MR Guided Transseptal Punctures in a Swine Heart

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Background:
We tested the feasibility of performing magnetic resonance (MR)-guided transseptal punctures of the swine heart from a transfemoral venous approach

Materials and Results
All procedures were performed under MR guidance in a 1.5 T MR scanner. A novel active MR intravascular needle system was utilized for needle tracking and septal punctures. Nineteen transseptal punctures were performed in five swine (40-45 kg) using combination of ECG-gated high resolution and non-ECG gated real time MR imaging techniques. The IVC was traversed from the femoral vein with the intravascular needle over a guide wire. Once the needle was in proper location and orientation in the right atrium, transseptal punctures were made. Active tracking of the needle traversing through the septum was possible. The location of the catheter tip was then confirmed using a segmented k-space MR imaging employing a steady state sequence (FIESTA). After a confirmatory ventriculogram using gadolinium-DTPA was performed, .014" guidewire was advanced into the left atrium and left ventricle. All punctures were made with out any change to cardiac rhythm or rate; post mortem analysis was performed on all animals and demonstrated that 18/19 (95%) punctures were directly through the fossa ovalis.

Conclusions
Using MR-guidance only and a novel active intravascular needle system we were able to repeatedly puncture the fossa ovalis from a transfemoral approach with direct visualization of all components including the needle, the atria, fossa ovalis, and surrounding vasculature.