Role of AF Termination: Is There Any Difference Between Direct to Sinus Rhythm Versus Via Atrial Tachycardia?

During catheter ablation of persistent atrial fibrillation (AF), the arrhythmia often organizes into a regular atrial tachyarrhythmia (AT) or directly terminates to sinus rhythm (SR). The termination of AF during ablation may be associated with higher long-term maintenance of SR, and has been proposed as an endpoint; however, there are also conflicting results and the effect of regular rhythms occurring during ablation on the clinical outcome is as yet unclear. AF termination cannot be achieved in all patients using current techniques. Some patients without AF termination with ablation do well clinically without arrhythmia recurrence and some patients with AF termination develop later recurrence of AT and/or AF. AF termination in patients with persistent AF can be achieved usually at the cost of extensive ablation, procedural risks, longer procedural and ablation times, and increased risk of post-ablation. During catheter ablation of persistent AF, Park et al demonstrated that termination during catheter ablation is associated with a better clinical outcome, especially in patients with longstanding persistent AF. However, it is currently unclear how to identify those who will not terminate with ablation and those who do not have any potential to restore SR or who will not terminate with ablation, but ultimately do well clinically.

In this issue of the Journal, Miyazaki et al show that AF termination during pulmonary vein (PV) antral ablation was associated with a better clinical outcome than for those without termination and those with termination during atrial substrate modification after multiple procedures but not after an initial procedure. The patients in whom AF terminated during PV antral ablation may have either an early stage of persistent AF or less remodeled atria, more likely PV-dependent AF. This may be the reason why all patients who underwent a second procedure among the patients with AF termination during PV antral ablation had PV reconnections, and reconnection of both sides of the PVs was more frequently observed in these patients.

Miyazaki et al also found that the AF termination mode was an independent predictor of clinical outcome after multiple AF ablation procedures. Direct conversion to SR during the initial AF ablation procedure predicted a better clinical outcome, compared with via AT. Direct conversion to SR during ablation reflects an elimination of the critical drivers and sufficient modification of the substrates that maintain persistent AF. On the other hand, when AF is still present, at least some of the critical drivers or substrate of AF are more likely to be still present, which may contribute to recurrence of AF after ablation. The AF termination site (ie, PV vs. atria), and mode of termination need to be correlated with the size and volume of the left atrium (LA), the duration of AF, or other clinical parameters reflecting AF chronicity, which were missed in this study. However, I believe that the LA size or volume may be different according to whether AF is terminated or not, or whether AF terminated during PV antral ablation vs. during left or right atrial ablation.

Using a stepwise ablation approach in patients with long-standing persistent AF, Park et al demonstrated that termination during catheter ablation is an independent predictor. They found that patients in whom AF converted to AT during ablation had a higher recurrence as either AT or combined AF/AT rather than AF alone. Miyazaki et al also found the patients with AF converted to AT during ablation in the initial procedure had a significantly higher AT recurrence rate after the last procedure than those in whom AF was directly terminated to SR. Those 2 studies indicated that mode of AF termination was closely associated with the type of recurrent arrhythmia and clinical outcome during follow-up. During stepwise ablation of persistent AF, newly-identified AT is an important part of the restoration of SR. However, it is unclear whether AT is a proarrhythmic consequence of the ablation itself, the result of incomplete ablation, or simply results from the unmasking of the arrhythmogenic driver after AF has been resolved.

Does the Site of AF Termination Matter?
The site of AF termination (ie, PV vs. LA or RA), or preferential structures inside the LA or RA, may be of great value in predicting AF-/AT-free survival during follow-up. According to Miyazaki et al, the PV antrum as a site of AF termination is the best site to result in better clinical outcome, compared with other atrial sites. In other words, minimal ablation to achieve AF termination may lead to a less proarrhythmic environment, which results in lower rate of AT/AF recurrence during follow-up.
Ban et al. recently demonstrated that in many cases successfully terminated ATs that develop after complex fractionated atrial electrogram (CFAE) guided ablation of AF originate in the border zones of the CFAE. In particular, the anterior wall near the LA appendage (LAA), the septum and the roof were frequently identified as AT termination sites, and were often related to the CFAE area, whereas the peri-mitral isthmus (MI) was the most common termination site of AT in non-CFAE areas. Miyazaki et al. also presented similar results; that is, preferential sites of AF termination in the LA were septum (11/39, 28.2%), LAA (10/39, 25.6%), MI (9/39, 23.1%), and LA anterior wall (4/39, 10.3%). In the RA, the appendage (3, 30%), septum (2, 20%), and crista terminalis (2, 20%) were common sites of AF termination. The mappable AT (initial/second procedure) was located at the MI (18/9), LAA (0/5), and cavotricuspid isthmus (CTI, 15/1). MI is the most common site of macro-reentrant mappable AT in both the initial and second procedures, whereas, in the RA, the CTI was a common site of AT only in the initial procedure, indicating that MI AT frequently recurred, whereas CTI-dependent AT did not. The LAA was also an important site for focal AT in the second procedure, which was not identified at initial procedure. It remains to be determined whether the LAA became a new source of focal AT or was manifested or unmasked after the initial ablation in this study. Further study to assess the role of the LAA in recurrent AF/AT after catheter ablation is warranted.

In patients with persistent AF, the clinical outcome after catheter ablation is significantly influenced by whether the ATs that develop after AF ablation are effectively eliminated under the guidance of meticulous mapping. Increasing the rate of acute termination of ATs during ablation may result in better outcomes, and the AF termination site and termination mode at the initial procedure have a significant effect on arrhythmia recurrence after multiple procedures. A good beginning always makes a good ending.

References