In which patients with heart failure should ablation of atrial fibrillation not be performed?

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Abstract

Catheter ablation of atrial fibrillation (AF) in patients with heart failure associated with a reduced EF (HFrEF) was associated with a significantly lower rate of a composite endpoint of death from any cause or hospitalization for worsening heart failure (HF) than medical therapy in the CASTLE-AF trial. In patients with HF and also with a preserved EF (HFpEF), AF is known to be associated with increased mortality. Although the particular benefit in patients with an EF >35% may suggest the need for prospective randomized control trial data in patients with HF to assess the role of ablation as a first-line therapy as Sessions AJ, et al. stated, we believe at present that 1) whether there is structural heart disease detected by cardiac images and 2) whether the left atrial voltage is generally low, should be assessed “before ablation” in each patient with HF to achieve a successful ablation.

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Introduction

Many ablation strategies and techniques have been proposed since pulmonary vein (PV) ostial isolation to eliminate atrial fibrillation (AF) triggers was introduced in 2000. Circumferential PV ablation, PV antrum isolation (PVAI), and extensive PV isolation (EPVI) have been performed widely as the principal procedures because they have attained high cure rates with an acceptable safety. Further, recently, some clinical trials have compared the effects of catheter ablation and rhythm control with medical therapy in patients with AF-associated heart failure (HF).

Ablation vs. Medical therapy in patients with AF and heart failure

The AATAC (Ablation vs. Amiodarone for Treatment of Persistent Atrial Fibrillation in Patients with Congestive Heart Failure and an Implanted ICD/CRT-D) trial compared the effect of catheter ablation and rhythm control with amiodarone in patients with AF-associated HF and showed that the sinus rhythm maintenance rate after ablation was significantly higher than after amiodarone therapy (70% vs. 34%), resulting in significant improvements in the QOL and mortality rates. Regarding the catheter ablation of AF with heart failure, in addition, Marrouche NF, et al. published in N Engl J Med 2018 that it was associated with a significantly lower rate of a composite endpoint of death from any cause or hospitalization for worsening HF than was medical therapy. In the CASTLE-AF trial, patients were included if they had paroxysmal or persistent AF, a New York Heart Association (NYHA) class II, III, or IV heart failure, and a left ventricular ejection fraction (LVEF) of 35% or less. That is, patients with HF with a reduced EF (HFrEF) were selected in the CASTLE-AF trial. In patients with HF and HFrEF with persistent symptoms despite medical therapy, catheter ablation (CA) is associated with a decreased all-cause mortality, decreased
rates of cardiovascular hospitalizations, and lower rates of recurrence as compared to medical therapy. In the manuscript published by Sessions AJ, et al., the patients were examined according to their ejection fraction (EF): EF <35% (n = 1024) and EF >35% (n=8955). They stated that mainly delaying treatment of AF with catheter ablation in patients with concurrent left ventricular dysfunction resulted in an increased all-cause mortality in all patients and significantly increased HF hospitalizations, strokes, and AF recurrence in patients with an EF >35%. Additionally, in patients with an EF <35%, it was written that a delay in performing catheter ablation impacted the outcomes, in particular the mortality risk. In the EF <35% group, catheter ablation did not impact the stroke rates with early use, however, the stroke event rates were low in this population. Those data in aggregate favor the early use of ablation of AF in patients with HF. Without touching on the early use of ablation of AF in patients with HF, the JCS guidelines determine that catheter ablation therapy in AF patients with HF is an option that can be expected to improve the prognosis and recommends applying the same indication level with or without HF on the basis of some study results at this time.

A case in which ablation was refractory?

Here, I am concerned about which patients with heart failure should an ablation of AF not be performed. In our institution’s cases, there were low-voltage areas in the anterior left atrium (LA) (Figure) in a patient with persistent AF and an EF of 24%. We performed an EPVI in the 1st procedure and created mitral isthmus block with a chemical ablation and performed an isolation of the posterior LA wall in the 2nd procedure 7 days after the 1st procedure. However, atrial tachycardia emerged after the EPVI and the HF did not improve. Therefore, the patient started taking amiodarone 200mg/day to maintain sinus rhythm (SR), and cardiac re-synchronized therapy (CRT) was performed. If the atrial tachycardia were to recur, we might have to perform an atrio-ventricular junctional (AVJ) ablation. We wonder whether an EPVI should be performed in this patient if an AVJ ablation must be performed.

Impact of the degree of LV dysfunction

AF is known to be associated with increased mortality only in patients with HF with a preserved EF (HFpEF), defined as the presence of signs and symptoms of HF with an EF of >50%. In our report, a total of 106 consecutive HF patients, including 51 (48.1%) with a reduced left ventricular ejection fraction (LVEF) (HFrEF) and 55 (51.9%) with a preserved LVEF (HFpEF), underwent AF ablation. All patients underwent a successful PVAI, and substrate modification was added in 38 (35.8%). In the patients with HFrEF, normalization of the LVEF (LVEF <50%) was observed in 37 (72.5%) patients during the follow-up period. Multivariate logistic analyses revealed that a smaller left ventricular end-diastolic diameter (LVDd) was the sole parameter predicting an LVEF normalization post-procedure (odds ratio [OR] = 0.863; 95% confidence interval [CI] = 0.779–0.955, p = 0.005). For the association between the LVDd and LVEF normalization post-procedure, the area under curve (AUC) of 0.774 (95% CI = 0.618–0.930) was observed. The optimal cut-off point for the LVDd for predicting an LVEF normalization post-procedure was 53.5 mm (sensitivity 64.9%, specificity 78.6%). Interestingly, in the CASTLE-AF trial, there was a significant interaction between the left ventricular ejection fraction (LVEF) and primary endpoint (death from any cause or admission for worsening heart failure), which implies that patients with an LVEF of 25% or more are more likely to have a benefit from ablation of AF than those with an LVEF of less than 25%.

Bipolar vs. Unipolar voltage mapping of AF ablation

We are contemplating the utility of the unipolar electrogram for assessing low-voltage areas. The result may help to judge how we should perform AF ablation, especially in patients with HF. Ablation of low-voltage areas in the left atrium (LA) has been reported as having therapeutic value for maintaining sinus rhythm. On the other hand, bipolar voltage criteria may be affected both by the activation direction of the superficial atrial activation and by insufficient contact with the endocardial tissue. There may also be differences in the visibility due to specific features of the mapping catheter (i.e., size of the electrodes, distance between the electrodes, etc.). In the near future, advanced atrial remodeling evaluated by unipolar electrograms (Figure) may show an important cause of atrial arrhythmias.
Cardiac magnetic resonance imaging

Prabhu S, et al. published the following study in J Am Coll Cardiol, 2017. This multicenter, randomized clinical trial enrolled patients with persistent AF and idiopathic cardiomyopathy (left ventricular ejection fraction [LVEF] ≤ 45%). After optimization of the rate control, the patients underwent cardiac magnetic resonance (CMR) imaging to assess the LVEF and late gadolinium enhancement, indicative of ventricular fibrosis, before randomization to either catheter ablation (CA) or ongoing medical rate control (MRC). A total of 301 patients were screened; 68 patients were randomized with 33 in each arm. The average AF burden post-CA was 1.6 ± 5.0% at 6 months. In the intention-to-treat analysis, the absolute LVEF improved by 18 ± 13% in the CA group as compared to 4.4 ± 13% in the MRC group (p < 0.0001) and normalized (LVEF ≥ 50%) in 58% versus 9% (p = 0.0002). In those undergoing CA, the absence of late gadolinium enhancement predicted greater improvements in the absolute LVEF (10.7%; p = 0.0069) and normalization at 6 months (73% vs. 29%; p = 0.0093).

Summary

Although Sessions AJ, et al. stated that of course, the particular benefit in patients with an EF > 35% suggests the need for prospective randomized control trial data in patients with HF to assess the role of ablation as a first-line therapy, we believe at present that 1) whether there is structural heart disease detected by cardiac MRI or scintigraphy and 2) whether the left atrial voltage is generally low, should be assessed “before ablation” in each patient with HF to achieve a successful ablation.

References

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The 3D view of the anterior left atrium with bipolar voltage mapping (A) and unipolar voltage mapping (B) with an OCTARAY® mapping catheter after the EPVI. The red area is 0.05 mV. The cut-off value in both A and B was 0.05 mV. 0.5 mV. The real low voltage area may be detected by the unipolar rather than the bipolar mapping.