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Titel des Beitrags: Pulmonary vein isolation supported by MRI-derived 3D-augmented biplane fluoroscopy: a feasibility study and a quantitative analysis of the accuracy of the technique.

Abstract: Despite the advancement of technology in electroanatomic mapping systems (EAMS), fluoroscopy remains a necessary, basic imaging modality for electrophysiology procedures. We present a feasibility study of new software that enables 3D-augmented fluoroscopy in biplane catheterization laboratories for planning and guidance of pulmonary vein isolation (PVI). The computer-assisted overlay registration accuracy was assessed in a clinical setting using an automatic calculation of overlay projection geometry that was derived from hardware sensors in C-arms, detectors, and patient table. Consecutive patients \( n = 89 \) underwent left atrium (LA) magnetic resonance imaging MRI scan prior to PVI. Ideal ablation lines encircling the ipsilateral pulmonary veins (PVs) at antral level were drawn onto the segmented LA surface. The 3D-model was superimposed onto biplane fluoroscopy and matched with angiographies of LA and PVs. Three-dimensional-overlay projection geometry was automatically calculated from C-arm, detectors, and table sensors. Accuracy of technique was assessed as alignment of MRI-derived 3D overlay and angiographic LA/PV anatomy. Integrity of registered overlay was quantified using landmark measurements. Alignment offsets were \( 1.3 \pm 1.5 \text{ mm in left PV, } 1.2 \pm 1.5 \text{ mm} \)
in right PV, and 1.1 ± 1.4 mm in LA roof region. Bravais-Pearson correlation of the landmark measurements was \( r = 0.978 \) (\( \leq 0.01 \)), mean offset between landmark distance measurements was 1.4 ± 0.78 mm. Average time needed for overlay registration was 9.5 ± 3.5 seconds. MRI-derived 3D-augmented fluoroscopy demonstrated a high level of accuracy when compared with LA/PV angiography. The new system could be especially useful to guide procedures not supported by EAMS, such as cryotechnique PVI.

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