

Contact Force Controlled Zero-Fluoroscopy Catheter Ablation of Right-Sided and Left-Atrial Arrhythmias

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Introduction: In children and young adults, radiation exposure should be avoided whenever possible in order to reduce or eliminate its long-term malignancy risk. However, the avoidance of fluoroscopy during catheter ablation of cardiac arrhythmias guided by a 3D mapping and navigation system is hampered by possible high contact forces that can occur unintended. Here we present a technique for zero-fluoroscopy catheter ablation of various cardiac arrhythmias employing an ablation catheter with integrated force sensor.

Methods: After informed written consent, a 7-French irrigated ablation catheter with integrated force sensor for real-time measurement (10 Hz) of tip electrode-tissue contact force (sensitivity <1g; TactiCath, Endosense, Geneva, Switzerland) was introduced via the right femoral vein. Using an electroanatomical mapping system (EnSite NavX, St. Jude Medical, St. Paul, MN, USA) with the "belly" patch surface electrode as reference, geometric contours of the external and common iliac vein, the inferior and superior vena cava (IVC, SVC), right atrium (RA) and coronary sinus (CS) were created by sweeping the catheter tip across the respective structures. Applied maximal and mean forces were below 100 and 50g, respectively. Then, using the formerly created contours, a steerable decapolar catheter was advanced via the right femoral vein into the CS and a quadpolar catheter into the right ventricle. Transseptal access was gained under transesophageal guidance.

Results: Zero fluoroscopy catheter ablation was initially performed in 9 adult patients (Arrhythmias: 4 AVNRT, 2 typical atrial flutter, 1 RVOT-non-sustained-VT, 2 WPW with left atrial accessory pathways, 1 symptomatic paroxysmal atrial fibrillation) and then in 5 patients aged 10-18 years (Arrhythmias: 4 AVNRT, 1 WPW with left atrial accessory pathway in a 10-year-old boy). In only one adult patient this approach failed due to an accessory pathway within an aneurysm of the coronary sinus which was visualized by coronary sinus angiography. No procedure-related complications occurred.

Conclusion: Zero fluoroscopy catheter ablation of right-sided and left atrial cardiac arrhythmias seems in general to be feasible, effective and safe when a 3D navigation system is combined with real-time tissue-tip contact force measurements.