Research Highlight

Breakthroughs in hybrid management of stand-alone AF

Laurent Pison

Department of Cardiology, Maastricht University Medical Centre and Cardiovascular Research Institute Maastricht, Maastricht, The Netherlands
Corresponding to: Laurent Pison, MD, PhD. Department of Cardiology, Maastricht University Medical Centre and Cardiovascular Research Institute, Maastricht, PO Box 5800, Maastricht, The Netherlands. Email: l.pison@mumc.nl.

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The hybrid atrial fibrillation (AF) procedure: the best of two worlds

According to the present evidence on the etiology and pathophysiology of AF, the ideal ablation strategy would (I) result in a long-lasting isolation of the pulmonary veins (PV); (II) tailor the subsequent ablation approach to the patient by delineating the underlying atrial electrical substrate; (III) always generate totally transmural linear lesions when those are required; and (IV) be minimally invasive. Unfortunately, none of the current endocardial transcatheter nor epicardial off-pump surgical techniques are able to fulfill all these requirements on their own. Nevertheless, both approaches seem to be complementary, as when performed in association (therefore referred to as "hybrid" or "convergent"), they can potentially improve their respective weaknesses. The epicardial surgical procedure results in superior transmurality of the lesion set, translating into longlasting PV isolation and conduction block across linear lesions (1). On the other hand, endocardial techniques excel in guiding substrate modification and ablation of atrial tachycardias, known to occur during the stepwise ablation of persistent AF, by the combined use of three-dimensional electroanatomical mapping systems and multipolar catheters (2). Another important advantage of the hybrid approach is the possibility of performing endocardial touch-up in case of an incomplete transmural epicardial lesion.

Safety and effectiveness of the hybrid ablation procedure

Gelsomino *et al.* recently published an interesting systematic literature overview on the existing studies on hybrid thoracoscopic and transvenous catheter ablation procedures for lone AF (3). They included nine observational studies based on the following inclusion criteria: studies with more than ten patients, follow-up of more than three months, minimally invasive beating heart surgery and transcatheter ablation either staged or as a single procedure for the treatment of lone AF. The total number of patients was 335, and 114 (34%) of them had undergone one or more previous endocardial catheter ablation procedures. One hundred and four (31%) had persistent AF and 162 (48%) long-standing persistent AF. Several procedural techniques were analyzed. One study reported on the results employing a sequential approach, combining minimally invasive surgical ablation followed 3 to 5 days later by endocardial catheter ablation. In two studies, a staged approach was described with a catheter procedure 30 to 45 days after the surgical ablation. The 6 remaining studies described a combined approach during which the endocardial catheter ablation followed the epicardial surgical ablation during the same procedure. In 4 studies, bipolar radiofrequency (RF) was used as the epicardial energy source and in five studies, monopolar RF was employed. The only lesion that was common to all included patients was PV isolation. Several other left and right linear lesions were reported in these studies but only a few papers described their use in detail. In all included studies, a minimum follow-up period of 12 months was reported with the use of at least one method of long-term monitoring. The adapted protocol for the use of antiarrhythmic drugs (AAD) and oral anticoagulation during the follow-up period was quite dissimilar between included studies. In all studies, the primary efficacy endpoint was defined according to the current guidelines, freedom from AF off AAD at 1-year follow-up. Regarding the energy source used during the epicardial surgical procedure, success rates ranged from 86% to 92% in patients treated with bipolar RF and from 37% to 89% in patients managed

with unipolar RF. Four studies reported success rate off AAD by the type of AF: 60-92% in paroxysmal AF, 50-78% in persistent AF and 20-100% in long-standing AF. Complications were reported in 14 (4%) patients with 3 early deaths (1%) and 3 conversions to sternotomy (1%), among others. There were no thromboembolic events. Two studies reported echocardiographic results before and after the hybrid procedure and only one study assessed quality of life.

The authors of this systematic literature overview paper conclude that the hybrid treatment of lone AF seems to be a safe technique with satisfactory 1-year results and an AAD-free success rate that is higher than in isolated procedures. Nevertheless, the authors also draw our attention to some important limitations of this paper and some unresolved issues. Due to the lack of data from prospective-randomized studies, the small number of included studies and the limited patient population, it was not possible to come to final conclusions. Another important point of debate is the timing between the epicardial surgical procedure and the endocardial catheter ablation approach. A simultaneous epicardial-endocardial procedure might result in false-negative results, such as the acute demonstration of conduction block across linear lesions which could be only temporary due to tissue edema, rather than a completely transmural lesion. On the other hand, a one-step procedure enables endocardial touch-ups in the case of incomplete epicardial lesions, and the targeted ablation of atrial tachycardias occurring, during the ablation of (long-standing) persistent AF.

Finally, we completely agree with Gelsomino *et al*. that large, multi-center and prospective-randomized trials are the next step in determining whether or not the hybrid approach may represent a gold-standard treatment, especially for patients with (long-standing) persistent AF.

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