2-D Interactive Scar Layer Visualization

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Background: Cardiac magnetic resonance imaging (MRI) is used in clinical routine for diagnosis, as it can provide information on morphology, perfusion, or tissue viability. For patients suffering from heart failure the viability analysis of the myocardium is critical. However, the transmurality of the scar can be challenging to interpret, but is of high value for therapy planning.

Objective: The location and transmurality of the scar is often examined by looking at the slices of the LGE-MRI. Another method is the visualization within an AHA bull's eye plot (BEP), where the scar transmurality is presented in percentage (1), see Fig. A. Or the scar mesh can be projected on the BEP, as depicted in Fig. B. However, with these methods it is not possible to differentiate between endocardial and epicardial scar. Therefore, we propose a new 2-D interactive scar layer visualization using the BEP.

Methods: The prior segmentation of the myocardial scar is required (2). Afterwards, the segmentation mask is divided into three layers, resulting in an endocardial, mid-cavity and epicardial layer (3). These layers can then be projected on the BEP, see Fig. D-F, or overlaid on top of each other, as illustrated in Fig. C. If all layers add up, the scar is transmural.

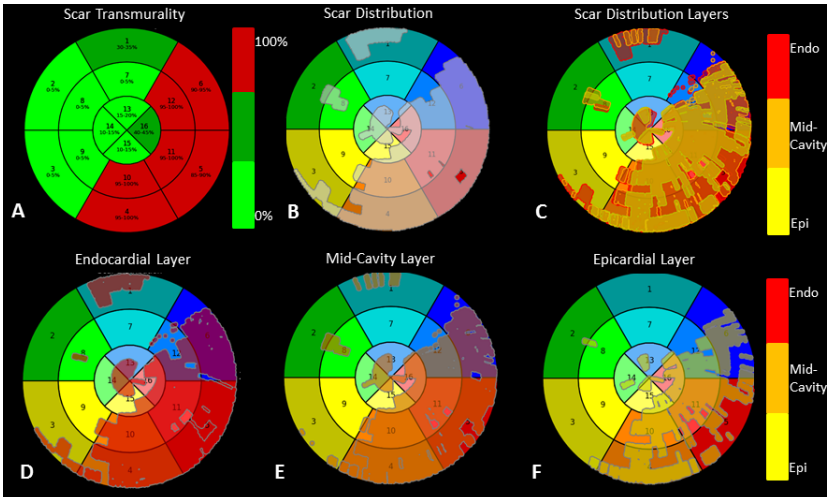

Figure: (A) Bull's eye plot (BEP) of the left ventricle showing the scar transmurality as percentage and color coding. (B) Shows the BEP with the scar volume. (C) Depicts the BEP with three scar layers, where the red layer corresponds to endocardial scar, the orange to mid-cavity and the yellow to epicardial scar. (D) Endocardial scar distribution. (E) Mid-cardial scar distribution. (F) Epicardial scar distribution.

Results: The myocardial scar tissue can be observed from the endocardium to the epicardium and ideal points for lead placement for cardiac resynchronization therapy can be found easier compared to traditional decision making in 2-D.

Conclusion: A novel method for interactive 2-D visualization of the scar layers within an AHA BEP has been presented. This visualization method can give precise information about the location and transmurality of the myocardial scarring.

Disclaimer: The methods and information presented in this paper are based on research and are not commercially available.

References

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