Title	Value of late gadolinium enhancement by magnetic resonance in patients with cardiac sarcoidosis: characteristic findings and clinical utility
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Could TnI level on admission predict function and infarct size in STEMI patient treated with pPCI – CMR study

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Introduction: Pain to balloon time could have significant error due to often imprecise pain onset time. We hypothesize that TnI level measured on admission could be easy monitored, independent predictor of infarct size and left ventricle function
Purpose: The purpose of the study was to evaluate which of the two factors better correlates with LV function and delayed enhancement volume after successfully treated first ST segment elevation myocardial infarction (STEMI).
Methods: 34 patients with first anterior STEMI who underwent successful primary PCI (TIMI III) were included into the study. Cardiovascular MRI was performed on 1.5 T scanner at discharge, using 32-channel cardiac coil. Viability was evaluated on contrast-enhanced images acquired with the use of an inversion-recovery segmented gradient-echo sequence 20 minutes after contrast injection. Infarct size and LV function were analyzed quantitatively on AW workstation using MASS software.
Results: Mean pain to balloon time was 3.8 ± 2.6 h (ranged between 1 do 14 h). Median TnI level on admission was 0.6 ng/ml (ranged between 0.0 and 25.55 ng/ml). Mean LVEF was 40.7% ± 10.9, scar size was 48 ml ± 23 or 31% ± 13.7 as a percent of LV volume. Linear regression analyses revealed mild correlation between pain to balloon time and LV EF ($R = 0.555$; $p < 0.001$) and low but statistically significant with infarct size as a % of LV volume ($R = 0.34$; $p = 0.048$). No correlation was found between TnI level on admission and infarct size or LVEF.
Conclusion: Patients with longer pain to balloon time have worse LV EF at discharge.
TnI level on admission could not be a predictor of infarct size or early ejection fraction.

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Comparison of Gadopentetate dimeglumine and Gadobenate dimeglumine in depiction of non-ischemic fibrosis in hypertrophic cardiomyopathy

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Background: There is a known link between myocardial fibrosis as defined by late gadolinium enhancement (LGE), severity of left ventricular remodeling and ventricular arrhythmias in hypertrophic cardiomyopathy (HCM). Noninvasive quantification of fibrosis may offer the possibility for risk stratification. Due to their often diffuse and blurred character these lesions remain difficult to differentiate from healthy myocardium in several cases.
Recent studies showed the superiority of Gadobenate dimeglumine (Gd-BOPTA) compared with Gadopentetate dimeglumine (Gd-DTPA) in distinguishing infarcted from viable myocardium which can be explained by the higher relaxivity of Gd-BOPTA. Therefore we hypothesized that Gd-BOPTA may have advantages over Gd-DTPA for depiction of non-ischemic fibrosis.
Methods: We prospectively enrolled eight Patients with clinically established HCM and positive LGE during clinical routine scan with 0.2 mmol/kg Gd-DTPA (0.5 molar). They underwent a second scan at least 72 hours apart from the first CMR exam with 0.2 mmol/kg Gd-BOPTA (0.5 molar) using the same CMR protocol and sequence parameters. None of the patients had renal failure, coronary artery disease or general contraindications for CMR.
LGE was assessed in a short axis stack acquired 15 minutes after contrast administration by using state of the art inversion recovery gradient echo sequence (slicethickness 6 mm, no gap, TE 5.0 ms, FA 30°, matrix 256 × 192) with a TI adjusted to null signal from normal myocardium. Positive LGE was judged positive if signal intensity was above mean + 2 standard deviations of remote myocardium.
Signal intensities of injured myocardium, healthy myocardium, LV cavity and air were measured in identical locations by using anatomical landmarks in dedicated software (CMR42, circle international). Signal to noise ratio (SNR) and contrast to noise ratio (CNR) were calculated.
Results: We observed no complications relating to contrast administration. Both the SNR of injured myocardium (39.1 ± 15.9 vs. 57.7 ± 25.2, $p = 0.02$) and the CNR between healthy and injured myocardium (37.2 ± 16.3 vs. 53.0 ± 23.5, $p = 0.021$) were significantly higher with Gd-BOPTA. SNR of LV cavity was significantly higher (56.9 ± 24.3 vs. 119.0 ± 5.8, $p = 0.002$) with Gd-BOPTA resulting in a poorer contrast between injured myocardium and blood which did not affect the diagnosis since LGE was exclusively non-subendocardial.
Conclusion: Gd-BOPTA improves the visualization of non-ischemic fibrosis in HCM. This may offer the potential for a more accurate quantification of focal myocardial fibrosis in this setting.

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Value of late gadolinium enhancement by magnetic resonance in patients with cardiac sarcoidosis: characteristic findings and clinical utility

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Introduction: Although cardiac involvement is an important prognostic factor in patients with sarcoidosis, cardiac sarcoidosis (CS) is often difficult to diagnose. Cardiac magnetic resonance (CMR) imaging with late gadolinium enhancement (LGE) is considered to be useful in identifying CS early.
Purpose: We investigated LGE characteristics in patients with CS.
Methods: The study included 17 patients who were diagnosed with CS by Japanese Ministry of Health and Welfare criteria and

underwent CMR. Among the 17, 15 had LGE and were evaluated retrospectively. We obtained LGE images (short-axis, vertical long-axis, and 4-chamber views) using an inversion recovery segmented gradient-echo sequence 10 minutes after we administered gadolinium-DTPA (0.15 mmol/Kg or 20 mL). We analyzed patterns (patchy or band-like appearance) and locations of LGE in LV using a 17-segment model. We also assessed the extent of LGE in each segment of LV (subepicardial, midwall, subendocardial and transmural). We evaluated relationships between LGE characteristics and LV function using cine MR images.

Results: We observed band-like LGE with distinct margin in 14 patients and patchy LGE in one. The band-like pattern correlated well with pathological findings in biopsy-proven CS. Transmural LGE (T-LGE) was observed in 7 patients. All patients with T-LGE also had subepicardial lesion. In the patients without T-LGE, LGE was most common in the subepicardial layer (74% of enhanced segments) and most frequently observed in the basal septal wall, especially on the RV side. The number of LGE segments of the patients with T-LGE was significantly larger than that of patients without T-LGE (14.0 ± 2.0 versus 4.3 ± 3.3 segments, $p < 0.0001$). The ejection fraction of the LV (LVEF) of the patients with T-LGE was significantly lower than that of patients without T-LGE (19.0 ± 5.9% versus 50.8 ± 6.5%, $p < 0.0001$), and the end-diastolic volume of the LV of the patients with T-LGE was significantly larger than that of patients without T-LGE (236.4 ± 50.6 versus 96.5 ± 9.7 mL, $P < 0.0001$).

Conclusion: Characteristic LGE pattern and location allow accurate diagnosis of CS. CMR with LGE is useful for diagnosing CS and predicting LV function.

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Imaging of aortic coarctation using Gd-DTPA and Gadofosveset: a comparative study

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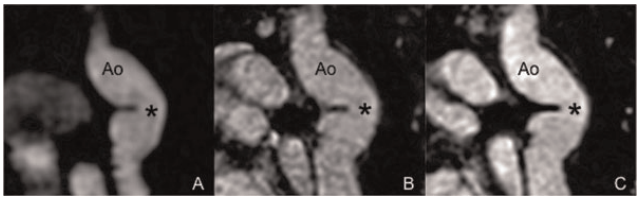
Objective: The use of Gadofosveset in combination with a 32 channel coil and optimized image sequences allows high resolution free breathing and ECG triggered imaging of the aortic arch in patients with coarctation with improved imaging results compared to previous techniques.

Figure 1 (abstract P261)



Background: First-pass breath-hold non-ECG-triggered 3D contrast-enhanced-magnetic-resonance-angiography (CEMRA) using Gd-DTPA is commonly used for assessment of the aortic arch. However, image resolution is limited due to time constraints and vascular borders are blurred due to vascular motion and insufficient breath holds.

Methods: In 7 patients (30 ± 7 yrs) the aortic arch was imaged after surgical repair (n = 6) or stent implantation (n = 1) on a 1.5 T clinical scanner (Philips Medical Systems). Patients were investigated twice within 7 days using Gd-DTPA (day 1, 0.10–0.17 mmol/kg) and Gadofosveset (day 2, 0.03 mmol/kg). First pass breath hold 3D CEMRA as well as a respiratory navigator gated and end-diastolic ECG triggered 3D steady-state free precession (SSFP) sequence with a T2 prepulse were used. Gadofosveset allowed the application of an inversion recovery (IR) prepulse to suppress surrounding tissue signal. Results were compared (Table 1).

Results: The navigator gated and ECG triggered 3D IR SSFP (Figure 1C) sequence showed best image quality results (Table 1). Cross sectional areas showed good interstudy agreement in the 3D SSFP technique without IR (Figure 1B) and 3D first pass CEMRA (Figure 1A) with similar image quality results using Gadofosveset and Gd-DTPA. However, these areas are smaller in end-diastolic ECG triggered respiratory gated sequences with and without IR prepulse than in breath hold 3D CEMRA (Table 1, all $p < 0.05$). Stent artifacts were similar in all sequences.

Conclusion: A respiratory-navigator-gated and ECG-triggered 3D-IR-SSFP-sequence after application of Gadofosveset allows free-breathing end-diastolic high-resolution imaging of the aortic arch in combination with a 32-channel-coil. Image

Table 1 (abstract P261) Values are expressed as mean ± standard deviation

Contrast Agent	Sequence	Contrast to Noise Ratio (CNR)	Vessel Wall sharpness (%)	Image quality (mean ± SD)	Vessel Area (cm^2)	Isotropic spatial resolution (mm^3)
Gd-DTPA	CEMRA	110 ± 10†	41 ± 4†	2.4 ± 0.8†	4.6 ± 1.9†	1.77
	SSFP	135 ± 11*	48 ± 6*	3.3 ± 0.5*	4.1 ± 1.7*	1.49
Gadofosveset	CEMRA	99 ± 21†	40 ± 4†	2.7 ± 0.5†	4.7 ± 2.1†	1.77
	SSFP	128 ± 19*	46 ± 3*	3.1 ± 0.7*	4.1 ± 1.6*	1.49
	SSFP+IR	154 ± 14	53 ± 5	3.7 ± 0.5	3.9 ± 1.7	1.49

†,*, no significant differences between corresponding sequences (Gd-DTPA vs Gadofosveset). Image quality: 1 = non diagnostic, 2 = diagnostic, 3 = good, 4 = excellent.