Afib and Cardiac Function
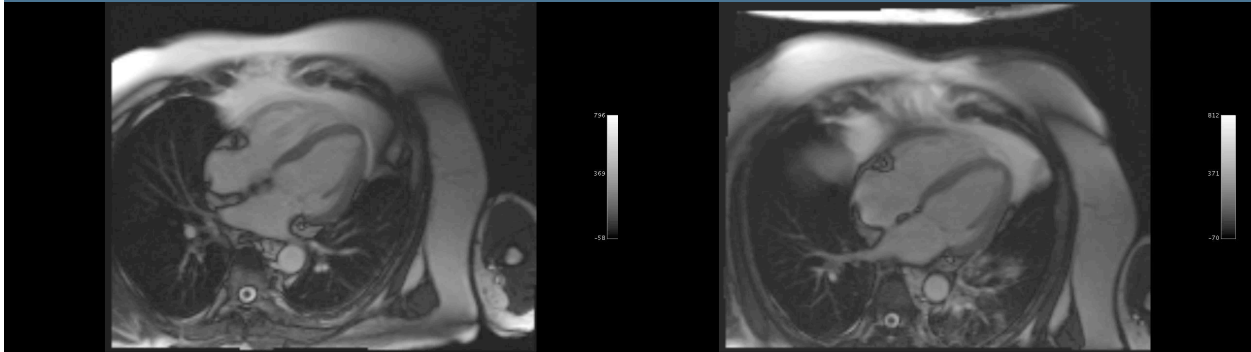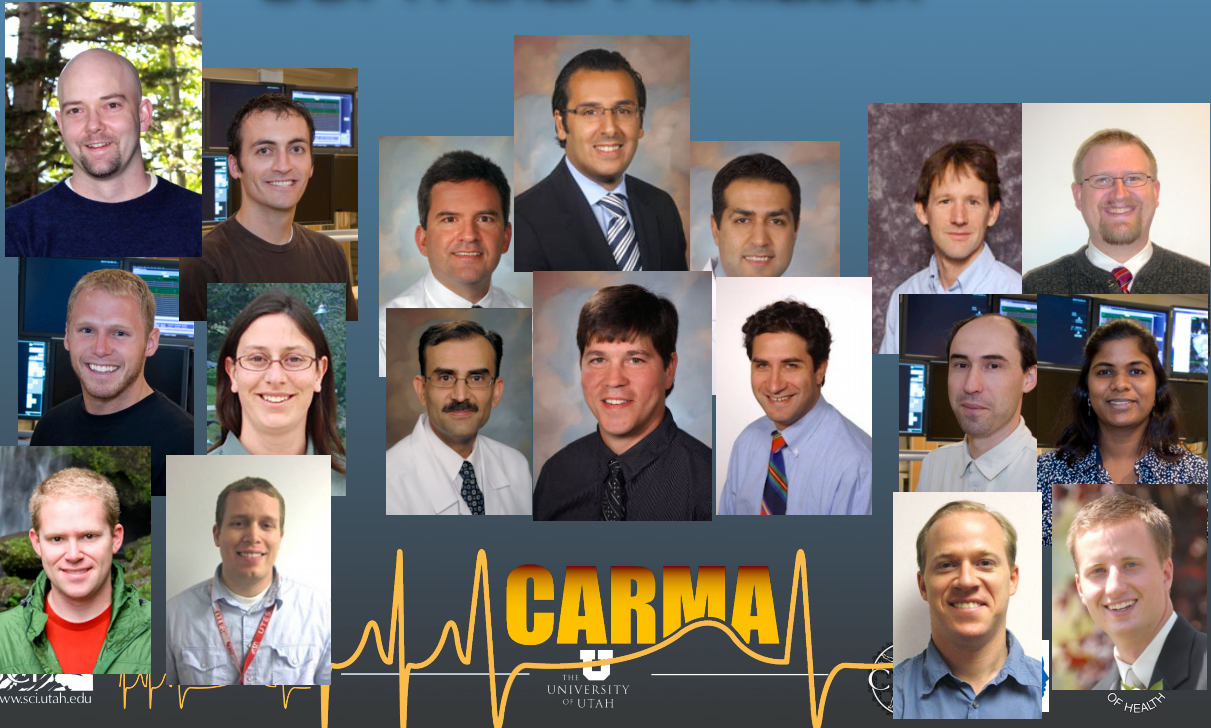
Normal Contraction

Atrial Fibrillation

DBP: Atrial Fibrillation
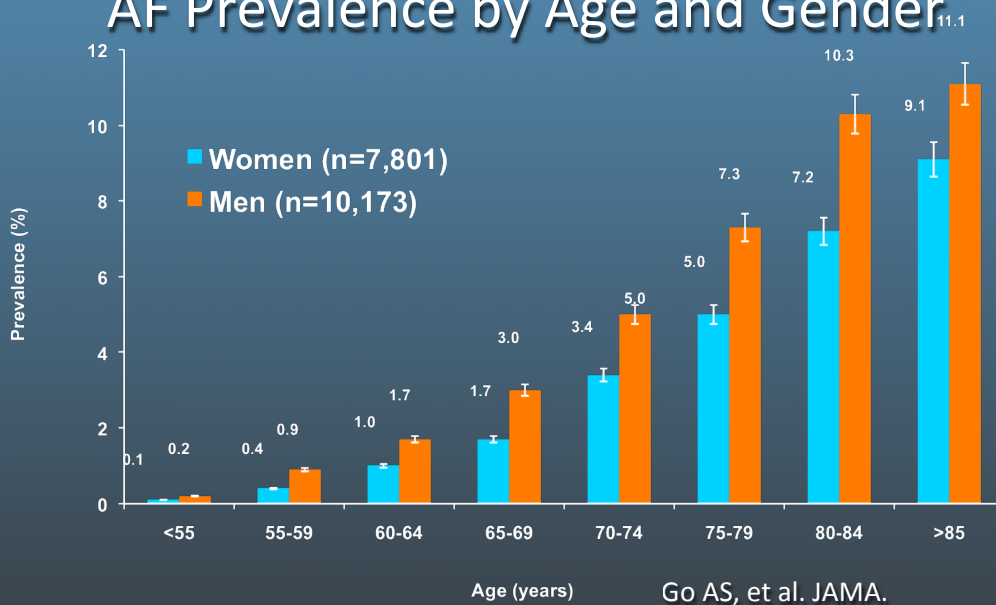
Everyone Should Worry about Afib

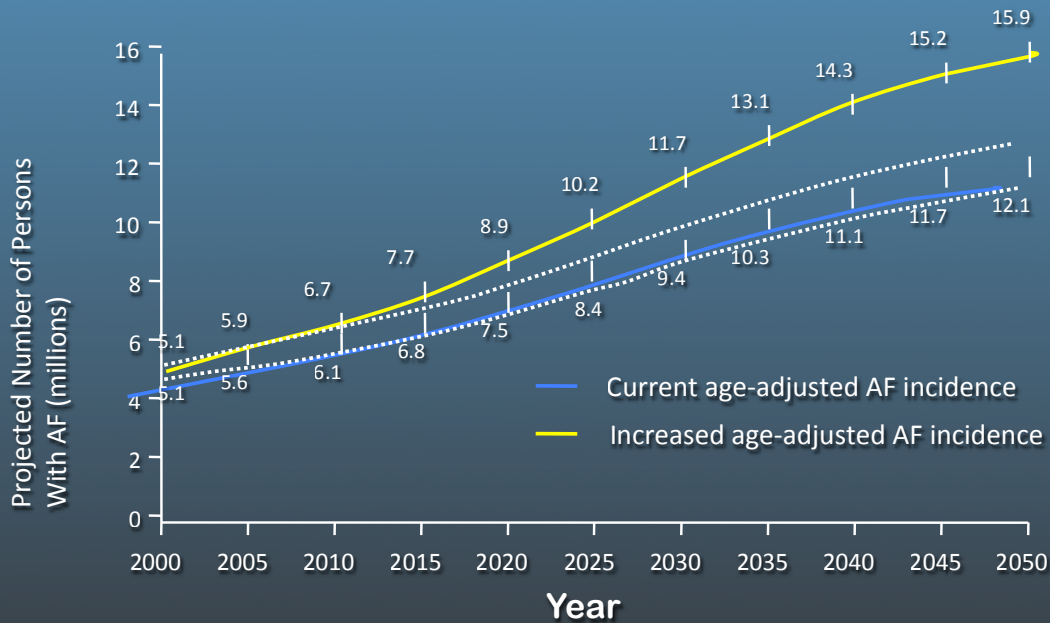NA-MIC AHM 2011

AF Prevalence by Age and Gender

Prevalence (%)

- Women (n=7,801)
- Men (n=10,173)

Age	Women	Men
<55	0.1	0.2
55-59	0.4	0.9
60-64	1.0	1.7
65-69	1.7	3.0
70-74	3.4	5.0
75-79	5.0	7.3
80-84	7.2	10.3
>85	9.1	11.1

Age (years)

Go AS, et al. JAMA. 2001;285:2370-2375.

AF Prevalence Is Increasing Rapidly

NA-MIC AHM 2011

Projected Number of Persons With AF (millions)

—— Current age-adjusted AF incidence
—— Increased age-adjusted AF incidence

Year

Miyasaka et al. *Circulation*. 2006;114:119-125.

Afib and the Brain

Afib and the Brain

15% of All Strokes

- AF prevalence
- Strokes attributable to AF

%

30
20
10
0

50–59 60–69 70–79 80–89

Age Range (years)
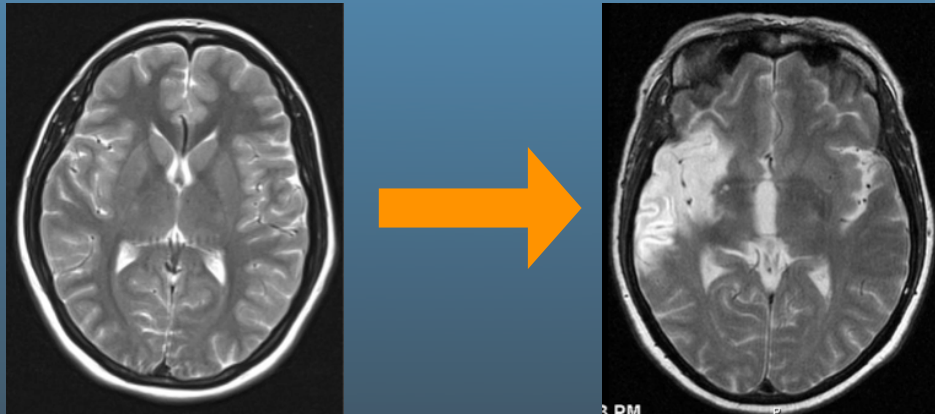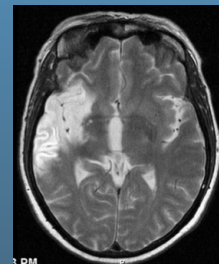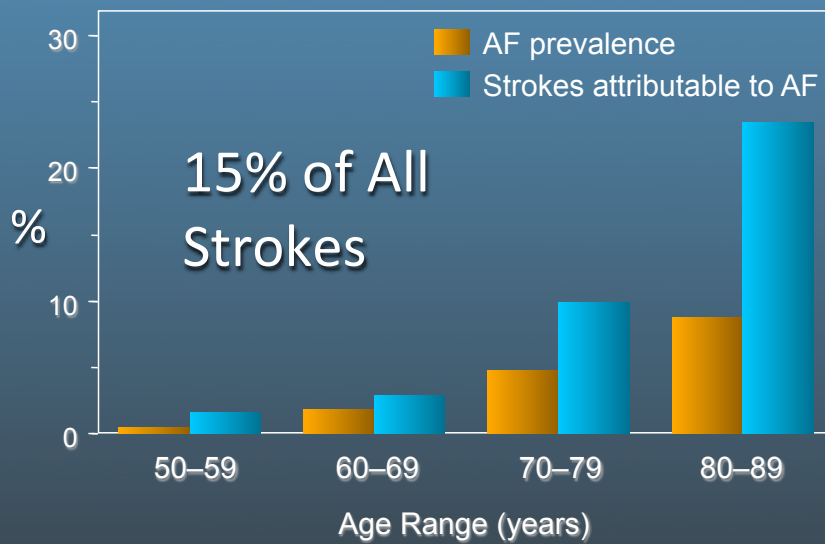
Wolf et al. Stroke 1991;22:983-988.
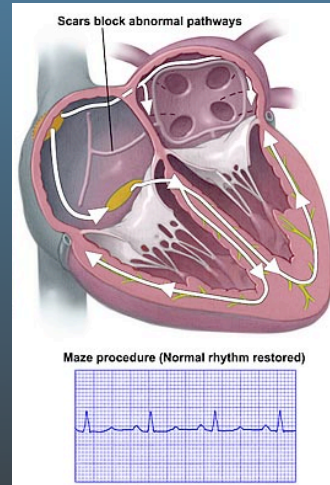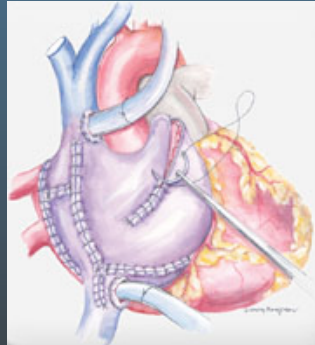
What is AF?
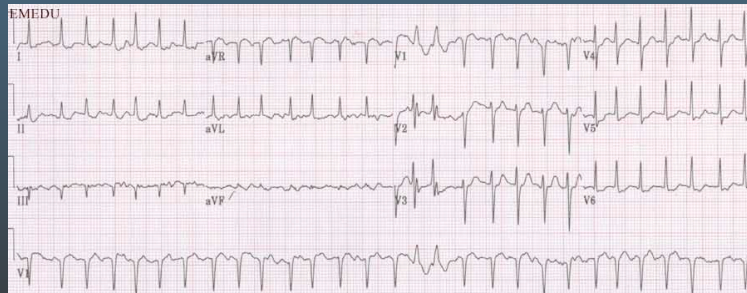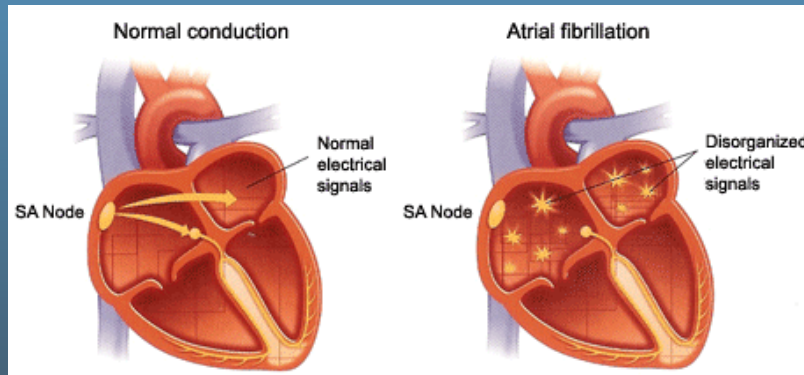
AF = Substrate + Trigger
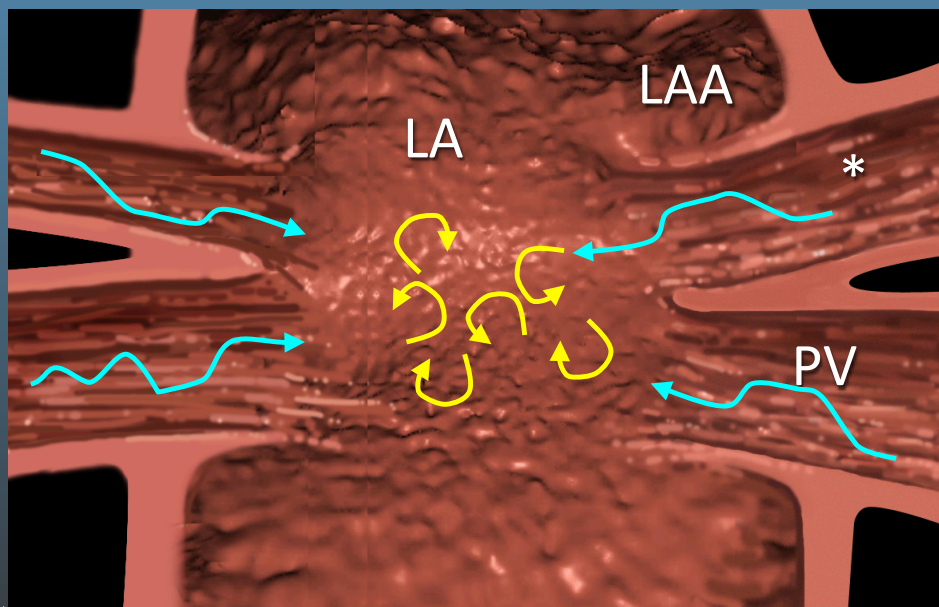
Treating AF

Drugs + Defibrillation

- Antiarrhythmics
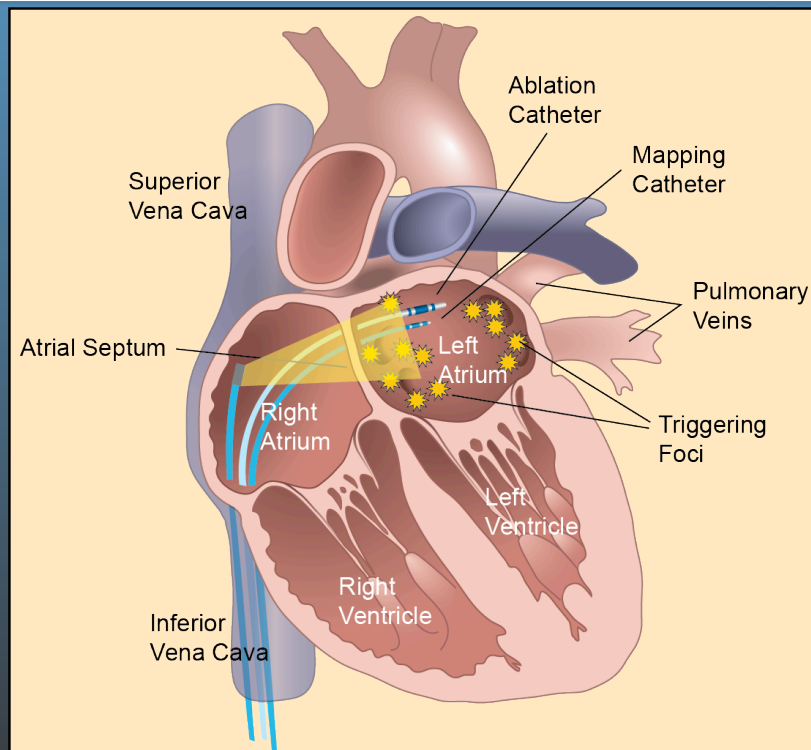- Anticoagulants
- Side effects
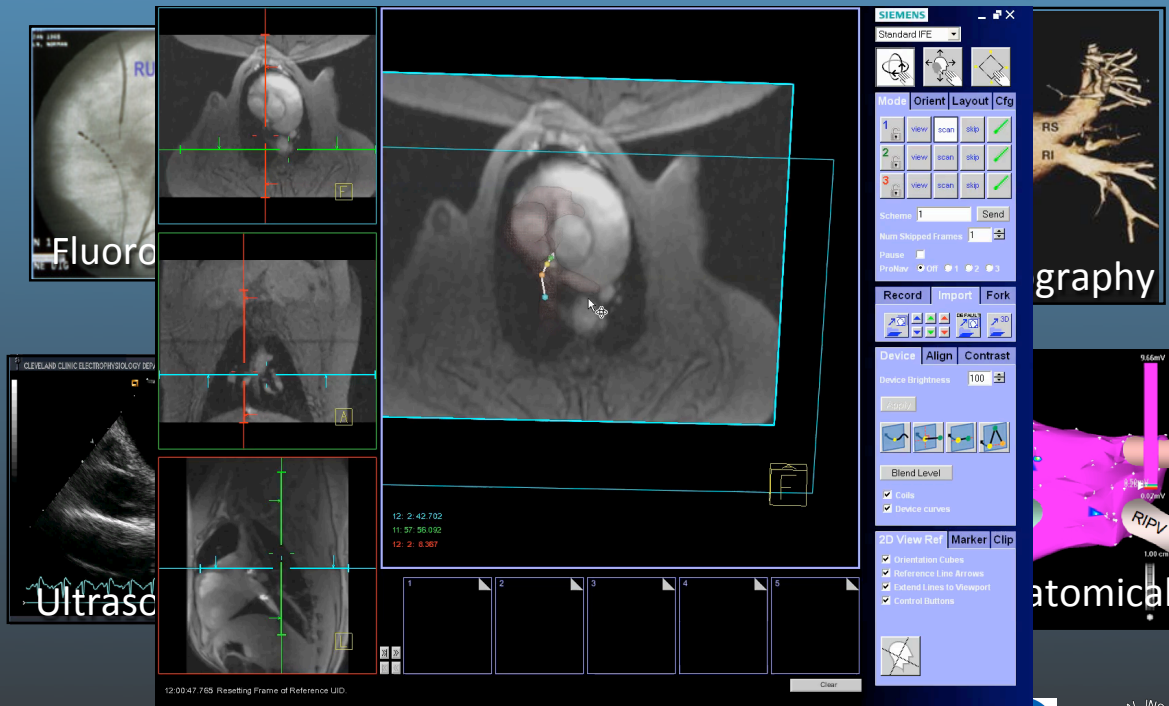- Life long burden

Intervention

- Maze procedure
- Ablation

Scars block abnormal pathways

Maze procedure (Normal rhythm restored)

Ablation of AFib

Superior Vena Cava

Atrial Septum

Right Atrium

Inferior Vena Cava

Ablation Catheter

Mapping Catheter

Pulmonary Veins

Left Atrium

Triggering Foci

Left Ventricle

Right Ventricle

Imaging Modalities in AF

Fluoro

graphy

Ultraso

atomical
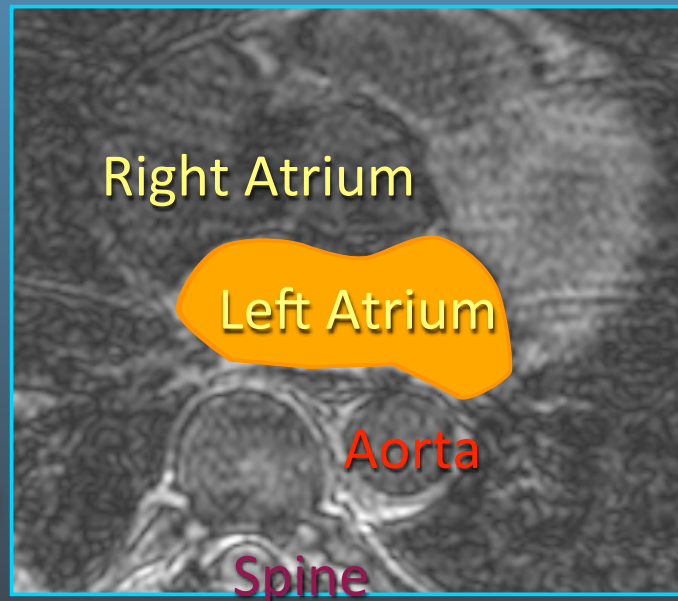
Real Time MRI

What is Image Analysis in AF?
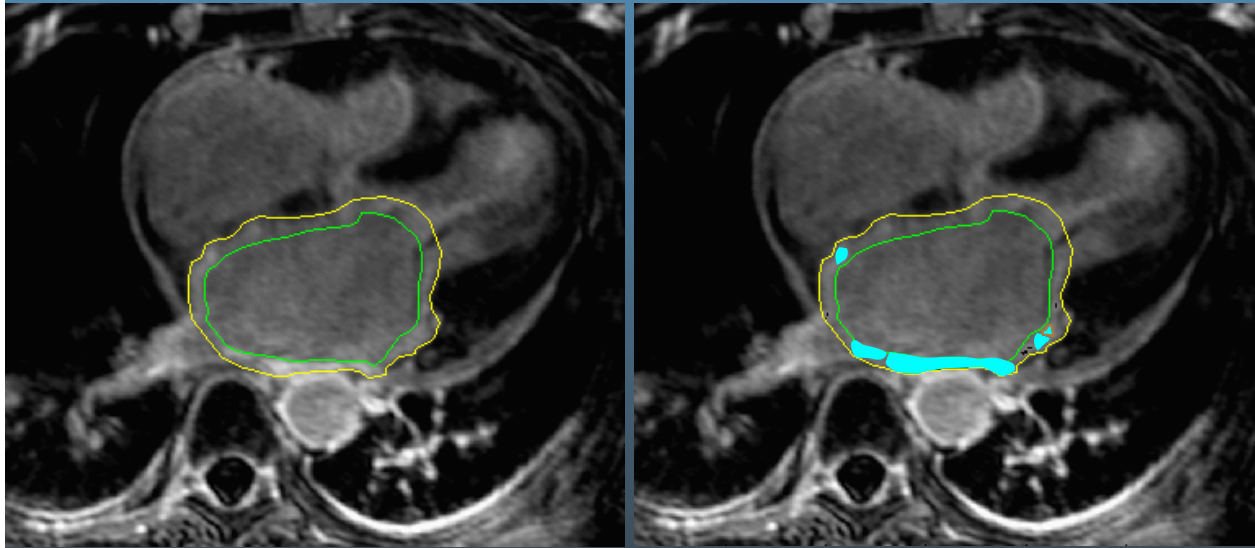
Identifying structures

Marking structures (segmentation)

Measuring structures

Quantifying changes in structure (and function)

Right Atrium

Left Atrium

Aorta

Spine

Quantifying Enhancement in Patients

DE-MRI with Segmented Epicardial and Endocardial Borders

Enhancement Detection

Pre-Ablation Imaging

Contrast Enhanced MRI
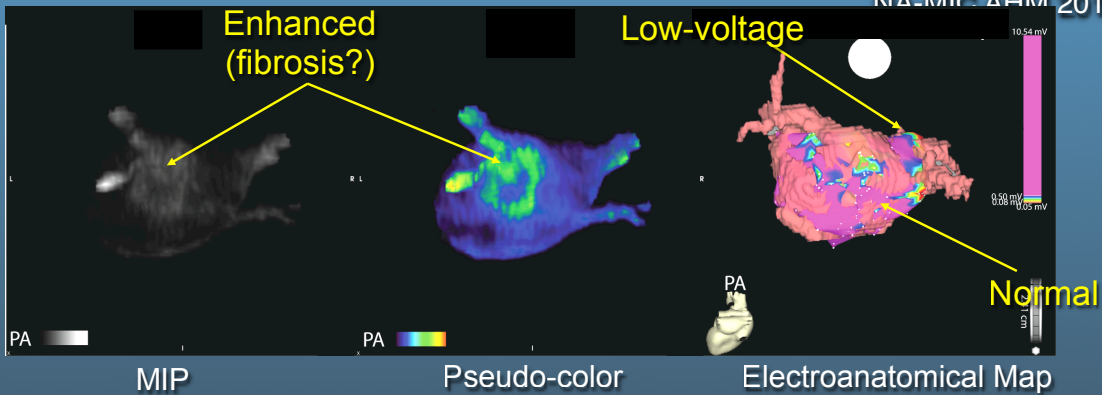
Input - Myocardial Contours

Region of Interest - Left Atrial Wall

Output - Detected Enhancement Overlaid on DE-MRI

Three Standard Deviation Threshold Detected Enhancement

Histogram of Pixel Intensity
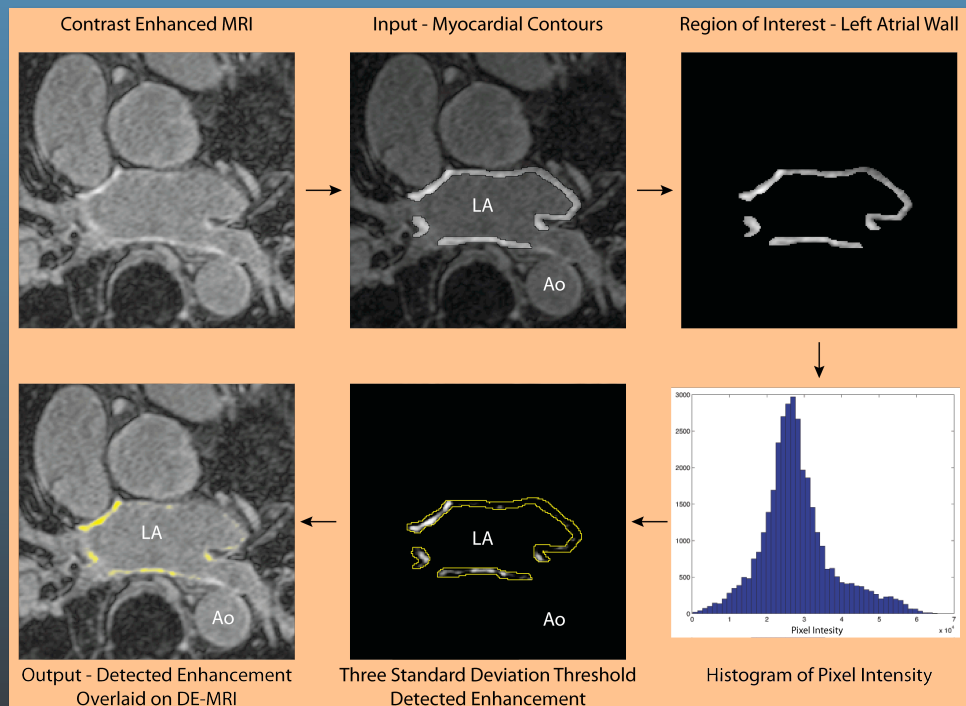
Diagnostic Analysis

Successful vs. Unsuccessful Ablation

Success

Failure

Enhanced (fibrosis?)

Low-voltage

Normal

MIP

Pseudo-color

Electroanatomical Map
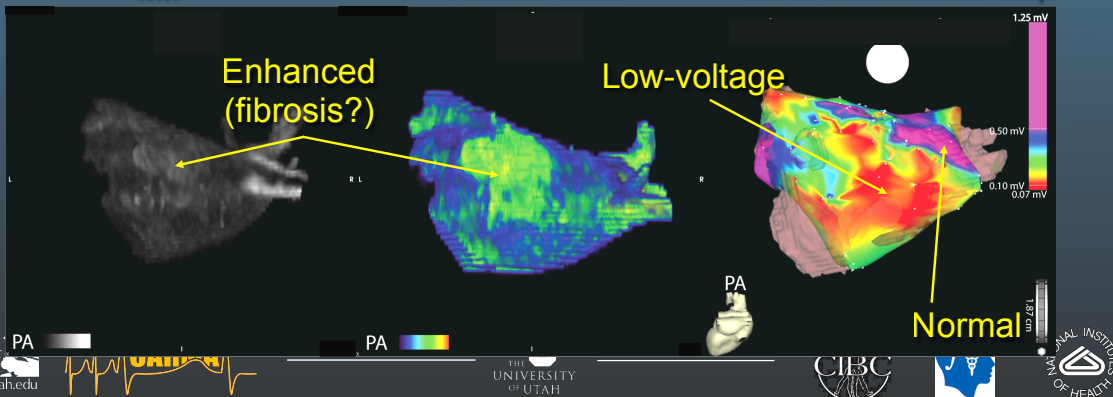
The University of Utah
Comprehensive Arrhythmia
Research & Management Center

Utah I
—— 0-5% Enhancement ——

Utah II
—— >5-20% Enhancement ——

Utah III
—— >20-35% Enhancement ——

Utah IV
—— >35% Enhancement ——
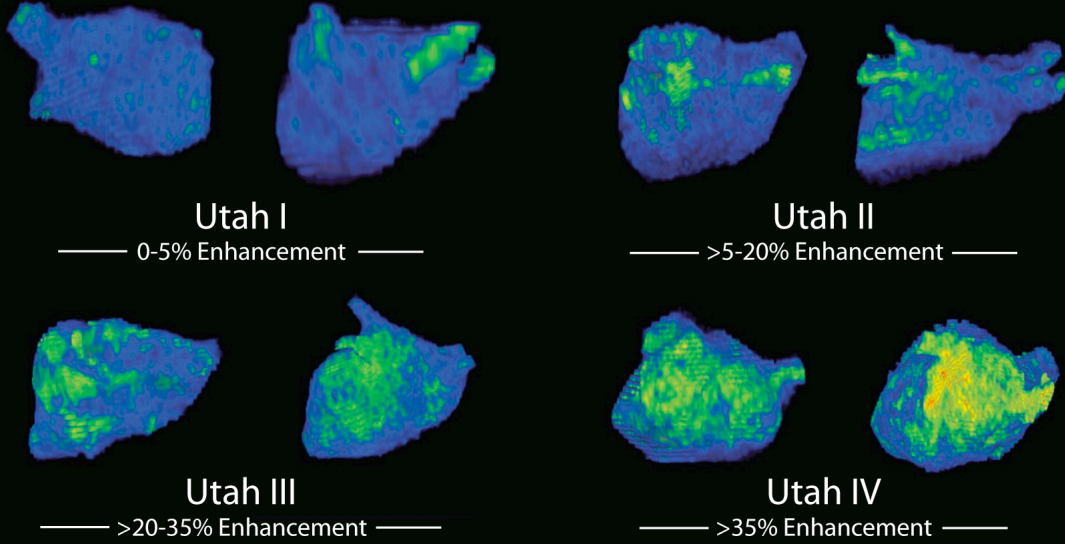
Post Ablation Analysis

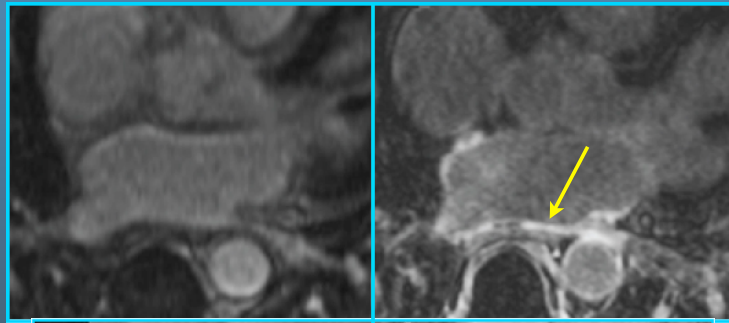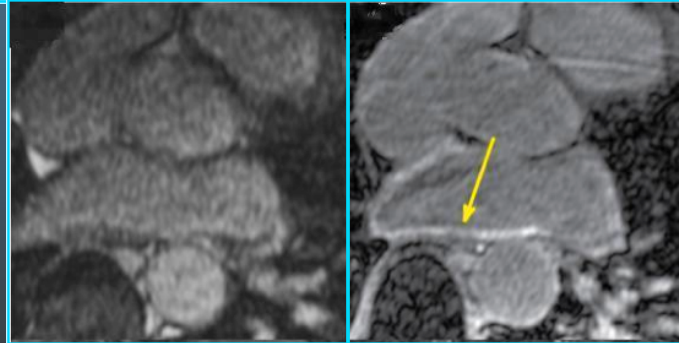# Scar Mapping

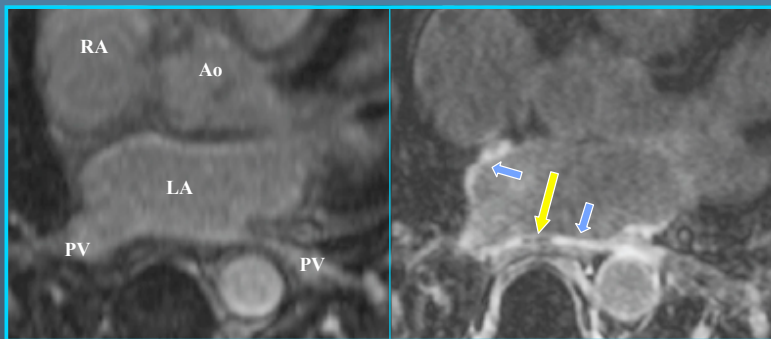Pre   Post

Patient #1

Patient #2

Quantifying Scar

RA
Ao
LA
PV   PV

PRE   POST (3 mo)

Pre-procedural MRI Scan

Follow-Up: <24 h

Follow-Up: 3 Months

Post Treatment Evaluation

Patient 1 — Incomplete Isolation — First PVAI - Posterior — Left — Complete Isolation — Second PVAI - Posterior — Left

Patient 2 — Incomplete Isolation — First PVAI - Posterior — Left — Complete Isolation — Second PVAI - Posterior — Left
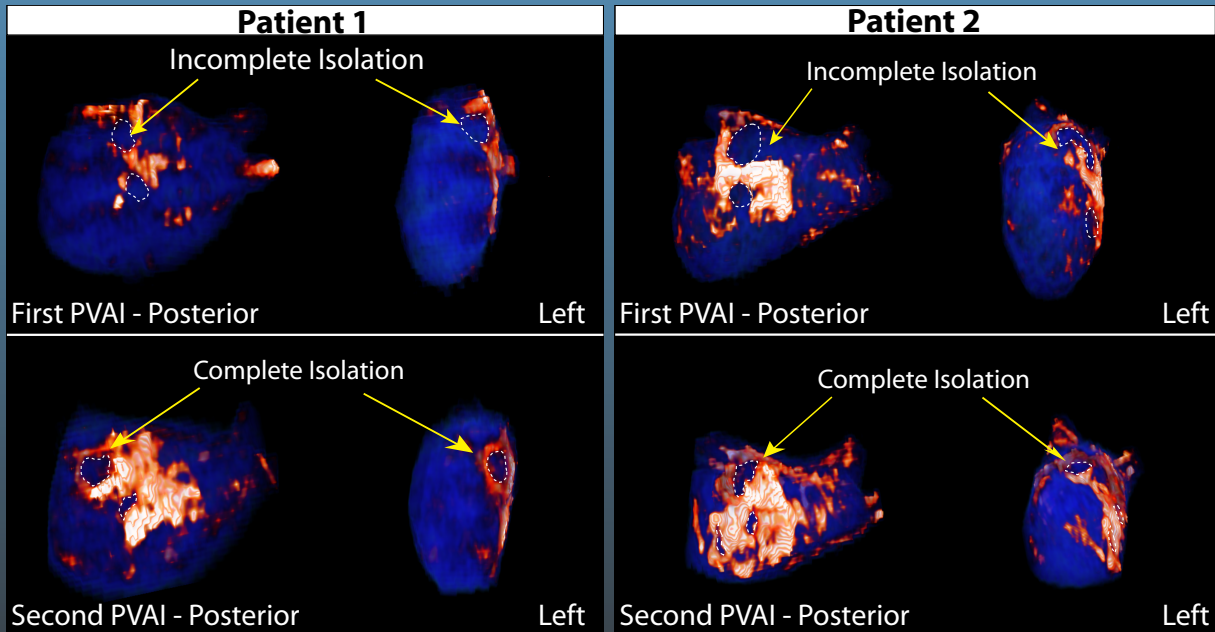
McGann et al. JACC,52(15): 1263-1272, 2008

The NA-MIC Goals

Aim 1. Develop and validate image-based longitudinal diagnostic indices for AF.

Aim 2. Develop automatic segmentation methods for the atrium and adjacent structures.
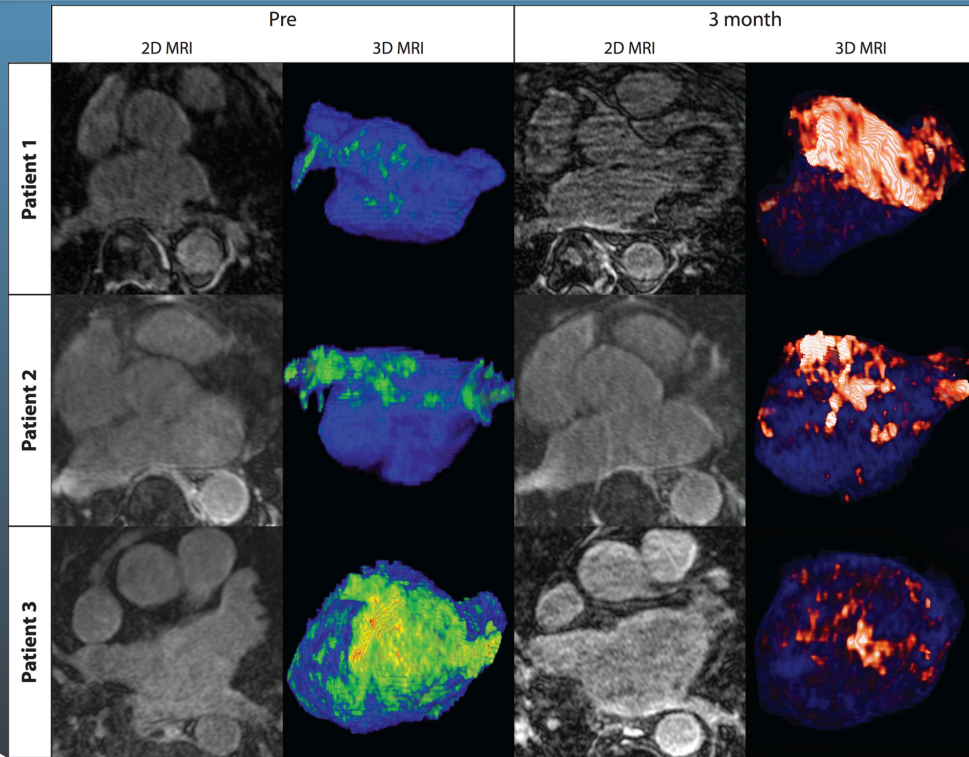
Aim 3. Develop an AF scoring scheme

The Data

The Shapes

NA-MIC Timetable
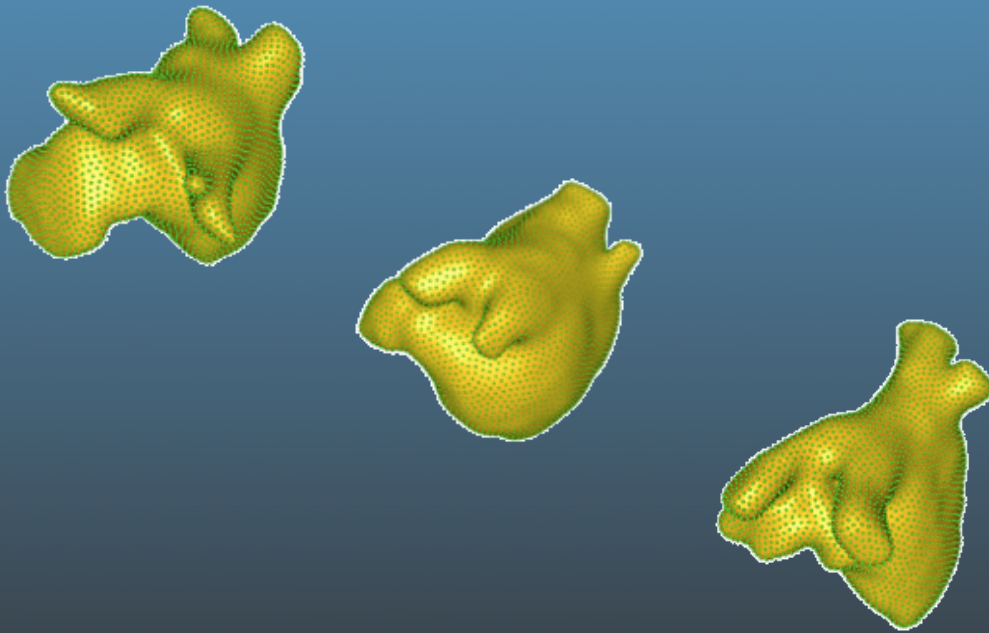
	Year 1	Year 2	Year 3
Aim 1	Evaluate existing algorithms	Integrate linear and nonlinear registration into prototype workflow	Optimize tools, tests, and validation, documentation
Aim 2	Evaluate existing and implement new tools for atrial wall segmentation and for tissue characterization	Joint segmentation of pre- and post-treatment data;efficient implementations through software and hardware acceleration	Refine segmentation tools, tests and validation, integrate post-treatment image segmentation into clinical workflow, documentation
Aim 3	Design of segmentation and registration workflow and application-specific GUI	Prototype workflow system for integrated registration and segmentation, pre-/post-analysis and visualization. Tests on existing database.	Tests on image data shared with other labs, establish database also with nonimage information for prototypical scoring system, training, and dissemination.

More Information

www.carmacenter.org

**www.na-mic.org/pages/
DBP:Atrial_Fibrillation**

Enjoy Utah!!