

AV Nodal Ablation in Heart Failure Patients with Atrial Fibrillation

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Abstract

The optimal medical treatment can fail in the intention to improve symptoms and quality of life of heart failure (HF) patients with severe left ventricular dysfunction and atrial fibrillation (AF) with uncontrolled ventricular rate. In these refractory cases to medical management, the necessity to utilize cardiac resynchronization therapy (CRT), or the need to use catheter ablation, or both, emerges in order to achieve hemodynamic improvement. Several clinical studies with CRT demonstrated structural and functional ventricular improvement. Moreover, there are additional beneficial effects in left ventricular remodeling. It was demonstrated that there is a significant improvement in left ventricular ejection fraction, and a significant decrease in end systolic and end diastolic volumes. However, CRT may be interrupted in over 30% of patients after successful implantation of a device and the most common reason for CRT interruption is the development of AF in 18% of the cases. Those patients whom do not respond to drug therapy will require atrioventricular nodal (AVN) catheter ablation in order to restore 100% CRT functionality and improvements in clinical outcomes. There are interesting published data documenting significant acute and long-term improvement in left ventricular function, cardiac performance, symptoms, exercise tolerance, clinical outcomes, and quality of life in selected HF patients with paroxysmal and persistent drug-refractory AF who have undergone AVN ablation and permanent pacemaker implantation.

Keywords: AV nodal catheter ablation; Atrial fibrillation; Congestive heart failure

Introduction

Congestive heart failure (HF) per se has a reserved prognosis in patients with low left ventricular ejection fraction, and this prognosis even worsens if atrial fibrillation (AF) develops. AF and HF are common cardiovascular diseases with high comorbidities and mortality and severe prognostic implications [1-5]. AF usually generates rapid ventricular response, irregularity of ventricular rhythm, loss of the atrial kick and organized atrial contribution to cardiac output, and in some cases with persistent or permanent AF, tachycardia-induced cardiomyopathy [6-13]. Aging has a profound impact on the histological and thus, electrophysiological changes in the human atrial myocardium which contribute to the higher prevalence of AF in the elderly [14-20]. The prevalence of AF in patients with advanced HF reaches up to 40%. AF is considered to be an independent predictor of morbidity and mortality increasing the risk of death and hospitalization in HF patients [11-13].

The optimal medical treatment can fail in the intention to improve symptoms and quality of life of HF patients with severe left ventricular dysfunction and AF with uncontrolled ventricular rate [21-24]. In these refractory cases to medical management, the necessity to utilize cardiac resynchronization therapy (CRT), or the need to use catheter ablation, or both, emerges in order to achieve hemodynamic improvement. Several clinical studies with CRT demonstrated structural and functional ventricular improvement. Moreover, there are additional beneficial effects in left ventricular remodeling. It was demonstrated that there is a significant improvement in left ventricular ejection fraction, and a significant decrease in end systolic and end diastolic volumes at 3 months of followup [25,26]. Importantly, these beneficial effects are dependent on continuous biventricular pacing since interruption of electric stimulation produce a progressive but not immediate loss of effect. However, CRT may be interrupted in over 30% of patients after successful implantation of a device and the most common reason for CRT interruption is the development of AF in 18% of the cases. Indeed, it was reported that almost 20% of patients who

undergo successful implantation of a defibrillator capable of delivering CRT develop an episode of AF with a rapid ventricular response, which at least temporarily results in the inability to deliver CRT [25-27]. Those patients whom do not respond to drug therapy will require atrioventricular nodal (AVN) catheter ablation in order to restore 100% CRT functionality and improvements in clinical outcomes. There are interesting published data documenting significant acute and long-term improvement in left ventricular function, cardiac performance, symptoms, exercise tolerance, clinical outcomes, and quality of life in selected HF patients with paroxysmal and persistent drug-refractory AF who have undergone AVN ablation and permanent pacemaker implantation.

AV Nodal Ablation

There are some data available from meta-analysis which reported beneficial evidence in favour of AVN catheter ablation followed by permanent pacemaker implantation in symptomatic, drug-refractory AF patients. In his meta-analysis, Wood et al. [28] examined 1181 patients from 21 different studies and found that exercise duration, ejection fraction, quality of life, symptoms, and hospital admissions improved significantly. In this study they observed that the only parameter that did not reach statistical significance was LV fractional shortening. However, this last parameter showed a tendency towards improvement. In another meta-analysis performed by Chatterjee et al.

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[29], they analyzed a total of 5 randomized or prospective trials with a total of 314 patients for efficacy review, another 11 studies (810 patients) for effectiveness review, and 47 studies (5632 patients) for safety review.

These authors found in this study that in the therapeutic management of refractory AF, AVN catheter ablation is associated with improvement in symptoms and quality of life, with a low incidence of procedure morbidity [29]. In addition, in patients with reduced systolic function, AVN ablation demonstrated also significantly improved echocardiographic outcomes relative to medical therapy alone. However, their results demonstrated also that there was no statistical difference in all-cause mortality, exercise duration, and left ventricular ejection fraction between AVN ablation and medical therapy groups [29]. Therefore, with this interventional procedure of “ablate and pace” we are offering our HF patients with AF a better quality of life due to hemodynamic improvements, but no longer survival.

Right ventricular pacing has been associated to deleterious alterations in left ventricular function. Hence, in order to avoid the noxious effects of long-term right ventricular pacing on left ventricular function after AVN catheter ablation [30], biventricular pacing has been proposed as an alternative pacing method. CRT significantly reduces hospitalizations for HF, and significantly improves functional capacity and left ventricular function in comparison with right ventricular pacing only [31-33]. Therefore, the current guidelines recommend CRT in patients with AF and left ventricular dysfunction who are candidates for AVN catheter ablation with an indication IIa level of evidence B [34,35]. Indeed, AVN ablation followed by CRT is an established strategy for improving symptoms and morbidity in patients with permanent AF, reduced left ventricular ejection fraction, and uncontrolled ventricular rate.

Discussion

Geelen et al. [36] stated that AVN ablation may predispose patients to an increased risk of sudden cardiac death. Early studies reported 1-year sudden death rates varying from 0% to 9% [28,37]. The majority of those patients who developed sudden cardiac death had a significant number of risk factors, including reduced left ventricular ejection fraction, advanced HF, and a history of ventricular arrhythmias [38,39]. Bradley et al. [40] found no significant difference in mortality when the “ablate and pace” procedure was compared to medical treatment. They demonstrated an all-cause mortality of 3.5% with AVN ablation and 3.3% with drug therapy at 1 year of follow-up in their meta-analysis of randomized trials comparing AVN catheter ablation with permanent pacemaker implantation and drug therapy. The rate of sudden cardiac death further decreased to 0.2% when pacing was incremented to an initial lower rate of 90 bpm [41]. Actually, sudden cardiac death is not a subject of concern anymore [42,43]. The 1 year total mortality is 6.3% and the rate of sudden cardiac death is only 2%, which is similar to that of control patients with AF who remain on drug therapy [28,44].

Conclusion

In conclusion, there are beneficial effects in left ventricular function, cardiac performance, symptoms, exercise tolerance, clinical outcomes, and quality of life in selected HF patients with paroxysmal and persistent drug-refractory AF who have undergone AVN ablation and permanent pacemaker implantation. Current guidelines recommend CRT in HF patients with AF whom are candidates for AVN catheter ablation with an indication IIa level of evidence B.

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