

Milano, 17 – 19 giugno 2009

III Convegno Nazionale di Ecocardiografia

Imaging non Invasivo di II livello

La RM nelle pericarditi e nelle masse intra ed extra
cardiache

S. Biasi

Second step : MR or CT on availability (8A)

MR:

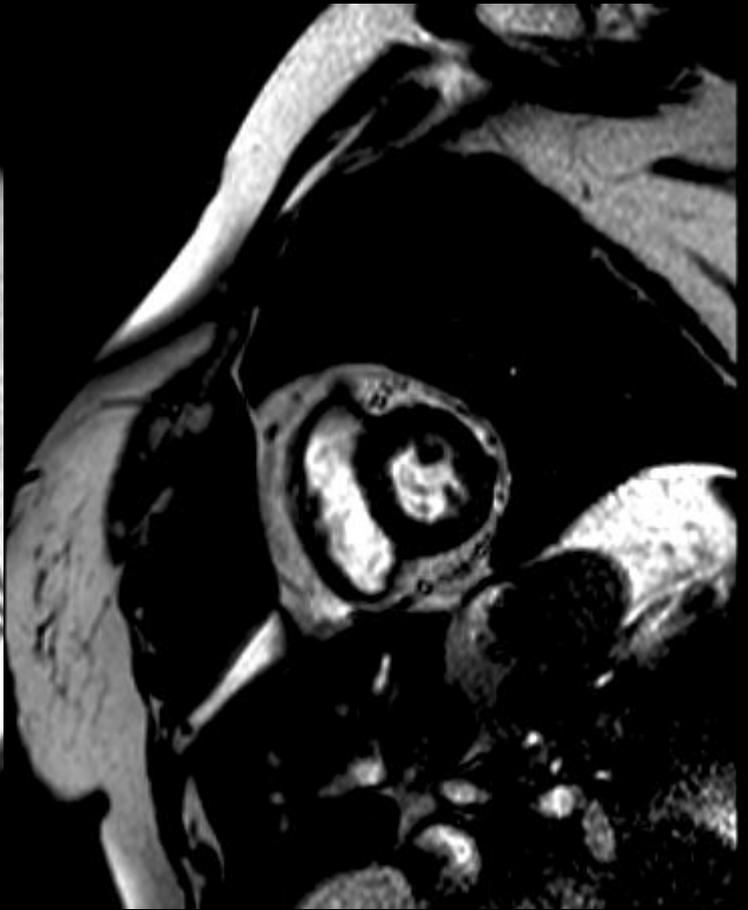
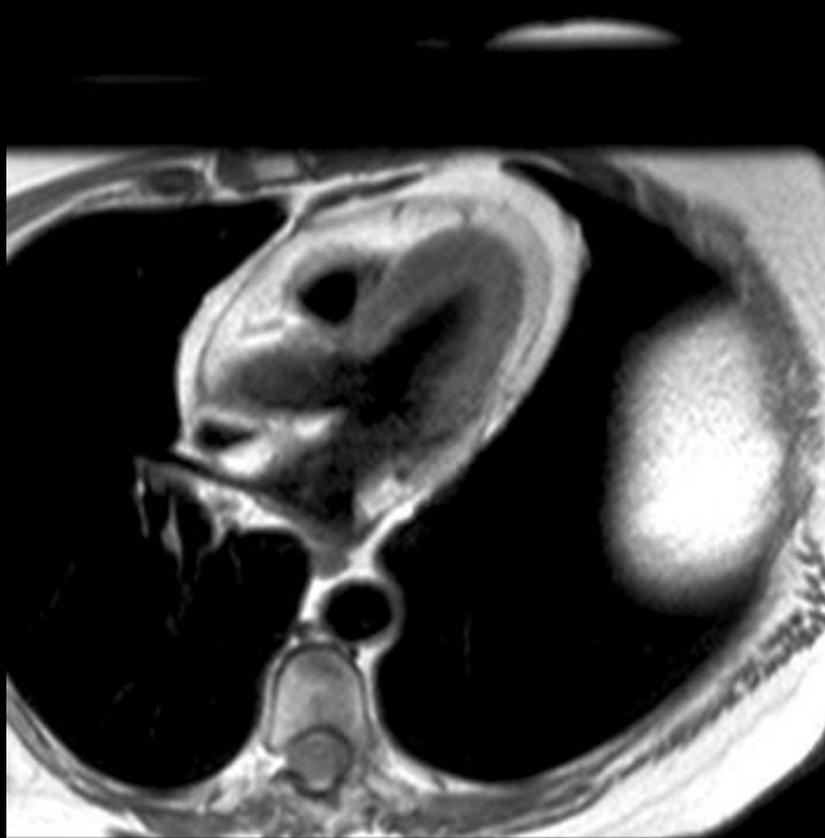
No ionizing radiation

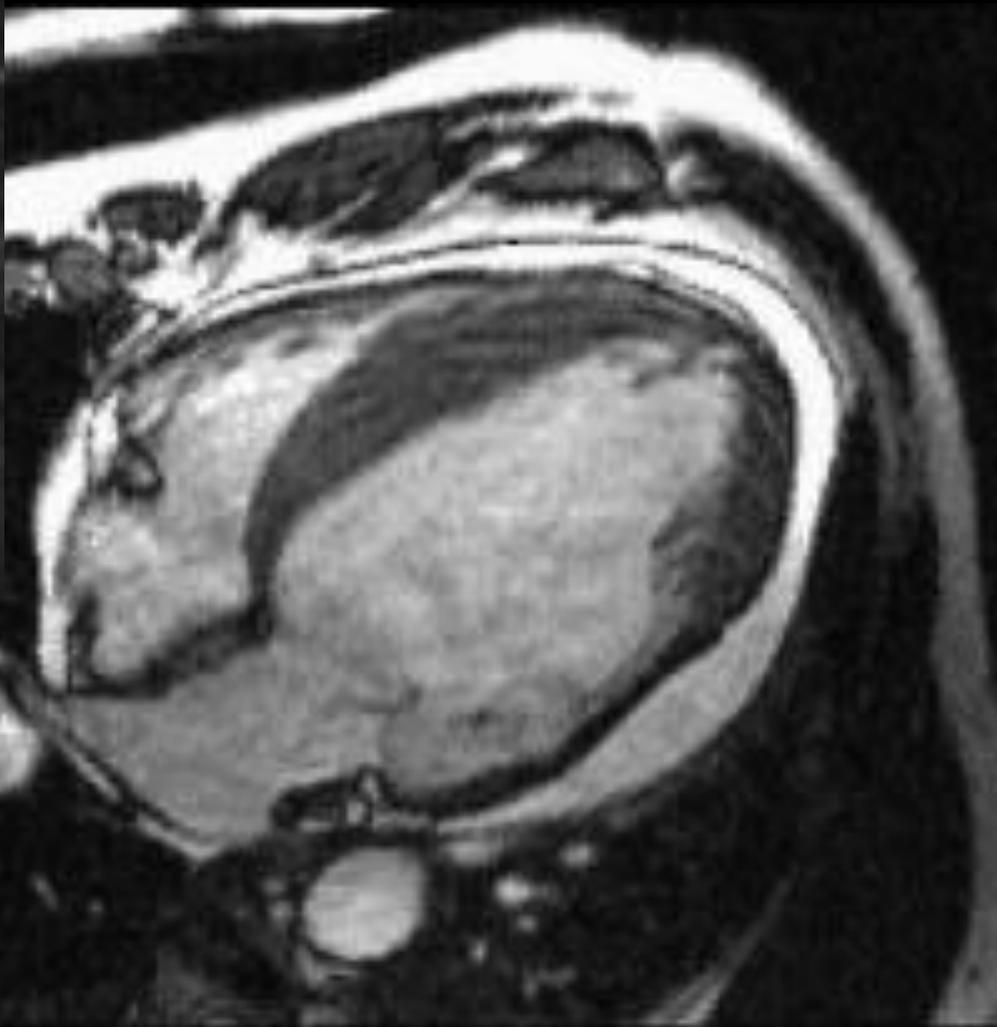
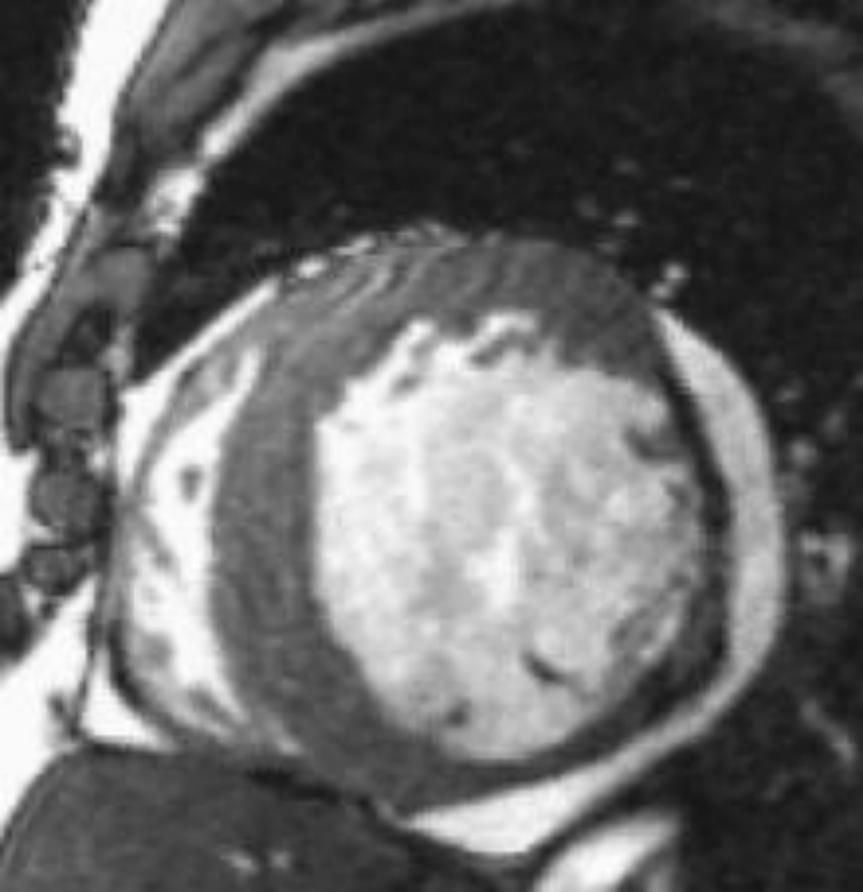
Useful for diagnosing haemorrhagic effusion

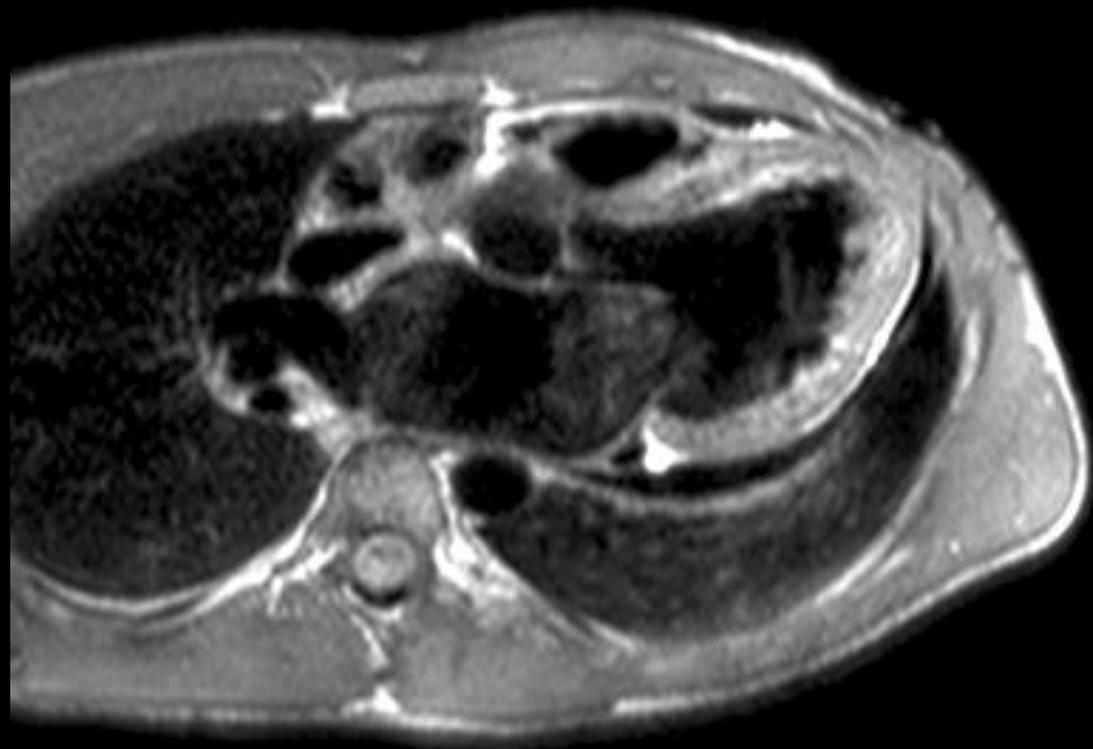
Associated pathology

Anatomical details (pitfalls in echocardiography)

Spatial resolution (pericardial thickness)



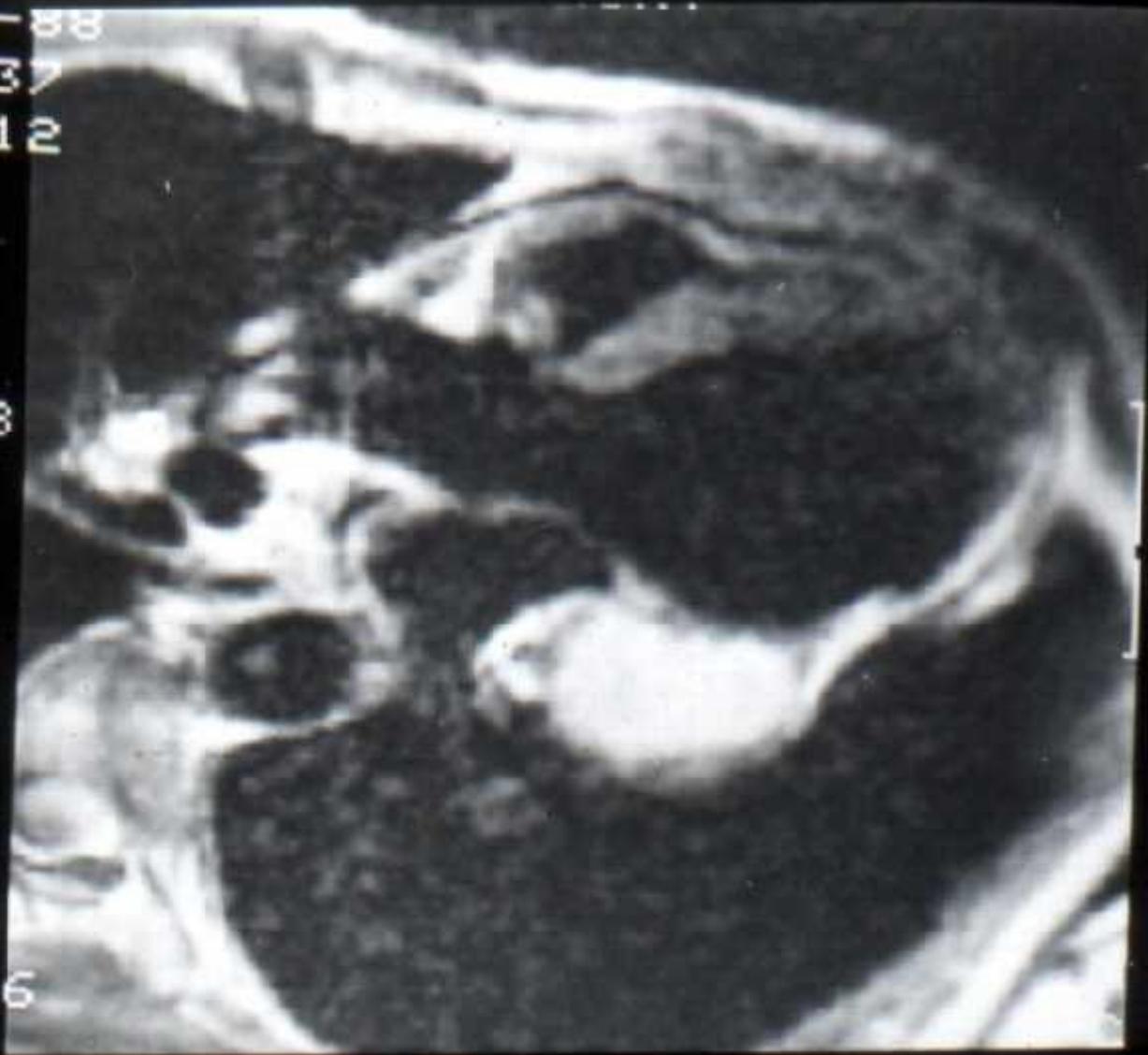




JUL-88
16:37
RE>12

1.78

88
30
8.0
28.6
47



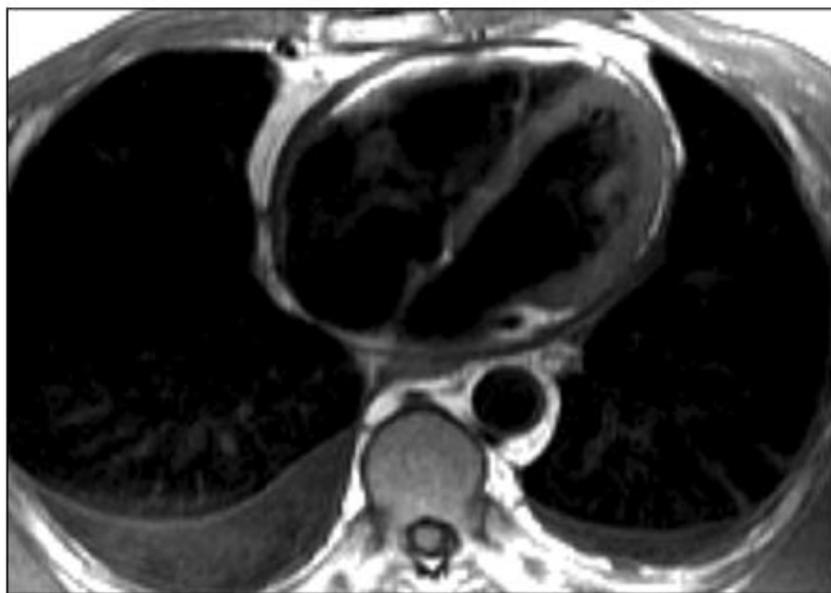
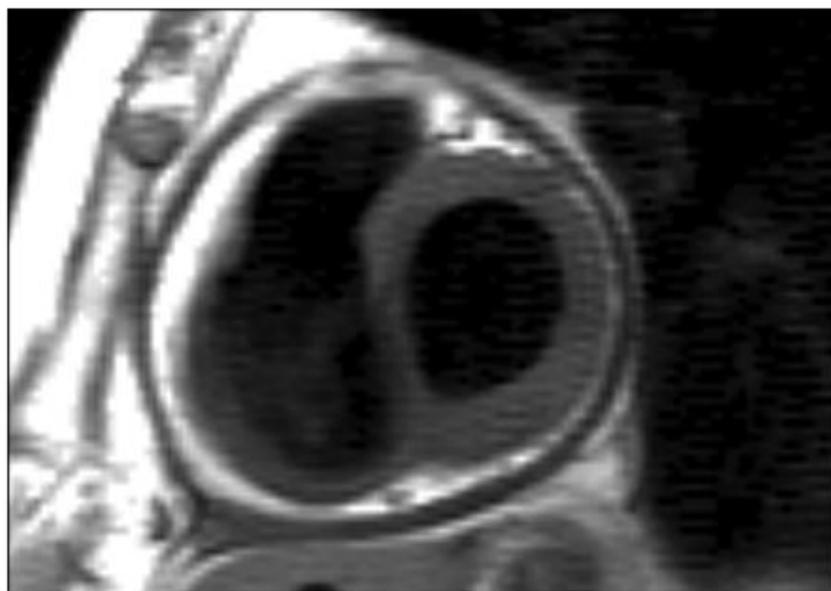
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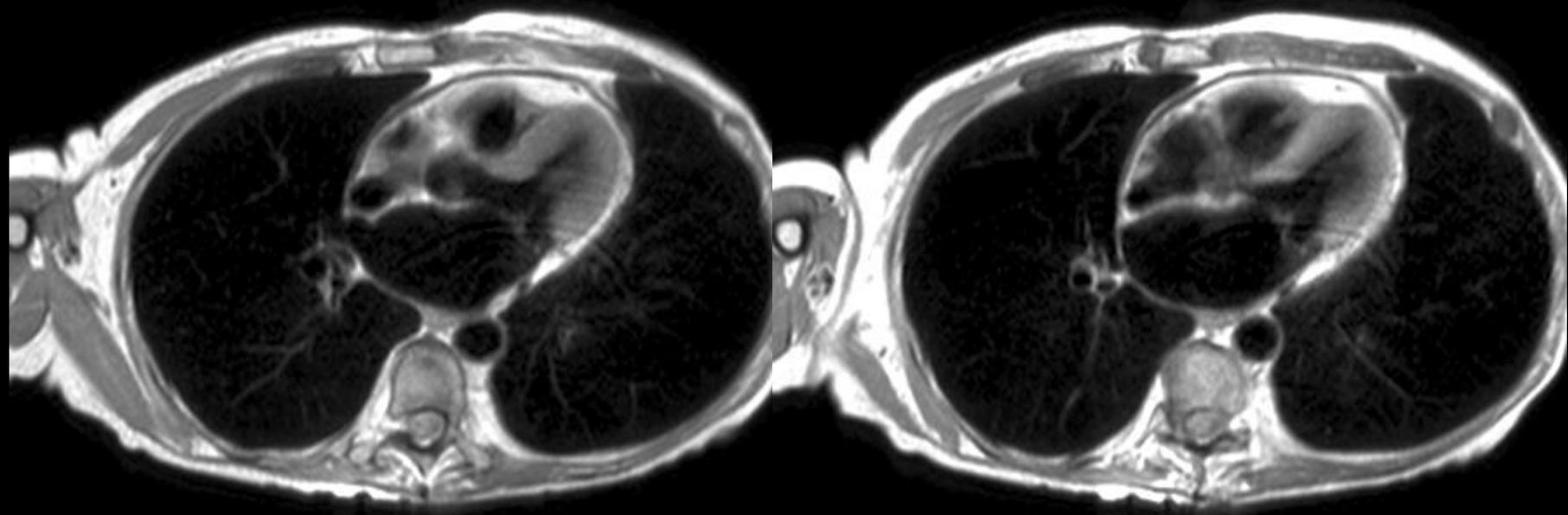
LEFT

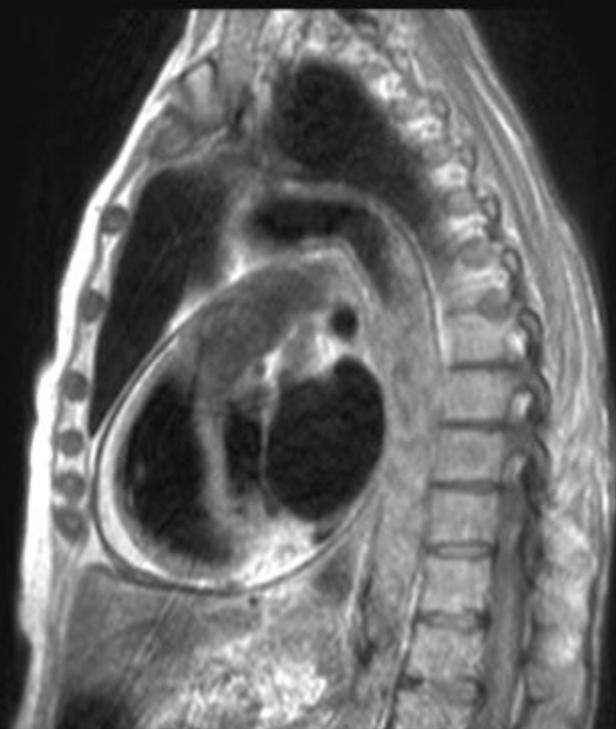
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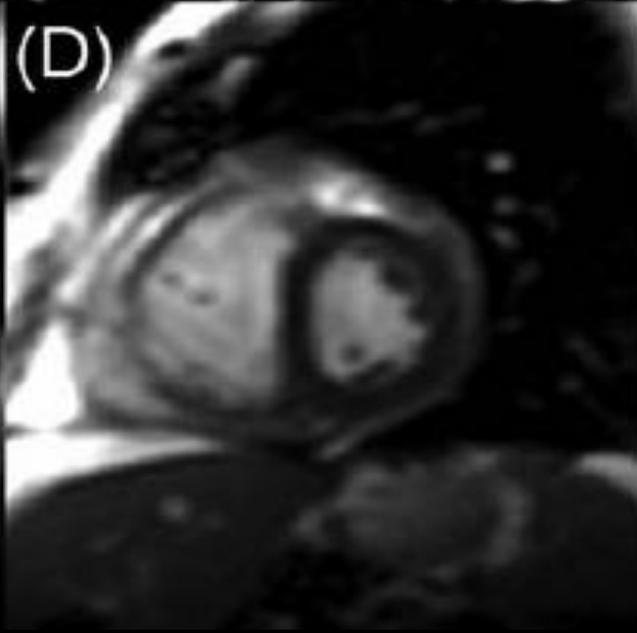
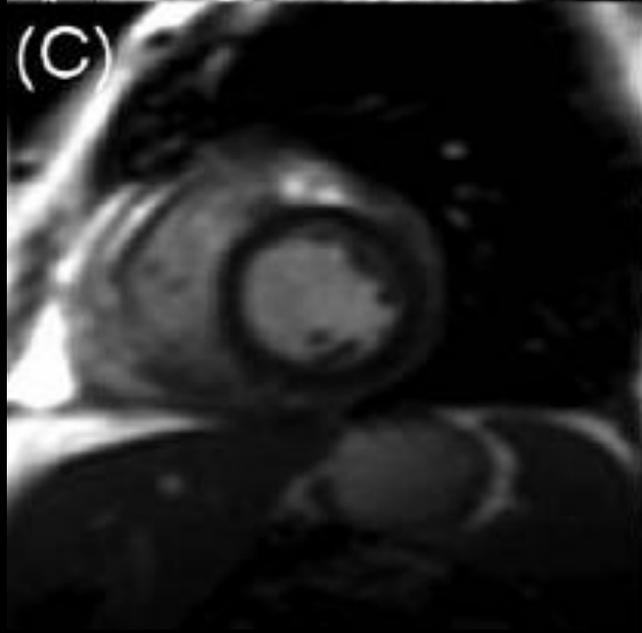
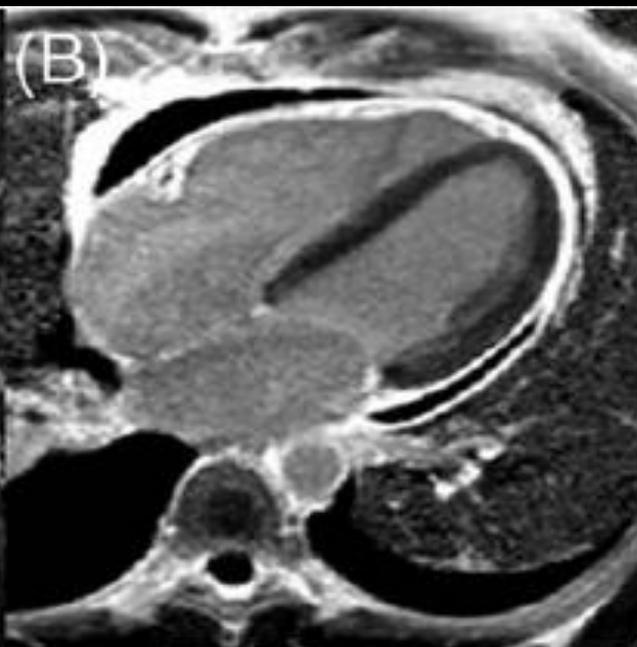
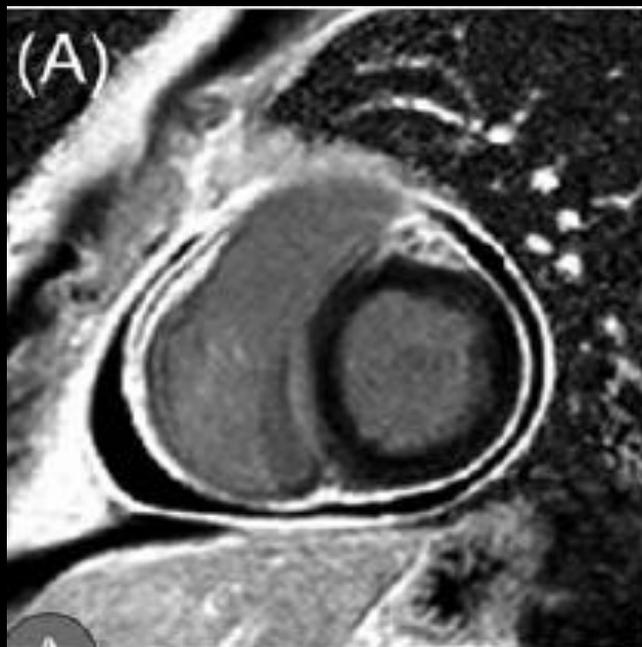
128
27

Chronic Constrictive Pericarditis, in a Patient Presenting with Increased Dyspnea









CISTI PERICARDICA



Criteria di appropriatezza per TC e MR

TC - A 8

- Evaluation of cardiac masses (suspected tumor or thrombus in pts with technically limited images from echocardiogram, MRI or TEE).

MR - A9

- Evaluation of cardiac masses
Use of contrast for perfusion enhancement

Informazioni

- Sede
- Estensione
- Rapporti con le strutture adiacenti
- Caratterizzare il tessuto (ipotesi di diagnosi istologica)
- Caratteristiche di benignità o malignità

Paediatric heart tumours

- ▶ Hamartomas
 - Rhabdomyoma
 - Fibroma
 - Purkinje cell hamartoma/histiocytoid cardiomyopathy
- ▶ Germ cell tumours

Benign tumours, seen primarily in adults

- ▶ Non-neoplastic masses
 - Mural thrombi
 - Lipomatous hypertrophy, atrial septum
 - Papillary fibroelastoma
- ▶ Benign neoplasms
 - Myxoma
 - Paraganglioma/pheochromocytoma

Malignant neoplasms

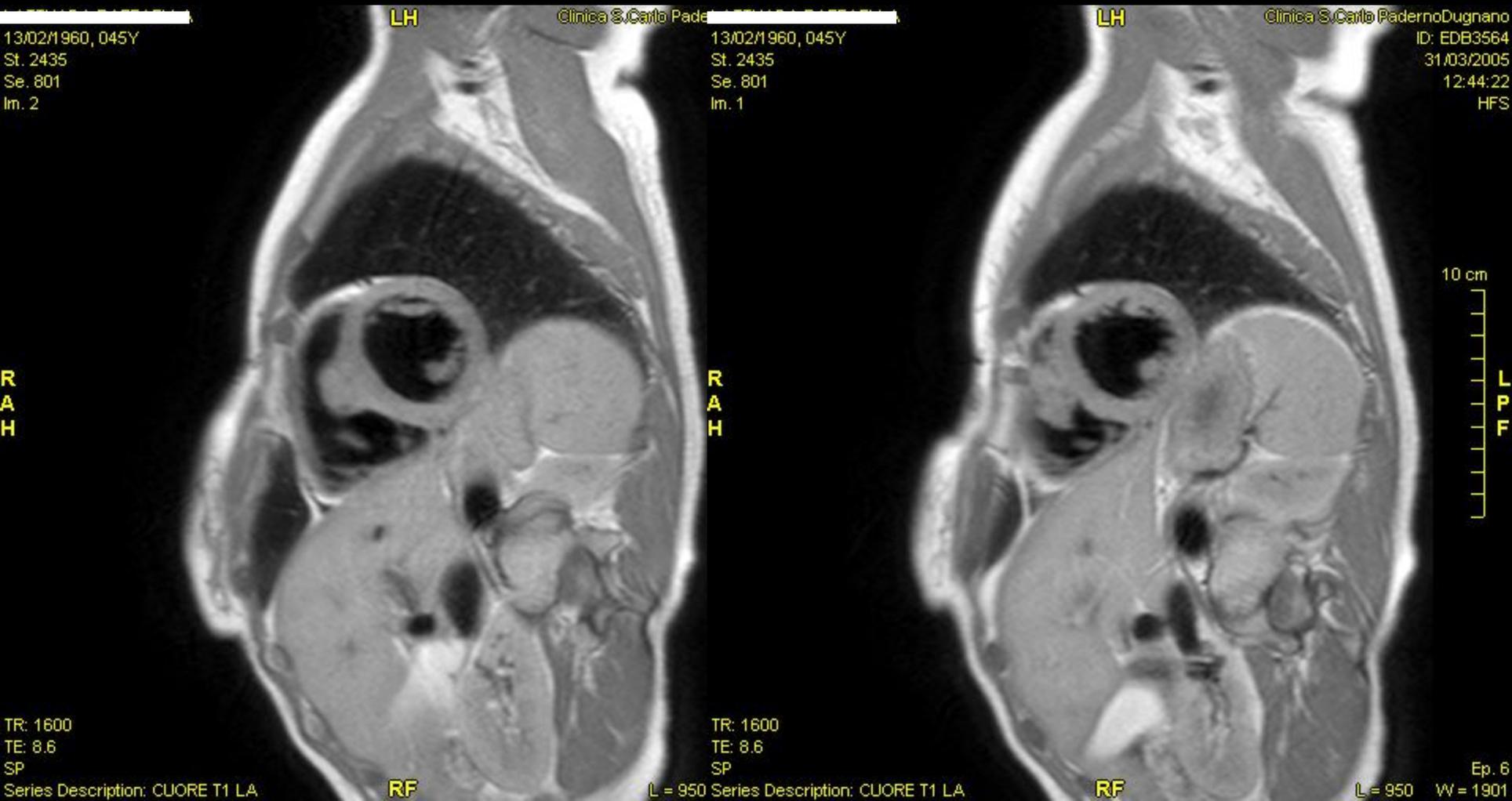
- ▶ Sarcomas
 - Angiosarcoma (mostly right atrium/pericardium)
 - Sarcomas with myofibroblastic differentiation (mostly left atrium)
 - *Undifferentiated/malignant fibrous histiocytoma*
 - *Leiomyosarcoma*
 - *Fibrosarcoma*
 - *Osteosarcoma*
 - Rhabdomyosarcoma
 - Synovial sarcoma
- ▶ Lymphomas
- ▶ Metastatic tumours (usually right sided)
 - Carcinomas
 - *Renal cell/hepatocellular, mostly intracavitary*
 - Sarcomas
 - Melanoma

Tumour type	%	Mean age at presentation
Rhabdomyoma‡	2	33 weeks
Fibroma‡	2	13 years
Rhabdomyosarcoma	<1	15 years
Haemangioma	1	31 years
Paraganglioma	<1	39 years
Sarcoma (angiosarcoma)	4	40 years
Sarcoma (myofibroblastic)	9	41 years
Myxoma	76	50 years
Papillary fibroelastoma	5	59 years
Lipomatous hypertrophy/lipoma	<1	64 years
Primary lymphoma	1	67 years

*Based on 250 tumour resections from 5 recent institutional surgical series.¹⁻⁵

Site, imaging characteristics	Most likely	Others
Left atrium, cavitory (pedunculated or broad based attachment)	Myxoma	Sarcoma, metastasis (extension of lung primary), haemangioma, paraganglioma
Left atrium, involving wall/pericardium	Sarcoma (fibrous or myogenous differentiation)	Lymphoma, metastasis, haemangioma, paraganglioma
Right atrium (cavitory mass)	Myxoma	Idiopathic thrombus, lipomatous hypertrophy, metastasis (especially renal cell, hepatocellular carcinoma), haemangioma
Right atrium, involving wall/septum pericardium	Angiosarcoma	Lipomatous hypertrophy, lymphoma, haemangioma, paraganglioma
Valve	Papillary fibroelastoma	Myxoma, hamartoma
Ventricle (cavitory mass)	(Rare)	Sarcoma, lipoma, haemangioma, myxoma, idiopathic thrombus, metastasis (right ventricle), inflammatory myofibroblastic tumour
Ventricle, involving wall	(Rare)	Haemangioma Lipoma Lymphoma sarcoma, including rhabdomyosarcoma
Pericardium	Metastasis	Mesothelioma, lymphoma, sarcoma, (especially angiosarcoma, synovial sarcoma), haemangioma, lymphoma, solitary fibrous tumour, lipoma

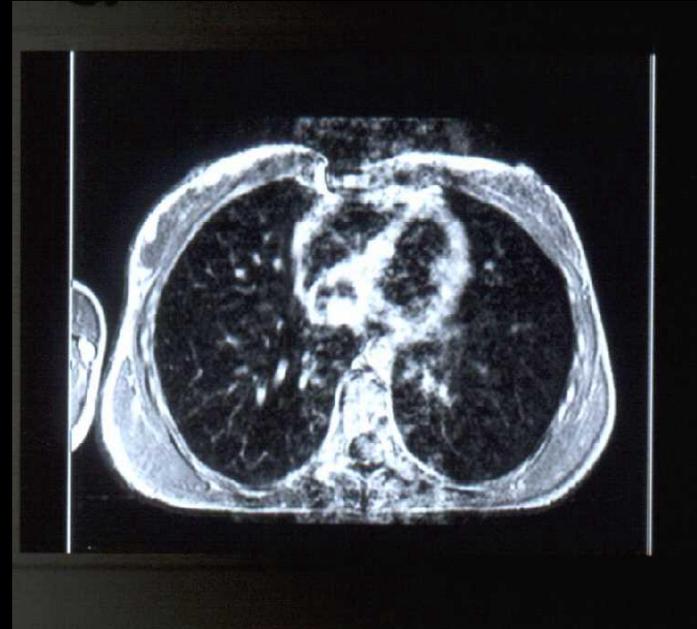
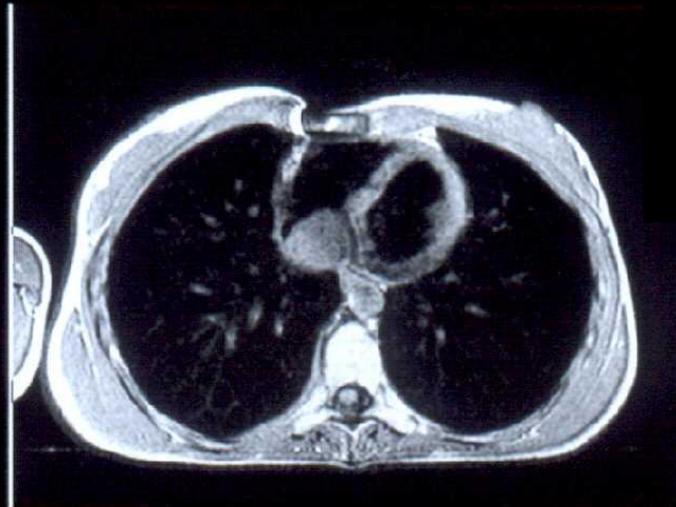
Neoformazione ventricolo destro



ANGIOSARCOMA: inomogeneità gadolinio

T1

CONTRASTO

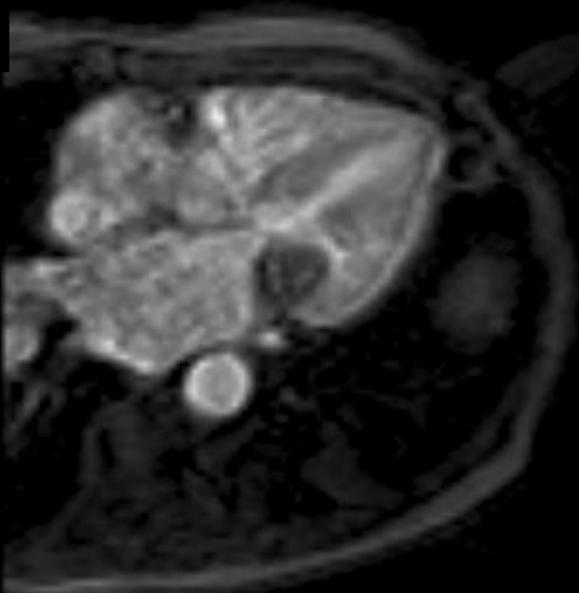
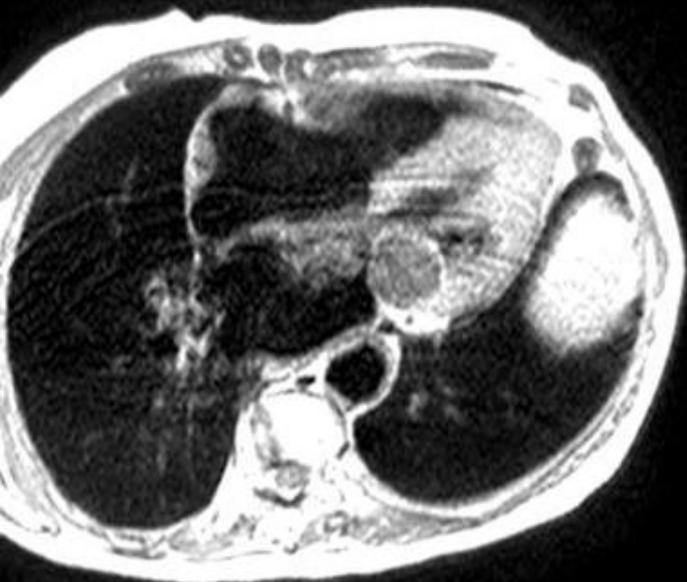


Enhancement del Gadolinio

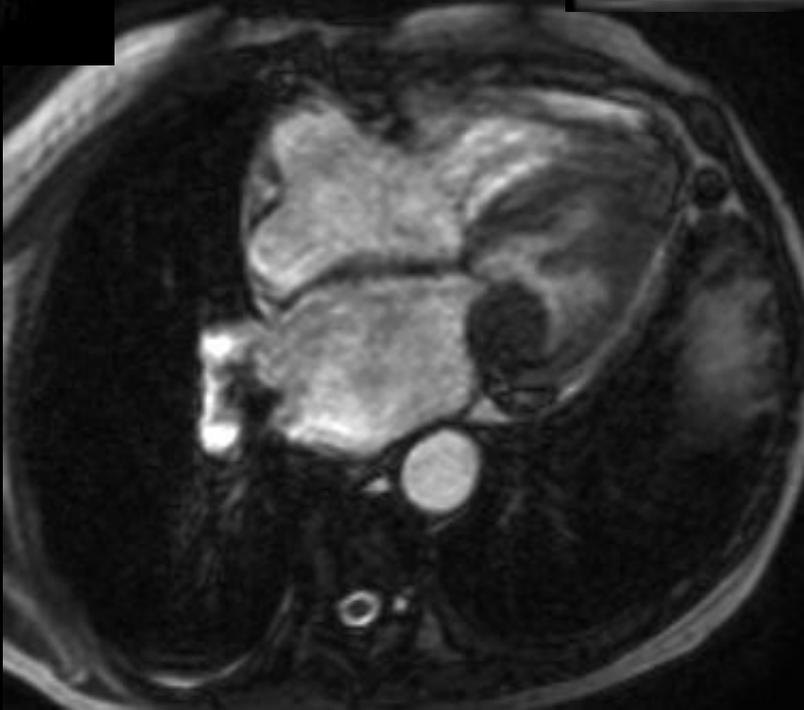
La specificità dell'enhancement del gadolinio per i tumori maligni aumenta solo quando si verifica un incremento medio o elevato del segnale .

Un incremento lieve può essere presente anche in tumori benigni.

Gadolinium



T 1



Gradient -cine

517
I. T. / MI DIV. CARDIOLOGIA
E 5 MHZ T
70.79 %
08 C2 E1
36 HZ

11 21
CINELOOP (R) REVIEW



COSIMO

0913

1

UP

T D1



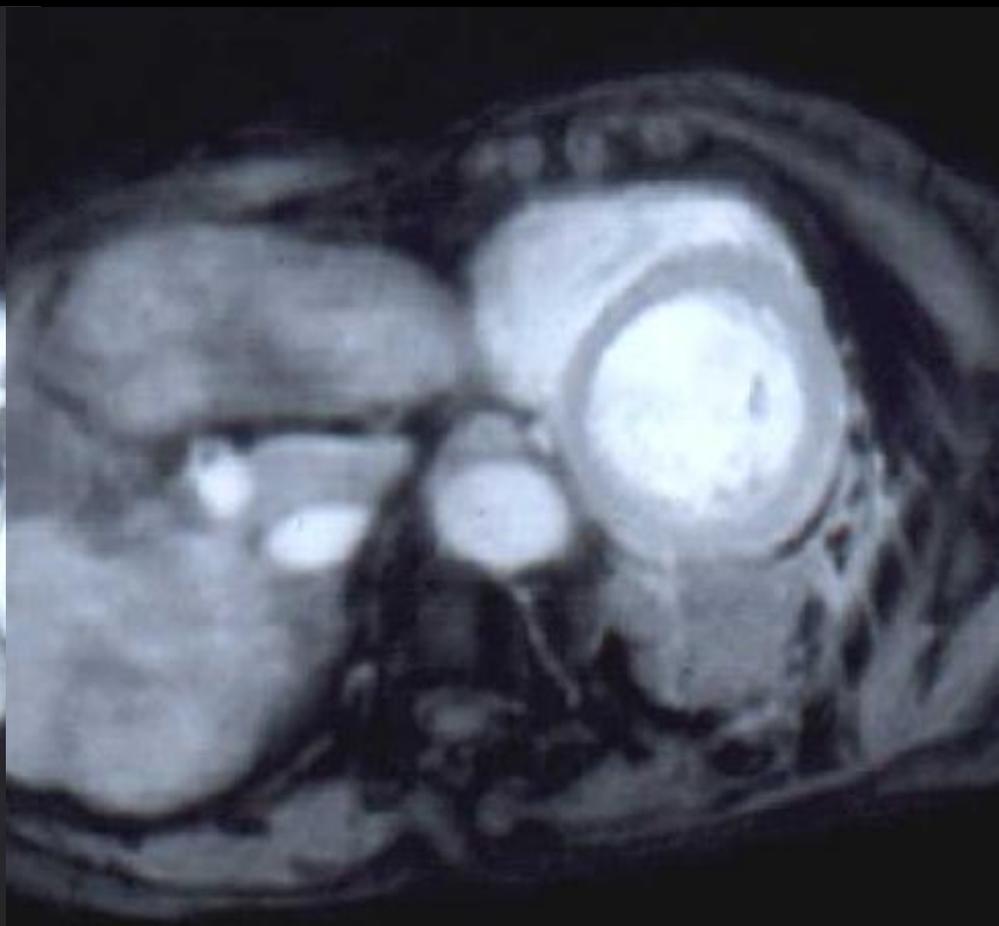
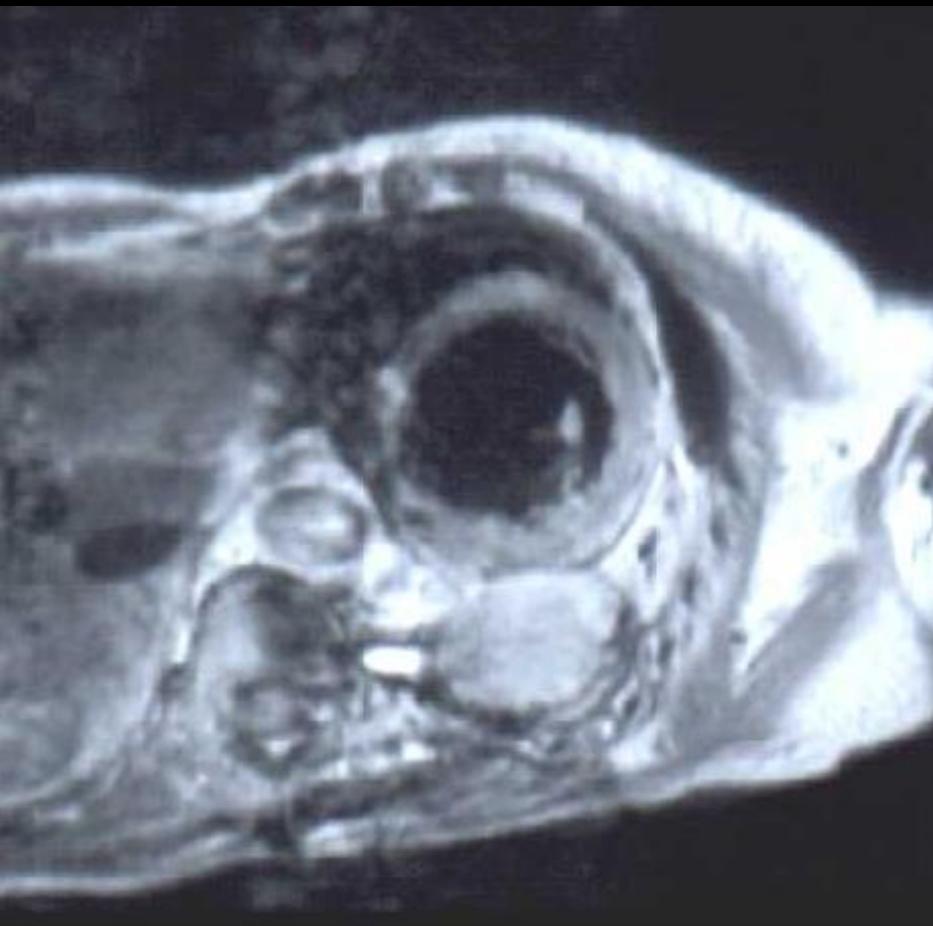
EC/RF

DATE: 11/10/83
TIME: 11:53
PATIENT: T. W. H.
CLINICAL: DIV. CARDIOLOGIA
REF: 74-107
BY: [unreadable]
TECH: [unreadable]

47 May 83
11:53



Infiltrazione del miocardio



Indicatori di malignità

Alta specificità:

- ✓ Infiltrazione dei tessuti adiacenti.
- ✓ Dimensioni del tumore superiore ai 5 cm.
- ✓ Presenza di versamento pericardico o pleurico

Hoffman et al.

Am J Cardiol 2003;92 :890

Indicatori di malignità

Alta sensibilità:

- ✓ localizzazione esterna al cuore
- ✓ inomogeneità
- ✓ enhancement del gadolinio

Hoffman

Am j cardiol 2003;92: 890

Tumors of the heart: review of the subject and report of 150 cases

“Tumors of the heart are rarely diagnosed before autopsy. Surgical treatment of these neoplasms is virtually unheard of, and the present state of diagnosis is far behind the therapeutic possibilities.”

Several authors have wholeheartedly subscribed to the view that the diagnosis of cardiac tumors is either impossible or a matter of chance. Seen from the threshold of an era of ever bolder cardiac surgery, these tumors present a dismal diagnostic prospect”

Prischard

Arch.Pathol 1951;51: 98

TIPI DI ENERGIA

Eco - TC - RM

- Ultrasuoni
- Radiazioni Ionizzanti (mezzi di contrasto iodati)
- Magnetismo (contrasto spontaneo / Gadolinio)

Ecocardiografia - Risonanza Magnetica - TC

Interagiscono con la materia in modo differente

- Calcio

- Tessuti molli

- Liquidi

SVOLTA NELLA DIAGNOSI

L'Ecocardiografia in tutte le sue varianti tecnologiche rimane il 1 step diagnostico.

MAGNET M 1.5 T

I.N.T. MILANO

ARIA

T D1 EB

2SE

0538

UP

H-SP

13-MAR-92

08:20:30

DISK1>2

L
E
F
T

MF 2.13

5 CM

TR .96

TE 17

SL 10.0

SP 51.6

Y 0

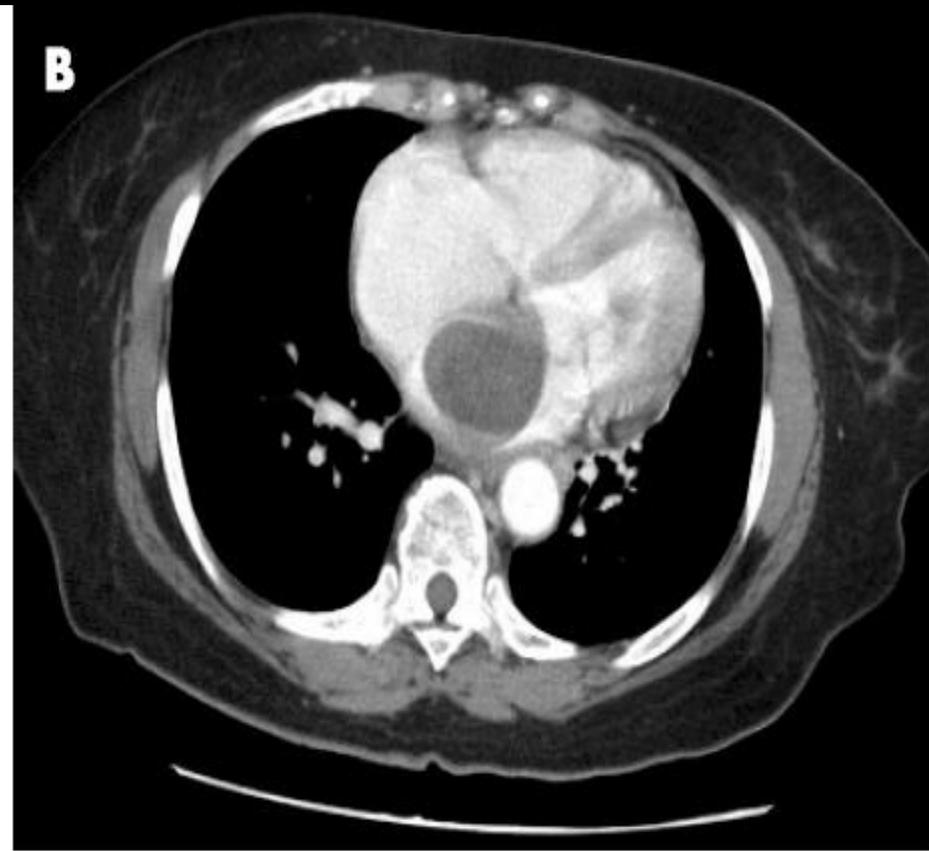
910

377

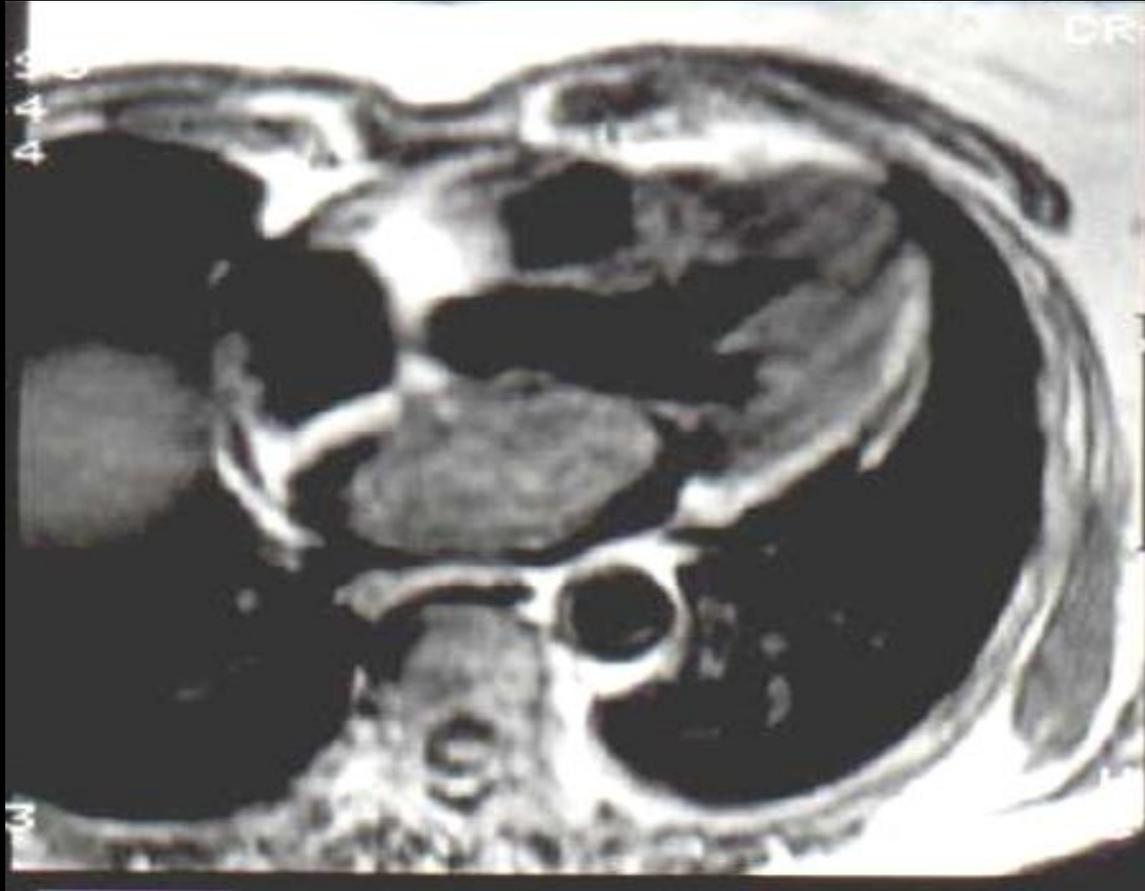
TD 603 RM/RFL



TC Mixoma



MIXOMA (immagine in T1)



Valutazione delle masse intracardiache

APPROPRIATEZZA CMR - TC

- I : INAPPROPRIATE (1 - 3)
- U : UNCERTAIN (4 - 6)
- A : APPROPRIATE (7 - 9)

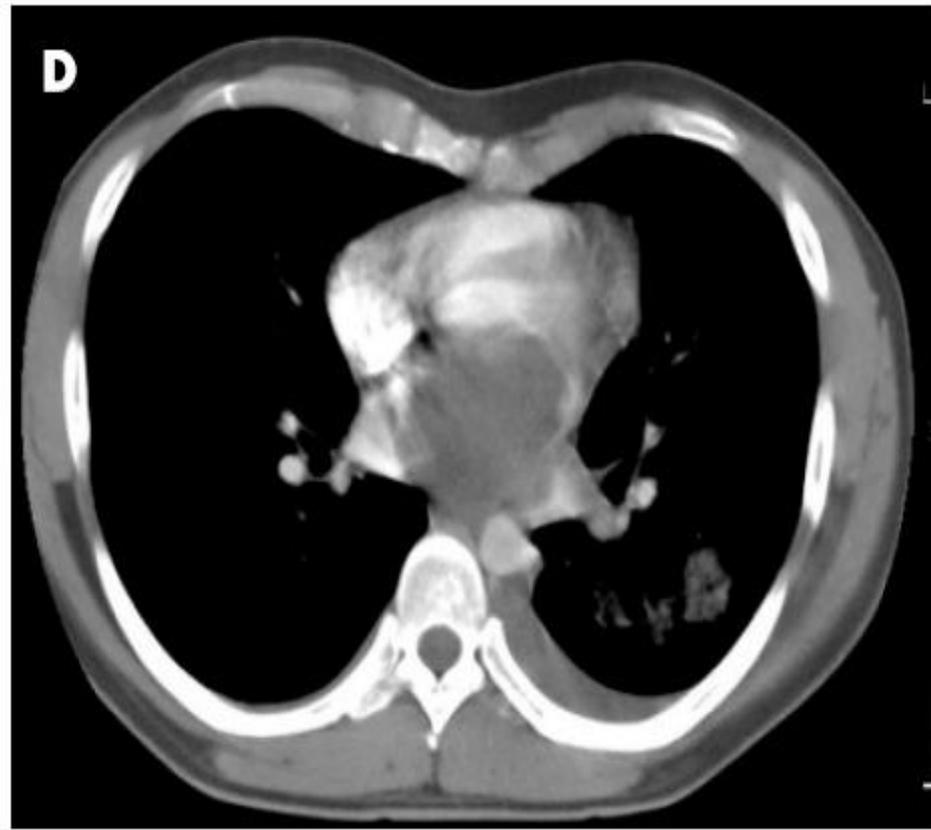
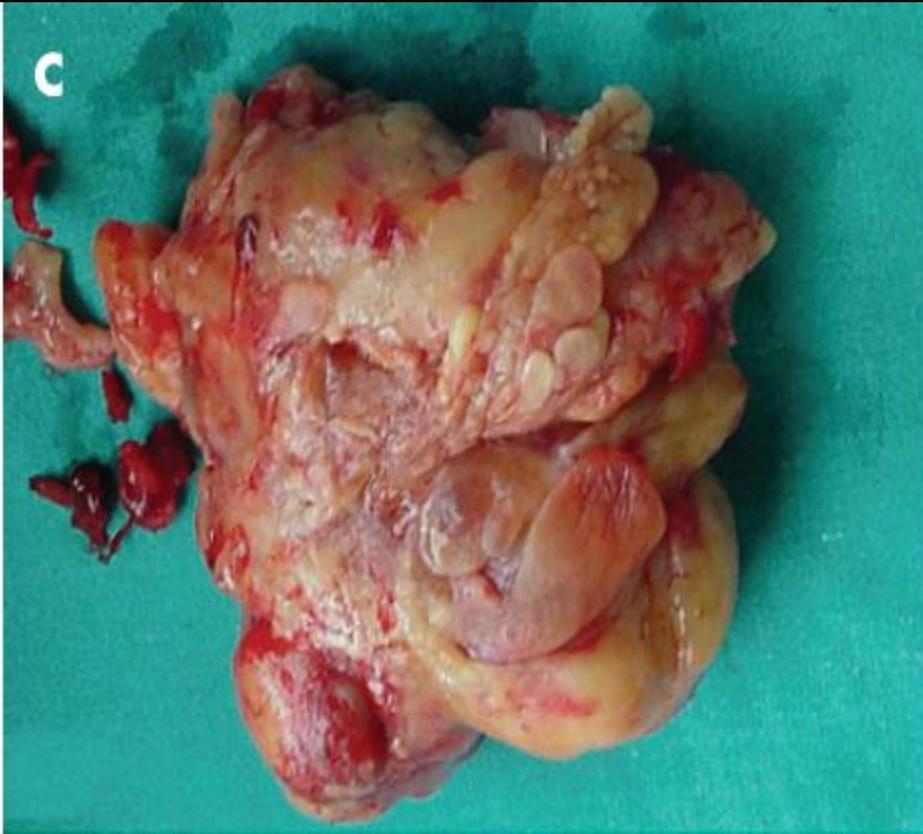
JACC : 2006; 48; 1476 - 1497

TC

I vantaggi e gli svantaggi della TC sono intermedi tra quelli dell'Ecocardiografia e della RM:

- Risoluzione spaziale migliore della RM ma non dell'Eco.
- Contrasto tissutale migliore dell'Eco ma non superiore a quello della RM per valutare le infiltrazioni ed il tipo di tumore.

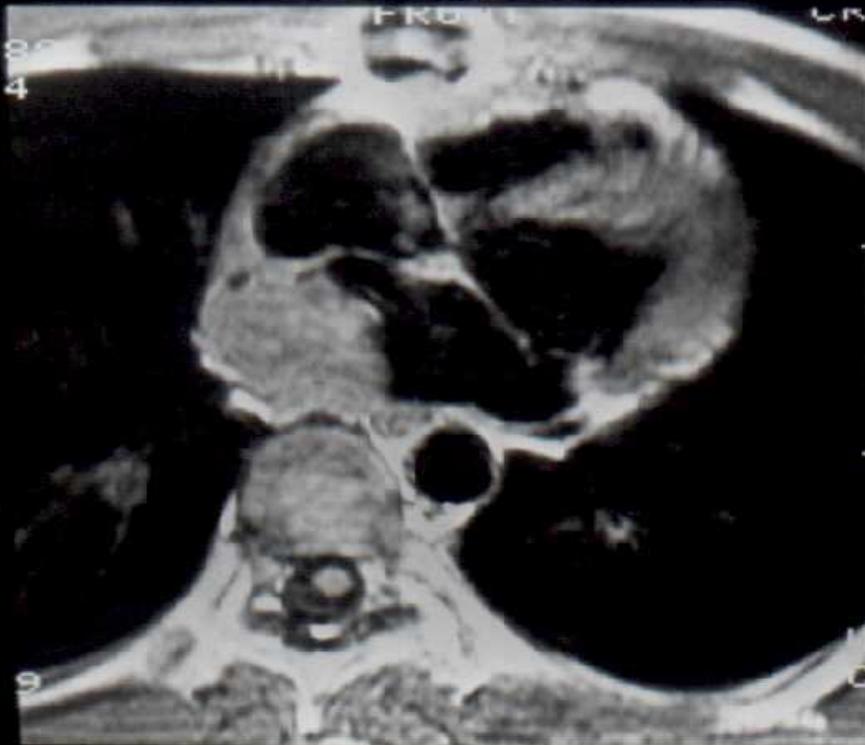
Leiomyosarcoma



Perché la RM

- La RM ha il più alto grado di contrasto tissutale tra le modalità di imaging il che la rende la metodica più sensibile per la rivelazione delle infiltrazioni e la tipologia del tumore.
- Offre maggiori possibilità di manipolazione

SARCOMA



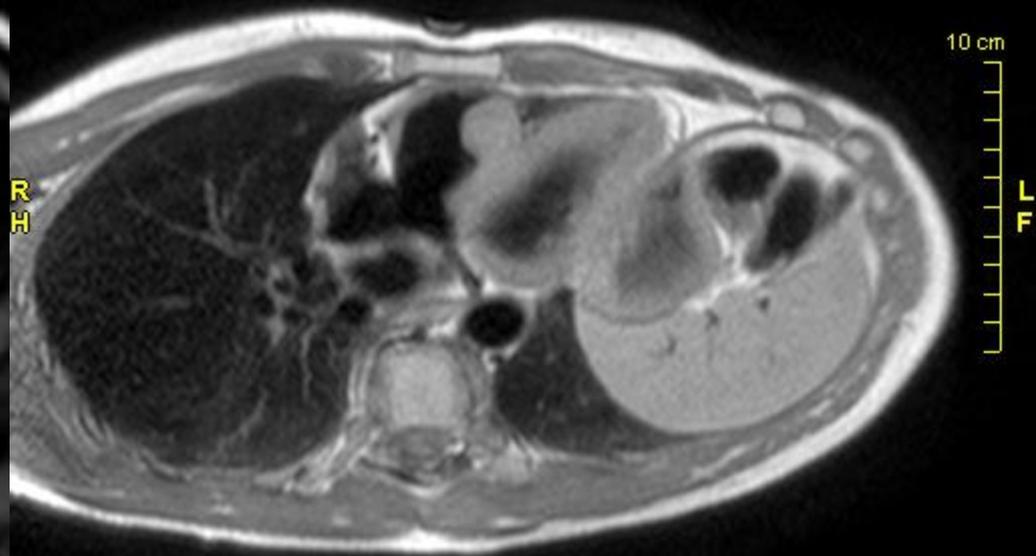
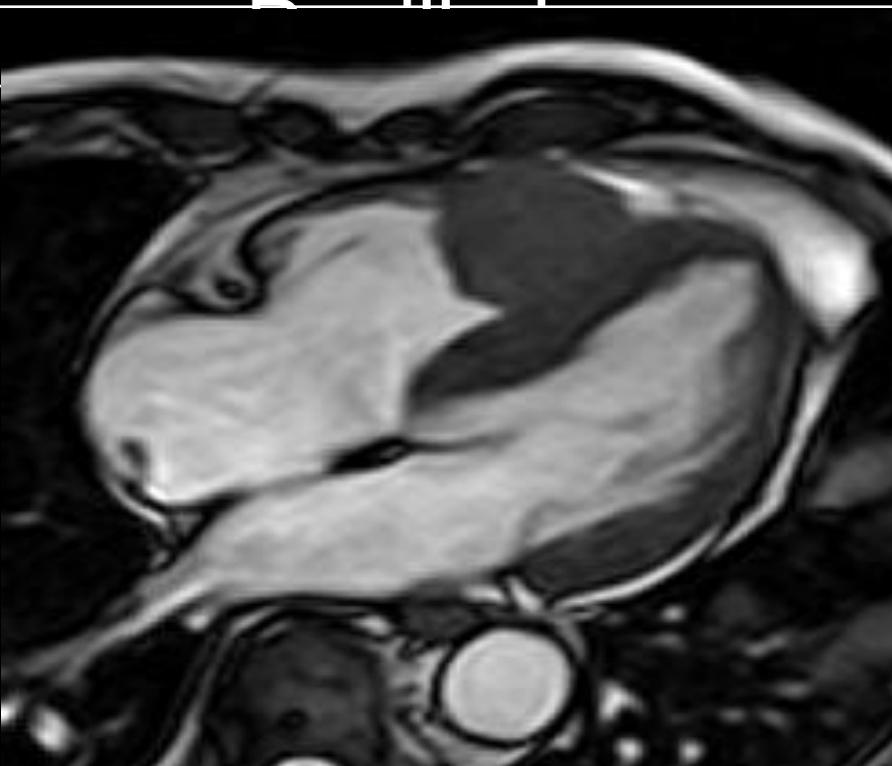
Tumore primitivo

Quattro Camere

L
13/02/1960, 045Y
St. 2435
Se. 1302
Im. 2

A

Clinica S. Carlo PadernoDugnano
ID: EDB3564
31/03/2005
12:36:03
HFS



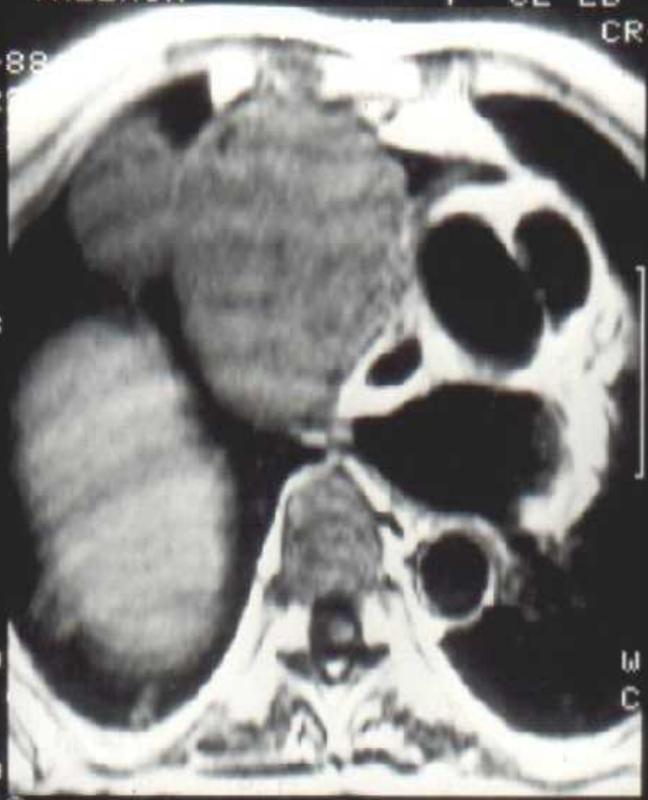
TR: 1600
TE: 8.6
SP

P

Ep. 5
L = 953 W = 1906

VALERIA I.R.I. MILANO
T C2 EB 4SE
CR-H-SP

22-JUN-88
13:26:25
STORE>1



E
LEFT
5 CM

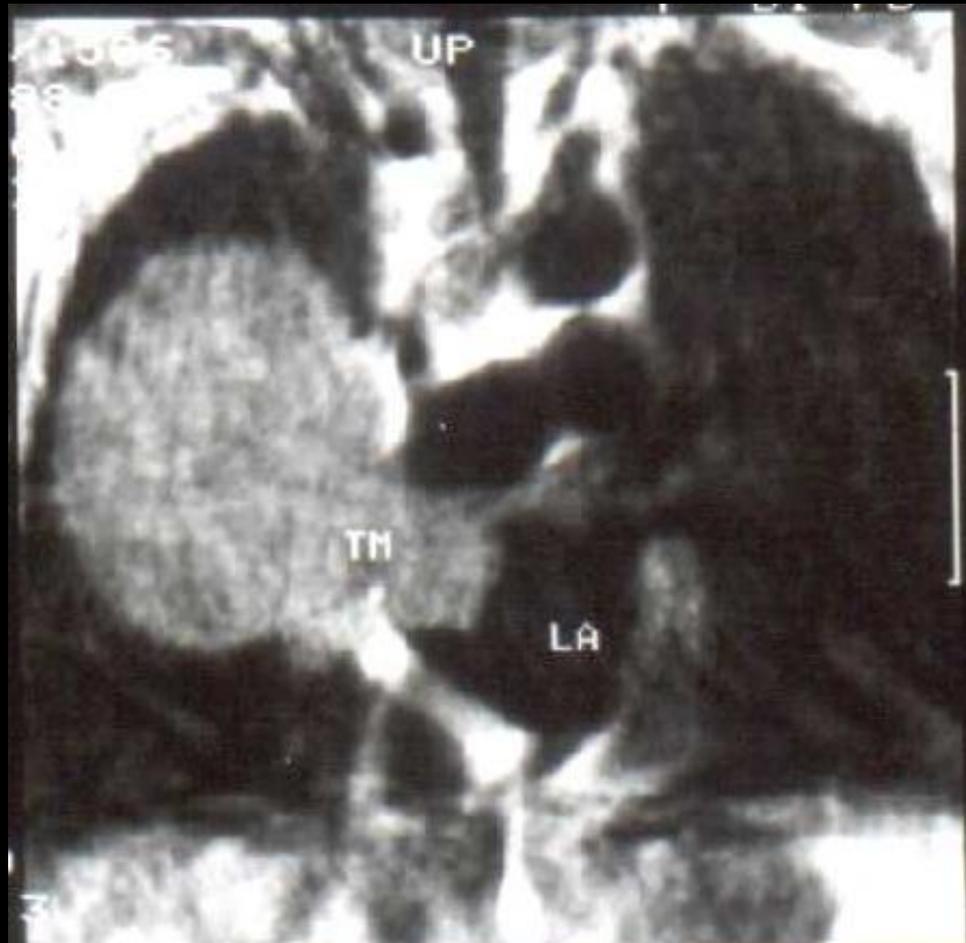
1.78

.59
17
8.0
-49
0
1.50
240

M 707
C 243



Localizzazione Esterna al Cuore



03-JUN-88
14:56:04
STORE>6

MF 1.31

TR .73
TE 17
SL 8.0
SP -16
Z 0
ZF 2.00

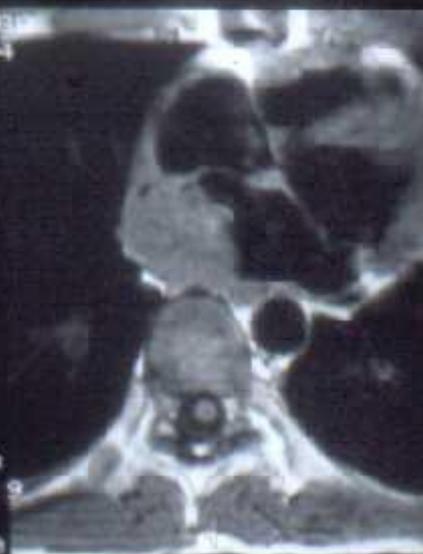


E
LEFT
5 CM

03-JUN-88
14:58:04
STORE>7

MF 1.31

TR .73
TE 17
SL 8.0
SP -4.9
Z 0
ZF 2.00



1049
310

880673371247
24-AUG-88
13:17:33
STORE>15

MF 1.56

TR .75
TE 22



FRONT-H-SP

LEFT
5 CM

880673371247
24-AUG-88
13:17:33
STORE>14

MF 1.56

TR .75
TE 22



FRONT

..... *“Il Paziente con il Sarcoma dell’atrio di cui ti avevo mandato la RM per avere un parere, ha poi deciso di farsi operare..... (estero), ma ha avuto una serie di complicanze perioperatorie tremende ed è poi deceduto sabato mattina (ma di ictus)”*

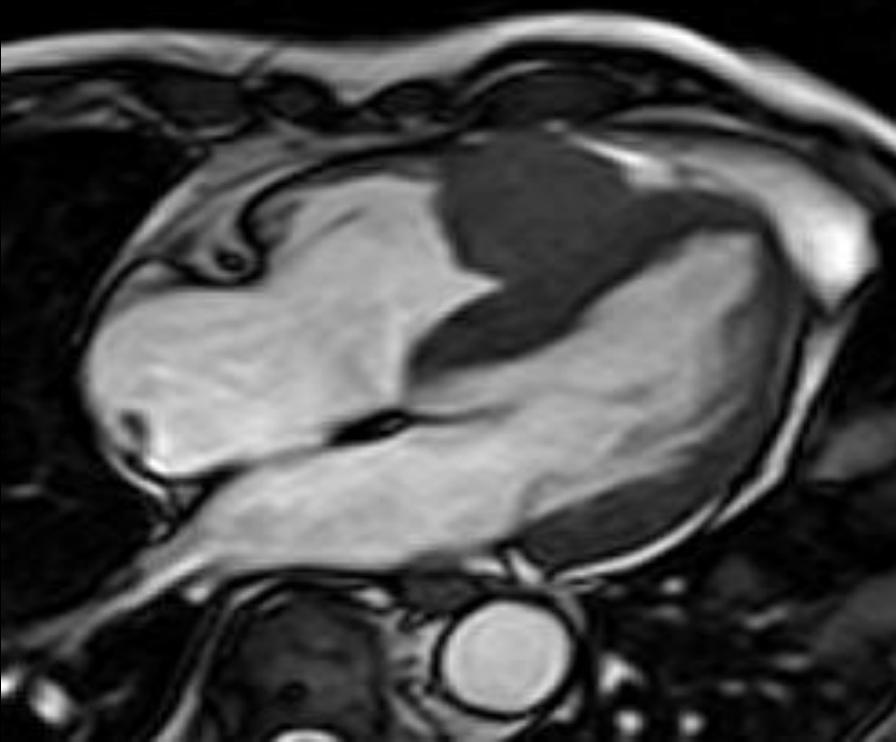
RMC: Masse intracardiache

Quattro Camere Papillari

L
13/02/1960, 045Y
St. 2435
Se. 1302
Im. 2

A

Clinica S. Carlo PadernoDugnano
ID: EDB3564
31/03/2005
12:36:03
HFS



TR: 1600
TE: 8.6
SP

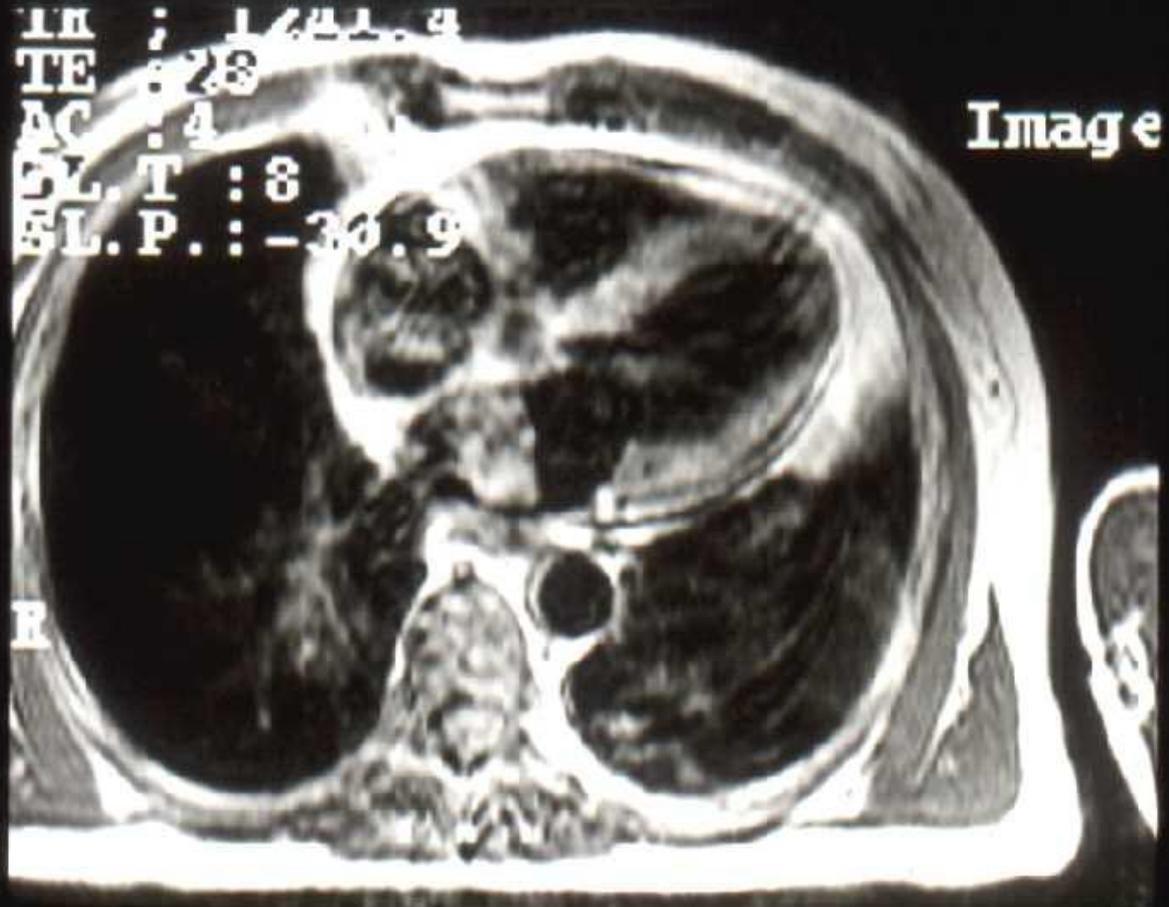
P

Ep. 5
L = 953 W = 1906

TROMBO



MIXOMA



Caratterizzazione Tissutale

“ Caratterizzare un tessuto non significa proporre una diagnosi istologica “.

Perché si chiede ?

- Esame ECO tecnicamente non soddisfacente o dubbio.
- Cerchiamo attraverso la caratterizzazione tissutale un preciso riferimento istologico.
- Differenziare una neoformazione benigna da una maligna

con quali armi?

Il valore delle sequenze

- Immagini con sequenze T1 - T2 pesate.(anat.)
- Immagini con sequenze Gr BH (cine)
- Immagini con sequenze di contrasto (perf.)
- Immagini per la valutazione dell'enhancement.

Imaging RMC nelle Masse

L'IMAGING RMC HA LE
POTENZIALITA PER DARCI QUESTE
RISPOSTE ?

RM - TC

- Il Cardiologo può lavorare in Risonanza.
- Con entrambe le metodiche otteniamo informazioni simili.
- Concetto di appropriatezza.

The concept of.....

Appropriate imaging study

“An appropriate imaging study is one in which the expected incremental information, combined with clinical judgement, exceeds the expected negative consequences by a sufficiently wide margin for a specific indication that the procedure is generally considered acceptable care and a reasonable approach for the indication.”

Negative consequences of imaging

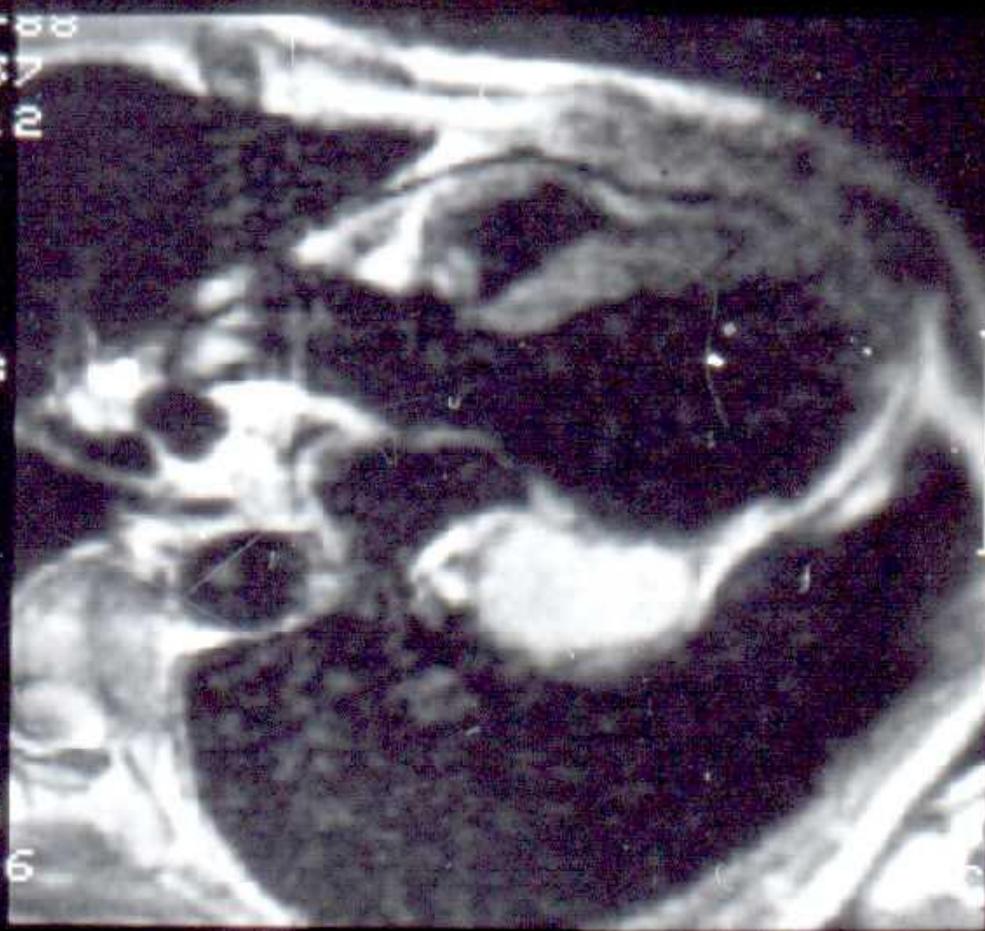
Include the risks of the procedure (i.e. radiation or contrast exposure).

The downstream impact of poor test performance such as delay in diagnosis (false negatives) or inappropriate diagnosis (false positives).

JUL-88
16:37
RE>12

1.78

88
30
8.0
28.6
47



175
5
128

27



Diagnosi Differenziale

- Molta della letteratura , anche recente, si basa sulle differenze di segnale tra le immagini T1, T2 e di densità protonica.
- La differenza tra neoformazione benigna o maligna, basata su queste caratteristiche è generalmente povera.

Protocollo attuale

- Acquisizione rapida di un gruppo di immagini per delineare la morfologia.
- Cine imaging
- First pass del gadolinio (perfusione)
- Valutazione del delayed enhancement

Considerazioni Finali

- Il ricorso a tecniche più sofisticate dell'ECO va attuato in presenza di ogni minimo dubbio.
- L'esame completo deve prevedere lo studio contrastografico.
- Il giudizio di malignità di una neoformazione deve essere posto con il concorso di più criteri.

Suggested Reading

- 1) CT and MRI of Primary Cardiac Malignancies
Radiographics 1999;19:1421 – 1434
- 2) CT and MRI of Benign Primary cardiac Neoplasm
with Echocardiographic Correlation
Radiographics 2000; 20 :1303 – 1319
- 3) Primary Cardiac and Pericardial Neoplasms:
Radiologic-Pathologic Correlation
Radiographics 2000;20: 1073 - 1103

CARATTERISTICHE TECNICHE

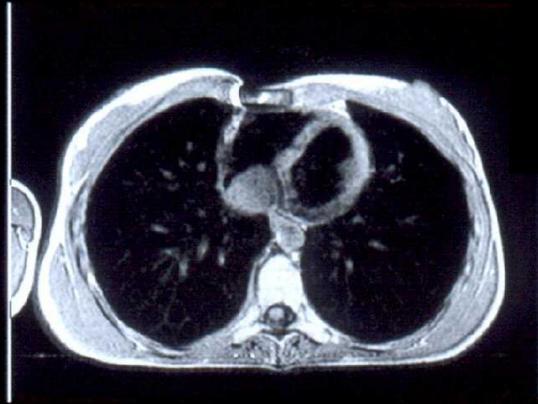
- Risoluzione spaziale e temporale
- Capacità di visualizzare il mediastino
- Multiplanarietà



ANGIOSARCOMA

T1

CONTRASTO



VENTRICOLO DESTRO

COLLORE-STRONG
186311266
SASIT
Sx: 1161
IN 1

A

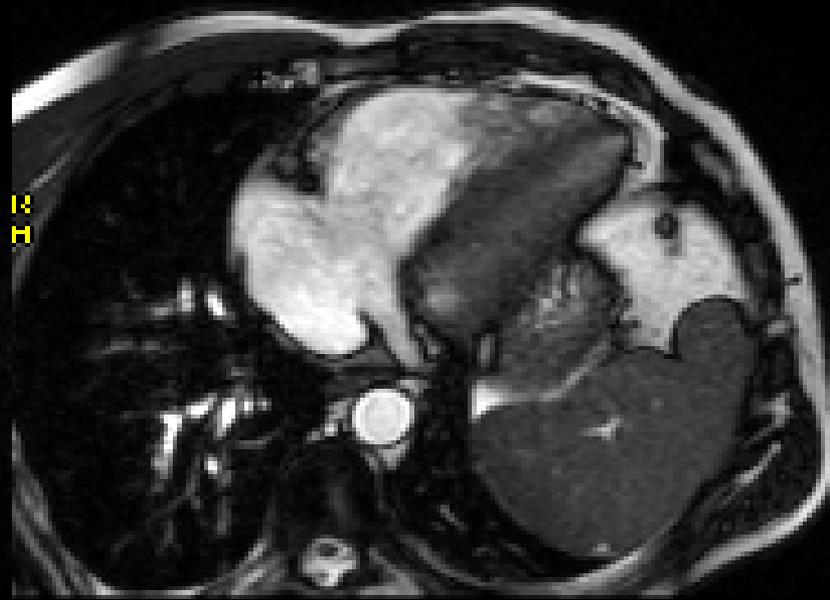


TR: 5011
TE: 2.2669
CG

17

COLLORE-STRONG
186311266
SASIT
Sx: 1161
IN 1

A



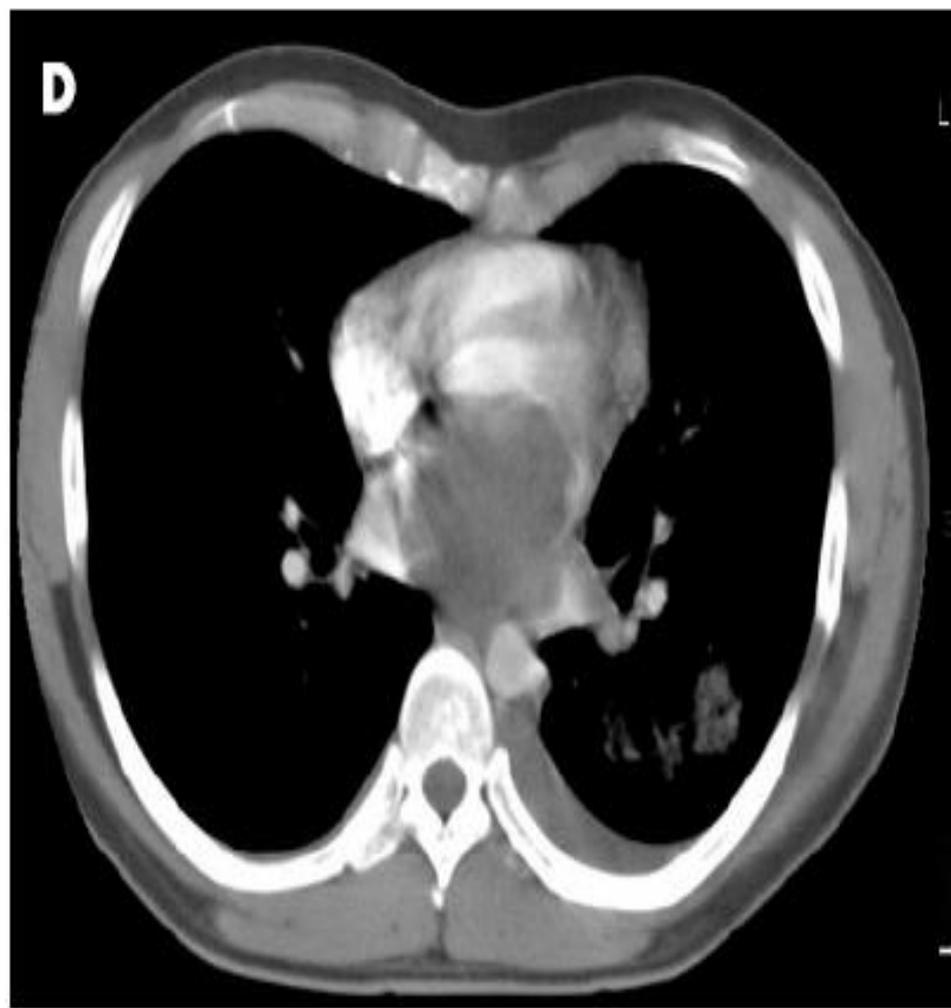
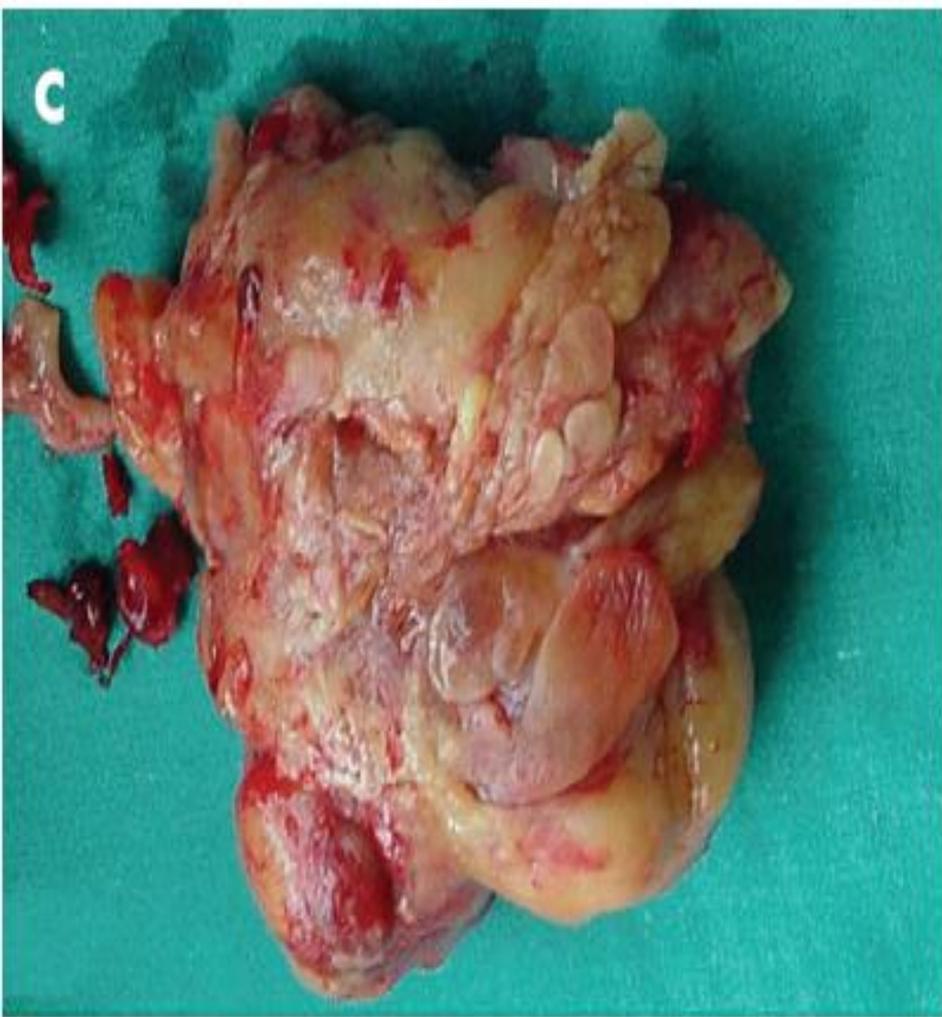
TR: 5011
TE: 2.2669
CG
Ep: 6
L = 1666 W = 2666

17

COLLORE-STRONG
186311266
SASIT
Sx: 1161
IN 1



Ep: 6
L = 1666 W = 2666



MACCHERONI

I.N.T. MILANO

ANDREA

T C1 FB 2SE

280218/1112

FRONT

CR-H-SP

26-SEP-8

10:00:13

STORE>36

MF 2.21

L
E
F
T

5 CM

TR 1.1

TE 28

SL 8.0

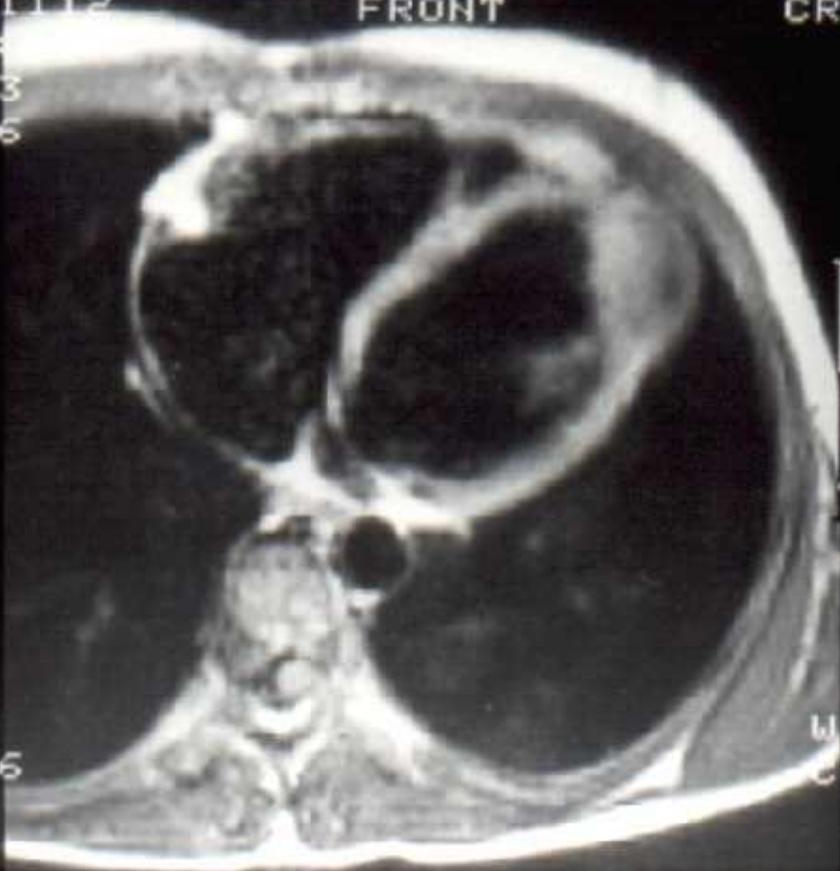
SP 5.6

0

EF 1.30

W 1358

C 160



Altre differenze riguardano:

- risoluzione temporale e spaziale**
- capacità di visualizzare il mediastino**
- angolazione delle immagini**
- versatilità**

MEZZI DI CONTRASTO

Sfruttano anche la capacità di utilizzare i mezzi di contrasto

- R.M.

- T.C.

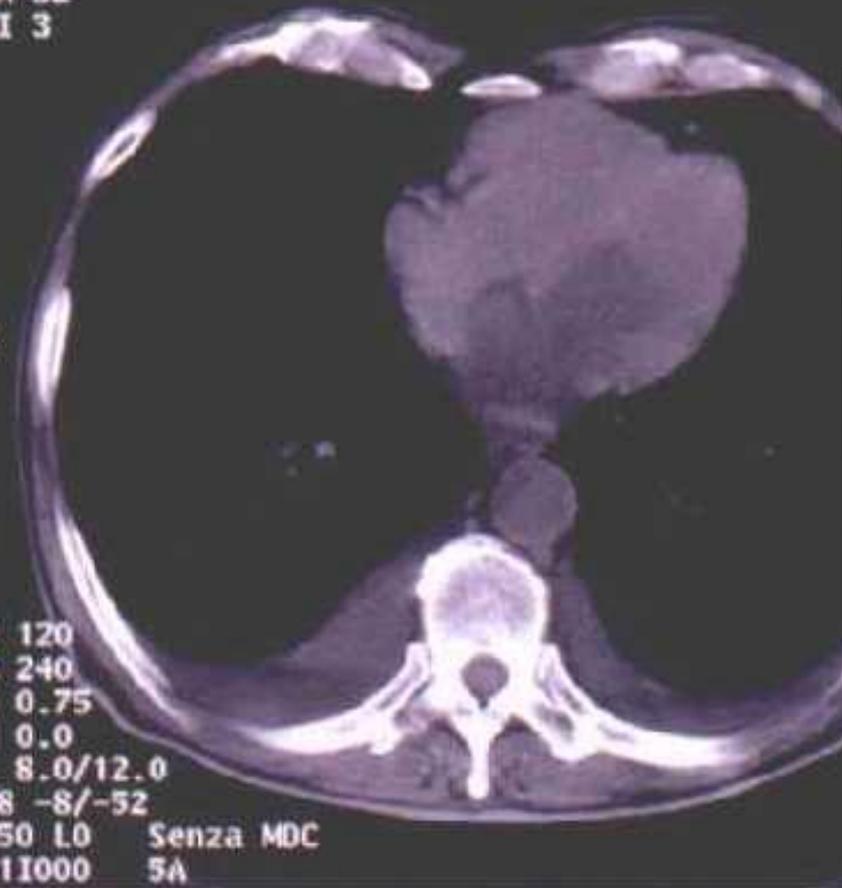
- Eco

Az. Osp. S. Carlo - MI-
SOMATOM PLUS 4
VB40B
H-SP-CR

A

TC 1482
21-MAR-1927
23-MAR-1999
09:11:26.51
TP -284.0
IMA 32
SPI 3

R



kV 120
mA 240
TI 0.75
GT 0.0
SL 8.0/12.0
348 -8/-52
AB50 L0 Senza MDC
101I000 5A

Az. Osp. S. Carlo - MI-
SOMATOM PLUS 4
VB40B
H-SP-CR

A

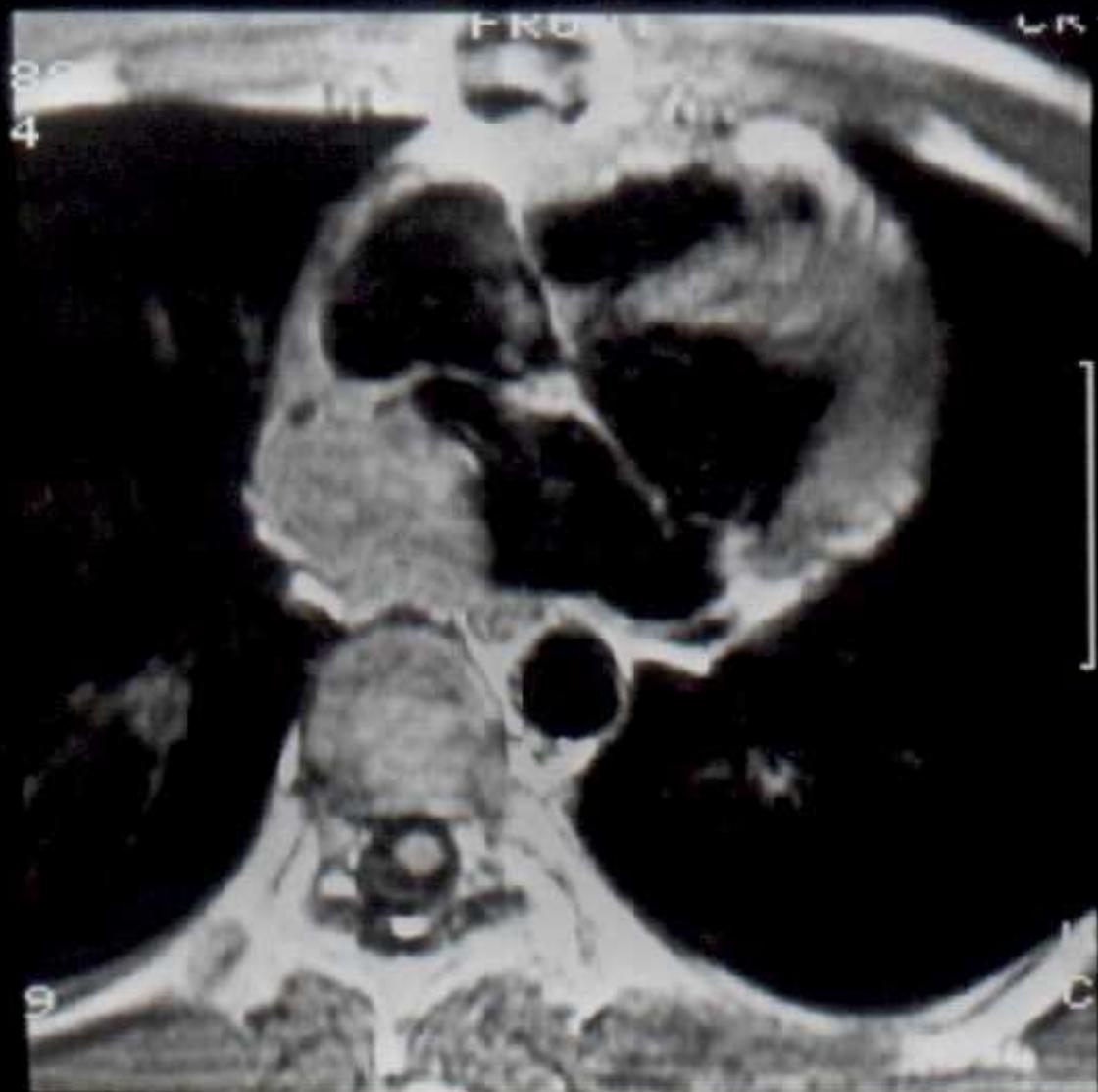
TC 1482
21-MAR-1927
23-MAR-1999
09:45:32.94
TP -250.5
IMA 82
SPI 10

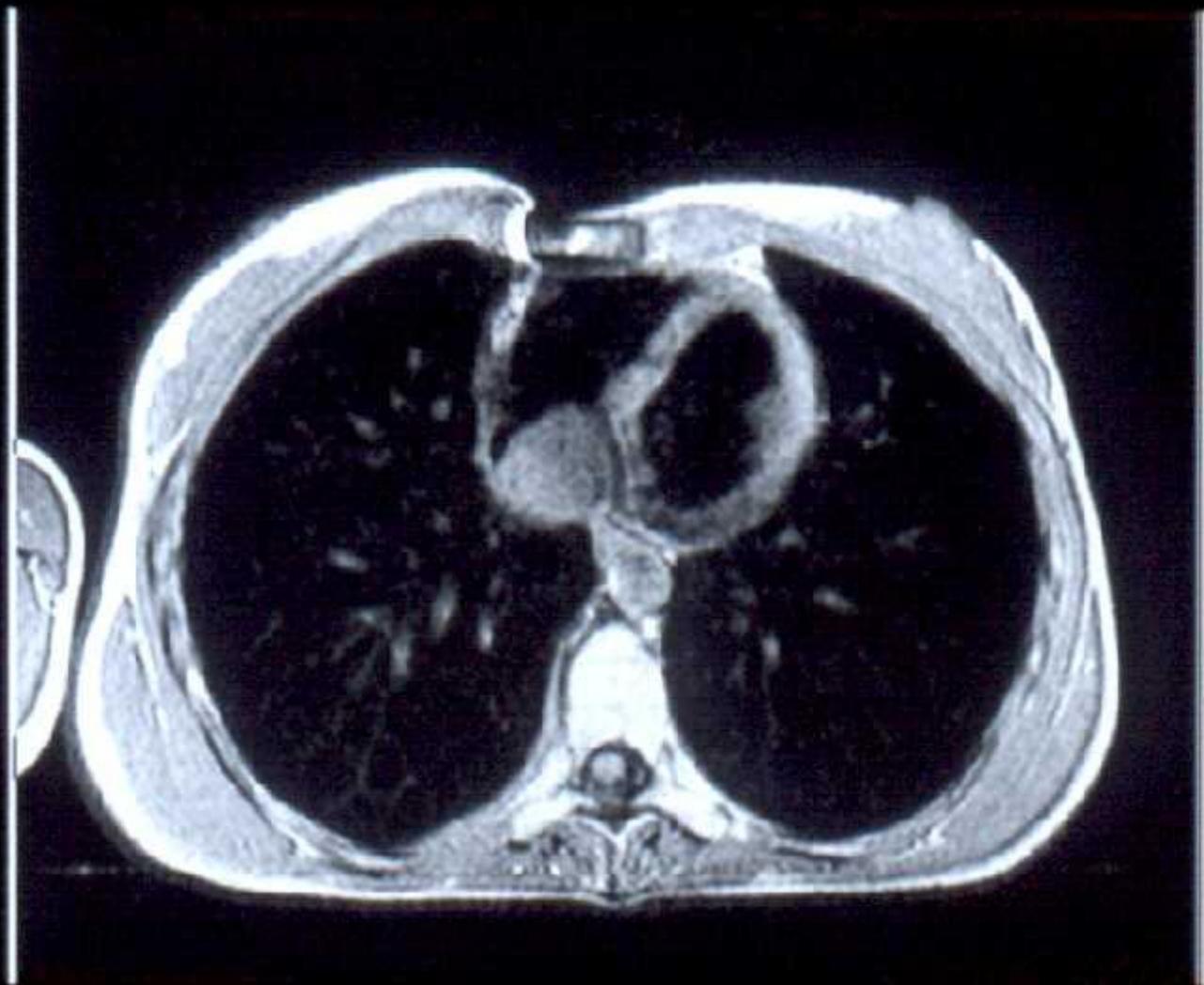
R

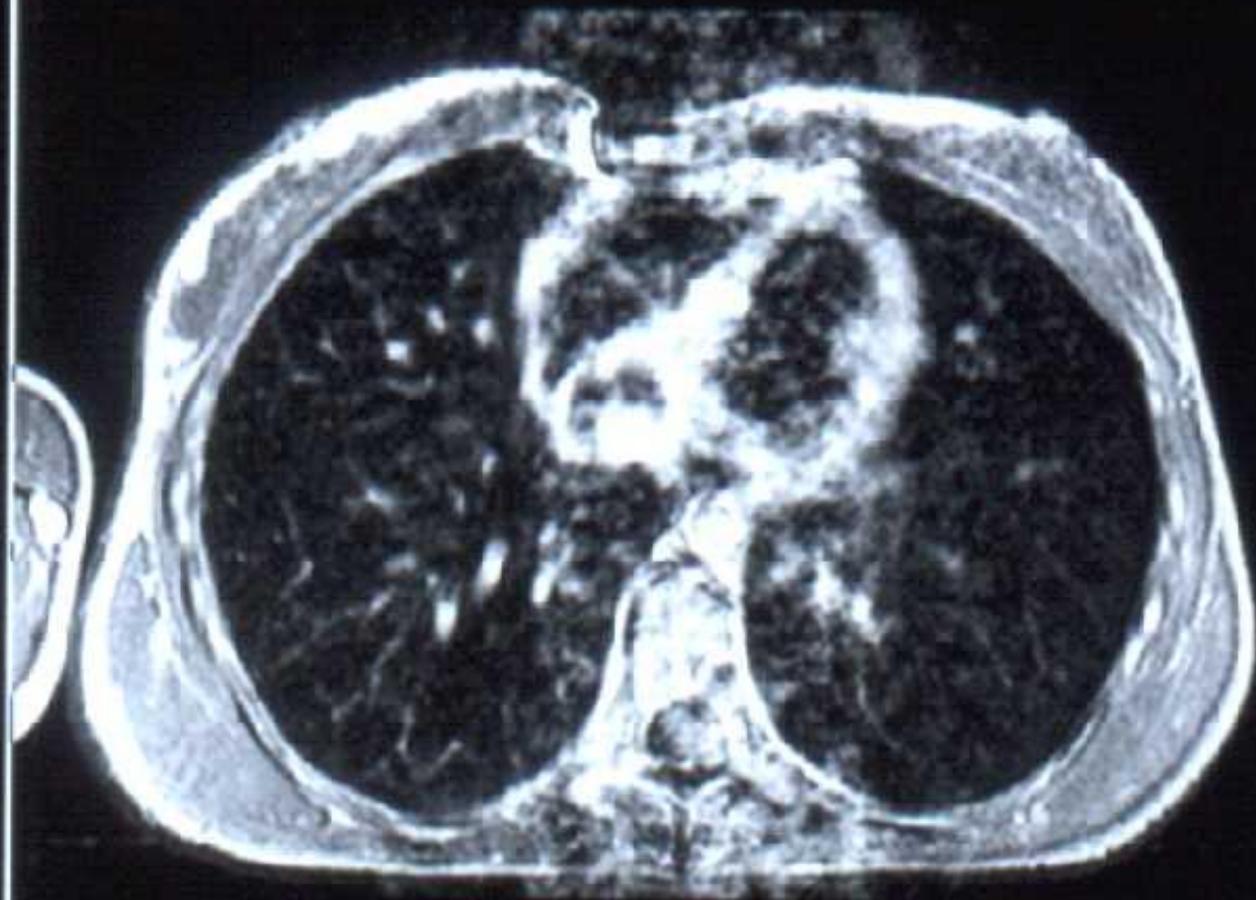


kV 120
mA 240
TI 0.75
GT 0.0
SL 8.0/12.0
353 -9/-46
AB50 L0 Mezzo di Contrasto
101I600 5A

W 408
C 38







MAGNETOM .5 T

I.N.T. MILANO

T B27FB 2SE

CR-H-SP

260563 / 823

FRONT

20-MAR-86

14:27:13

STORE>7



LEFT

5 CM

MF 2.21

TR 0.3

TE 30

SL 10

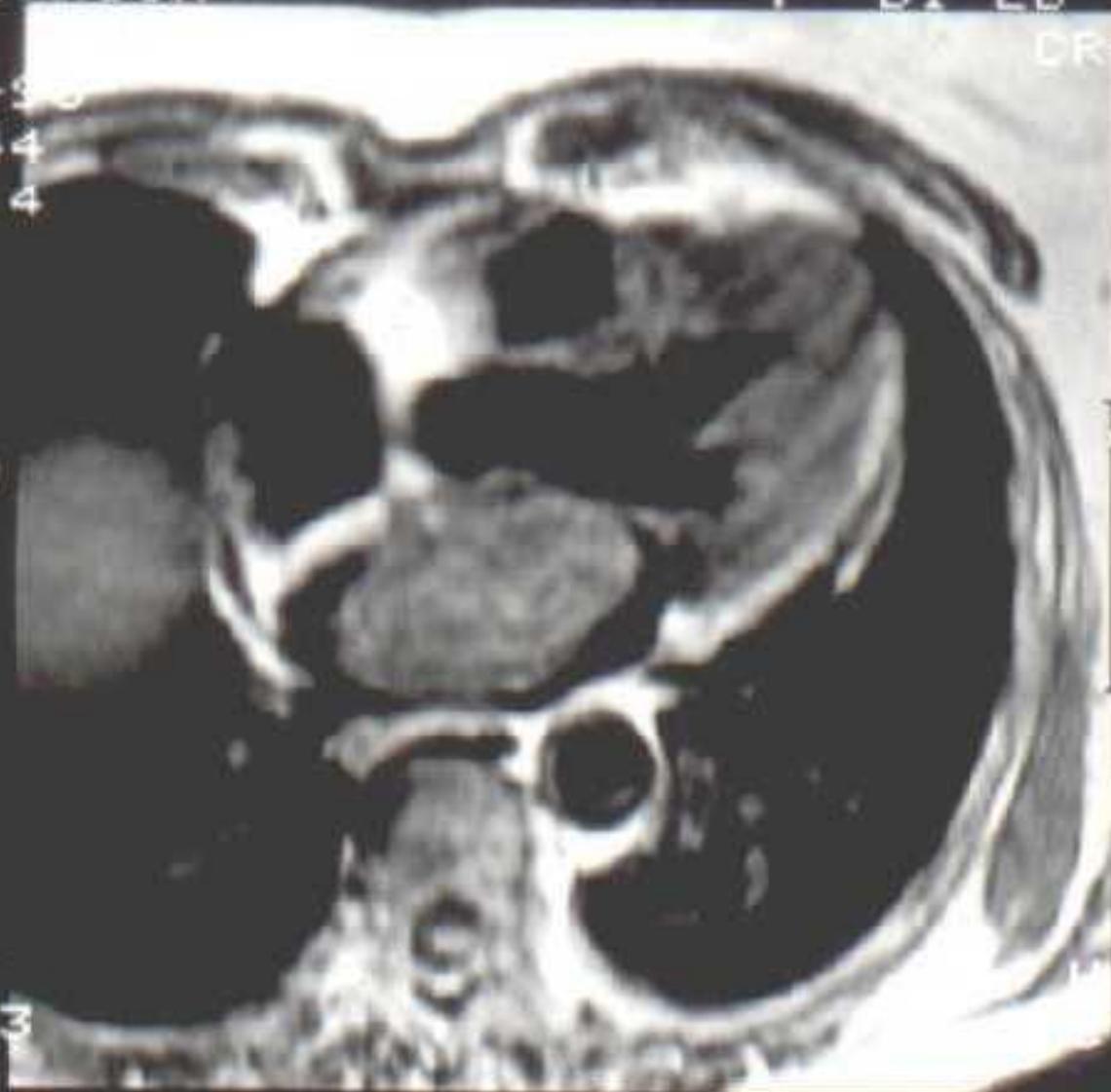
SP 20

W 1328

C 640

MAG
ROL...
1645
28-AUG-90
13:26:44
DISK1>14

I.N.T. MILANO
T D1 EB 4SE
DR-H-SP



L
E
F
T

5 CM

1264
634

MF 1.60

TR .85
TE 17
SL 6.0
SP -44.3
Z 0
ZF 1.60
TD 358

Store

EC/NA

MAGNETOM 1.5 T

I.N.T. MILANO

T C2 FB 2SE

283984/0056

PROSTATE

CR-H-SP

13-JAN-88

17:25:12

STORE>16

E

LEFT

MF 2.00

5 CM

TR .98

TE 28

SL 8.0

SP 45.2

Z 0

RF 1.30

953

256



MAGNETOM 1.5 T

I. N. I. MILANO
T C2 FB 2SE
CR-H-SP

1798
12-DEC-
11:29:4
STORE>14



LEFT
↑

MF 2.13

5 CM

TR 1.3
TE 28
SL 5.0
SP 24.0
Z 0
ZF 1.30
TD 280

W
C 1263
320

1022071269

-AUG-88

:21:57

DRE>9

CR-H-

L
E
F
T

5

1.78

LA

T

.76

22

9.0

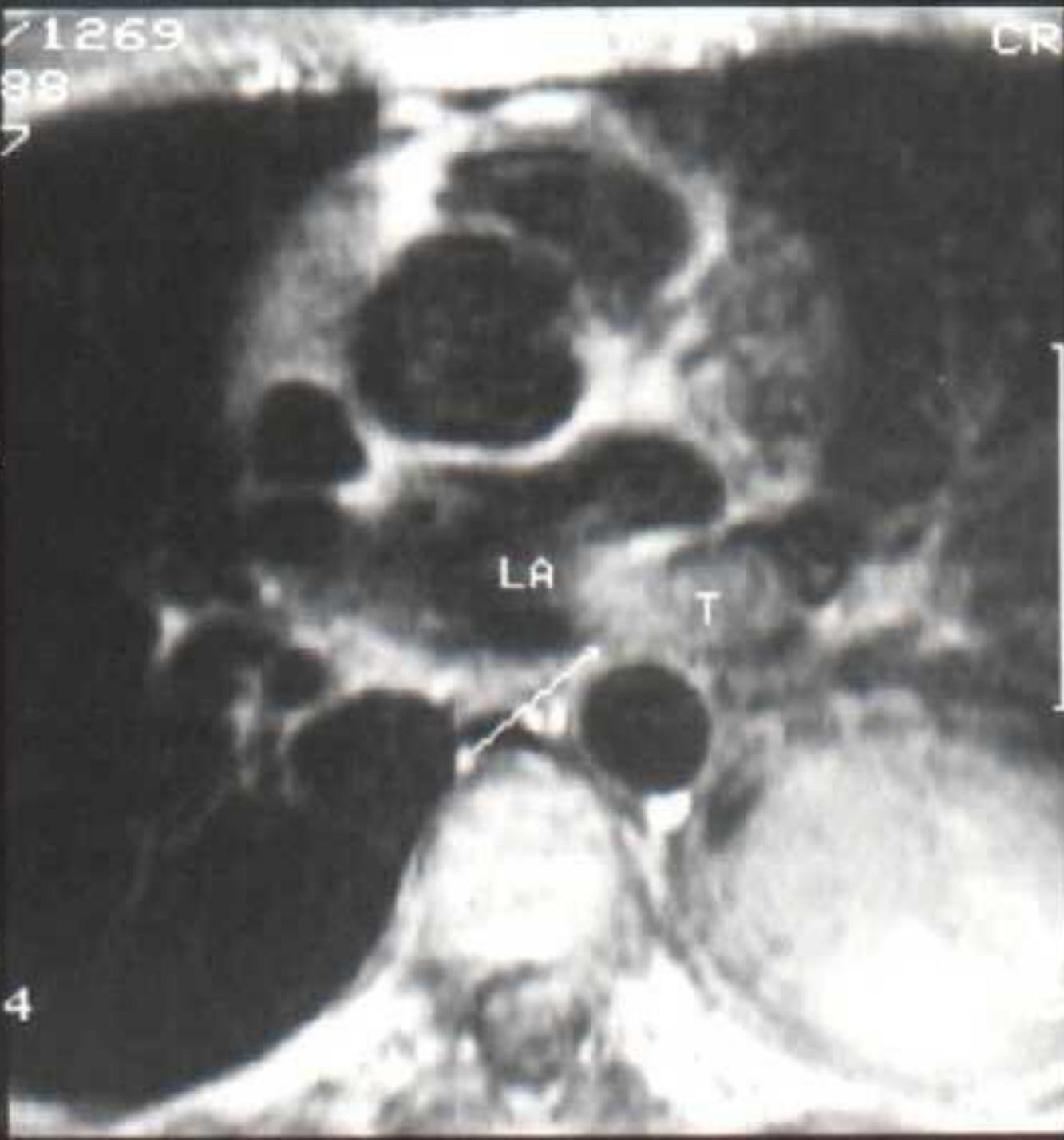
14.4

0

1.80

1

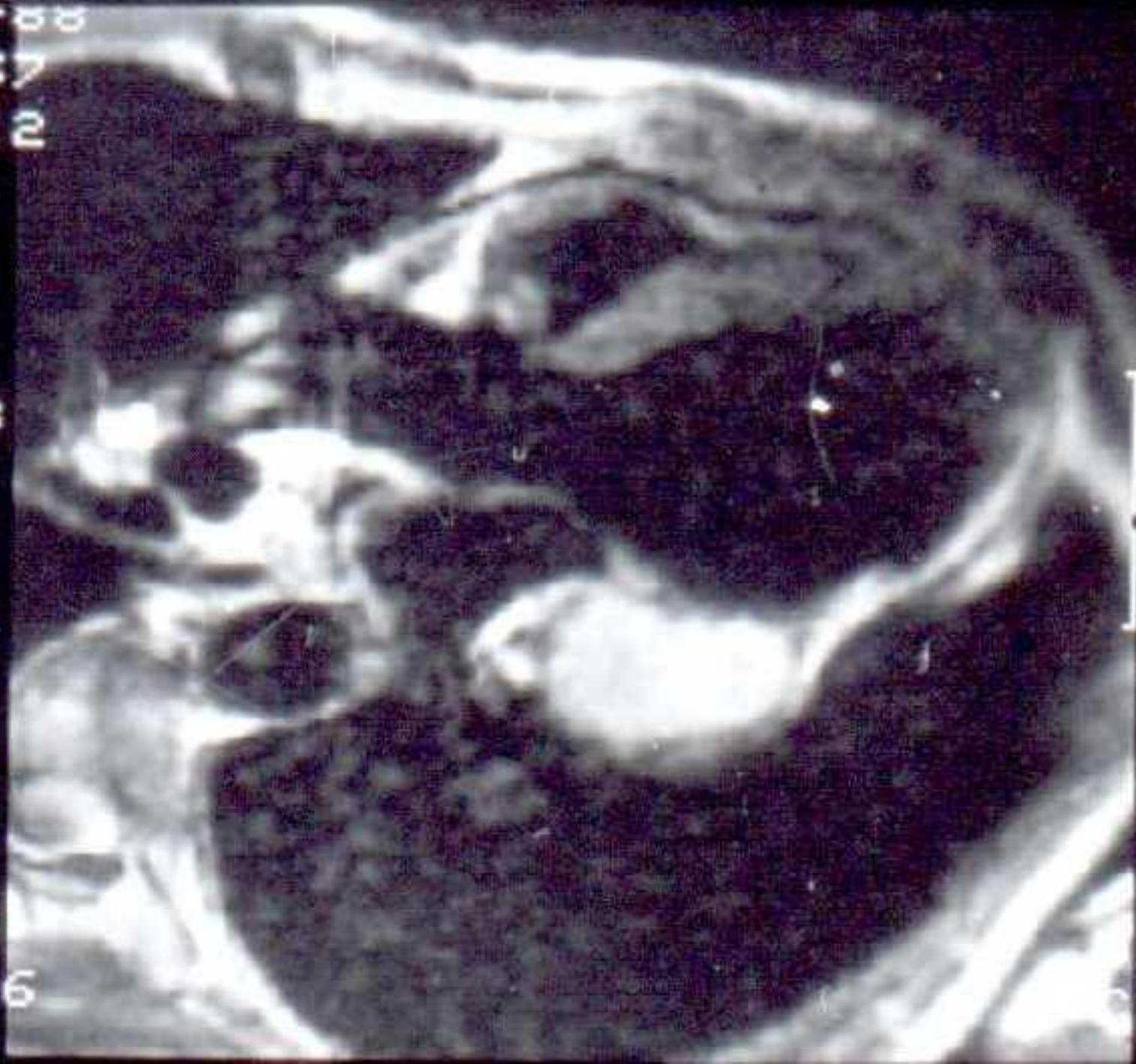
2



JUL-88
16:37
RE>12

1.78

88
30
8.0
28.6
47



CONCLUSIONI

Le tecniche di "imaging" ci permettono di dare,

nella quasi totalità dei casi, risposte attendibili

per un corretto approccio diagnostico e

terapeutico. In alcune situazioni una sola metodica è sufficiente. Nella maggior parte delle

situazioni almeno due di esse vanno

utilizzate

Cosiderazioni Finali

CONCLUSIONI

Diagnostica *oltre* gli ultrasuoni

263238/889
04-APR-86
12:18:15
STORE>18

T B27FB 2SE
FRONT CR-H-SP

MF 2.67

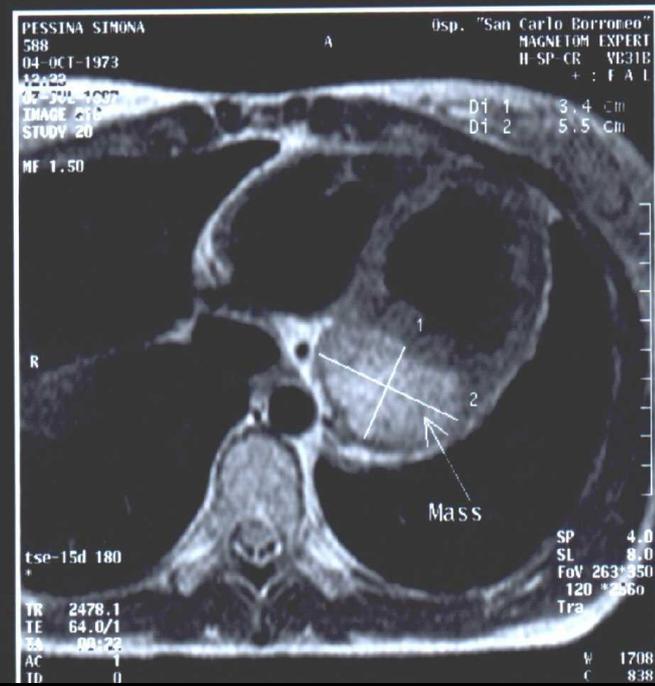
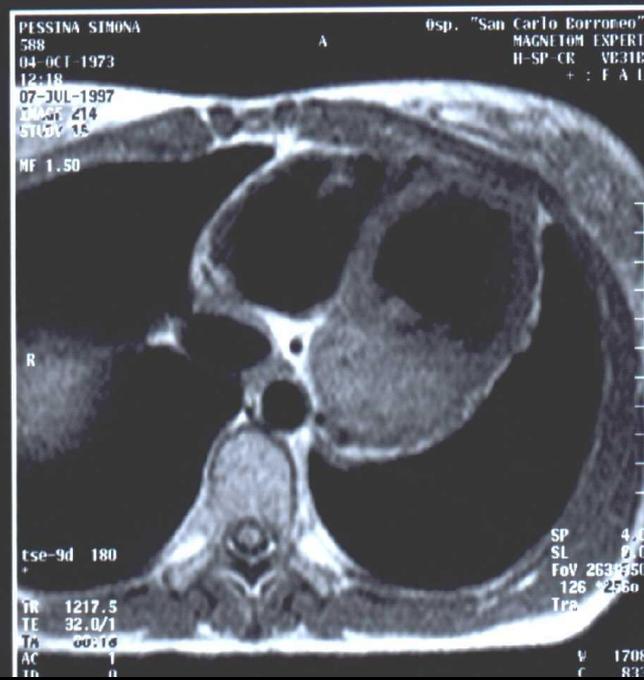
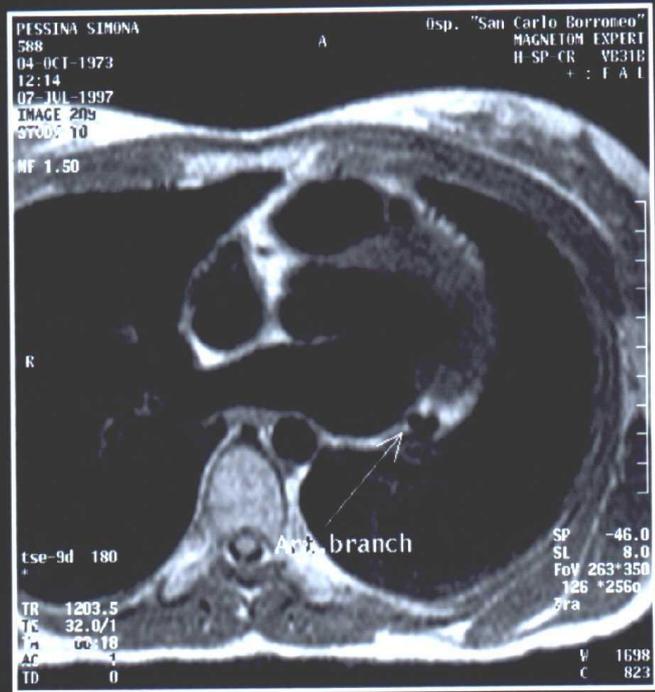
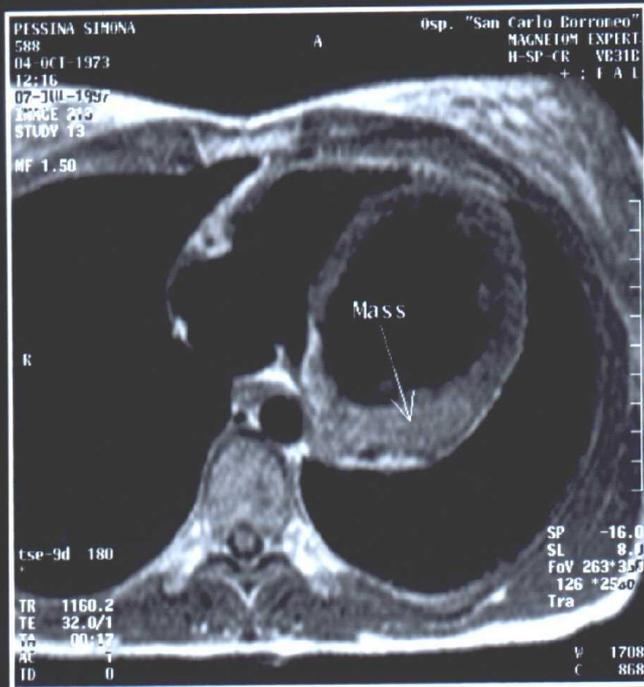
TR 0.6
TE 30
SL 5
SP -10
Z 0
TD 280



L
E
F
T

5 CM

W 2090
C 1138



TC 1482
21-MAR-1927
23-MAR-1999
09:45:32.94
TP -250.5
IMA 82
SPI 10

A

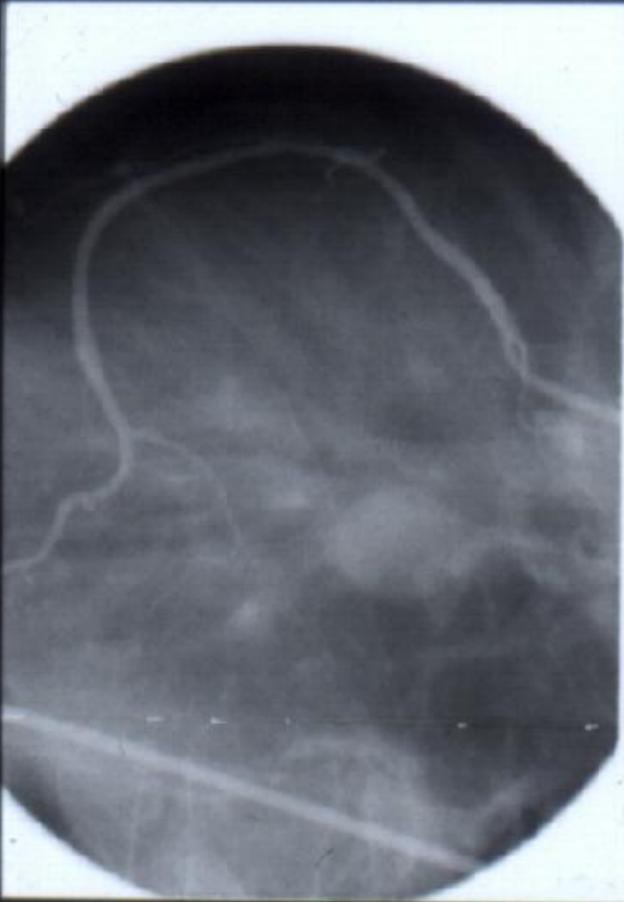
R



kV 120
mA 240
TI 0.75
GT 0.0
SL 8.0/12.0
353 -9/-46

AB50 L0 Mezzo di Contrasto
1011600 5A

W 408
C 38



7417874/0492
06-MAR-92
11:40:20
DISK1>2

FRONT

CR-H-SP



MF 1.73

5 CM

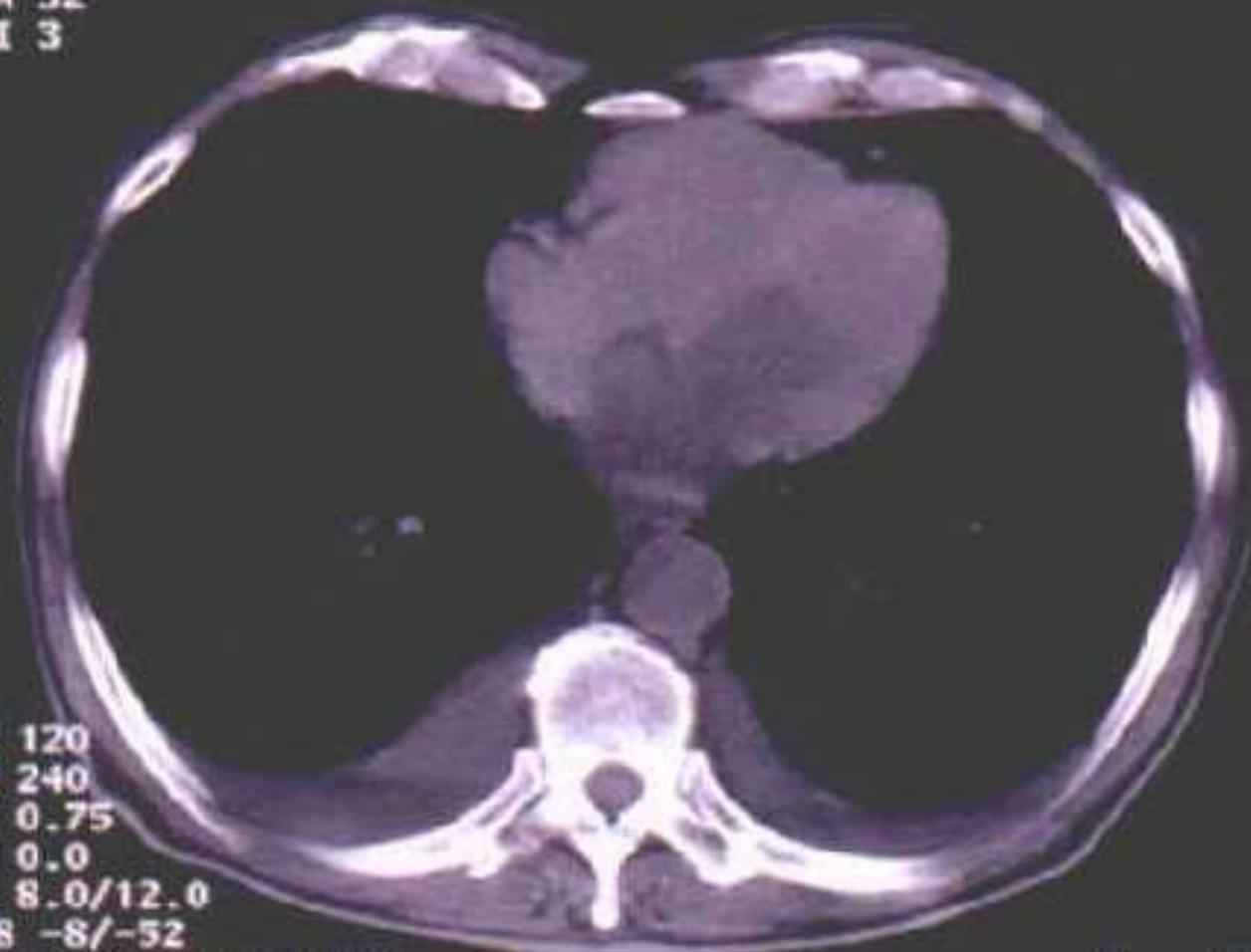
TR 1.5
TE 35
SL 8.0
SP 15.0
Z 0
ZF 1.40
TD 340 YR/PB

M 1213
C 560
TA 3:3

TC 1482
21-MAR-1927
23-MAR-1999
09:11:26.51
TP -284.0
IMA 32
SPI 3

A

R



kV 120
mA 240
TI 0.75
GT 0.0
SL 8.0/12.0
348 -8/-52

AB50 L0 Senza MDC
1011000 5A

W 394
C 28