

POSTER PRESENTATION

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Clinical feasibility of targeted cardiac resynchronization lead delivery using a 3D MRI cardiac model

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Background

Cardiac resynchronization therapy (CRT) aims to reduce dyssynchronous contraction through simultaneous pacing of the right ventricular (RV) septum and left ventricular (LV) lateral wall. Up to 40% of patients do not respond, largely attributed to lack of dyssynchrony and/or transmural scar at pacing sites. In this pilot study we tested the feasibility of guiding LV and RV leads to “optimal” segmental targets using a MRI-based 3D surface rendered cardiac model.

Methods

Ten consecutive patients planned for CRT were recruited. All patients underwent cardiac MRI inclusive of cine and delayed enhancement (DE) imaging using a 3T scanner. A blinded interpreter determined the time to maximal radial wall thickening (TmWT) and myocardial scar burden for each of 16 segments. All potential LV lead targets were ranked according to scar burden (lowest first) and then sub-ranked by TmWT (highest first). All potential RV lead targets were ranked according to scar burden (lowest first). These rankings were encoded onto a surface rendered cardiac model, displayed in standard fluoroscopic views (Figure 1A) and used to direct lead placement by fluoroscopy. A cardiac gated CT was then performed at a 1-month follow-up visit (Figure 1B) to assess procedural success for target achievement.

Results

Mean age and LVEF was 68.5 ± 6.7 years and $25.6 \pm 10.8\%$, with a mean NYHA class of 2.9 ± 0.6 . “Optimal” LV and RV pacing sites differed from conventional pacing sites (basal posterolateral segment and RV apex) in 9 and 4 patients, respectively. All patients successfully underwent CRT device implantation with a mean fluoroscopy time of 23 ± 10.9 minutes. Post-device CT imaging showed LV and RV leads to be successfully delivered to the “optimal” or immediately adjacent segment in 90% and 90% of patients, respectively. The only documented complication was a small pericardial effusion not requiring drainage in a patient that was prescribed conventional lead positioning by the model.

Conclusions

In this pilot study we demonstrate that a targeted approach to CRT lead placement using an MRI-based cardiac model is clinically feasible. A prospective clinical trial evaluating the clinical benefit of this approach is planned.

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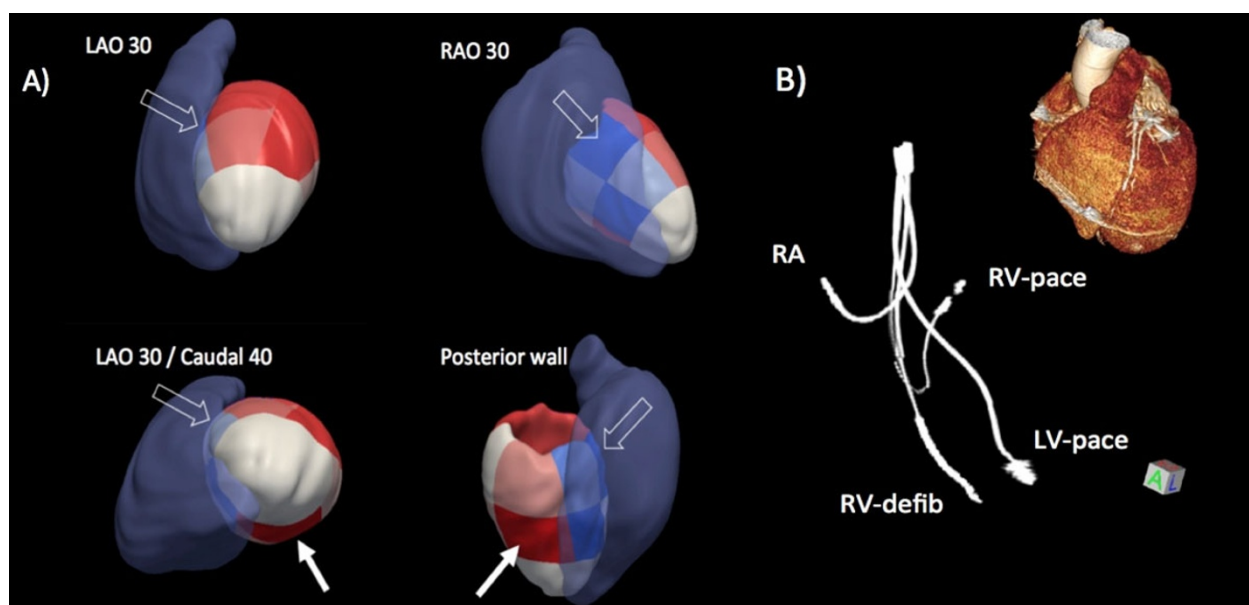


Figure 1. A) MRI-based model with ranked LV targets (red) and RV targets (blue), shown in standard fluoroscopic views and a posterior view. Optimal LV and RV paced segments shown by solid and transparent arrows. B) Post-implant volume rendered CT of same patient showing successful delivery of leads to non-standard positions with complete avoidance of distal septal scar and posterolateral wall scar.

Figure 1

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