Pulmonary vein isolation: do all roads lead to Rome?

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Pulmonary vein isolation (PVI) for the treatment of atrial fibrillation (AF) appears to be here to stay. In just a few years since the landmark publications by Haissaguerre and Pappone, countless variations on the theme of ostial or antral PVI, with or without additional lines or point lesions, have been published. The procedure has found its way into daily practice and international guidelines, and is currently the most performed ablation in the Netherlands. In some centres, it accounts for the bulk of procedures. At the risk of raining on the parade, this begs a number of questions. Given the paucity of randomised trials comparing PVI with other therapeutic modalities (for example, surgery), lack of long-term follow-up, lack of consensus on which method of PVI is best (if any), and lack of clarity on which patients should best be treated and in which stage of their disease, one cannot help but long for the impossibility of stopping the roller-coaster and taking stock of what we are actually doing. Although the article in this issue by the Groningen group may describe only a modest series by international standards, it does address a number of the aforementioned issues and is to be commended for doing so.¹

In their single-centre, single-operator experience of PVI in 99 patients, Tan et al. primarily describe predictors of success and acute and six-month outcome. They found paroxysmal as opposed to persistent AF and left atrial ablation time to be independent predictors of success.¹ The observation that PVI was more successful in patients with paroxysmal AF is by no means new, and probably reflects the less profound electrical and structural remodelling in these

individuals. It is therefore interesting that the authors found no difference in left atrial dimensions between the success and failure groups. This finding is at odds with numerous previously published findings for both percutaneous and surgical maze-like procedures, where left atrial enlargement was associated with poorer outcome, and is most probably a reflection of selection bias of patients with relatively little left atrial enlargement in this series.²⁻⁵ While current practice and guidelines dictate that PVI is reserved for patients who remain highly symptomatic despite several anti-arrhythmic drug regimens (at least one in the salient guideline, and at least two or major adverse effects of drug in the study at hand), this finding could suggest that treatment should be given much earlier in the disease course. Wazni and co-workers addressed this issue several years ago in a prospective randomised study comparing drug therapy to PVI as first-line therapy for previously untreated paroxysmal AF.⁶ While the study was relatively small (n=70 patients), they found significantly fewer AF recurrences over one year of follow-up (13% versus 63%) and a better quality of life in the PVI group. The A4 study by Jaïs et al. paints a similar picture.⁷ A total of 112 patients with symptomatic paroxysmal AF were randomised to either drug therapy or PVI. At one-year follow-up, the success rate was significantly higher in the PVI group (89% free of recurrence versus 23% in the drug therapy group). It should be noted that the results were probably biased towards PVI because the study allowed crossover from the drug to ablation arm in the event of failure, leading to 63% crossovers at three months. That the early or first-line use of PVI would encounter insurmountable logistic limitations with the current capacity of electrophysiology laboratories in the Netherlands is self-evident, but it is nonetheless worth more than a passing thought from a mechanistic point of view.

The finding that total left atrial ablation time was a predictor of success invites further discussion. The authors hypothesise that the reason for this is that a longer ablation time indicates more extensive transmural and/or contiguous lesion formation, or better transmurality at the ridge between the left-sided veins

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and/or left superior PV and left atrial appendage, areas known for PV reconnection.⁸ This seems overly cryptic. What they are probably saying is that the longer ablation time either denotes greater compartmentalisation or debulking of the left atrium, or isolation of more PVs. Two recent reports provide evidence for the former. In these elegant MRI studies of patients undergoing a first PVI, the authors negatively correlated volume of left atrial scar formation with AF recurrence rate.^{9,10} Table 2, however, offers a more likely explanation in the study at hand: there was significantly less complete PV isolation in the failure group (80 versus 97%).¹ In other words, a shorter LA ablation time translates into fewer predefined electrophysiological endpoints. Irrespective of the mechanism by which PVI successfully eliminates AF, be it debulking, isolation of triggers, removal of perpetuators, autonomic modulation, or a combination of the above, true electrical isolation of that part of the posterior left atrium seems to be critical. Several studies emphasise this fact, having demonstrated a correlation between recurrence of AF and PV re-conduction.^{11,12}

A recurrent issue when reading any report on PVI is the definition of procedural success. Do the authors mean free of symptoms or free of documented AF? And is that by daily telemonitoring, ECG, Holter, or implantable loop recorder? And are patients on or off antiarrhythmic drugs? The variations are endless, and the literature contains them all. This is not only a question of semantics – procedural success may vary widely depending upon the definition used. Senatore et al. compared the results of Holter versus daily transtelephonic monitoring following PVI in 72 patients and made several important observations: firstly, 50% of AF recurrences were asymptomatic. This immediately implies overestimation of procedural success in purely symptom-driven follow-up. Secondly, the AF recurrence rate with daily monitoring was double that of Holter monitoring on day 30 and 120. On the basis of these observations, success rate could be anywhere between 72 and 86%, depending on the definition used.¹³ Hindricks et al. reported highly similar findings in a cohort of 114 patients following PVI, with success rates of 64 to 93%, again depending solely on the definition used.¹⁴ These observations cry out for a universal definition of PVI success. Initiatives such as the German Competence Network on Atrial Fibrillation (AFNET) are a step in the right direction.

Tan and co-workers present a meticulously documented series of PVI, in which admirable attention has been paid to objective electrophysiological endpoints. It reads as an invitation to centres where PVI is performed to harmonise definitions and follow-up, and to participate in central data registry. ■

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Rectification

In the September 2009 issue of the Netherlands Heart Journal, a figure belonging to the Department of Cardiology of Leiden University Medical Center was mistakenly depicted in the article by Buck et al. and on the front page of the journal. The authors sincerely apologise for this mistake.