

Atrial Fibrillation From Primary to Tertiary



Modifiers of Atrial Fibrillation

- Hypertension
- Diabetes
- Alcohol
- Exercise
- Sleep Apnea
- Obesity

AF Classification

Paroxysmal AF: AF that terminates spontaneously or with intervention within 7 days of onset
-episodes may recur with variable frequency

Persistent AF: Continuous AF that is sustained >7 days

Long-standing persistent AF: Continuous AF >12 months in duration

Permanent AF: The patient and clinician make a joint decision to stop further attempts to restore and/or maintain sinus rhythm

Hypertension

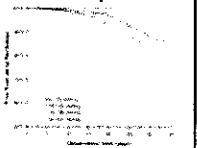
Well established independent risk factor for AF

Risk increases in cases of uncontrolled HTN

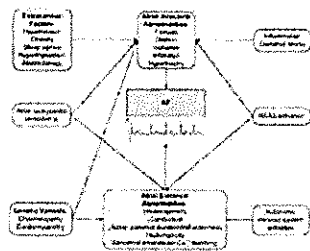
-particularly in patients with EF < 40%

- Blood pressures that are near the upper limit of normal predict risk for AF in healthy middle-aged men.....

...and women



Atrial Fibrillation - Pathophysiology



Diabetes

-Promotes diffuse atrial interstitial fibrosis and conduction slowing

Independent risk factor in development of AF

-No evidence diabetes predicts recurrence in AF

Obesity

LEGACY trial: obese with AF who underwent weight loss had improvement in arrhythmia free survival
 -355 patients with BMI \geq 27
 -best results is seen in those that lost >10%



J Am Coll Cardiol 2015 May 19;55(20):2152-62

Natural History of Atrial Fibrillation

"AF begets AF"

Increasing burden of AF leads to increased atrial remodeling and fibrosis contributing to the long term persistence of AF

Heritability of AF

Significance of AF

-Associated with:

- 5- fold increased risk of stroke
- 3-fold risk of heart failure
- 2-fold increased risk of dementia
- 2-fold increase risk of mortality

Keywords

Original Investigation Association of Atrial Tissue Fibrosis Identified by Delayed Enhancement MRI and Atrial Fibrillation Catheter Ablation The DECAAF Study

James T. Manolis MD, David W. Kim MD, Cornelia Zerkow MD, MS, Prasad Jayaram MD, Nathan Abrams MD, James M. Haines MD, Eugene H. Hahn MD, PhD, Nathaniel Scharf MD, Andrew P. Chen MD, Scott D. Stewart MD, Thomas G. Broun MD, Michael J. Reardon MD, Michael M. Marmorek MD, Elizabeth M. Mittleman MD, Benjamin J. Stiles MD, J. Michael DeGuzman MD, E. M. Whellan MD, Yulia P. Panchenko MD, Andrew B. Finkelstein MD

Multi-centered, prospective observational cohort study
 15 sites, US, Europe, Australia

Aim: to evaluate LA fibrosis by DE-MRI and its association with subsequent AF ablation outcome

250 patients had DE-MRI prior to AF ablation
 -90 day post procedural blanking period
 -follow up one year via ECG and ambulatory monitoring

Circulation 2008 Apr 7;118(15):1756-67

Significance of AF

-AF patients are hospitalized twice as often as patients without AF
 -AF patients are 3 times more likely to have multiple admissions

Cost:

- Treating patients with AF adds \$26 billion to the U.S. healthcare bill annually
- increase annual health care cost of \$8700 per patient
- AF affects between 2.7 million and 6.1 million American adults
- expected to double over the next 25 years

	No. of AF Patients in Study	Paroxysmal	Persistent
		(n=49)	(n=49)
Age	67.8 ± 10.5	67.8 ± 10.5	67.8 ± 10.5
Sex	31 (58%)	15 (31%)	16 (33%)
Female	36 (62%)	14 (29%)	22 (45%)
AF type			
Paroxysmal	168 (84%)	168 (84%)	0 (0%)
Persistent	32 (16%)	0 (0%)	32 (16%)
Unknown	1 (0.5%)	0 (0%)	1 (0.5%)
Atrial fibrillation burden			
1	40 (20%)	40 (20%)	0 (0%)
2	102 (51%)	102 (51%)	0 (0%)
3	80 (40%)	80 (40%)	0 (0%)
4	28 (14%)	28 (14%)	0 (0%)
5	20 (10%)	20 (10%)	0 (0%)
6	2 (1%)	2 (1%)	0 (0%)
7	1 (0.5%)	1 (0.5%)	0 (0%)
8	1 (0.5%)	1 (0.5%)	0 (0%)
9	1 (0.5%)	1 (0.5%)	0 (0%)
10	1 (0.5%)	1 (0.5%)	0 (0%)
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45	1 (0.5%)	1 (0.5%)	0 (0%)
46	1 (0.5%)	1 (0.5%)	0 (0%)
47	1 (0.5%)	1 (0.5%)	0 (0%)
48	1 (0.5%)	1 (0.5%)	0 (0%)
49	1 (0.5%)	1 (0.5%)	0 (0%)
50	1 (0.5%)	1 (0.5%)	0 (0%)

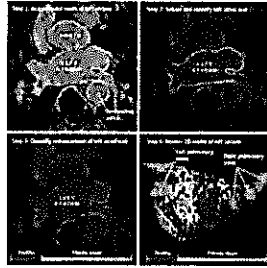
64.6% paroxysmal
 28.8% persistent

Fibrosis

- stage 1: < 10%
- stage 2: >10 < 20%
- stage 3: >20 < 30%
- stage 4: >30%

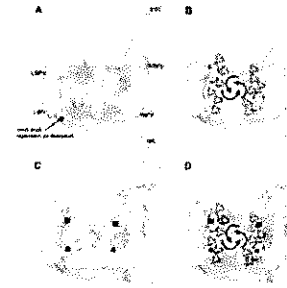
Circulation 2009 Apr 7;119(15):1756-67

LA Fibrosis Image Quantification

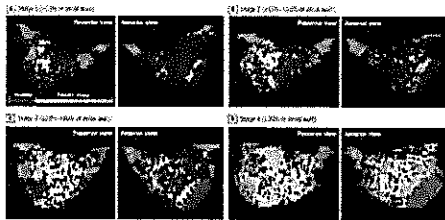


Circulation. 2009 Apr 7;119(15):1733-47

AF Mechanisms



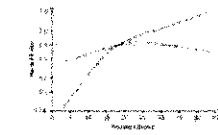
LA Fibrosis Stages



Circulation. 2009 Apr 7;119(15):1733-47

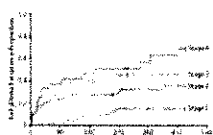
Atrial Fibrillation Tenants of Treatment

- 1) PREVENT STROKE
 - 1) Warfarin (Vit K inhibitor)
 - 2) Factor Xa and direct thrombin inhibitors (rivaroxaban, apixaban, dabigatran)
 - 3) Left atrial appendage occlusion devices (Watchman, Lariat)
- 2) Treat symptoms
 - 1) Rate Control (beta blockers, calcium channel blockers)
 - 2) Rhythm Control
 - 1) Class I and class III antiarrhythmics
 - 2) Catheter ablation



Adjusted for age, sex, hypertension, diabetes, heart failure, prior AF, stroke, and CHD. AF recurrence is significantly higher in patients with progressive LA fibrosis (P < .001). AF recurrence is significantly higher in patients with progressive LA fibrosis (P < .001).

AF recurrence with progressive % Fibrosis with covariate analysis



Incidence of arrhythmia recurrence during follow up - recurrence defined as AF, atrial flutter, or any episode of tachycardia lasting at least 30 seconds after 90 day blanking period

Circulation. 2009 Apr 7;119(15):1733-47

Atrial Fibrillation Treatment Guidelines

Indications for catheter ablation of atrial fibrillation

Symptomatic AF with documented AF on ECG or Holter or implantable loop recorder (ILR) and any of the following:

- 1) Persistent AF after at least 1 year of medical therapy
- 2) Symptomatic AF with documented AF on ECG or ILR and any of the following:
 - a) Persistent AF after at least 1 year of medical therapy
 - b) Long-standing persistent AF after at least 1 year of medical therapy

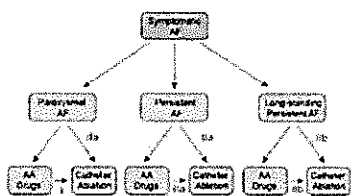
Class I: Catheter ablation is recommended. Class IIa: Catheter ablation may be considered. Class IIb: Catheter ablation may be considered.

Class	Level of Evidence
I	A
IIa	B-NF
IIb	1, 1D
III	B-A
III	C-AS
III	C-LO

J Am Coll Cardiol 2014;64(21):e1-e76

Pulmonary Vein Isolation Ablation

Indications for Catheter Ablation of Symptomatic Atrial Fibrillation



J Am Coll Cardiol 2014;64:1413-476

Pre and Post Cryo PVI Ablation



Pulmonary Vein Isolation Ablation

SPONTANEOUS TERMINATION OF ATRIAL FIBRILLATION BY A FOCAL BURST OF ELECTRICAL ACTIVITY IN THE PULMONARY VEINS

M. Haissaguerre, M.D., Pierre Jais, M.D., Denis Clancy, M.D., Richard Scavo, M.D., Alain Picot, M.D., Michel Hocini, M.D., Sylvain Chevroux, M.D., Jacques Le Breton, M.D., François Le Breton, M.D., and Pierre-Jean Camelier, M.D.

Publication from group in Bordeaux, France 1998

Described successful ablation of focal triggers of atrial fibrillation localized to the pulmonary veins

Became the cornerstone of atrial fibrillation ablation

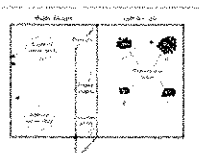


Figure 1. Location of the focal burst of electrical activity in the pulmonary veins. The focal burst of electrical activity is located in the pulmonary veins. The focal burst of electrical activity is located in the pulmonary veins.

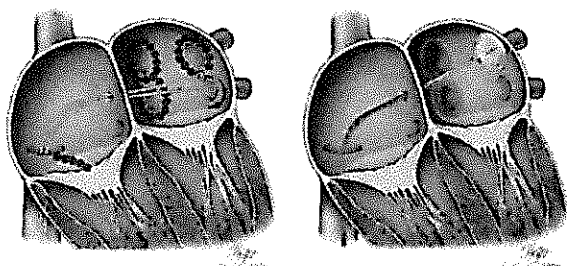
N Engl J Med 1998 Sep 3;339:1051-54

Pulmonary Vein Isolation Ablation

Radiofrequency - "burning"
Cryotherapy - "freezing"



Pulmonary Vein Isolation Ablation



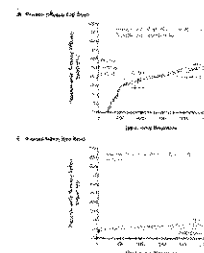
Heart Rhythm 2007 Oct 5;5(10):1475-84

Radiofrequency vs. Cryotherapy

Cryoballoon or Radiofrequency Ablation for Paroxysmal Atrial Fibrillation

Comparison of cryoballoon and radiofrequency ablation for paroxysmal atrial fibrillation

- Multicenter randomized trial to determine noninferiority of cryotherapy to radiofrequency in PAF PVI ablation
- Noninferiority in efficacy and safety



N Engl J Med 2016;374:2231-41

Pulmonary Vein Isolation Ablation

Patients that are not good ablation candidates:

1. Long standing persistent atrial fibrillation
2. Previous failed ablation attempts
3. Severe mitral regurgitation
4. Severe left atrial enlargement
5. Morbidly obese (BMI > 40)
6. Elderly (age > 80)
7. Alcohol abuse/Excessive alcohol use

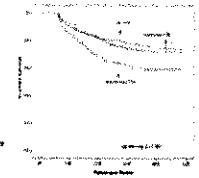
Hypertension

Following AF ablation, hypertension has been shown to be an independent risk factor for AF recurrence

- 531 consecutive patients undergoing their first AF catheter ablation
- prospective study

3 groups:

- Uncontrolled hypertension despite medical treatment
- Patients with controlled hypertension via medical therapy
- Patients without hypertension



Post-ablation

Typically a post procedure 3 month healing phase is observed
Over the course of the 3 months, it is not uncommon for episodes of atrial fibrillation to recur

- change anti-arrhythmic drug
- cardioversion
- 2nd ablation

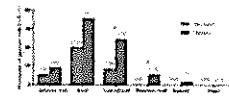
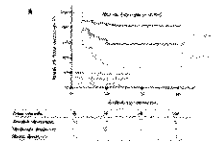
Anti-arrhythmic drugs are discontinued at the end of 3 months
Oral anticoagulation is continued

Alcohol

Moderate and heavy drinking increases the risk of post-ablation AF recurrence

Impact of Alcohol Consumption on Substrate Remodeling and Atrial Fibrillation Recurrence After Ablation

Journal of the American Heart Association 2015;4:e004111



Post-Ablation

Your patient has completed a pulmonary vein isolation ablation...

Now the patient is in the healing phase...

How do we enhance success for arrhythmia free survival?

Obstructive Sleep Apnea

OSA increases the risk of AF recurrence following AF ablation

