Significance of Pulmonary Vein Antral Region in Atrial Fibrillation Patients: A MRI Approach

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Introduction:
Atrial Fibrillation (AF) is the most common heart rhythm disturbance and is closely linked to structural remodeling in the tissue in the left atrium (LA). Using a special form of Magnetic Resonance Imaging known as Late Gadolinium Enhancement-MRI, we have developed a system of quantifying the extent and distribution of this remodeling in the heart using the enhancement created by the gadolinium. By identifying the total volume of enhanced tissue, which appears to be associated with an increase in fibrosis, we can establish for each patient a score in the Utah AF Classification System (I-IV). The Utah score is a global score and yet the distribution of fibrosis is not uniform throughout the entire LA, nor is it consistent across patients. The purpose of this study was to determine whether the extent of structural remodeling in certain regions of the left atrium, and specifically within the antral region of the pulmonary veins, was a more sensitive and specific predictor of AF treatment outcomes than the current Utah Classification Score.

Methods:
Because the target of AF treatments is primarily the insertion points (ostia) of the pulmonary veins into the atria, we separated enhancement in these regions, called antral regions, from the main body of the left atrium. For 97 patients we reprocessed the LGE-MRI scans, recomputed the Utah score from the reduced atrial tissue, and compared its ability to predict outcome to that of the global score.

Modified Segmentations:

Results:
Protocol 1: 86% of patients did not change score [77-92%, CI 95%] when retaining original wall volume
Protocol 2: 96% of patients did not change score [90-99%, CI 95%] when segmentations did not retain original volume.

Discussion:
These findings support the hypothesis that inclusion of fibrosis in the regions of the left atrium close to the pulmonary veins does not play a role in predicting outcomes from ablation. A possible mechanism is that fibrosis in this region is an early sign of the underlying tissue disease and so is present in virtually all patients with AF, irrespective of their Utah score.

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