Myocardial interstitial remodelling in a patient with cardiac amyloidosis and myocardial infarction

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Male, 74 years old

Diabetes

Hypertension

Previous **anterior MI** (6 years before, PCI in LAD)

Previous **admissions for HF** (↑ troponin, ↑ BNP)

Admission for heart failure

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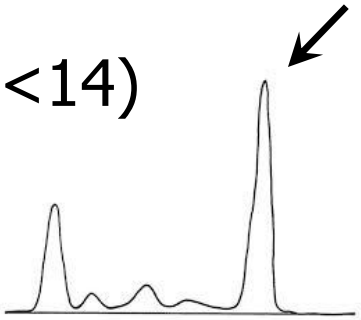
At admission…

Creatinine **1.39** mg/dl (r.v. <1.2)

HS Troponin **304** ng/ L (r.v. <14)

Monoclonal gammopathy



Echocardiography

LV hypertrophy (EDD 48, IVS 15, PW 13)

LV dysfunction (EF 35%; E/E' 30)

Mitral regurgitation (moderate-to-severe)

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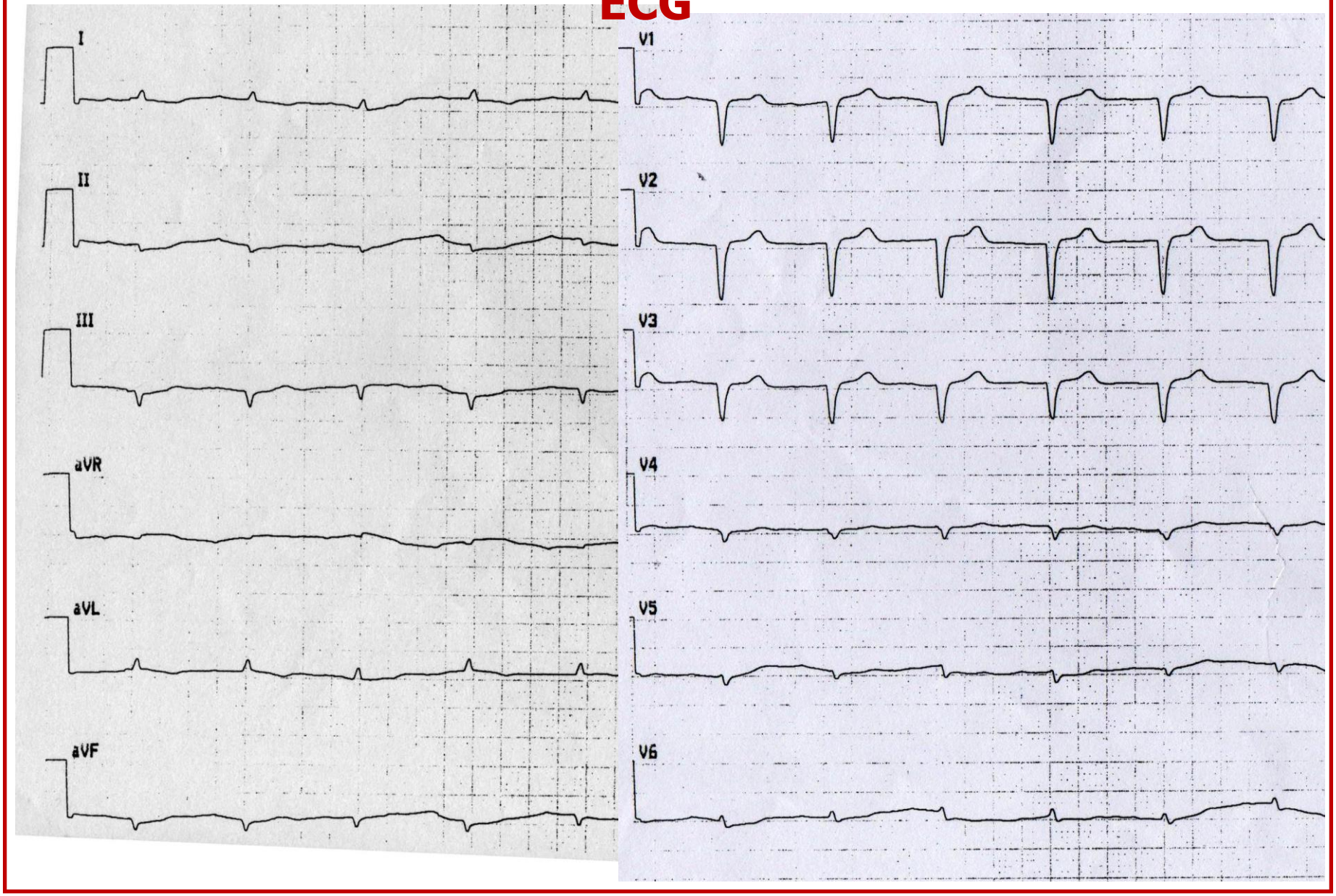
ECG



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CMR

LV hypertrophy (LVMI 150 g/m^2, IVS 18, PW 17 mm)

LV dysfunction (EDV 93 ml/m^2, EF 35%)

RV dysfunction (EDV 55 ml/m^2, EF 50%)

Mitral regurgitation

Pleural effusion

Diffuse LGE

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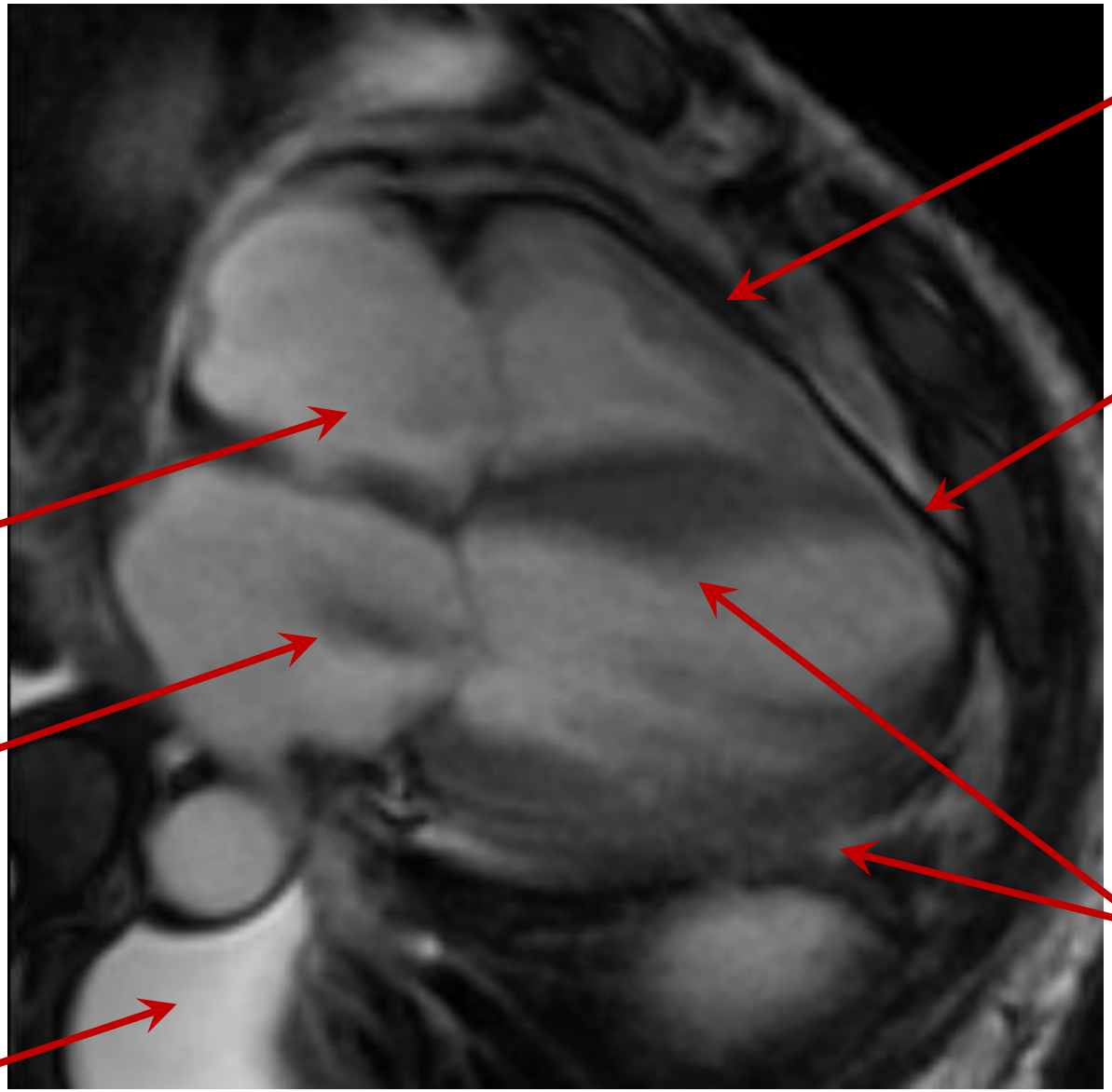
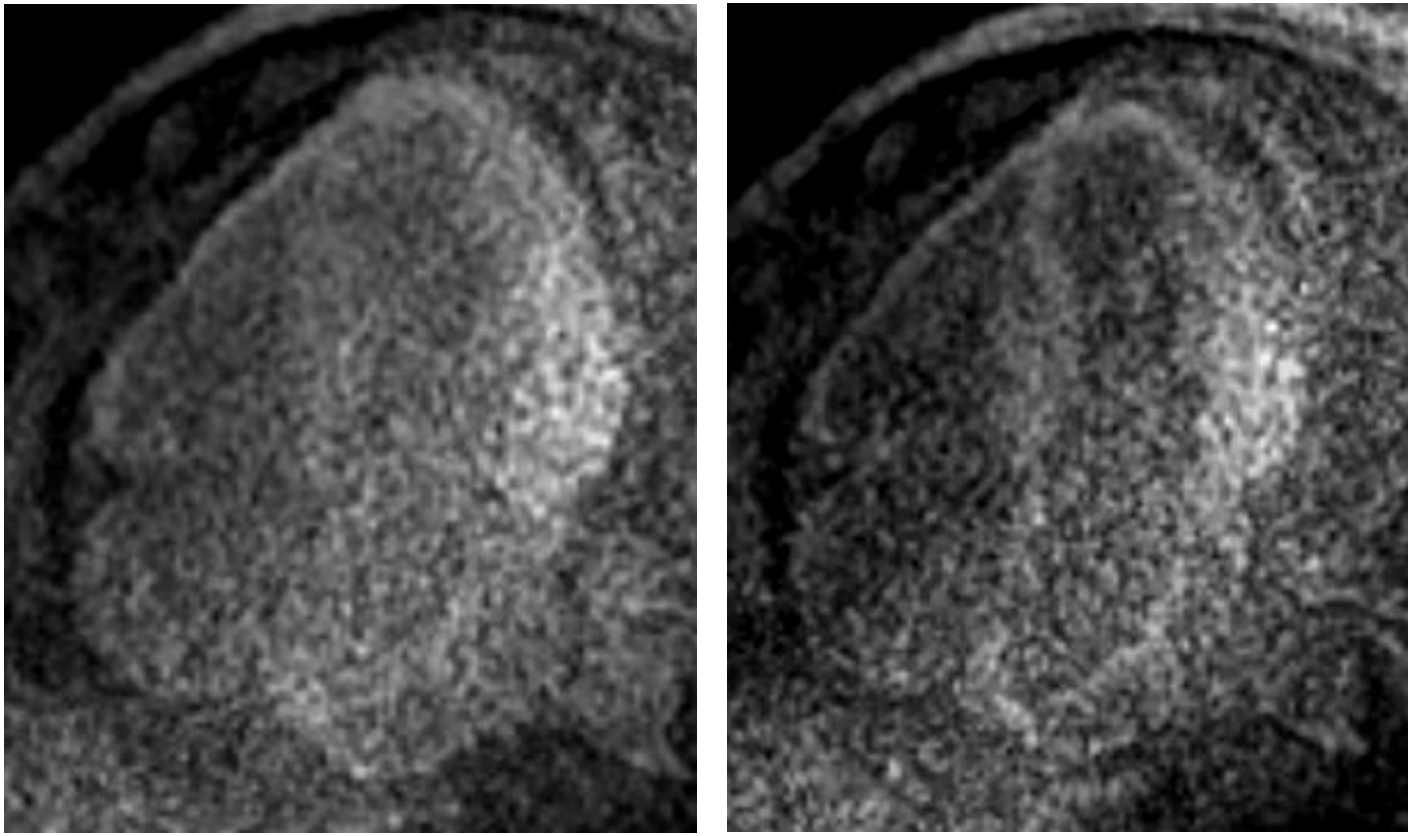
Cine bSSFP



Barison et al, EuroCMR 2014

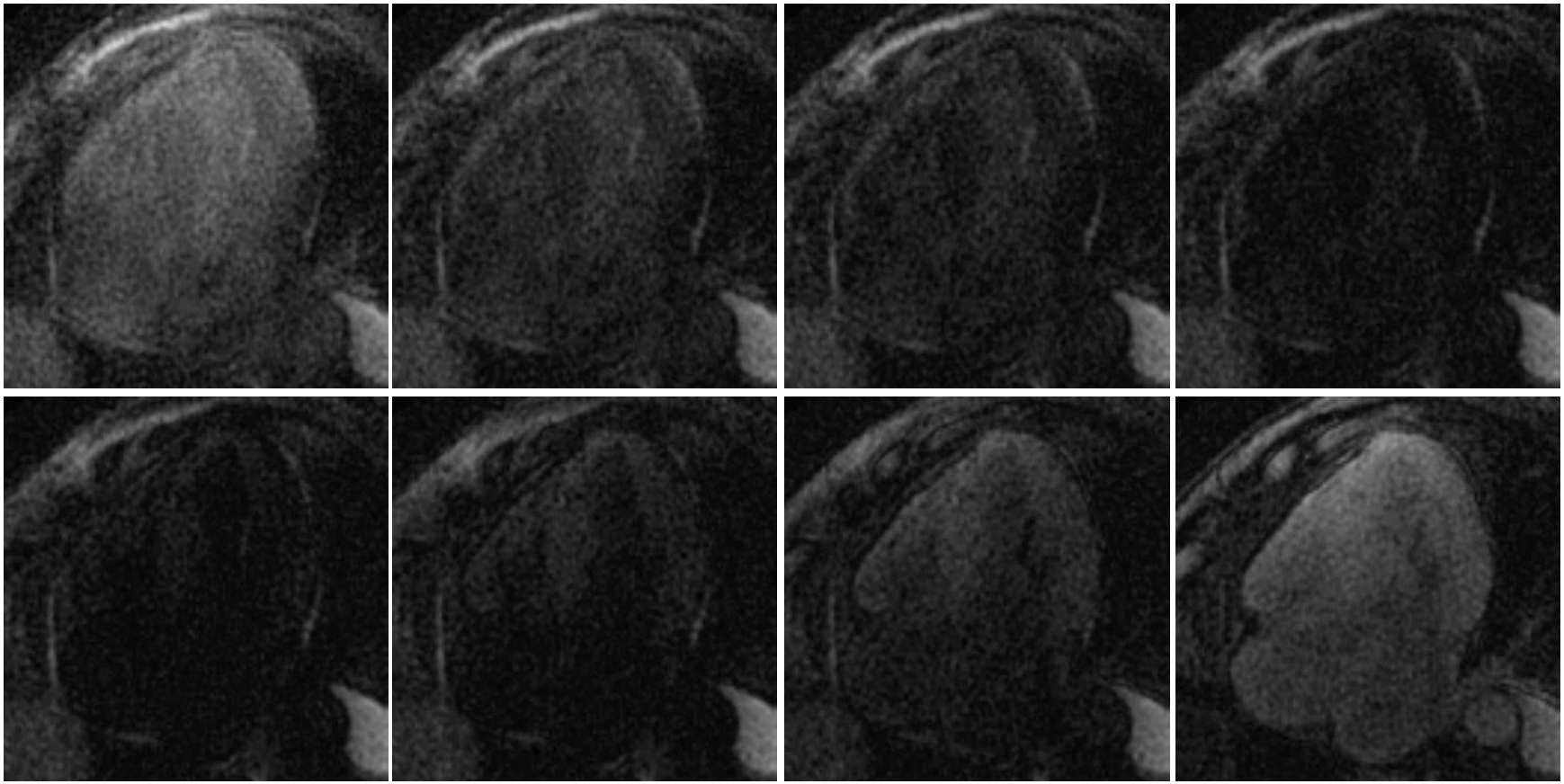
LGE



Diffuse LGE, with **difficult myocardial nulling** (variable appearance according to TI; early Gd washout…)

Barison et al, EuroCMR 2014

TI-scout



The myocardium nulls before the bloodpool, indicating diffuse interstitial expansion typical of amyloidosis *(Maceira et al, Circ 2005)*

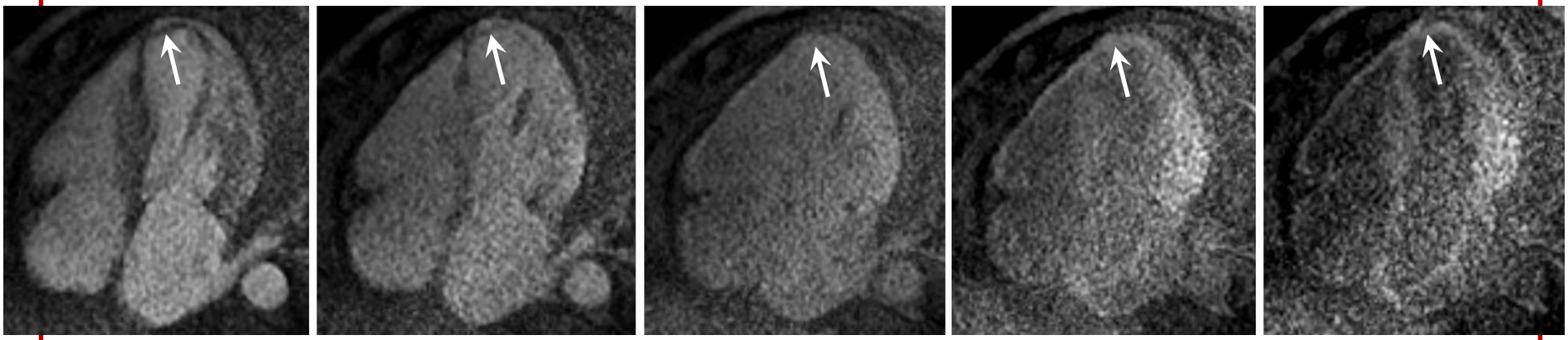
Barison et al, EuroCMR 2014

WHAT'S INSIDE LGE?

Gadolinium kinetics from LGE

LGE at 1,2,3,4… min after contrast injection (0.2 mmol/Kg Gd)

Aquaro et al, Int J Cardiovasc Imaging 2014



1 min 3 min 5 min 7 min 10 min

Early and diffuse myocardial enhancement → cardiac amyloid

Early bloodpool darkening (rapid Gd wash-out) → systemic amyloid

Apical late enhancement (arrow)→ myocardial infarction

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WHAT'S INSIDE LGE?

Gadolinium kinetics from T1 mapping

-before contrast injection

-1, 3, 5, 10 min after contrast injection (0.2 mmol/Kg Gd)

$R1_{post} - R1_{pre} = r^{*}[\mathbf{Gd}]$ where R1=1/T1

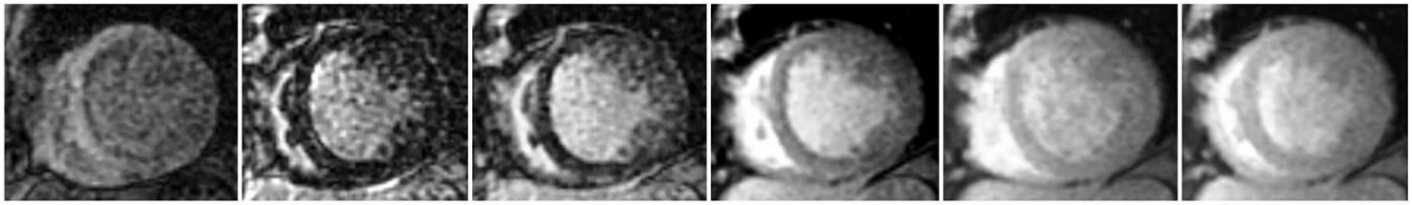
$[\mathbf{Gd}] = (R1_{post} - R1_{pre}) / r$

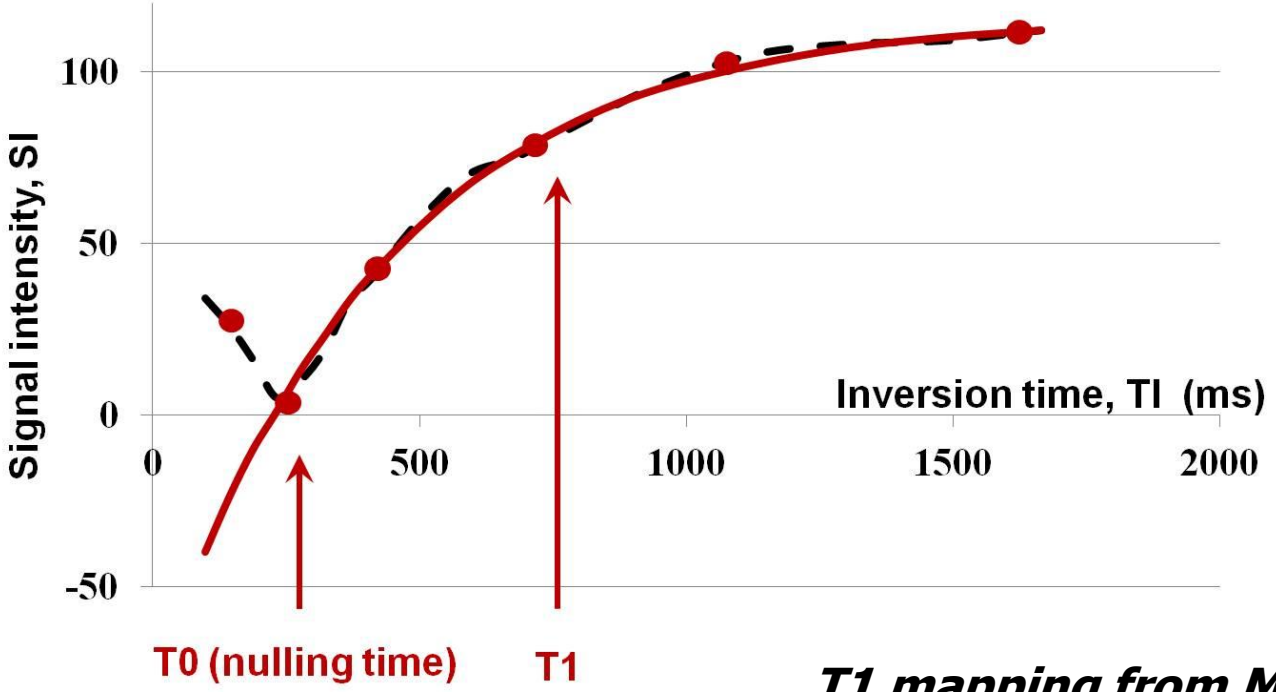
If ***r*** is assumed ≈3.5 $(mM^{*}s)^{-1}$ at 1.5T (*Weinmann et al, Acad Radiol 2002*) absolute Gd concentration can be calculated; otherwise, gadolinium concentration can be expressed in arbitrary units (as in this case).

Barison et al, EuroCMR 2014

WHAT'S INSIDE LGE?

Gadolinium kinetics from T1 mapping





T1 mapping from MCine-IR (Milanesi et al, JMRI 2013)

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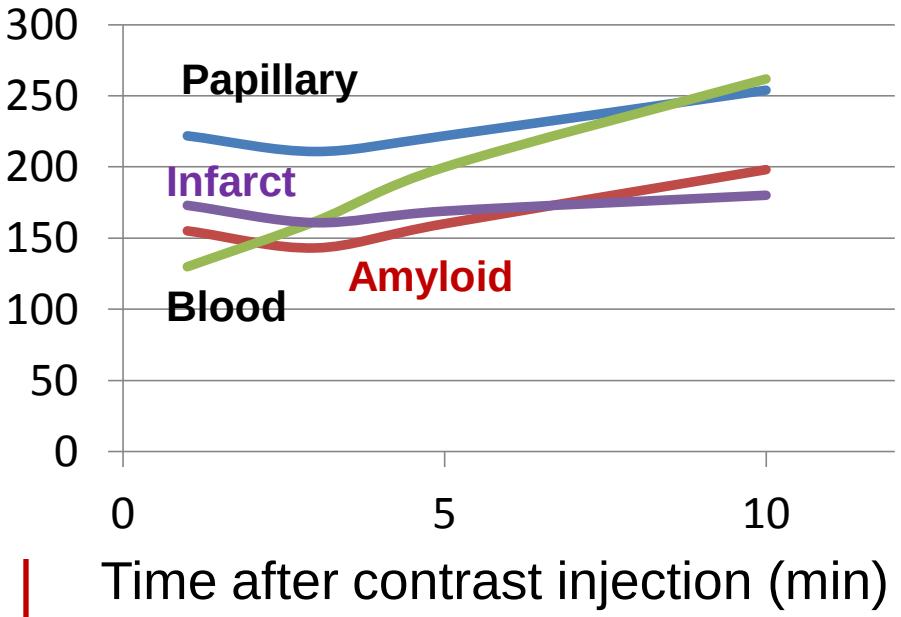
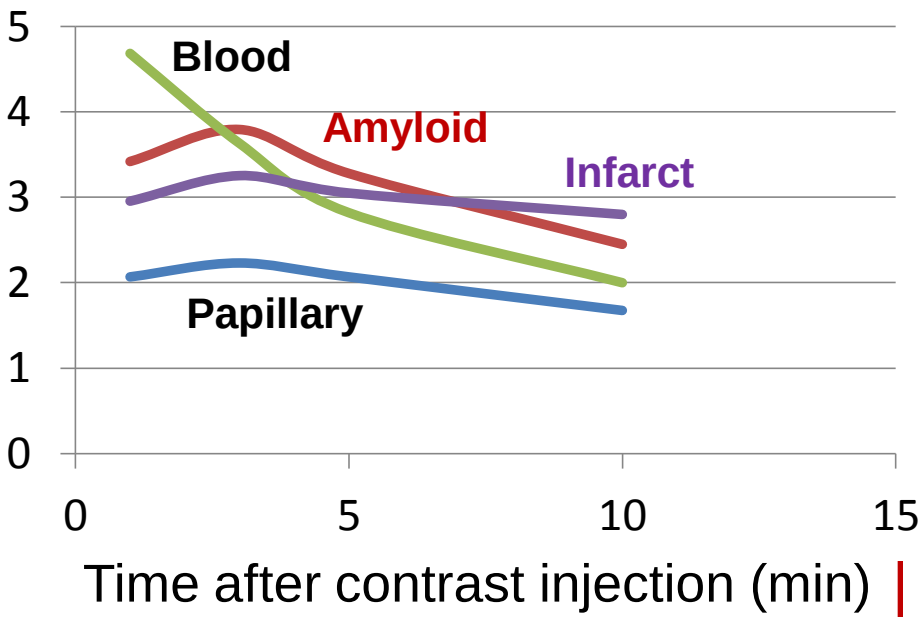
WHAT'S INSIDE LGE?

Gadolinium kinetics from T1 mapping

A. Tissue nulling times (T0) (ms)



B. Tissue Gd concentration (a.u.)



The papillary muscle displayed normal nulling times, possibly because it was spared by both ischaemic necrosis and amyloidosis (normal myocardium?)

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CONCLUSIONS

Early post-contrast imaging

-First pass perfusion (ischaemia, MVO…)

-Early enhancement (thrombus, MVO…)

Intermediate post-contrast imaging (at 1,2,3… 10 min)

-Progressive enhancement

-T1 mapping

} **Gd kinetics** (fibrosis vs. amyloid …)

Late post-contrast imaging

-Late gadolinium enhancement (replacement fibrosis)

-T1 mapping (interstitial fibrosis, equil/pseudoequil ECV)

Barison et al, EuroCMR 2014