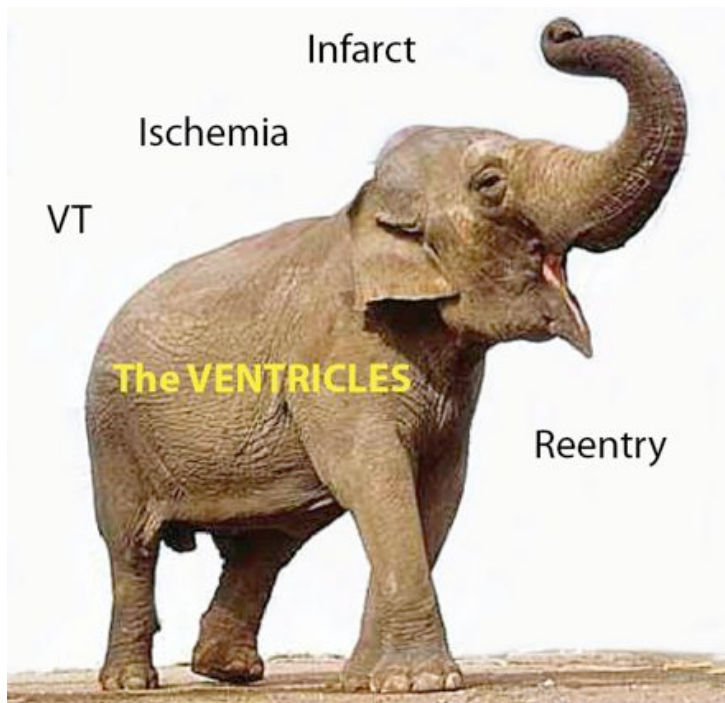
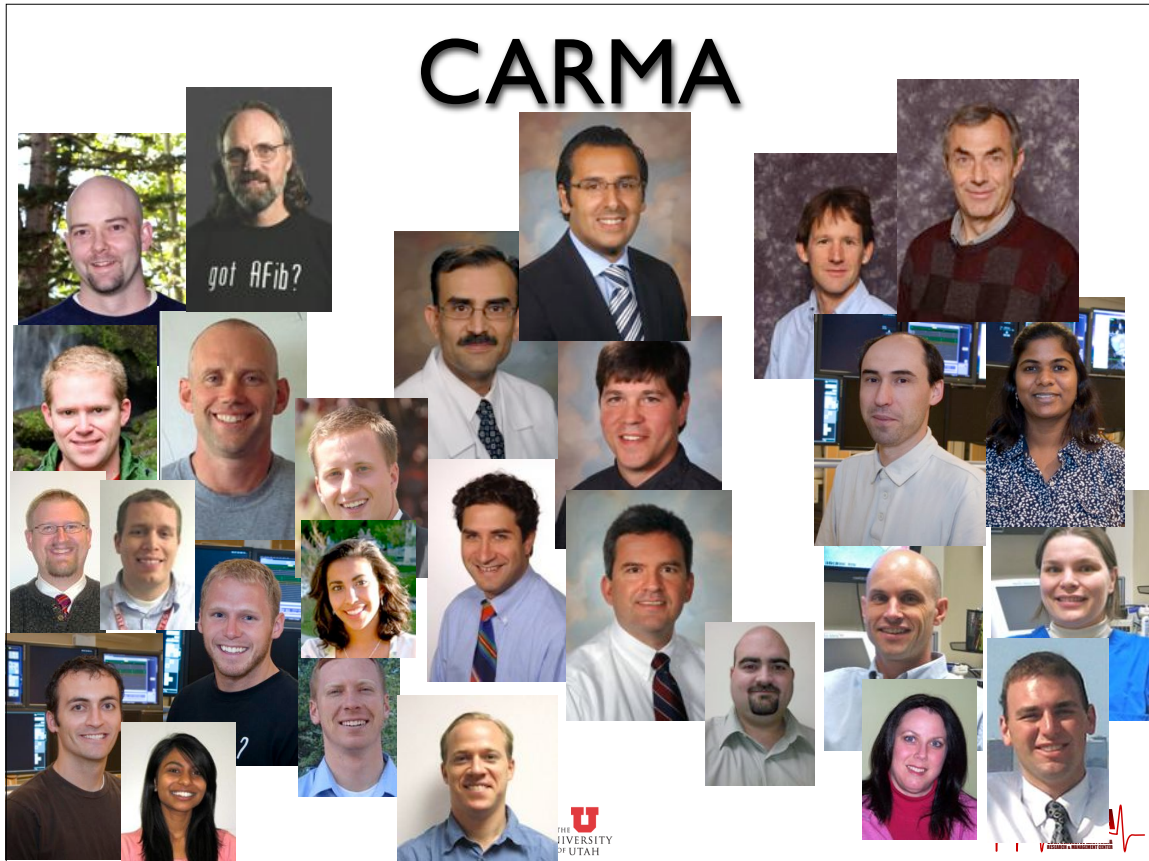
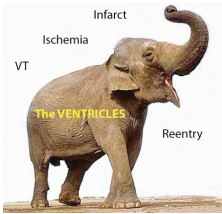


# Imaging Based Analysis of Patients with Atrial Fibrillation

Rob MacLeod, University of Utah  
CARMA Center, SCI Institute, CVRTI  
Bioengineering Department

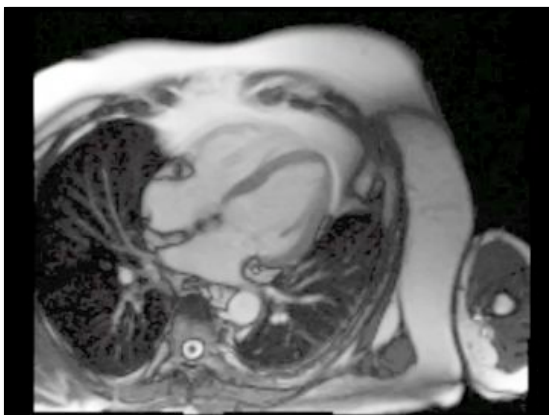




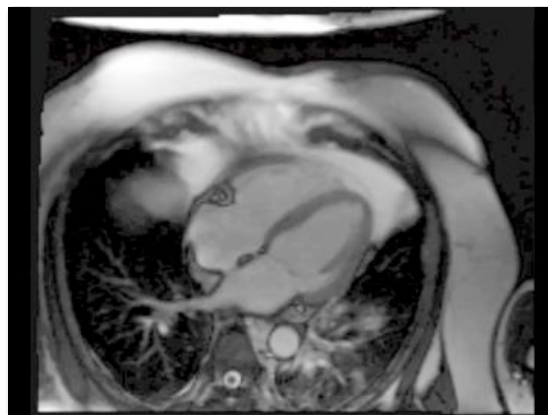
# What is Atrial Fibrillation? = Afib = AF



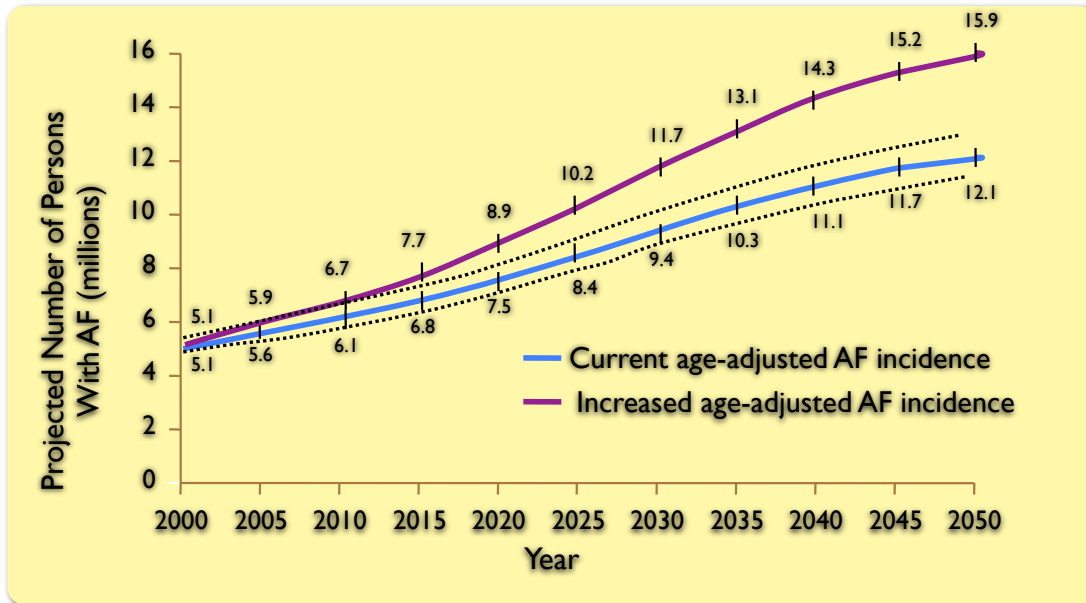
Normal Contraction



Atrial Fibrillation



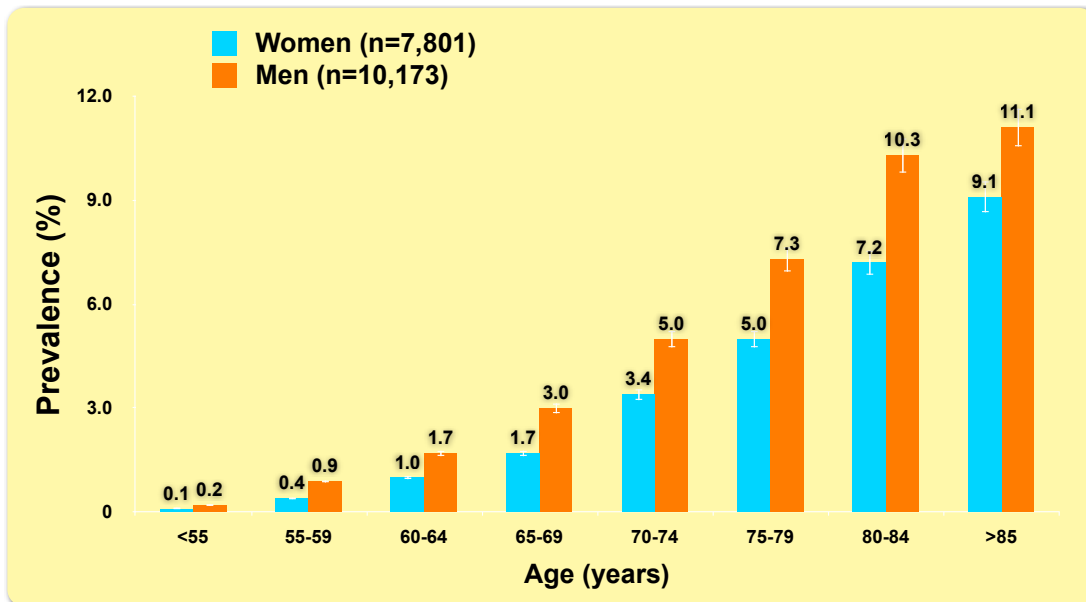
# AF Prevalence



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



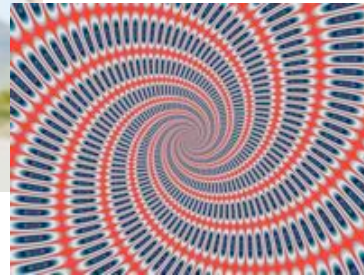
# We All Get Older



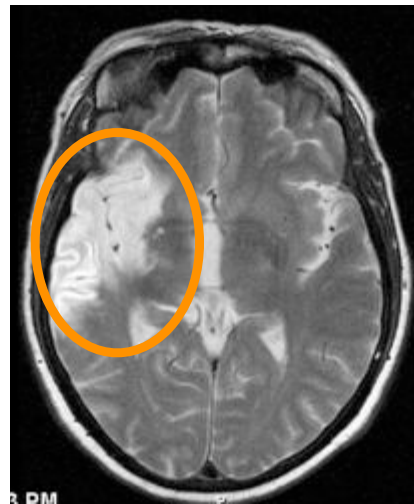
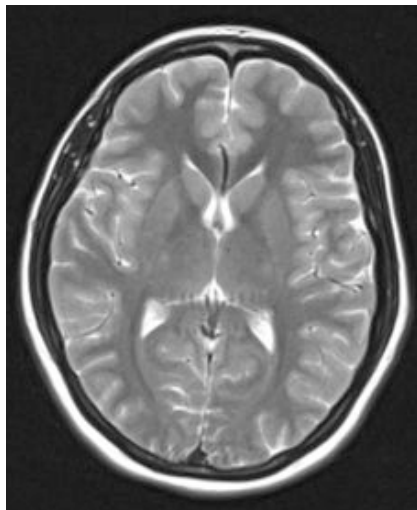
Go AS, et al. *JAMA*. 2001;285:2370-2375.



# So What?



# 20% of Strokes



**\$20 billion/year**





# What Causes AFib?



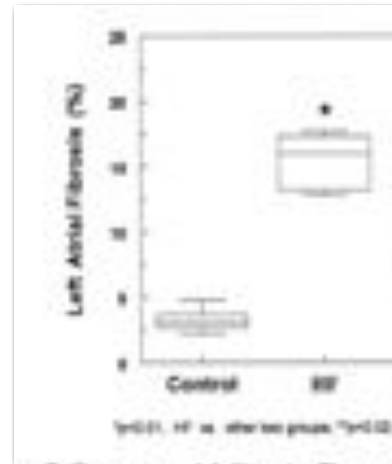
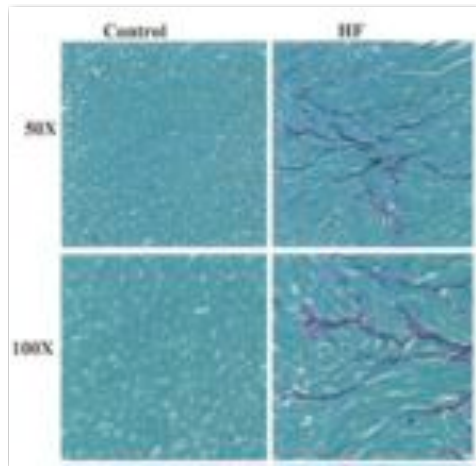
**Substrate**

+

**Trigger**



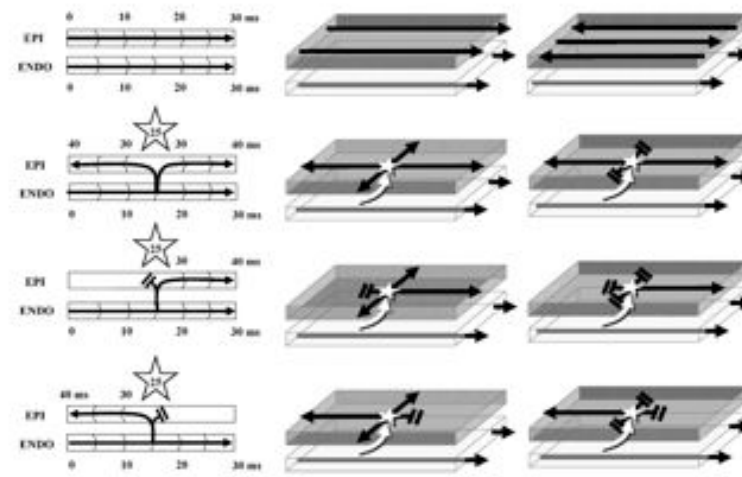
# Substrate:Fibrosis



Lee KW, et al. Circ. 2006; 1703-1712.



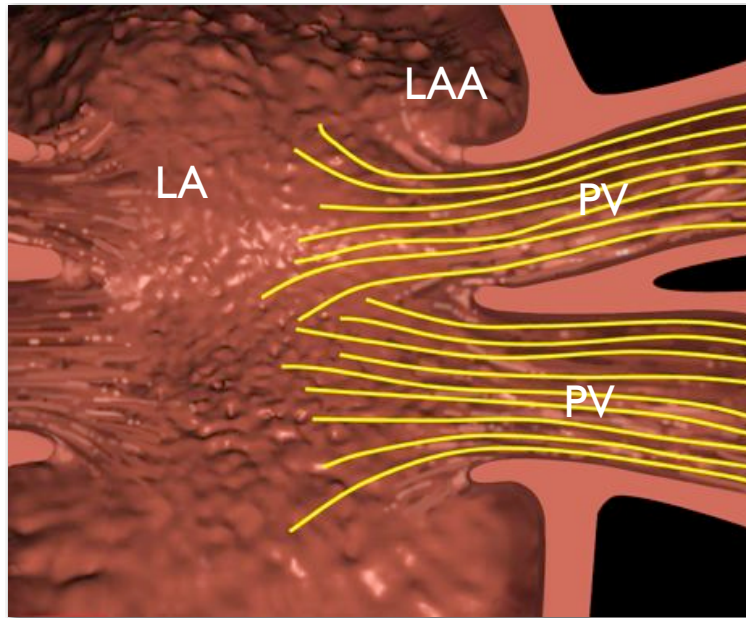
# Complex Propagation



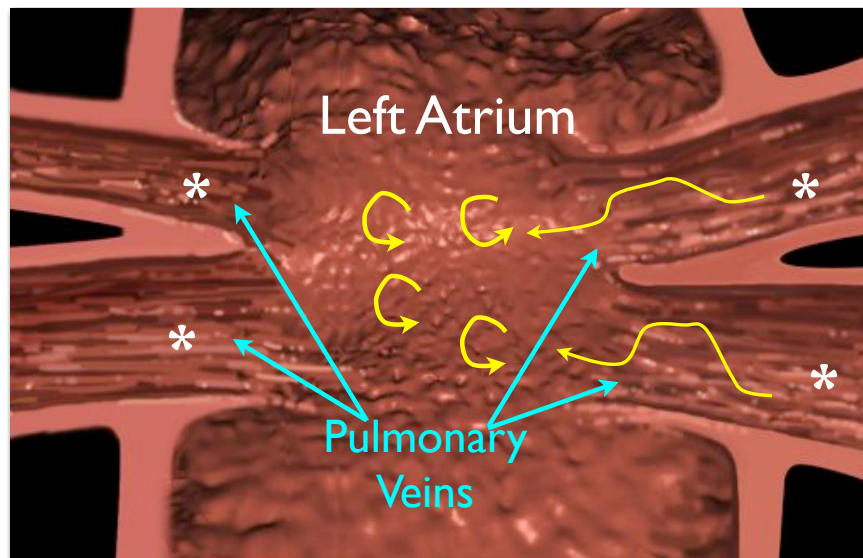
de Groot, .... Allesie MA. Circ. 2010; 1674-1682.



# Substrate: Extension of muscle sleeves

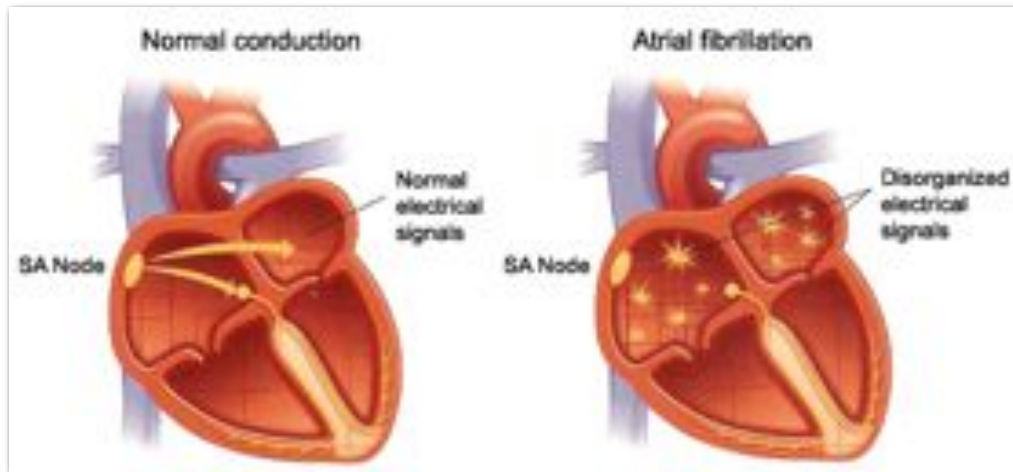


# Triggers

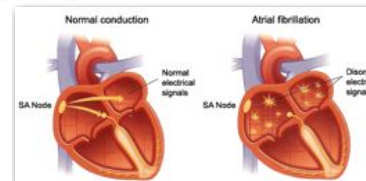




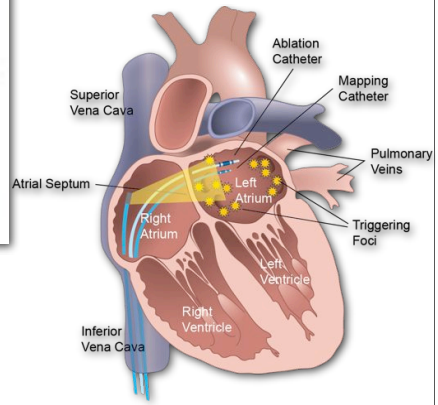
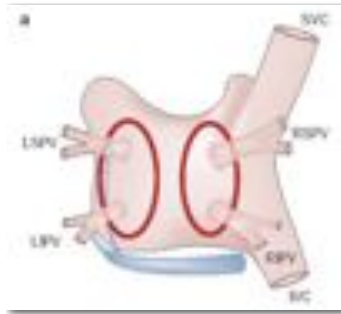
# Clinical Result



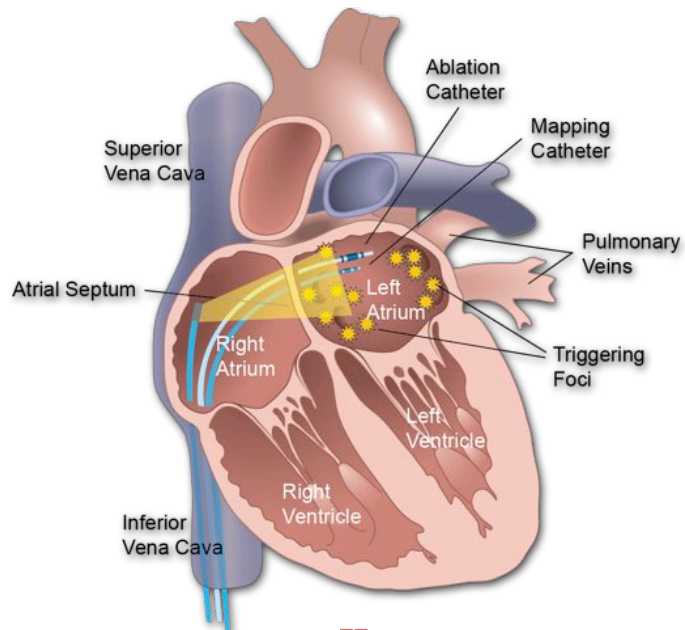
# Clinical Result



# Treatment?



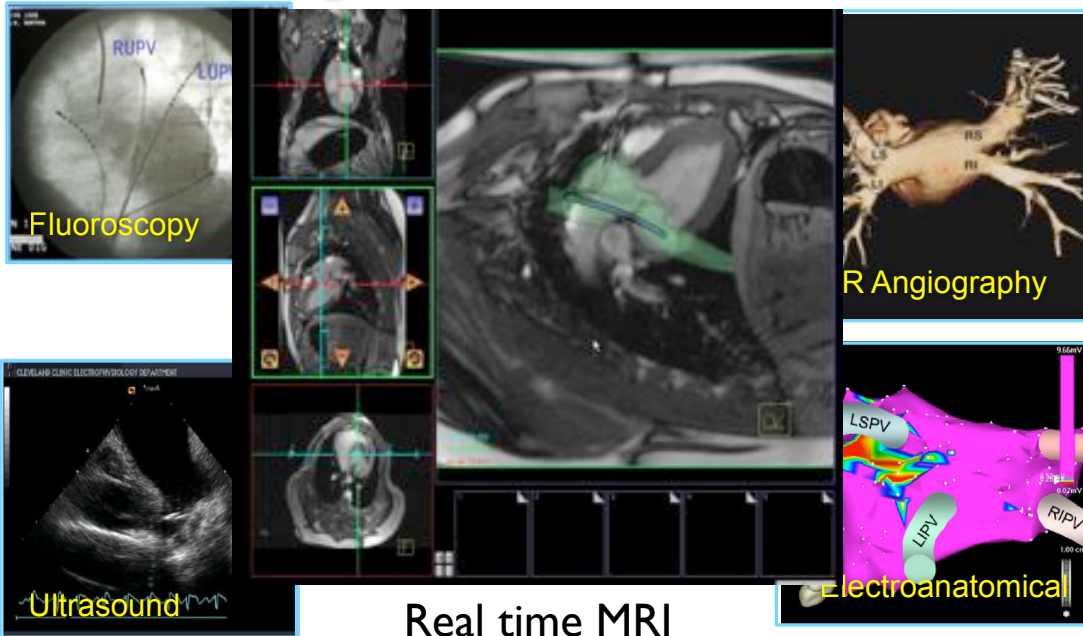
# Catheter Ablation



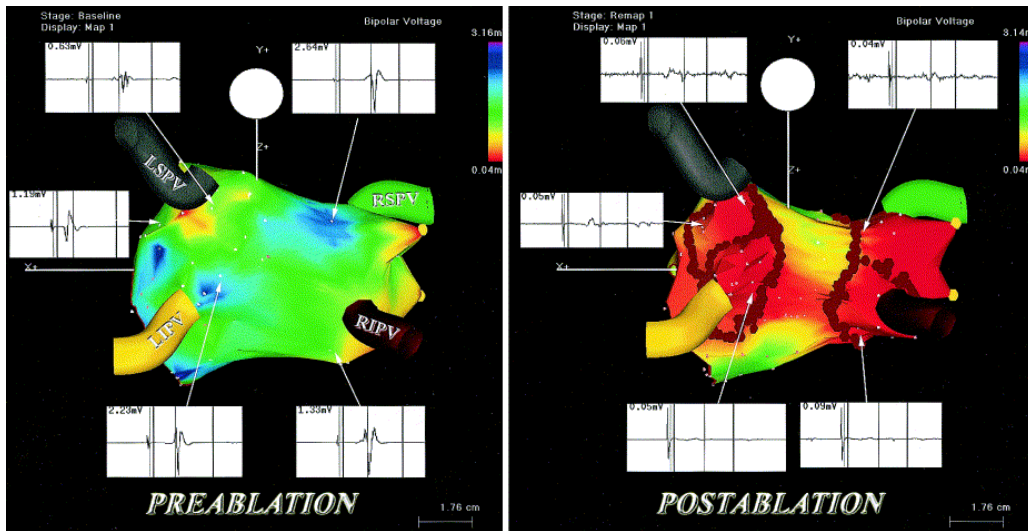
# Imaging in AF



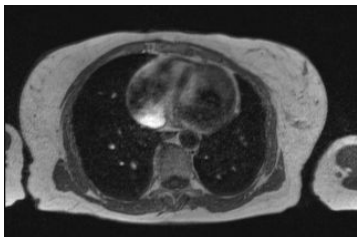
## Imaging Modalities in AF



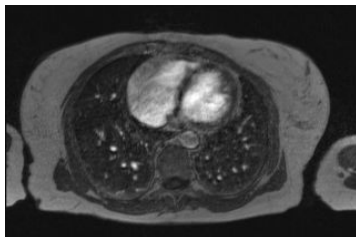
# Electroanatomical Mapping



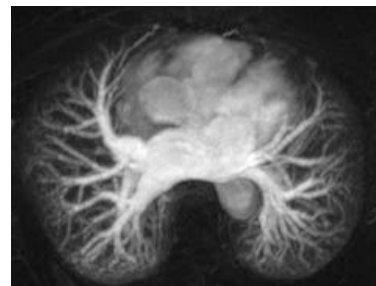
# MR Angiography



Pre



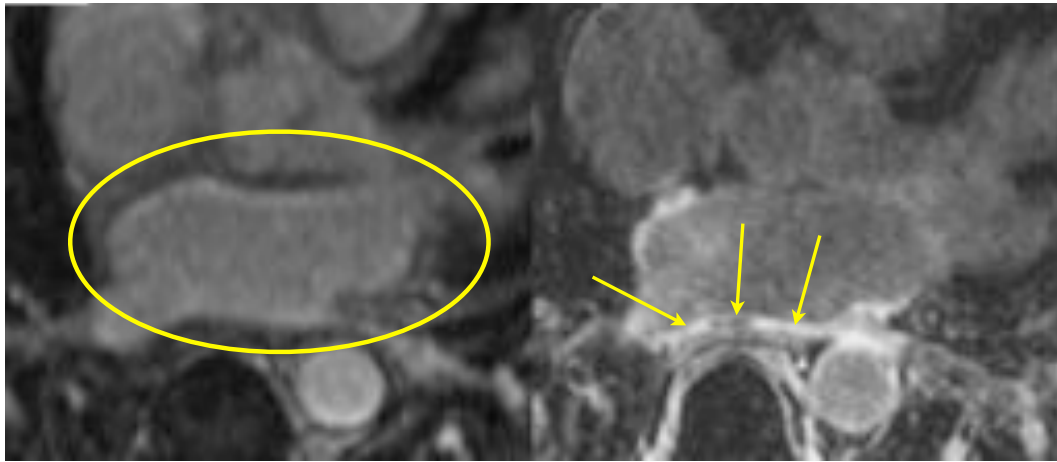
First Pass



Subtraction



# Late Gadolinium Enhancement

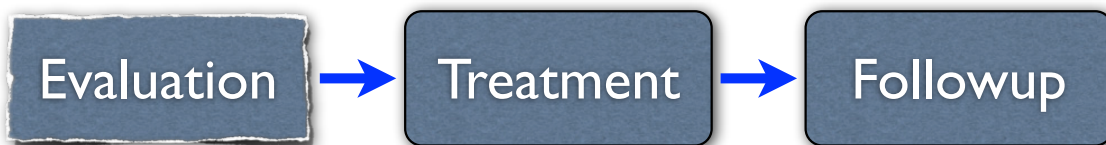


Pre-treatment

3 month Post



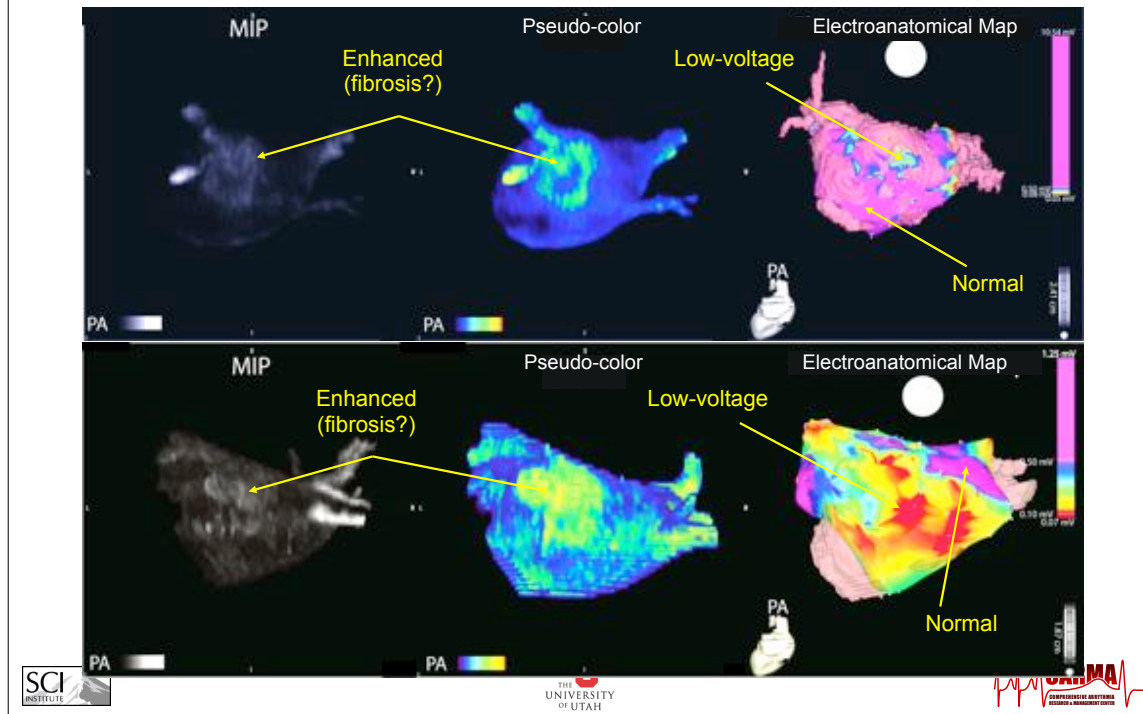
# Patient Workflow





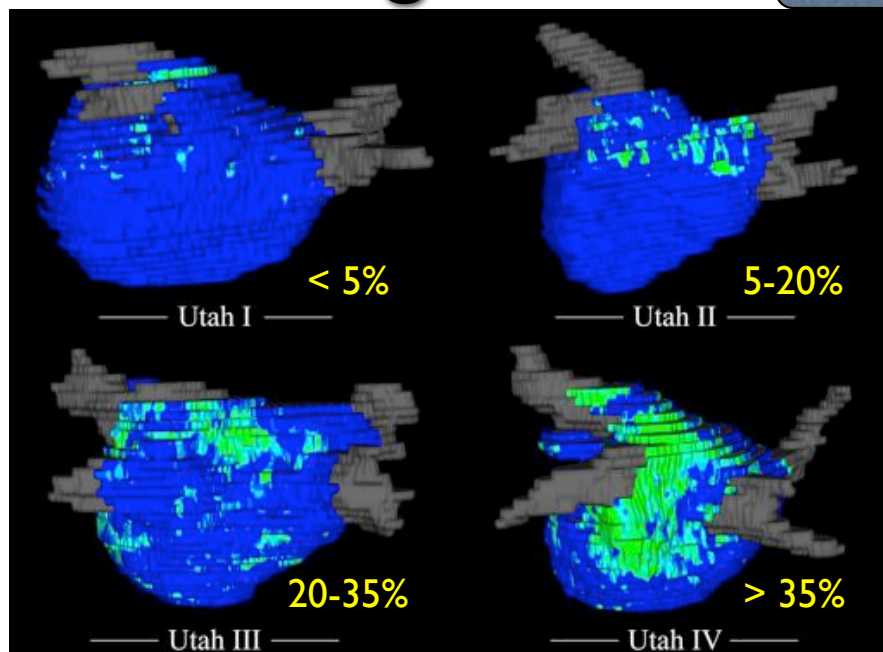
# Fibrosis and Outcome

Evaluation



# Utah Scoring Scheme

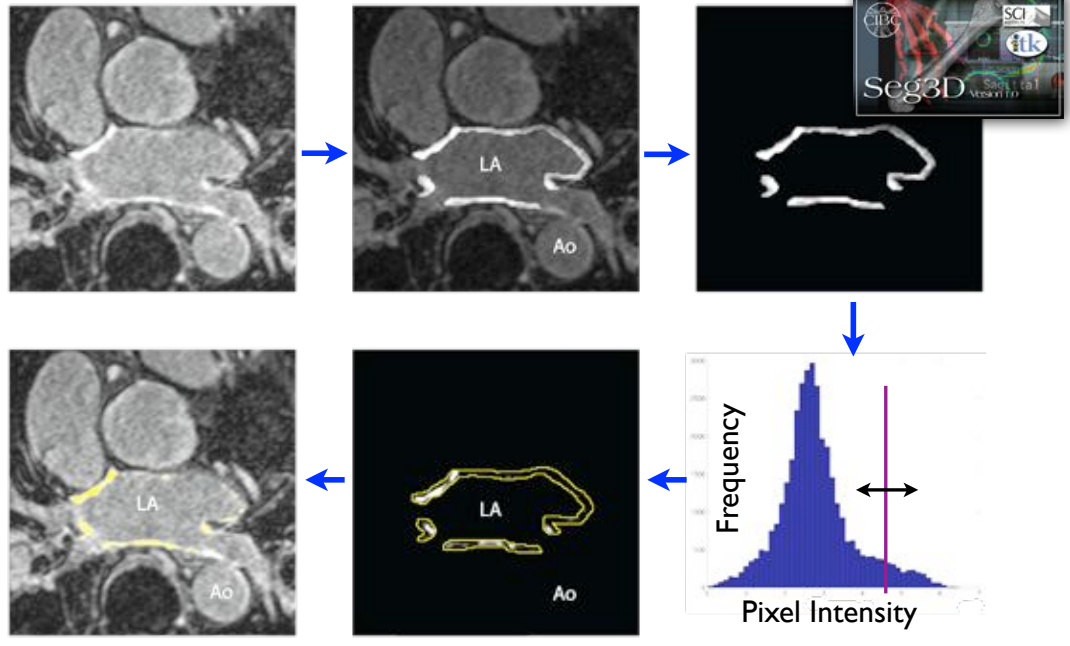
Evaluation



Akoum et al. J Cardiovasc Electrophysiol, 22:16-22, 2011

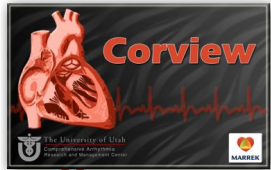
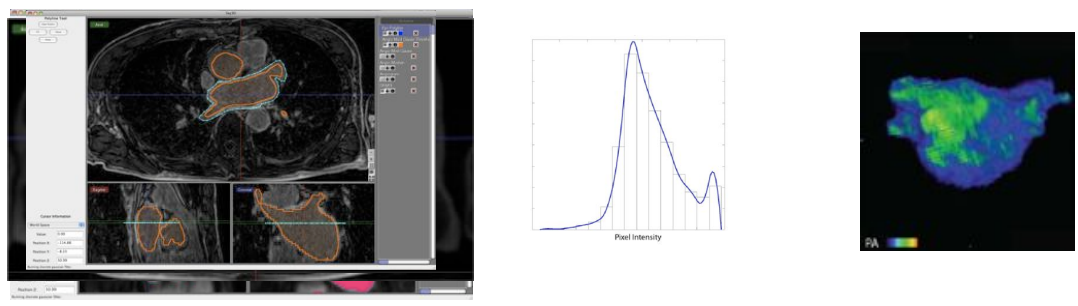
# Fibrosis Image Analysis

Evaluation



# Past Workflow

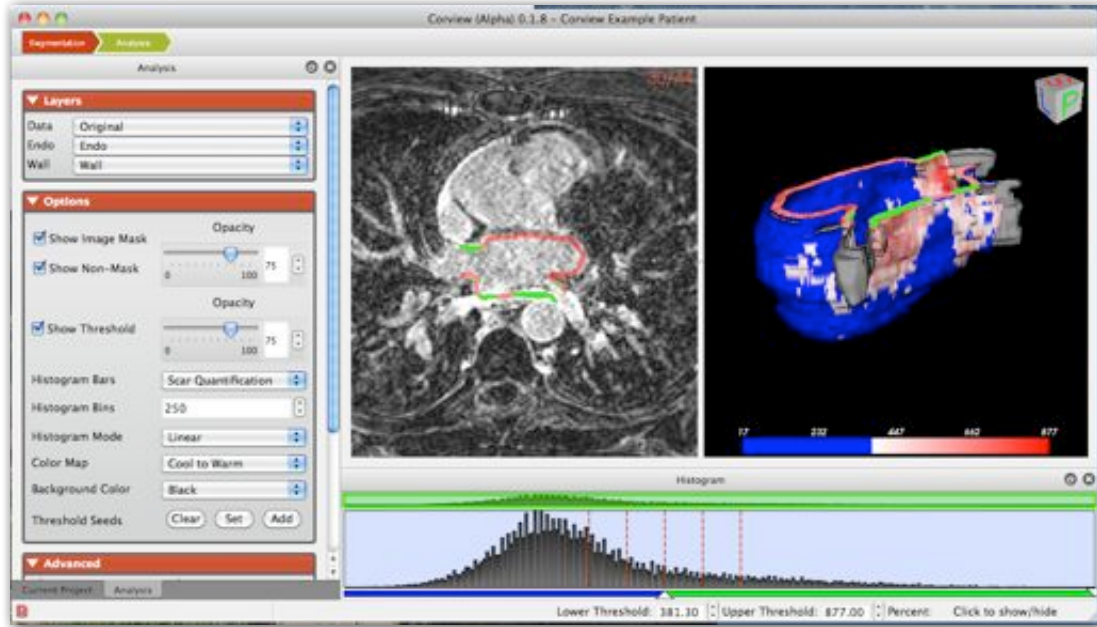
Evaluation





# Corview

Evaluation

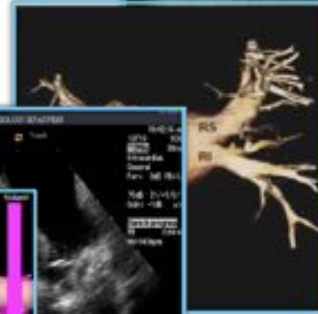
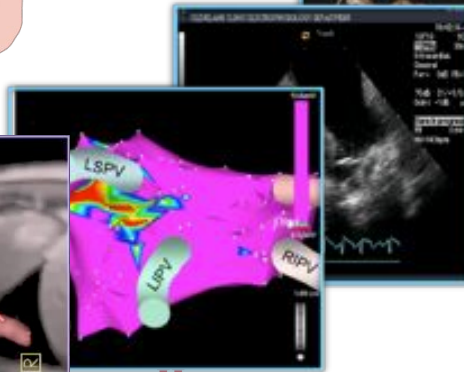
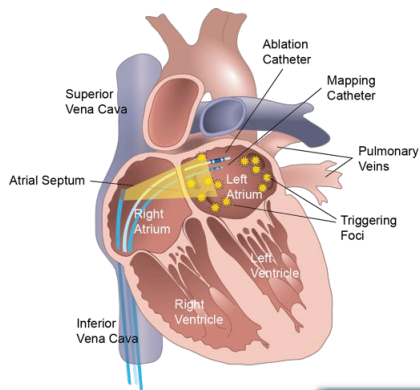


## Patient Workflow



# Ablation Guidance

Treatment



# MRI Guided Ablation





# Real Time MRI

Treatment



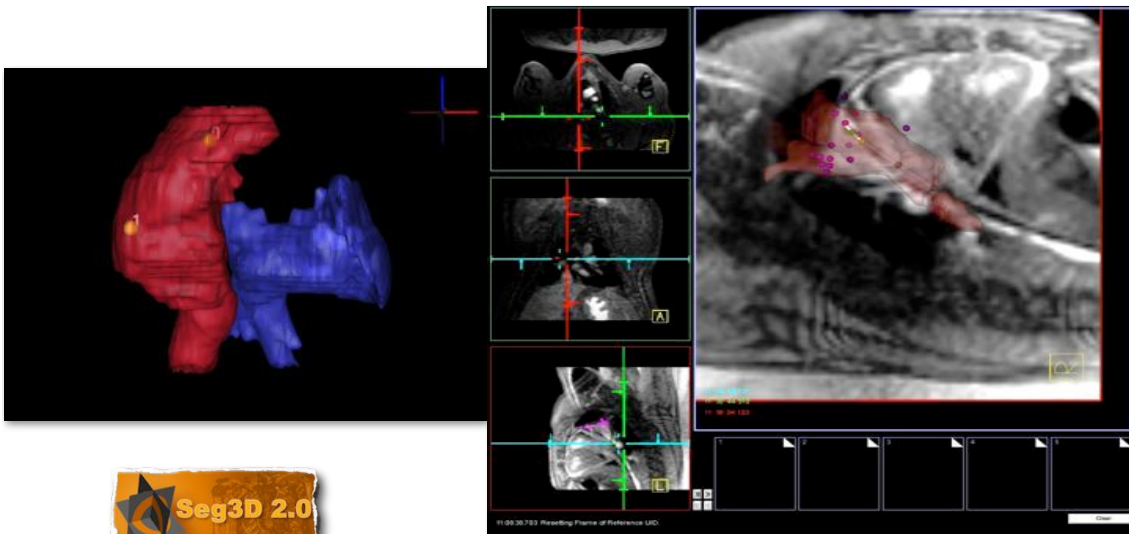
THE UNIVERSITY OF UTAH

March, 2011



# Segmentation for Guidance

Treatment



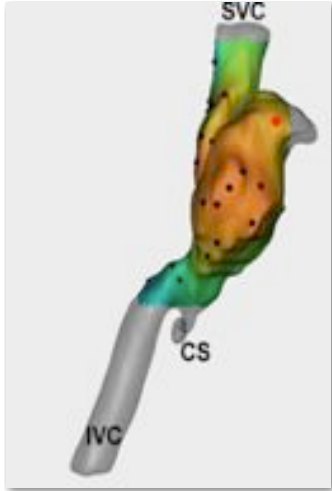
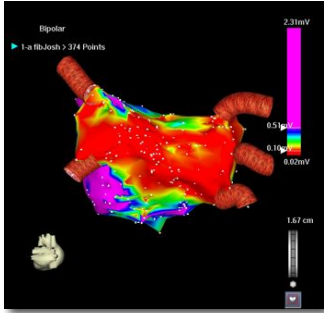
THE UNIVERSITY OF UTAH



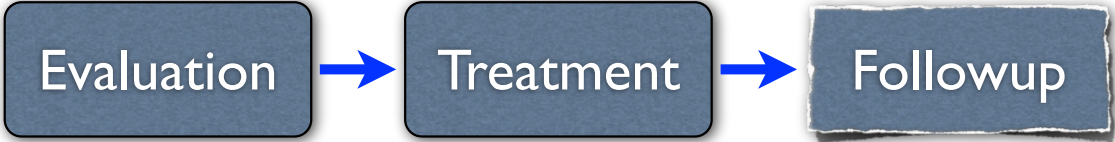


# Electroanatomical Mapping

Treatment

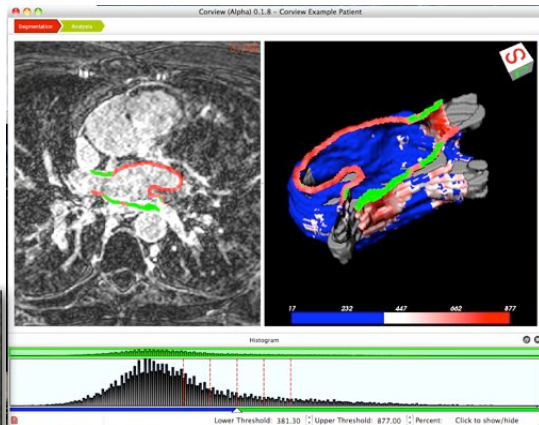
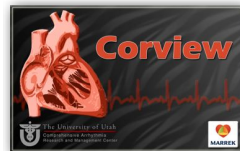
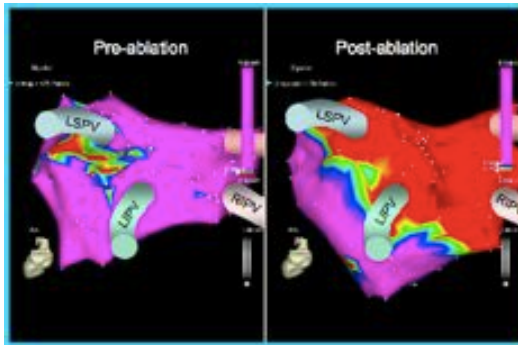


# Patient Workflow



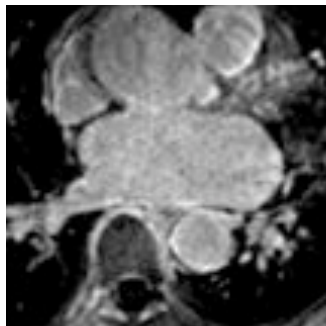
# EAM vs. MRI

Followup



# Tracking Ablation

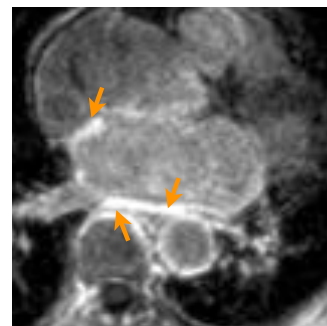
Followup



LGE (pre)



LGE (<1 hr)

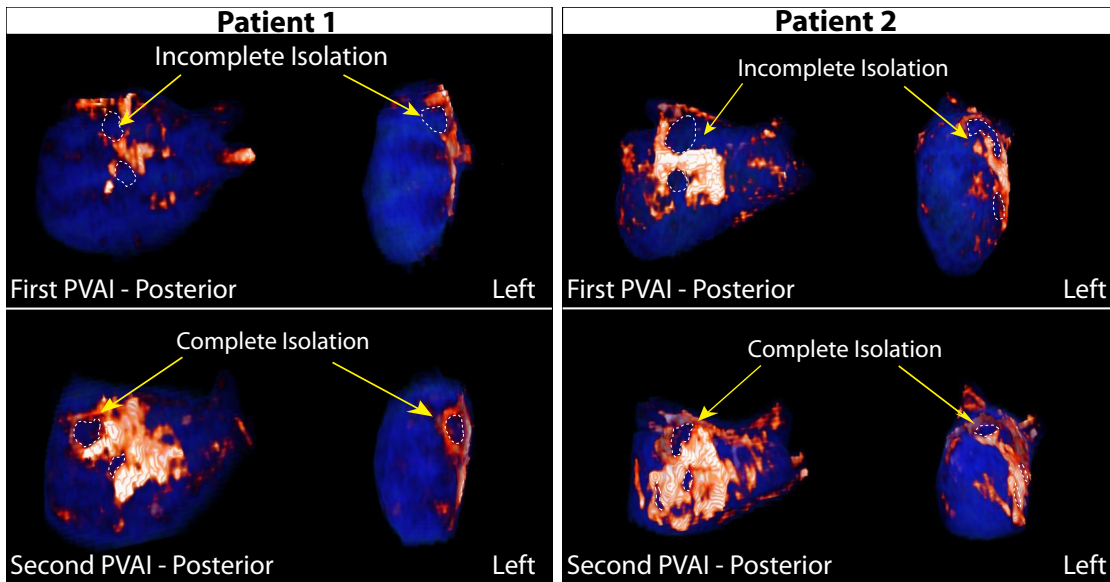


LGE (3 mo)



# Repeat Ablation

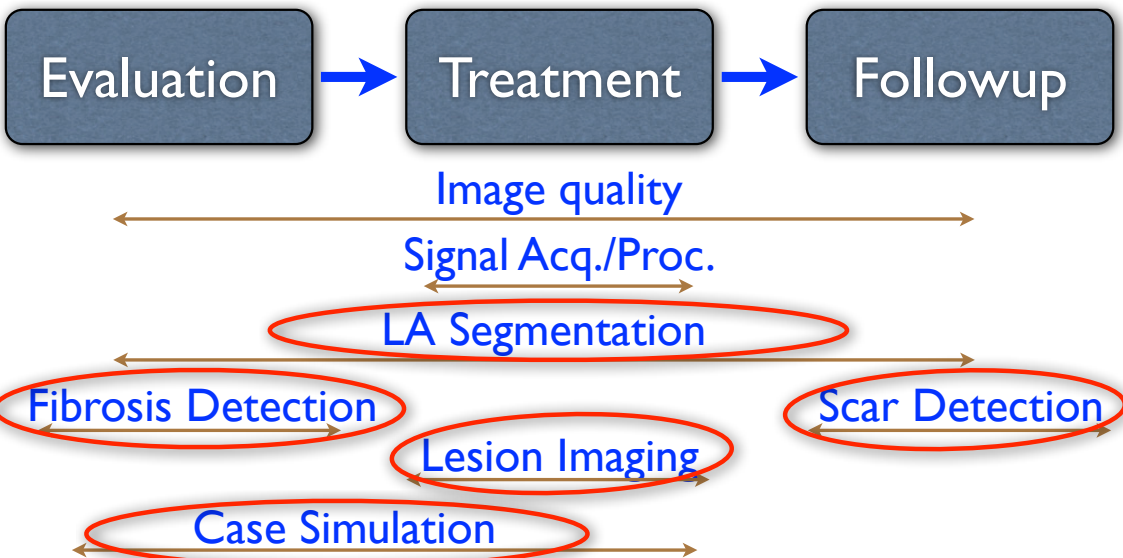
Followup



McGann et al. JACC,52(15): 1263-1272, 2008



# Open Challenges



# Clinical Impact

