

IV CONGRESSO NAZIONALE DI  
ECOCARDIOGRAFIA  
Milano 10 – 12 marzo 2010

TC e RM nelle malattie del pericardio e masse  
cardiache

Prof. Francesco De Cobelli



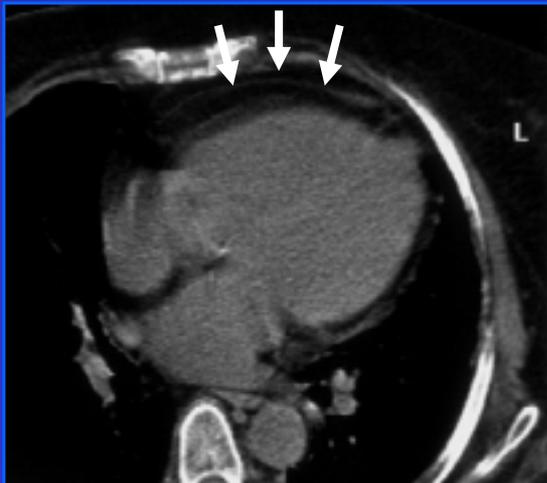
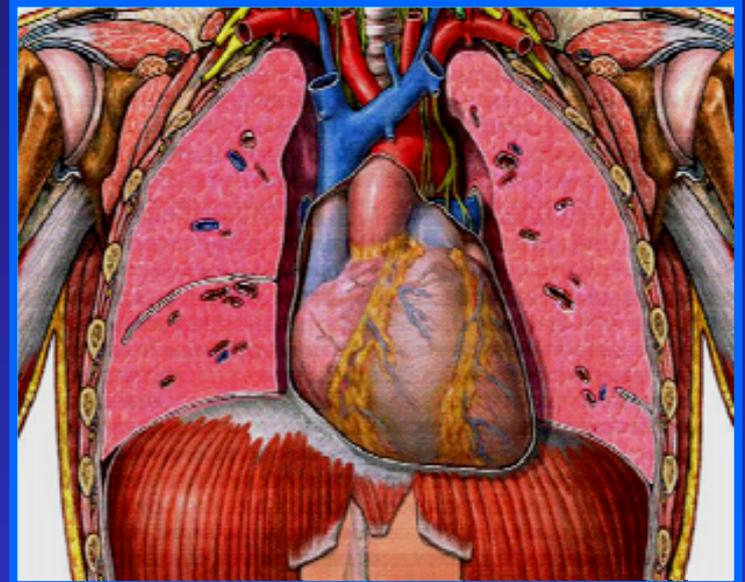
Cattedra, U.O. e Dipartimento di Radiologia  
Università VITA-SALUTE San Raffaele  
IRCCS H San Raffaele

# Pericardio normale

PERICARDIO PARIETALE — Tess. fibroso  
— mesotelio

FLUIDO (20-60 ml)

EPICARDIO - mesotelio



## TC

linea iperdensa all'interno del  
tessuto adiposo ipodenso

## LIMITE CardioRM:

mancata dimostrazione del calcio →TC

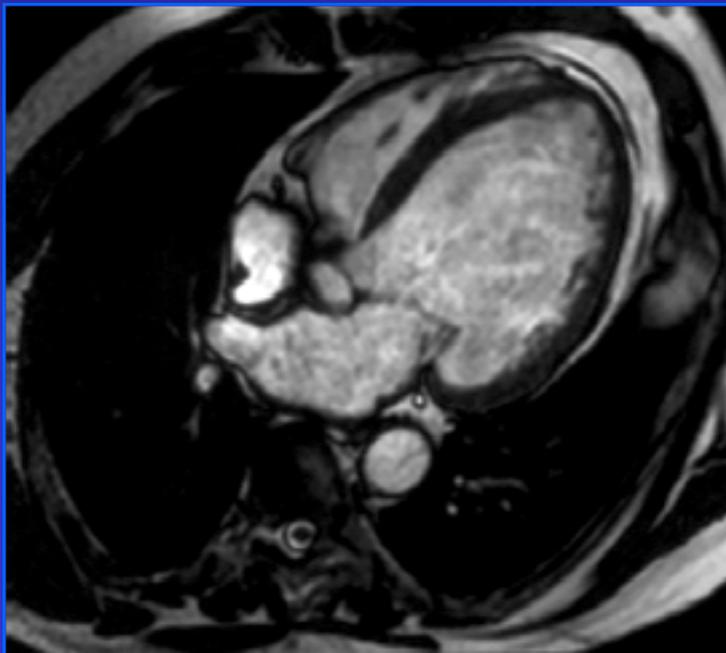
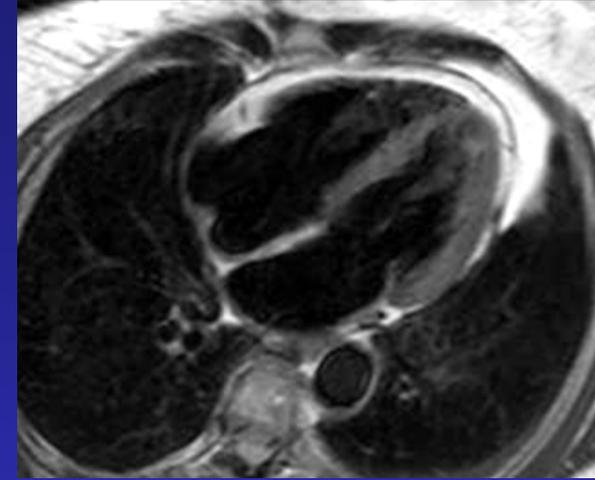
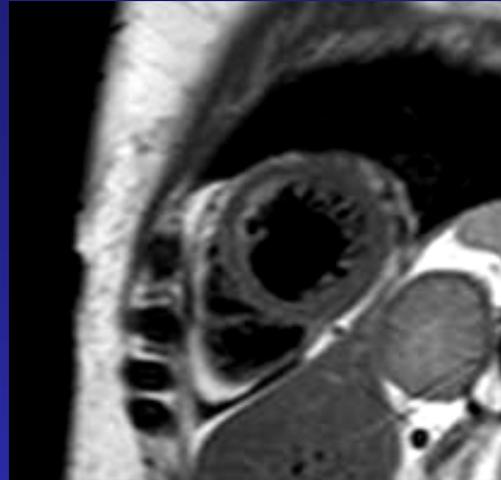
## RM Tecnica di studio

- Sequenze black blood (anche fat-sat / STIR)  
(anatomia, morfologia, edema, contrasto intrinseco)
- Sequenze cine (mobilità, impatto funzionale)
- Sequenza di perfusione (vascolarizzazione)
  - o T1 bh pre e post contrasto
- Late enhancement (aree di infiammazione, fibrosi e necrosi)

# Pericardio Normale in RM

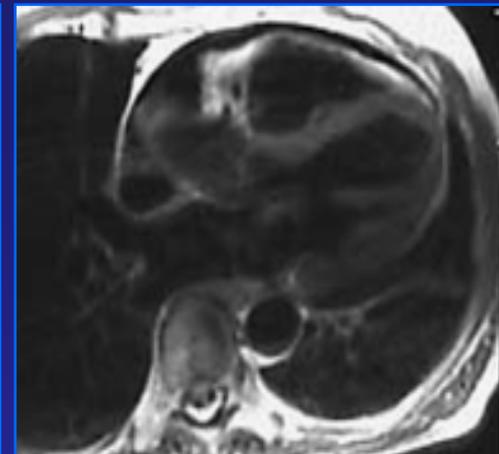
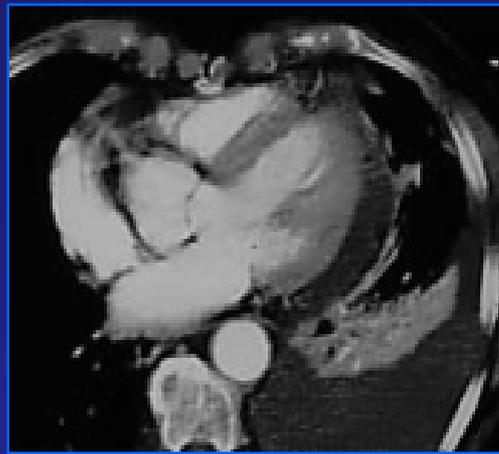
## LINEA IPOINTENSA

- spessore normale 1-3 mm

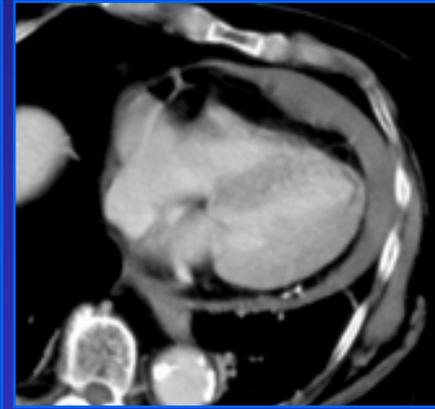
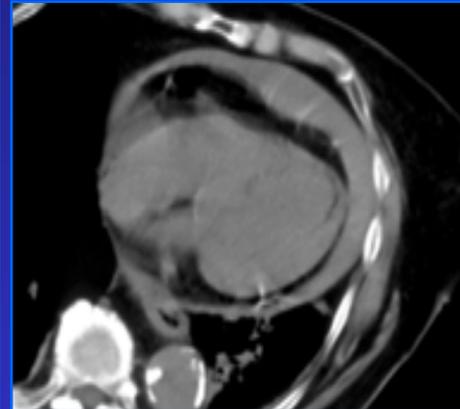
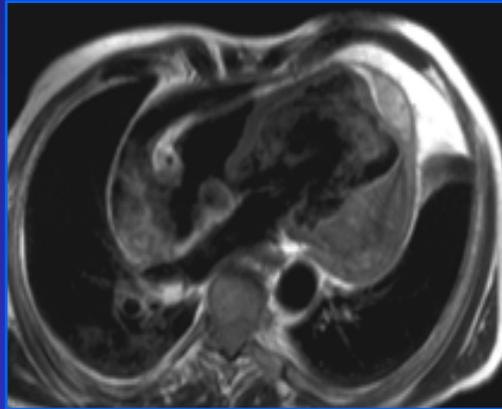




Versamento  
pericardico



Emopericardio



Calcificazioni  
pericardiche



Pneumo-  
pericardio



# PERICARDITE INFIAMMATORIA

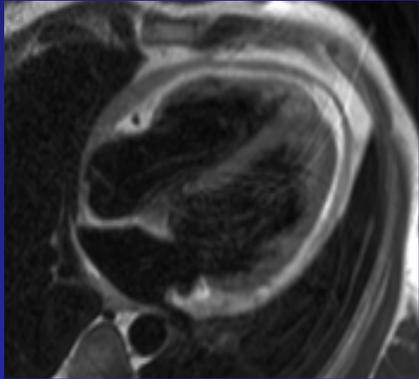
## Processi infiammatori dei foglietti pericardici

- Spesso in corso di malattie sistemiche:
  - Artrite reumatoide
  - LES
  - Uremia
  - Sclerodermia
  - Sarcoidosi
  - Sindrome di Dressler (pericardite post-infartuale)
- Infezioni virali, batteriche, fungine

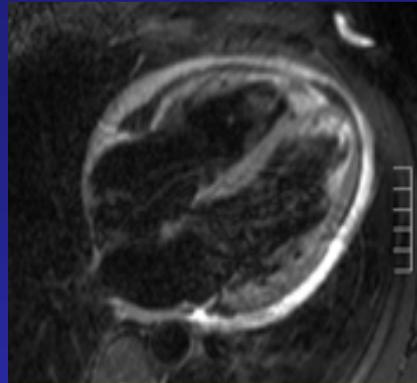
### Manifestazioni cliniche:

- dolore
- sfregamento pericardico
- alterazioni ECG
  - (sopraslivellamento ST)
  - (inversione PR)

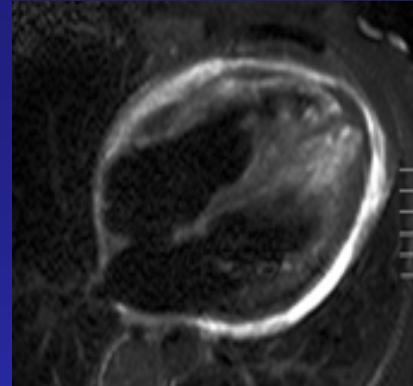
# PERICARDITE ACUTA



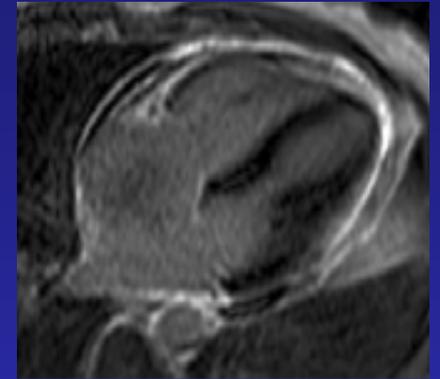
Black-blood



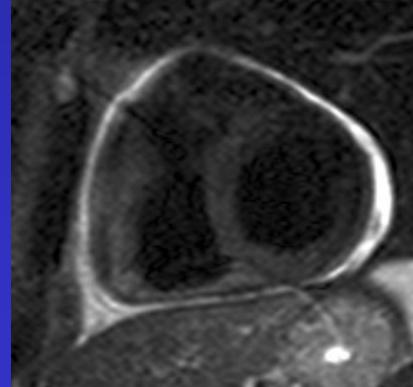
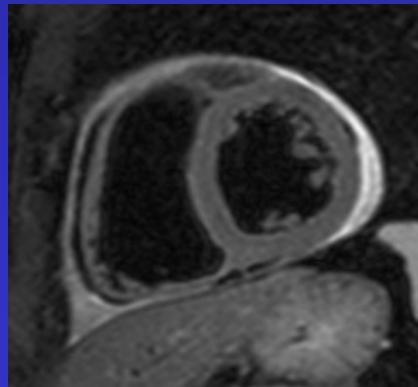
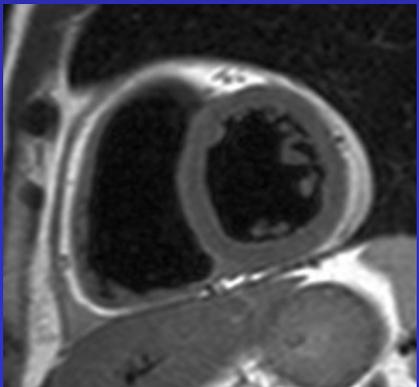
Black-blood fat sat



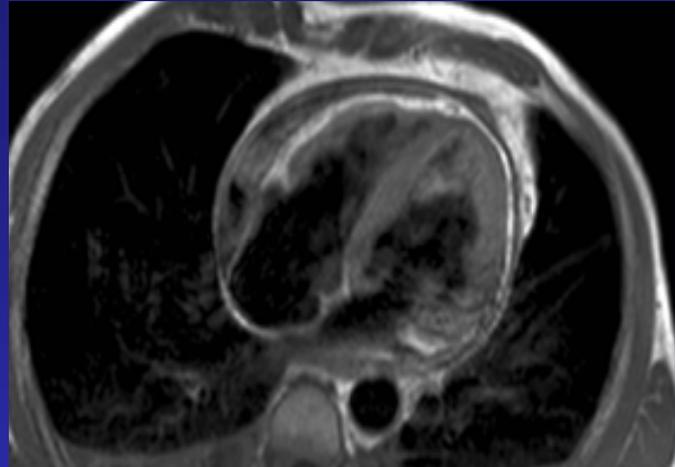
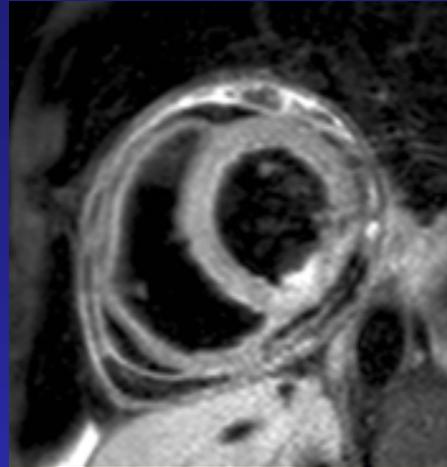
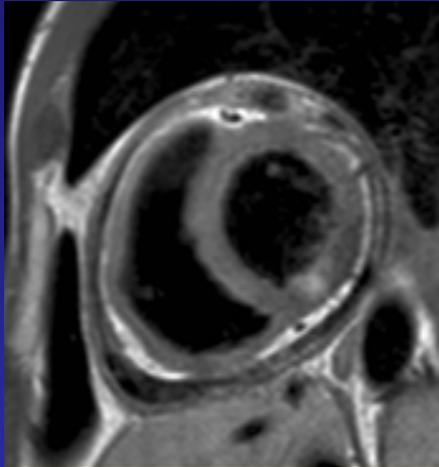
STIR



Gd-LE MR



# MIOPERICARDITE



International Journal of Cardiology 127 (2008) 17–26

www.elsevier.com

Review

Myopericarditis: Etiology, management, and prognosis

Massimo Imazio \*, Rita Trinchero

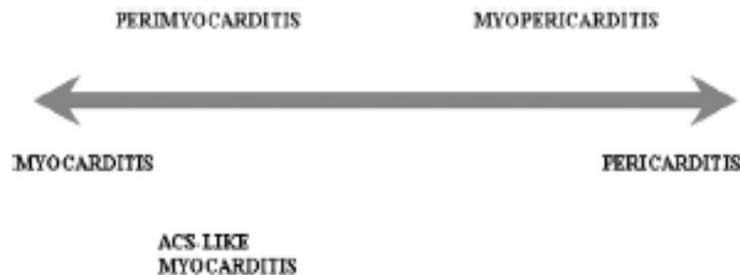
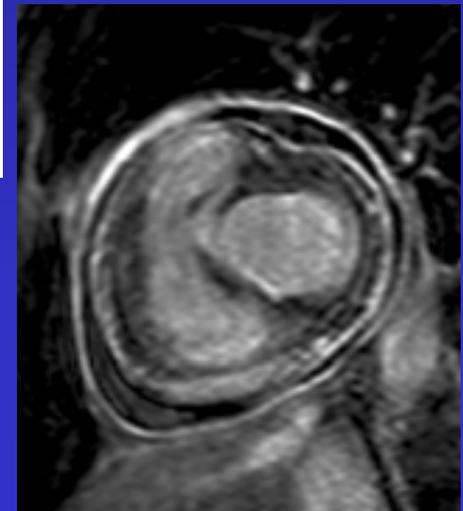
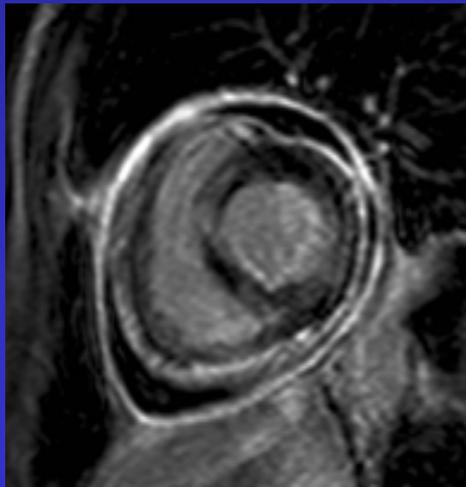


Fig. 1. The clinical spectrum of myocardial and pericardial syndromes (ACS-like myocarditis = myocarditis mimicking an acute coronary syndrome; see text for details).



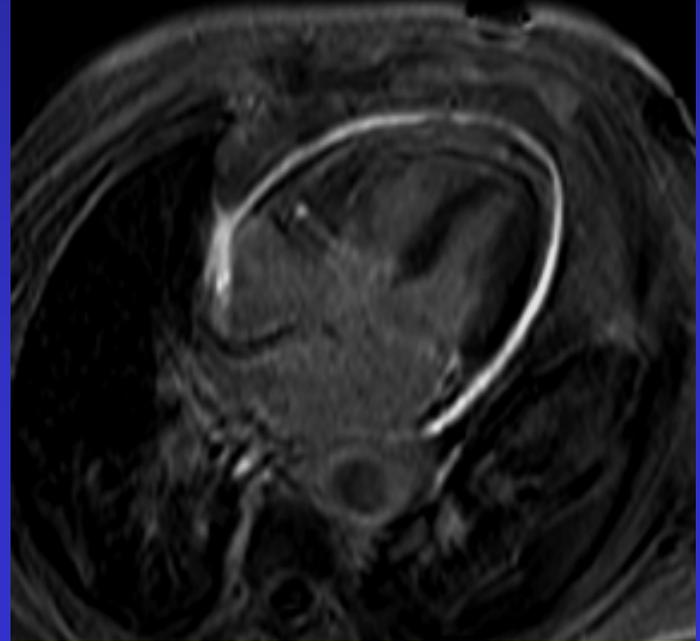
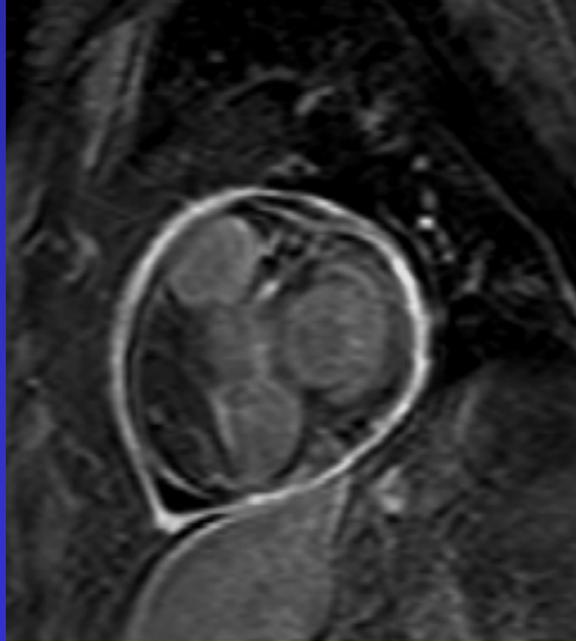
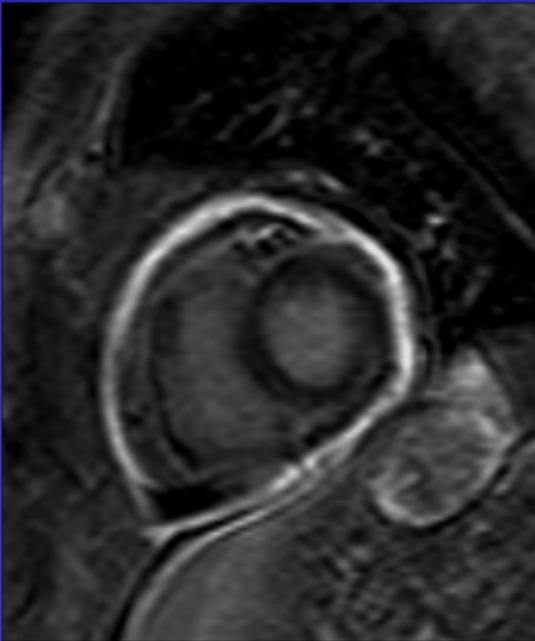
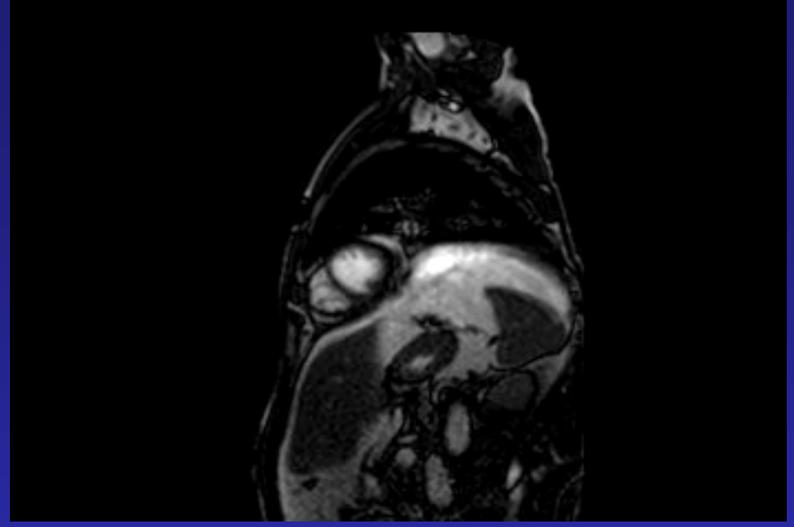
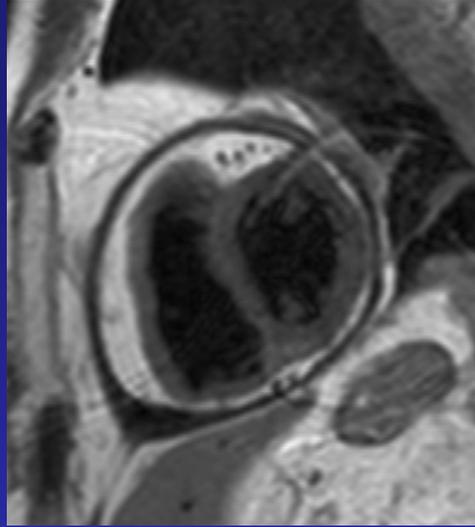
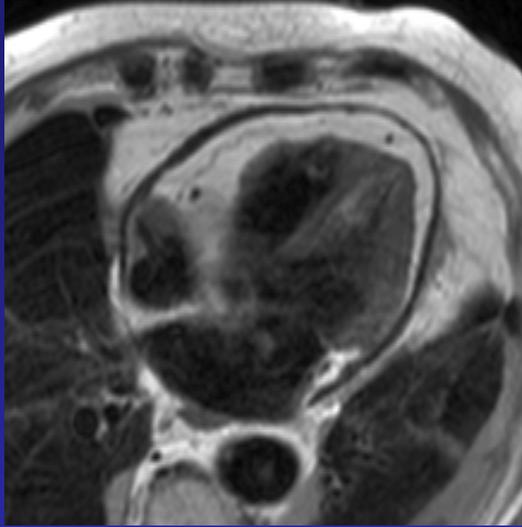
# PERICARDITE COSTRITTIVA

Evoluzione subacuta/cronica caratterizzata dalla fusione dei foglietti parietale e viscerale con trasformazione del sacco pericardico in "cotenna" fibrosa o fibrocalcifica



## **Ostacolo al riempimento ventricolare diastolico**

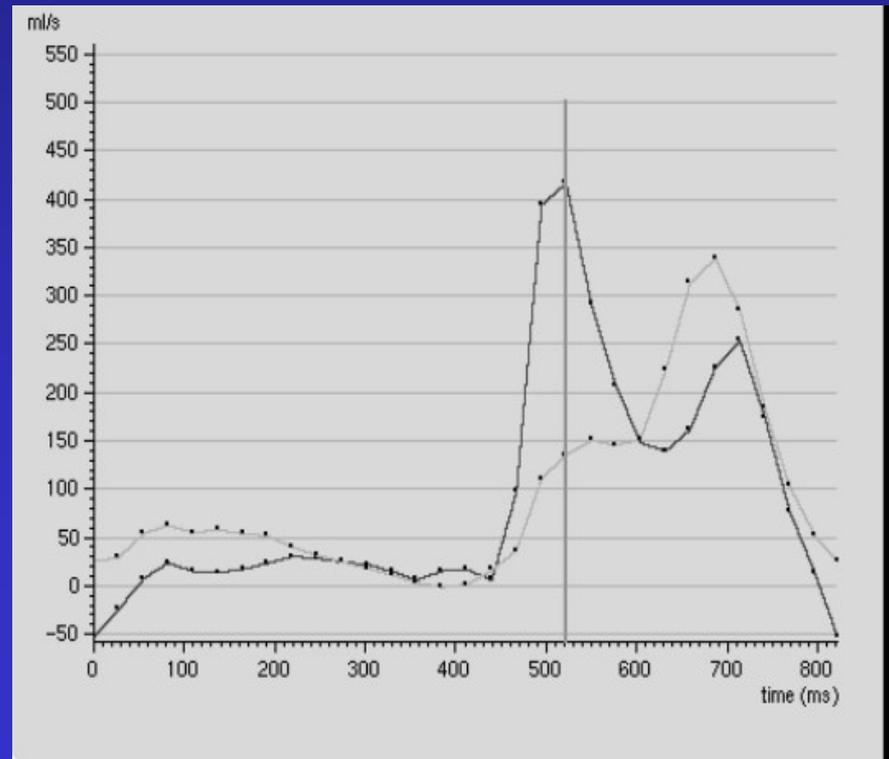
- Pericardio ispessito
- Basso segnale in T1w e T2w
- Calcificazioni (TC)
- Alterato pattern di riempimento diastolico dei ventricoli
- Dilatazione vene cave
- Movimento paradossale del setto in fase inspiratoria



# PERICARDITE COSTRITTIVA



Flussi trans-mitralico e  
trans-tricuspidalico



# Diagnosi differenziale

cardiomiopatia  
restrittiva

vs

pericardite  
costrittiva

## Diagnosi RM di pericardite costrittiva:

ispessimento pericardio + ostacolato riempimento  
diastolico

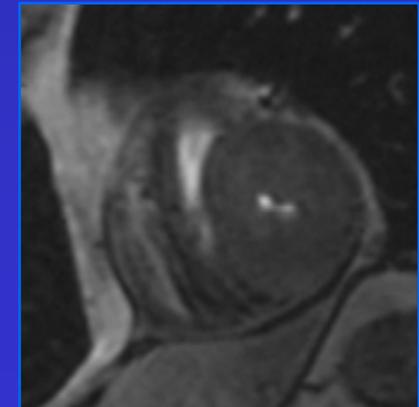
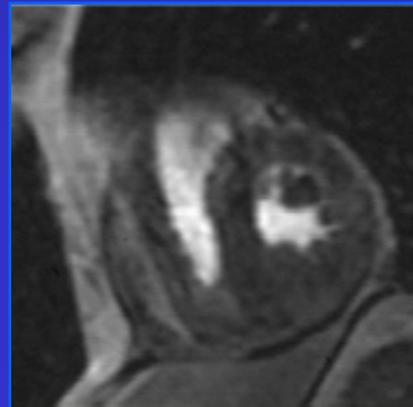
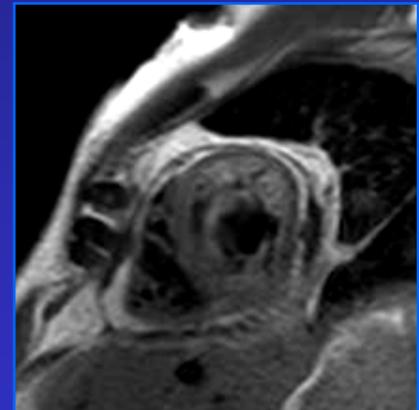
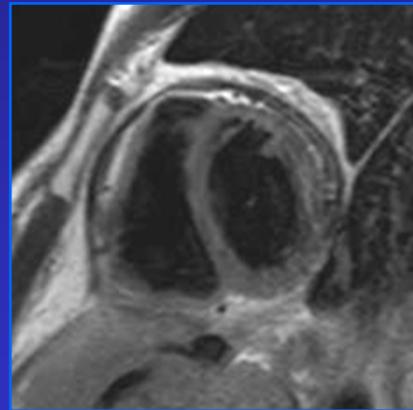
- Accuratezza 93%
- Sensibilità 88%
- Specificità 100 %

(Masui T, Finck S, Higgins CB. Radiology 1982)

## Falsi negativi

per cut off ispessimento pericardico  
(4mm)

(Hancock E.W. Heart 2001)

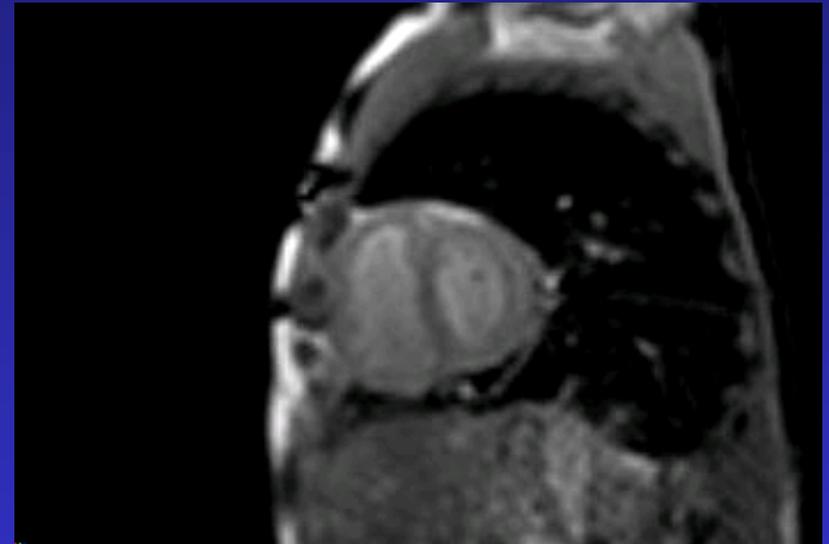


# Diagnosi differenziale

cardiomiopatia  
restrittiva

vs

pericardite  
costrittiva

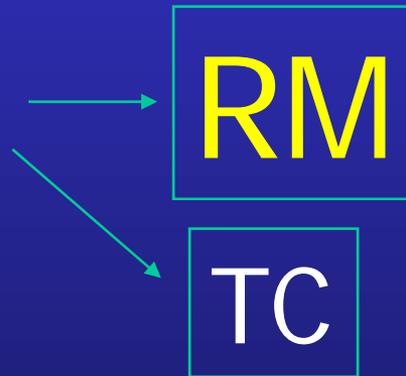


## \*Influenza del respiro sul movimento settale:

- 4 su 6 pz con CP → Appiattimento – sbandieramento del setto verso sinistra all'inizio dell'inspirazione
- 4 su 4 pz con RCM → Normale convessità del setto durante tutte le fasi del respiro

# Tumori cardio-pericardici

- Tumori primitivi a incidenza rara: prevalenza 0.001-0.03% (casistiche autoptiche)
- Frequenza tumori secondari o metastatici: 100 volte superiore (1-3%)
- **Diagnosi:** ecocordio



Clinical indications for cardiovascular magnetic resonance (CMR) : Consensus Panel report

D.J Pennell, U.P.Sechtem,C.B.Higgins, et al; Eur Heart J 2004;25: 1940.

- **Detection and characterization of cardiac and pericardiac tumors (Class I)**

**Imaging:** 1. Ecocardiografia :diagnosi difficile, spesso non conclusiva

## 2. Cardio-RM:

- Presenza (artefatto/variante anatomica/lesione), localizzazione
- Estensione locoregionale, ev infiltrazione di strutture cardiache e mediastiniche
- Effetti emodinamici del tumore
- Caratterizzazione di alcuni tessuti + sede e caratteristiche lesione → tipo di tumore, diagnosi diff pseudomasse, pianificazione terapia

# Tumori cardiaci e pericardici primitivi

Frequenza relativa

Benigni (75%)

Maligni (25%)

- 
- Mixoma
  - Fibroelastoma papillare
  - Rabdomioma
  - Fibroma
  - Amartoma, lipoma, teratoma, emangioma, paraganglioma, tumore cistico nodo AV

- 
- Angiosarcoma
  - Rabdomiosarcoma
  - Istiocitoma fibroso m.
  - Sarcoma indiff, osteosarcoma, mixo/leiomiosarcoma
  - linfoma
  - mesotelioma

# PSEUDOMASSE CARDIACHE

- Strutture anatomiche
- False immagini ecografiche
- Lipomatosi setto interatriale
- Trombi
- Ematomi di parete
- Pseudoaneurismi
- Granulomi
- Cardiomiopatia ipertrofica focale

# Tumori cardiaci

## Caratteristiche di benignità

- origine da AS (mixoma)
- lesione unica (no rabdomioma)
- margini netti (emangioma?)
- capsula o pseudocapsula (no emangioma)
- segnale omogeneo (mixoma? emangioma?)
- raramente versamento pericardico ematico
- sviluppo endocavitario (mixoma)

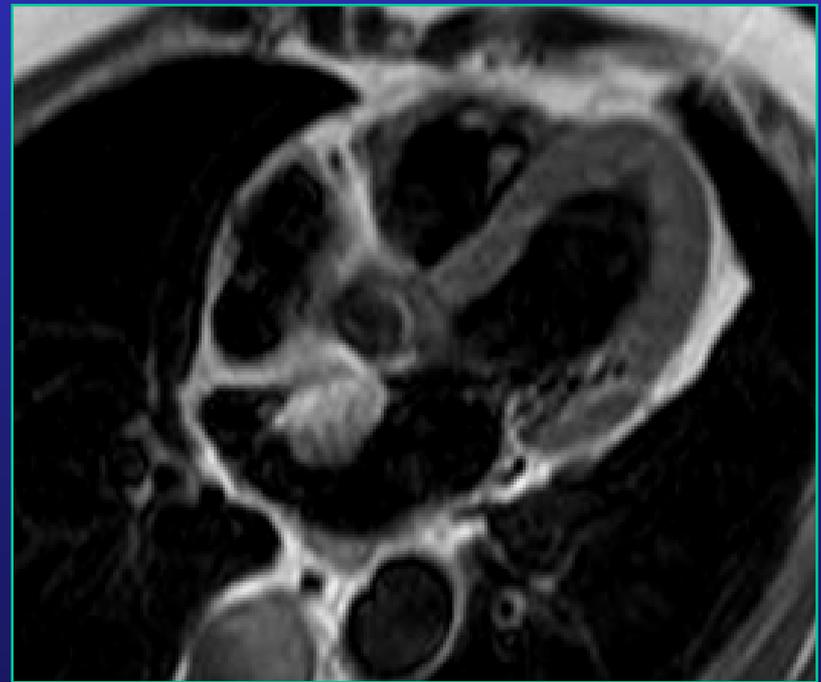
Grebenc ML, et al. Radiographics 2000; 20: 1073-1103.

Hoffmann U, et al. Am J Cardiol 2003; 92:890-895.

# mixoma

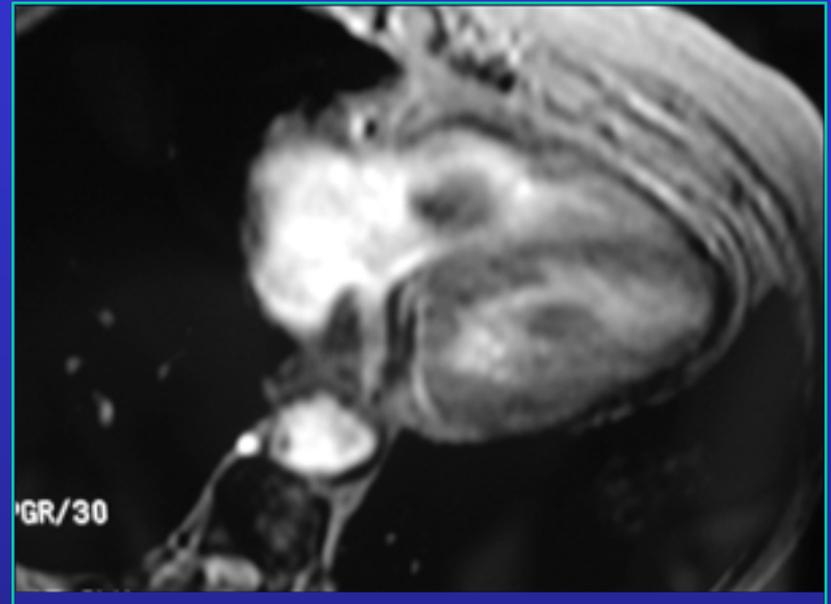
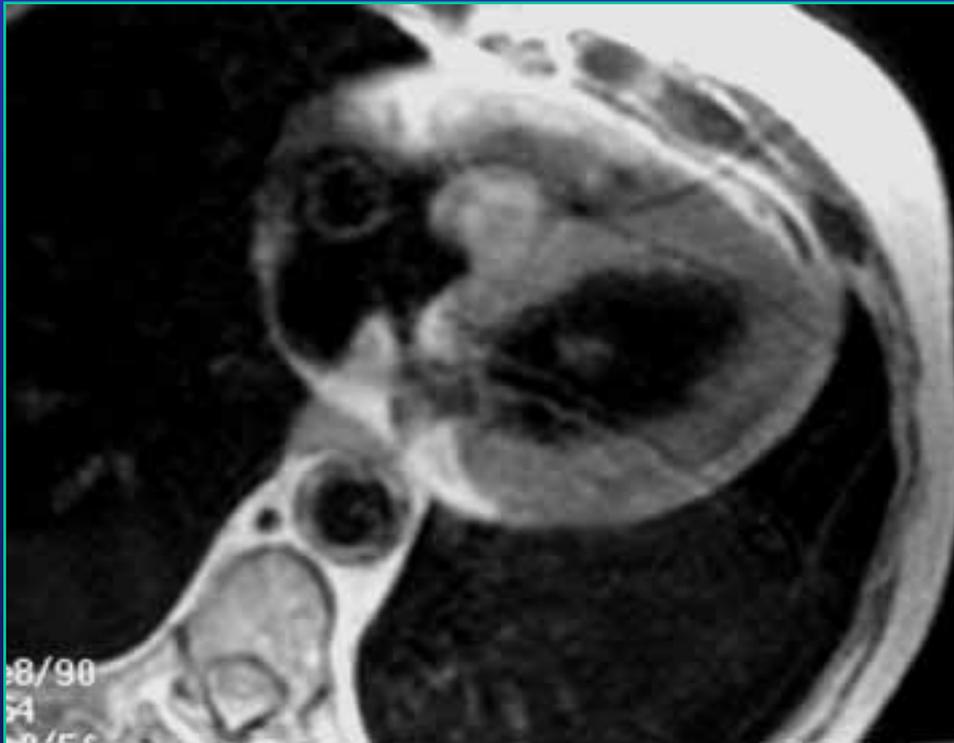
- Origine dalla sup. endocardica
- Non infiltra i tessuti circostanti
- **Sviluppo endocavitario**

- **Sede:** - 75% AS (setto IA)
  - 20% AD
  - 5%:ventricoli
- **Peduncolati**; ¼ sessili

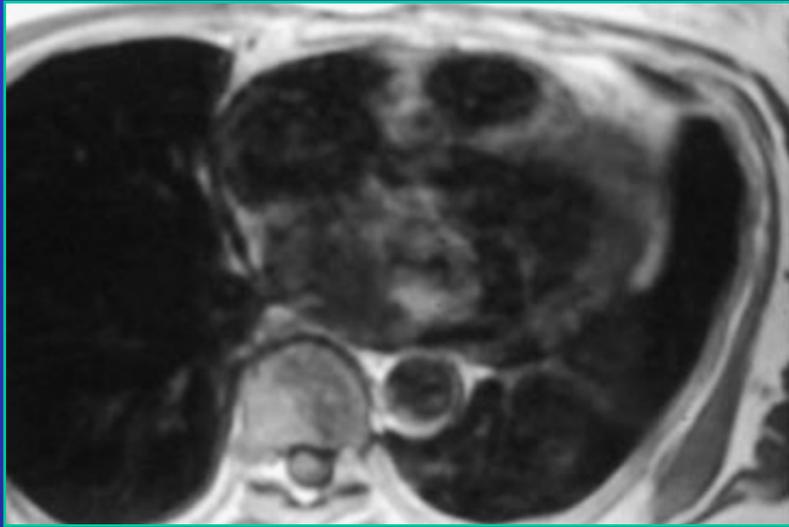


# mixoma

- Generalmente asintomatici
- Se sintomatici:
  - embolie periferiche
  - Impegno nella valvola A-V
  - astenia, leucocitosi, ↑VES



# mixoma



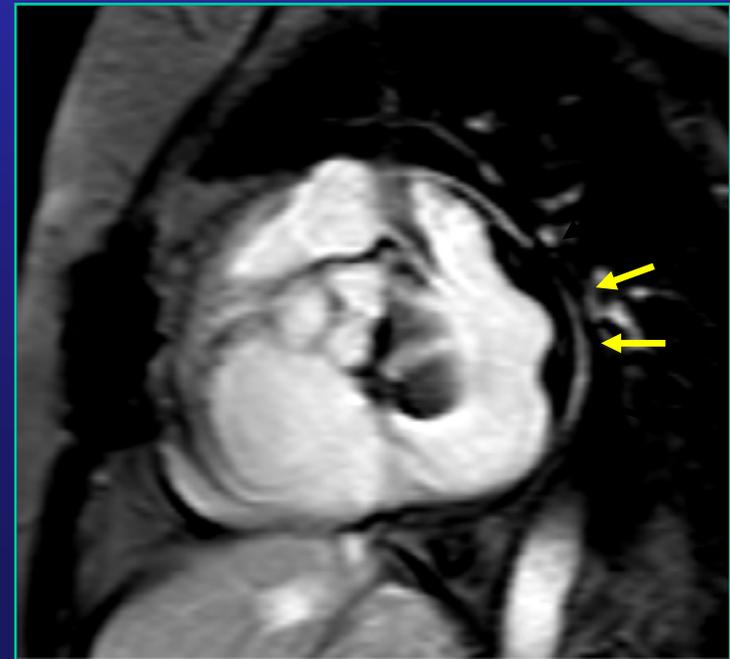
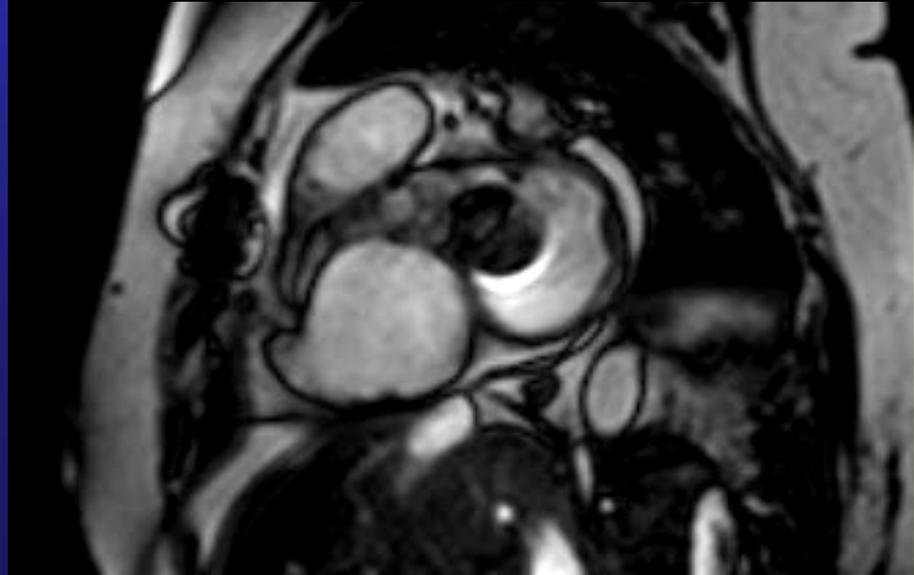
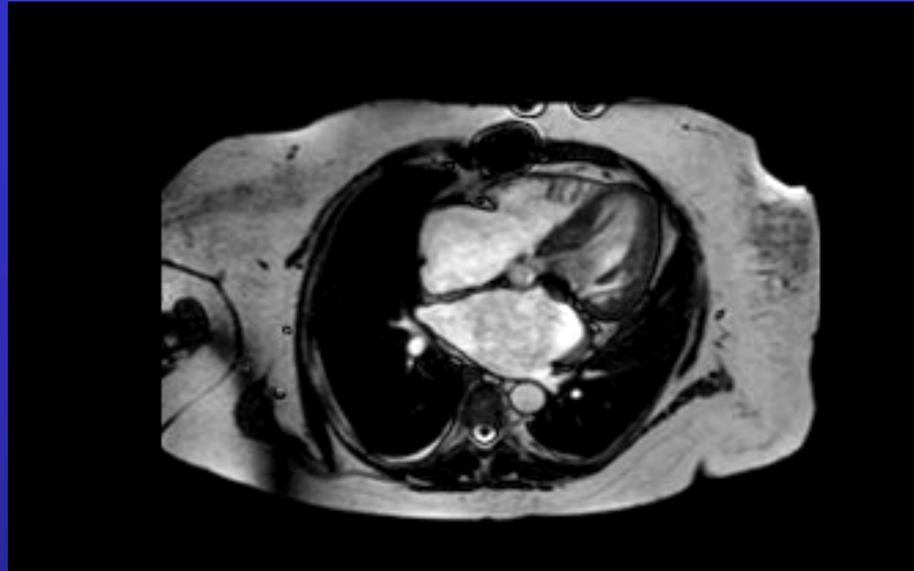
- **Segnale eterogeneo**
  - componente mixomatosa: ↓ in T1; ↑ in T2;
  - fibrosi
  - trombosi superficiali
  - calcificazioni
  - componenti emorragiche
  - ↓↓ in "Cine" (Fe)

## Enhancement disomogeneo

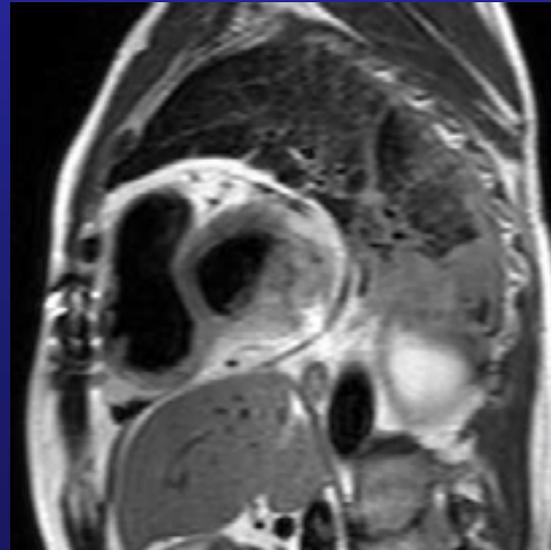
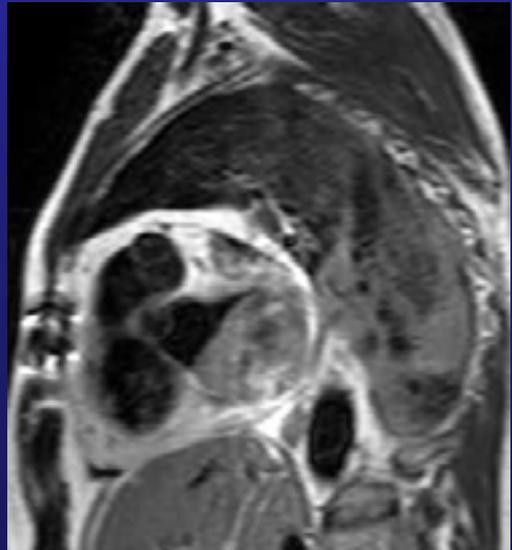
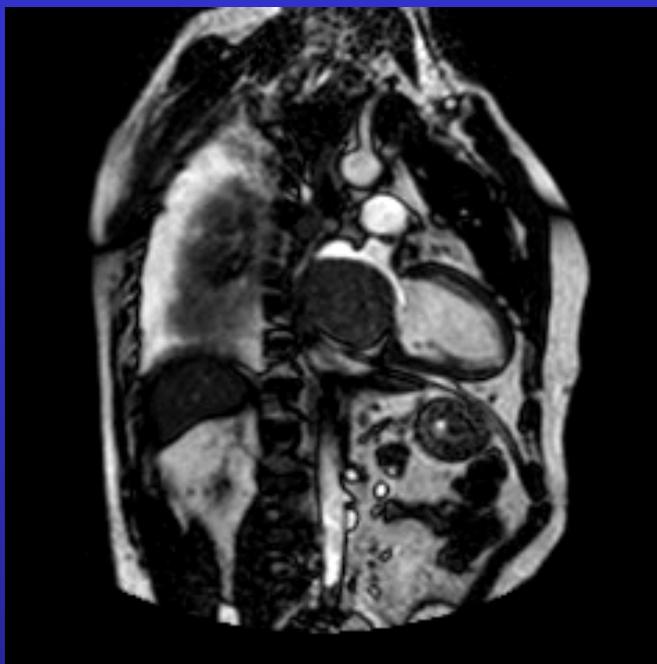
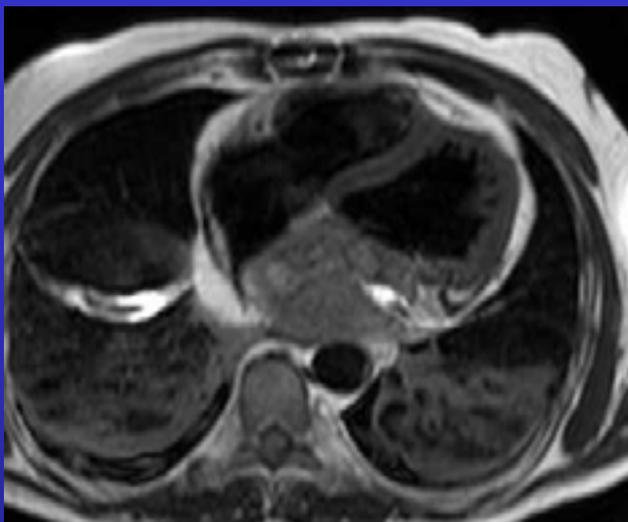
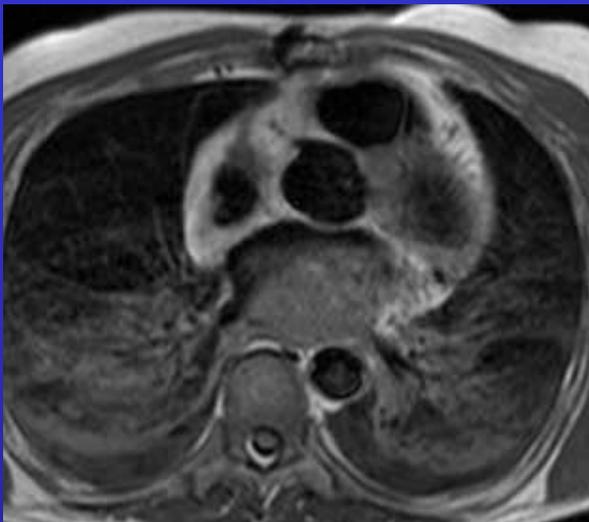
**DD** con trombi, ematomi,

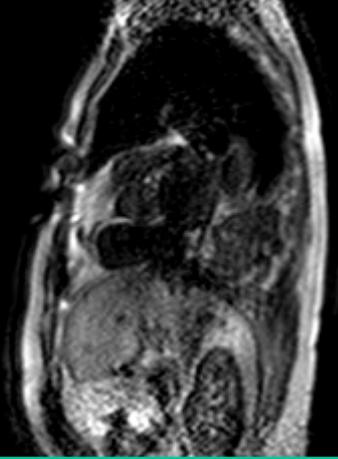
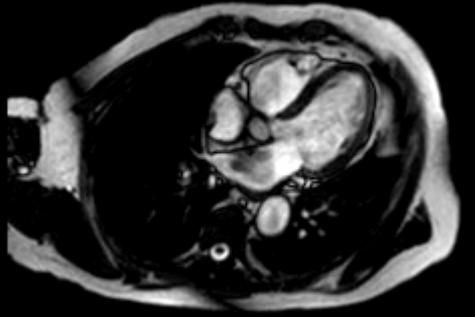
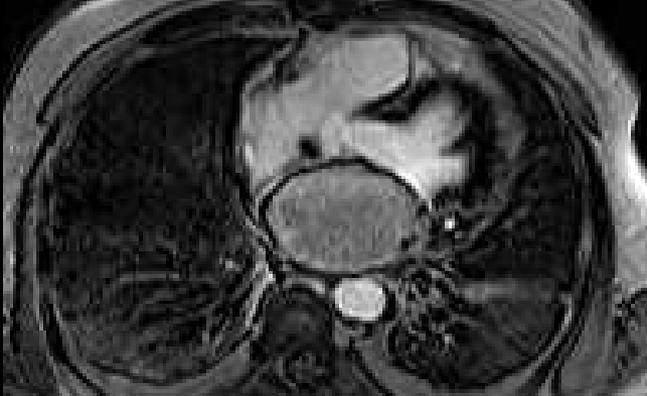
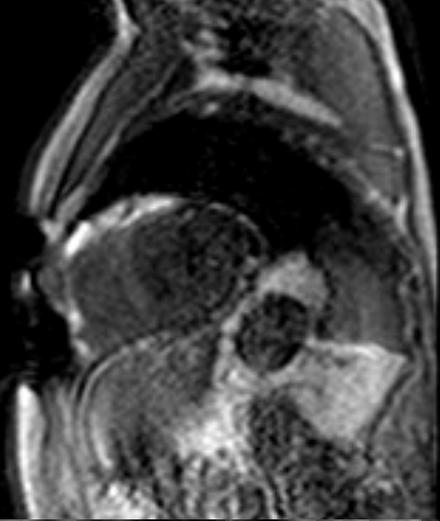
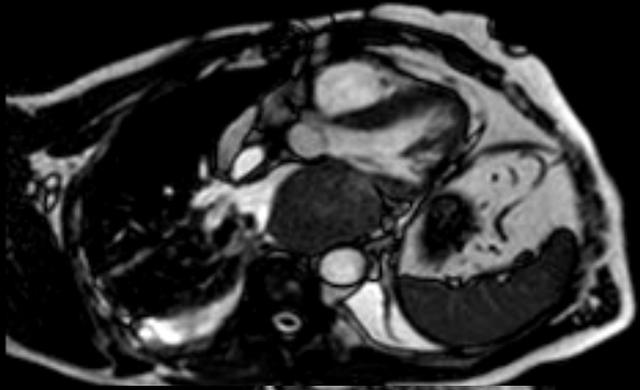
- No enhancement e no peduncolo
- Trombi atriali: in auricola o cavità dilatate
- Trombi ventricolari: in aree con alterata contrattilità o aneurismatiche

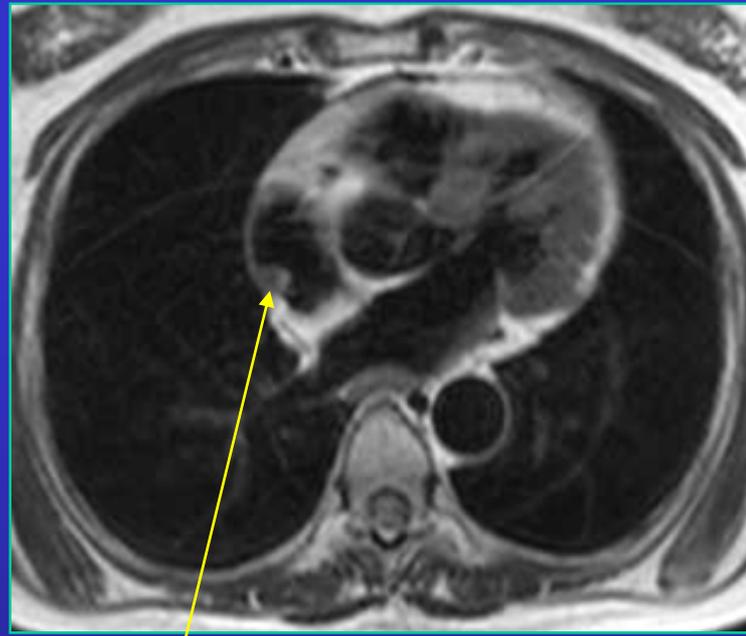
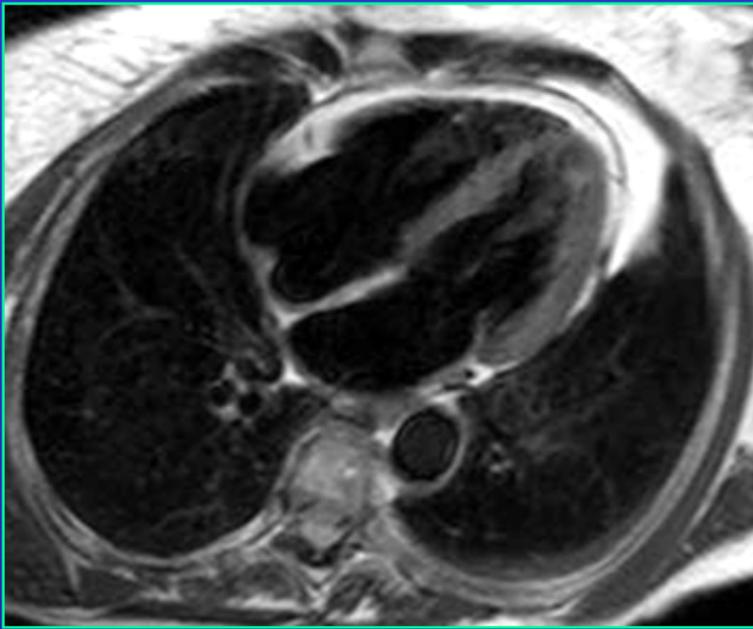
# trombo atrio sn



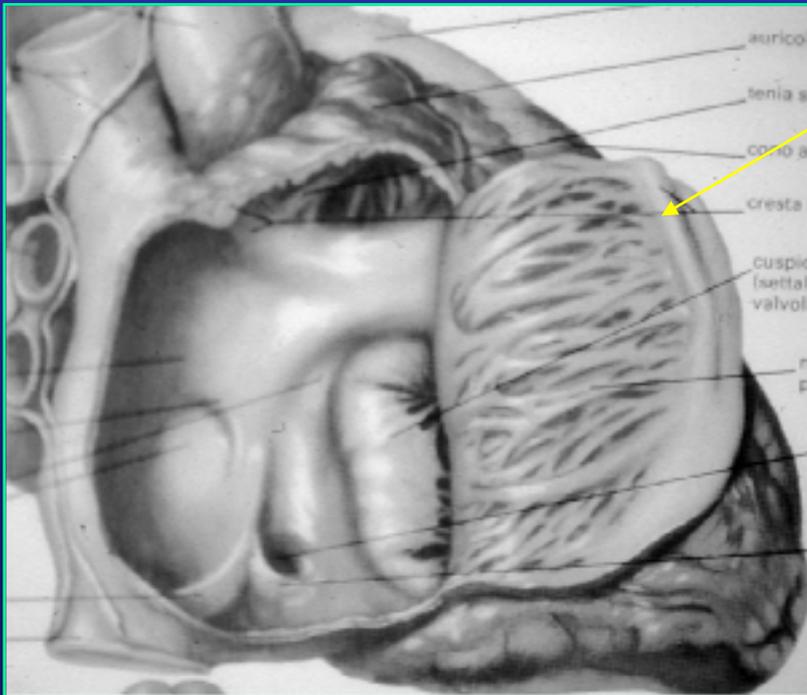
# Caso clinico FB



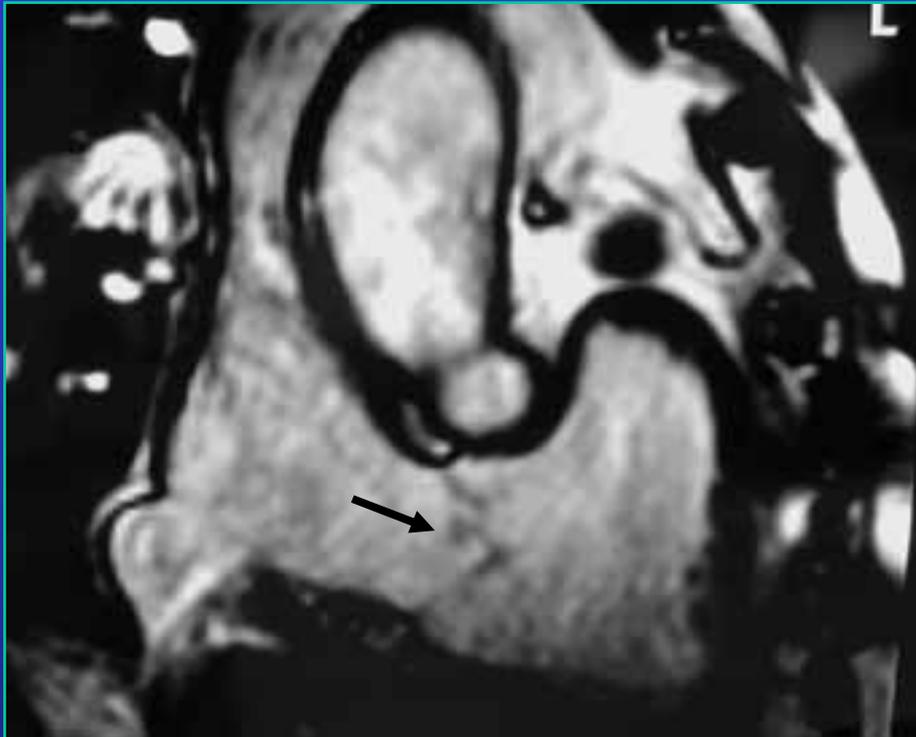




cresta terminale



# fibroelastoma papillare



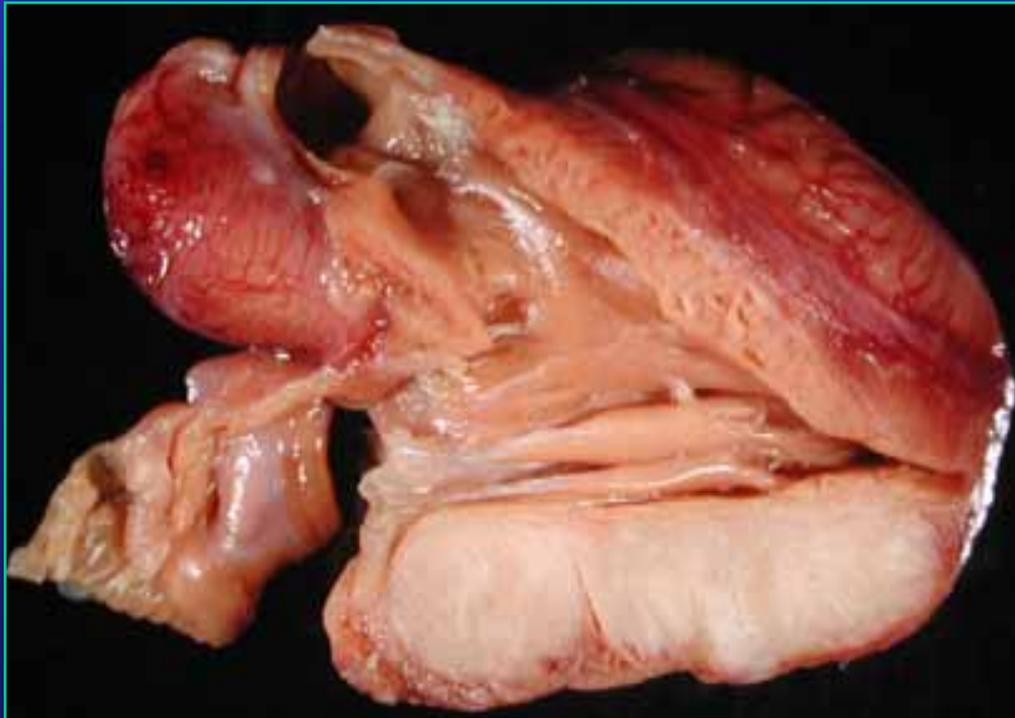
- . 10% dei tumori cardiaci ; generalmente asintomatici
- . Piccole dimensioni (<1 cm); masserelle collegate da peduncolo all'endocardio
- . 90% originano dalla superficie valvolare
- . Ben visualizzati in ecocardiografia come piccole masse mobili e omogenee
- . Difficile visualizzazione con TC e RM → sequenze cine!
- DD vegetazioni endocarditiche (associate a distruzione lembi valvolari)

Wintersperger BJ, et al. Eur Radiology 2000; 10: 443.

Sun JP, et al. Circulation 2001; 103: 2687.

# fibroma

- Età pediatrica
- Sede più frequente: ventricoli (parete libera VS e setto IV)
- Sviluppo nella parete; rotondeggianti, dimensioni medio-grandi (2-10 cm)
- Segni e sintomi: 1/3 asintomatici; alterazioni ECG; aritmie; scompenso cardiaco; morte improvvisa

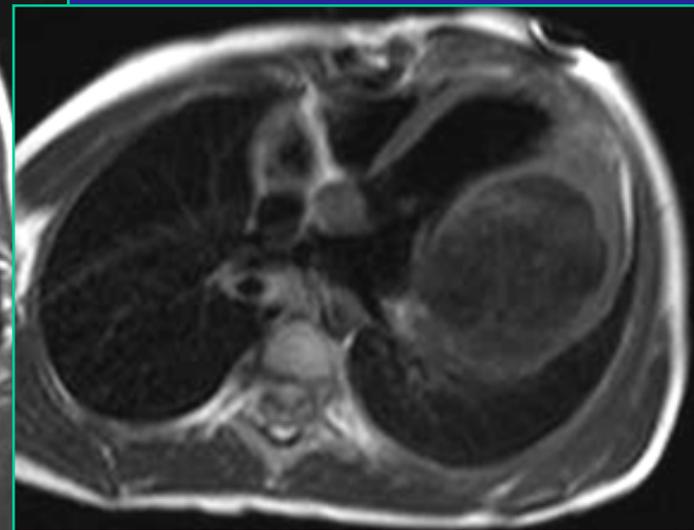
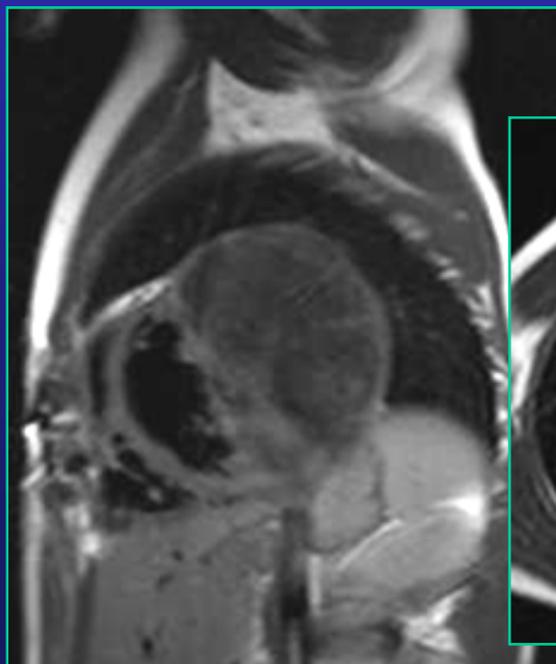
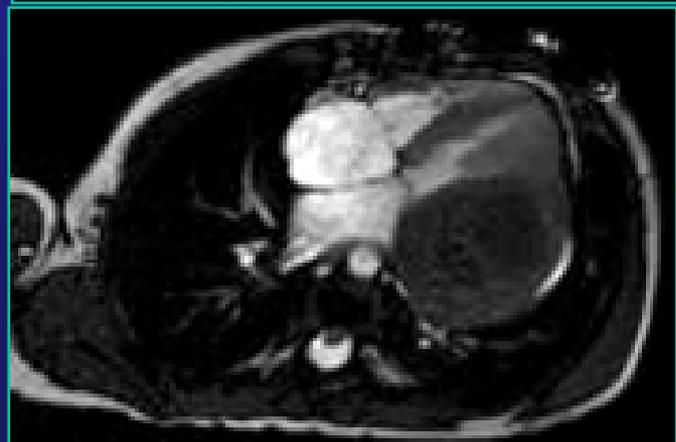
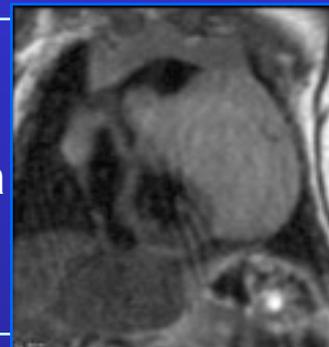


# fibroma

- **Segnale omogeneo** (↓ in T2w): no componenti cistiche, emorragiche o necrotiche
- Calcificazioni
- D.D. con raddomiomi in bambini

## raddomiomi

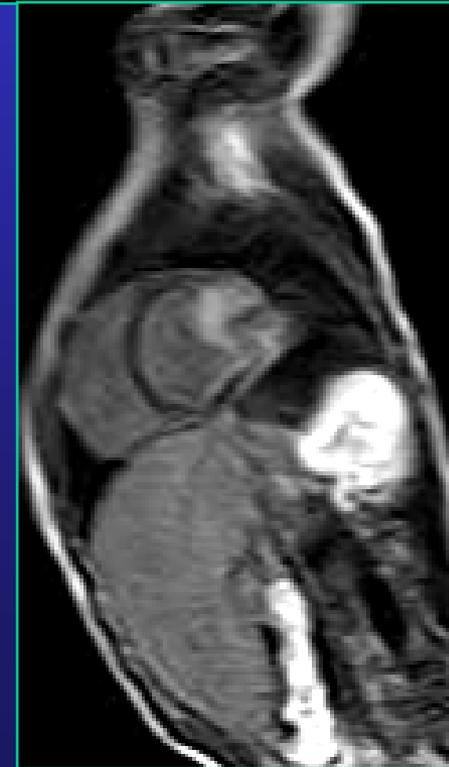
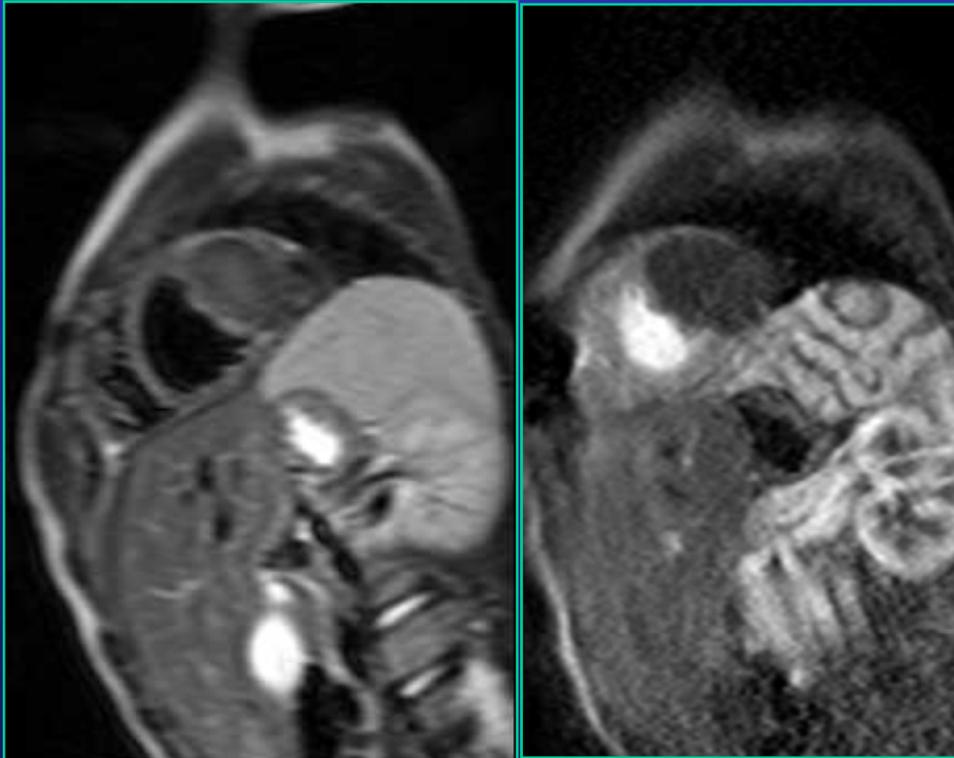
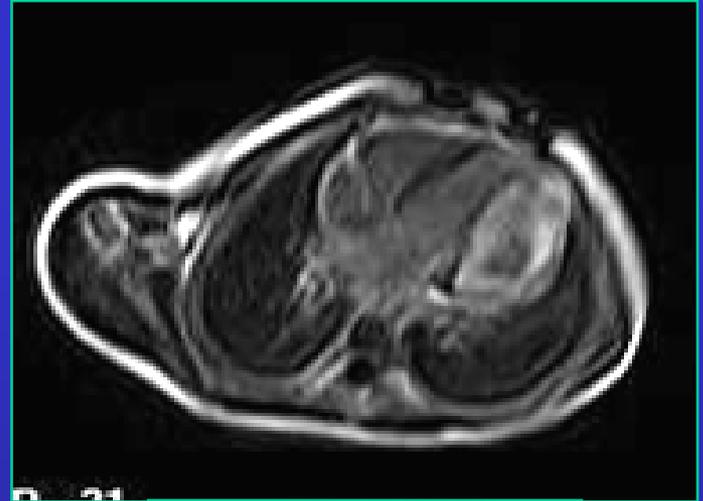
- Spesso multifocali  
50% sclerosi tuberosa
- ↑ in T2
- No calcificazioni



# fibroma

Scarsa vascolarizzazione  
Fibroblasti e tessuto collagene

- No enhancement precoce
- SI LATE ENHANCEMENT

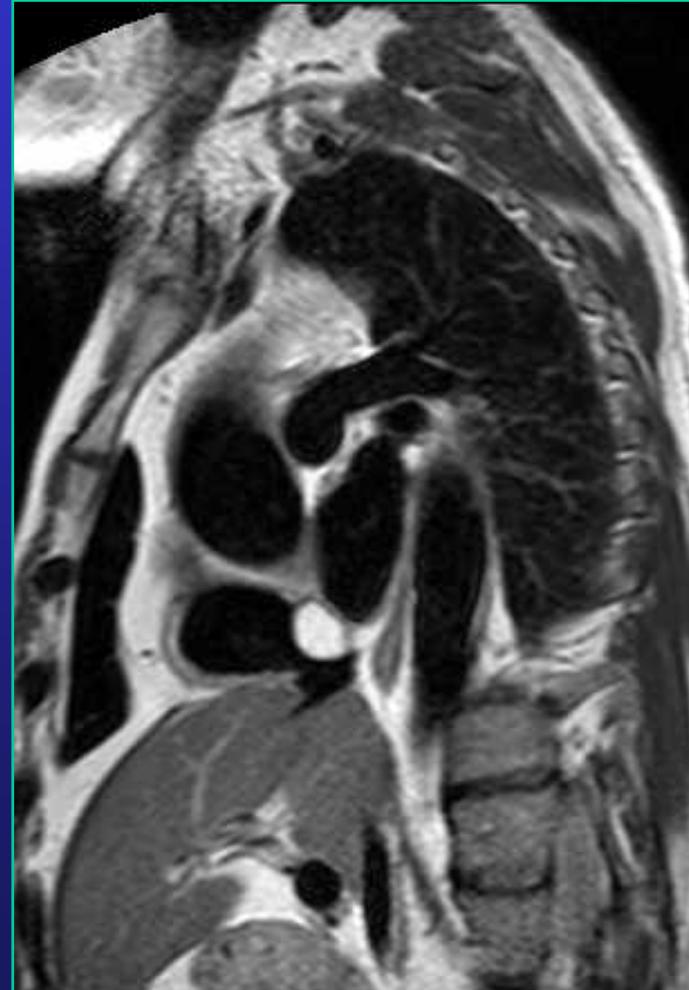
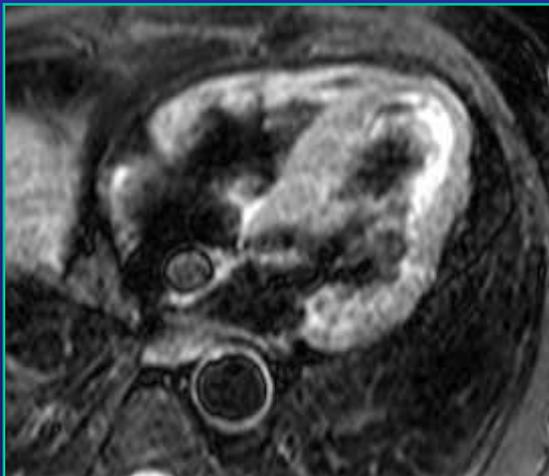
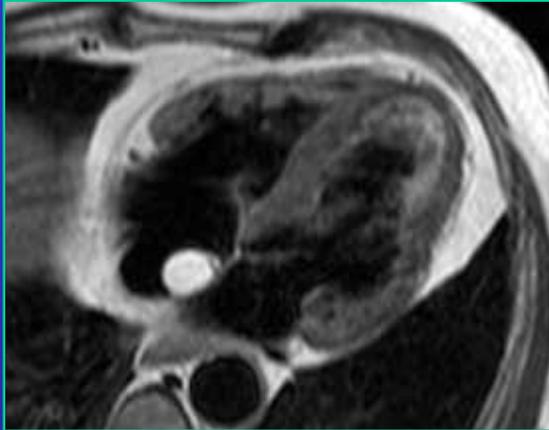


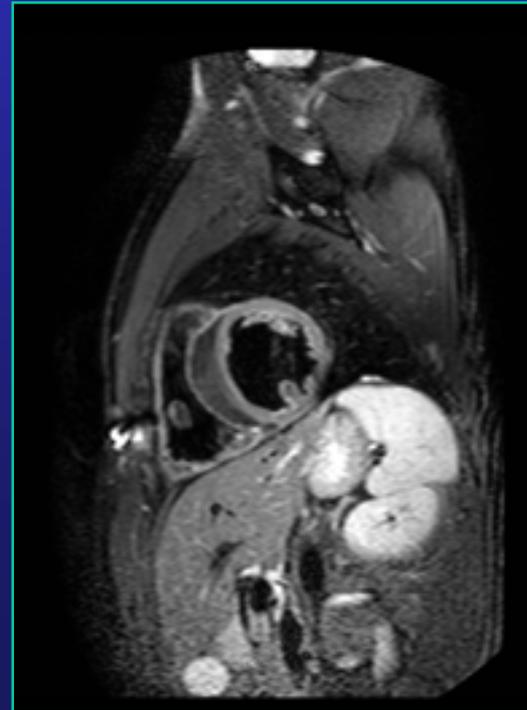
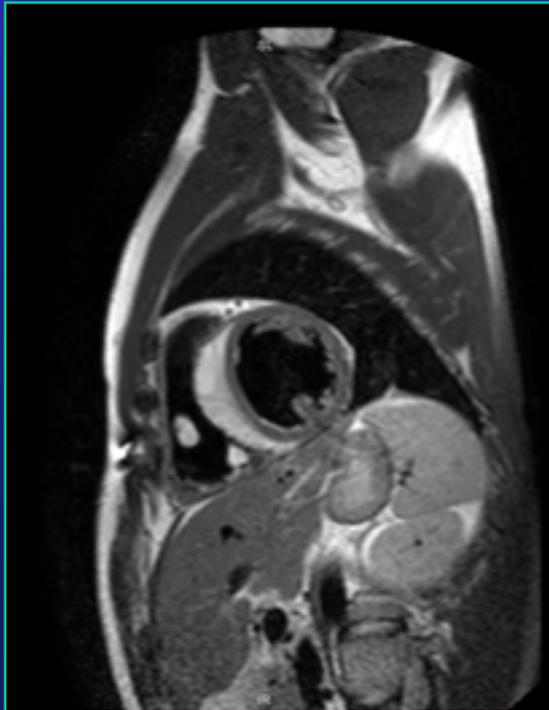
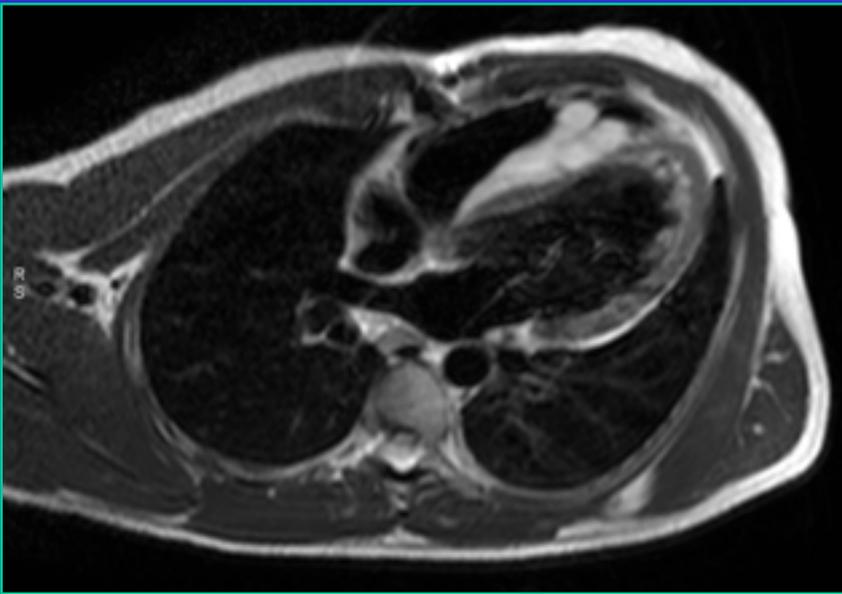
# lipoma

Segnale iperintenso che si sopprime  
in fat sat

Origine epicardio/endocardio

DD mixoma - lipomatosi setto

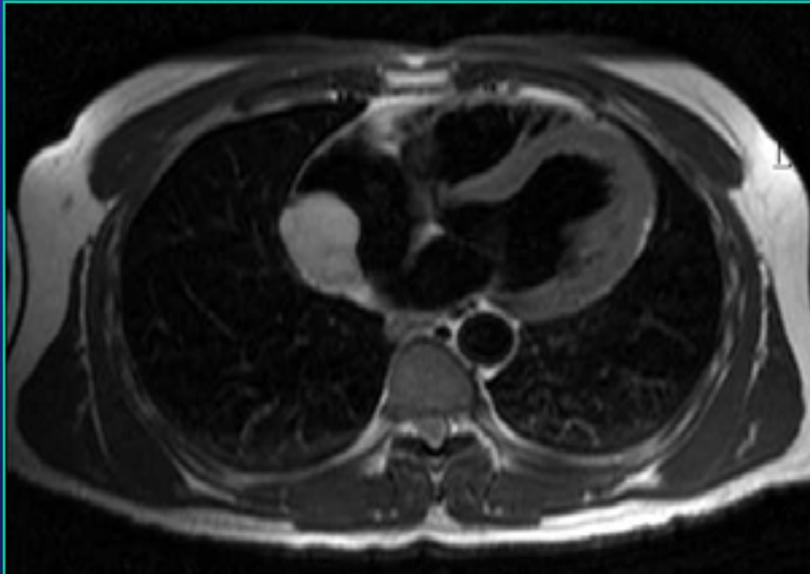




lipomatosi  
setto IV dx

# angioma

- . 5-10% tumori benigni
- . Segnale e enhancement omogeneo o disomogeneo (iper T2) in relazione alla classificazione: cavernosi, capillari, arterovenosi.
- . Endocardici (capillari)/intramurali (tutte le tre categorie)
- . D.D. con angiosarcomi, paragangliomi (atriali, prod catecolamine)



# Tumori cardiaci

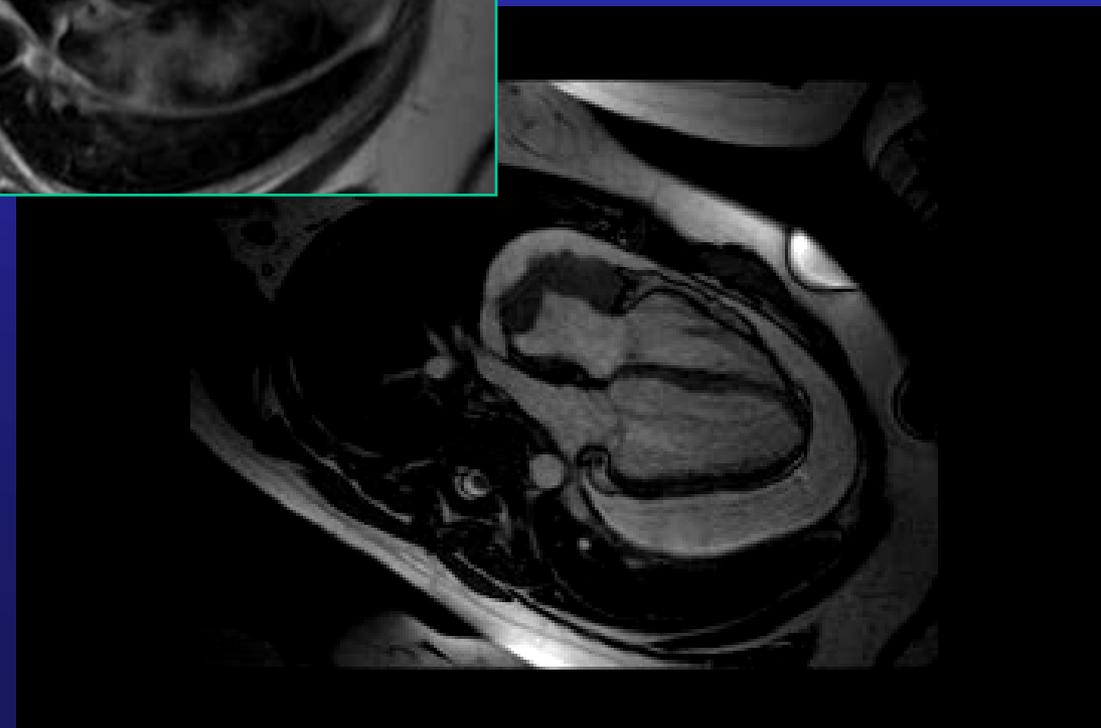
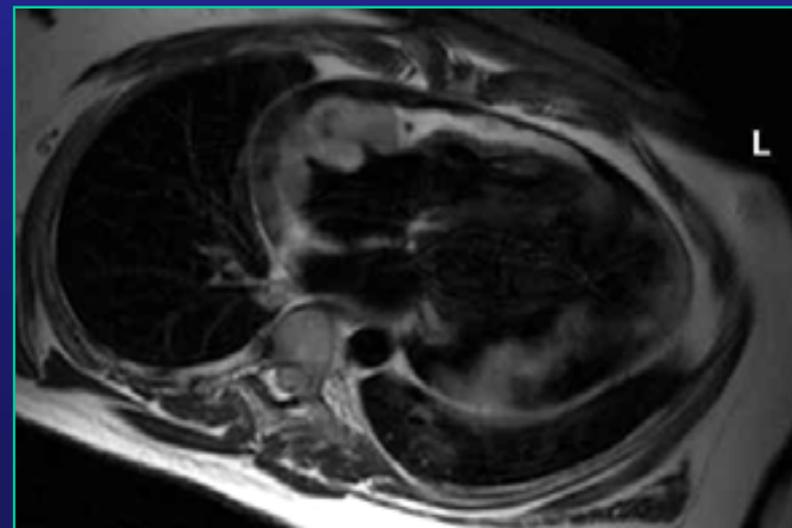
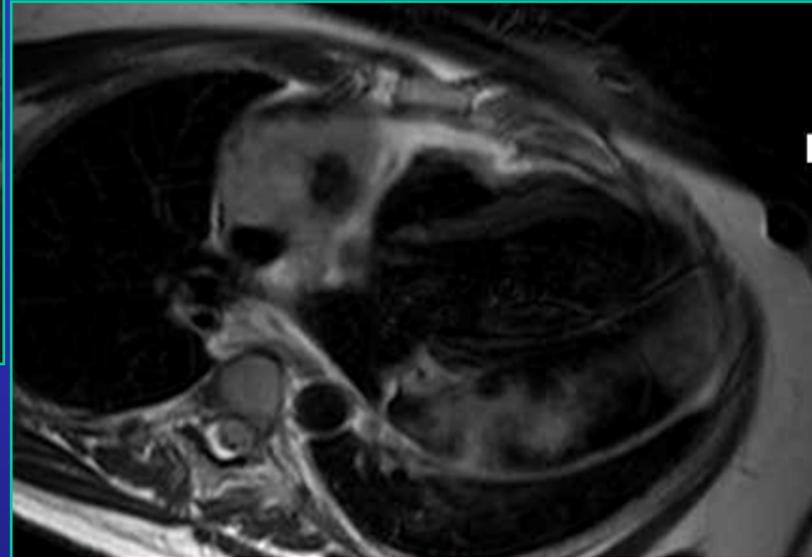
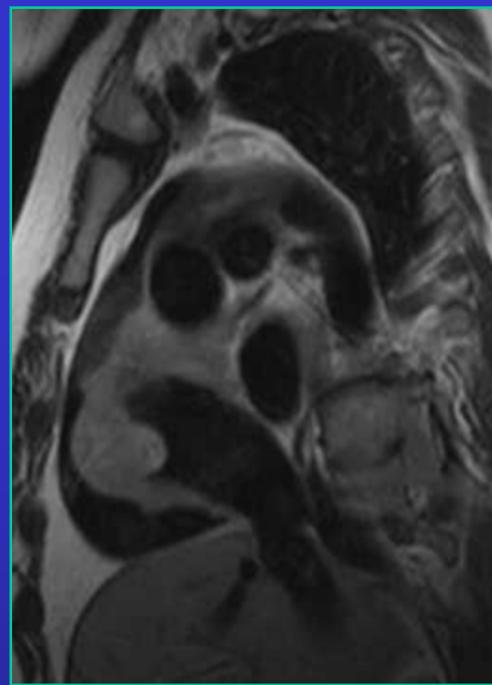
## Caratteristiche di sospetta malignità

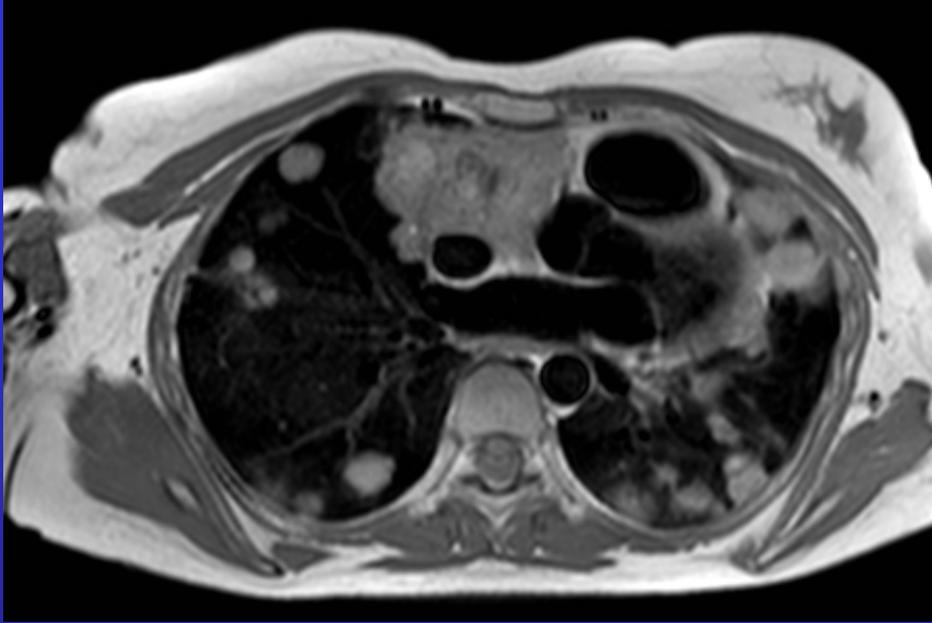
- origine da AD (angiosarcoma)
- larga base di impianto
- crescita infiltrativa intramurale
- assenza di pseudocapsula
- segnale disomogeneo (dopo m.d.c.)
- invasione/ispessimento pericardio (diffuso o nodulare)
- emopericardio
- a volte multifocali (mts)

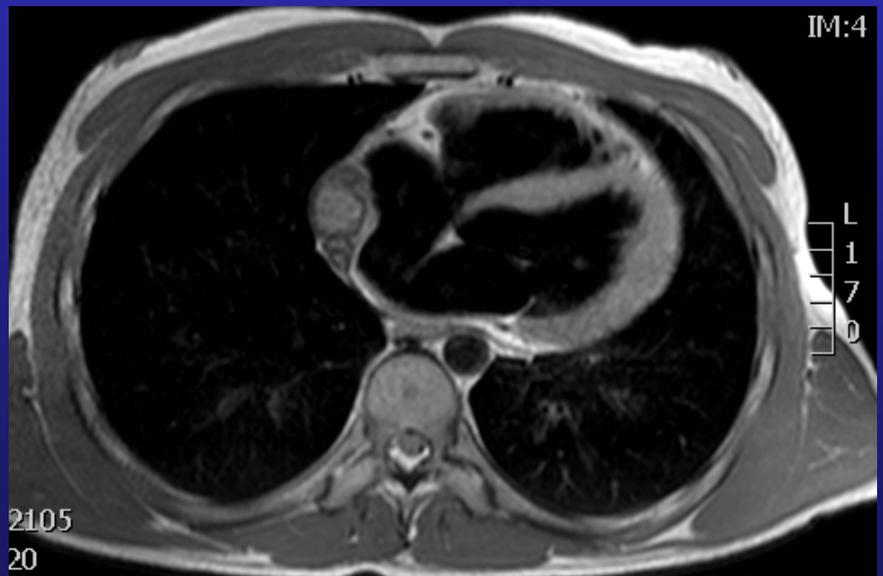
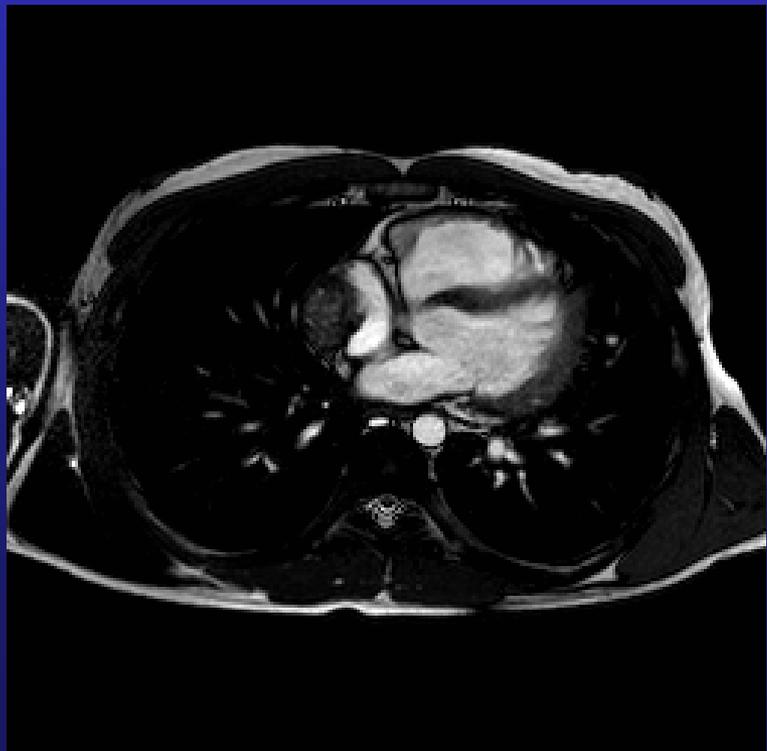
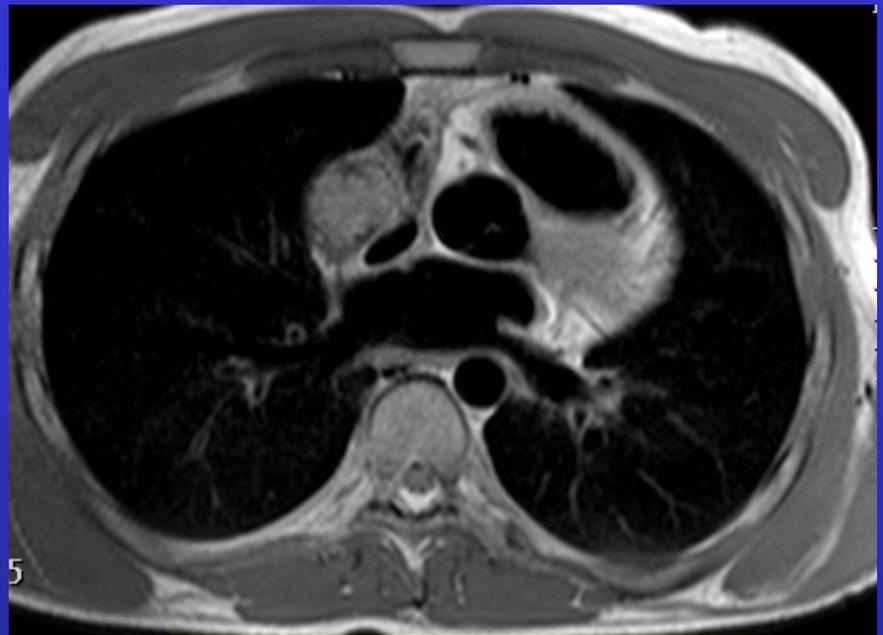
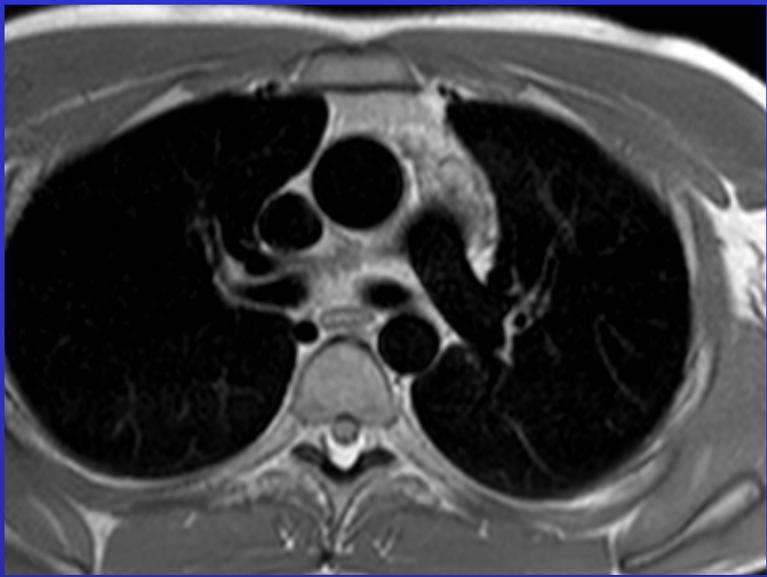


Grebenc ML, et al. Radiographics  
2000; 20: 1073-1103.

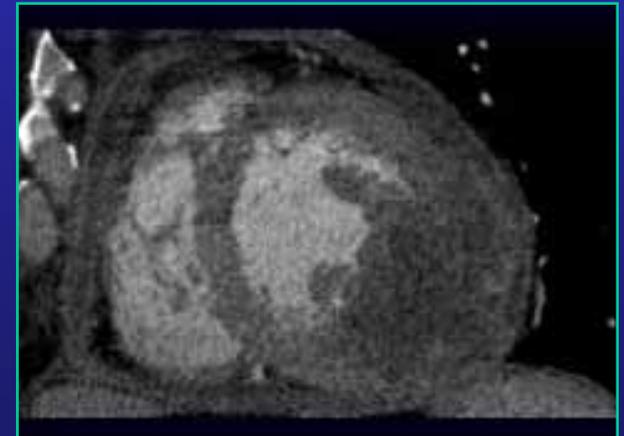
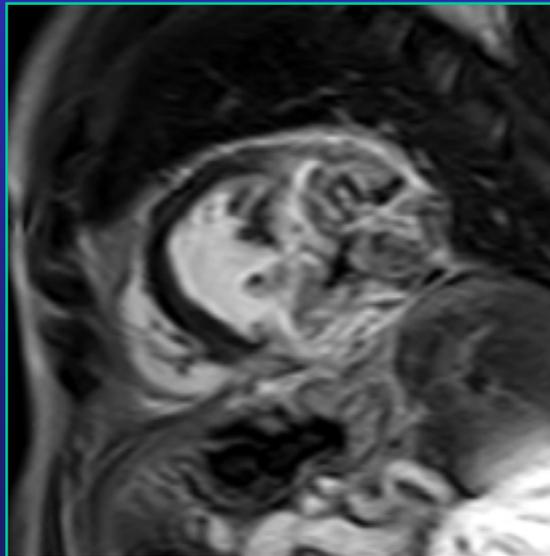
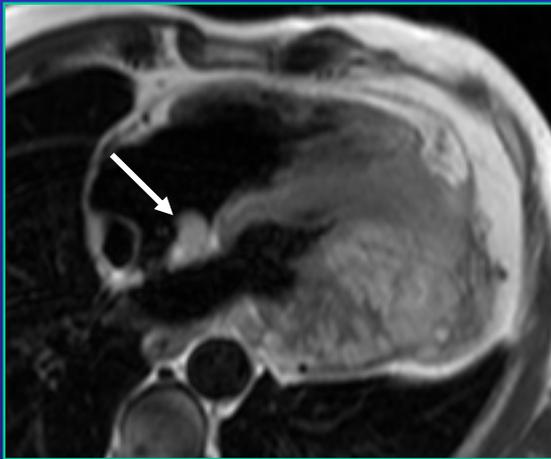
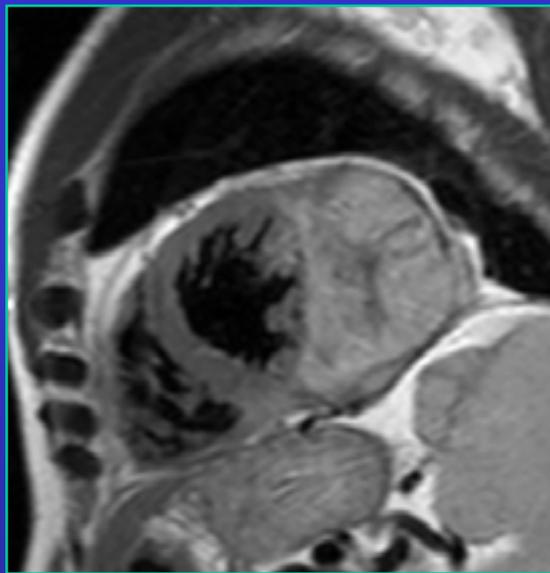
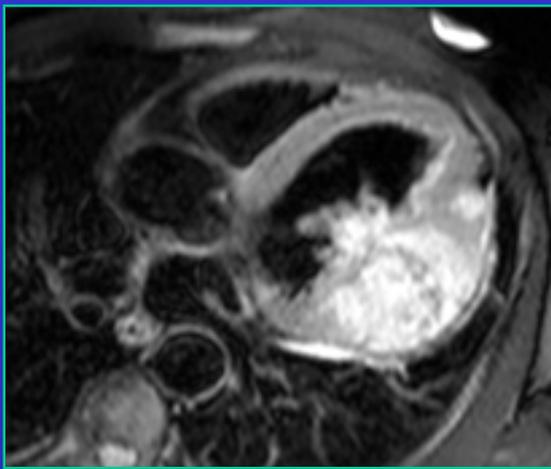
**angiosarcoma:** origine AD,  
forma irregolare infiltrante  
segnale disomogeneo (necrosi emorragie)  
emopericardio → scompenso dx,  
metastasi precoci



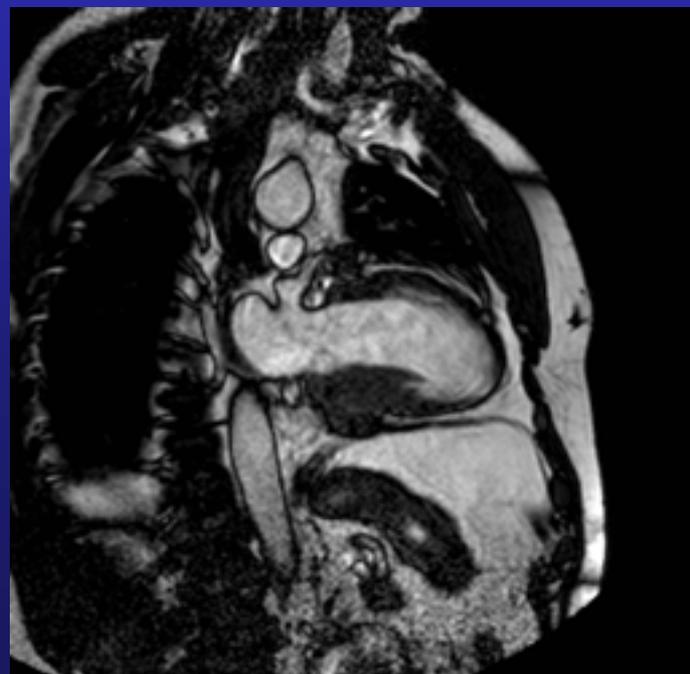
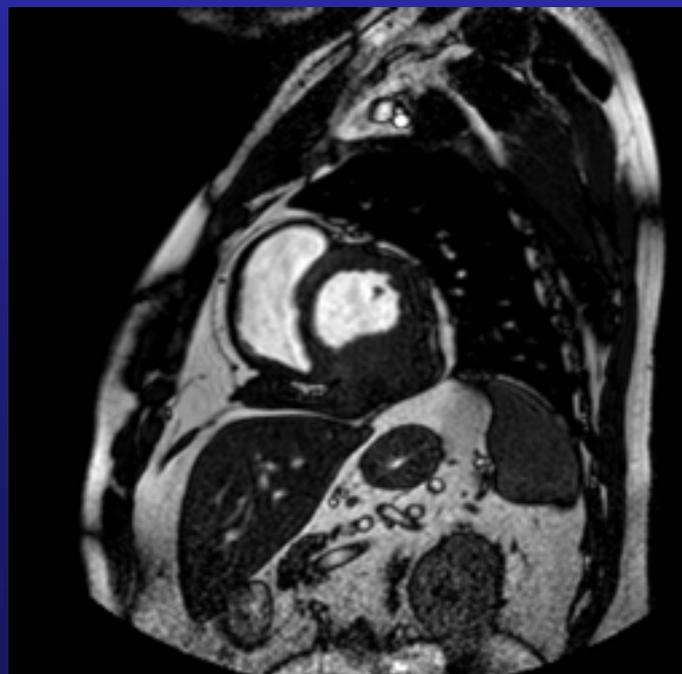
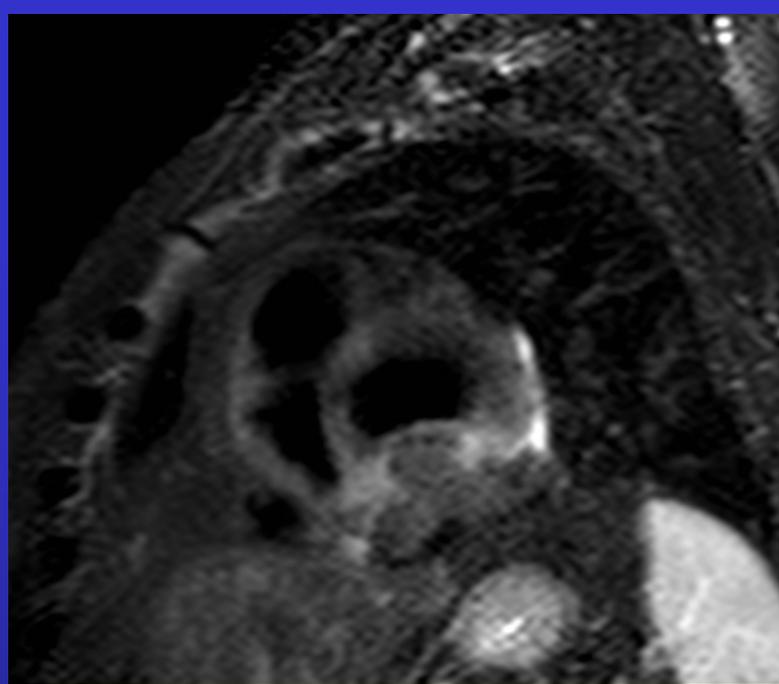
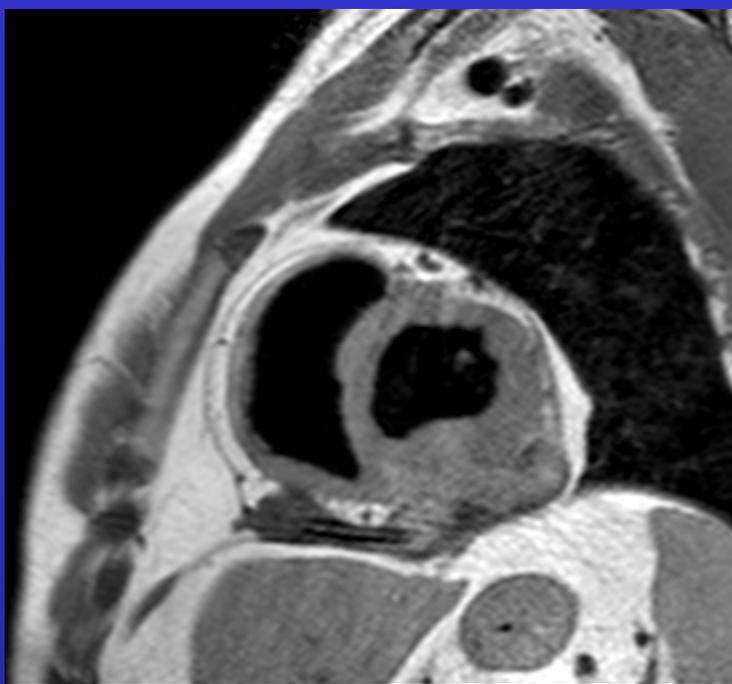


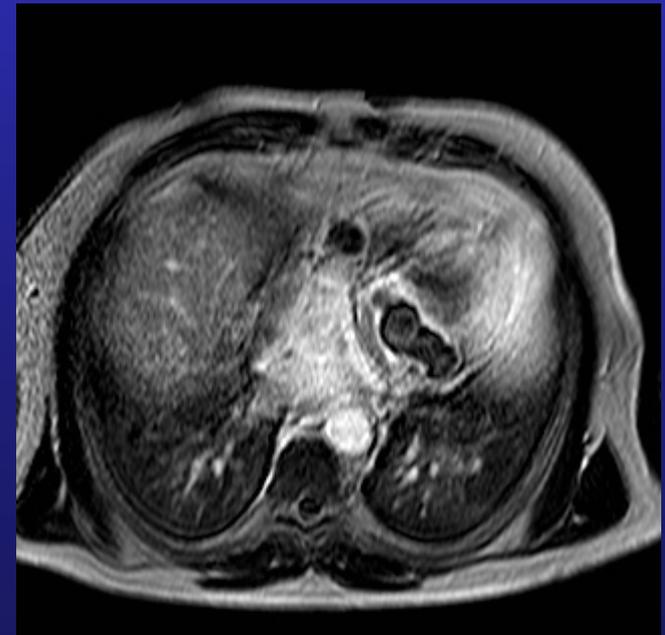
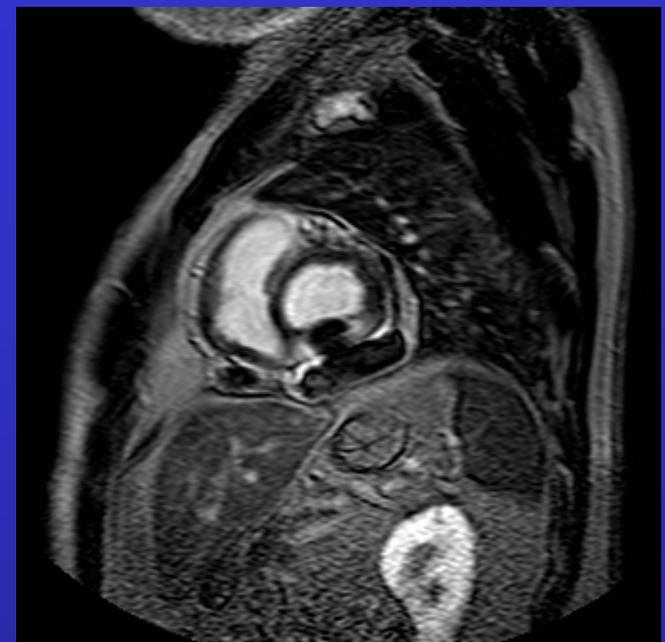


mesotelioma pericardico

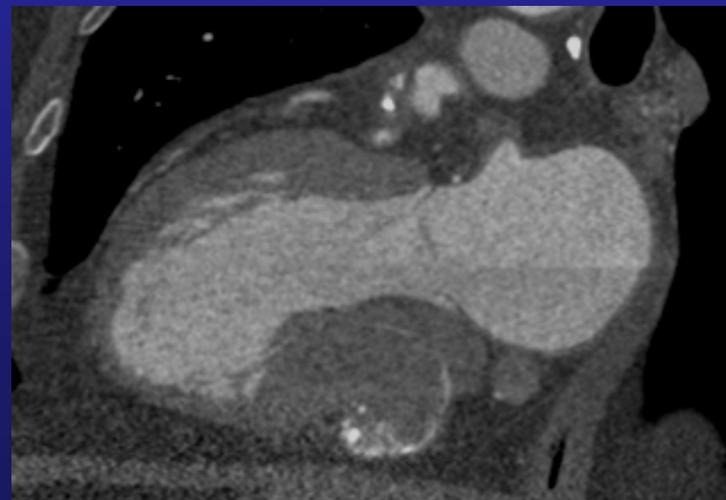
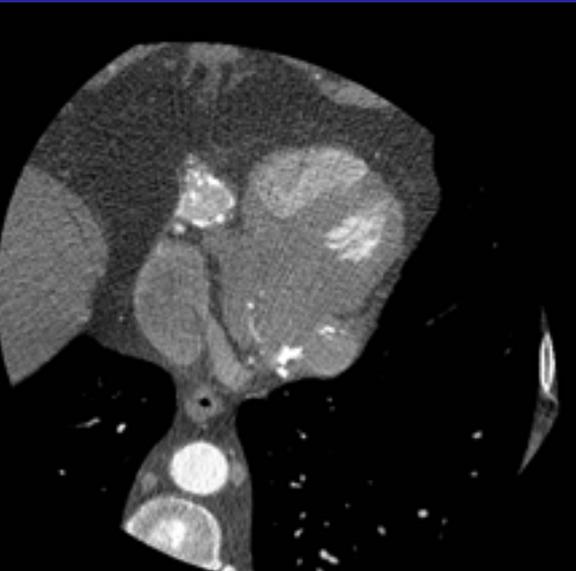
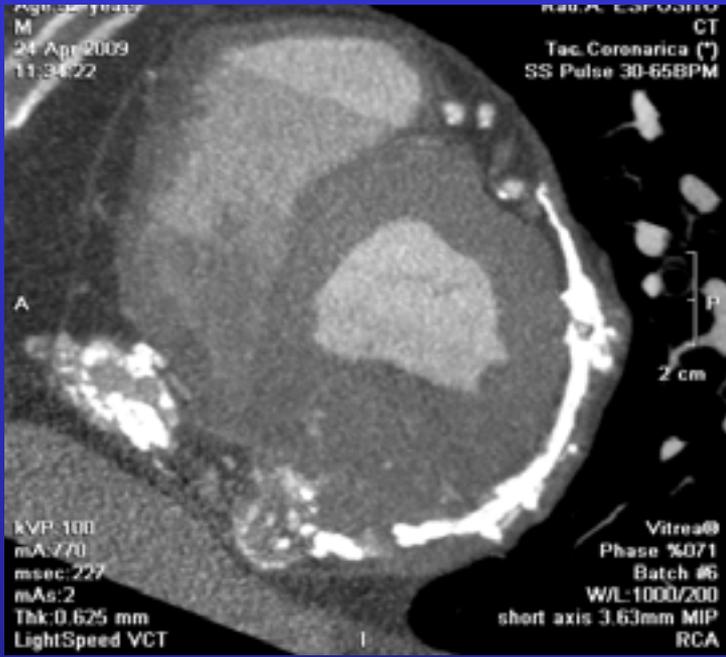
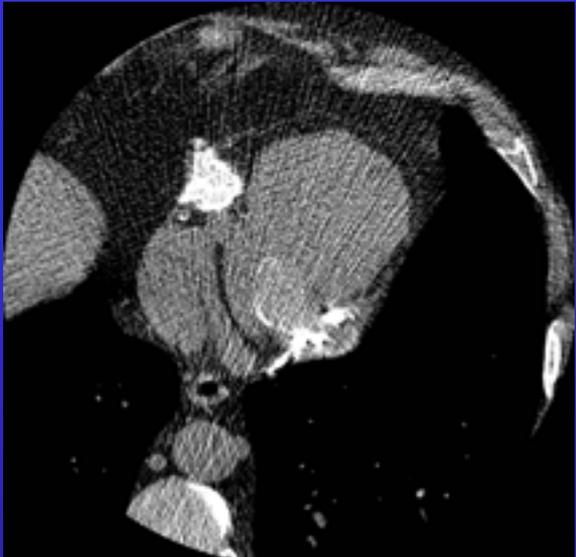


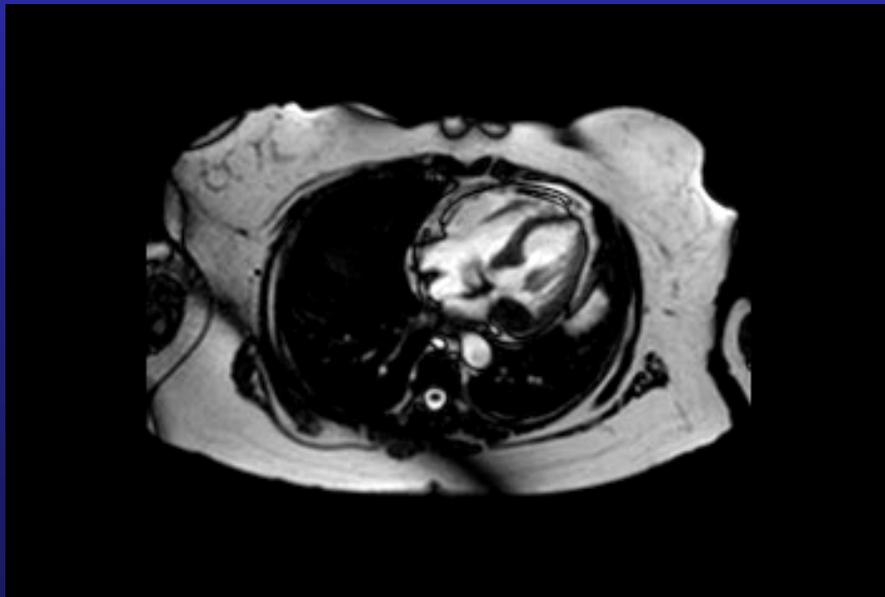
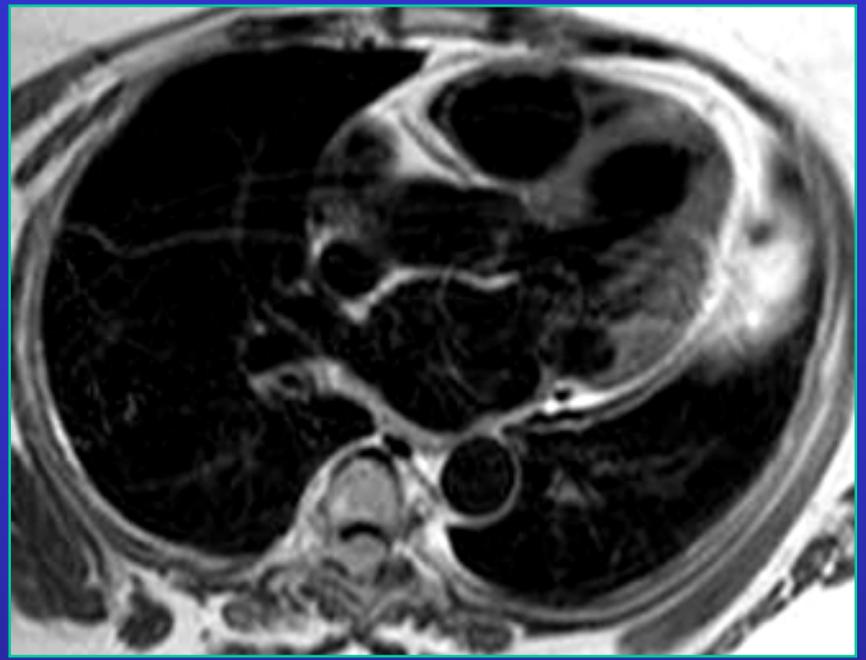
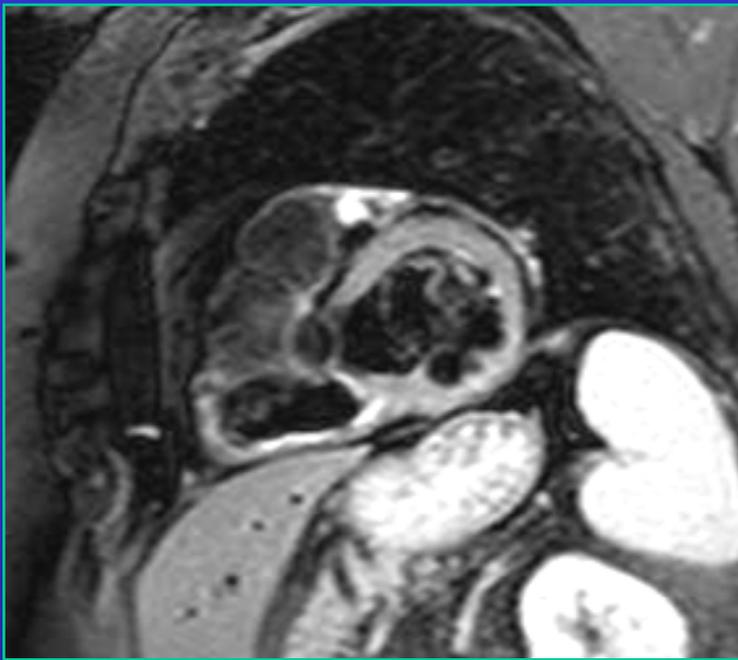
**rabdomiosarcoma:** origine ventricoli, sviluppo intramurale infiltrante, segnale iperintenso in T2 con enhancement disomogeneo (necrosi)





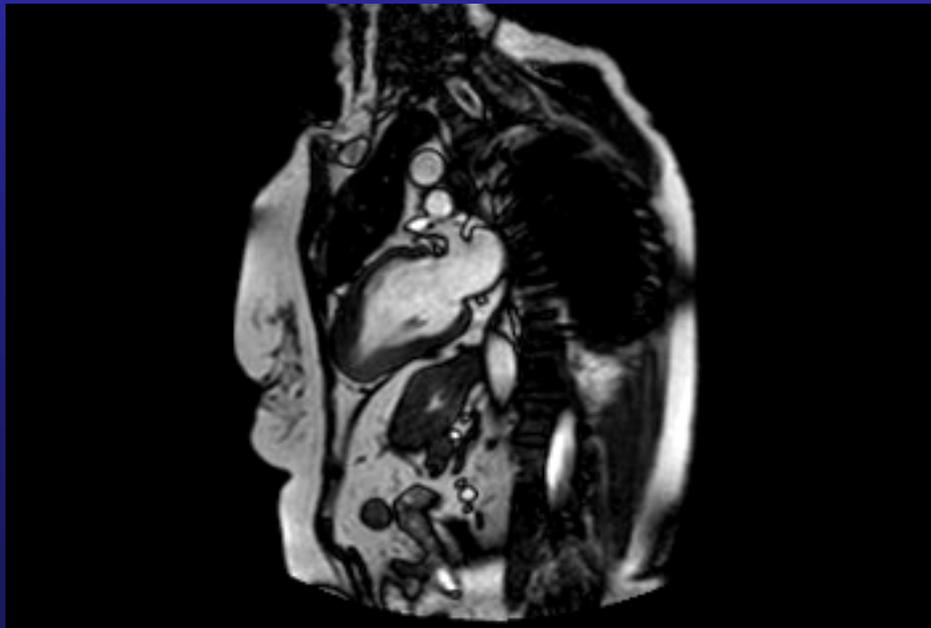
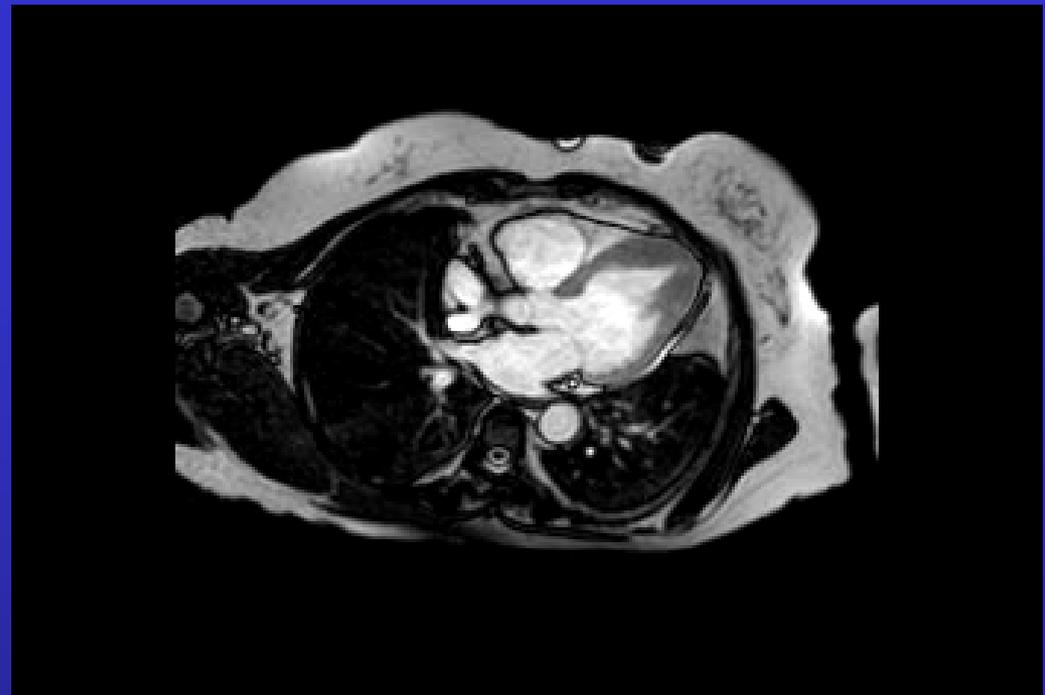
**DD sarcomi VS  
granulomi da necrosi caseosa**  
Sede anulus mitralico posteriore  
Segnale ipointenso  
Calcificazioni periferiche in TC

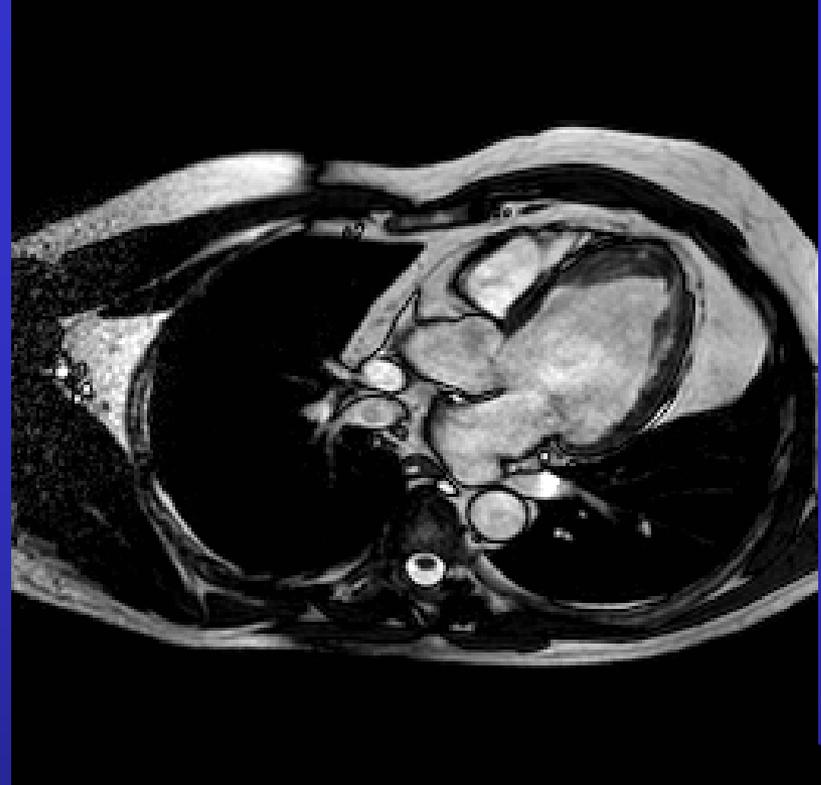
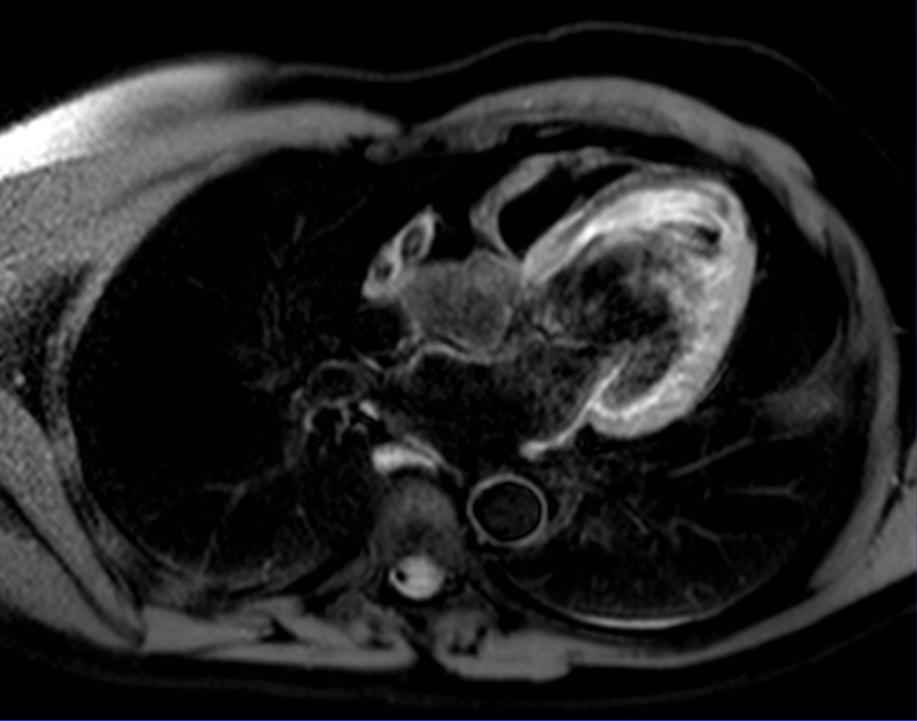




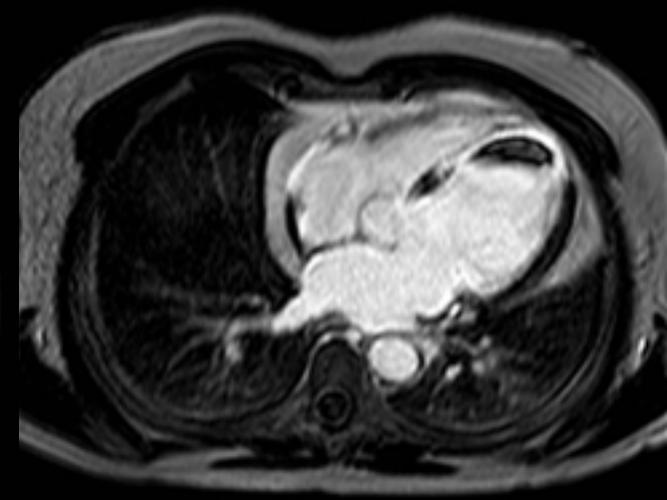
granuloma caseoso

# HCM apicale





trombo su esito ischemico



# Tumori cardio-pericardici

**RM** dopo ETT e/o ETE



- conferma sospetto diagnostico
  - estensione locoregionale, infiltrazione
  - caratterizzazione
  - pianificazione chirurgica, follow-up
- Sequenze: morfologiche FSE black-blood+FatSat, cine, perfusione, late enhancement