Three Dimensional Rotational Angiography Fused with Multimodal Imaging Modalities Offers a Novel, Accurate, Fast and Safe Way to Guide Endomyocardial Injections into the Ischemic Heart

D. Dauwé 1, D. Nuyens 2, S. De Buck 1, P. Claus 1, G. Gheysens 1, M. Koole 1, W. Coudryzer 1, S. Dymarkowski 3, N. Vanden Driessche 1, L. Janssens 1, J. Bogaert 4, H. Heidbuchel 5, S. Janssens 3

1 Clinical Cardiology - Imaging and Cardiovascular Dynamics, Department of Cardiovascular Sciences, KULeuven, Belgium.
2 Nuclear Medicine and Molecular Imaging - 1 Translational MRI, Department of Imaging and Pathology, KULeuven, Belgium.
3 Clinical Radiology, Catholic University Hospitals Leuven, Belgium.

Background

- Development of protein- and cell-based therapy for advanced ischemic heart disease requires efficient and widely applicable intramyocardial (IM) delivery strategies.

- NOGA-platform technology (Bioense Webster®) is used for guided percutaneous IM injections into the ischemic myocardium and differentiates regions of non-viable, viable ischemic/hibernating and viable healthy myocardium. This is based on real-time acquisition of functional data, represented in a 3D endovascular electromechanical map.

- LARCA [Leuven Augmented Reality Catheter Ablation] is an ‘in-house’ developed system, integrating selective 3D angiograms with live biplane fluoroscopy, currently used in our center on a daily basis to guide electrophysiological ablation procedures in all heart chambers.

- NOGA, without compromising injection accuracy.

Aim

We tested whether integration of MRI, CT and 18F-FDG-PET imaging modalities in a novel mapping technique, based on an extension of our LARCA-system, allows safe and equally accurate IM injections as existing electromechanical mapping systems (NOGA).

Animal Model & Experimental Design

- Infarct Induction: 90° Balloon Inflation (Pressure Ltd = 25-30 kg DomesSc Pigs)

- Animal Model & Experimental Design

- NOSI = LARCA-CT Guided IM Injections (n=3)

- NOGA = LARCA-CT Guided IM Injections (n=3)

- Head to Head Comparison: NOGA vs LARCA-CT Guided IM Injections (n=4)

- 6 injection spots in each animal

- 3D wall motion analysis

- 3D endocardial wall motion analysis

Results

- Necrosis Markers and Post-Infarct LV Remodeling

  TNF release at 2h reperfusion: 60±8 µg/L (S.13)

- Figure 6: Injection Spots Identified by UVA

- Ventricular Arrhythmias Requiring DC-shock

  NOGA (n=6) 4/6

  LARCA (n=11) 1/11

- Ventricular perforation

  NOGA (n=6) 0/6

  LARCA (n=11) 0/11

- Procedure Time

  NOGA (n=6) Total Procedure Time (min) 130±4

  LARCA (n=11) Total Procedure Time (min) 77±6

- Table 2: Inclusion Criteria

- Myocardial Viability

  LARCA-CT

- Summary and Conclusion

  - 3DRotational LV Angiography fused with multimodal imaging offers a new and promising strategy to guide IM injections towards the infarct border zone.

  - Endovascular procedure times and major arrhythmic side effects are significantly reduced in comparison to NOGA, without compromising injection accuracy.

  - Fusion with CT or 18F-FDG-PET offers a valuable alternative in MRI-incompatible patients.

References and Acknowledgements


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4. The authors report no conflict of interest.