

Management of the Patient with AF and CHF Against all odds

Siva Soma Oklahoma Heart Institute



Oklahoma Heart Research & Education Foundation presents

Outline

- AF and CHF Why are they so important ?
- Interplay of AF-CHF
- Choice of agents for rate and rhythm control.
- Rate versus rhythm control
- Catheter ablation of AF in CHF
- Role of Pacemaker / AV node ablation



AF and CHF - Why are they so important ?

- Atrial Fibrillation and heart failure have emerged as the "new cardiovascular epidemics" over the last 2 decades.
- AF is the most common clinical arrhythmia in the US
 - Estimated prevalence ~ 7-8 million
 - Projected prevalence ~ 12 million by 2030
- Heart failure affects ~ 6.5 million patients in the US
 - Projected prevalence ~ 8.5 million by 2030
 - Most common discharge diagnosis
- Represent significant economic burden and proportion of health care costs

3. Heidenreich et al. Circ Heart Fail. 2013. Forecasting the impact of heart failure in the United States: a policy statement from the American Heart Association.

^{1:} Colilla et al. Am J Cardiol. 2013 Oct 15;112(8):1142-7. Estimates of current and future incidence and prevalence of atrial fibrillation in the U.S. adult population. 2: Mozaffarian et al. *Circulation*. 2015;131:e29–322. American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Heart disease and stroke statistics–2015 update: a report from the American Heart Association.

- Share many predisposing factors including hypertension, diabetes, ischemic and valvular heart disease, obesity etc
- Aging population Increased prevalence of AF
- Improvements in monitoring has resulted in more accurate detection of AF
- Improved survival after HF diagnosis Beta blockers and ACE/ARBs-- Increased prevalence of CHF.
- Better treatment and " salvage " of patients with acute MI

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AF and CHF



AF-CHF : Vicious cycle

- AF is a strong independent risk factor for subsequent development of HF
- HF and AF can interact to perpetuate and exacerbate each other through mechanisms such as rate-dependent worsening of cardiac function, fibrosis, and activation of neurohumoral vasoconstrictors.
- AF can worsen symptoms in patients with HF and conversely, worsened HF can promote a rapid ventricular response in AF.

AF-CHF : Vicious cycle



CHF and AF: A Double Whammy!



Verma Et al. Circulation. 2017;135:1547-1563. Treatment of Patients With Atrial Fibrillation and Heart Failure With Reduced Ejection Fraction.

CHF and AF: A Double Whammy!

TABLE 2. Cox Multivariable Proportional Hazards Models Examining the Impact of the Comorbid Condition on Mortality

Models	Men, Adjusted HR (95% Cl)	Women, Adjusted HR (95% Cl)
Comorbid condition as a time-dependent variable		
(A) Mortality after AF		
Impact of incident CHF	2.7 (1.9 to 3.7)*	3.1 (2.2 to 4.2)*
(B) Mortality after CHF		
Impact of incident AF	1.6 (1.2 to 2.1)†	2.7 (2.0 to 3.6)*

The combination of AF and HF irrespective of which comes first is associated with a further 2-3 fold increase in mortality

Wang et al . <u>Circulation</u>. 2003 Jun 17;107(23):2920-5. Temporal relations of atrial fibrillation and congestive heart failure and their joint influence on mortality: the Framingham Heart Study.

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Prevention of Thromboembolism

- CHADS-Vasc score
 H-Heart failure
- Choice of Anticoagulation agents include
 - Warfarin
 - Newer oral anticoagulation agents including dabigatran, rivaroxaban, apixaban and edoxaban.
- "Reasonable to recommend oral anticoagulants in patients with AF and CHF irrespective of the presence of other risk factors"



2019 update to AF management guidelines

For patients with AF (except with moderate-to-severe mitral stenosis or a mechanical heart valve) and a CHA₂DS₂-VASc score of 1 in men and 2 in women, prescribing an oral anticoagulant to reduce thromboembolic stroke risk may be considered (S4.1.1-31–S4.1.1-35).

Verma Et al. Circulation. 2017;135:1547-1563. Treatment of Patients With Atrial Fibrillation and Heart Failure With Reduced Ejection Fraction.

Rate control agents



- Beta Blockers
- Non Dihydropyridine Calcium channel blockers
 - Verapamil and Diltiazem

Digoxin

Strict or lenient rate control ?



- Asymptomatic patients with AF : Lenient rate control strategy is reasonable . RACE II trial .
- Persistent AF and CHF : Most patients have symptoms with minor exertion and increased heart rate .
- More strict rate control (<80 bpm) may be needed in this group (based on pace/ablate studies). Van Gelder et al. Lancet. 2016 Aug 20; 388 :818-28. Rate

control in atrial fibrillation.

Which of the following anti arrythmic agents can be used in a patient with AF and acute CHF?

1. Flecainide

- 2. Dronedarone
- 3. Amiodarone

4. All of the above

Anti arrhythmic agents for rhythm control in HFrEF

Class III

- Amiodarone
- Dofetilide
- Sotalol
- Class Ic agents Flecainide and Propaphenone. Contraindicated with structural heart disease
- Dronedarone/Multaq Contraindicated in patients with NYHA class III or IV HF and in patients who have had an episode of decompensated HF in the past 4 weeks, especially if they have depressed LV function

• Dofetilide :

- Initiation in hospital for safety.
- Not recommended with severe LVH > 15 mm.
- Should be used with caution in patients at risk QT prolongation TdP

Amiodarone

- Potent but significant side effects including
 - Sun allergy
 - Thyroid dysfunction
 - Liver function disturbances
 - Gastro-intestinal complaints
 - Neurological complications
 - Pulmonary abnormalities
 - Sick sinus syndrome/ AVN conduction disturbances
- Advantage No significant pro arrythmia

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Which strategy is best for a patient with AF and CHF ?

- 1. Rate control strategy
- 2. Rhythm control strategy
- 3. Who cares? Refer to Dr Sandler . He will figure it out



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Rhythm Control versus Rate Control for Atrial Fibrillation and Heart Failure

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- 1376 patients enrolled .
 - 682 Rythm-control group
 - 694 Rate-control group.
- HFrEF- HF with reduced
 EF
- Followed for a mean of 37 months.
- Primary outcome death from cardiovascular causes



 No significant difference in secondary outcomes

Drug	Rhythm-Control Group (N = 682)	Rate-Control Group (N = 694)	P Value
Amiodarone	82	7	<0.001
Sotalol	2	<1	0.02
Dofetilide	<1	<1	0.62
Beta-blocker	80	88	<0.001
Digoxin	51	75	< 0.001
Verapamil or diltiazem	2	3	0.10
ACE inhibitor	81	82	0.41
ARB	16	13	0.09
ACE inhibitor or ARB	94	94	0.57
Diuretic	80	82	0.37
Aldosterone antagonist	47	49	0.51
Oral anticoagulant	88	92	0.03
Aspirin	34	31	0.31
Lipid-lowering drug	44	46	0.61

* ACE denotes angiotensin-converting enzyme, and ARB angiotensin-receptor blocker.

Choice of AAD was
 primarily Amiodarone

What about Catheter ablation as rhythm control strategy for AF ?

- Multiple studies performed in past Studies have very heterogeneous patient population
- Observational studies
- Meta analysis
- Randomized control trials
- Recent and ongoing studies

Meta analysis- AF ablation in CHF

	No. of studies	No. of patients	Success single (%)	Success final (%)	Complications (%)	LVEF improvement (%)	Other findings
Wilton, 2010 ⁴¹	8	483	45-73	69–96	4.8	+11	_
Dagres, 2011 ³²	9	354	-	-	6.7	+11	CAD relates to no LVEF improvement
Anselmino, 2014 ⁴³	26	1838	36-44	54-67	4.2	+13	NT-proBNP and patients with LVEF < 35%; time to first AF and CHF diagnosis relate to recurrences
Ganesan, 2015 ⁴⁴	19	914	56	82	5.5	+13	Improvement in exercise capacity and QoL

- Significant heterogeneity in studies
- Uniformity in conclusion regarding outcomes

AF ablation in HF Impact on LVEF



Randomized clinical trials

	Sample Size	Age, y	NICM, %	Comparator Arm	LVEF, %	Follow- Up, mo	Single- Procedure Success, %	Multiprocedure Success, %	LVEF Improvement, %	Other Comments
Khan 2008 ⁸⁴	81 (41)	60	27	AV nodal ablation + BIV pacing	27	6	68	88	+8	Improved 6MHW and Minnesota score
MacDonald 2011 ¹¹⁶	41 (22)	62	37	Medical rate control	36	12	40	50	+4	No difference vs rate control, high complication rate
Jones 2013 ¹¹⁷	52 (26)	63	73	Medical rate control	22	12	68	88	+11	Minnesota score, BNP, and peak oxygen consumption improved
Hunter 2014 ¹¹⁸	366 (67)	54	82	Medical rate control	42	20	38	81	+8	Minnesota score and peak oxygen consumption improved
Di Biase 2016 ¹¹⁹	203 (102)	62	38	Amiodarone	29	24		70	+8	1.4 procedures per patient, 6MHW, Minnesota score, hospitalization and death improved by ablation

Small improvements in LEVF and 6 MWT

Verma Et al. Circulation. 2017;135:1547-1563. Treatment of Patients With Atrial Fibrillation and Heart Failure With Reduced Ejection Fraction.

Catheter Ablation Versus Medical Rate Control in Atrial Fibrillation and Systolic Dysfunction



The CAMERA-MRI Study

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JACC JOURNAL CME/MOC

CAMERA – MRI

- Small randomized study. 68 patients
- Persistent AF and Idiopathic cardiomyopathy . LVEF < 45%
- Catheter ablation compared to rate control (resting HR < 80 and exercise <110 bpm)
- Cardiac MRI with LGE to assess scar burden
- Attempted to avoid heterogeneous nature of previous studies. Excluded patients with LVSD due to ischemic and valvular heart disease
- Goal: to determine whether the restoration of sinus rhythm with catheter ablation would improve LVSD compared with medical rate control in which the etiology of the underlying cardiomyopathy was otherwise unexplained, apart from the presence of AF



 Inferior line

 Inferior line

 Catheter
 Medical Rate

 Ablation
 Medical Rate

 Control

 Prabhu, S. et al. J Am Coll Cardiol. 2017;70(16):1949-61.

Conclusion : Restoration of sinus rhythm with CA results in significant improvements in LVEF, particularly in the absence of ventricular fibrosis on CMR.

Ablation Versus Amiodarone for Treatment of Persistent Atrial Fibrillation in Patients With Congestive Heart Failure and an Implanted Device Results From the AATAC Multicenter Randomized Trial

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AATAC Trial

- Randomized trial (n = 202) comparing
 - AF ablation n = 102
 - Rhythm control with Amiodarone n = 101
- Follow up : 24 month
- Primary end point : Recurrence of AF
- Majority of patients has Ischemic cardiomyopathy . 62%



Ablation Versus Amiodarone for Treatment of Persistent Atrial Fibrillation in Patients With Congestive Heart Failure and an Implanted Device, Volume: 133, Issue: 17, Pages: 1637-1644



Catheter Ablation for Atrial Fibrillation with Heart Failure

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- Randomized control trial
- Catheter ablation (179 patients) vs medical therapy (rate or rhythm control) (184 patients)
- Primary end point : Composite of death from any cause or hospitalization for worsening heart failure.
- A rhythm-control strategy was used in approximately 30% of the patients in the medical-therapy group
- In the ablation group, 63% of patients were in sinus rhythm at 60 months versus 22% in the medical-therapy group





What about diastolic CHF ?

Catheter ablation of atrial fibrillation in patients with heart failure and preserved ejection fraction

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No randomized control trial. Observational and retrospective data

2019 update to AF Management guidelines

Recommendation

1. AF catheter ablation may be reasonable in selected patients with symptomatic AF and HF with reduced left ventricular (LV) ejection fraction (HFrEF) to potentially lower mortality rate and reduce hospitalization for HF (S6.3.4-1, S6.3.4-2).



IIb : Benefit ≥ risk

6.3. AF Catheter Ablation to Maintain Sinus Rhythm

6.3.4. Catheter Ablation in HF

January CT, Wann LS, Calkins H, Chen LY, Cigarroa JE, Cleveland Jr JC, Ellinor PT, Ezekowitz MD, Field ME, Furie KL, Heidenreich PA, Murray KT, Shea JB, Tracy CM, Yancy CW, 2019 AHA/ACC/HRS Focused Update of the 2014 AHA/ACC/HRS Guideline for the Management of Patients With Atrial Fibrillation, Journal of the American College of Cardiology (2019)

Risk Factor management

Shared risk factors for AF and CHF

- Obesity
- Hypertension
- Obstructive sleep apnea



(Left) Obesity is associated with a variety of associated comorbidities. These are all associated with progression of the atrial substrate and the development of atrial fibrillation (AF). (Top) A dedicated weight management program with weight loss (WL) is associated with reverse remodeling of the atrial substrate and a dose-dependent reduction in the AF burden, which is sustained in the long term. (Bottom) The consequence of weight fluctuation, which somewhat curtails the beneficial effects of WL.

Which strategy is best for a patient with AF and CHF ?

- 1. Rate control strategy
- 2. Rhythm control strategy
- 3. Who cares? Refer to Dr Sandler . He will figure it out

Various factors influence decision

- What is the driver ? AF or CHF ?
- HFrEF or HFpEF?
- AF induced/Tachycardia medicated cardiomyopathy?
- Assess symptoms and goals of care
- May sometimes need anti arrythmic drug in conjunction with ablation
- Patient specific approach : Including medications, technique of ablation and procedural endpoints

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Who needs pacemaker /AV node ablation ?

- Significant remodeling of atrium
- Comorbid conditions
- "Permanent AF" at time of referral

Table 1. Characteristics of the Patients at Baseline.*			
Characteristic	Treatment Type		
	Ablation (N = 179)	Medical Therapy (N=184)	
Age — yr			
Median	64	64	
Range	56-71	56-73.5	
Male sex — no. (%)	156 (87)	155 (84)	
Body-mass index ⁻			
Median	29.0	29.1	
Range	25.9–32.2	25.9-32.3	
New York Heart Association class — no./total no. (%)			
I	20/174 (11)	19/179 (11)	
II	101/174 (58)	109/179 (61)	
III	50/174 (29)	49/179 (27)	
IV	3/174 (2)	2/179 (1)	
Cause of heart failure — no. (%)‡			
Ischemic	72 (40)	96 (52)	
Nonischemic	107 (60)	88 (48)	
Type of atrial fibrillation — no. (%)			
Paroxysmal	54 (30)	64 (35)	
Persistent	125 (70)	120 (65)	
Long-standing persistent (duration >1 year)	51 (28)	55 (30)	
Left atrial diameter			
Total no. of patients evaluated	162	172	
Median — mm	48.0	49.5	
Interquartile range — mm	45.0-54.0	5.0-55.0	

Pacemaker – AV node ablation

- Medically refractory AF -- AV node ablation and pacemaker implant strategy
- Burden of Chronic RV apical pacing can lead to pacing induced cardiomyopathy
- Biventricular pacing
- BLOCK-HF study.
 - Patients with AV block and reduced EF had improved outcomes when undergoing biventricular in comparison with RV-only pacing.

RV pacing vs Biventricular Pacing

TABLE 1 Right Ventricular Pacing Versus Biventricular Pacing in Patients With AV Block

Study (Ref. #)	Patients	Design	Endpoints	Outcomes
AV block				
PACE (18)	n = 177 LVEF >45% Bradycardia (SND, AVB)	Prospective, randomized, double-blind, multicenter CRT vs. RV 1- to 2-yr follow-up	LVEF	1-yr: 62.2% \pm 7.0% vs. 54.8% \pm 9.1%; p < 0.001 2-yr: 62.9% \pm 8.8% vs. 53.0% \pm 10.1%; p < 0.001
			LVESV	1-yr: 27.6 ± 10.4 ml vs. 35.7 ± 16.3 ml; p < 0.001 2-yr: 25.3 ± 10.2 ml vs. 38.3 ± 20.3 ml; p < 0.001
PREVENT HF (20)	n = 108 LVEF 54 \pm 12% AV block, VP $>$ 80% NYHA functional	Prospective, 1:1 randomized, multicenter BVP vs. RVP (pacer/ICD) 12-month follow-up	Primary: change in LVEDV at 12 months Secondary: LVESV, EF, HF hospitalization, mortality	No significant differences in volumes, EF, mortality, or HF
Block-HF (19)	n = 691 LVEF <50% AV block NYHA functional class I, II, III	Prospective, randomized, multicenter BVP vs. RVP (pacer/ICD) Mean follow-up of 37 months	Primary: composite of death, urgent care visit for HF, 15% increase in LVESVI	45.8% vs. 55.6% (HR: 0.74; 95% Cl: 0.60 to 0.90)
BioPace (21)	n = 1,810 Any LVEF AV block	Prospective, randomized, multicenter BVP vs. RVP Mean follow-up of 5.6 yrs	Primary: composite of time to death, HF hospitalization	HR: 0.87; 95% CI: 0.75 to 1.01; $p = 0.08$ Nonstatistically significant trend toward BVP

His bundle pacing

Electrocardiographic maps

Pugazhendhi Vijayaraman et al. JACC 2017;69:3099-3114

AORTIC ROOT, MEMBRANOUS SEPTUM, TRICUSPID ANNULUS

Figure 14-3 Orientation of Septal Structures as Viewed From Right Side. Schematic representation of atrial (A) and ventricular (V) aspect of the membranous septum (MS) and its relation to aortic root and valve cusps (A). AV node and the course of His bundle is superimposed on the membranous septum (B). Corresponding anatomic section is shown on the right panel. The proximal portion of the His bundle is on the right atrial (RA)-left ventricular (LV) aspect of the MS. The distal portion of the His bundle is in the right ventricle (RV)-LV aspect of the MS. (Courtesy Dr. K. Shivkumar, UCLA Arrhythmia Center.)

His bundle pacing

- Await randomized clinical trials comparing His bundle to Biv pacemakers.
- His bundle lead technology and tools are still evolving.

Thank you