

Szív MR vizsgálat az ISZB diagnosztikájában.

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Pécs, 2016.04.08

Cardiovascular MRI

**University of Pécs
Diagnostic Center**

**1,5 T Siemens Magnetom
Avanto**



Analysis:

MASS 7.6 (MEDIS, NL)

based on short axis movies

Parameters: **EDV, ESV, SV, EF, LVM**

Cardiovascular MRI



Contrast injector

Non Invasive Blood pressure

Stress pump (Adenosin)

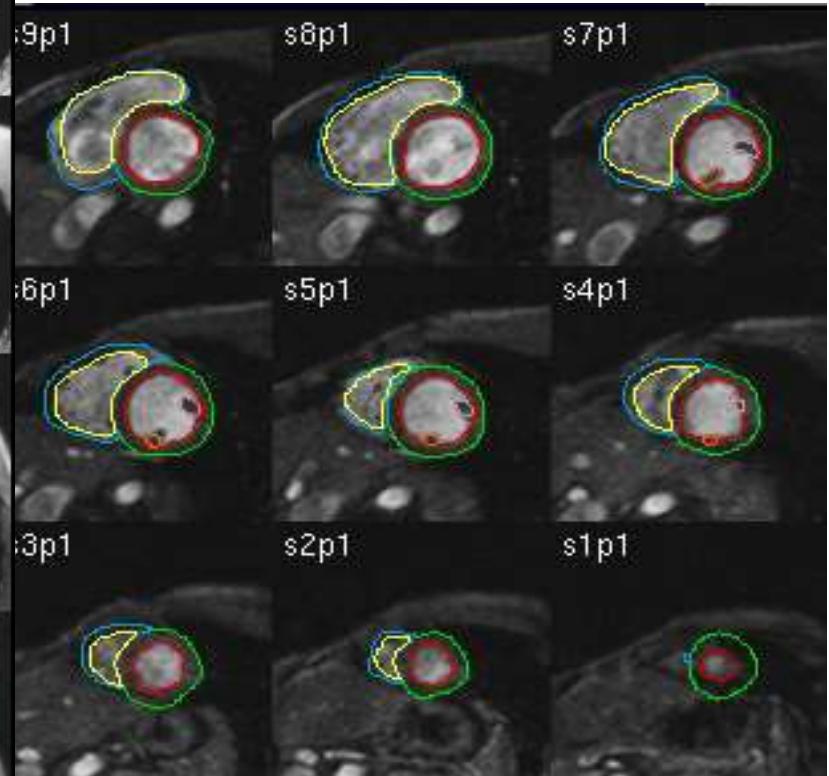
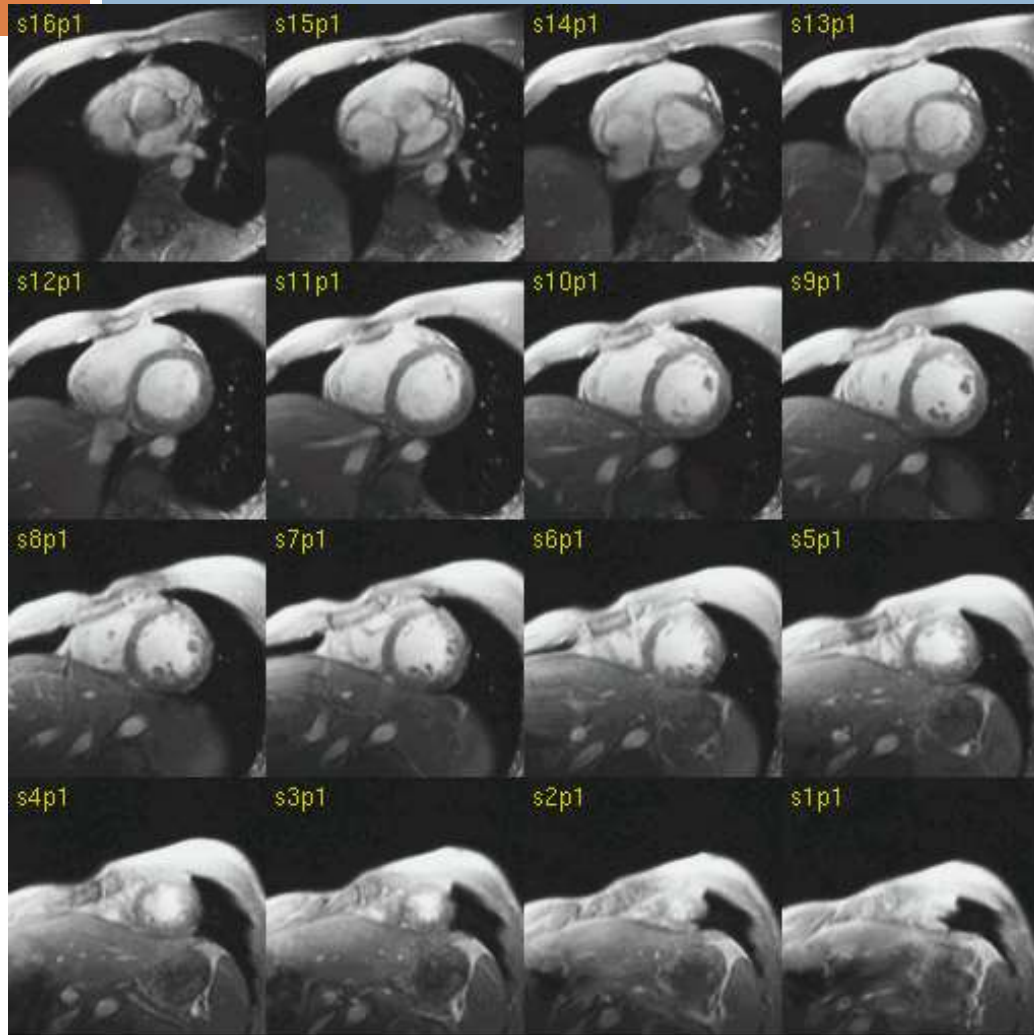
Visual and verbal communication

ECG & SpO2



Administration of contrast

Global left ventricular function



Regional left ventricular function

$$\text{Wall thickening} = 100 * (D_s - D_d) / D_d$$

Left ventricle: 17 segment

Basal 6 – 6 segments

and

inferoseptal
anteroseptal
anterior

Middle

anterolateral
Inferolateral

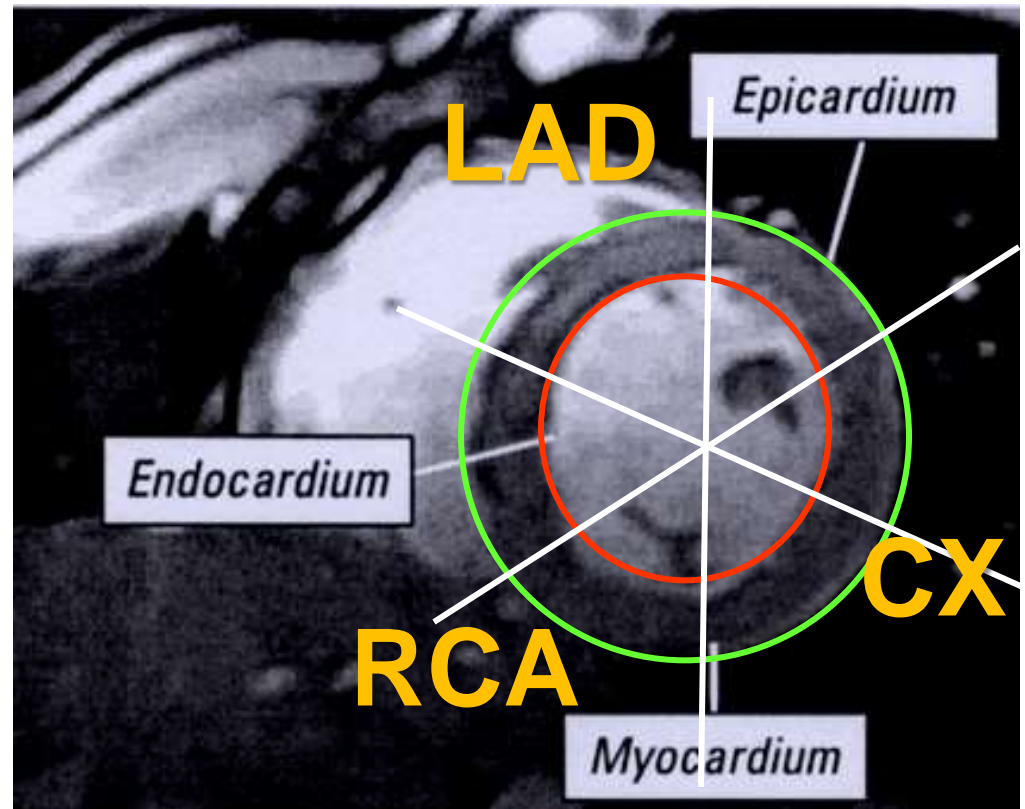
Apical

4 segments

Septal
Anterior
Lateral
Inferior

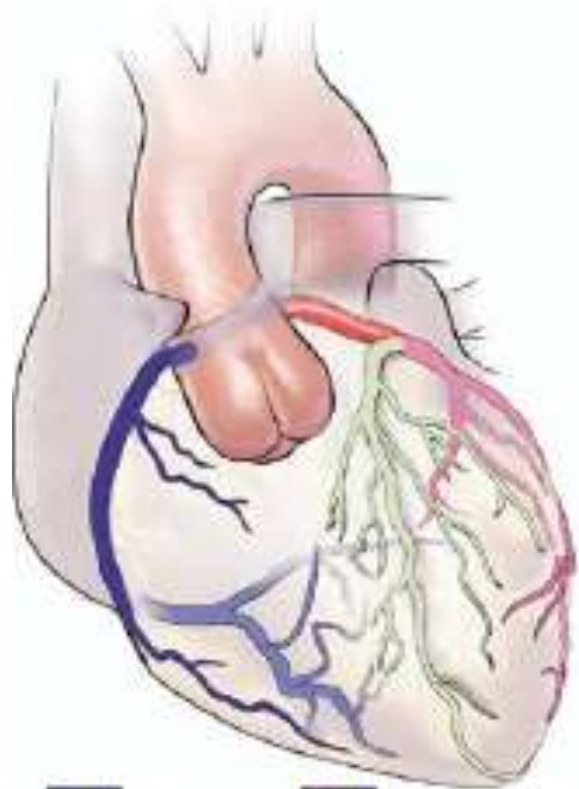
Apex

1 segment

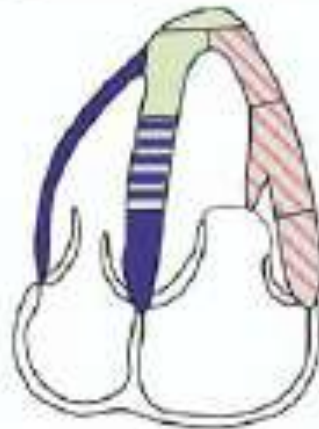


Left ventricular mass = LV muscle volume *
1,05

Coronary blood supply



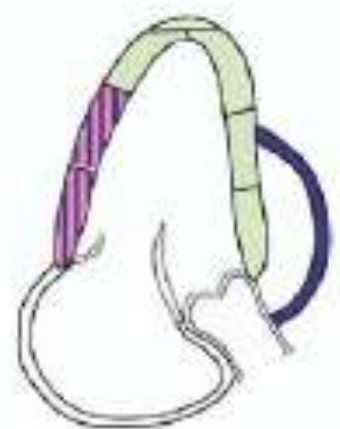
① Four Chamber



② Two Chamber



③ Long Axis



④ Base



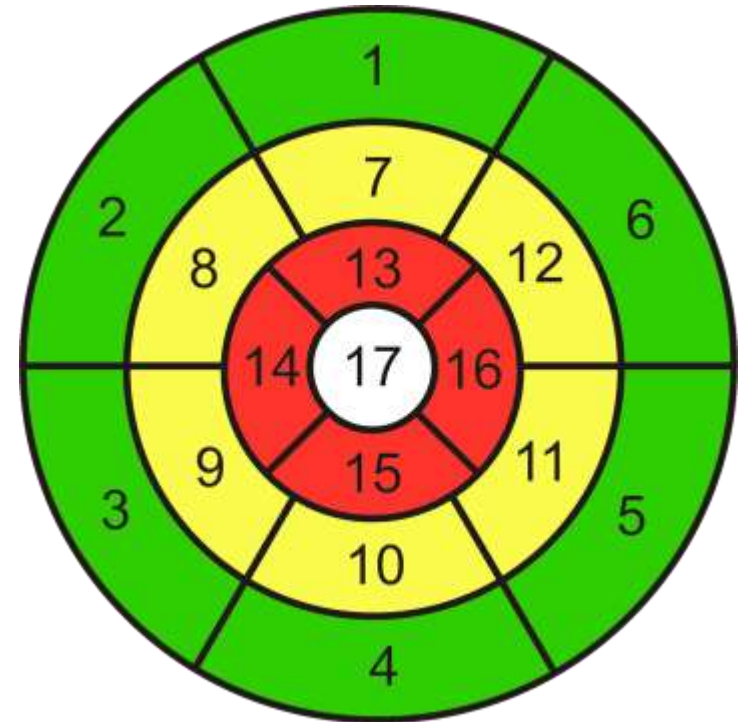
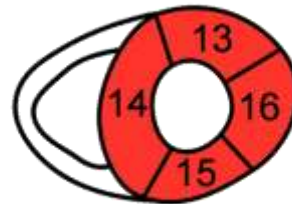
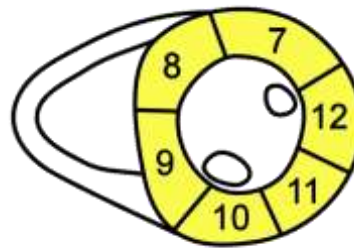
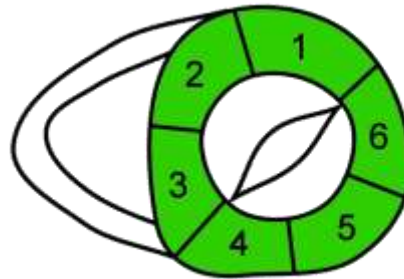
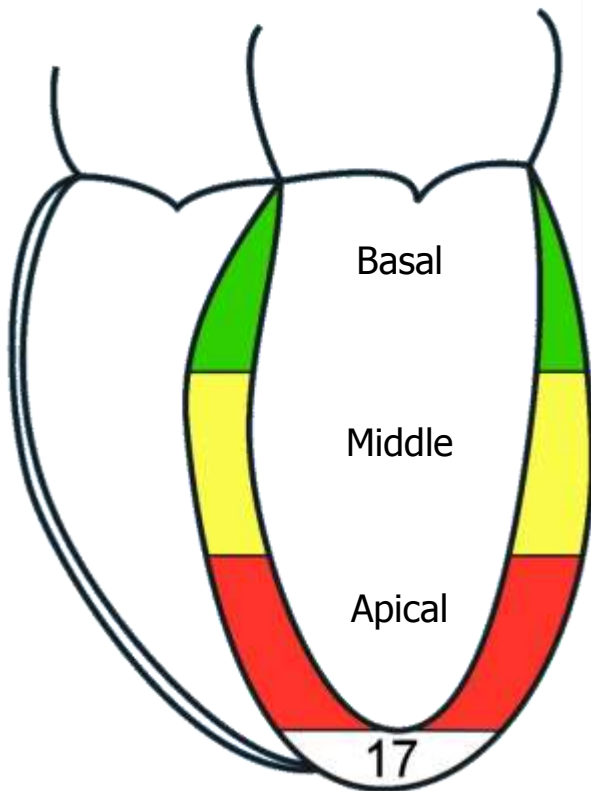
⑤ Mid



⑥ Apex

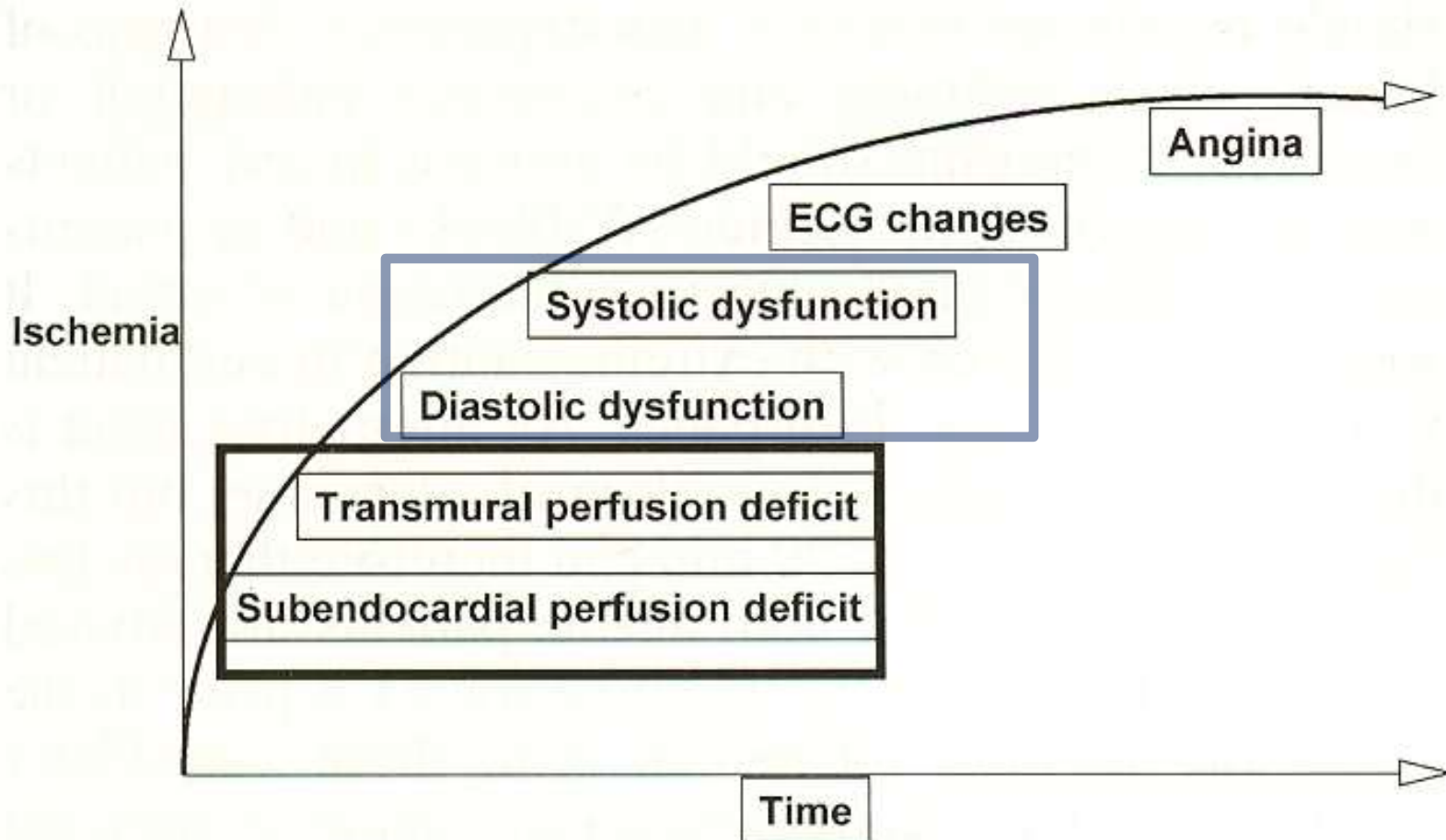


Regional left ventricular function



Bull's eye diagram

Ischemic cascade



Dobutamin stressz MR

kizárási kritériumok

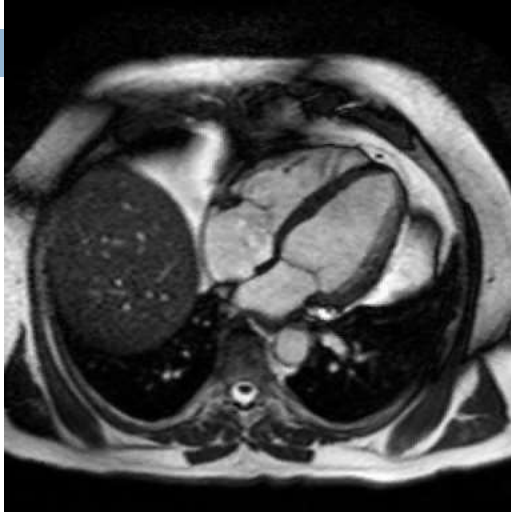
- ❑ Nem MR-kompatibilis kardiológiai pacemaker, cardioverter
- ❑ defibrillátor, neurostimulátor.
- ❑ Starr–Edwards mechanikus műbillentyű.
- ❑ Bizonyos agyi aneurysmaklippek beültetése utáni állapot.
- ❑ Fülimplantátumok.
- ❑ Nyugalmi dyspnoe.
- ❑ Ismert allergia dobutaminra.
- ❑ Szignifikáns billentyűhibák.
- ❑ Glaucoma.
- ❑ Claustrophobia.
- ❑ Ha a páciens nem képes tartósan a hátán feküdni, háti fájdalom.
- ❑ Nyugtalanosság.
- ❑ Pitvarfibrilláció.

Megszakítási indikációk

- Újonnan megjelenő vagy rosszabbodó falmozgászavar.
- 40 Hgmm-nél nagyobb szisztolés vérnyomásesés.
- Jelentős (240/120 Hgmm-nél nagyobb) vérnyomás-emelkedés.
- Súlyos mellkasi fájdalmak.
- Súlyos dyspnoe.
- A balkamra-funkció globális romlása.
- Komplex kamrai aritmiák.
- Magas kamrai frekvenciával járó pitvarfi brilláció/flatten.
- Nem tolerálható mellékhatások (hányinger, hányás).
- A beteg kérése.
- Célfrekvencia elérése $(220 - \text{életkor}) \times 0,85$

Dobutamin-Stressz MR: 4-üreg

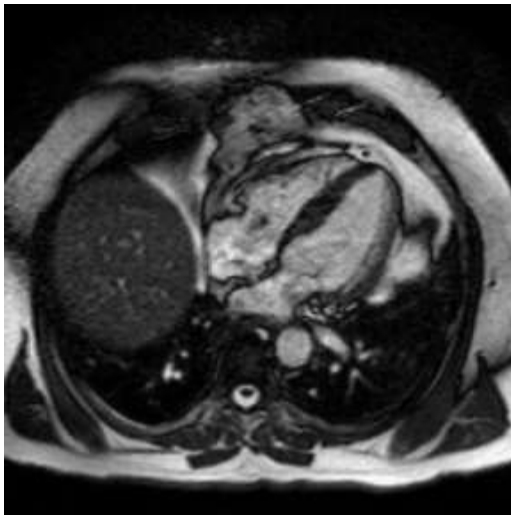
nyugalmi



20 μ g



30 μ g

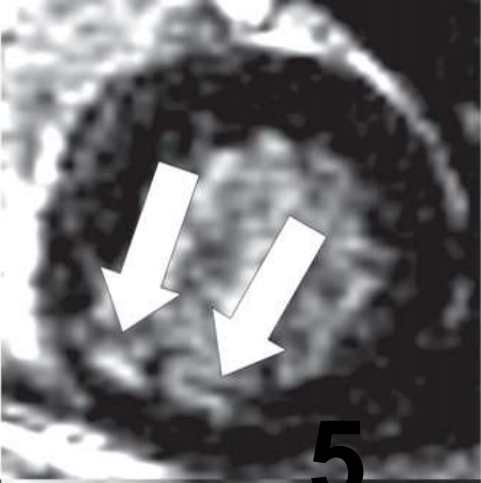


40 μ g





LE



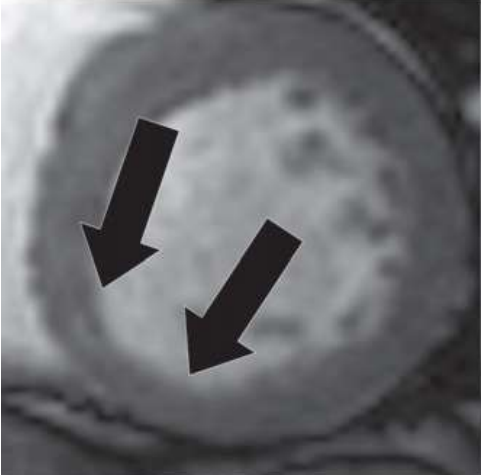
Nyugalmi

5

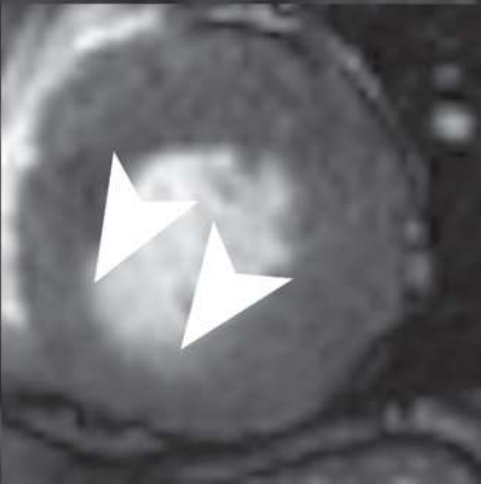
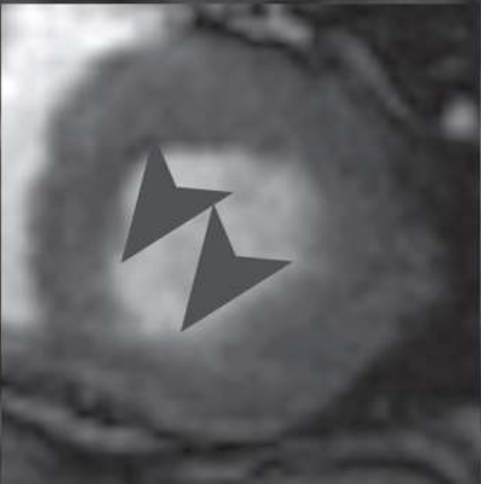
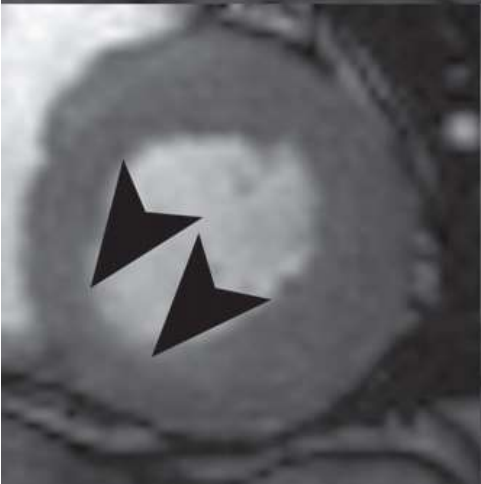
30 ug/kg/p



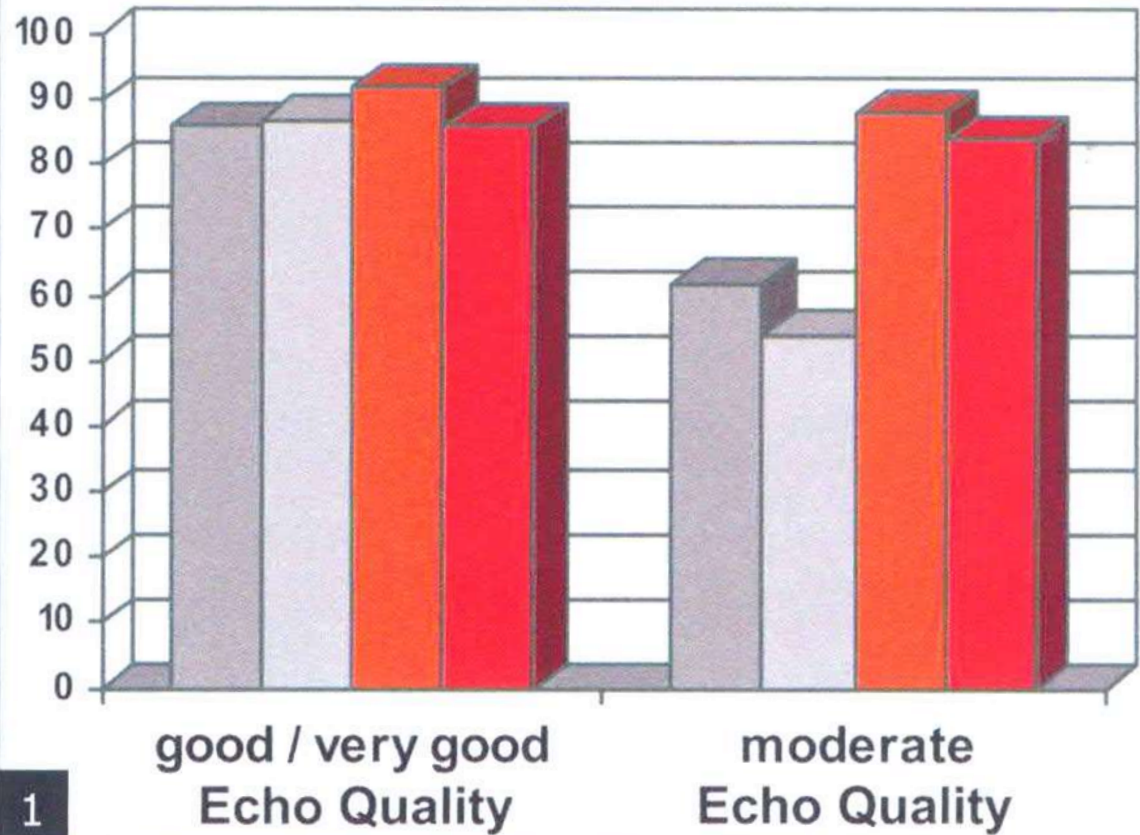
ED



ES

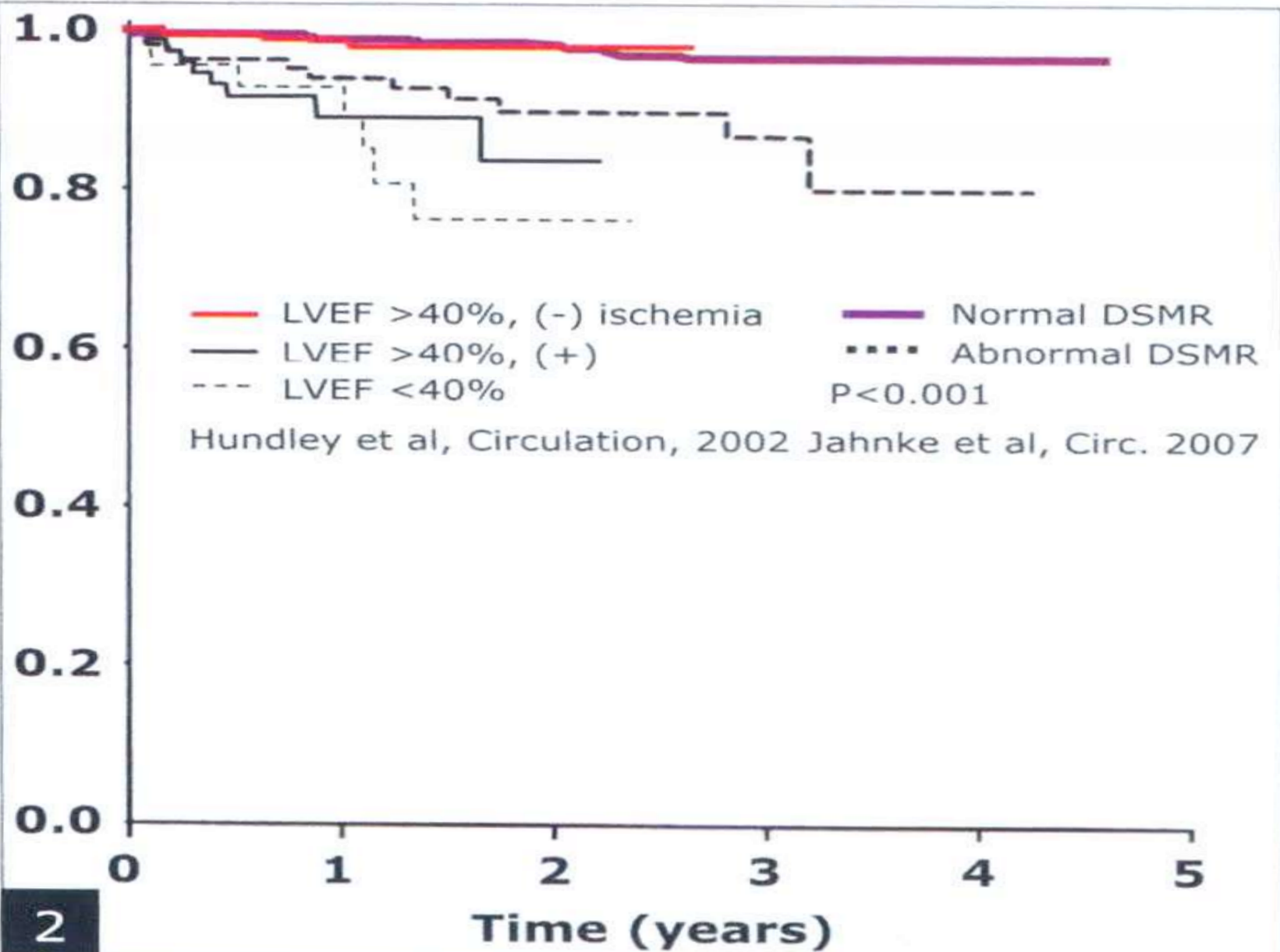


Dobutamin stressz MR

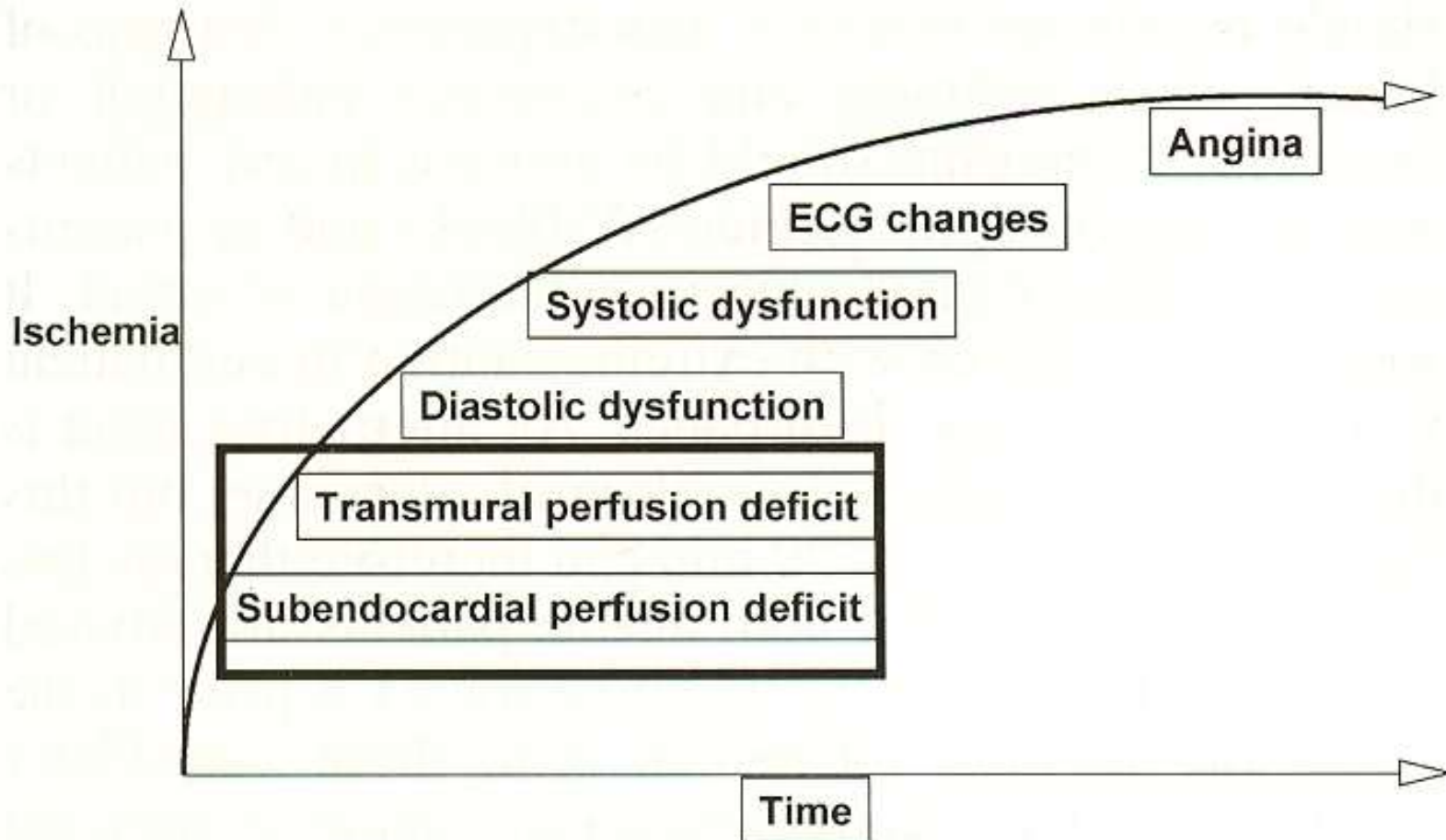


- sensitivity (DSE)
- specificity (DSE)
- sensitivity (DS-CMR)
- specificity (DS-CMR)

Event Free Survival (%)



Ischemic cascade



Stressz „first pass” perfúziós MR

- non-invazív
- szívizom iszkémia kimutatása
- koszorúér betegség mértékének, fiziológiai szignifikanciájának meghatározása

MR perfúzió

- 1986 egy szeletes turboFLASH
 - érzékeny a pulzus változásaira
 - rossz a szív lefedettsége
 - korlátozott a perfúziós defektus kvantifikálása

- 1990 több szeletes turboFLASH
 - kép minőség nem megfelelő
 - gyakoriak a műtermékek

 hibrid EPI

 - gyorsabb scan idő
 - 7-8 szelet / szívütés

- jelenleg turboFLASH
 trueFISP
 hibrid EPI
 - paralel akvizíciós technikával (SENSE, GRAPPA)
 - magas térbeli és időbeli felbontás
 - kevesebb műtermék

Adenosin < - > dipyridamol, I

▪ Adenosin

▪ Hatás:

▪ vazodilatáció

- az A1 és A2 sejtfelszíni adenosin receptorokon hatva gátolja a lassú Ca^{2+} beáramlást
- A2 receptorokon hatva aktiválja a simaizmok adenilát- cikláz enzimét
- K^+ csatorna nyitó

▪ sinus- és AV- csomó gátlása

▪ Mellékhatások:

- Enyhe vérnyomáscsökkenés reflexes pulzusszám emelkedéssel, fejfájás, angina pectoris, bőrpír, sinus- és AV-csomó fokozott blokkolása, proarrhythmias effektusok, dyspnoe, asthmás betegekben bronchusgörcs

▪ Kontraindikációk:

- Asthma bronchiale, másod- vagy harmadfokú AV-blokk, sick sinus szindróma, pitvari flutter relatív ellenjavallat

▪ Gyógyszerkölsönhatások: dipyridamol, methyxantinok

Adenosin < - > dipyridamol, II

□ Dipyridamol

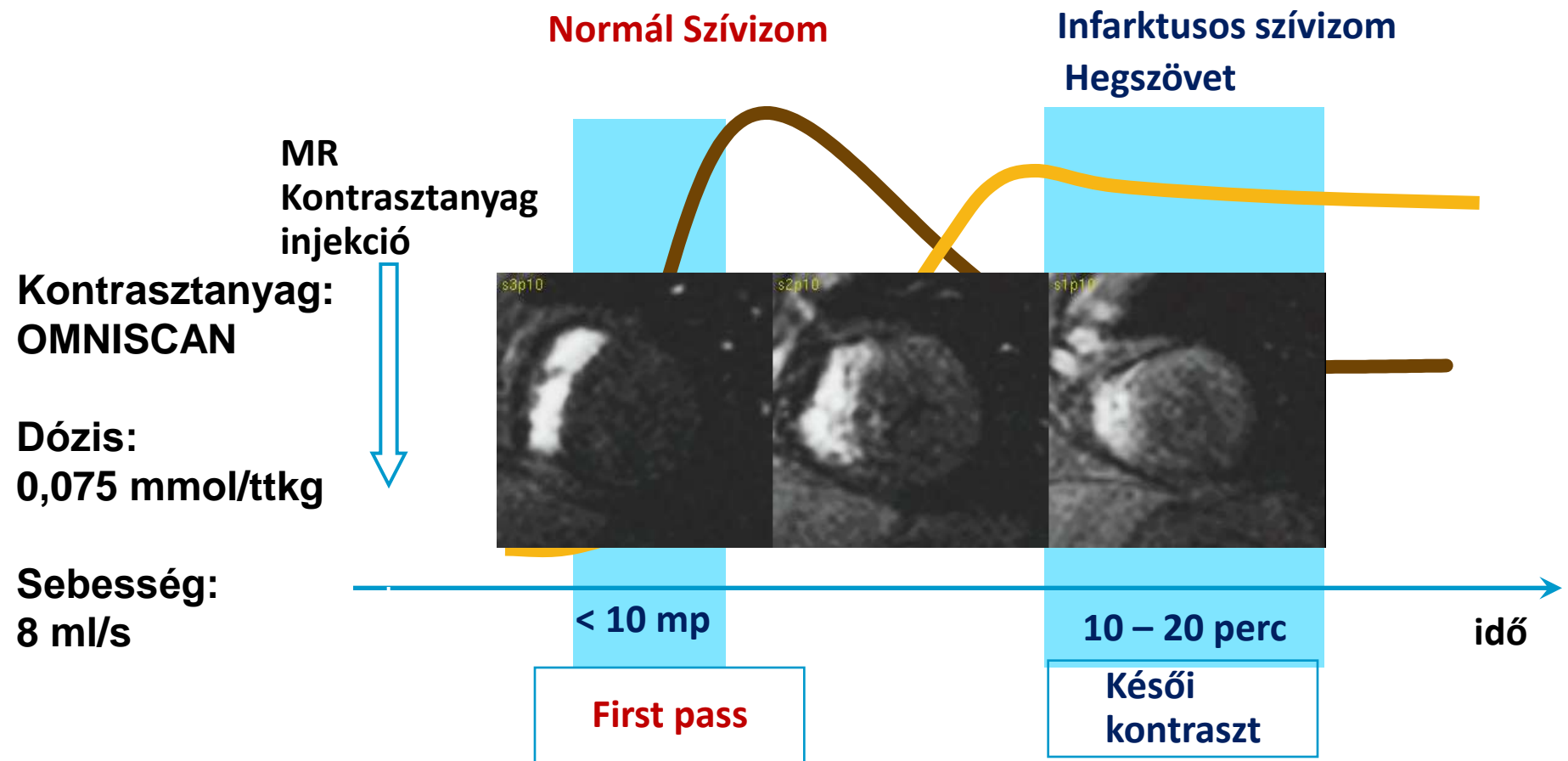
- Hatás: (adenosin deaminase gátlás)
 - Coronaria vazodilatátor, adenosintranszport gátlásán keresztül
 - Gátolja a thrombocyták kitapadását a károsodott érfalhoz
 - Fokozza a cAMP képződését
 - Csökkenti a thrombocyták Ca^{2+} tartalmát
- Melléhatások:
 - Vérnyomáscsökkenés, fejfájás, kipirulás, szédülés, syncope, angina pectoris, gastrointestinális irritáció
- Gyógyszerkölcsonhatások: adenosin

Adenosin < - > dipyridamol, III

Farmakon	Utasítások a betegnek	Adagolás	Antidotum
Dipyridamol (perfúzió)	Koffeintartalmú élelmiszereket (tea, kávé, csokoládé...) ne fogyasszon, és aminophyllin vagy nitrát tartalmú gyógyszereit hagyja el a vizsgálatot megelőző 24 órában	0.56 mg/kg/perc 4 percig Hatásmaximum kb. 3-4 perc múlva (féléletidő: 30 perc)	250 mg Aminophyllin i.v. lassan, EKG monitorozás mellett Nitroglycerin sublingualisan
Adenosin (perfúzió)		140 µg/kg/perc maximum 6 percig (féléletidő: 4-10 másodperc)	Infusio leállítása! (ha szükséges: 250 mg Aminophyllin i.v. lassan, EKG monitorozás mellett)

Perfúziós MRI IV

Késői kontraszt



Módszer - MRI vizsgálat IV.



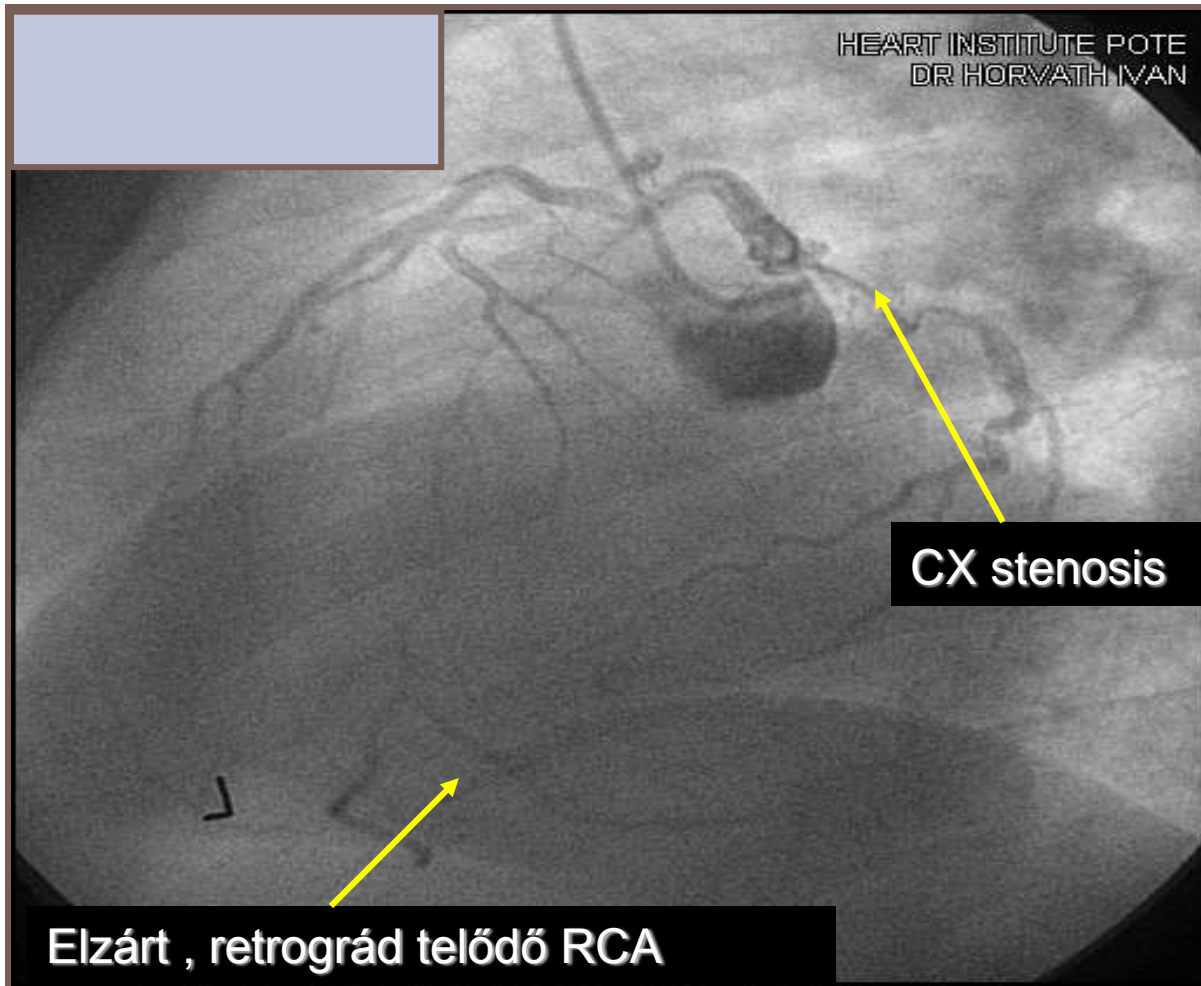
Perfúziós felvételek

3 rövidtengelyi szelet
Basalis, kp., csúcsi
Minden szív ciklusban

Adenozin:

Dózis: 140 $\mu\text{g}/\text{ttkg}/\text{perc}$
Időtartam: 3-4 perc

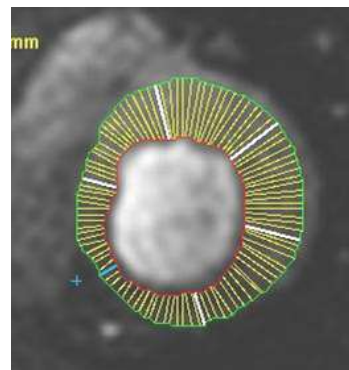
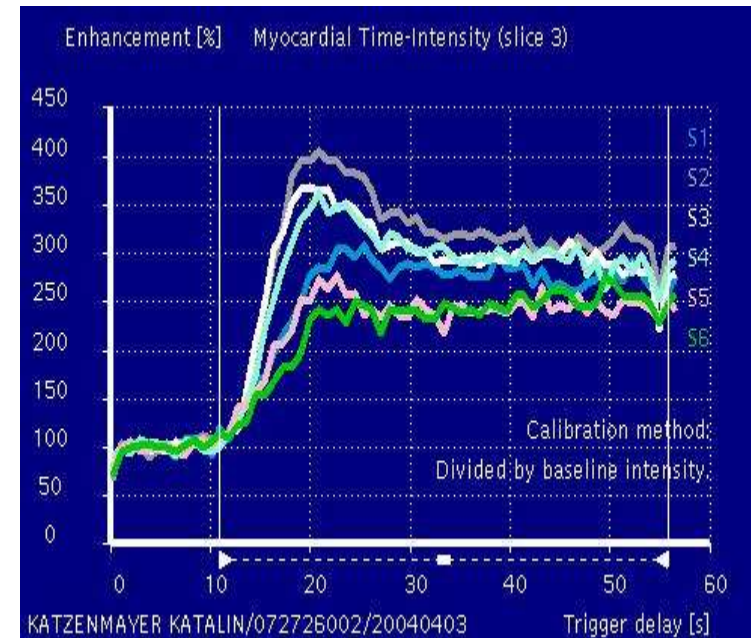
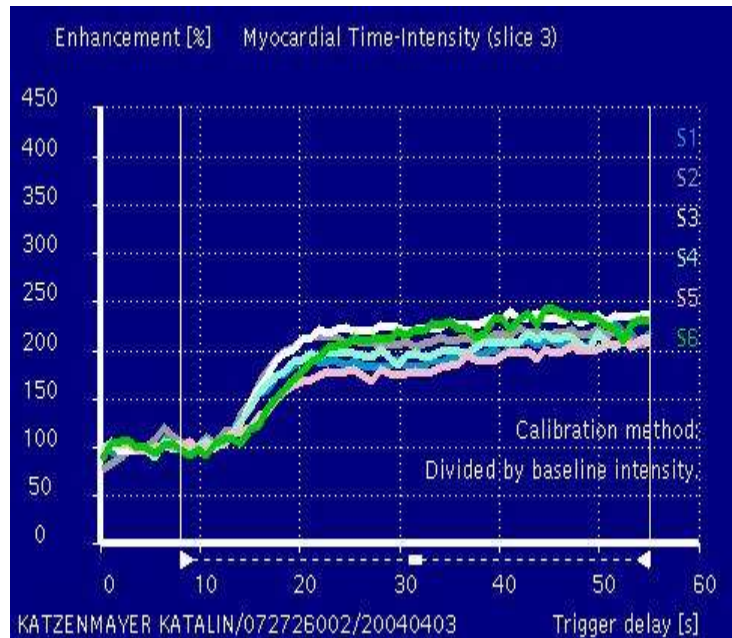
Módszer - Koronarográfia



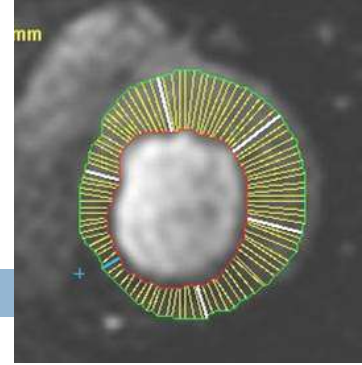
A QCA–val
75%-osnál
nagyobb
szűkületet
tekintettük
szignifikánsnak.

Rest

Adenosine Stress



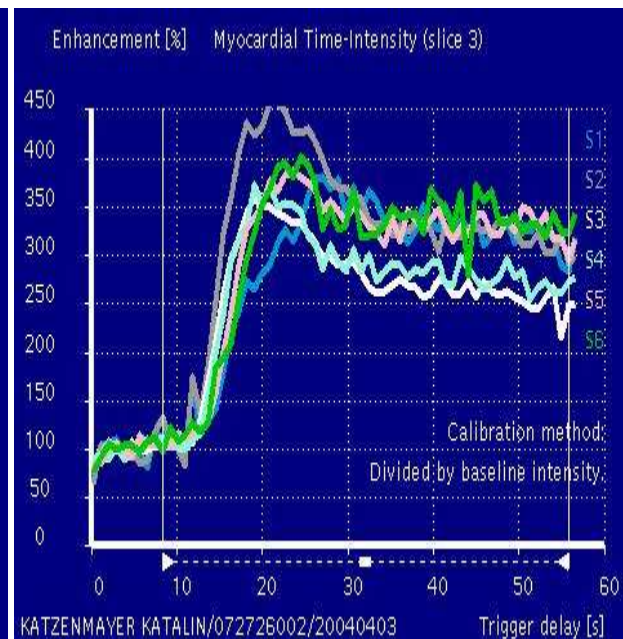
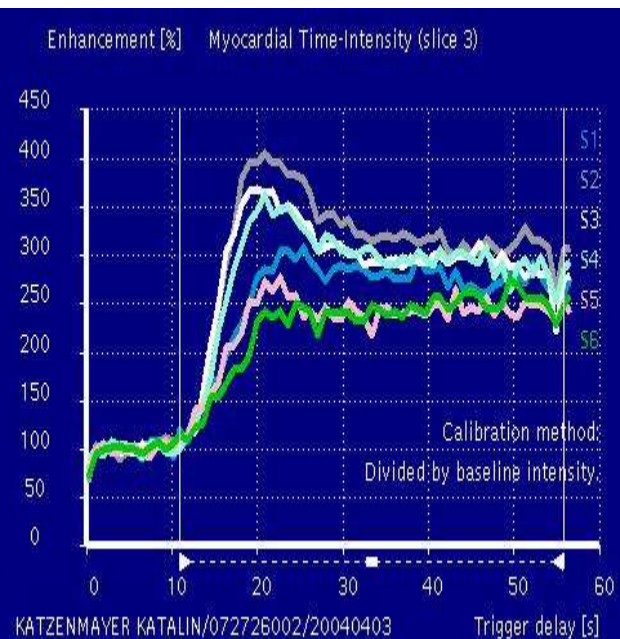
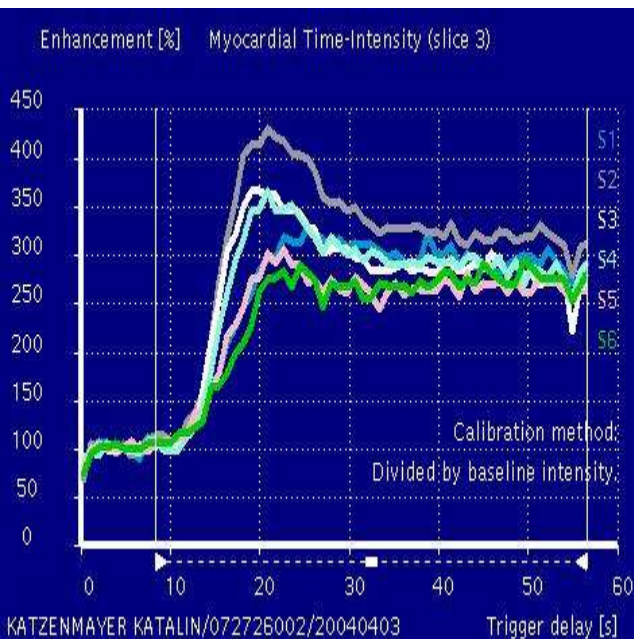
Adenosine Stress



Transmural

Subendo+mid myocardial

Subepicardial



MR IMPACT II

(**M**agnetic **R**esonance **I**maging for **M**ycocardial **P**erfusion **A**ssessment
in **C**oronary artery disease **T**rial)

**A phase III multicenter, multivendor trial
comparing perfusion cardiac magnetic resonance
versus
single photon emission computed tomography
for the detection of coronary artery disease.**

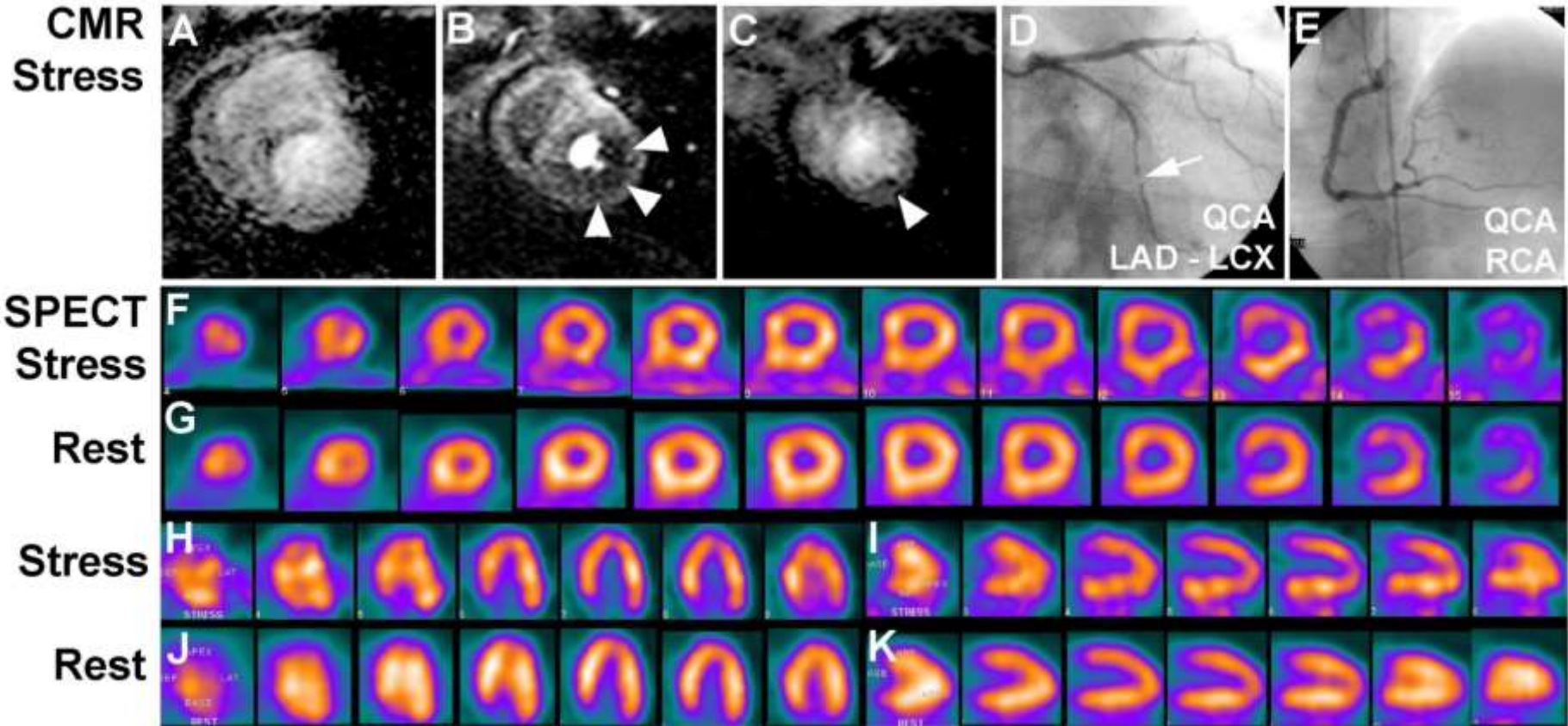
J. Schwitter, ¹ C. Wacker, ² N. Wilke, ³
N. Al-Saadi, ⁴ N. Hoebel, ⁵ T. Simor ⁶

¹ Zurich, Switzerland, ² Würzburg, Germany, ³ Gainesville/Jacksonville, US

⁴ Berlin Germany, ⁵ Munich, Germany, GEHC, ⁶ Pecs, Hungary

- 33 centres, 1.5 Tesla, 465 patients
- Patients with chest pain undergoing coronary angiography
- CAD defined as >50% diameter stenosis in at least one vessel with at least 2mm diameter

Stress MR – CORON –SPECT IMPACT II Study



MR IMPACT II

Detection of Coronary Artery Disease Comparison Between CMR and SPECT by ROC Analyses

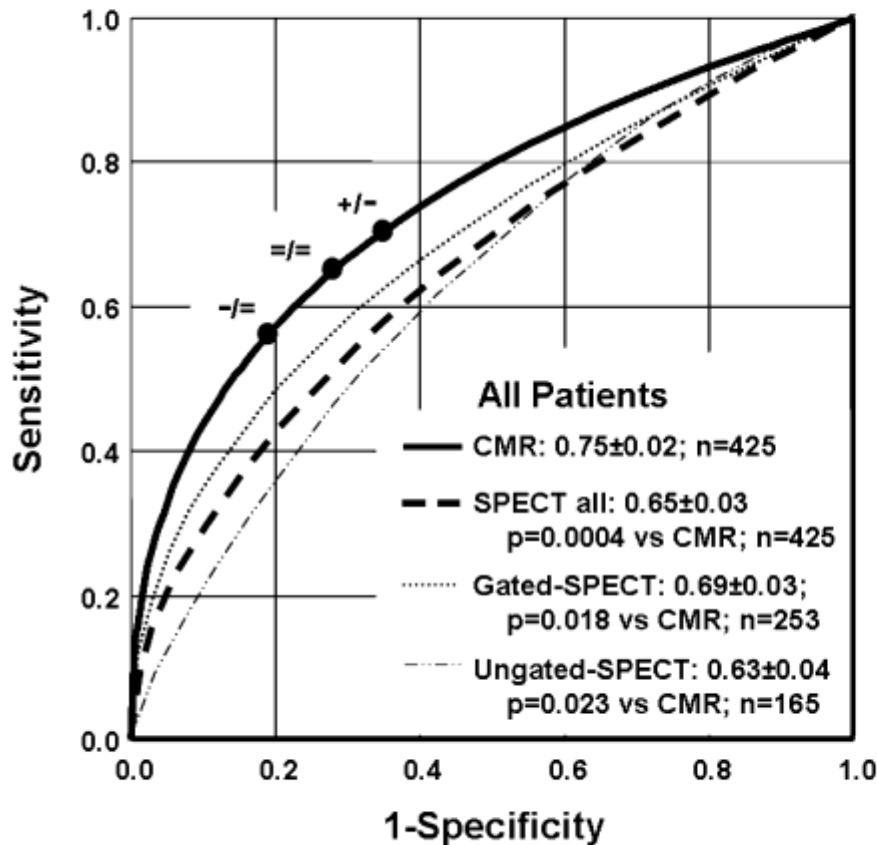
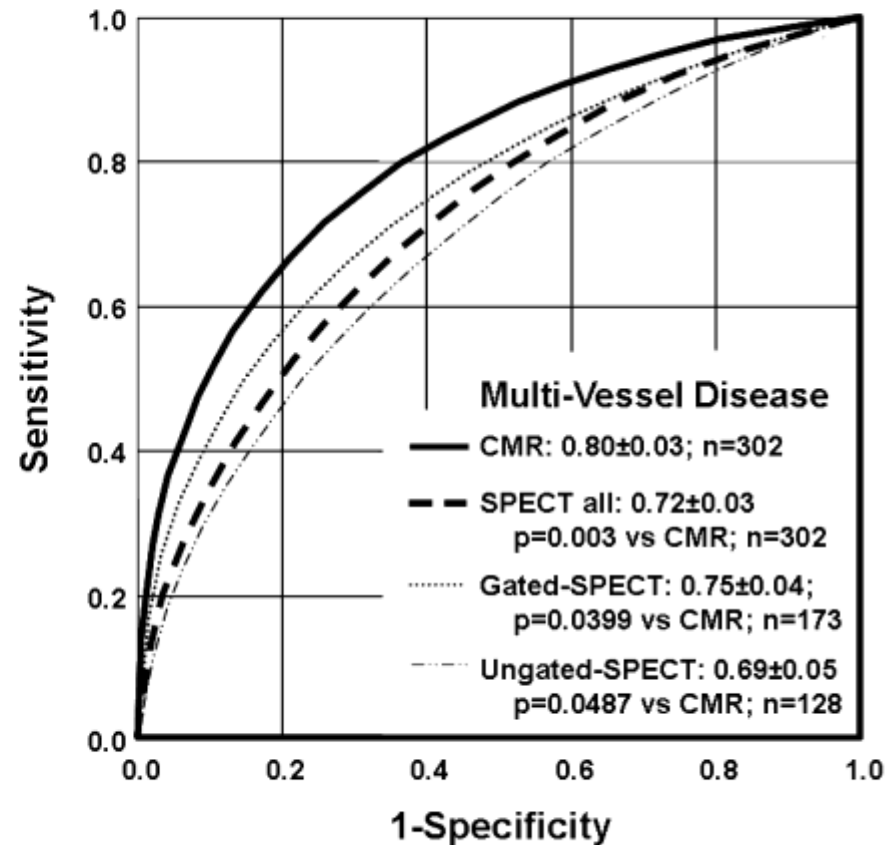


Figure 4a



4b

MR-IMPACT II

It is the largest multicenter MR/SPECT trial performed so far using ^{99m}Tc -tracers and ECG-gating (33 centers, 465 patients)

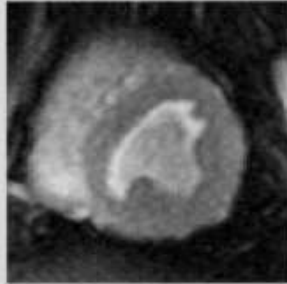
It shows:

- Perfusion-CMR (at 0.075 mmol/kg Gd-DTPA-BMA) is superior to SPECT for the detection of coronary artery disease
- Perfusion-CMR is a short and safe test, is sensitive and specific, and can be recommended as an alternative for SPECT imaging in experienced centers

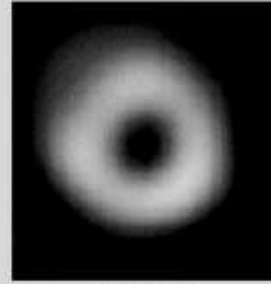
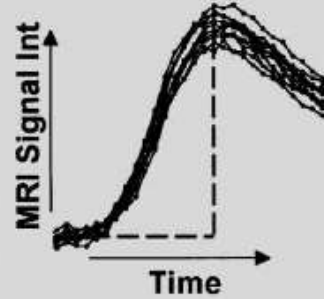
Quantitation of Relative Regional Flow by CMR

Lee DC et al. Circulation 110:58-65, 2004

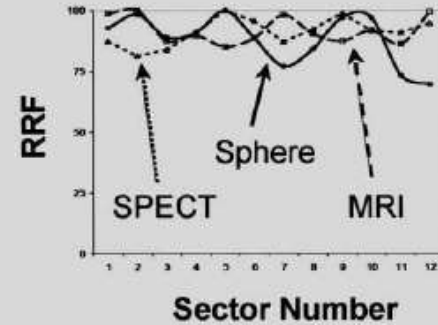
No Stenosis



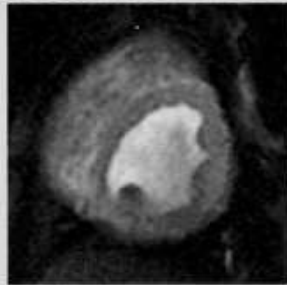
MRI



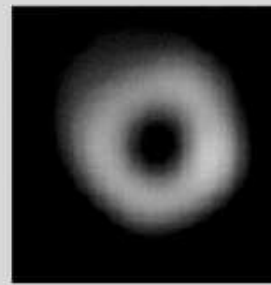
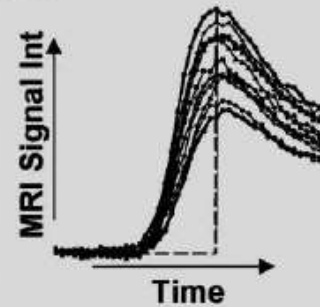
SPECT



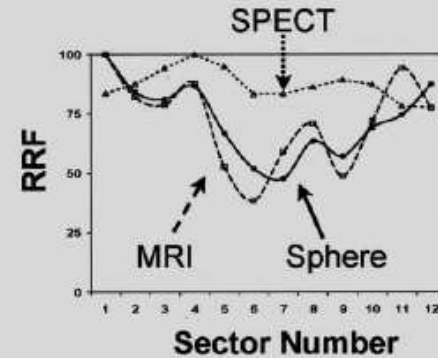
Moderate Stenosis



MRI



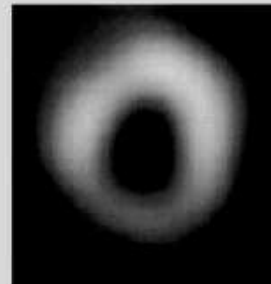
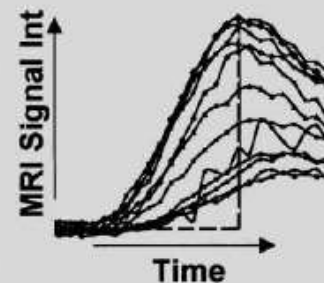
SPECT



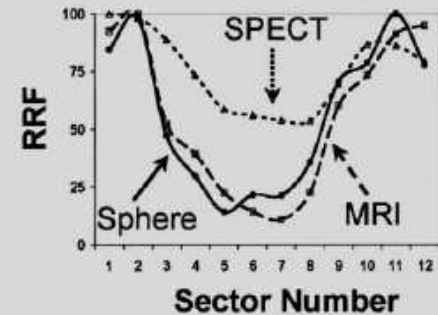
Severe Stenosis



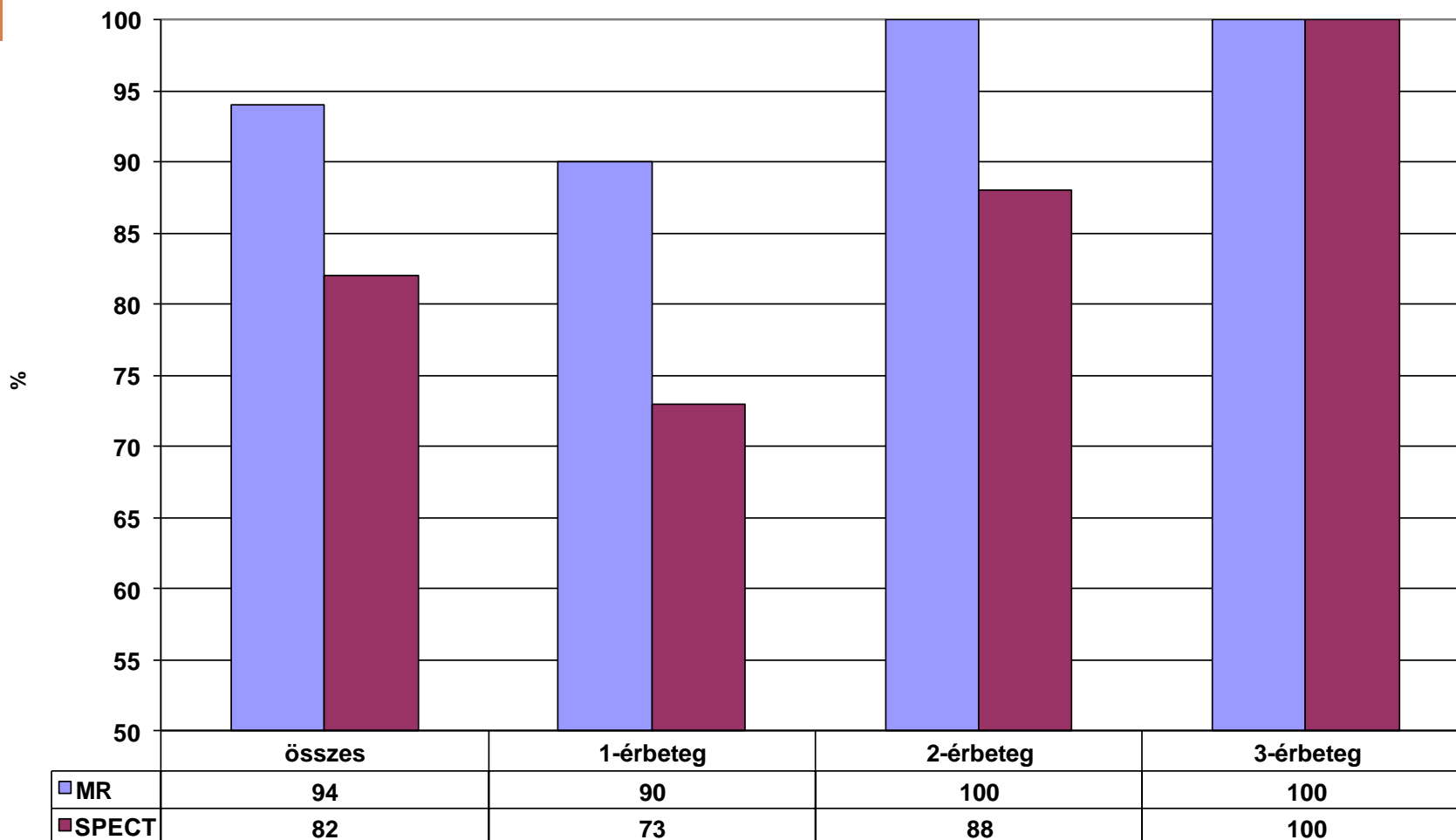
MRI



SPECT

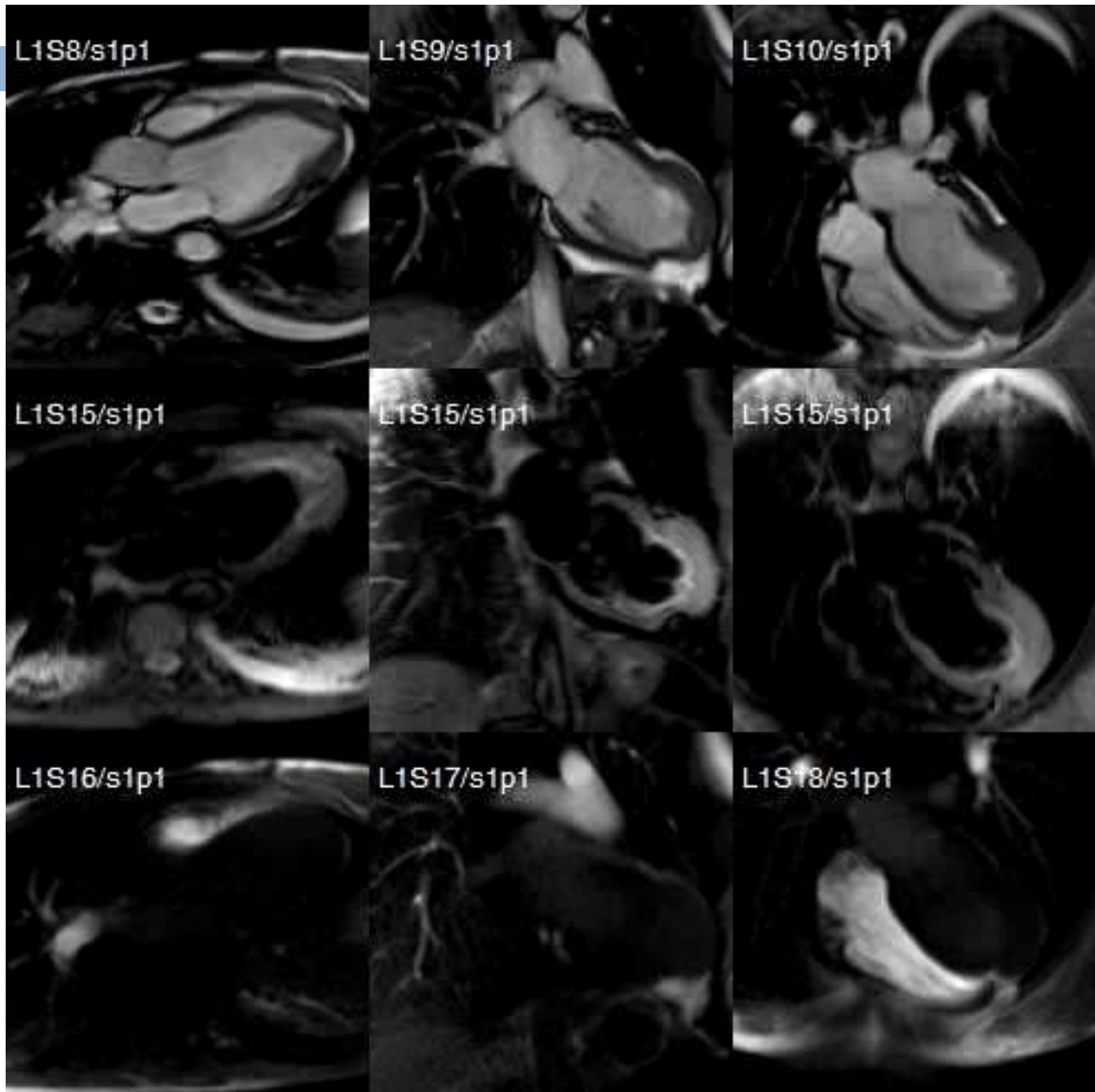


A perfúziós MR és a SPECT szenzitivitásának összehasonlítása



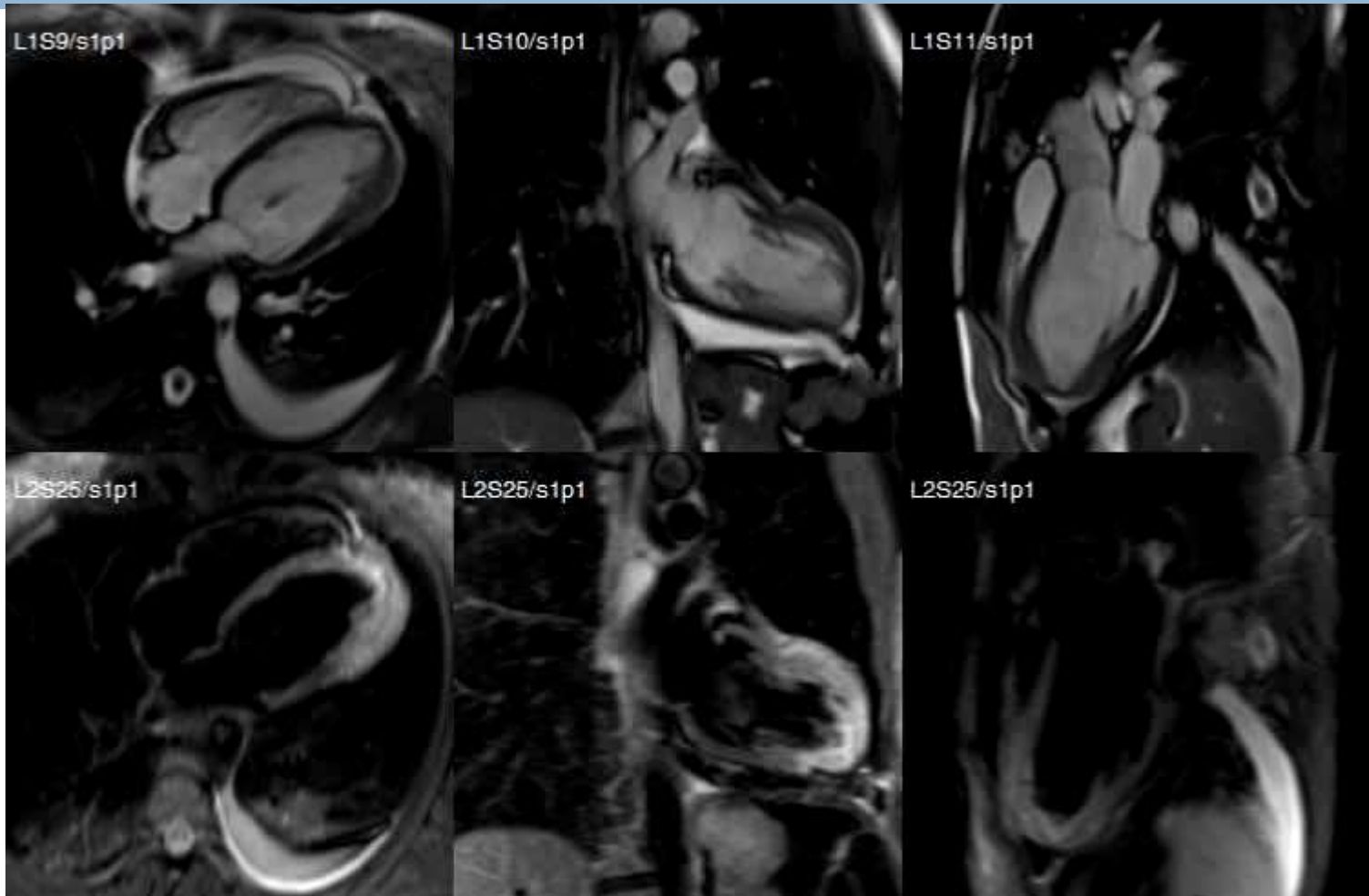
Tako Tsubo

EF: 47 %
EDV: 95 ml
ESV: 48 ml
LV Wt: 105 g



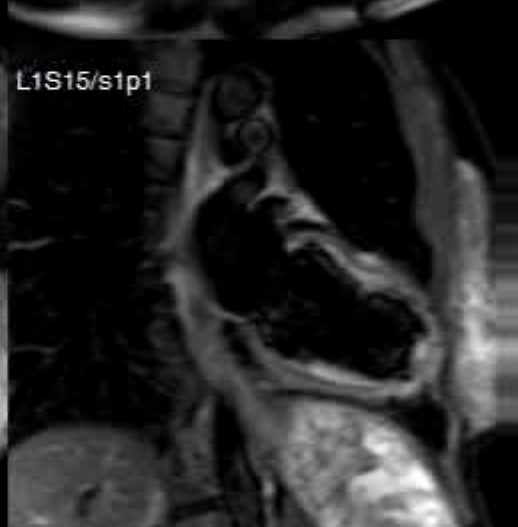
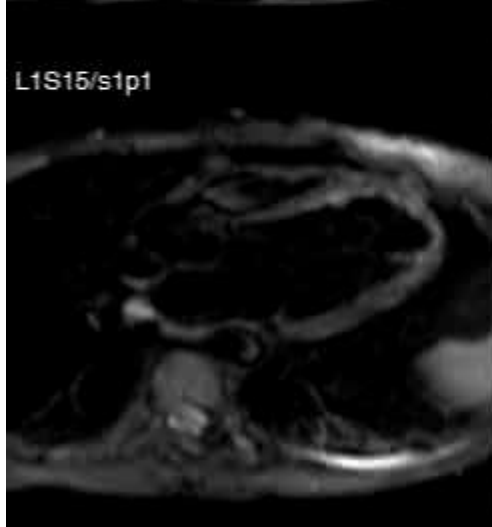
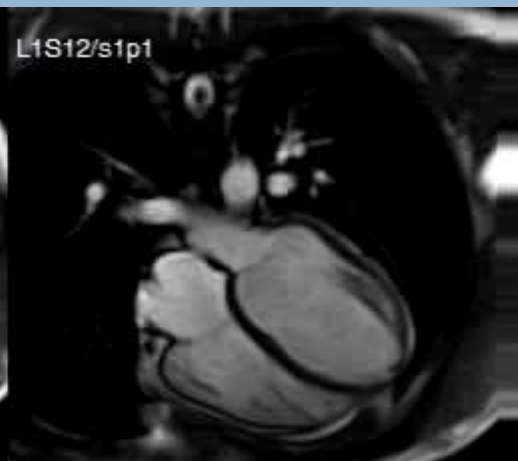
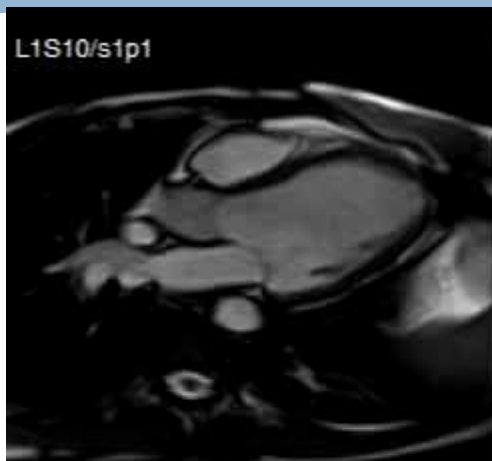
Tako Tsubo 1 hét

EF: 67 %
EDV: 100 ml
ESV: 32 ml
LV Wt: 80 g



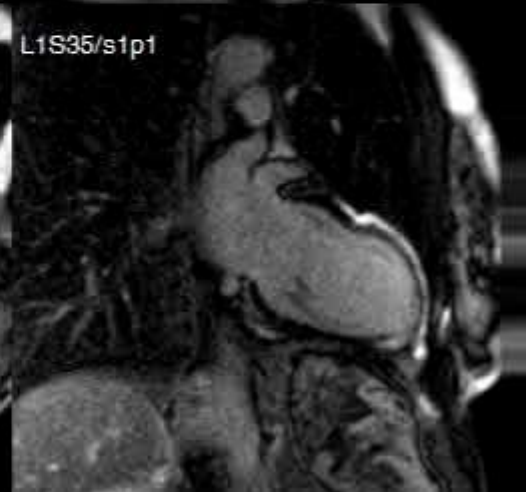
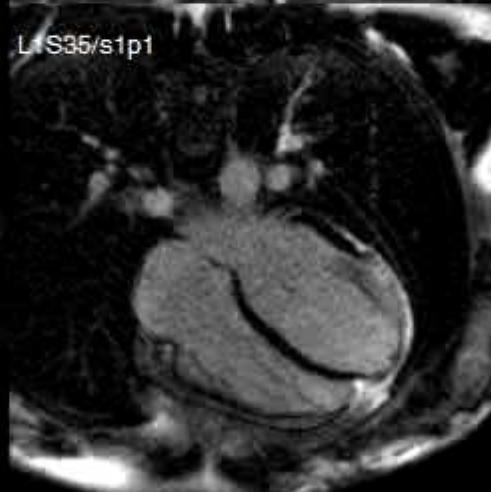
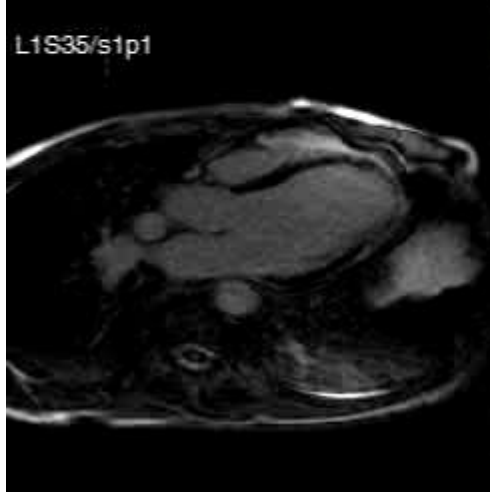
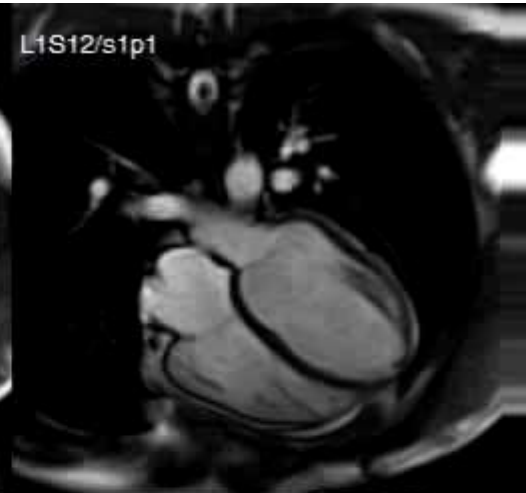
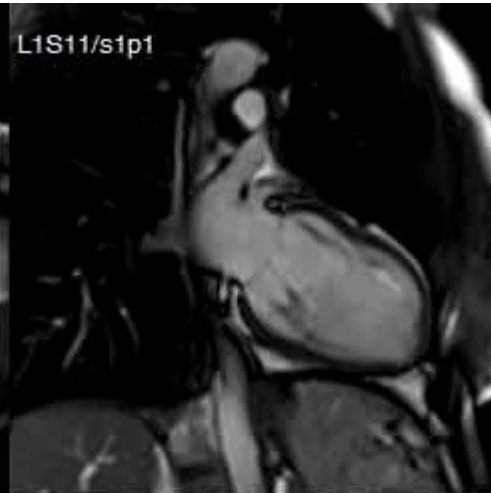
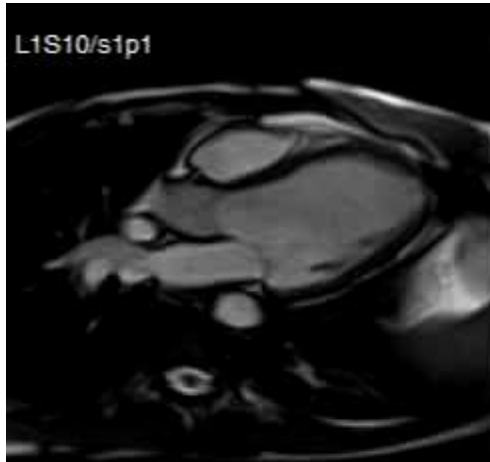
Tako Tsubo 1 hónap

EF: 66 %
EDV: 146 ml
ESV: 50 ml
LV Wt: 70 g



Tako Tsubo 1 hónap

EF: 66 %
EDV: 146 ml
ESV: 50 ml
Wt: 70 g



A scenic landscape featuring a calm lake reflecting the surrounding green forest and rugged, rocky mountains under a clear blue sky. The water is exceptionally still, acting as a perfect mirror for the sky, the dense forest of evergreen trees on the right, and the jagged, grey rock formations of the mountains in the background. The overall atmosphere is serene and majestic.

KÖSZÖNÖM A FIGYELMET!