FIRST IN MAN: REAL-TIME MAGNETIC RESONANCE-GUIDED ABLATION OF TYPICAL RIGHT ATRIAL FLUTTER USING ACTIVE CATHETER TRACKING

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Introduction: MR-guided electrophysiology (MR-EP) has the potential to improve catheter navigation, to visualize ablation injury and to avoid ionizing radiation. This study investigated the feasibility of an actively-tracked, fully MR-guided, electroanatomical mapping and ablation system. This represents first such system used in humans.

Methods: Two patients with typical right atrial flutter underwent cavotricuspid isthmus (CTI) ablation under MR guidance. The MR-EP suite integrated a Philips 1.5T Achieva scanner (Philips, Best, The Netherlands), an EP recording system (Horizon System, Imricor, Burnsville, MN, USA), an RF generator (St Jude Medical, St Paul, MN, USA), and a real-time image guidance platform (iSuite, Philips).

Under anaesthesia, a baseline MRI was performed. 3D right atrial shells were created by automated segmentation of a whole-heart MR scan (3D BTFE) and CTI anatomy delineated. Using the shell for guidance, deflectable MR-EP RF Vision catheters (Imricor) were placed in the CS and RA using MR-guided active tracking alone. Isochronal activation maps were created prior to ablation. RF ablation of the CTI was performed under active MR-guidance, with brief cine sequences for catheter position confirmation (35-40W for 40-60sec). Post ablation, activation maps were repeated and native-T1 weighted, T2 weighted and LGE imaging of the lesions was performed prior to removal from the scanner.

Results: Both patients underwent ablation of the CTI without use of fluoroscopy, with no complications. High fidelity electrograms were recorded with minimal MR interference. Active tracking of the catheter tip was accurate, with tracking position corroborated by conventional imaging sequences prior to each energy delivery. Total procedure times were 307min and 315min. Septal to lateral transisthmus conduction interval was lengthened to 142ms and 134ms respectively, and atrial flutter was uninducible post-ablation. Imaging confirmed both T2 weighted and late gadolinium enhancement of the CTI with no gaps identified. The patients remain free of atrial flutter at 44 days and 23 days respectively.

Conclusions: This study confirms feasibility in man of active-tracked MR-guided ablation of typical atrial flutter in man.

Figure 1 (top) MR-EP suite set-up. The MRI scanner is covered by sterile drapes on the left, with view mapping system displayed on right. (bottom left) Localised activation time shell on pacing from CS prior to ablation. (bottom right) Single slice of multi planar reconstruction demonstrating catheter position adjacent to CTI.