Pre- and Post-Procedure MRI Imaging of the Atrium: Current and Future Role

Nazem Akoum, MD, MS, FHRS

Comprehensive Arrhythmia Research and Management (CARMA) Center

University of Utah
Disclosures

• None
LGE-MRI of the left atrium
Pre-Procedural MRI

• Atrial structure and Fibrosis

Intra-procedural MRI

Post-Procedural MRI

• Damage Assessment
• Scarring
DE-MRI based staging of atrial tissue remodeling

University of Utah Classification of AF

Utah Stage I

Utah Stage II

Utah Stage III

Utah Stage IV

Akoum et al. JCE. 2011 Jan;22(1):16-22
DECAAF-Participating centers

- Loyola University
- Massachusetts General Hospital
- Kitsap Biology Clinic
- CARMA Center
- U Penn
- Ohio State
- Ghent University Hospital
- CHU Bordeaux
- St. Antonius Ziekenhuis
- Asklepios Klinik St. Georg
- Institut Für Diagnostische und Interventionelle Radiodagnostik
- Universitätsklinikum Leipzig
- Klinikum Coburg
- Kerckhoff Klinik
- Universidad de Barcelona
- University of Adelaide

CARMA
AFib Recurrence and Fibrosis

Recurrence Censored after 325 days

Hazard Ratio of AFib Recurrence

- Estimated Hazard Ratio
- Upper Limit of 95% CI
- Lower Limit of 95% CI

adjusted for age, gender, hypertension, CHF, mitral valve disease, diabetes and study sites

Percent Fibrosis
Proportion Recurrence Free at Day 325

Stage I  Stage II  Stage III  Stage IV

DECAAF; HRS late breaking trial 2013
In subjects with no abnormal mass in the LAA, the LAA in MRI was clear and had low intensity in both the double-IR (A) and triple-IR (B) sequences.

Ohyama H et al. Stroke 2003;34:2436-2439
**Predictive accuracy**

**ROC analysis**

Model including CHADS2, AF type, INR

Model including CHADS2, AF type, INR and Utah Stage (fibrosis)

![ROC Curve for CHADS2, AF type, INR](image1)

Area under ROC curve = 0.6740

![ROC Curve for CHADS2, AF type, INR, and Utah Stage](image2)

Area under ROC curve = 0.80

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Akoum et al, 2013, In review
Pre-Procedure MRI

- Atrial structure and Fibrosis

Intra-procedure MRI

Post Procedure MRI

- Damage Assessment
- Scarring
Esophageal Tissue Injury Following Pulmonary Vein Isolation Using the PVAC: Assessment by Endoscopy and Magnetic Resonance Imaging

Pacing and Clinical Electrophysiology
Volume 36, Issue 4, pages 477-485, 4 FEB 2013 DOI: 10.1111/pace.12085
Figure 2. Example of a patient who developed left inferior pulmonary vein (LIPV) narrowing post-ablation. **Top row:** Serial axial MRA images showing normal LIPV pre-ablation with progressive narrowing 24 hours post-ablation and 3 months post-ablation. (red arrows). **Bottom row:** Corresponding ostial/proximal LIPV cross-sectional views and area measurements.
A, A series of T2 signal images of the left atrium (LA) and pulmonary veins in 2 patients, with arrows pointing toward regions of hyperenhancement in column 2.
A and B, A series of reconstructed 3-dimensional left atrial shells to visualize T2 and the delayed enhancement (DE) signal in patients shown in Figure 2.
Macroscopic section and MRI of the ablation line.

Ranjan R et al. Circ Arrhythm Electrophysiolog 2011;4:279-286
AF recurrence

Log rank p < 0.01

Residual <10% (n=87)
Residual >10% (n=85)
Pre-Procedure MRI
• Atrial structure and Fibrosis

Intra-procedure MRI
• Real Time MRI

Post Procedure MRI
• Scarring and Reverse remodeling
Acute Identification and Targeting of Gaps
Catheter Localization in Real Time MRI - EP
Summary

• Peri-procedural MRI of the atrium adds substantial value to the planning, conduction and follow up after catheter ablation procedures
Thank You

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outline

• Pre-procedure
  • Anatomy
  • Fibrosis quantification
• Post Procedure
  • Immediately post
    • No reflow
    • Esophageal injury
    • Pv stenosis
  • 3 months post
    • Overall scarring
    • PV encirclement
    • Guidance for redo procedures