How to Improve Cardiac Resynchronization Therapy Benefit in Atrial Fibrillation Patients

Pulmonary Vein Isolation (and Beyond)

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KEYWORDS

• Catheter ablation • Atrial fibrillation • Heart failure • Cardiac resynchronization therapy • Pulmonary vein ablation • Triggers

KEY POINTS

- Cardiac resynchronization therapy (CRT) is not as effective in heart failure (HF) patients with atrial fibrillation (AF) undergoing CRT for inadequate biventricular capture and loss of atrioventricular (AV) synchrony.
- Catheter ablation of AF can improve CRT benefit by restoring both interventricular and AV synchrony, but no study has specifically addressed this issue.
- Regardless of CRT, many clinical trials have shown that catheter ablation of AF is a safe and effective strategy to achieve rhythm control in patients with HF.
- PVI-alone is not enough in patients with HF and an ablation strategy targeting non-PV triggers and the substrate is necessary.

INTRODUCTION

Atrial fibrillation (AF) and heart failure (HF) often coexist, and when they do clinical outcomes worsen. Although cardiac resynchronization therapy (CRT) is an important treatment for symptomatic HF patients in sinus rhythm (SR) with low left ventricular ejection fraction (LVEF) and ventricular dyssynchrony, its role is still not well defined in patients with AF.

Disclosures: The authors have nothing to disclose and no conflict relevant to the subject matter or materials discussed in this article.

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Card Electrophysiol Clin 7 (2015) 755–764
http://dx.doi.org/10.1016/j.ccep.2015.08.007
1877-9182/15/$ – see front matter

CRT is not as effective in patients with AF undergoing CRT for two main reasons: loss of atrioventricular (AV) synchrony and inadequate biventricular capture. The latter can be addressed either with pharmacologic therapy to slow ventricular response or with AV node ablation (AVNA) to achieve near 100% biventricular pacing. Both can be restored with strategies that aim to achieve rhythm control, namely antiarrhythmic drugs (AADs) or catheter ablation.

This article discusses the role and techniques of catheter ablation of AF in patients with HF, and its possible application in CRT recipients.

ATRIAL FIBRILLATION AND HEART FAILURE

AF and HF are the two current epidemics of cardiovascular disease and they often coexist.[1,2] The prevalence of AF in patients with HF increases with HF severity, from 10% to 20% in patients with mild to moderate HF to more than 50% in patients with severe HF.[2–5] Inversely, the lifetime prevalence of HF in AF has been estimated at 40%.[3] Coexistence of HF and AF is associated with an increased risk for hospitalization, stroke, and mortality, with a four- to eight-fold increase versus a two-fold increase in AF alone.[2,6,7]

The pathophysiologic relationship between AF and HF is not completely understood.[8] On one hand, it can be attributed to shared risk factors, such as age, diabetes, hypertension, obesity, sleep apnea, valvular or structural heart disease, and coronary artery disease. On the other hand, a vicious cycle where AF begets HF and HF begets AF also plays an important role. Indeed, AF facilitates the development and progression of HF reducing cardiac output by means of heart rate elevation and irregularity and loss of atrial function and AV synchrony.[9–13] Conversely, HF can facilitate the development and progression of AF via atrial dilatation and fibrosis secondary to elevated left ventricular filling pressures, functional valvular regurgitation, and volume retention mediated by activation of the renin-angiotensin-aldosterone system.[11,12]

ATRIAL FIBRILLATION AND CARDIAC RESYNCHRONIZATION THERAPY

It has been estimated that 20% to 25% of those eligible for CRT have AF; despite this, almost all the landmark randomized controlled clinical trials on CRT have excluded patients with pre-existing AF.[3,14,15] Thus, current guidelines are cautious when it comes to CRT in patients with AF and symptomatic systolic dysfunction (Class IIa, Level of Evidence C).[16]

CRT is not as effective in patients with AF: the high intrinsic ventricular rate reduces biventricular capture, thus precluding optimal ventricular synchronization, and loss of atrial systole makes AV optimization impossible.[17] To improve CRT benefit in AF rate and rhythm control strategies are important: the former addresses ventricular desynchronization, whereas the latter can potentially restore interventricular and AV synchrony.

AVNA has emerged as an important adjunctive therapy for CRT recipients with AF. Observational studies have shown that, compared with AV nodal blocking drugs, AVNA increases LVEF, exercise tolerance, and survival.[18] AVNA restores ventricular synchrony but does not address AV optimization, for which a strategy to obtain rhythm control is warranted.

As in patients with normal systolic function, it has been shown that rhythm control with AADs is not superior to rate control in reducing mortality in patients with HF.[19] The lack of benefit from AADs reflects their poor efficacy in maintaining SR, along with their negative inotropic and proarrhythmic effects. Catheter ablation offers an opportunity to achieve and maintain SR without the downsides of AADs.

STUDIES ON ATRIAL FIBRILLATION ABLATION IN PATIENTS WITH HEART FAILURE

Multiple observational studies suggest that catheter ablation for AF is as effective in maintaining SR in patients with HF as it is in those without (**Table 1**).[20–31] The most important difference is a higher risk of recurrence, with more repeat procedures required to achieve comparable AF-free survival in the HF population.[32] Moreover, catheter ablation improves prognostic markers, including left ventricular function (LVEF), exercise capacity, and quality of life (QoL) in HF patients with AF (**Figs. 1** and **2**). The population enrolled in these studies is heterogeneous, and comprises patients with different HF etiologies and AF types. Interestingly, some patients showed normalization of LVEF after AF ablation, with better results seen in patients with a more rapid ventricular response and/or nonischemic cardiomyopathy, suggesting the presence of a reversible AF-induced cardiomyopathy. Indeed, in this subpopulation, effective and sustained maintenance of SR seems to be curative.[33]

To date, five randomized controlled trials have evaluated the role of catheter ablation for rhythm control in patients with HF (**Table 2**).[34–38] Four of them compared AF ablation with rate control, either pharmacologic or through AVNA, and one compared ablation with rhythm control. In the