Journal of Cardiovascular Magnetic Resonance

BioMed Central

Poster presentation

Open Access

Contrast-enhanced whole heart coronary MRI with a bolus infusion of gadobenate dimeglumine at 1.5 t

Peng Hu*[1], Jonathan Chan[1], Jouke Smink[2], Beth Goddu[1], Kraig V Kissinger[1], Lois Goepfert[1], Warren J Manning[1] and Reza Nezafat[1]

Address: [1]Beth Israel Deaconess Medical Center, Boston, MA, USA and [2]Philips Healthcare, Best, Netherlands

* Corresponding author

from 13th Annual SCMR Scientific Sessions
Phoenix, AZ, USA. 21-24 January 2010

Published: 21 January 2010

Journal of Cardiovascular Magnetic Resonance 2010, **12**(Suppl 1):P51 doi:10.1186/1532-429X-12-S1-P51

This abstract is available from: http://jcmr-online.com/content/12/S1/P51

Introduction

The potential benefits of contrast agents have been studied for coronary MRI; however the contrast timing/injection rate and sequence remain to be optimized. We investigated three infusion schemes (bolus, hybrid, slow) of gadobenate dimeglumine ([Gd-BOPTA]$^{2-}$, MultiHance; Bracco Imaging SpA, Milan, Italy), a high relaxivity extracellular contrast agent, for improved whole-heart coronary MRI by measuring blood T_1 kinetics. Subsequently, we developed a contrast-enhanced whole-heart coronary MRI method at 1.5 T using an inversion-recovery SSFP sequence acquired after a bolus infusion.

Methods

Four healthy adult subjects were imaged three times each using three infusion schemes: a) bolus ($0.2 mmol/kg @ 2 ml/s$), b) hybrid ($0.1 mmol/kg @ 2 ml/s$ plus $0.1 mmol/kg @ 0.1 ml/s$), and c) slow ($0.2 mmol/kg @ 0.3 ml/s$). A Look-Locker sequence was used for quantitative T_1 measurements. Subsequently, seven healthy subjects were recruited for evaluation of a contrast-enhanced whole-heart coronary MRI with a bolus infusion. Free-breathing SSFP coronary MRI (TR/TE/α = 3.6/1.8/90°, FOV = 300 × 300 × 120 mm^3, resolution = 1.3 × 1.3 × 1.3 mm^3, T_2-Prep, ×2 accelerated) was performed before contrast injection. Gd-BOPTA ($0.2 mmol/kg @ 2 ml/s$) was injected intravenously, immediately followed by a Look-Locker sequence to visually determine the optimal inversion time. A contrast-enhanced whole-heart coronary was then acquired with identical imaging parameters with the exception of replacing the T_2-Prep with a non-selective inversion pulse. For both acquisitions, a noise scan was performed immediately after acquisition. The blood SNR and blood-myocardium CNR were measured.

Results

Figure 1 shows the blood T_1 during the first 10 min after contrast injection. The bolus injection yields the fastest

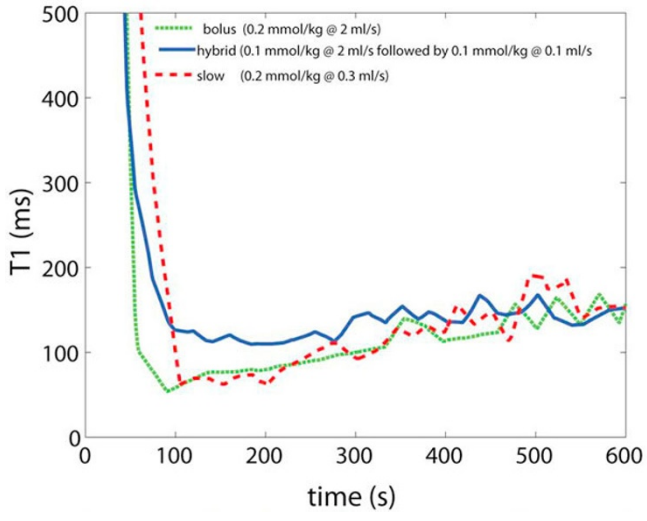

Figure 1
Time course of blood T_1 up to 10 minutes after contrast injection using three infusion schemes.

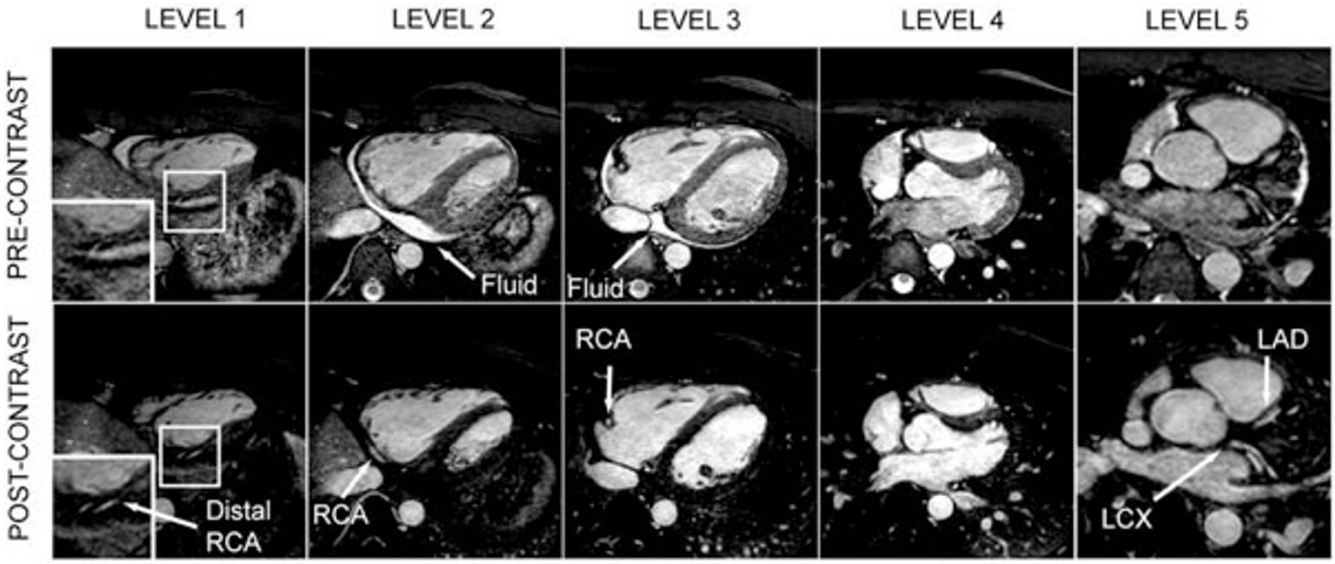

Figure 2
Example coronary images acquired on a healthy subject using an SSFP sequence before (top row) and after (bottom row) a bolus injection of Gd-BOPTA.

and largest T_1 reduction in the initial 1-2 minutes. Slow infusion reduces the T_1 at a slower pace than bolus, but was similar to bolus ~ 2-3 min after injection. A hybrid infusion results in the lowest decrease in T_1, but also the most stable. Figure 2 shows a comparison of contrast-enhanced and non-contrast coronary images. The coronary SNR and CNR were significantly improved by 36% (58.5 ± 18.7 vs. 79.5 ± 17.5) and 101% (27.3 ± 11.4 vs. 55.0 ± 12.1), respectively ($p < 0.003$ for both). Figure 3 shows reformatted examples of the LAD, which shows improved visualization of mid and distal LAD.

Conclusion

Contrast-enhanced whole heart coronary MRI with a bolus infusion of Gd-BOPTA using inversion-recovery SSFP at 1.5 T results in enhanced SNR and CNR.

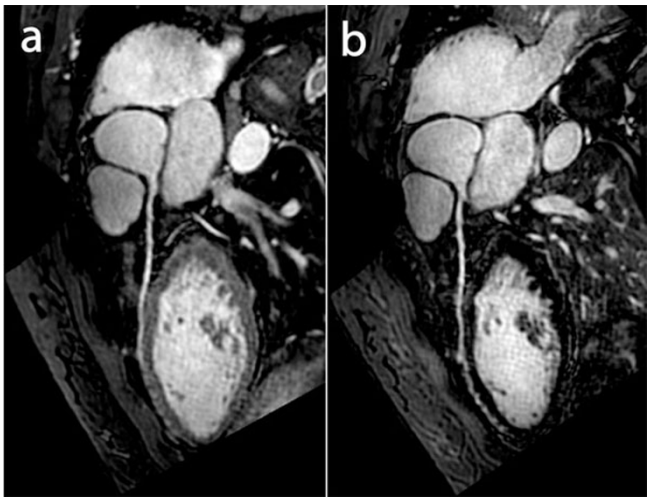

Figure 3
Reformatted non-contrast (a) and contrast-enhanced (b) LAD images. The improved suppression of myocardial signal using Gd-BOPTA facilities depiction of mid and distal right coronary artery.