

Oral presentation

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Rapid right ventricular pacing with mr-compatible pacemaker lead for magnetic resonance-guided aortic balloon valvuloplasty in swine

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Objectives

To assess the feasibility of rapid right ventricular pacing with a Magnetic Resonance (MR)-compatible pacemaker lead during MR-guided aortic valvuloplasty.

Background

The feasibility of MR-guided aortic valvuloplasty in animal models has been demonstrated. However, to translate this MR-guided procedure into humans rapid pacing has to be performed to provide balloon stability.

Methods

6 pigs (weight 48 ± 3 kg) were investigated. All experiments were performed using an interventional 1.5 Tesla MRI system. Interventions were monitored using a steady-state free precession real-time imaging sequence. Parameters of the sequence were TR/TE = 2.5/1.25 ms, flip angle 45° , slice thickness 8 mm, matrix 128×128 reconstructed to 256×256 using zero-filling. A MR-compatible pacemaker lead was placed in the right ventricular apex under fluoroscopic MR-guidance before the valvuloplasty. After positioning of the balloon into the left ventricular outflow tract/aortic valve valvuloplasty was performed under rapid right ventricular pacing at a heart rate of 180 bpm to minimize cardiac output. For improved visualization the balloon was filled with Resovist.

Results

Positioning of the pacemaker lead under MR-guidance was easily feasible in all swine (sensing 6 ± 1 mV, thresh-

old 1 ± 0.5 V). The lead could be visualized in the SSFP imaging without inducing any artifacts. Rapid right ventricular pacing was feasible in all cases and balloon stability at time of inflation was achieved with no balloon movement. Valvuloplasty was successfully accomplished in all experiments. At gross pathologic examination no signs of heating related myocardial damage were detectable documenting safety of pacing with MR-compatible leads. No complications such as pericardial effusion related to the pacemaker lead were observed Figure 1.

Conclusion

Rapid right ventricular pacing with MR-compatible pacemaker lead is feasible and effective. The balloon remained in stable position during the critical phase of the procedure. This study demonstrates that MR-guided aortic valve balloon valvuloplasty may soon become reality in humans.

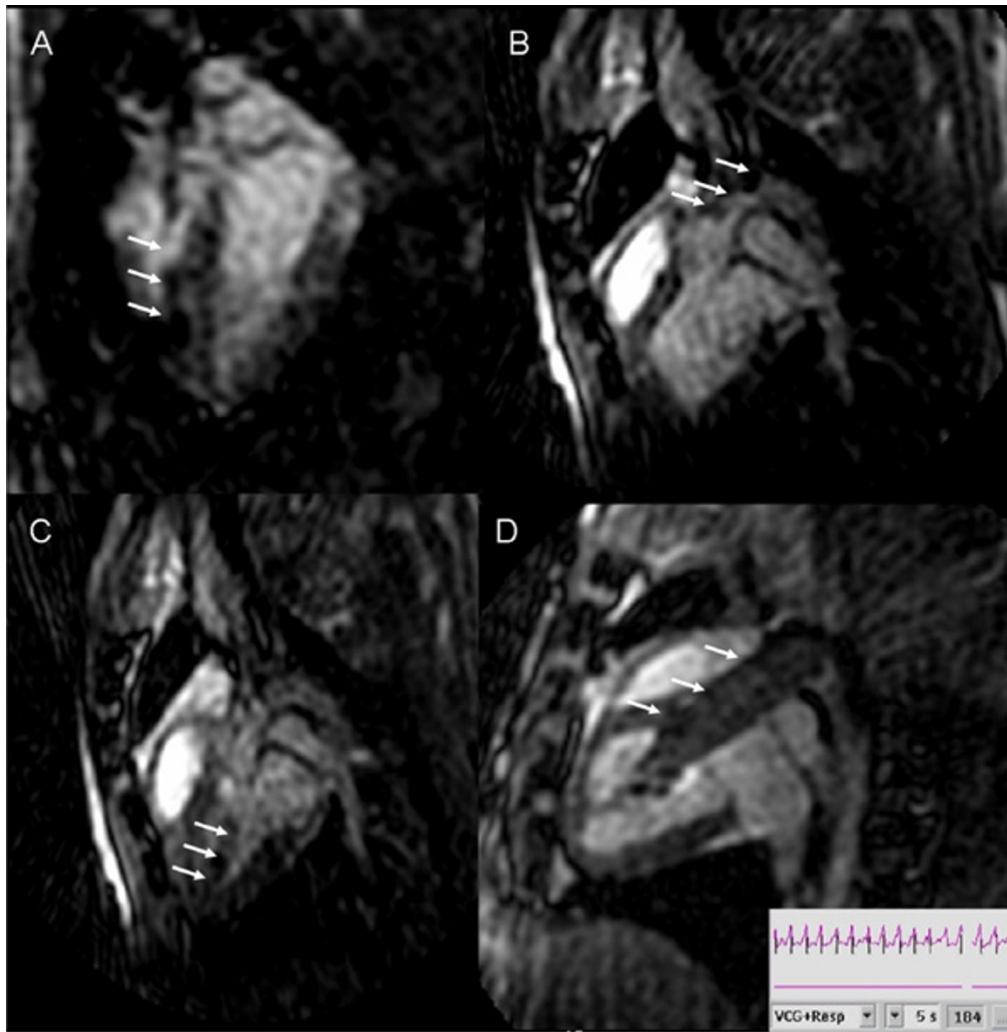


Figure 1

MR-guided aortic valvuloplasty. A real-time steady-state free precession MR-sequence was used for monitoring of the intervention. Panel A. A MR-compatible pacemaker lead (arrows) was placed in the right ventricular apex of the heart under MR-guidance before the valvuloplasty. Panel B. A Cobra-catheter with a passive MR-compatible guidewire (arrows) was positioned in the aorta ascendens. Panel C. The catheter and the guidewire (arrows) were then placed in the left ventricle. Panel D. After the pacing rate of approximately 180 bpm the balloon was inflated with diluted 5% Resovist to perform valvuloplasty.

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