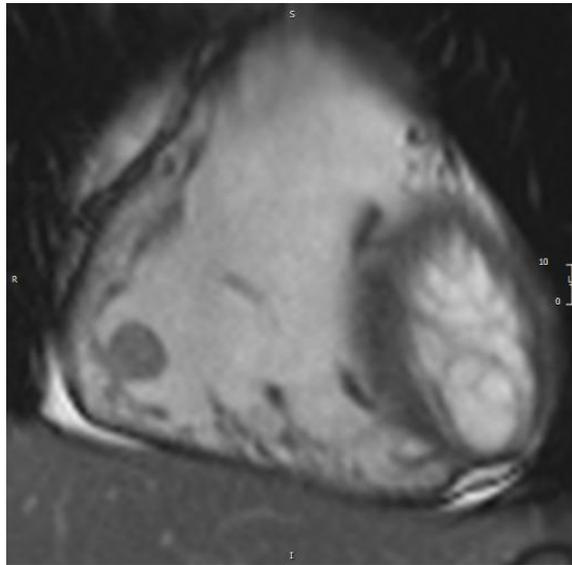
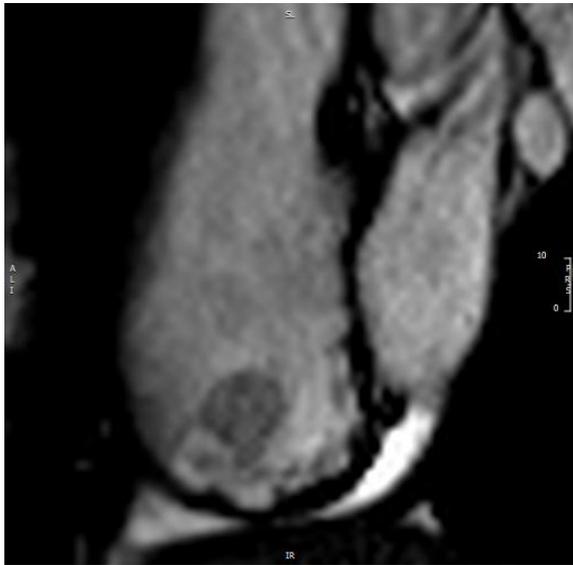


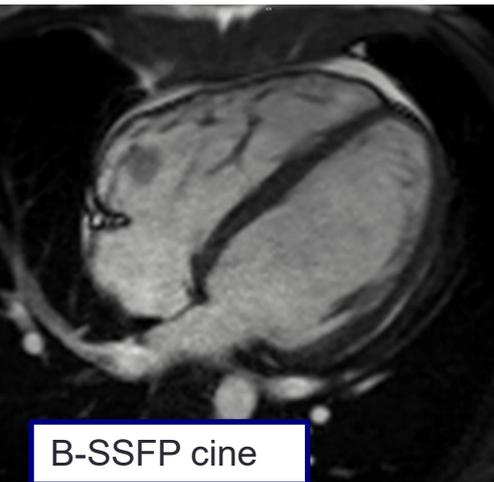
Strange looking



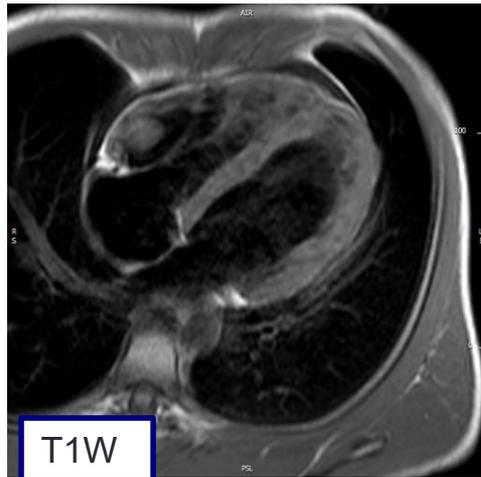
15 yo asymptomatic
Random finding on
echo for athletic
screening

Coronal View RV

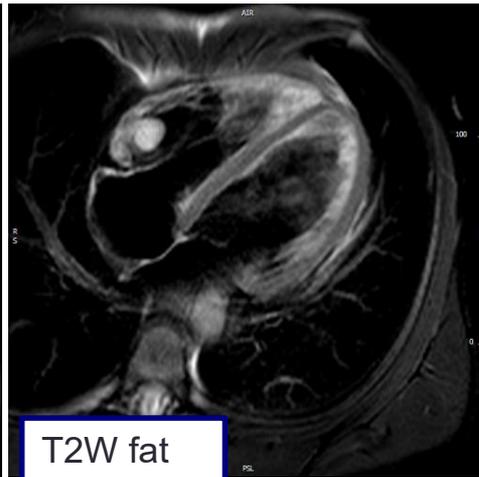




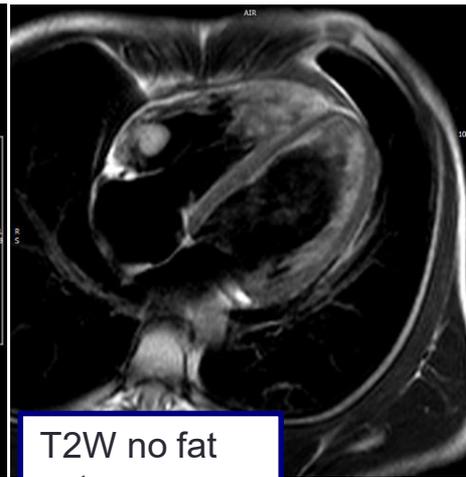
B-SSFP cine



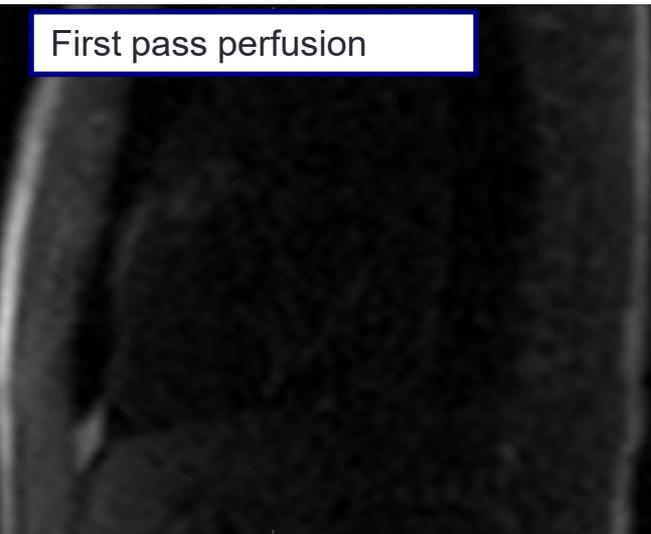
T1W



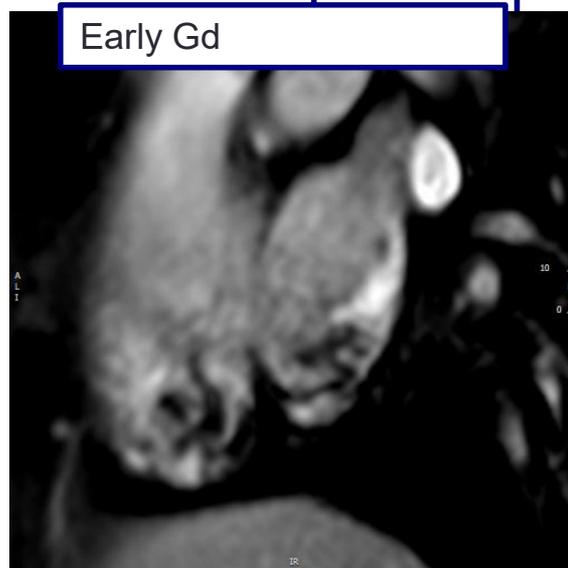
T2W fat sat



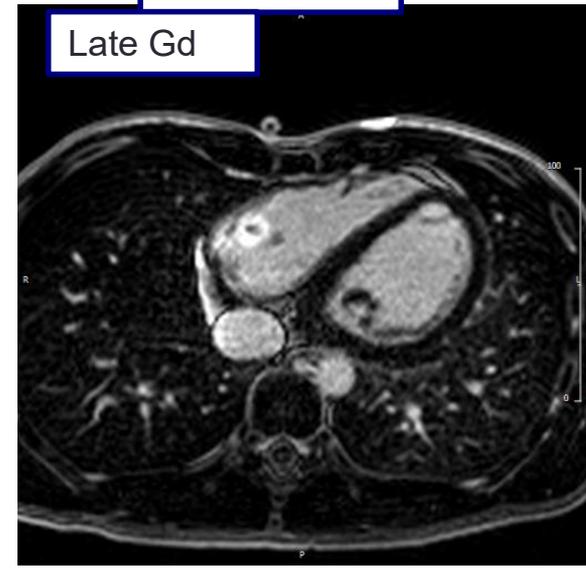
T2W no fat sat



First pass perfusion

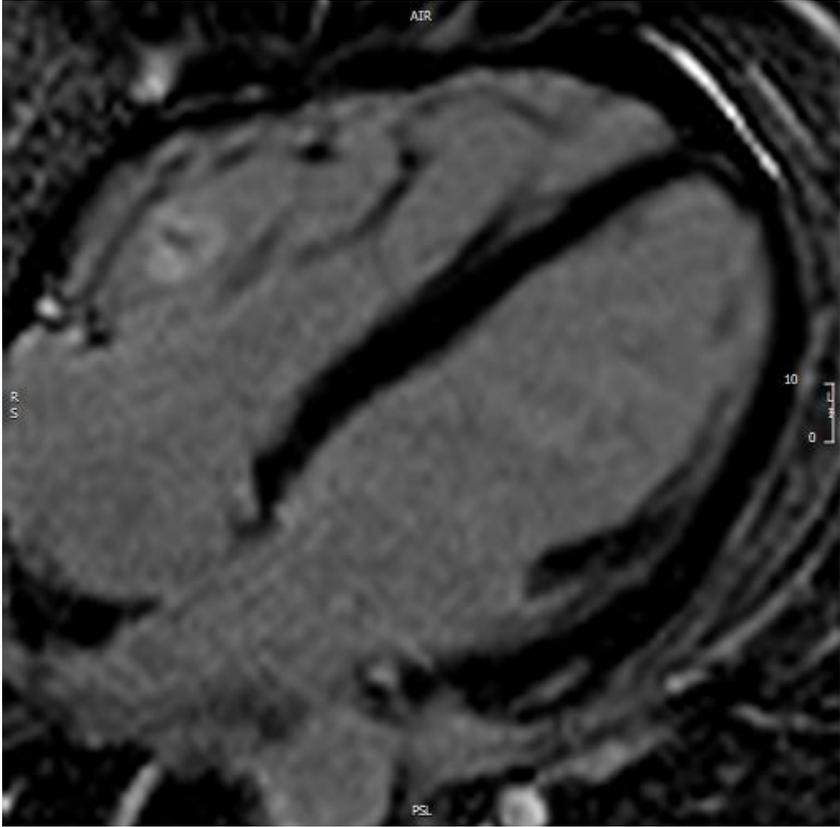
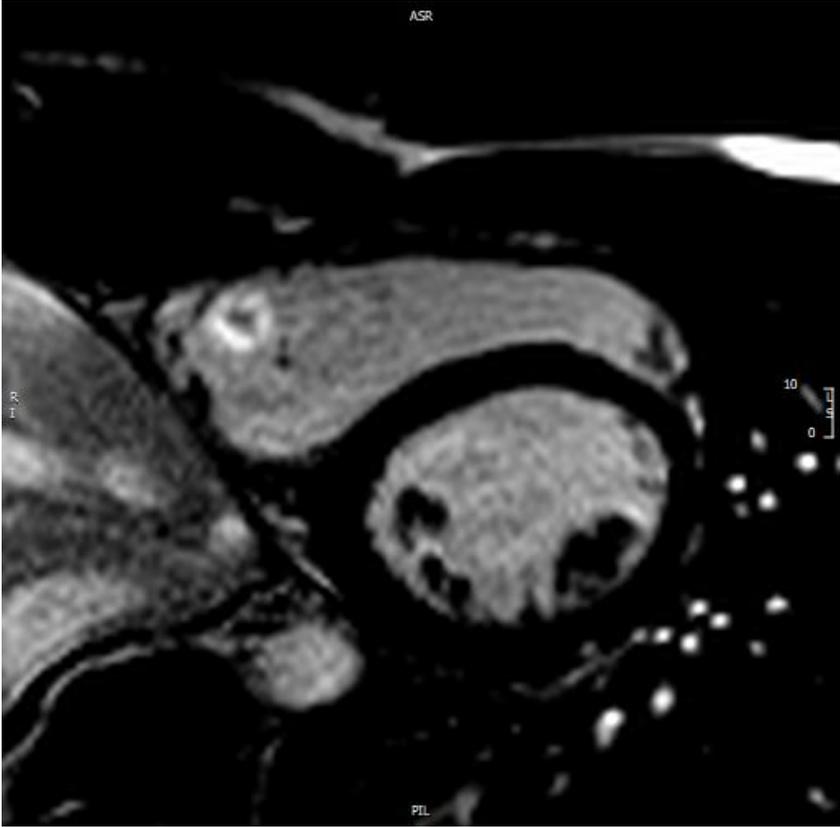


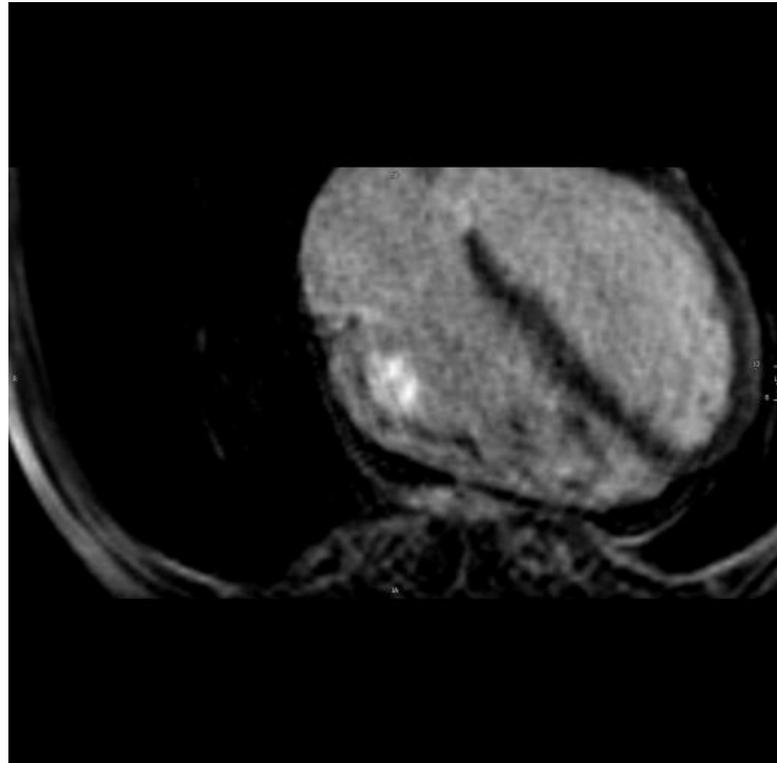
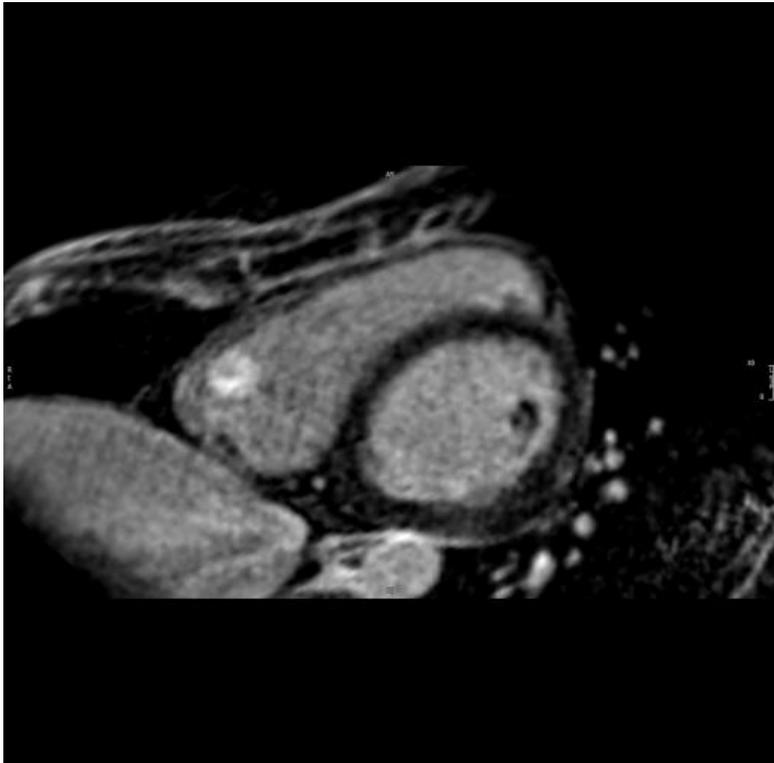
Early Gd



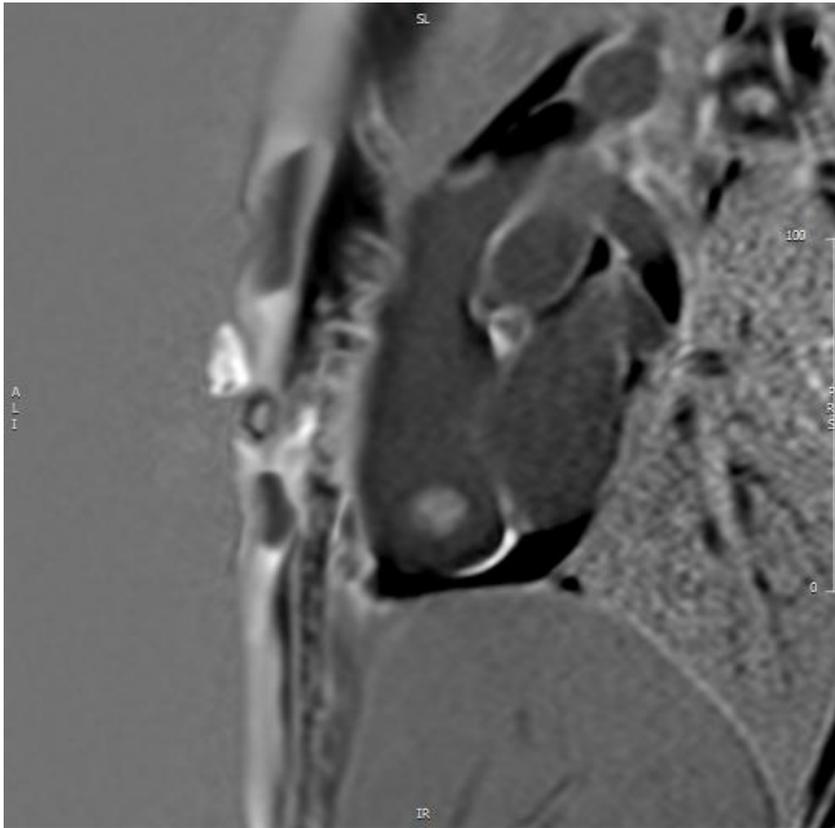
Late Gd

Late Gd images

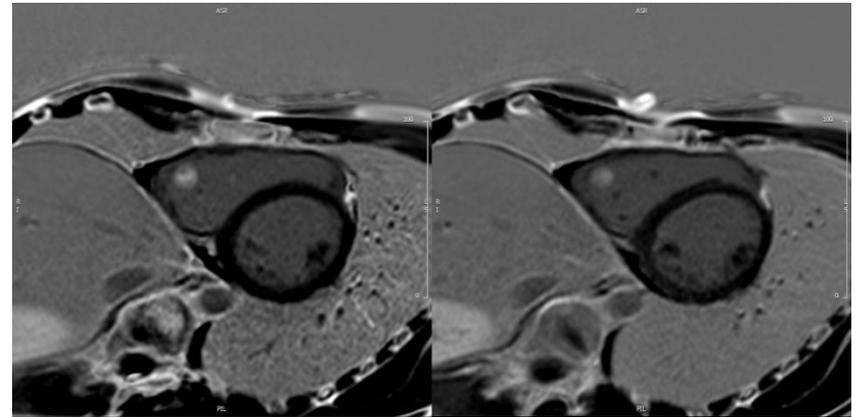




Late Late GD images

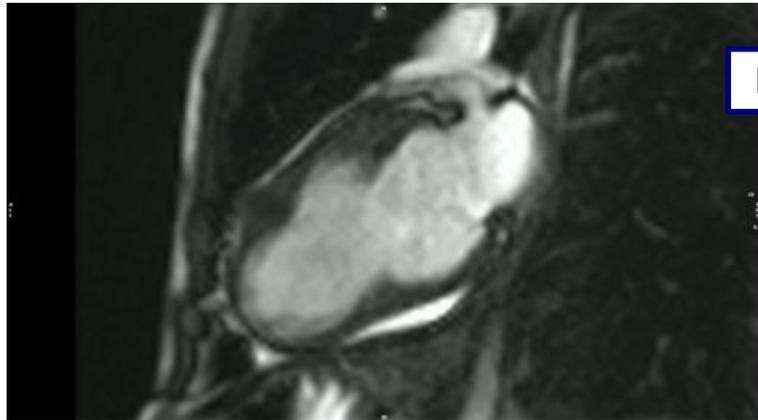


Black blood LGE

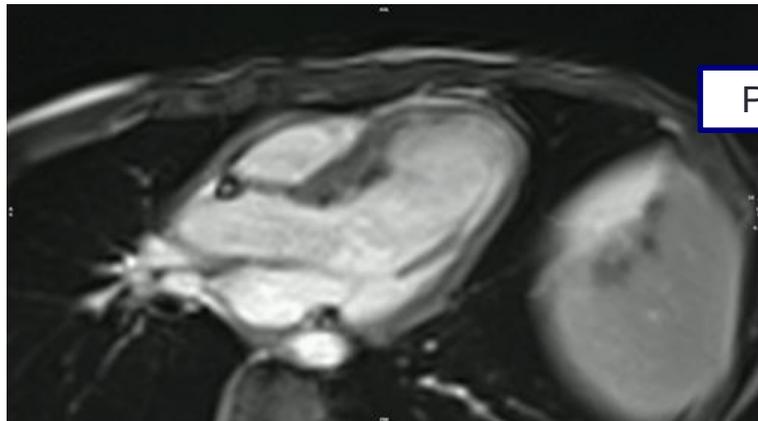
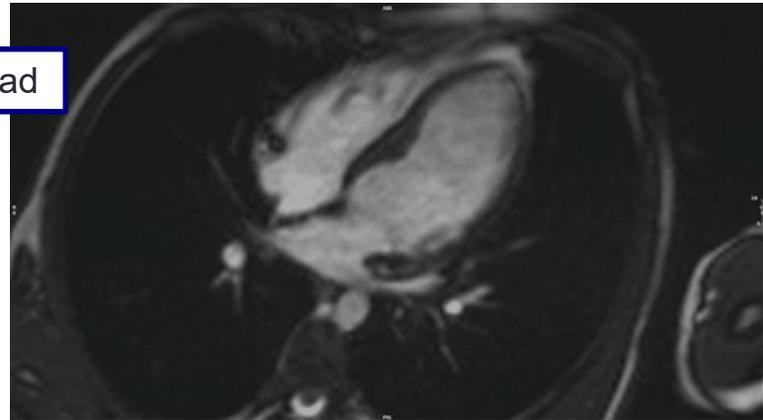


Cavernous Haemangioma

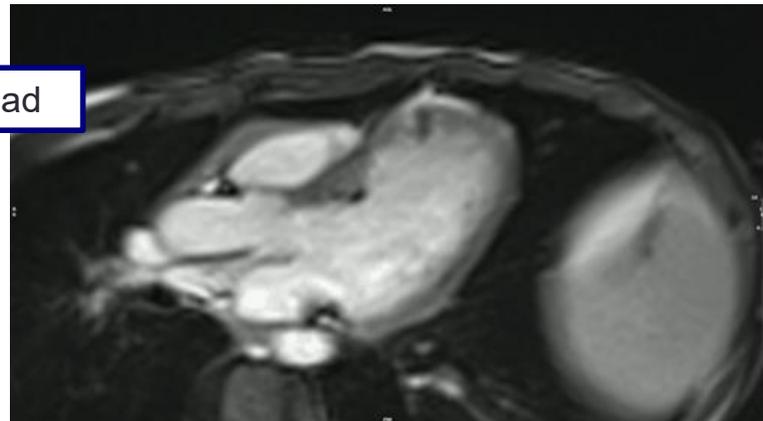




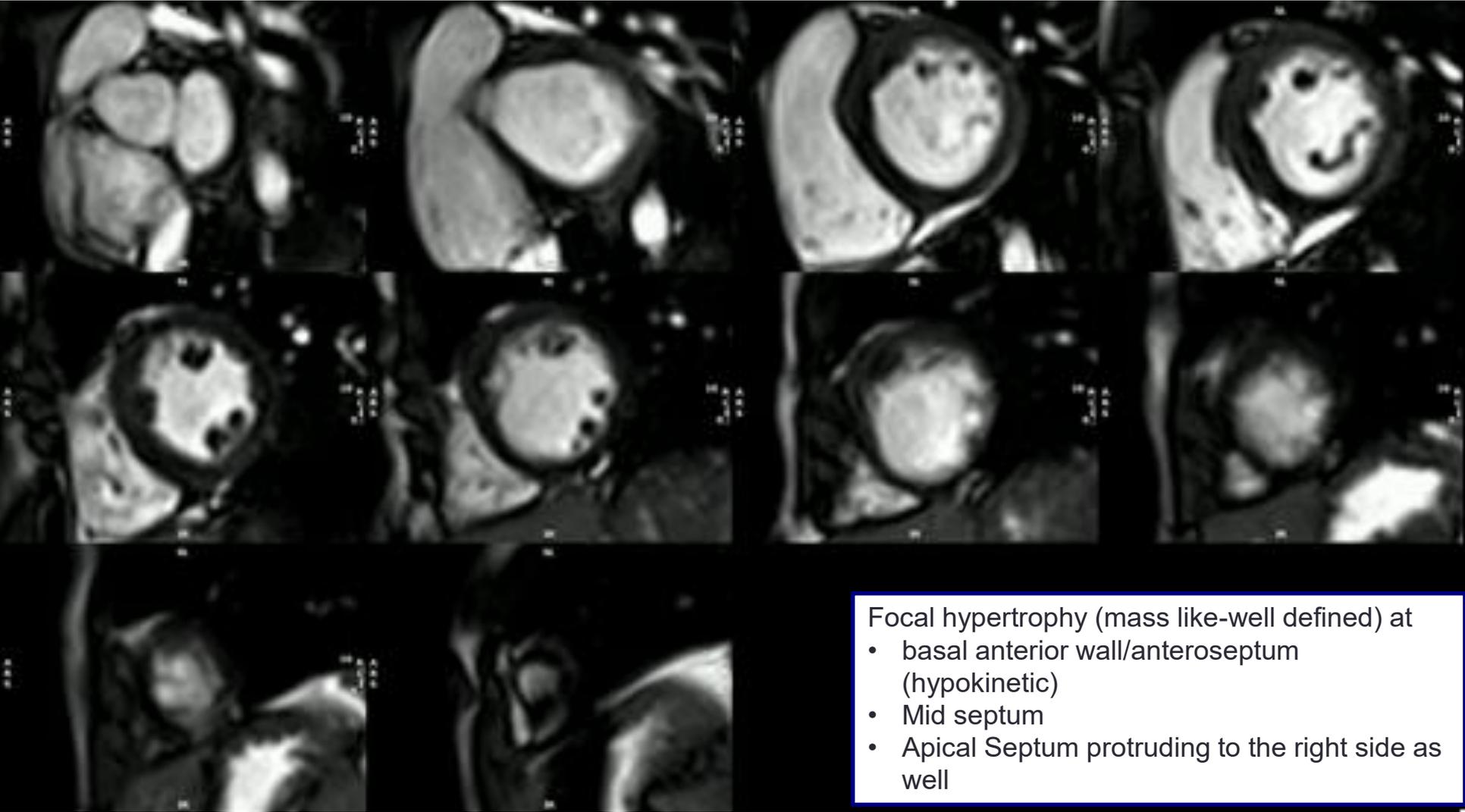
Pre-Gad



Post-Gad



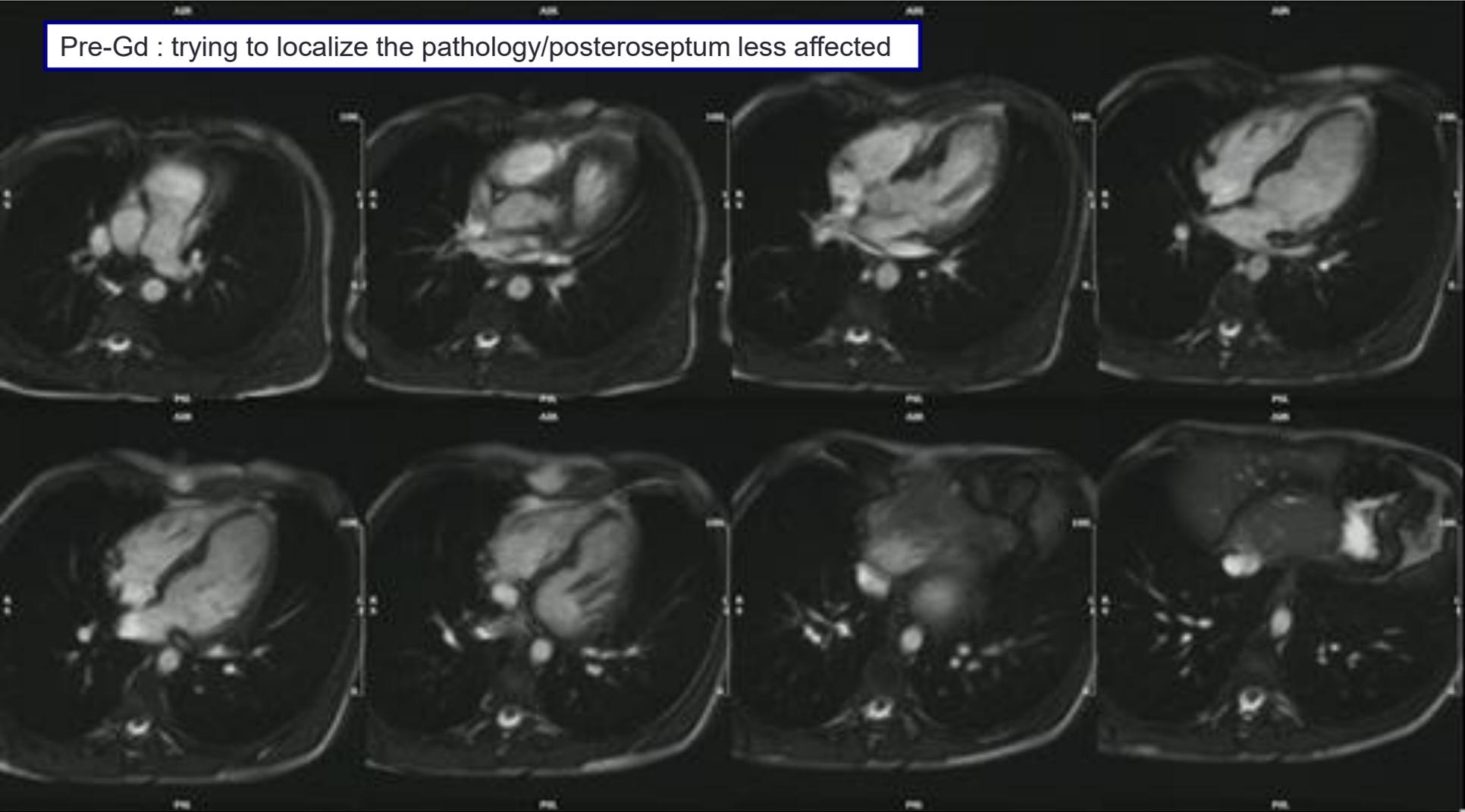
- Acute Lymphoblastic Leukemia in 2014- Chemo for 1 month- stopped due to liver cirrhosis
- CARDIAC ARREST ON FIRST SUBMISSION
- Ongoing courses with dexamethazone
- Echo septal hypokinesia and altered texture
- Referred for CMR scan to assess for fibrosis
- No other information

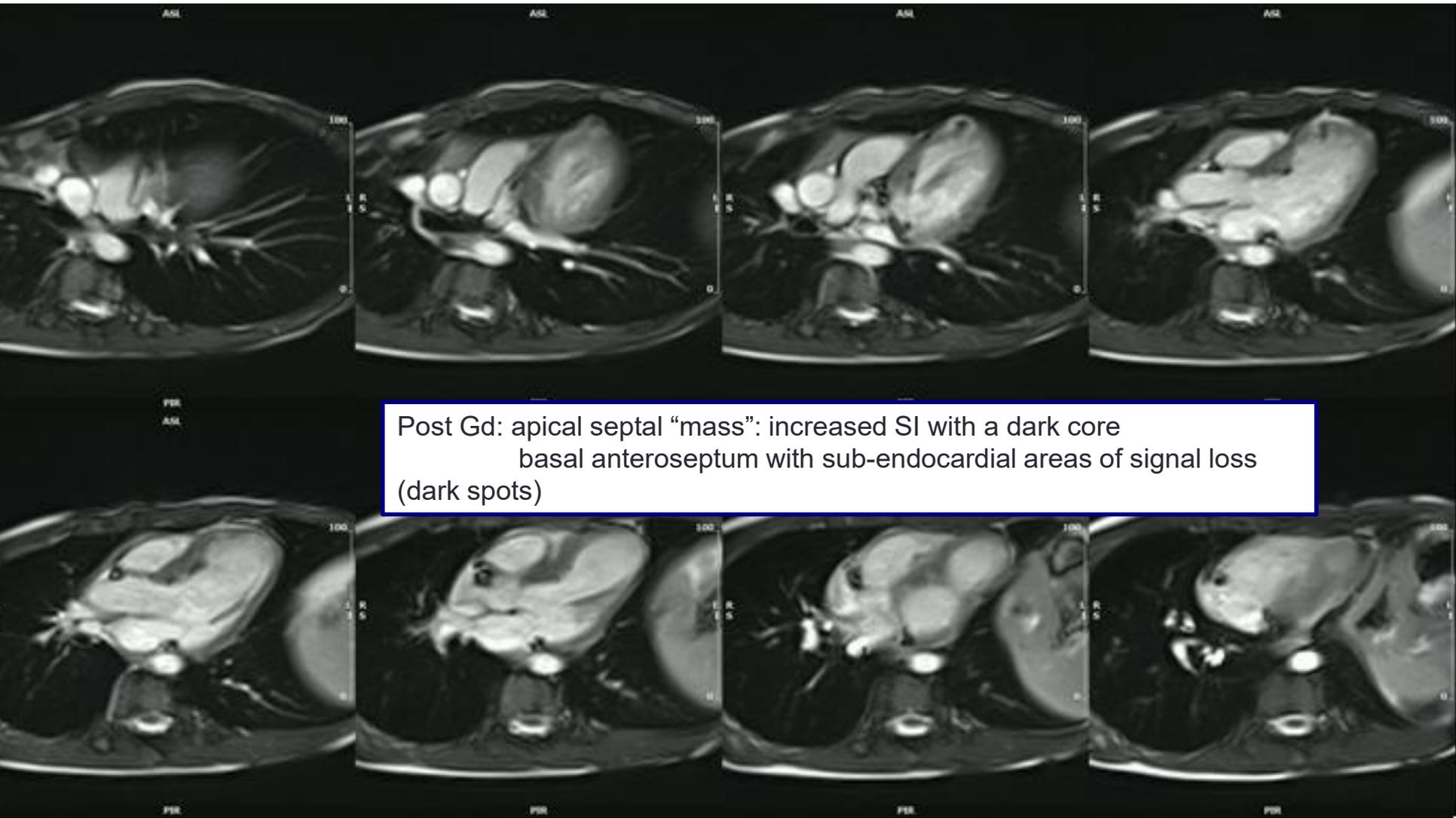


Focal hypertrophy (mass like-well defined) at

- basal anterior wall/anteroseptum (hypokinetic)
- Mid septum
- Apical Septum protruding to the right side as well

Pre-Gd : trying to localize the pathology/posteroseptum less affected

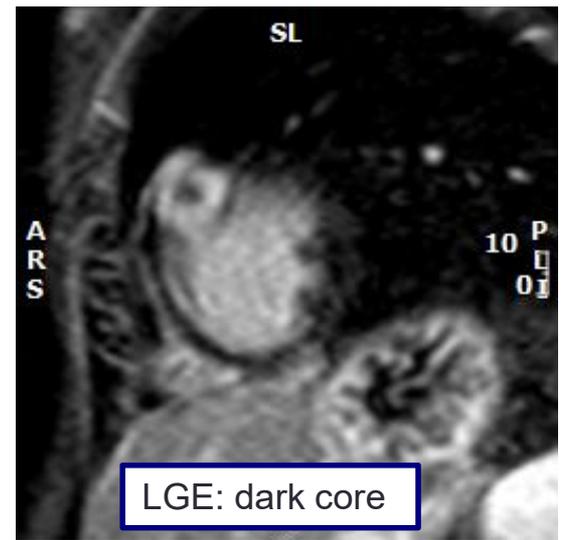




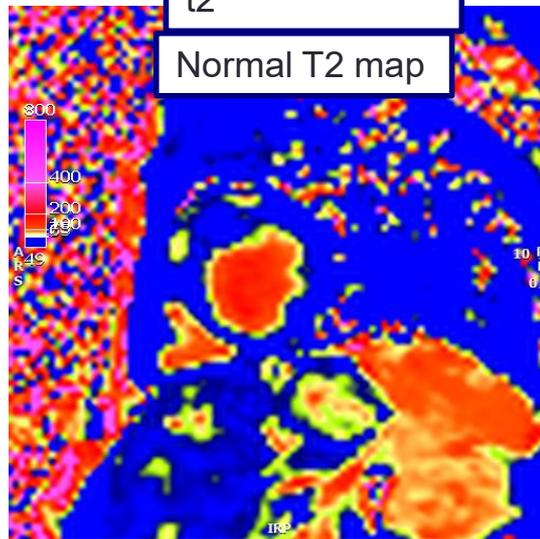
Post Gd: apical septal “mass”: increased SI with a dark core
basal anteroseptum with sub-endocardial areas of signal loss
(dark spots)



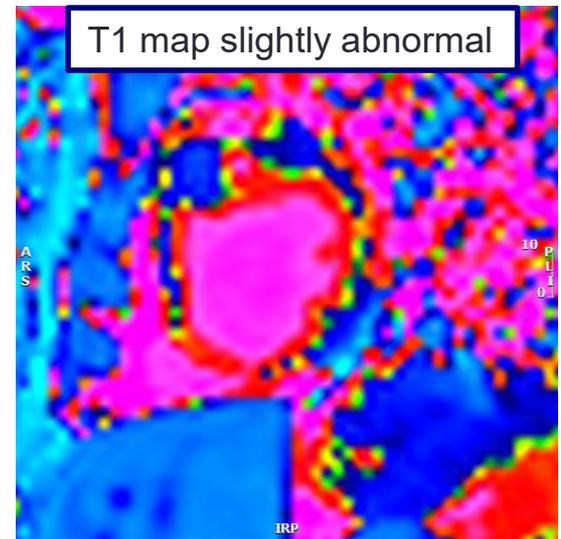
STIR: dark core
BUT NORMAL
t2



LGE: dark core

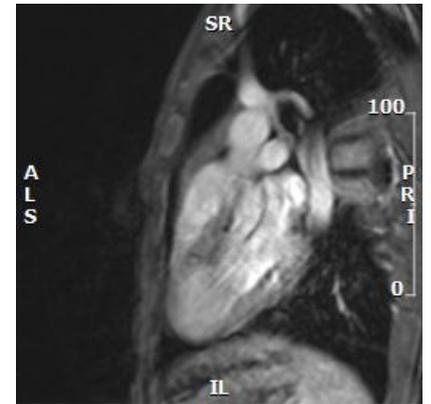
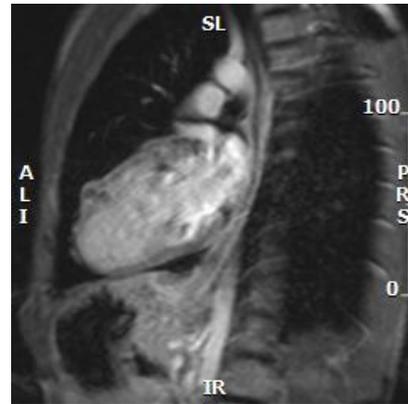
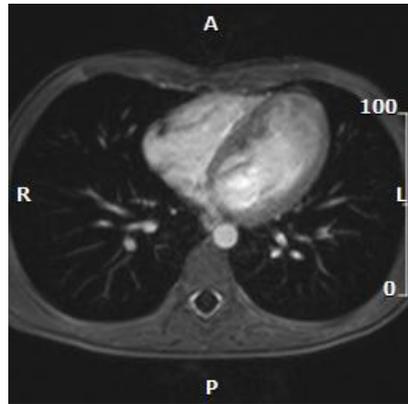
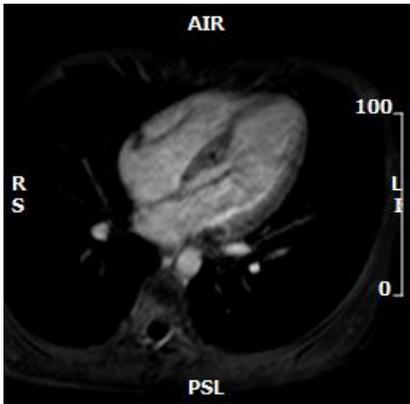


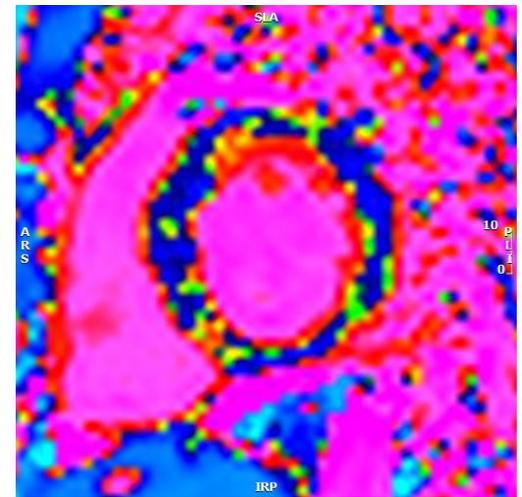
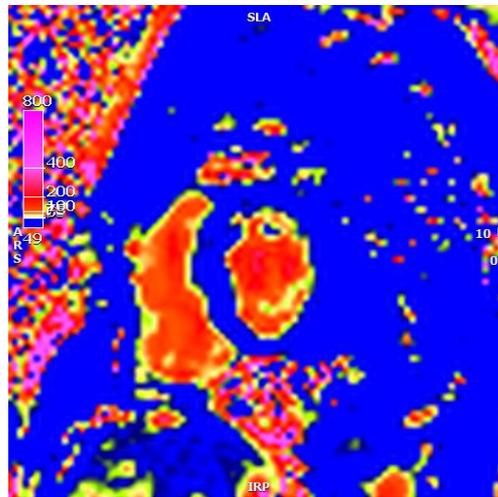
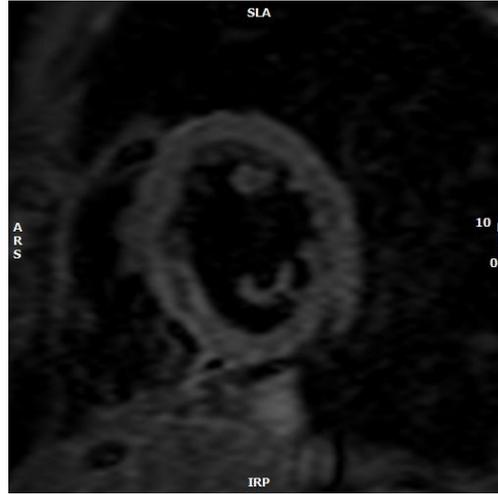
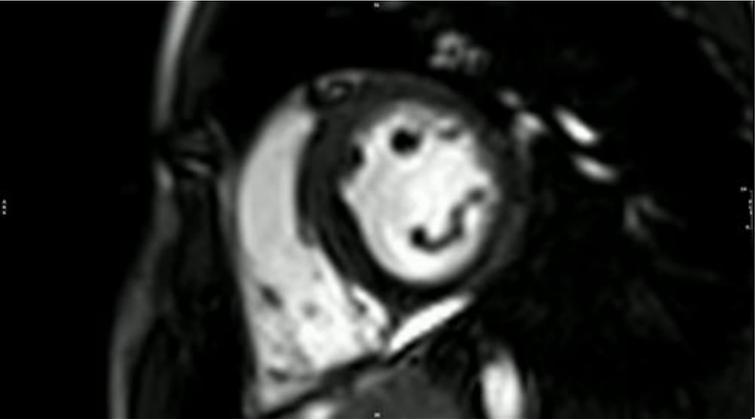
Normal T2 map

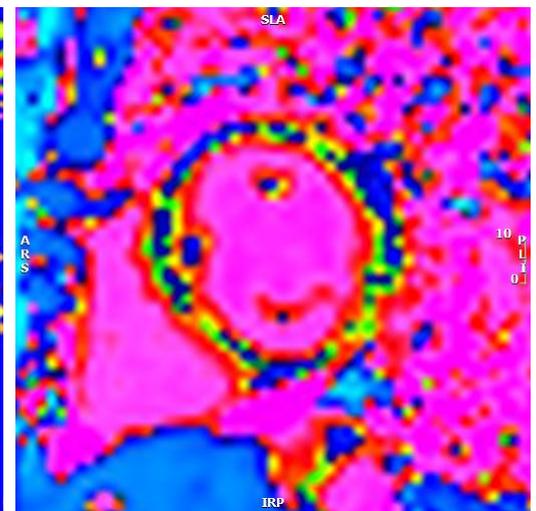
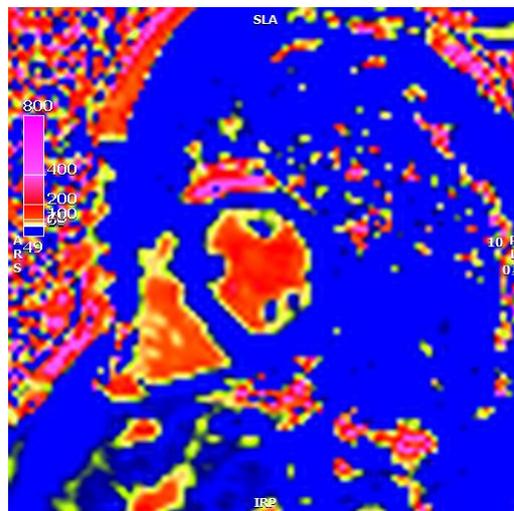
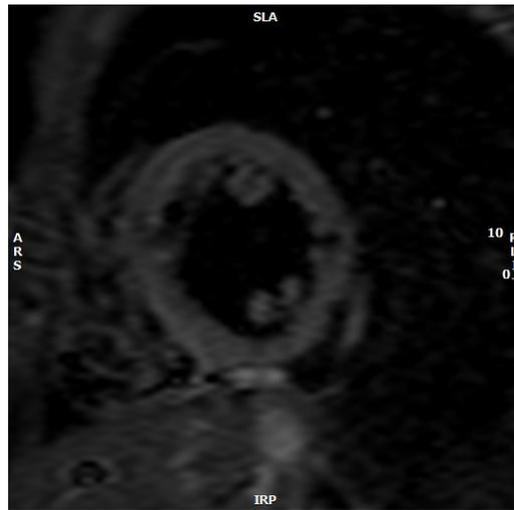
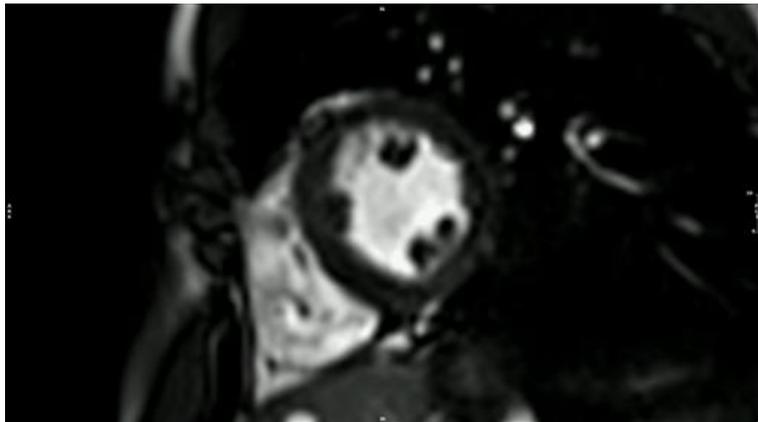


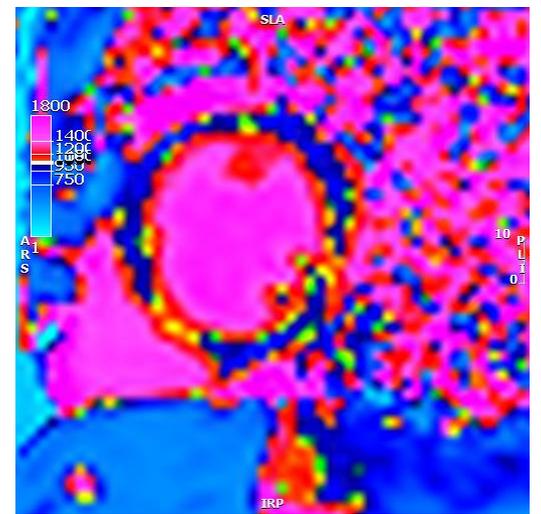
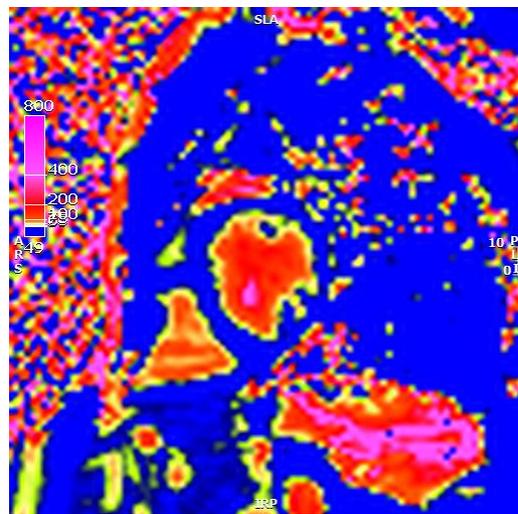
T1 map slightly abnormal

Early Gd- dark core at apical mass
dark sub-endocardial spots at basal
septum

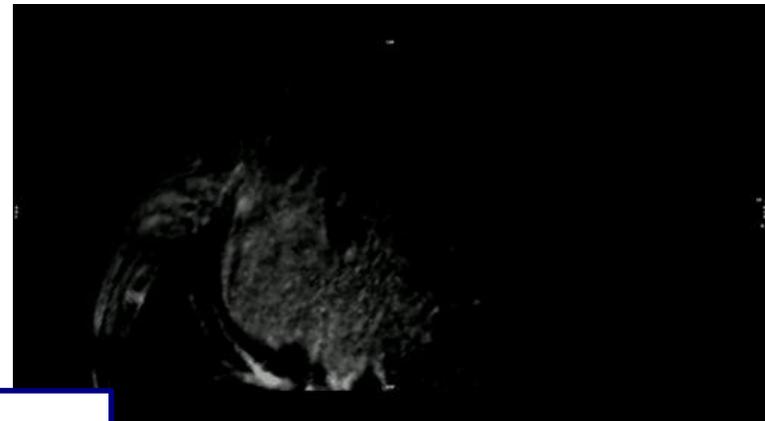
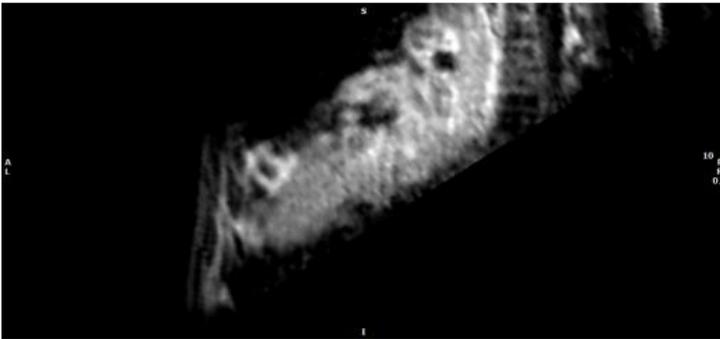
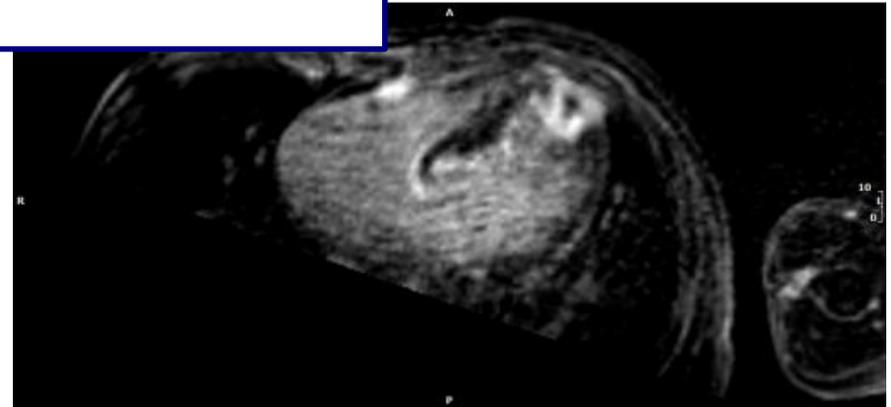
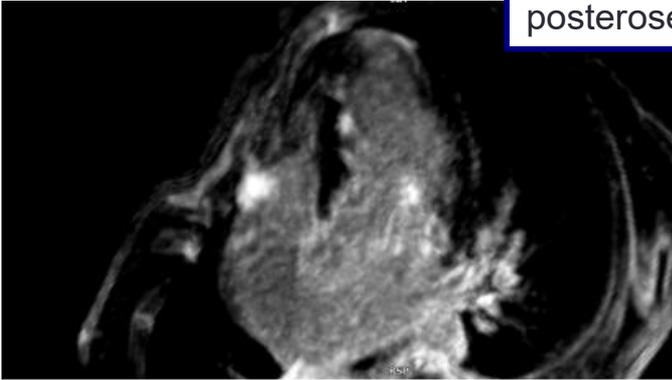




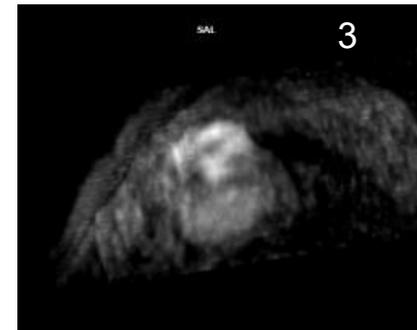
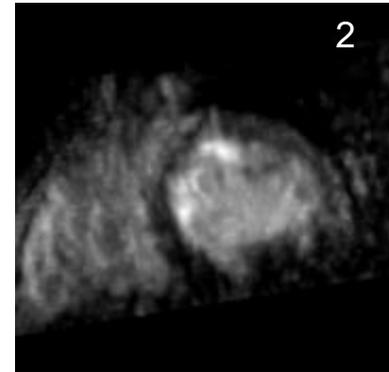
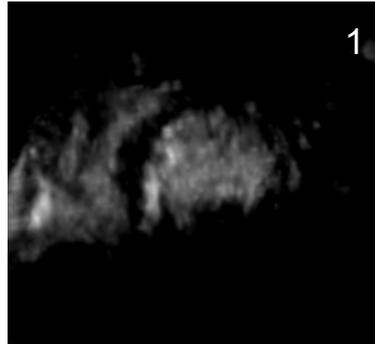
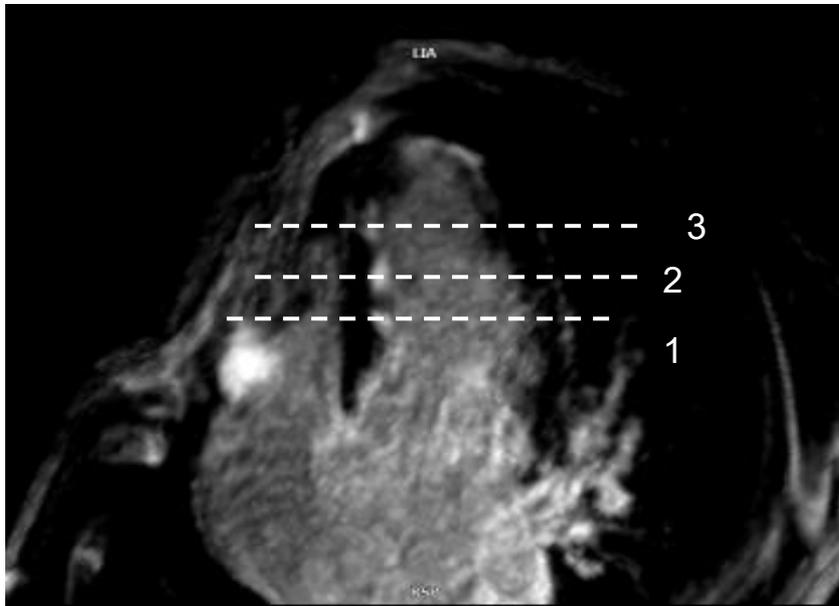




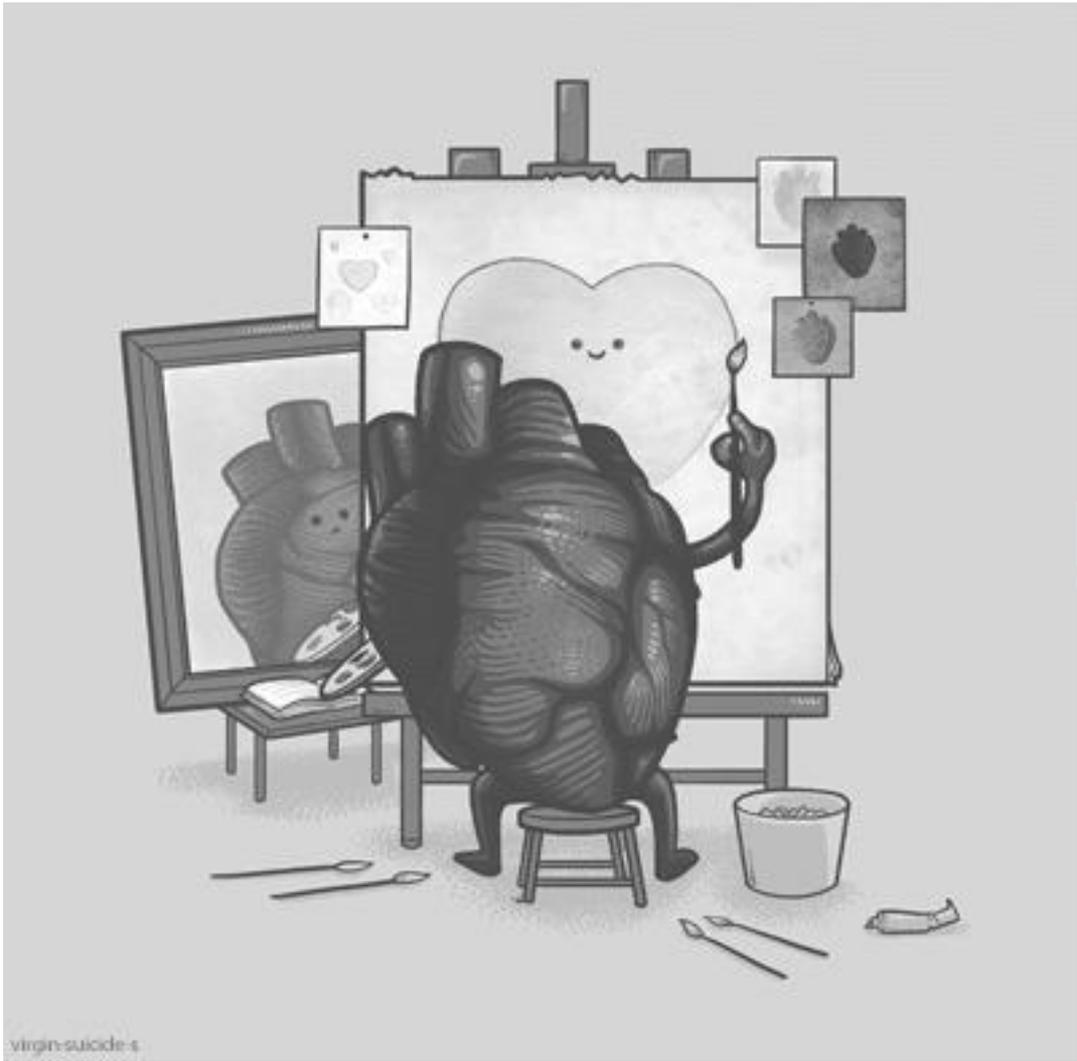
3D very late LGE >20min
Sub-endocardial LGE in the
posteroseptum



3D very late LGE >20min
Apical septal mass looks bigger



3D very late LGE >20min
Sub-endocardial LGE in the
posteroseptum

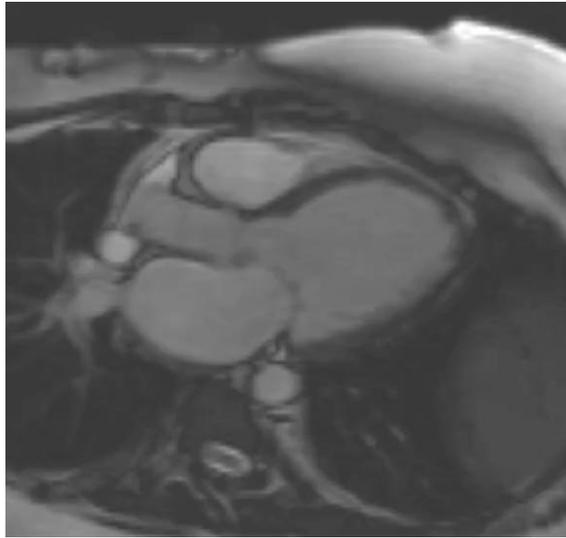


Quiz

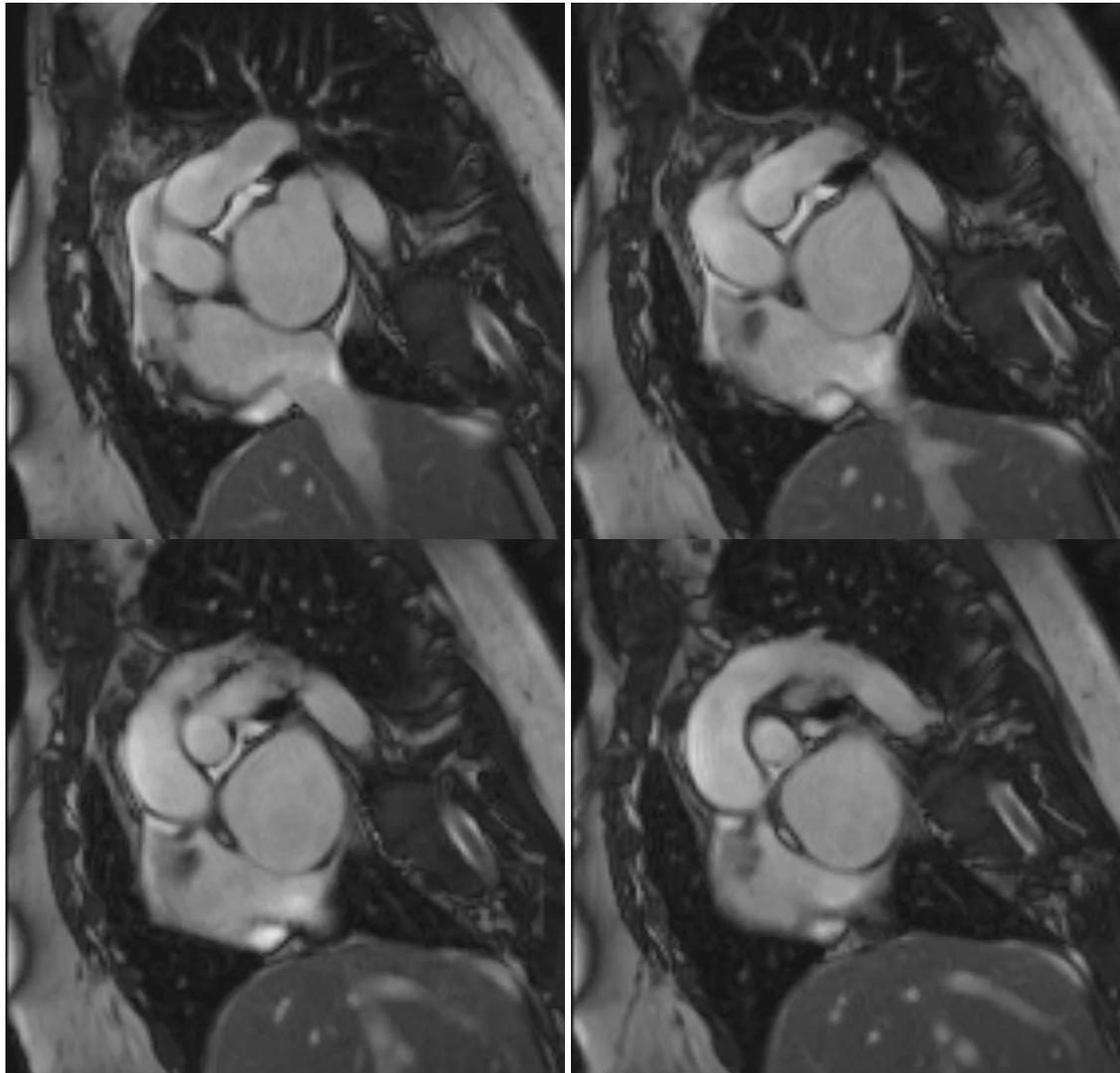
Case quiz: Case 1



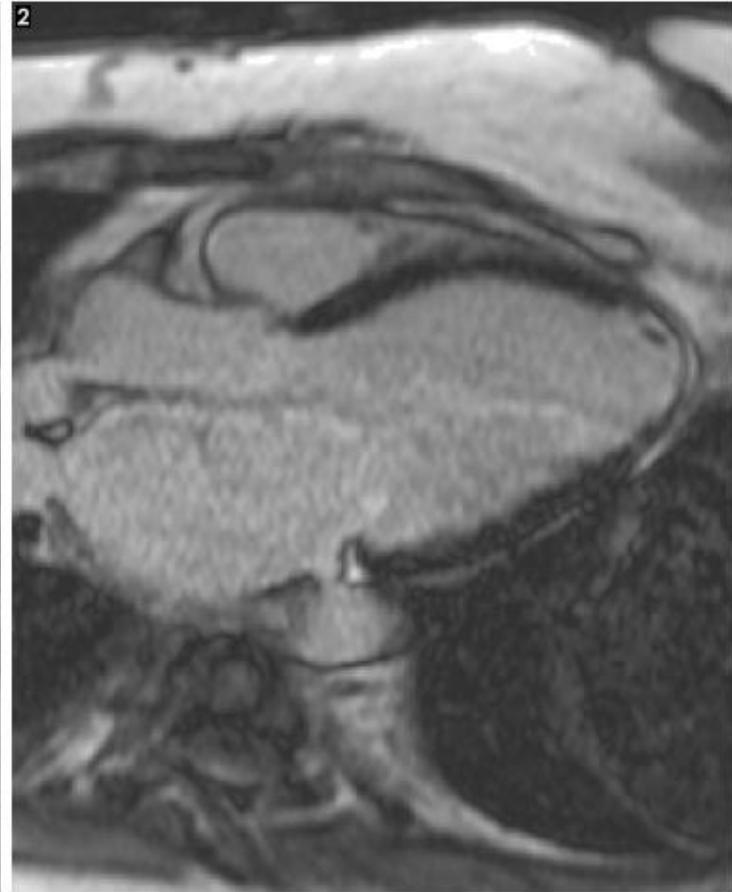
Case quiz: Case 1



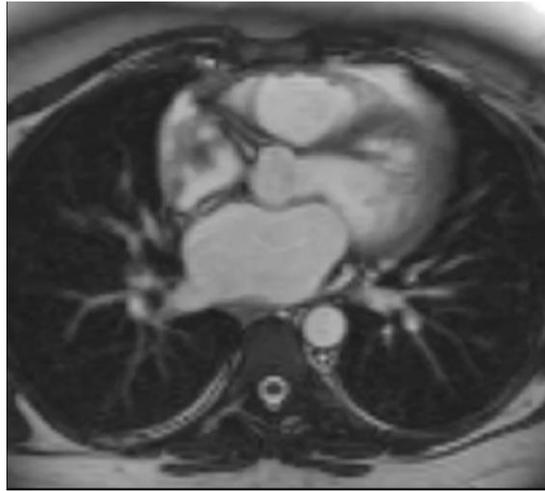
Case quiz: Case 1



Case quiz: Case 1

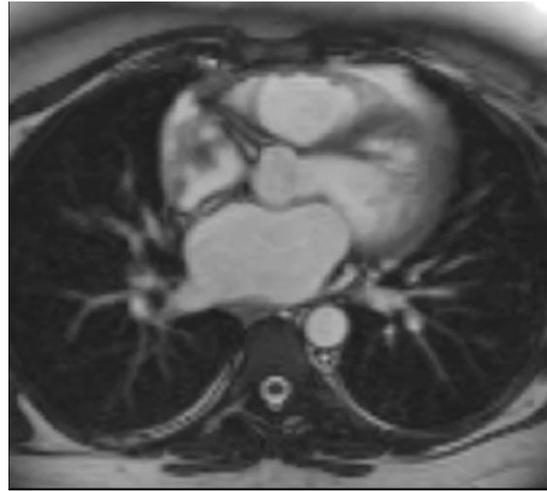


Case quiz: Case 1



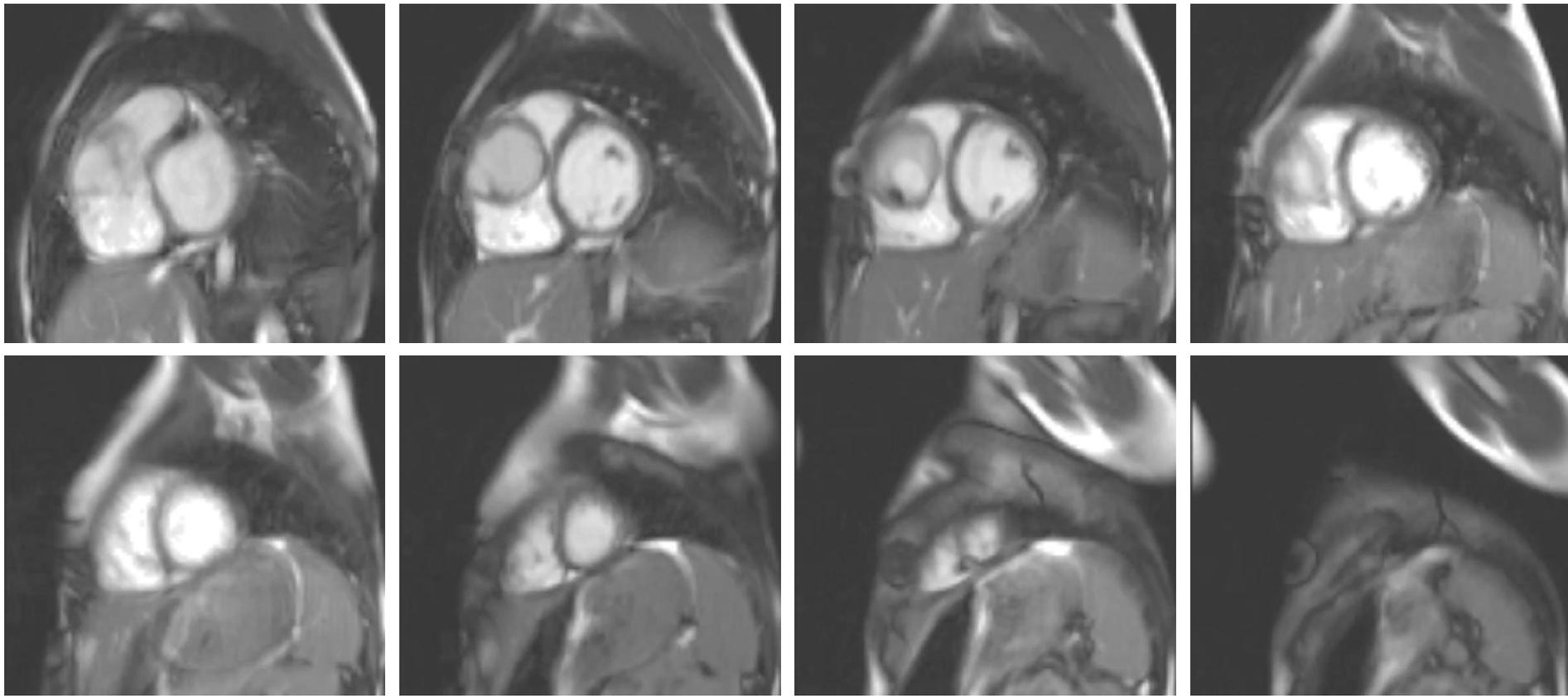
- A. Crista terminalis
- B. Thrombus
- C. Chiari network
- D. Lipoma

Case quiz: Case 1

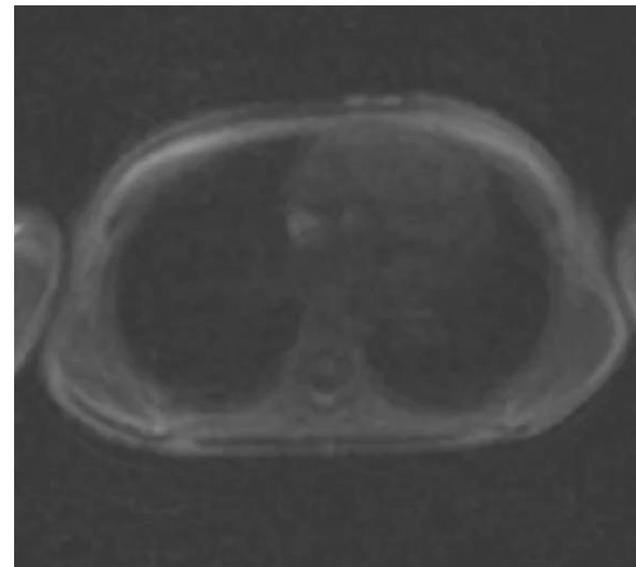
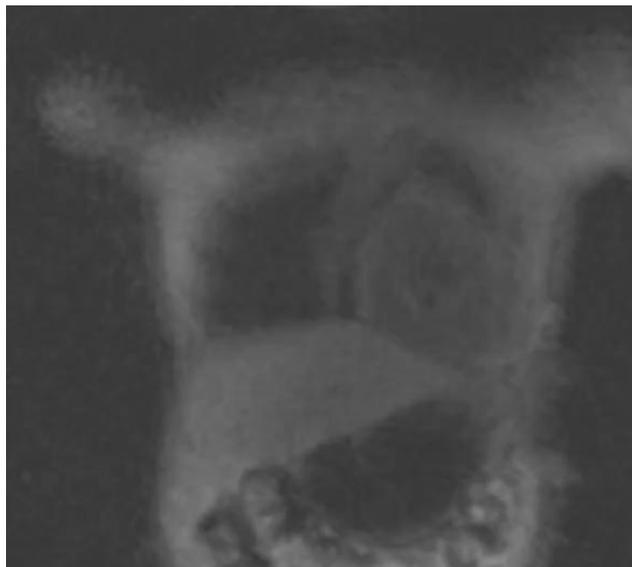
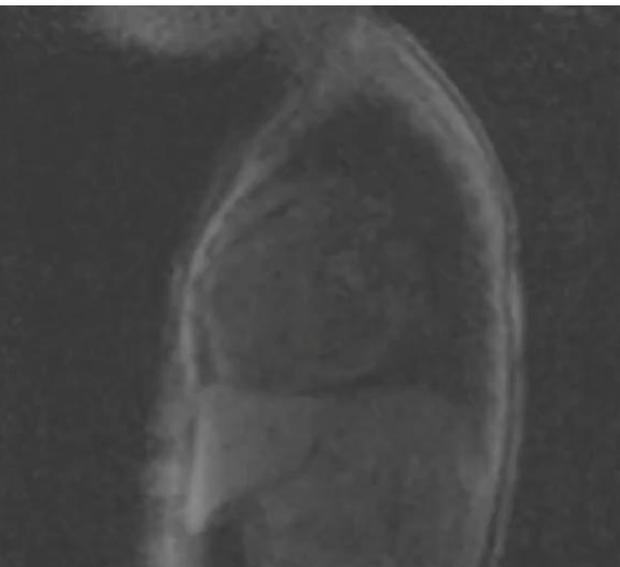


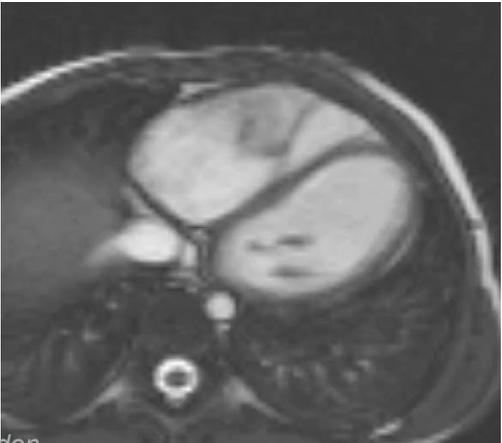
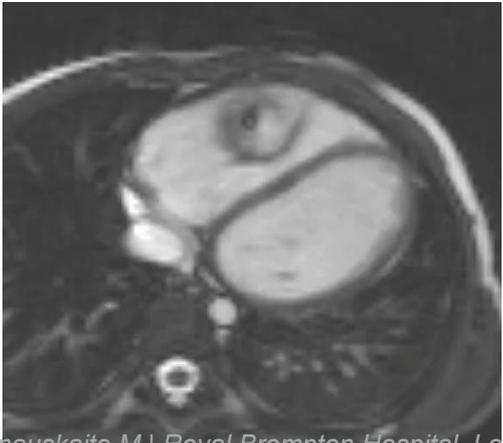
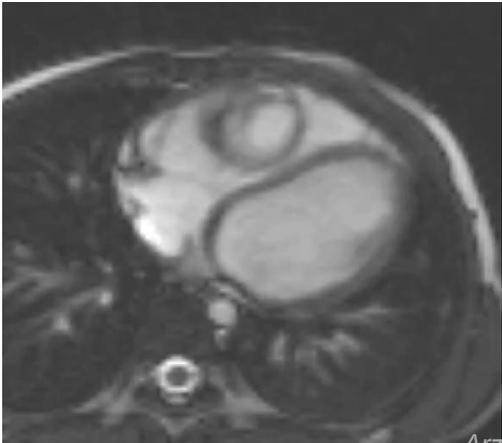
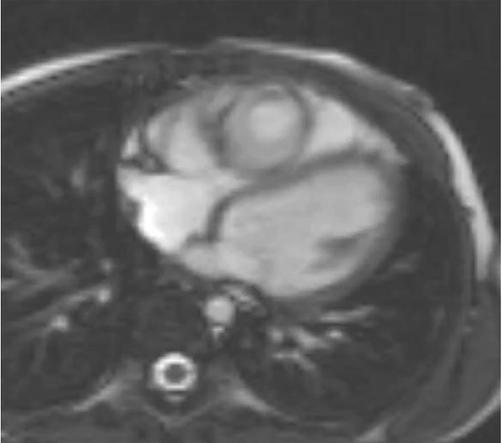
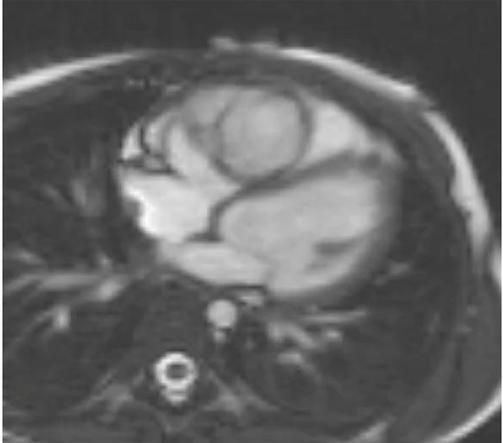
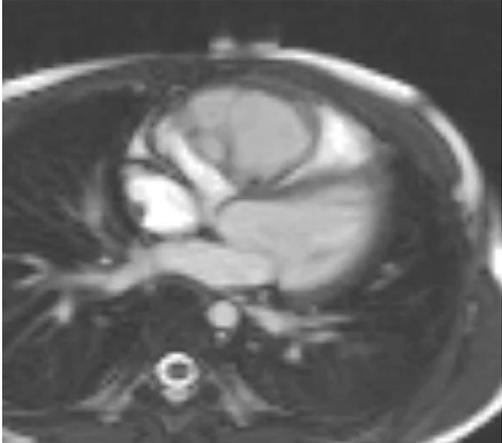
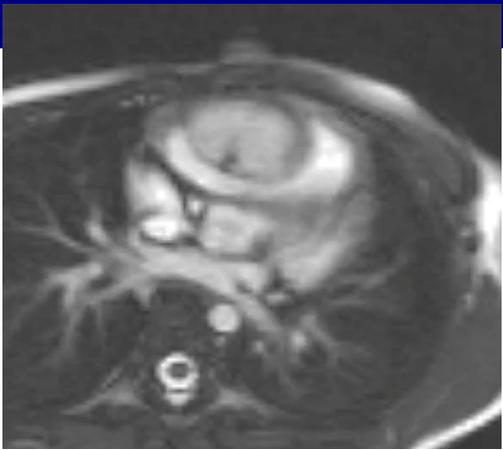
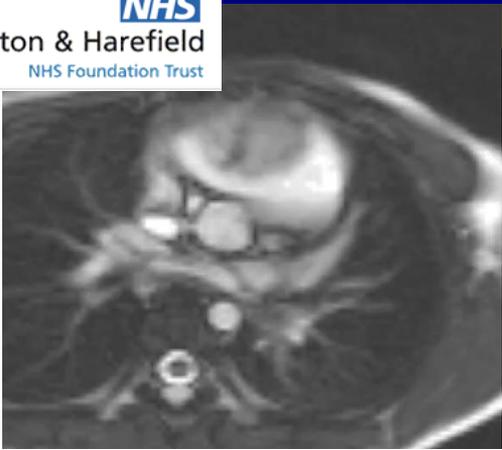
- A. Crista terminalis
- B. Thrombus
- C. Chiari network

Case quiz: Case 2

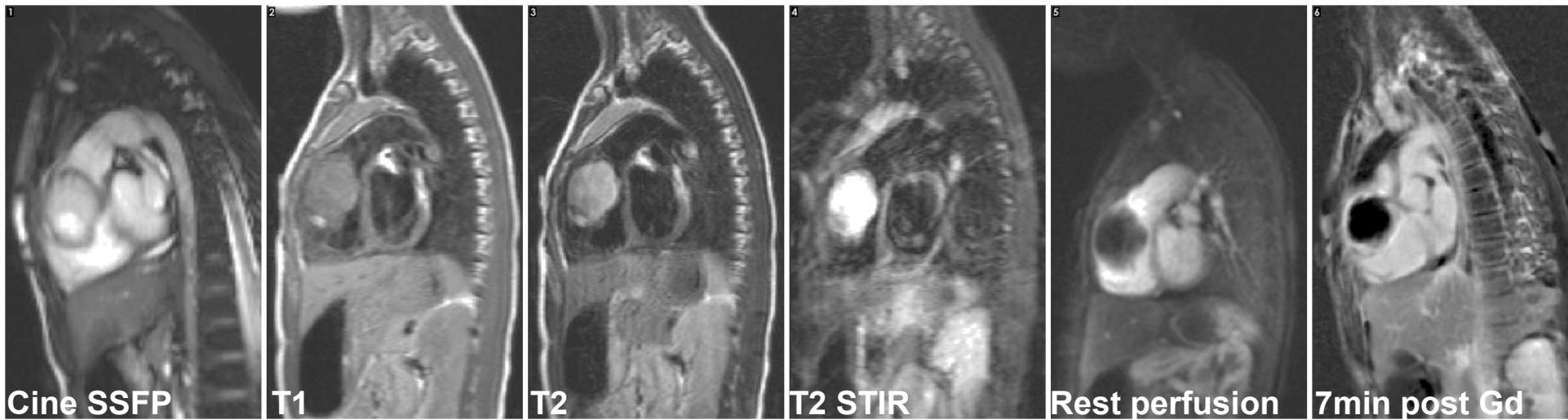


Case quiz: Case 2

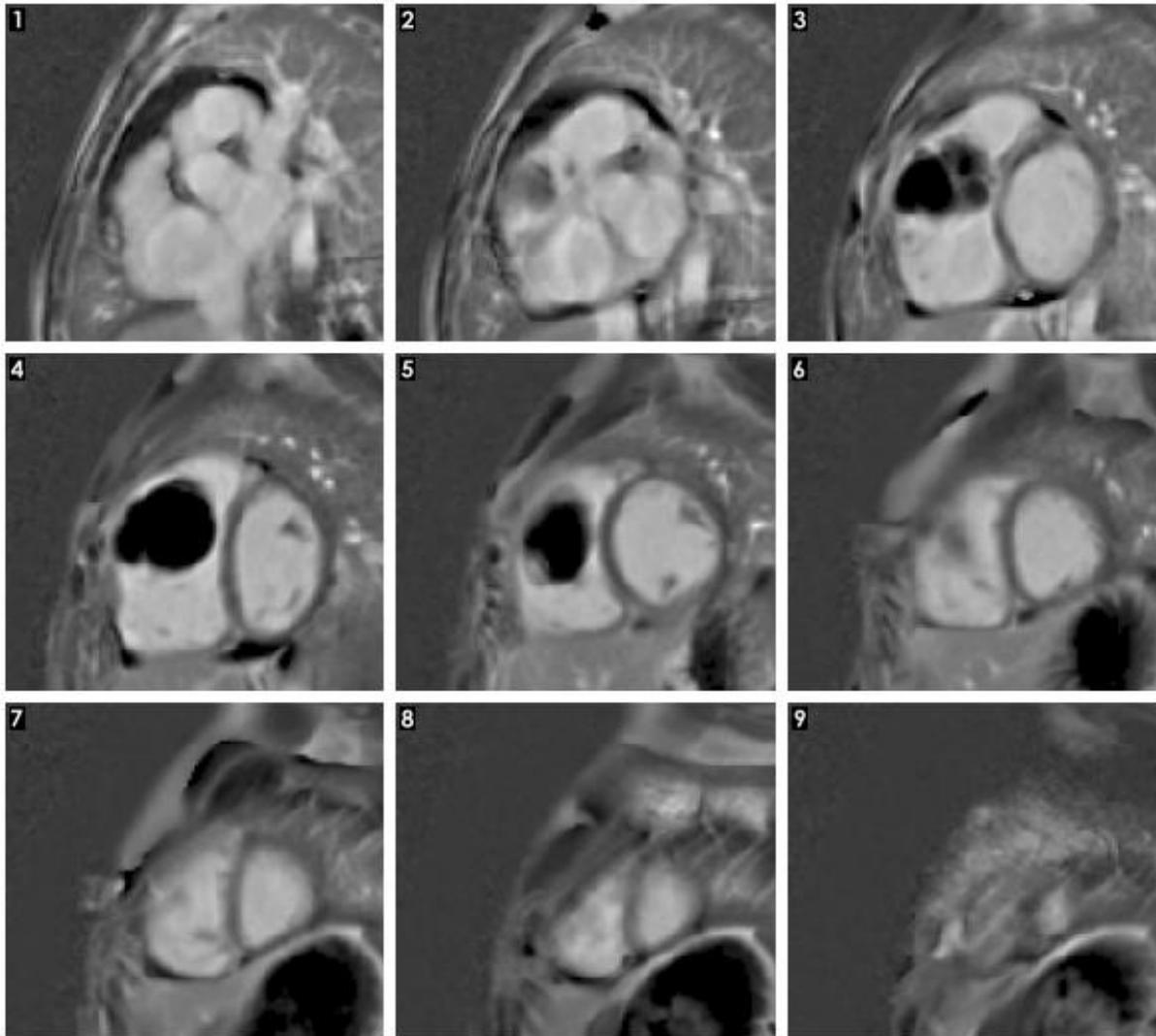




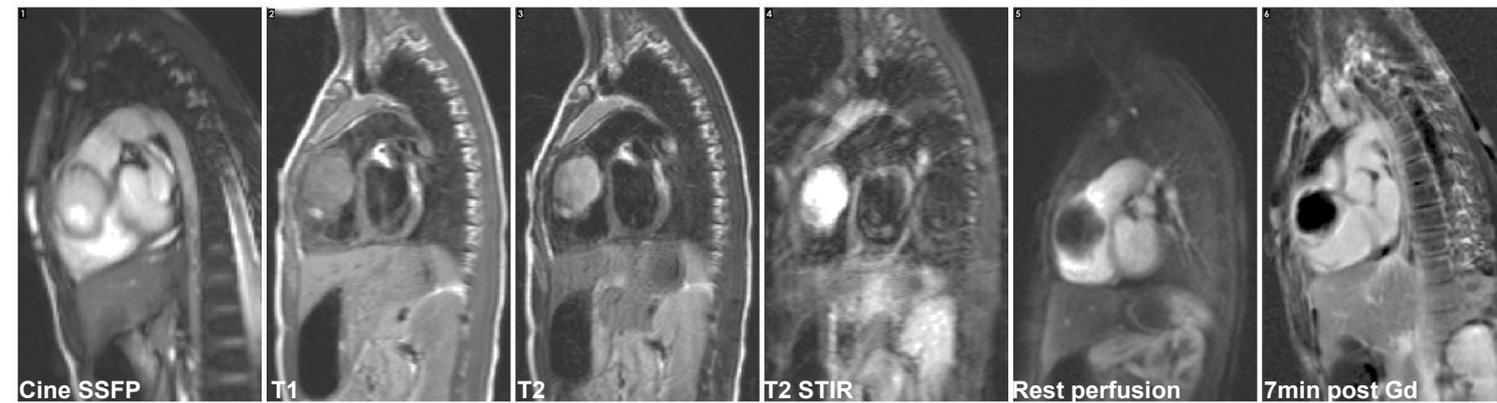
Case quiz: Case 2



Case quiz: Case 2

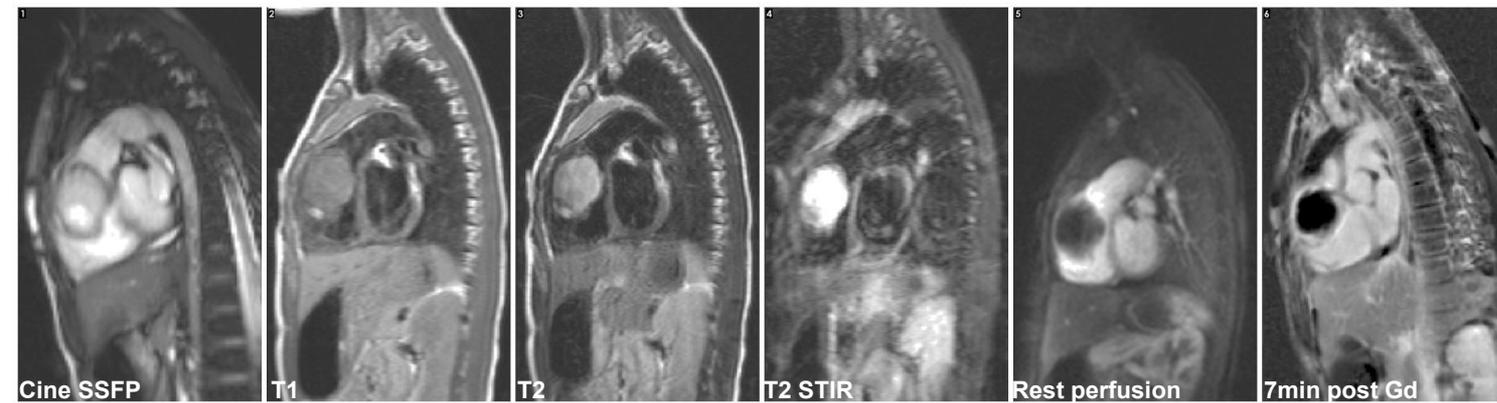


Case quiz: Case 2



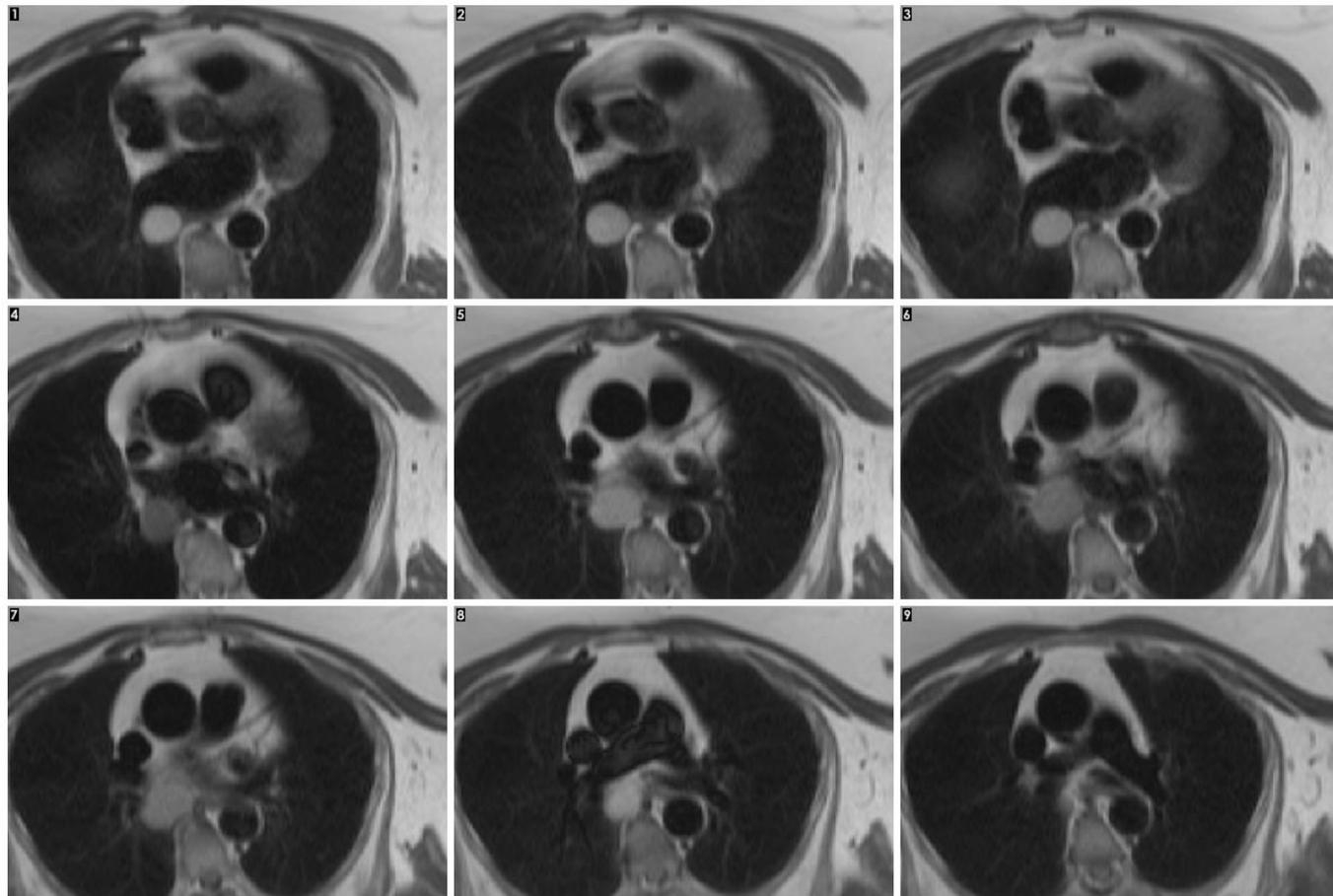
- A. Lipoma
- B. Bronchogenic cyst
- C. Thrombus
- D. Haemangioma
- E. Teratoma

Case quiz: Case 2

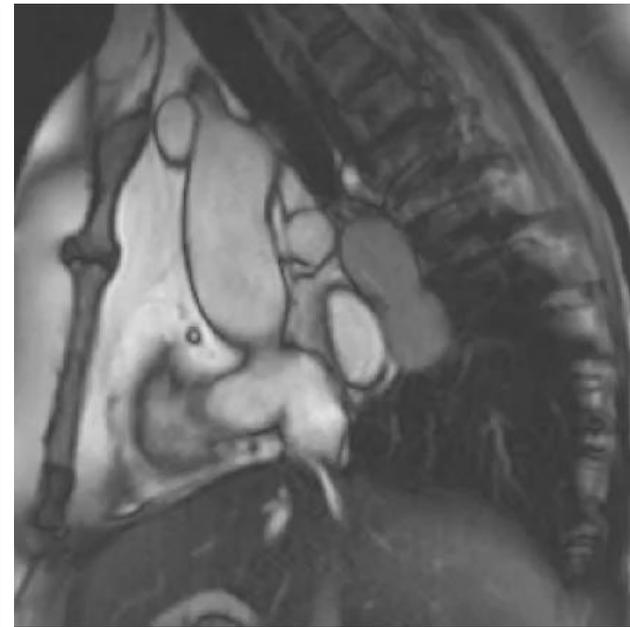
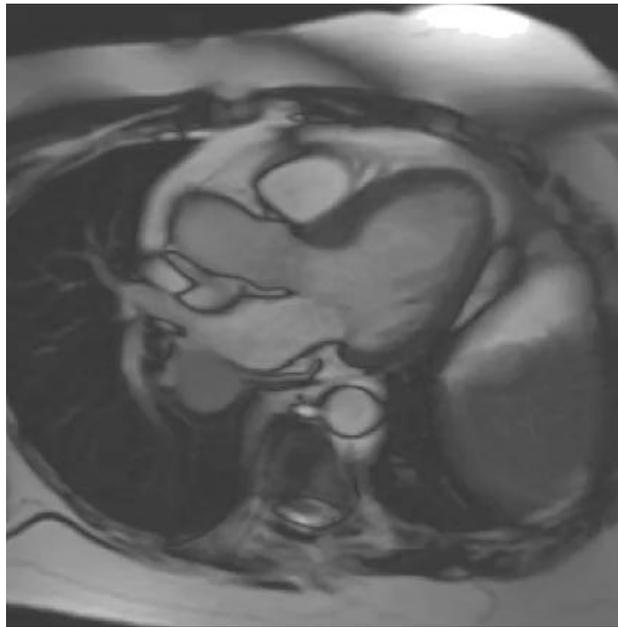
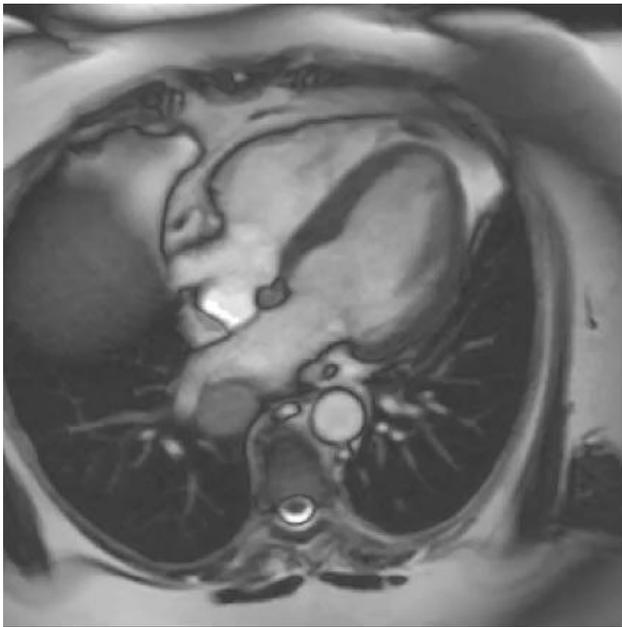


E. Teratoma

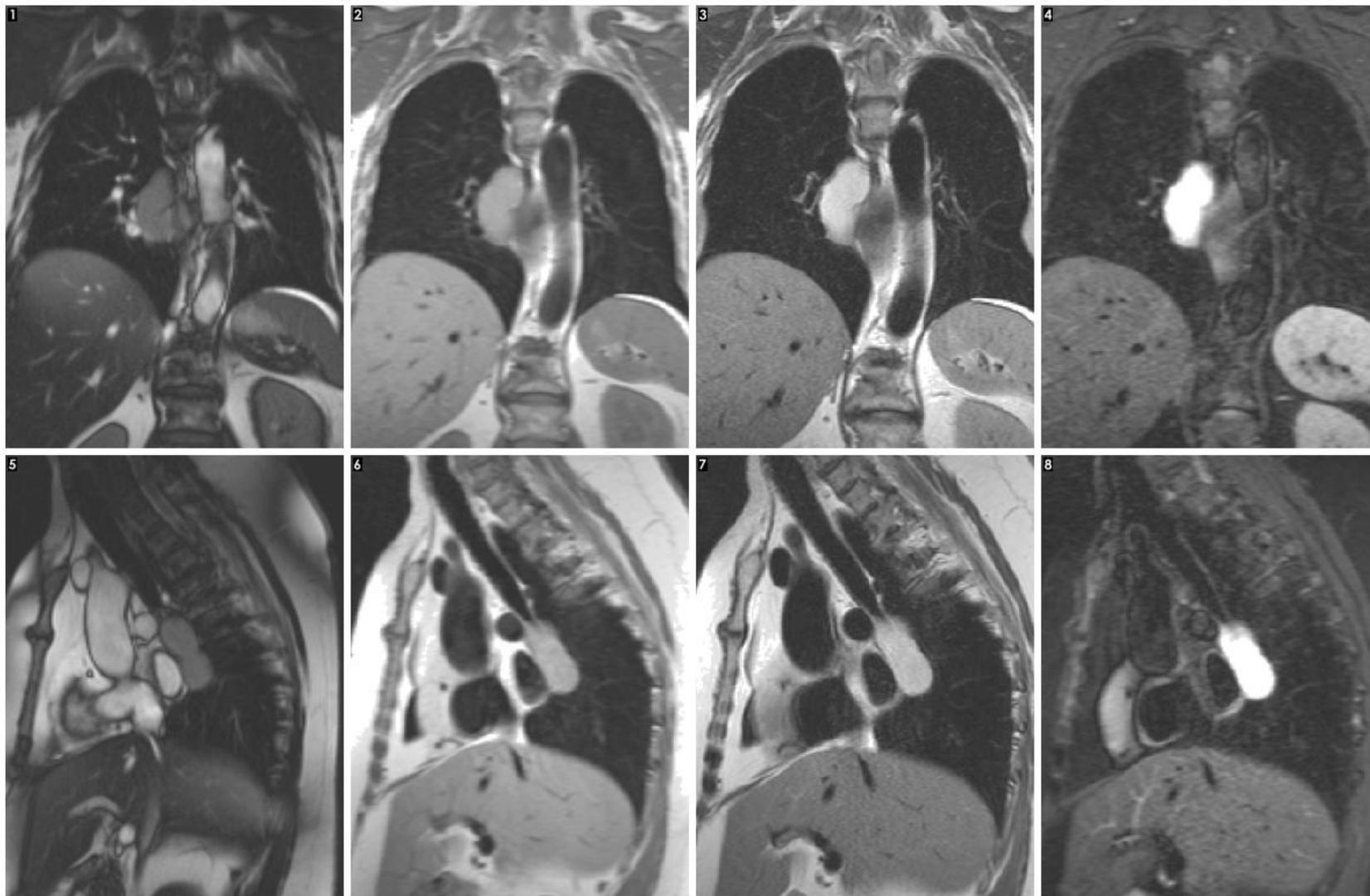
Case quiz: Case no 3



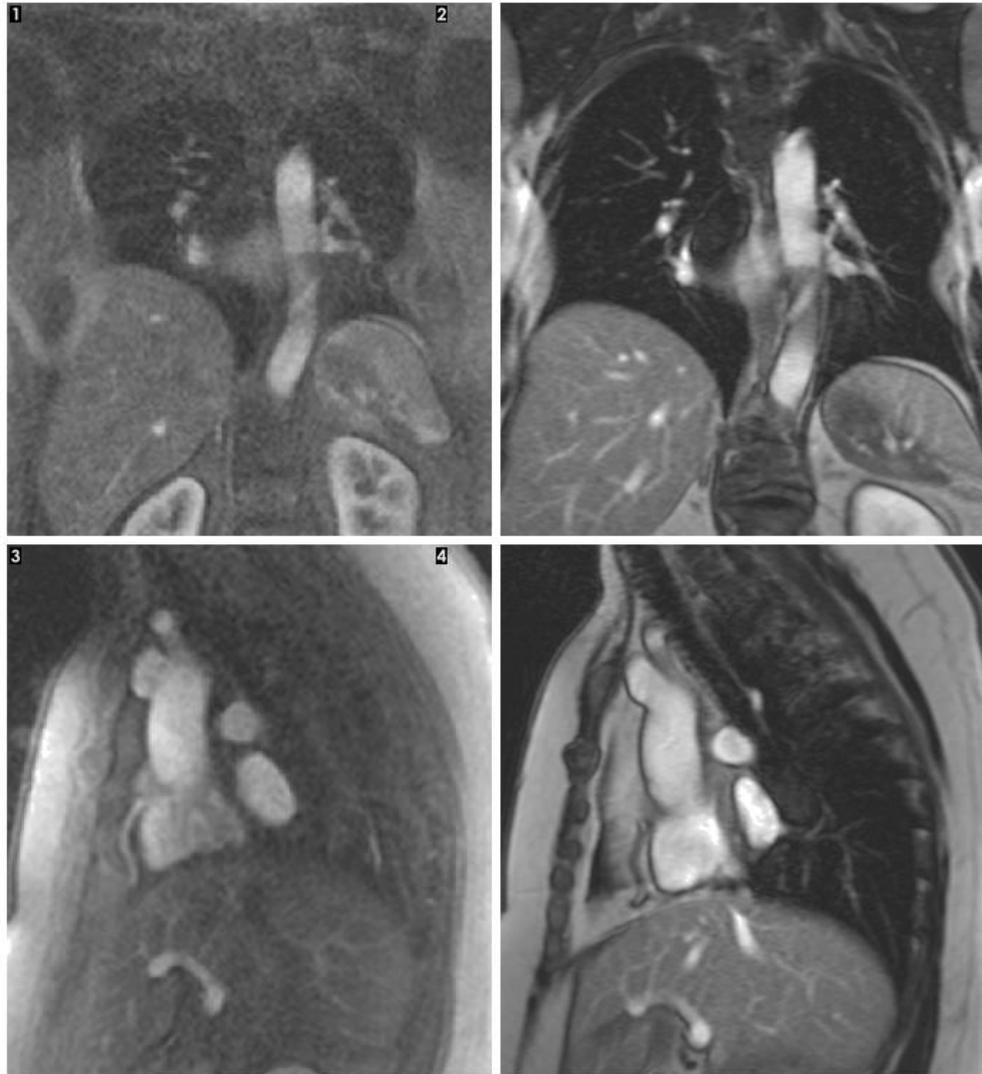
Case quiz: Case no 3



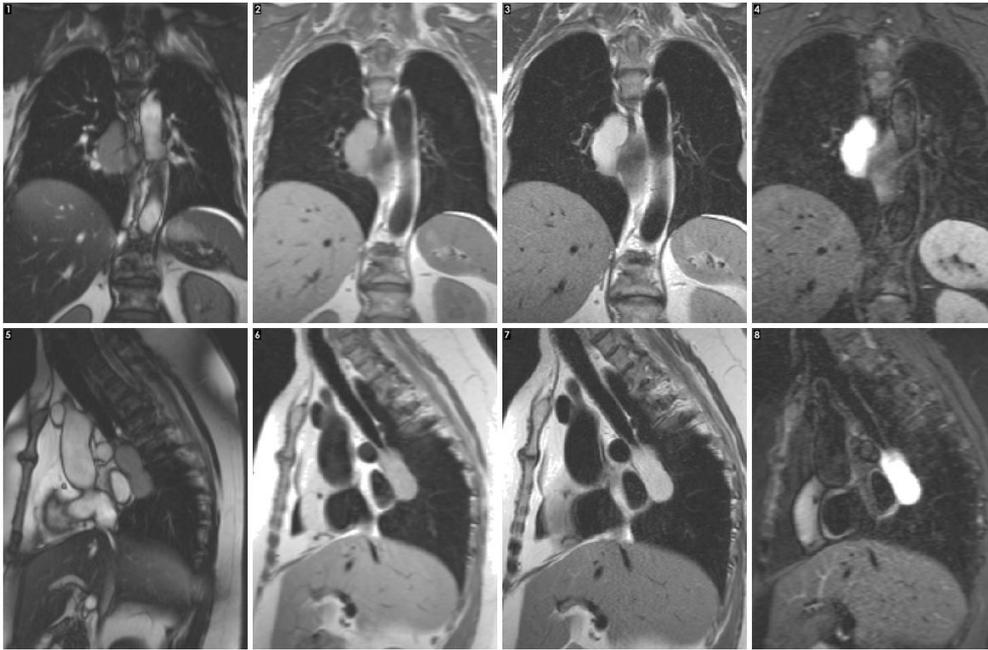
Case quiz: Case no 3



Case quiz: Case no 3

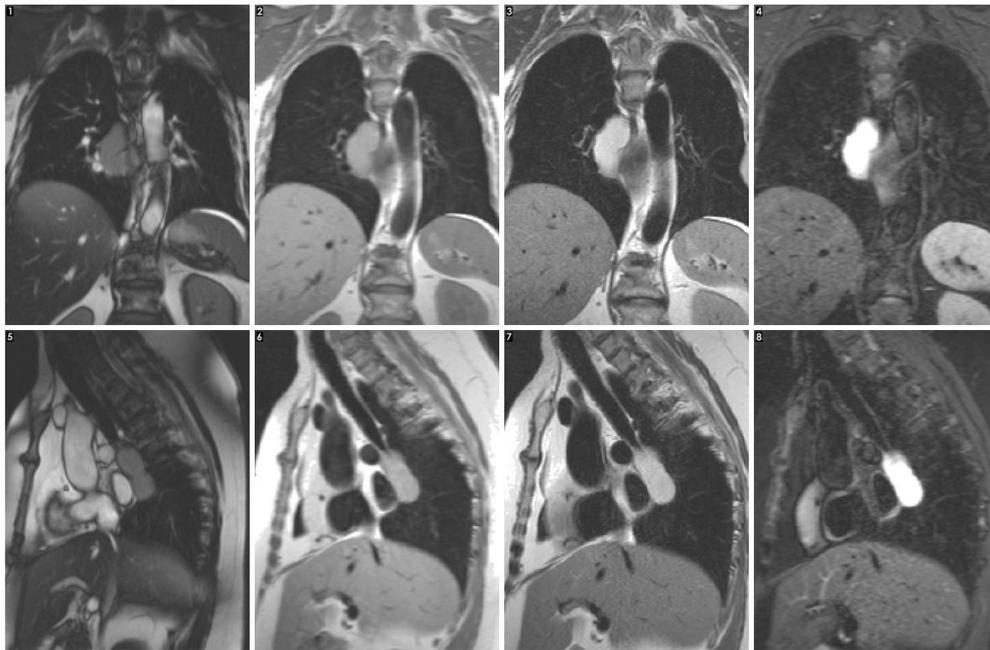


Case quiz: Case no 3



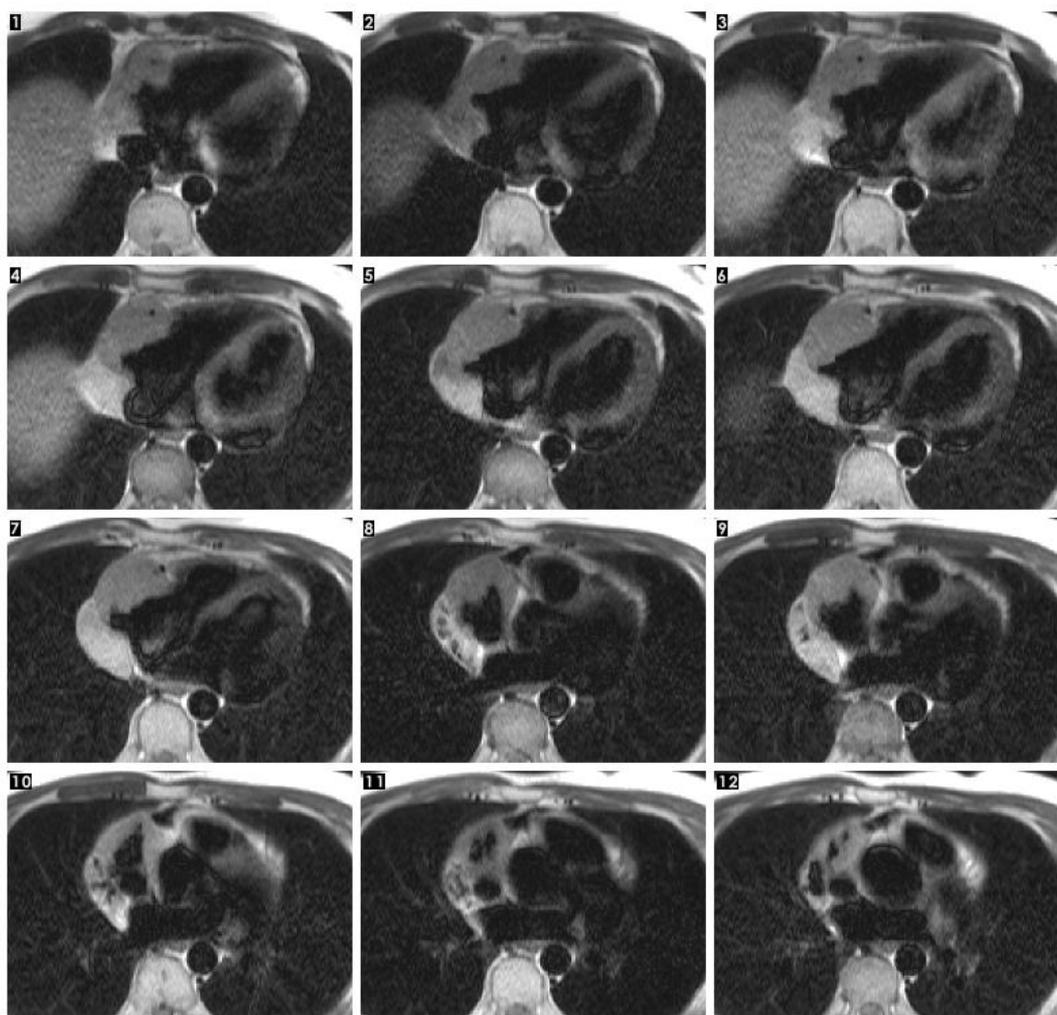
- A. Lipoma
- B. Bronchogenic cyst
- C. Thrombus
- D. Haemangioma

Case quiz: Case no 3



B. Bronchogenic cyst

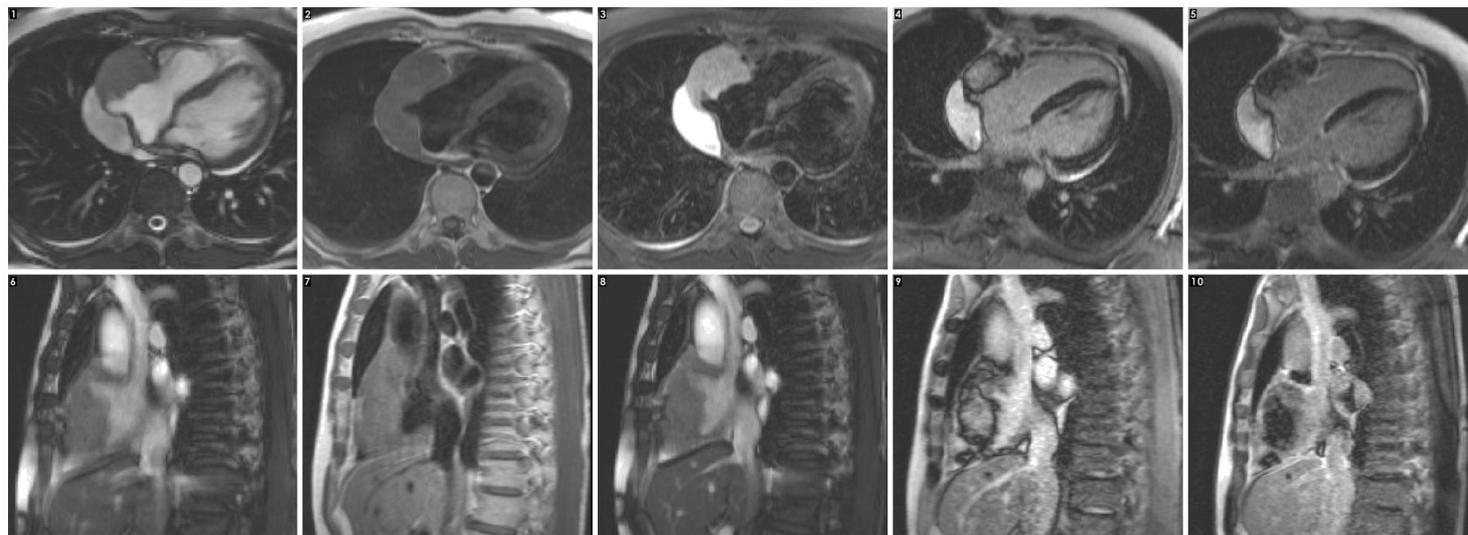
Case quiz: Case 4



Case quiz: Case 4

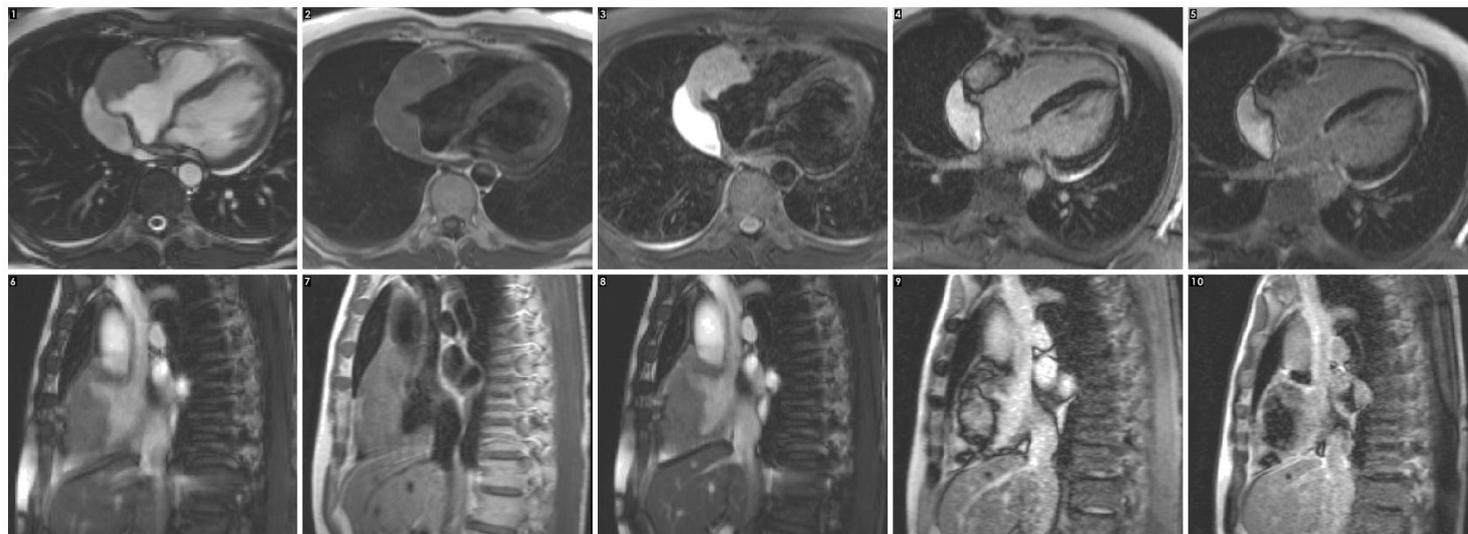


Case quiz: Case 4



- A. Myxoma
- B. Pericardial cyst
- C. Thrombus
- D. Angiosarcoma
- E. Lymphoma

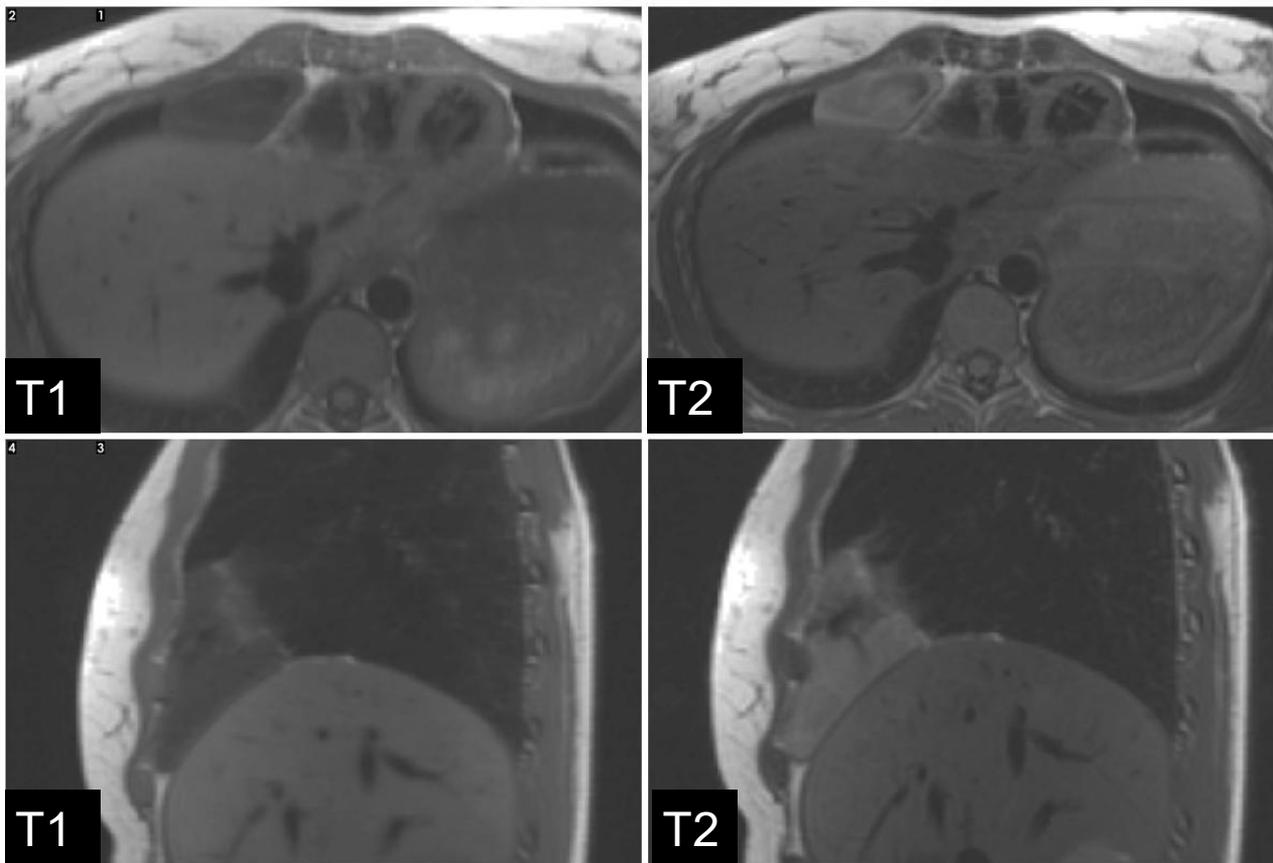
Case quiz: Case 4



D. Angiosarcoma

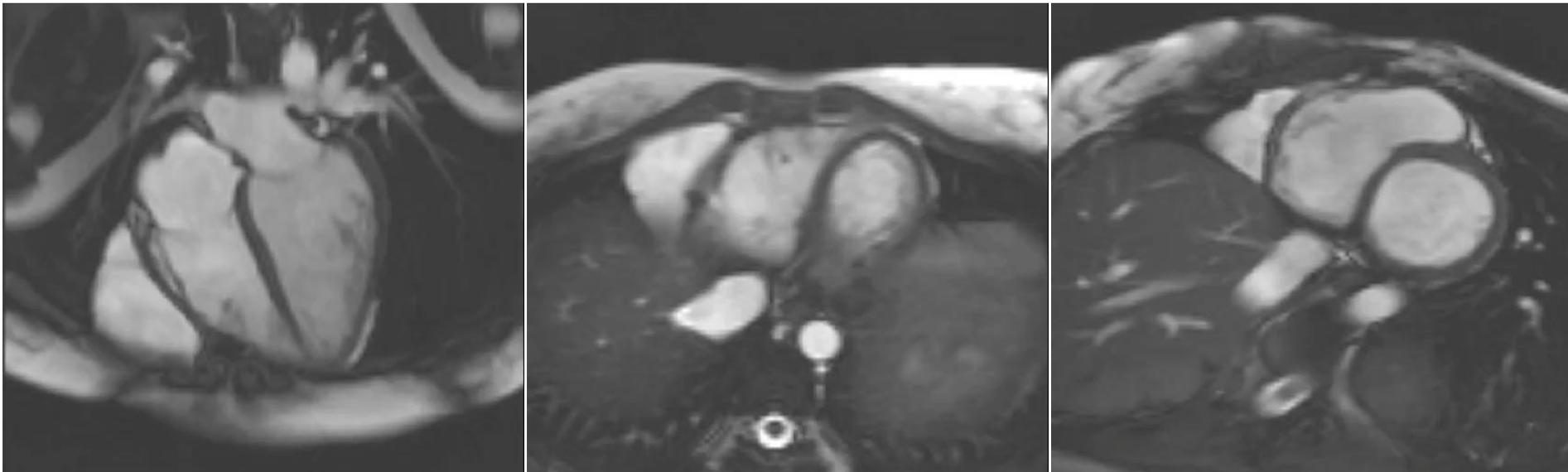
Case quiz: Case 5

- 32y female admitted for urosepsis. Incidental mass seen on CT. CMR 3 months later

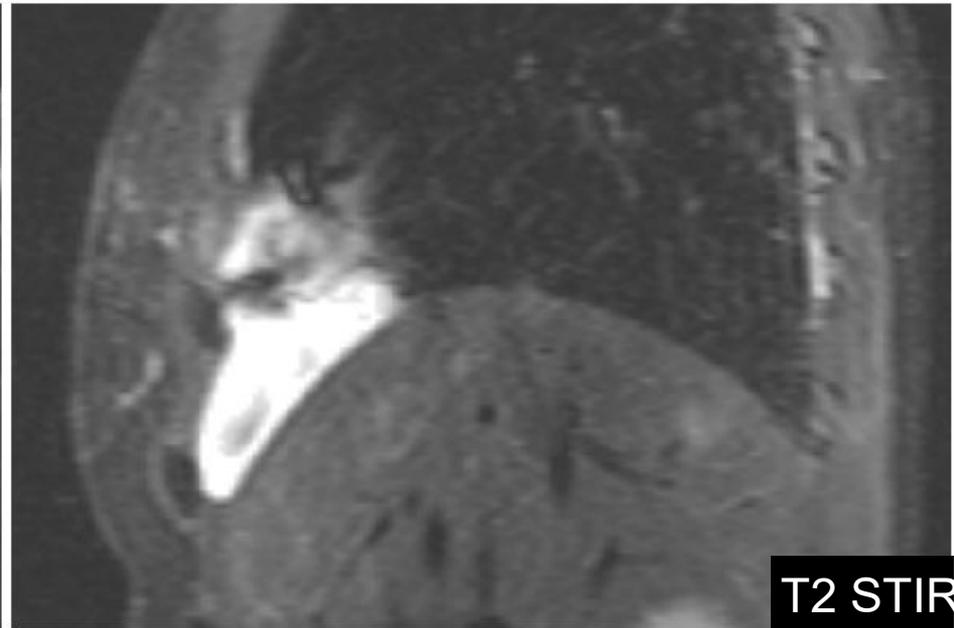
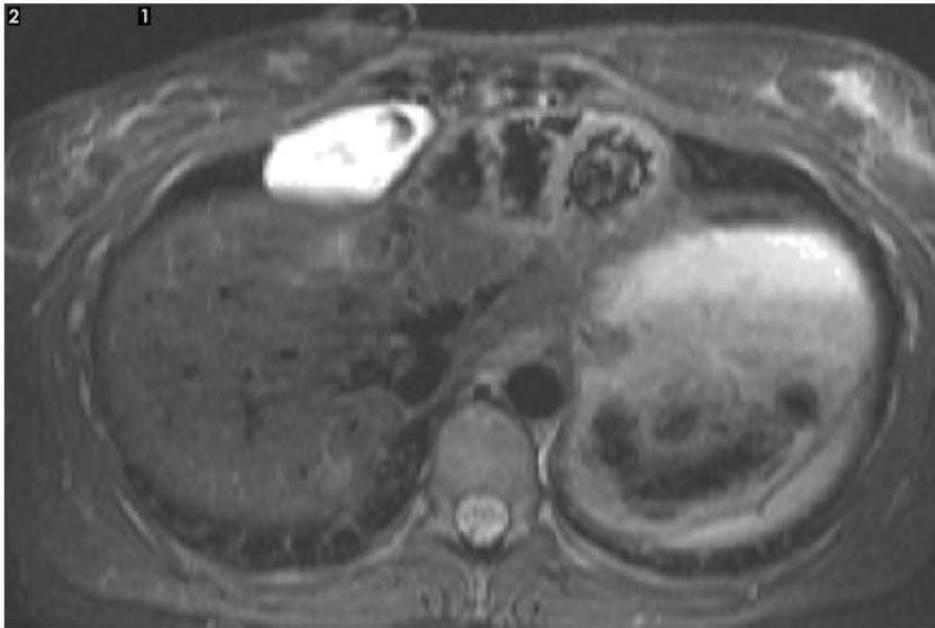


Case quiz: Case 5

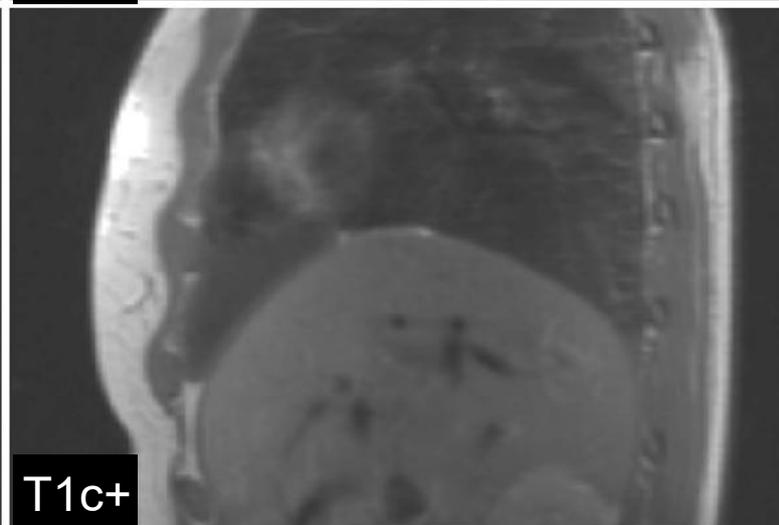
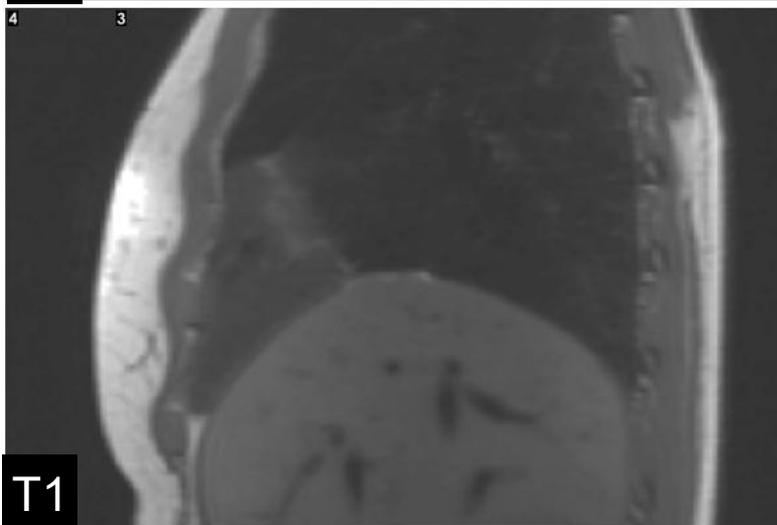
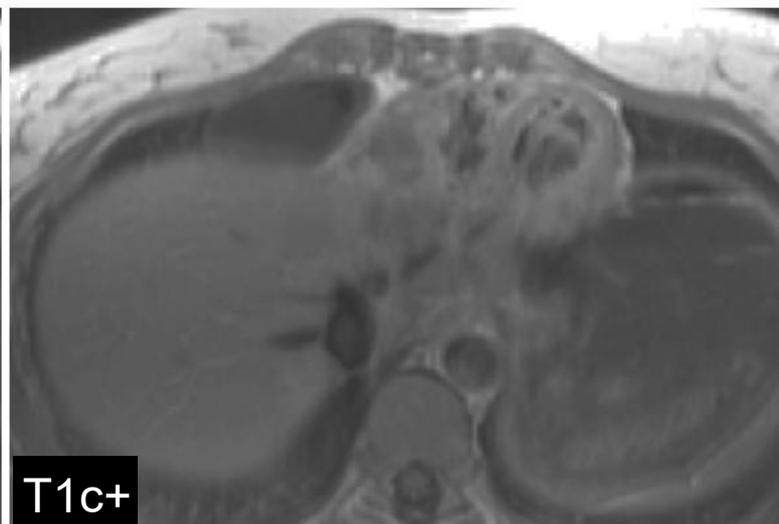
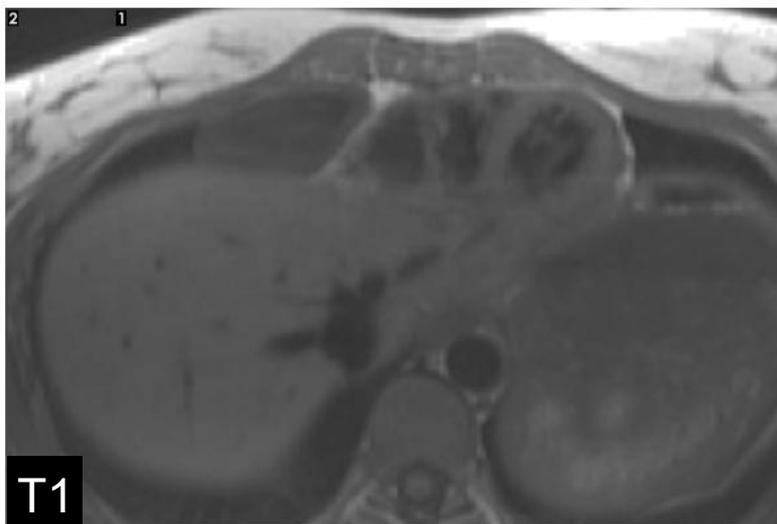
- 32y female admitted for urosepsis. Incidental mass seen on CT. CMR 3 months later



Case quiz: Case 5



Case quiz: Case 5



Case quiz: Case 5



- A. Thymoma
- B. Lipoma
- C. Thrombus
- D. Pericardial cyst
- E. Metastasis

Case quiz: Case 5

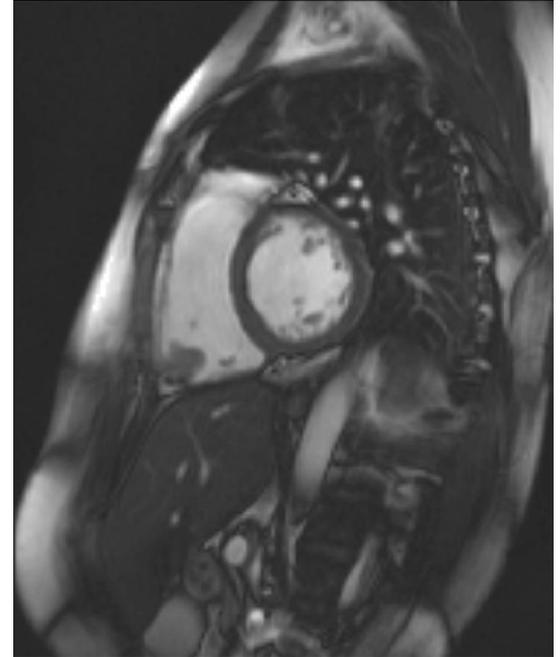
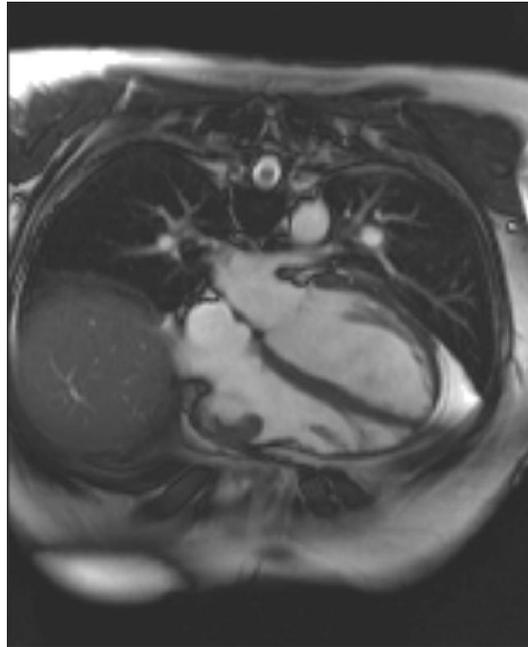


D. Pericardial cyst



RV mass

- 33 y/o male
- SOB
- Multiple PE's
- No DVT
- RV mass on Echocardiogram



RV mass

