

Quantification of Left atrium Fibrosis from LGE MRI in Atrial Fibrillation

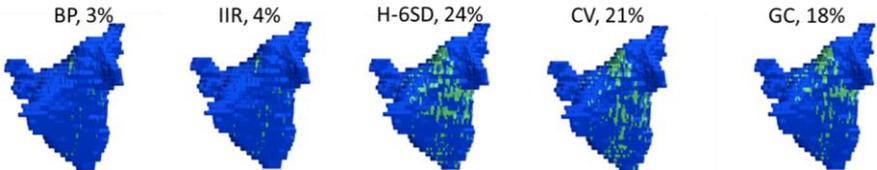
Alice Andalò¹, Claudio Fabbri¹, Maddalena Valinoti¹, Alessandro Masci¹,
Cristiana Corsi¹

¹ DEI, University of Bologna, Campus of Cesena, Bologna, Italy

Introduction. The DECAAF study reported that extent of fibrosis in the left atrium (LA) in atrial fibrillation (AF) patients may predict recurrences after the ablation procedure. Therefore the information about the fibrosis extent may help the electrophysiologist in patient's selection for the ablation procedure. Late gadolinium enhanced magnetic resonance imaging (LGE-MRI) is a recent technique used for LA fibrosis distribution assessment in the LA wall. Unfortunately, LGE-MRI analysis does not rely on a standardized image processing protocol. The aim of the study was to compare different methods to quantify fibrosis in the LA in the 3D domain.

Methods. LGE-MRI from 60 AF patients acquired at the CARMA Center (University of Utah) in which manual tracing of LA wall by expert radiologist was available, were analysed applying five different approaches for fibrosis segmentation: an histogram-based (H-6SD), the image intensity ratio (IIR), the blood pool normalization (BP), the Chan-Vese (CV) and the graph-cut (GC) method. For each method we quantified the percentage of fibrosis with respect to the entire LA wall mass.

Results. Results showed these five approaches can be divided in two groups; the group composed by the H-6SD, CV and GC is characterized similar results (mean coefficient of variation=0.3), while the results obtained applying BP and IIR strongly depend on the quality of the acquisition (mean coefficient of variation=0.62) (see Figure). Utah stage classification resulted in a wide disagreement (22/60 patients, 37%) among BP and IIR. The two approaches which best matched the Utah classification were the CV and GC (49/60 patients, 82%)



Conclusions. This study confirmed the evaluation of the quantification method appears critical and further research is needed to define a satisfactory standard for the segmentation of atrial fibrosis. A standardized image acquisition protocol would improve the performance of methods based on blood pool reference values.