

Editorial



Catheter Ablation is Effective for Recovery from Sinus Node Dysfunction in Patients with Atrial Fibrillation, But Close Monitoring is Still Needed

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Detrimental effect of atrial fibrillation (AF) on sinus node (SN) function has been one of the most frequently investigated topics of basic and clinical researches. Ongoing AF could cause direct impairment to the SN function.¹⁻³⁾ Expression of ion channels making pacemaker funny current (I_f) in the SN was reported to be downregulated,¹⁾ and spontaneous Ca^{2+} release from sarcoplasmic reticulum was known to become dysfunctional by ongoing AF, deteriorating the SN automaticity.²⁾ In addition, AF-induced atrioventricular dyssynchrony and lack of effective coordinated atrial contraction causes elevation of atrial pressure. The high atrial pressure along with ongoing AF could induce atrial fibrosis.⁴⁾⁵⁾ Significant fibrosis, particularly within SN and perinodal atrial tissues, can predispose patients to sinus node dysfunction (SND). In a recent study using late gadolinium enhancement cardiac magnetic resonance, Akoum et al.⁶⁾ showed that perinodal and both atrial fibrosis was more extensive in patients with SND compared to those without.

On the other hand, recovery of SND after AF catheter ablation (AFCA) has been suggested by various studies. Hocini et al.⁷⁾ revealed that successful AFCA was followed by marked increase in mean and maximal heart rate as well as significant reduction in the corrected SN recovery time. In a retrospective study performed by Kim et al.,⁸⁾ requirement of permanent pacemaker (PPM) was reduced by successful AFCA in AF patients with tachy-brady syndrome.

However, efficacy of AFCA and recovery of SN function would not be perfect in all patients, which makes PPM implantation still needed in some patients with SND undergoing AFCA. Moreover, syncope, if accompanied by traumatic cranial injury, could lead to more serious complications because anticoagulation therapy would be mandatory in significant proportion of this patient group. It is still challenging to identify patients at higher risk of persistent SND and its complications. Optimal follow-up intervals or appropriate screening tests for the patients with ongoing risk of SND-related syncope remain unclear as well.

In a recent retrospective study in the *Korean Circulation Journal*, Hwang et al.⁹⁾ provided us with valuable information on the incidence, time course, and predictors of PPM implantation after AFCA in AF patients with SND. About 11% of this patient population eventually underwent a PPM implantation following the AFCA during a mean follow-up period of 47.5 ± 28.8 -months

with 56% of pacemakers implanted within 3 months. Elevated left atrial (LA) filling pressure (E/Em) and extra-pulmonary vein LA ablation (anterior linear ablation) were independent predictors for PPM implantation. The risk of PPM implantation was also associated with longer procedure time, lack of post-AFCA heart rate increase, AF recurrence, and requirement of antiarrhythmic drugs during follow-up. Interestingly, elevated LA pressure, longer procedure time, additional linear ablation, and AF recurrent are associated with increased risk of atrial fibrosis in line with results from previous studies.⁴⁻⁶⁾

However, the present study excluded patients with surgical AF ablation, valvular AF, or valve surgery who are also frequently associated with SND and/or PPM requirement.¹⁰⁾ Therefore, their results cannot be generalized in the excluded patient population. Unfortunately, risk of PPM implantation was not evaluated separately in subgroups with tachy-brady syndrome and marked sinus bradycardia. The two subgroups might show different response to AFCA in terms of the recovery of SND. Evaluation of fibrosis extent in perinodal or right atrial tissue using imaging modalities would have been more informative. In addition, we still do not know which one would be better between ‘ablation first’ and ‘pacemaker first’ strategies in terms of recurrence of syncope, falling-down, trauma, stroke, and quality of life.

In conclusion, AFCA is effective but not perfect for recovery from SND. Therefore, more attention needs to be paid to patients with multiple risk factors for PPM requirement suggested from the present study such as high LA filling pressure, extensive AFCA, and AF recurrence following AFCA, particularly during the first year following AFCA. Prospective studies deserve to be performed to find additional risk factors for AFCA-refractory SND requiring PPM, or to assess whether earlier AFCA would lead to better outcomes in terms of SND recovery before irreversible changes occur in the function and structure of SN and atrium.

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