Guiding transseptal puncture by 3D-overlay of the Left Atrium and Ascending Aorta by a new Software-Prototype

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Purpose

- **Prototype Development**
  Merging of 3D-Datasets with 2D biplane fluoroscopic imaging
- **Clinical Application**
  Pulmonary Vein Isolation in interventional treatment of Atrial Fibrillation
- **Transseptal Puncture**
  Performed to access Left Atrium (LA). Controlled by TEE, intracardiac ultrasound, pressure

Material & Methods

Visual guidance for transseptal puncture by 3D-overlay in bi-plane fluoroscopy

3D-Models of important anatomic landmarks (LA, Aorta, Coronary Sinus) are superimposed onto biplane fluoroscopy.
3D-Models are selectively visualized on the basis of a preprocedurally acquired MR-Angiography

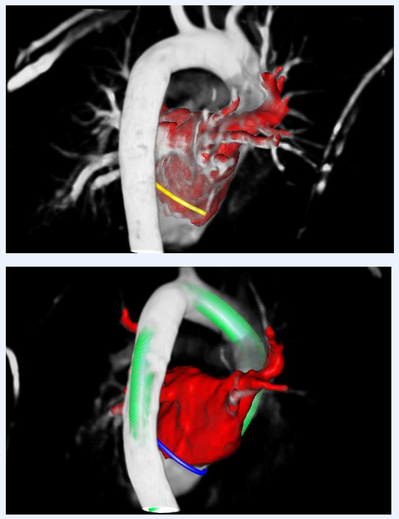

Fig. 1: Preprocedural 3D-Datasets (MR-Angio-graphies), segmented Left Atrium, Coronary Sinus manually selected

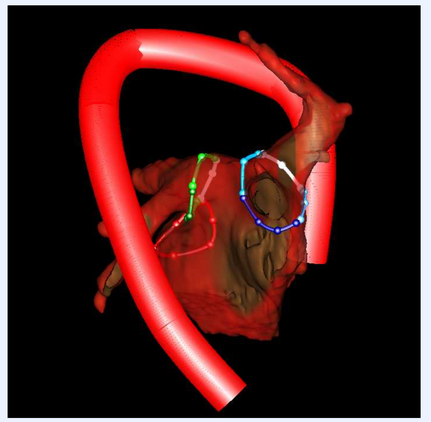

Fig. 2: 3D-Volume consisting in segmented Left Atrium and abstract model of Aorta

Fig. 3: 3D-Volumes of segmented Left Atrium, abstract model of Aorta and assumed position of Coronary Sinus

Results

- Integration of the 3D-Model on fluoroscopy was matched by Coronary Sinus Model and placed Coronary Sinus Catheter in 61 left atrial procedures
- Initial Left Atrial position, aligned to CS-catheter before transseptal puncture, was compared to second Left Atrial position based on dye injection after transseptal puncture. Mean difference measured by three-dimensional Euclidean Distance:
  ø 10,8 mm
- All punctures succeeded, pericardial effusions were ruled out by echocardiography, no complications occurred

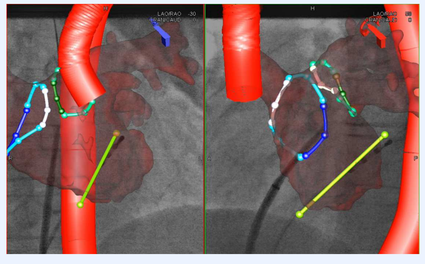

Fig. 4: Biplane fluoroscopy on Prototype-Screen (-30˚ /60˚ RAO/LAO), super-imposed left atrium, ascending + descending Aorta. Mapping-Catheter in CS-Position at moment of transseptal puncture

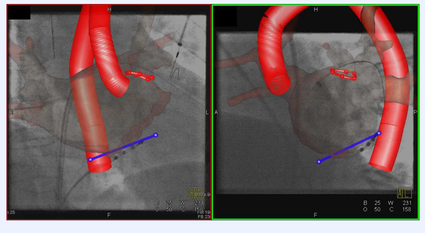

Fig. 5: Biplane fluoroscopy on Prototype-Screen (-30˚ /60˚ RAO/LAO), super-imposed left atrium, Aorta, ostium of left atrial appendix highlighted by red loop. Mapping-Catheter in CS-Position

Conclusions

- The 3D-Overlay of Left Atrium, Coronary Sinus and Aorta on biplane fluoroscopic imaging provides **important anatomic landmarks** to perform **transseptal puncture**
- 3D-Fluoroscopy, additionally applied to conventional techniques of transseptal puncture (pressure-control, ultrasound), can **increase the safety** of the procedure

Acknowledgment
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