

## Three dimensional modelling in structural heart disease: How can LGE MRI help electrophysiologist?

**Poster No.:** P-0089  
**Congress:** ESCR 2017  
**Type:** Scientific Poster  
**Authors:** S. K. Ternovoy, L. Yeghiazaryan, O. Aparina, O. Stukalova, N. Mironova; Moscow/RU  
**Keywords:** Ischaemia / Infarction, Inflammation, Image registration, Segmentation, Contrast agent-intravenous, Computer Applications-3D, MR, Cardiac, Anatomy

Any information contained in this pdf file is automatically generated from digital material submitted to EPOS by third parties in the form of scientific presentations. References to any names, marks, products, or services of third parties or hypertext links to third-party sites or information are provided solely as a convenience to you and do not in any way constitute or imply ECR's endorsement, sponsorship or recommendation of the third party, information, product or service. ECR is not responsible for the content of these pages and does not make any representations regarding the content or accuracy of material in this file.

As per copyright regulations, any unauthorised use of the material or parts thereof as well as commercial reproduction or multiple distribution by any traditional or electronically based reproduction/publication method ist strictly prohibited.

You agree to defend, indemnify, and hold ECR harmless from and against any and all claims, damages, costs, and expenses, including attorneys' fees, arising from or related to your use of these pages.

Please note: Links to movies, ppt slideshows and any other multimedia files are not available in the pdf version of presentations.

[www.myESR.org](http://www.myESR.org)

## Purpose

Left ventricle (LV) structural changes (scar tissue and grey zones (GZ)) are the substrate for development of ventricular arrhythmias (VA). Estimation the spatial relations between the LV structural changes and location of VA s is the aim of the study.

## Methods and Materials

Study enrolled 25 patients (pts) with prior myocardial infarction(MI).

Patients underwent

- 24-hour ECG monitoring;

- body surface electroanatomical activation mapping with reconstruction of LV 3D models for location the VA origin. On 3D models of LV electroanatomic isopotential and isochrone maps were reconstructed. On these maps the location of VA origin was detected as a point of earliest electrical activation.

- LGE MRI on 1.5 T clinical scanner using high resolution(1.25x1.25x2.5mm) inversion-recovery pulse sequence (TI 290-340ms, TE 2,4ms, TR 750-950ms). On obtained images LV myocardium epicardial endocardial surface were segmented manually. Scar tissue threshold was 3.5SD above the mean LV signal intensity(SI), GZ threshold was 2.5-3.5SD above the mean LV SI. Scar and GZ were mapped on reconstructed 3D models of LV structure.

- Both 3D models of LV structure and LV electroanatomical maps were divided into 17 segments manually. Both these 3D models were evaluated simultaneously by two experts (radiologist and electrophysiologist). The relations between location of VA in comparison with the LV myocardial structure were assessed.

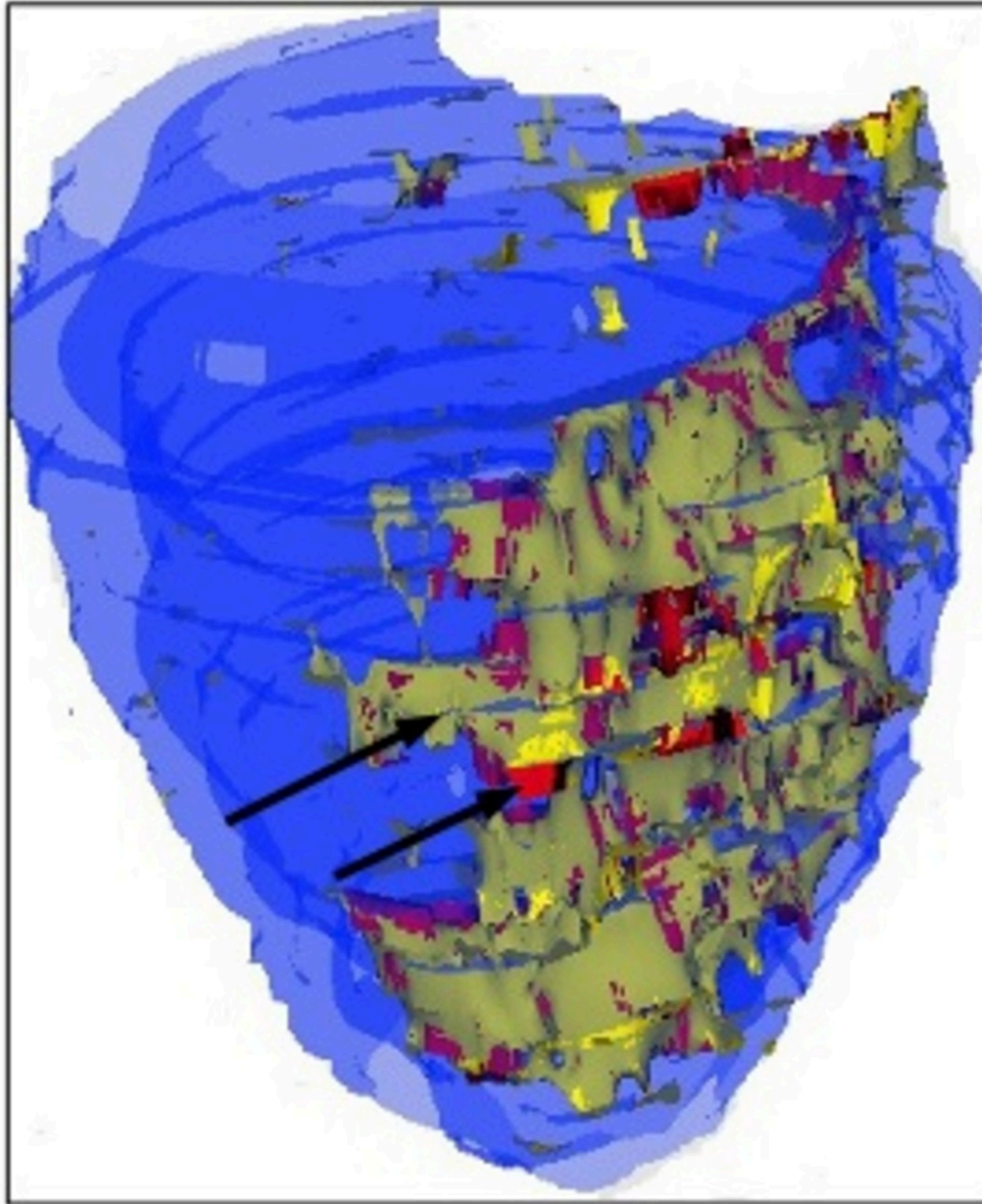
## Results

The extent of scar tissue was 7.7 [4; 18.5] %. The extent of GZ was 7.3 [5.5; 10.3] %. The infarct zone had heterogenic structure. The scar zone was mosaic and was surrounded by regions of GZ.

In 73% of patients (18 patients) VA origin was the zone of enhancement. It should be mentioned that in most cases the location of VA was endocardial surface of LV (14 patients). At the same time some patients had epicardial origin of VA (4 patients). No relations between the depth of LV damage (enhancement transmural) and the origin of VA was estimated.

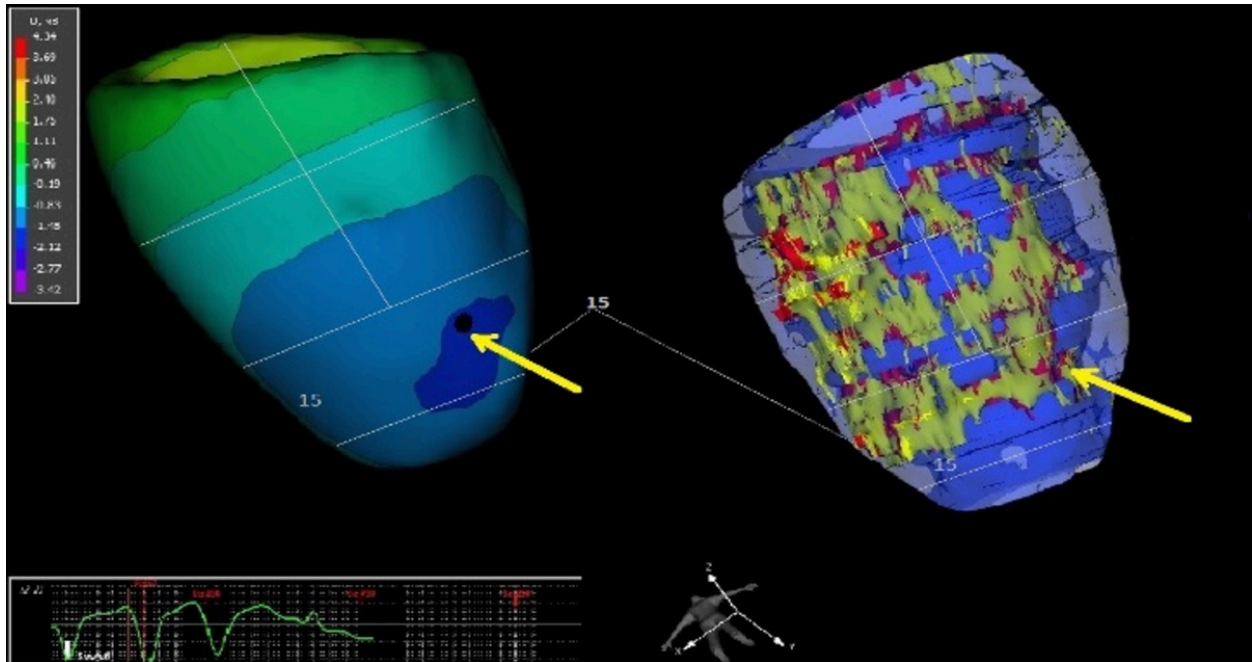
However, data regarding the structure of LV in the location of VA may be helpful for planning ablation. The thickness and structure of LV myocardium in planned ablation site may give an opportunity to use optimal energy and decrease the risk of pericardial effusion or hemopericardium.

Images for this section:



**Fig. 1:** 3D map of left ventricle. The epicardial and endocardial surfaces of healthy myocardium are marked blue. The zone of infarction has a heterogeneous structure. The scar tissue is marked red. It is surrounded by a grey zone which is marked yellow

© Dept. Clinical Electrophysiology, Dept. Tomography, Russian Cardiology Research and Production Complex - Moscow/RU



**Fig. 2:** The 3D electroanatomic map (left) and 3D structure map of the left ventricle. On both maps the division into 17 segments is performed, origin of ventricular arrhythmia is pointed by yellow arrow. The origin of ventricular arrhythmia is located in zone where scar tissue, gray zone and healthy myocardium are met together.

© Dept. Clinical Electrophysiology, Dept. Tomography, Russian Cardiology Research and Production Complex - Moscow/RU

## Conclusion

A robust approach without need for special software for simultaneous assessment of left ventricular structural and electrophysiological properties is described.

In majority of patients with prior myocardial infarction ventricular arrhythmias may originate from zones of LGE. The data regarding the structure of the left ventricle in the planned site of ablation may improve the safety of the ablation procedure.