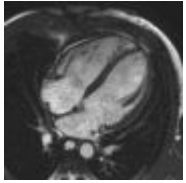


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KARDIOLÓGIAI
KÖZPONT

Felnőttkorú Veleszületett Szívbeteggek 7. Fóruma

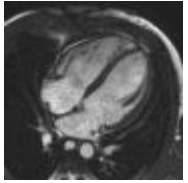
Felnőttkorú Fallot tetralogia **MRI a hosszú távú nyomonkövetésben**

Tóth Attila, 2015 VSZÉK



Történelem I.

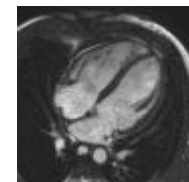
- 1934-39: Rabi
 - Proton mágneses mometum
 - RF spektrum, mágneses grádiensek
- 1946: mágneses rezonancia jelensége
 - 1952: Bloch & Purcell – Nobel
- 195x – 6x: nem képalkotó eszköz (NMR)
- 1972: CT
 - Hounsfield



Történelem II.

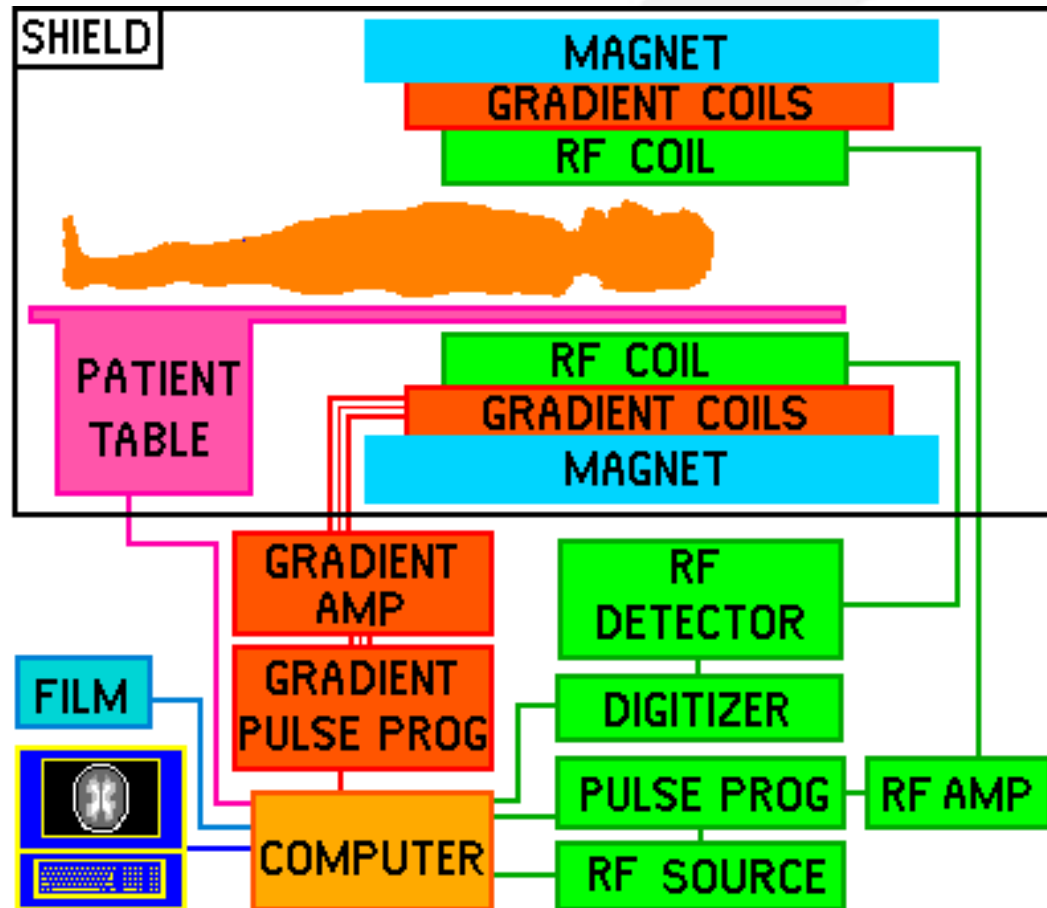
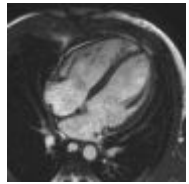
- 1973: backprojection MRI – Lauterbur
- 1975: Fourier imaging – Ernst ('91: Nobel)
- 1977: echo planar imaging (EPI) – Mansfield
- 1980: Fourier transzform. MRI – Edelstein
- 1986: grádiens echo, multi slice (5 min)
- 1987: MRA – Dumoulin
- 2003: Lauterbur & Mansfield – Nobel díj

Elemek mágneses tulajdonságai

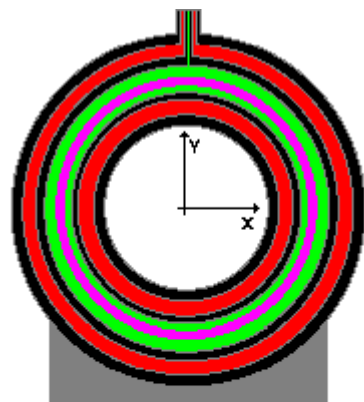
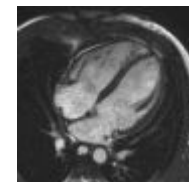


Elem	Izotóp	Párosítatlan proton	Párosítatlan neutron	Spin	γ (MHz/T)	Termé- szetes	Biológiai
H	^1H	1	0	1/2	42.575	99.985	0.63
C	^{13}C	0	1	1/2	10.71	1.11	0.094
Na	^{23}Na	1	2	3/2	11.27	100	0.00041
P	^{31}P	1	0	1/2	17.25	100	0.0024

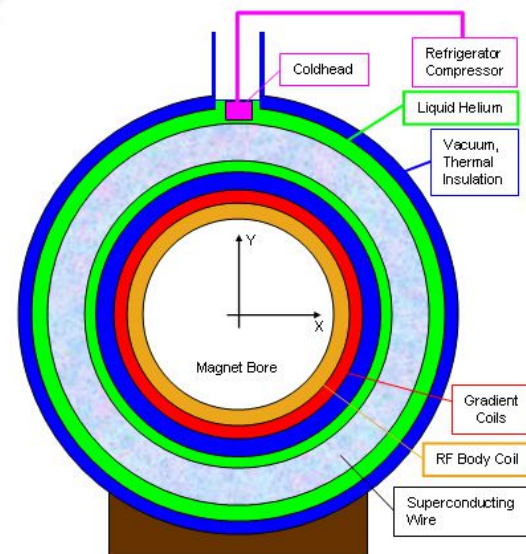
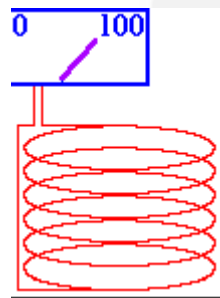
MR hardver



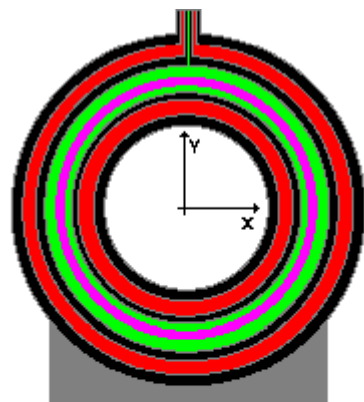
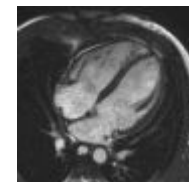
Mágnes



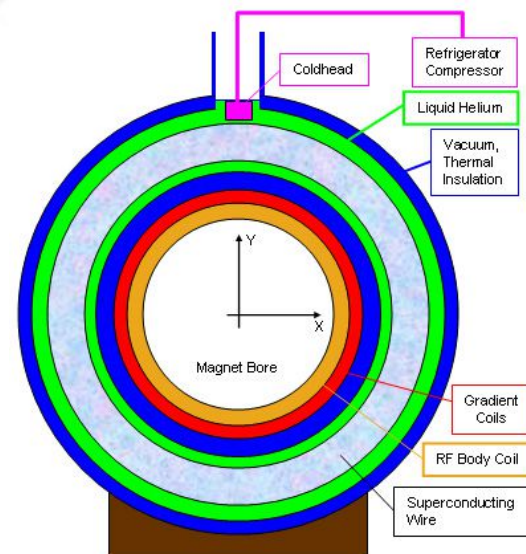
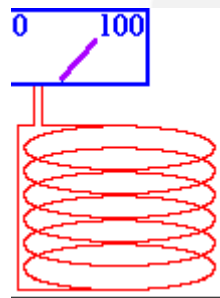
- Vacuum
- Liquid Helium
- Liquid Nitrogen
- Container & Support
- Superconducting Coil



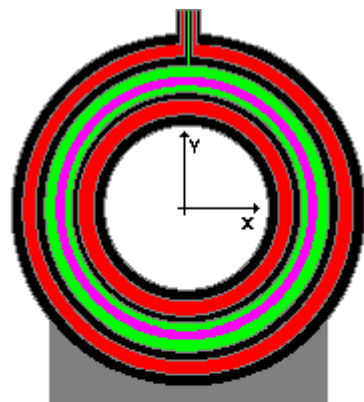
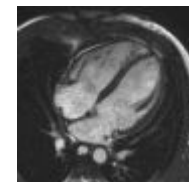
Mágnes



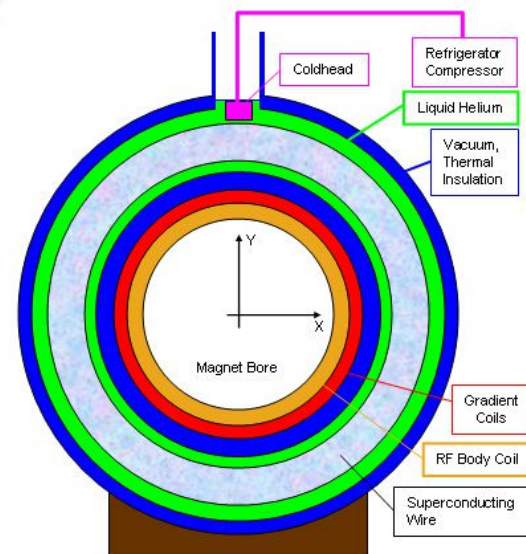
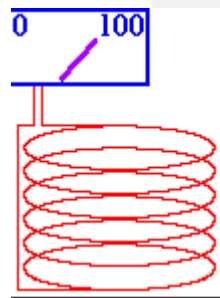
- Vacuum
- Liquid Helium
- Liquid Nitrogen
- Container & Support
- Superconducting Coil



Mágnes



- Vacuum
- Liquid Helium
- Liquid Nitrogen
- Container & Support
- Superconducting Coil

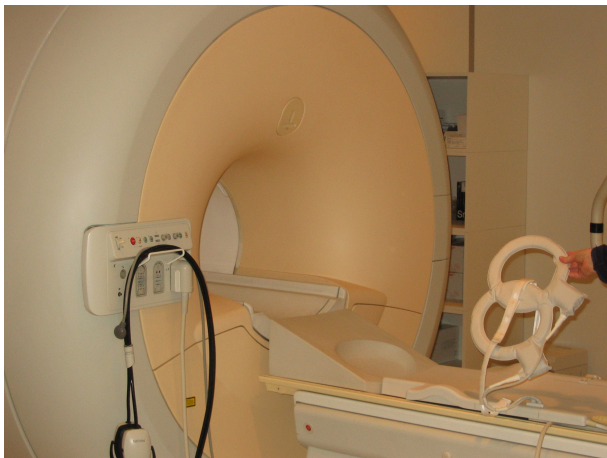
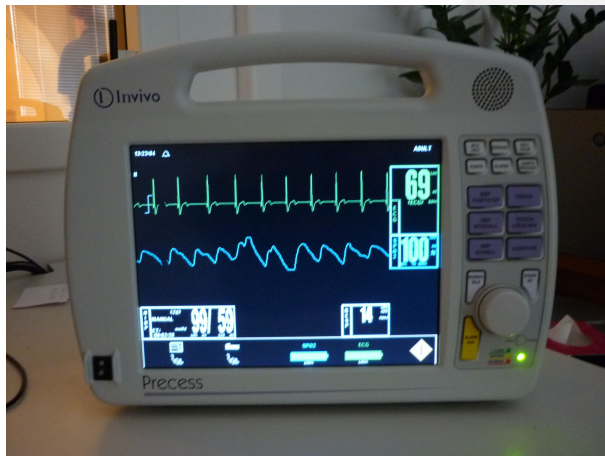




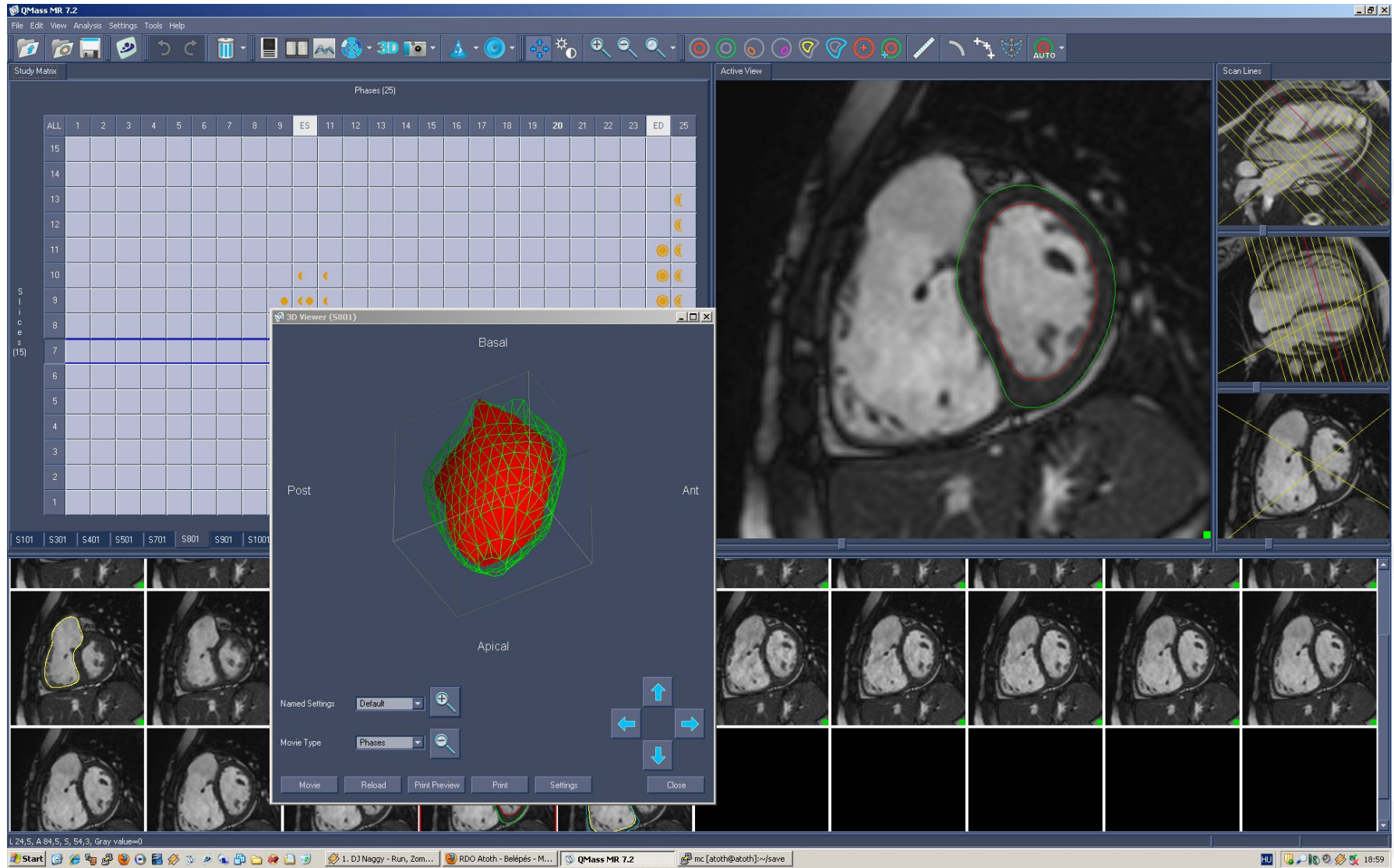
Mágneses tér és rádió hullámok



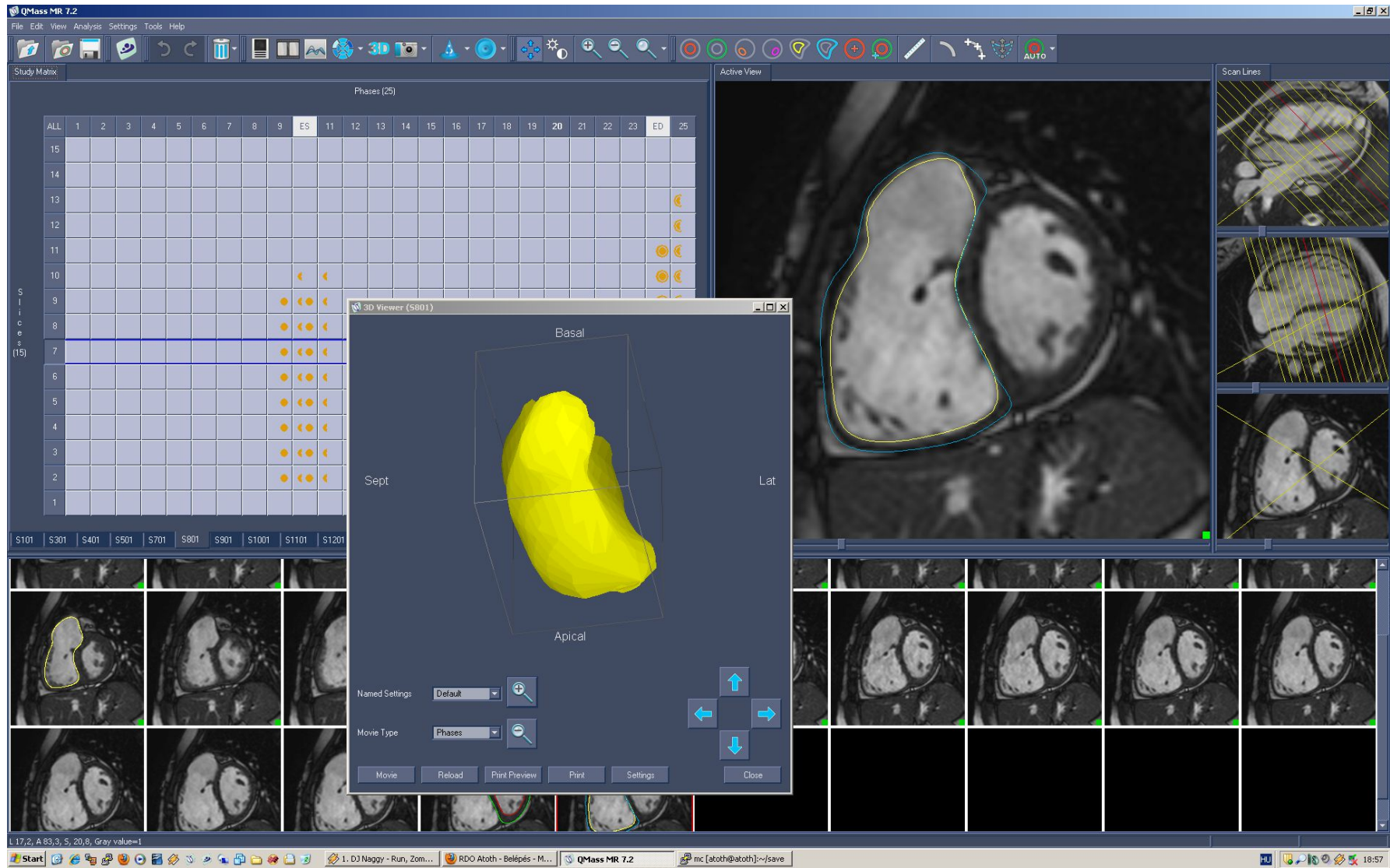
MR technika: hosszú és hangos



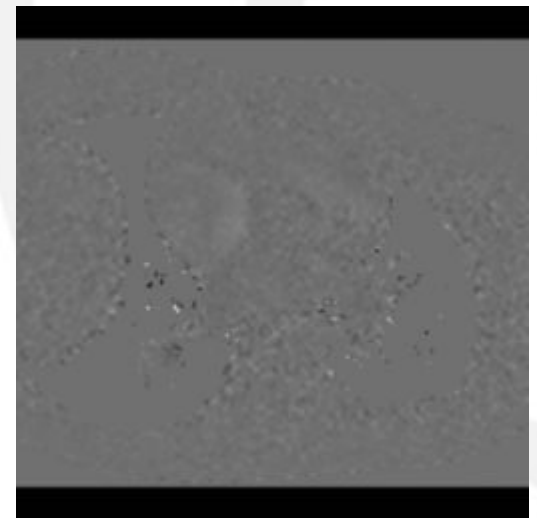
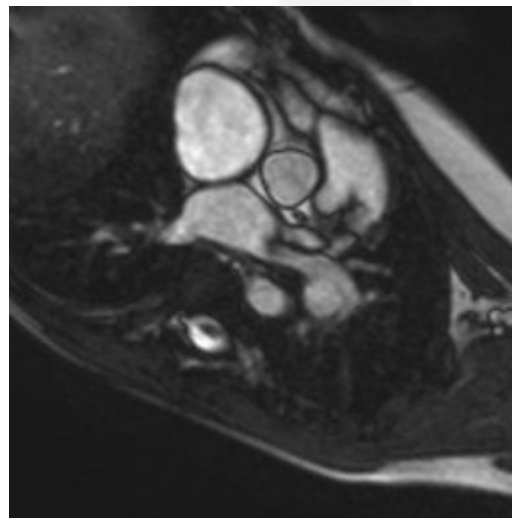
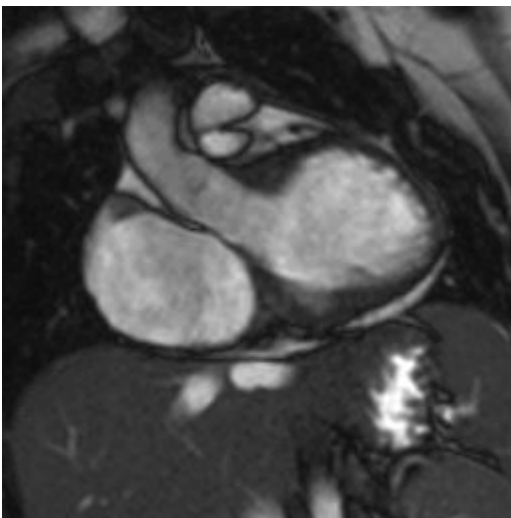
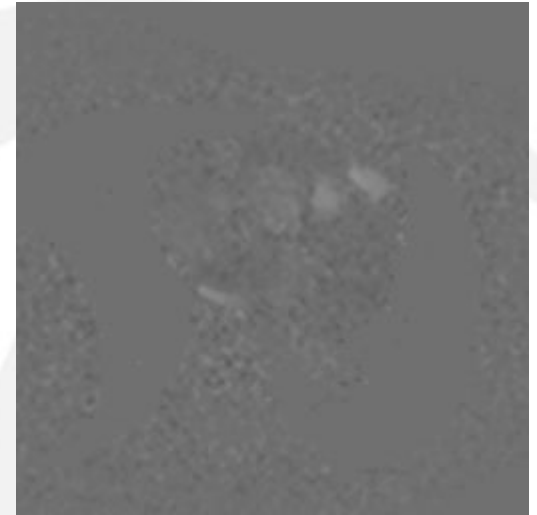
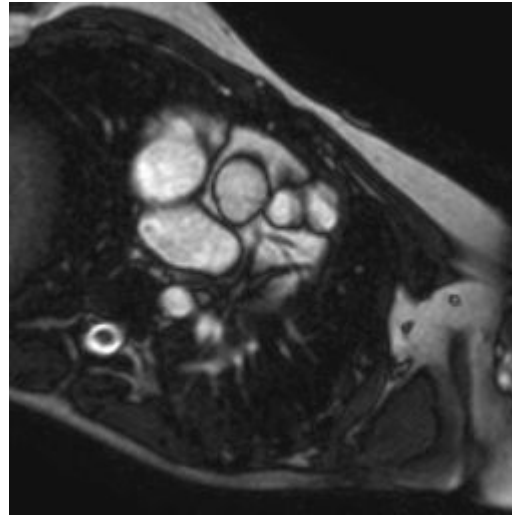
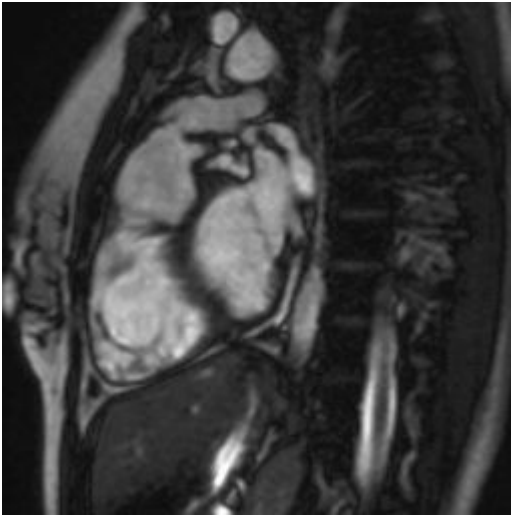
Bal kamrai kiértékelés: Simpson metódus



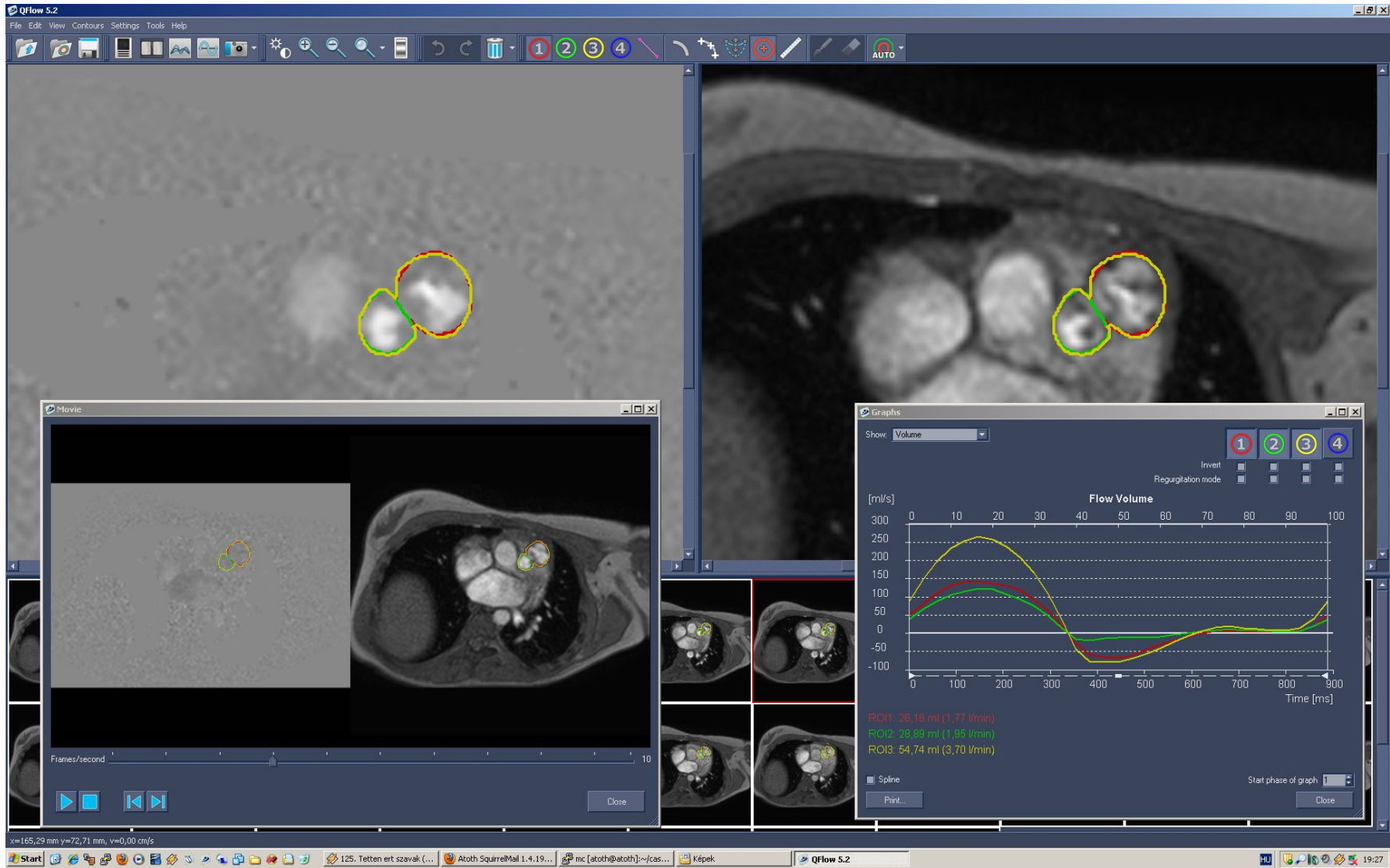
Jobb kamrai kiértékelés hasonló módon



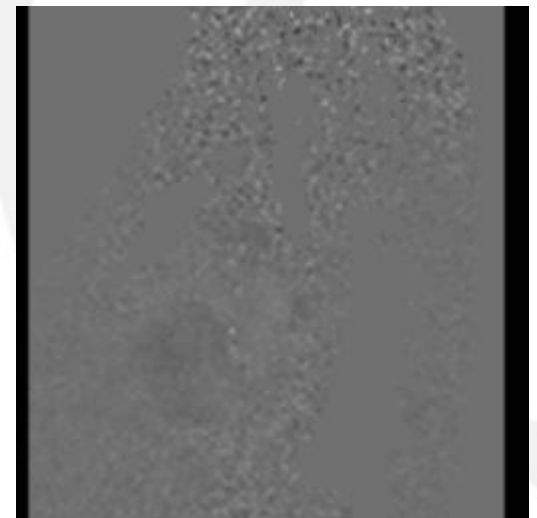
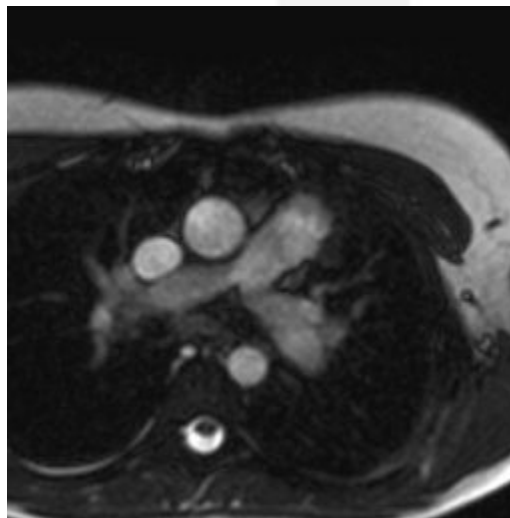
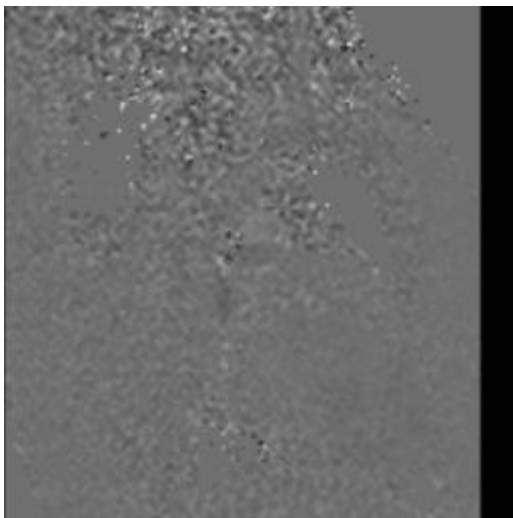
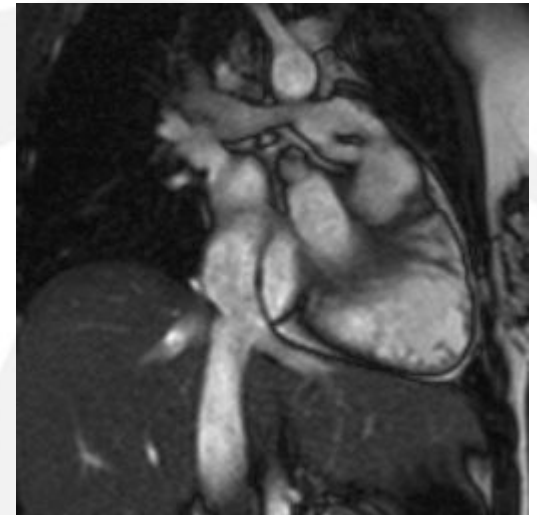
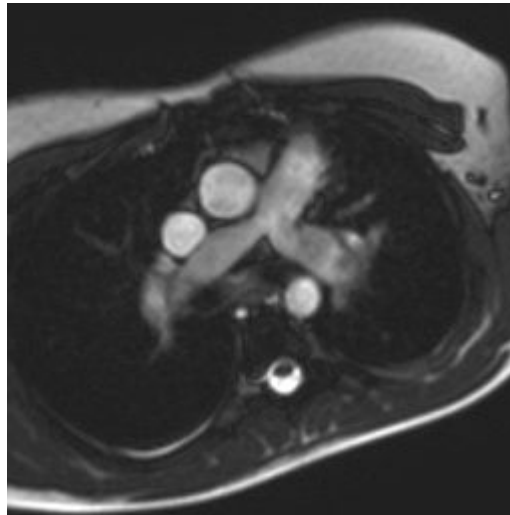
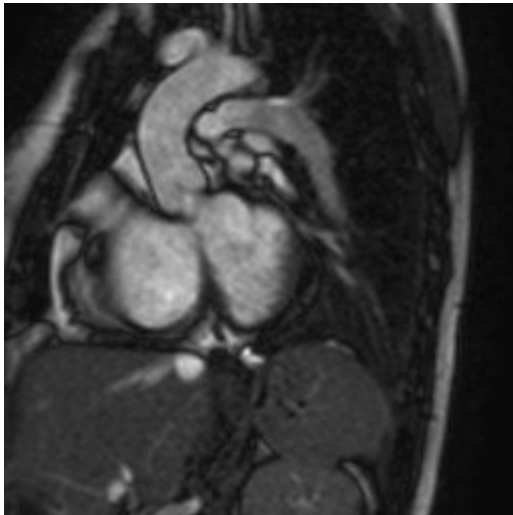
Áramlás mérés: billentyű hibák



Double-Decker jobb kamrai kiáramlás



Pulmonalis differenciált flow



1931 11 18 F
 SURVEY_BFFE FOV 450
 2009 11 02,11:45 Slice 13/21

Planscan

Geometry: **Navigator A**

Delete

Copy

☒ Volume ☒ Stack ☒ Slab



☐ All midplanes ☐ 3PPS

System Ready

21

HC Screen

HC Case

Compose

Compose



Scan: 3



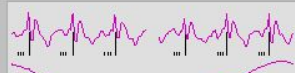
More...

All

View

Window

RAL

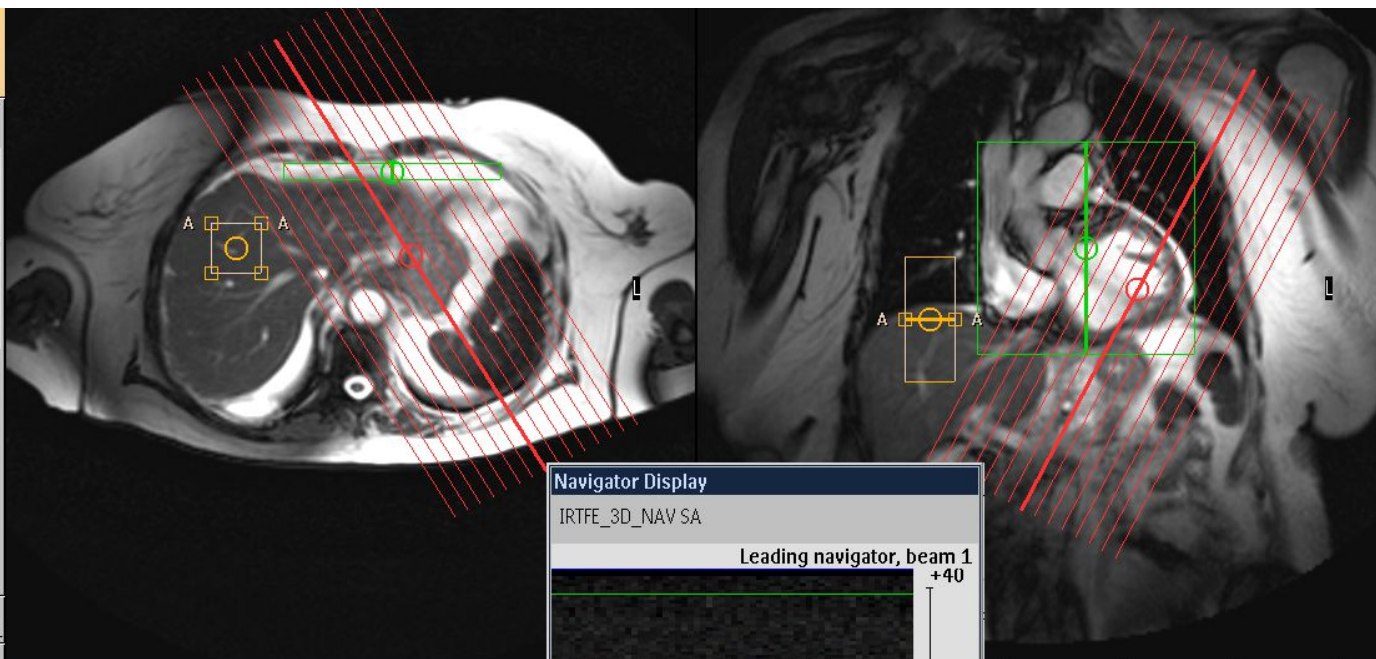


VCG+Resp

5 s

79

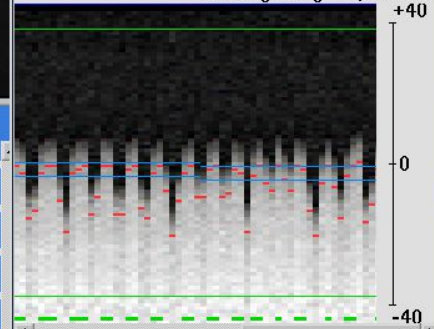
IRTFE_3D_NAV SA



Navigator Display

IRTFE_3D_NAV SA

Leading navigator, beam 1



Save

Hide

Respiratory compensat... no

Navigator respiratory c... gate and track

type lead

gating window 5

gating level drift continuous

scale factor 0.6

length 75.55

coil/element 2

Flow compensation no

ScanAlign Cancel Proceed

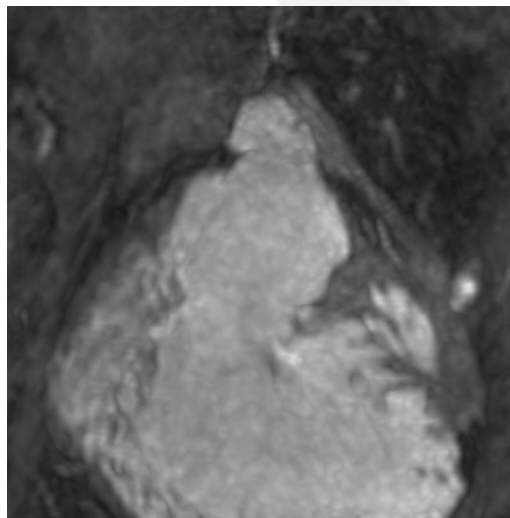
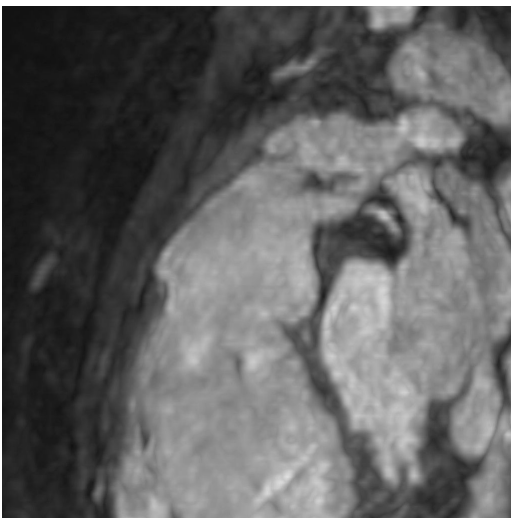
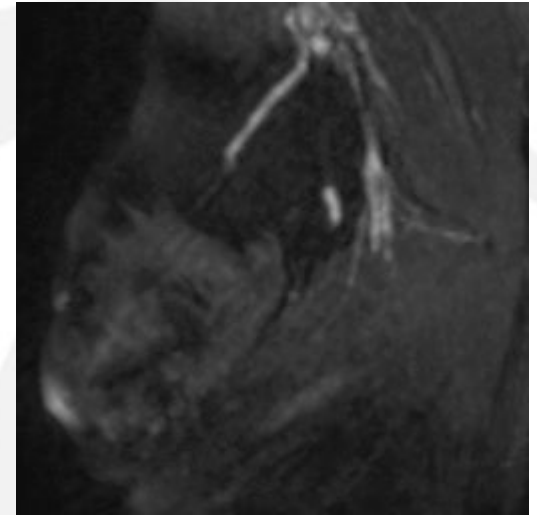
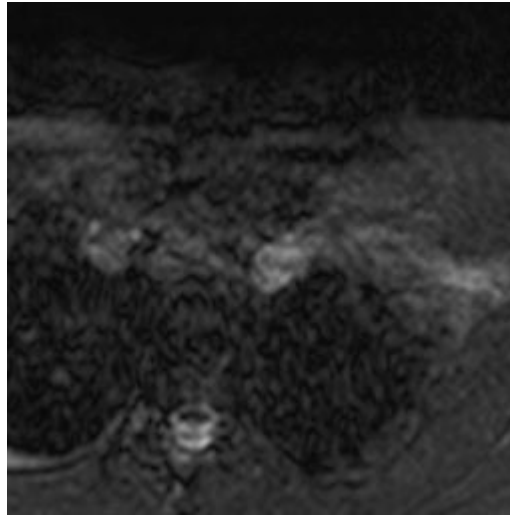
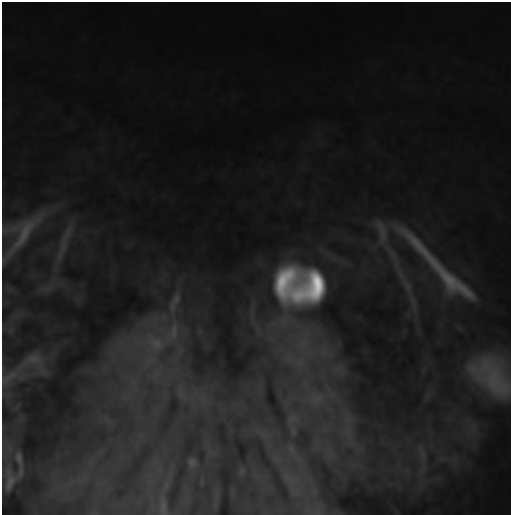
postproc offc/ang conflicts

Total scan duration	02:00.0
Rel. signal level (%)	100
Act. TR/TE (ms)	3.9 / 1.16
ACQ matrix M x P	188 x 171
ACQ voxel MPS (mm)	1.60 / 1.75 / 8.00
REC voxel MPS (mm)	1.25 / 1.25 / 8.00
Scan percentage (%)	91
TFE shots	79
TFE dur. shot / acq (ms)	162.8 / 116.4
TFE shot interval (beats)	1
Min. TI delay	56.2
Entered heartrate	80
Trigger delay max. / act...	675.0 / 566.0
Max. heart phases	3
Act. WFS (pix) / BW (Hz)	0.710 / 305.7
Min. WFS (pix) / Max. B...	0.152 / 1426.8
SAR / whole body	< 8 % / 0.3 W/kg

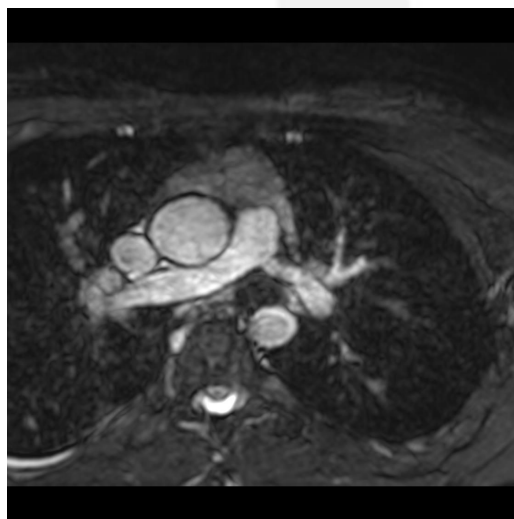
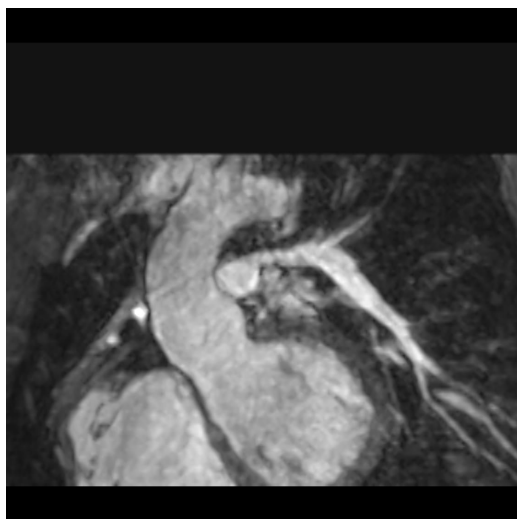
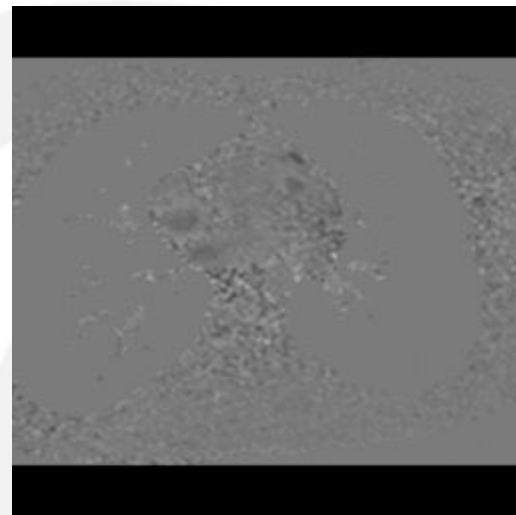
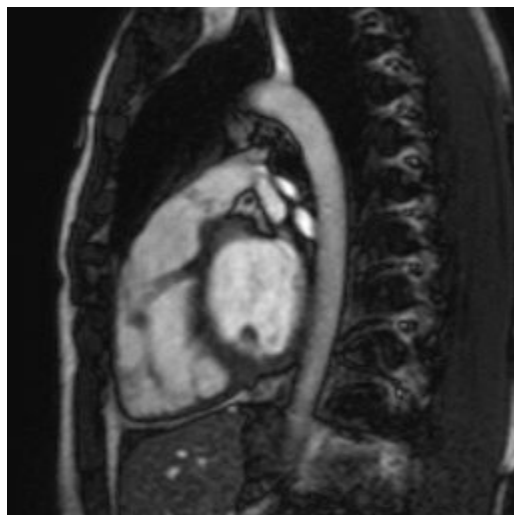
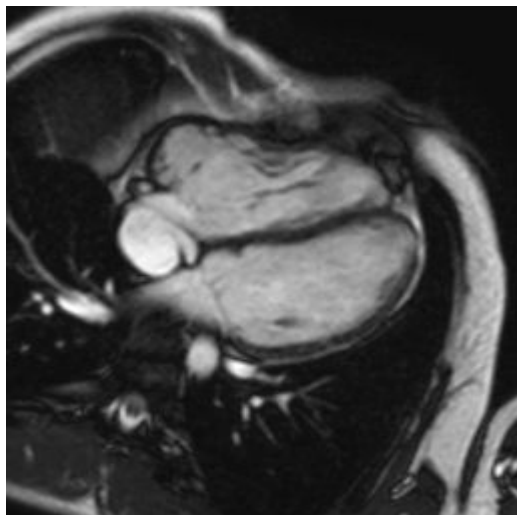


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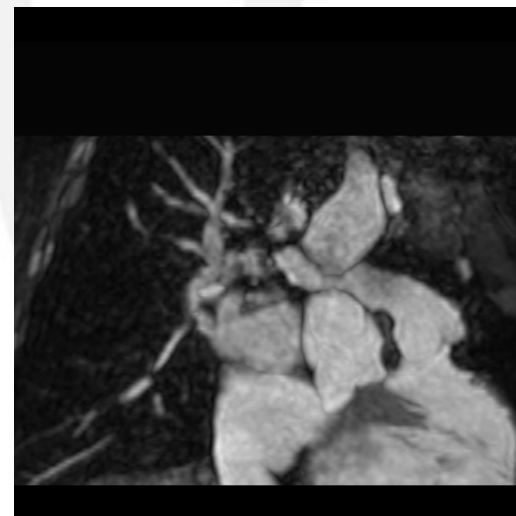
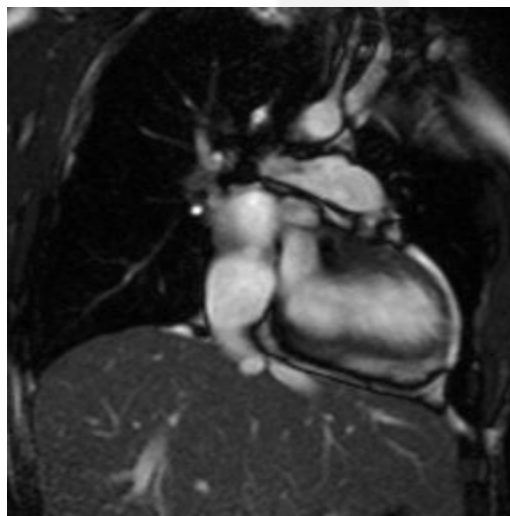
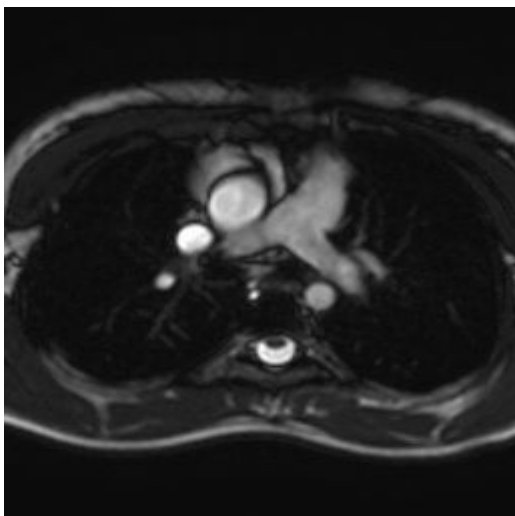
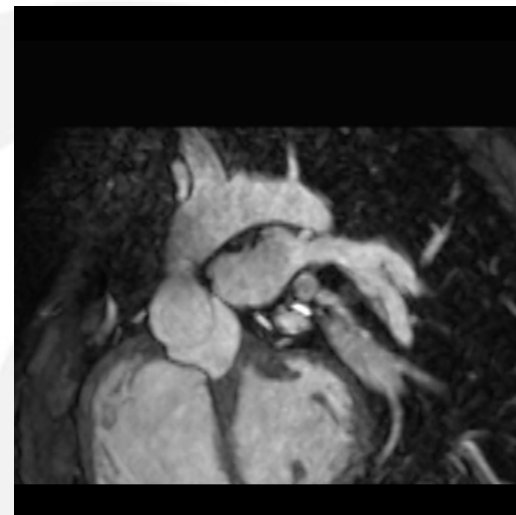
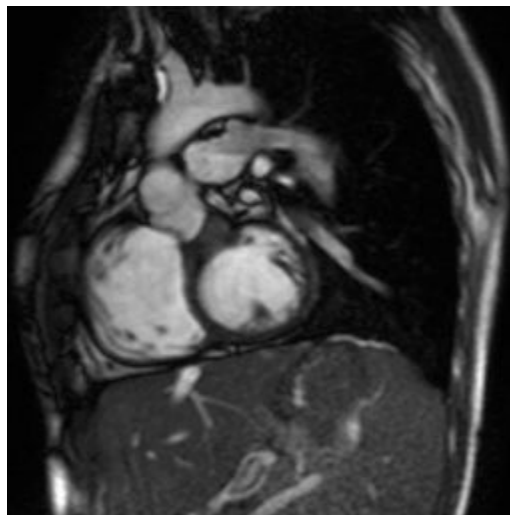
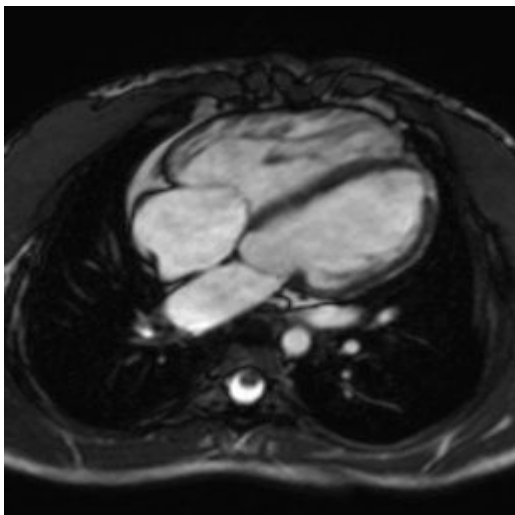
Kontrasztanyag adás nélküli 3D MRA



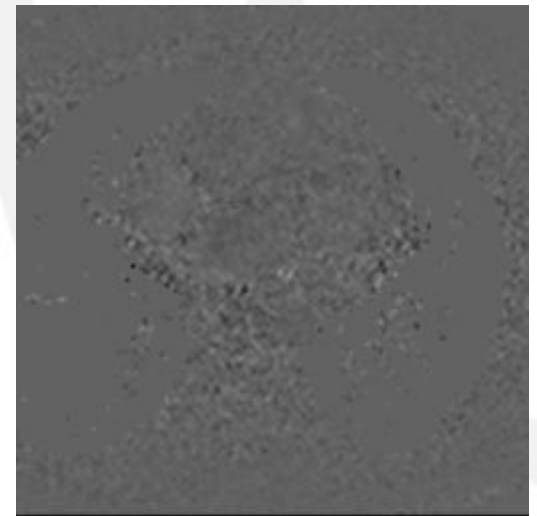
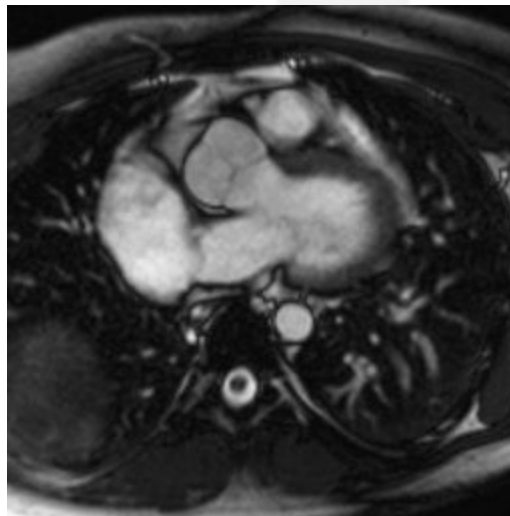
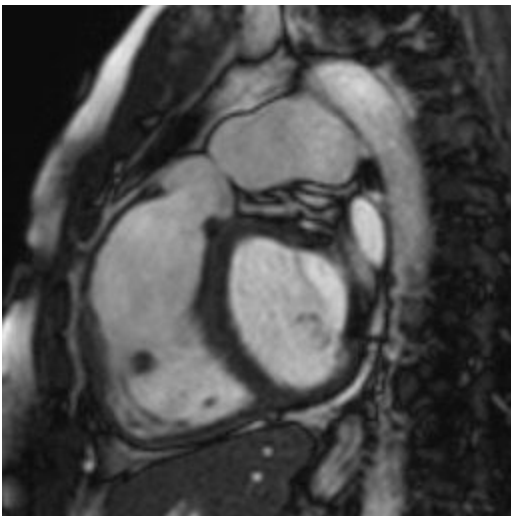
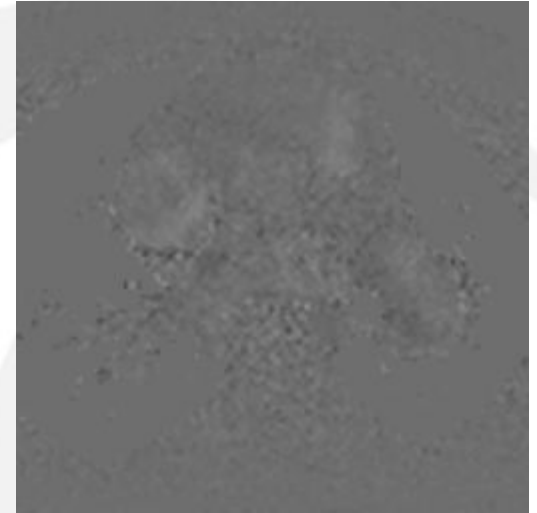
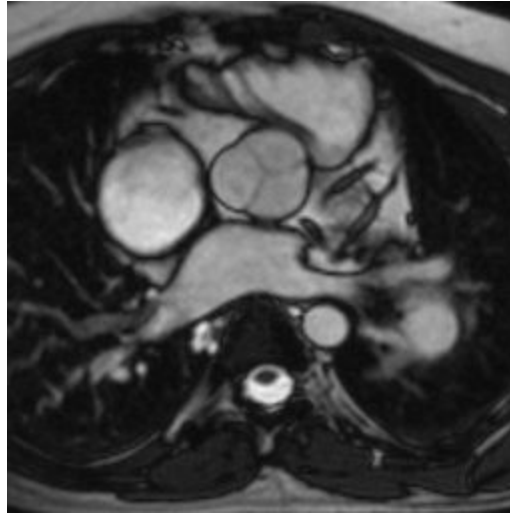
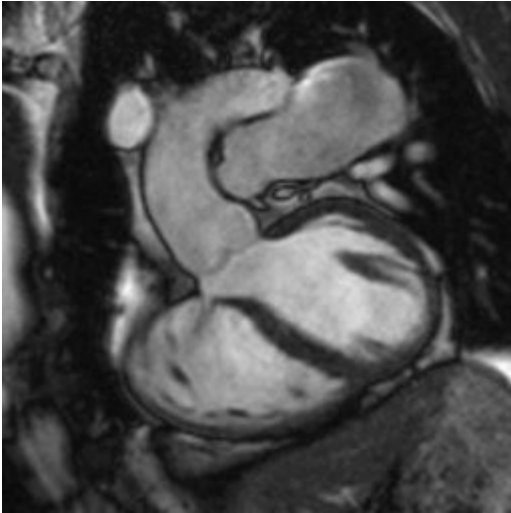
J-B 78-22%, PA Rf: 17%, Qp/Qs: 0.96



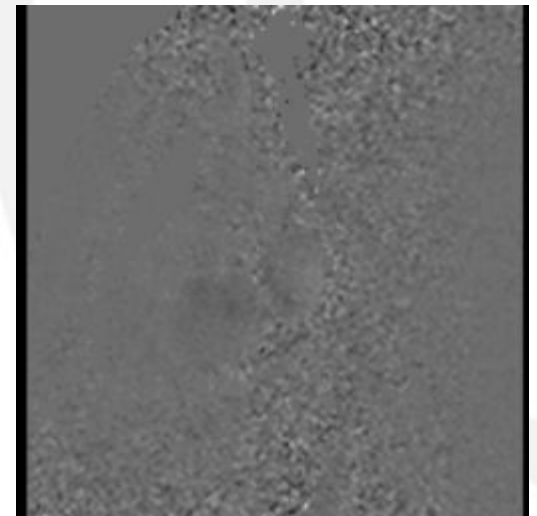
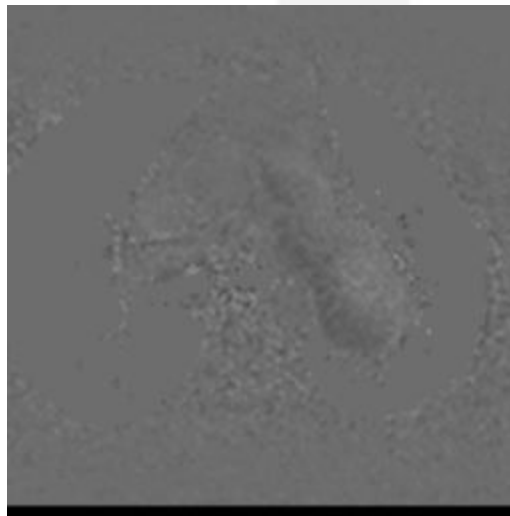
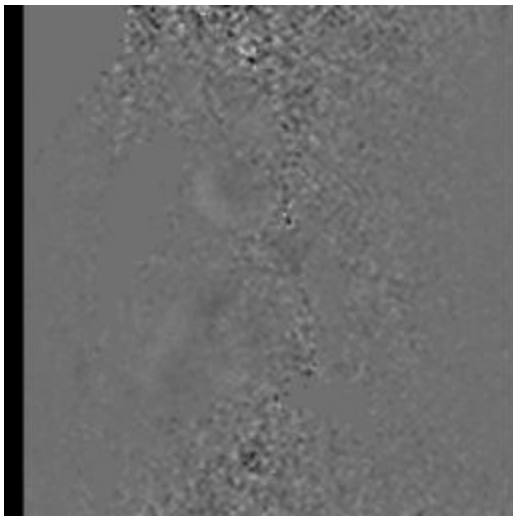
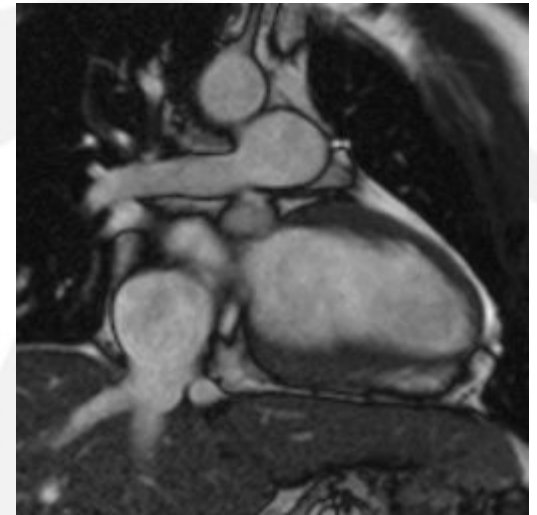
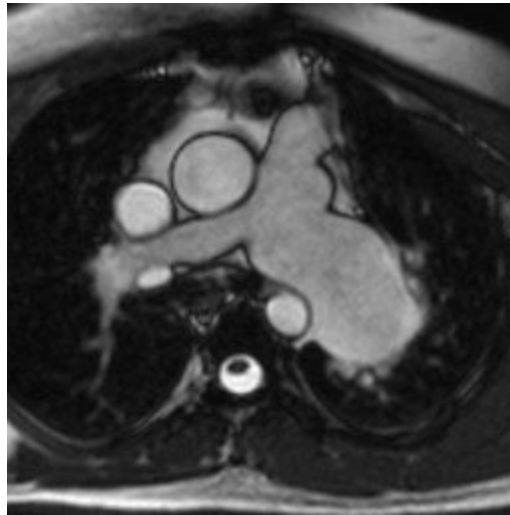
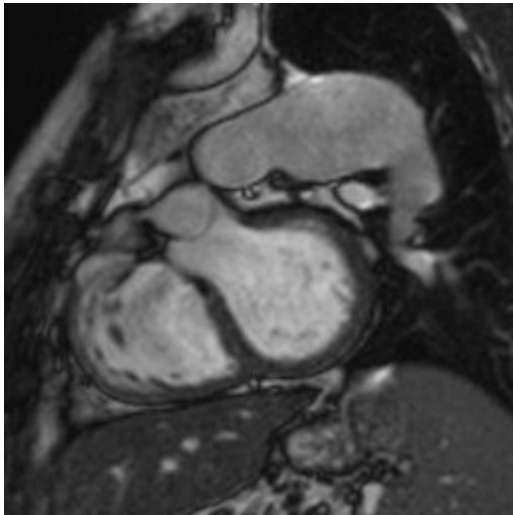
J-B 20-80%, Qp/Qs: 1.04, PA Rf 4%



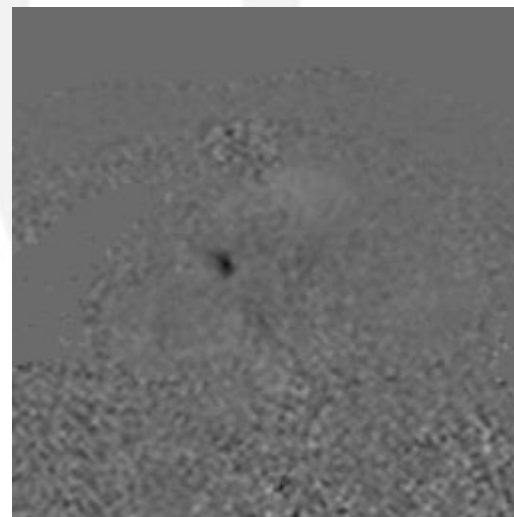
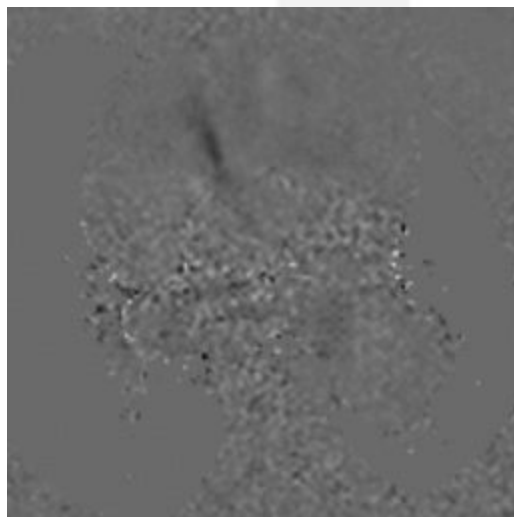
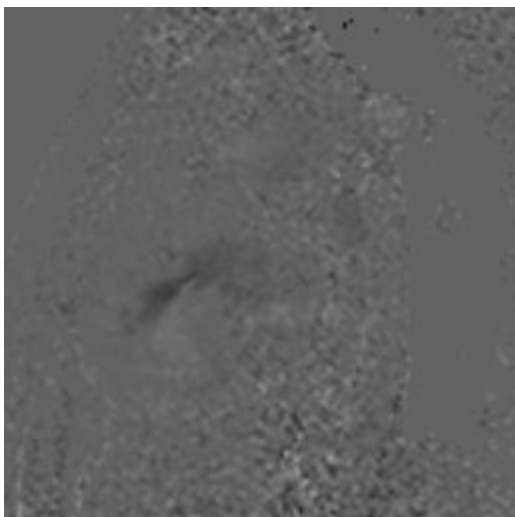
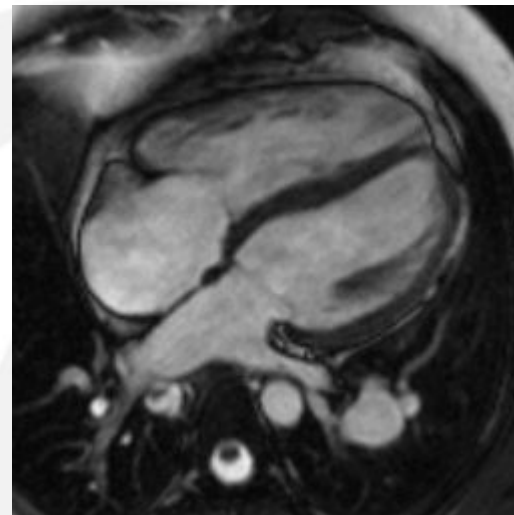
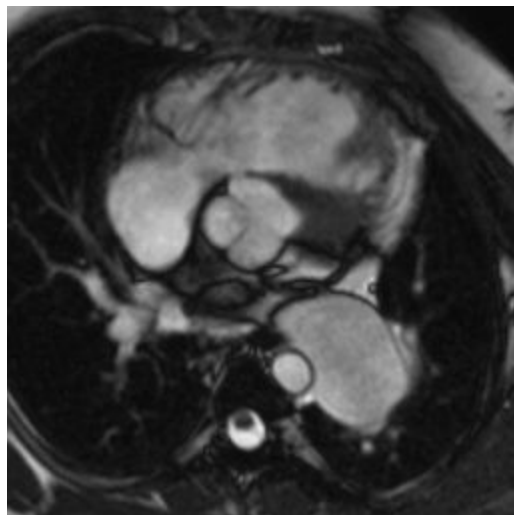
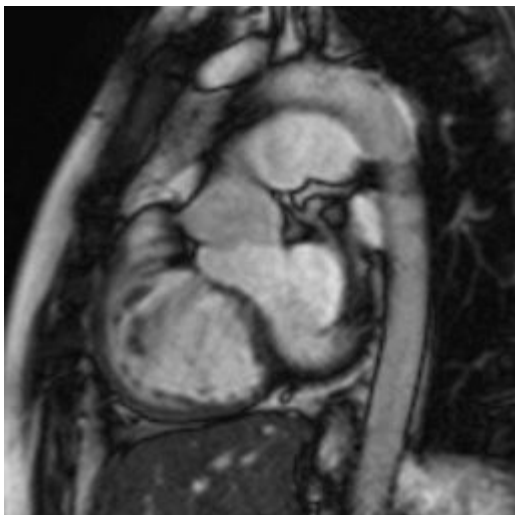
P: 261 27 19, A: 115 5 2, Qp/Qs: 1.26



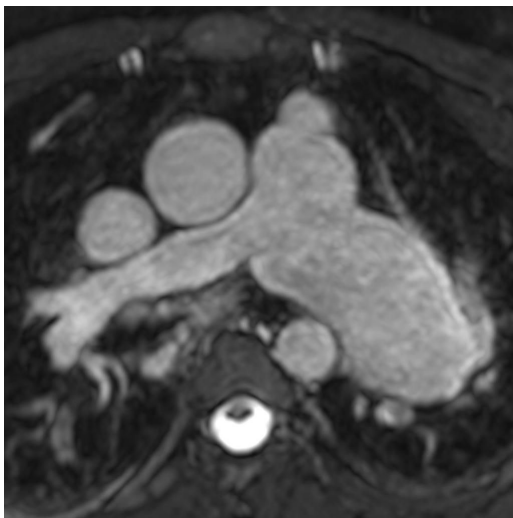
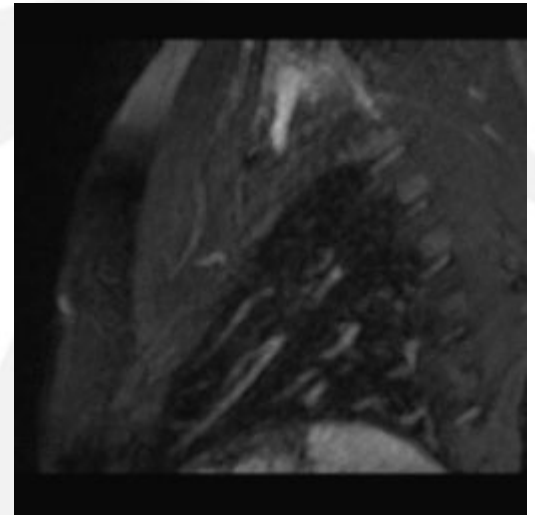
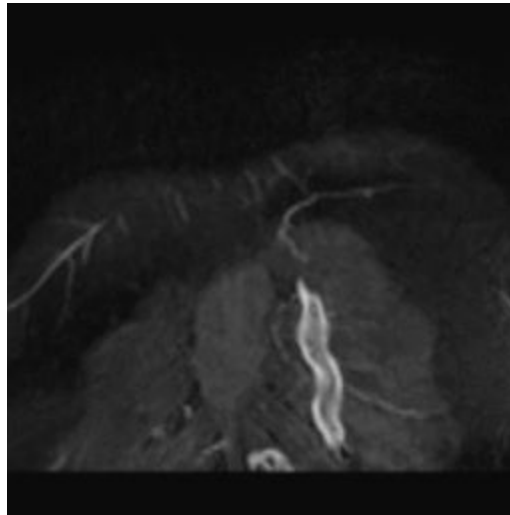
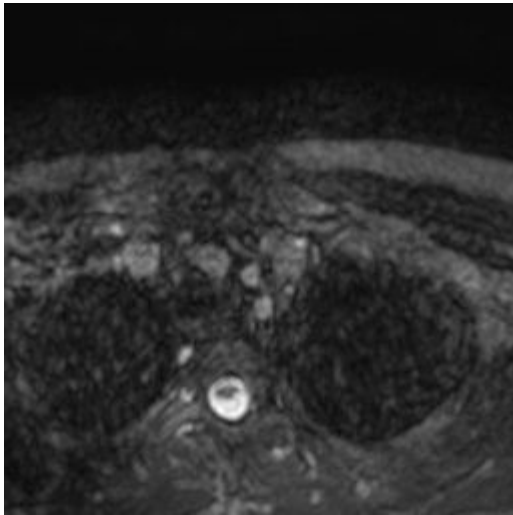
J: 111 5 0, B: 176 12 38, J-B 57-43%



VSD: 257 21/13 0

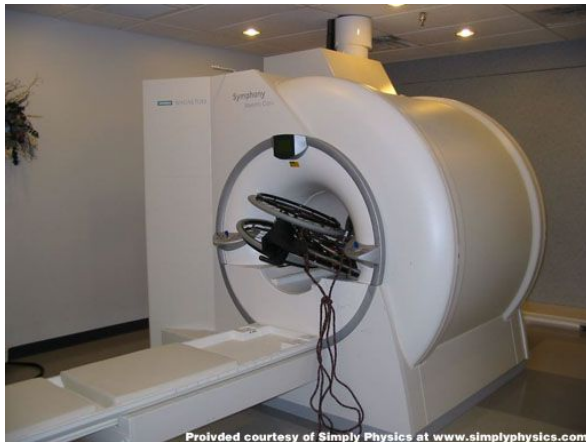


3D NAV MRA





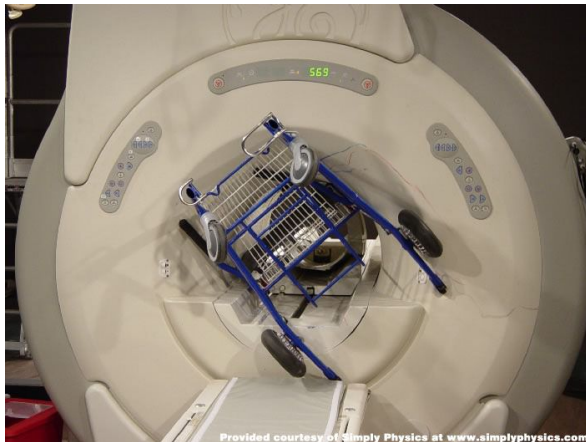
Biztonság: betegszállító, takarító



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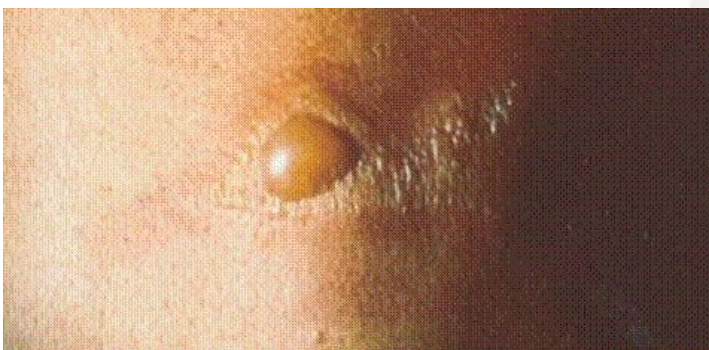
Provided courtesy of Simply Physics at www.simplyphysics.com



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<http://www.simplyphysics.com>

Biztonság: tetkó, EKG, SpO2



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KÖZPONT

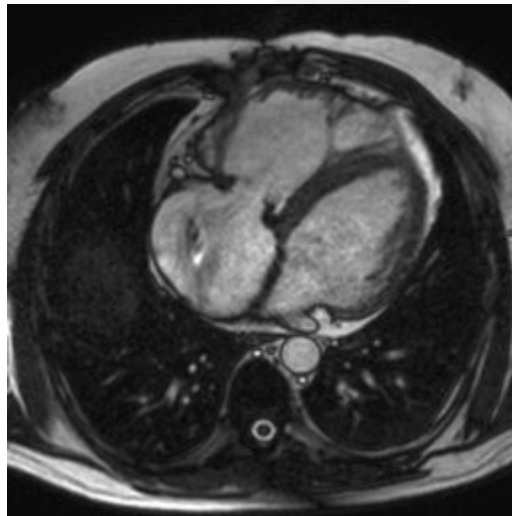
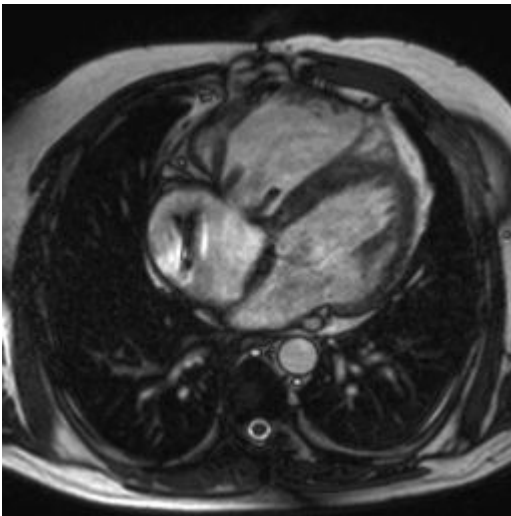
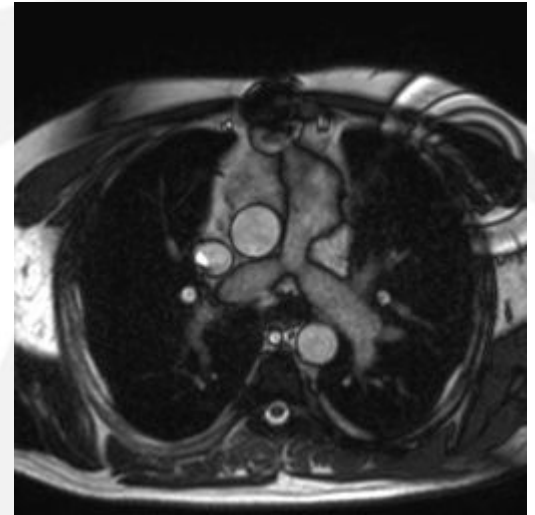
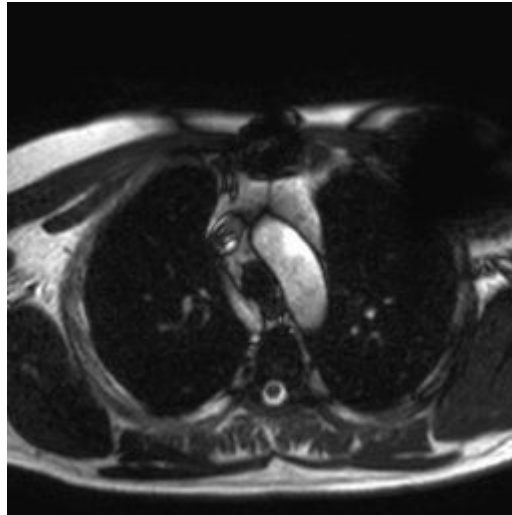
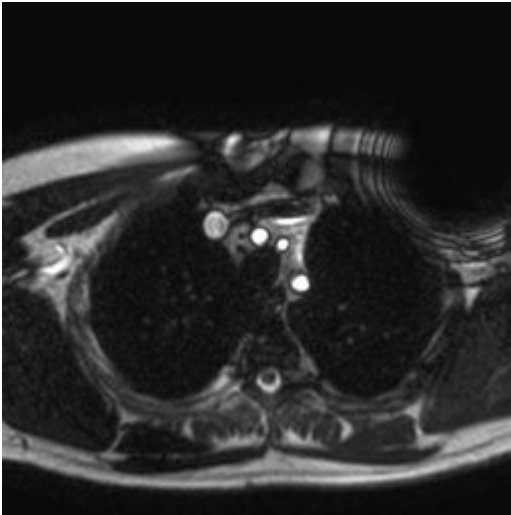
<http://www.simplyphysics.com>



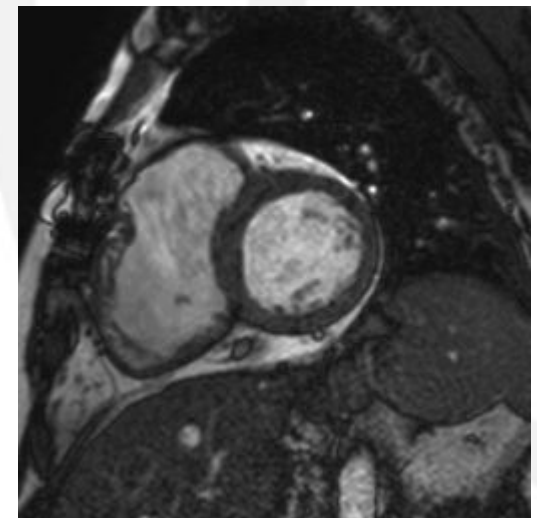
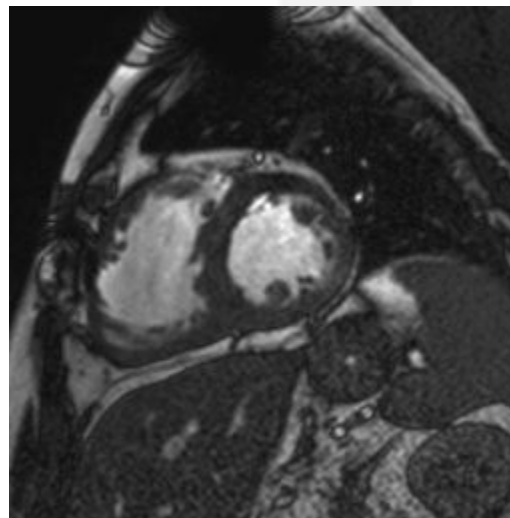
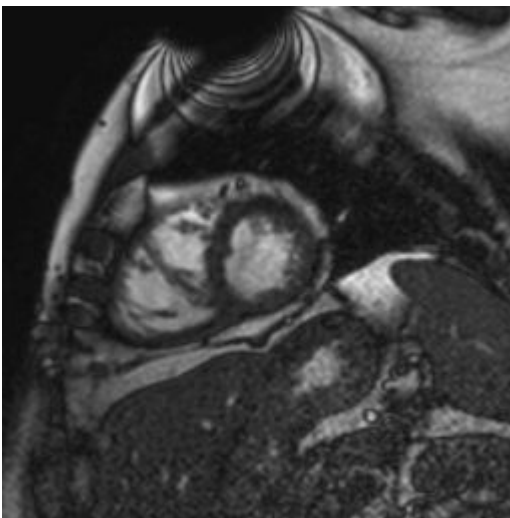
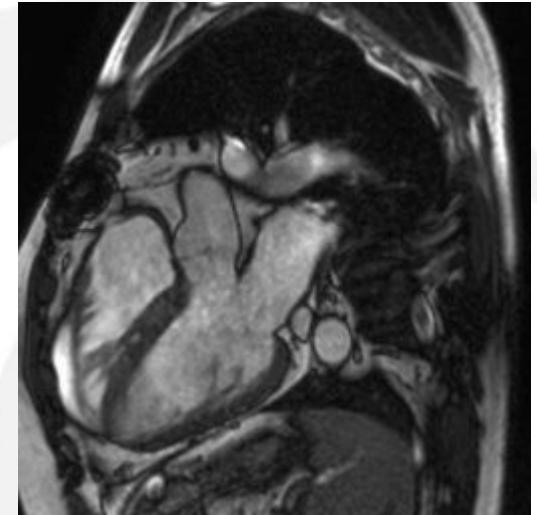
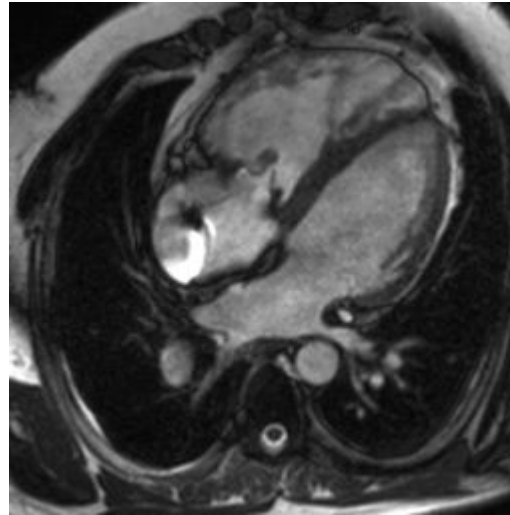
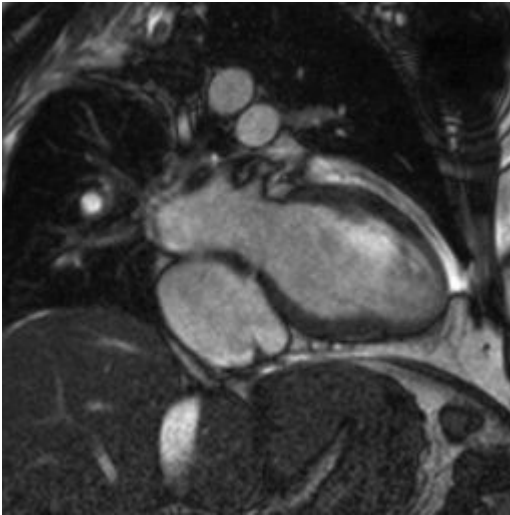
Biztonság: kötelező matricák



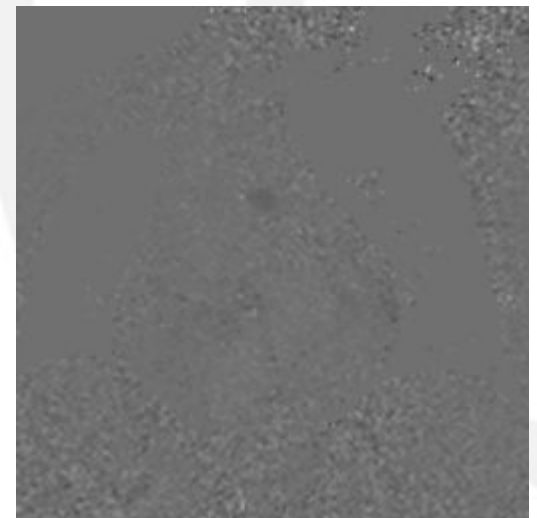
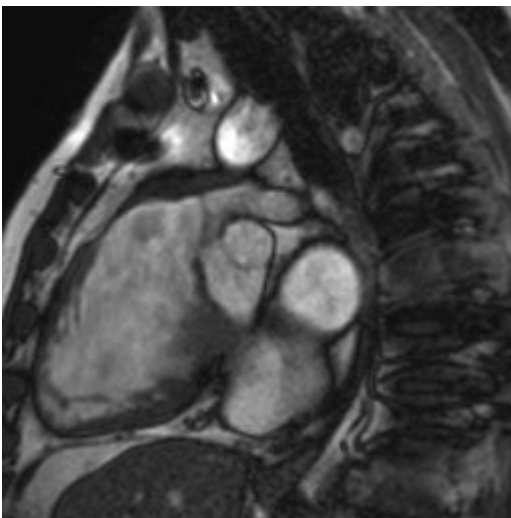
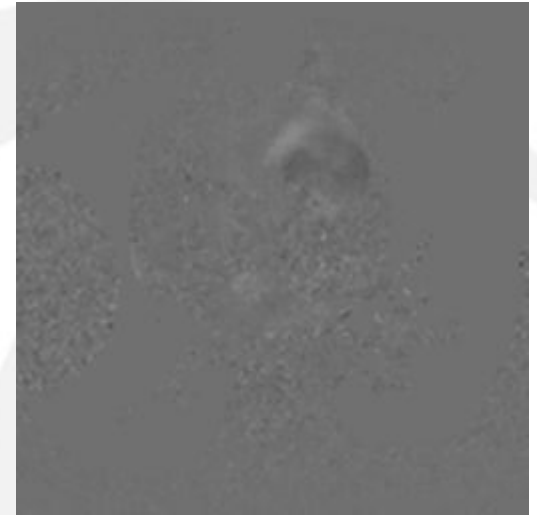
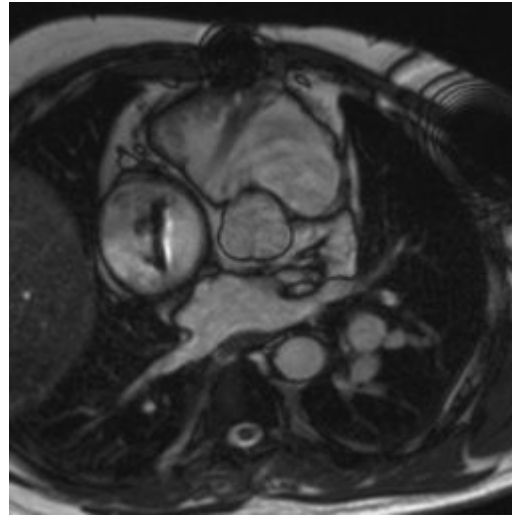
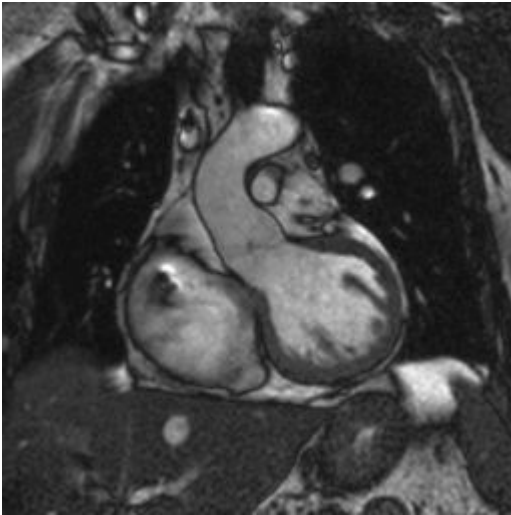
Fallot-tetralogia + pacemaker



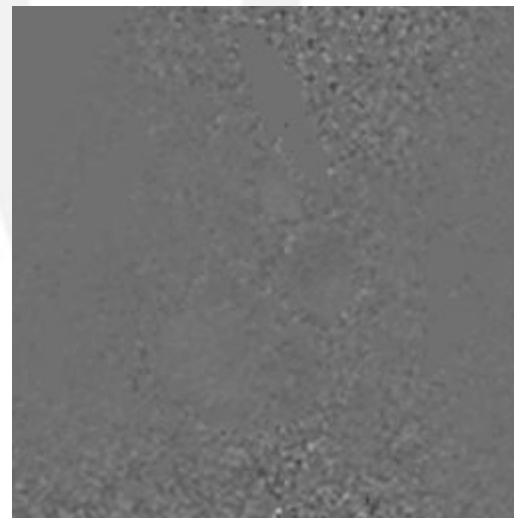
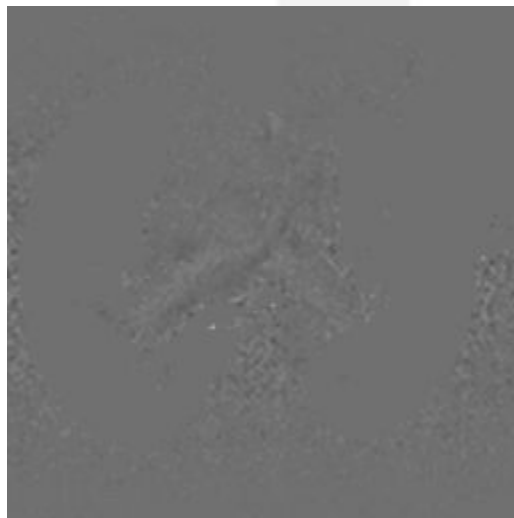
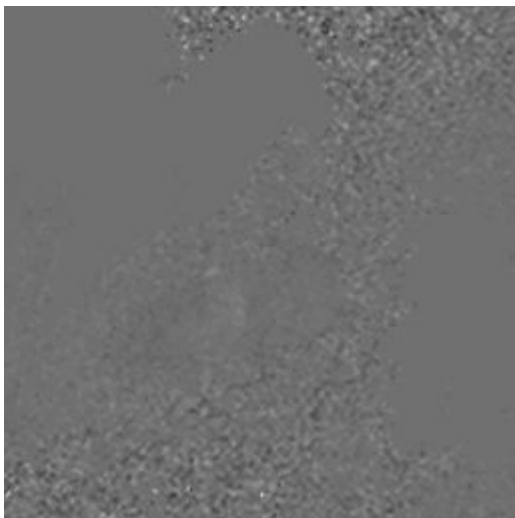
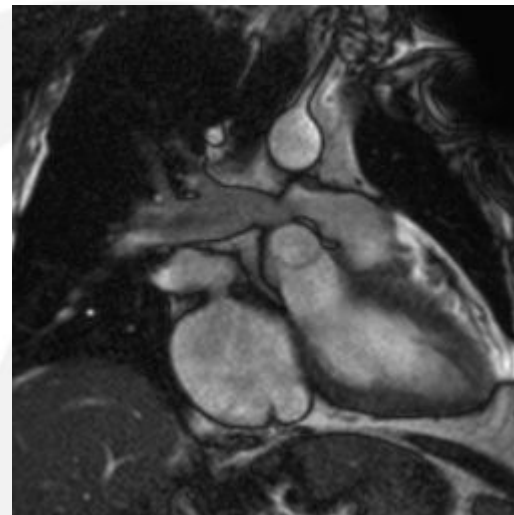
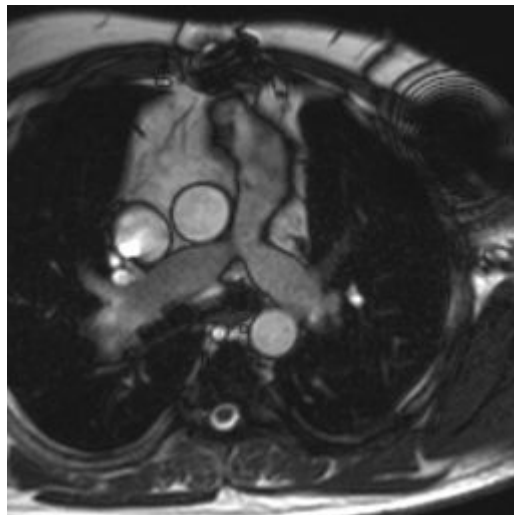
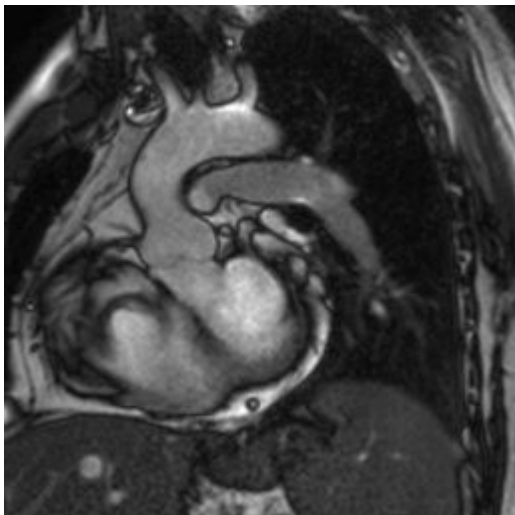
Bal és jobb kamra egyaránt pontos



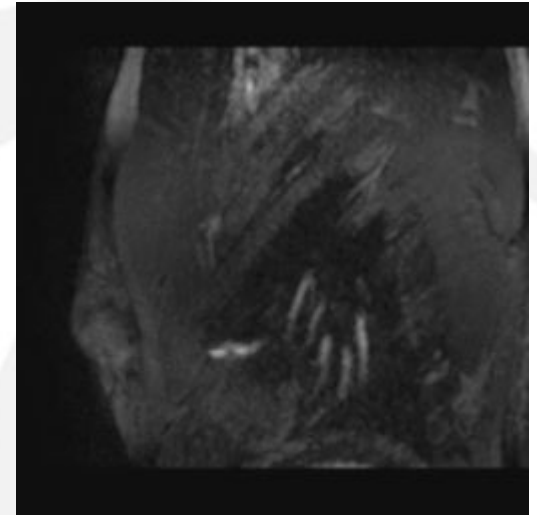
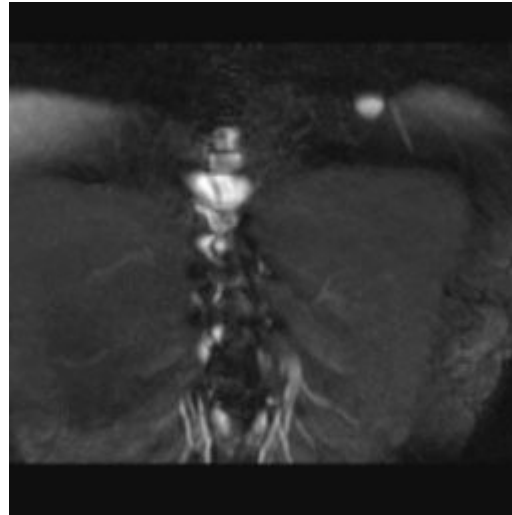
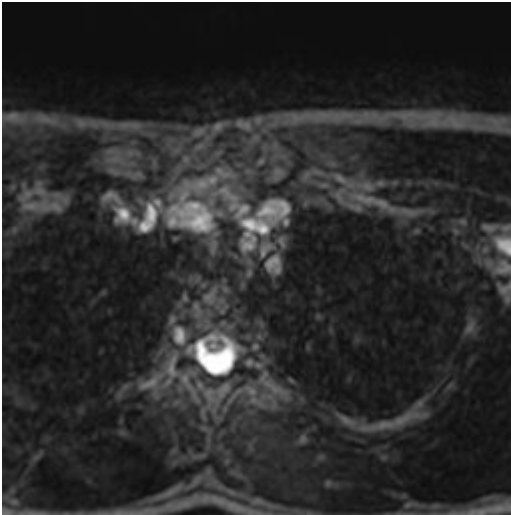
Pulmonalis insufficientia



Tüdő véráramlási arány: 50-50%



Melody billentyű előtt: bal főtörzs



Köszönet

- Kádár Krisztina
- Simor Tanár
- Vágó Hajni
- Merkely Béla
- Balázs Gyuri, Hüttl Kálmán
- Fiatal rezidensek és szakorvos jelöltek
- Asszisztenseink és tudományos diákkörös hallgatóink



VSZÉK – Szív MR labor

