Pulmonary vein anatomy assessment prior to atrial fibrillation ablation using balloon-based technologies: can it really be abandoned?

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This editorial refers to ‘Impact of pulmonary vein anatomy assessed by cardiac magnetic resonance imaging on endoscopic pulmonary vein isolation in consecutive patients’ by A. Metzner et al., on page 474

Catheter ablation has become an established treatment modality for patients with symptomatic, drug-refractory atrial fibrillation. Moreover, current guidelines recommend that catheter ablation may be considered first-line therapy in selected patients with paroxysmal atrial fibrillation and minimal or no heart disease. Consequently, the number of patients deemed suitable for interventional treatment of atrial fibrillation is steadily increasing. It has been accepted that pulmonary vein (PV) isolation forms the cornerstone of any atrial fibrillation ablation strategy. Traditionally, radiofrequency energy is applied in a point-by-point fashion using a standard mapping and ablation catheter to accomplish the lesion set. This approach, however, is technically demanding due to complex anatomy of the left atrium and PVs, respectively, necessitating a high level of expertise. Pre- and peri-procedural imaging of the left atrium and PVs [e.g. by computed tomography, magnetic resonance imaging (MRI), transoesophageal echocardiography, rotational angiography] helps to understand the individual cardiac anatomy thus facilitating catheter navigation and lesion placement particularly after integration into a 3D electroanatomic mapping system.

Within the last several years, new technologies specifically designed for PV isolation have been introduced in order to simplify the ablation procedure. Balloon-based catheter designs using cryo-energy or high-intensity-focused ultrasound may allow for continuous lesion placement with only a few energy applications (‘single-shot’ devices). These approaches, however, are limited by fixed balloon sizes which do not sufficiently account for the variable PV anatomy and which renders wide circumferential lesion placement at the antral level of the PVs difficult.

The endoscopic laser balloon ablation system (Cardiofocus) provides a novel approach that is designed to overcome these major limitations of current balloon-based technologies. Direct visualization of the endocardial surface and usage of a compliant balloon with an adjustable size may help to deliver lesions at the intended target sites despite considerable variations in PV anatomy. Preliminary studies have demonstrated the feasibility, safety, and efficacy of this approach.

In this issue of Europace, Metzner et al. investigated the impact of individual PV anatomy assessed by pre-interventional cardiac MRI on acute ablation outcome, i.e. PV isolation, in 51 patients suffering from paroxysmal atrial fibrillation. In total, 192 out of 195 (98%) PVs could be successfully isolated. In 75% of patients, two separate left-sided and right-sided PVs, respectively, could be identified on MRI. Correlation analysis revealed that individual PV anatomy had no influence on acute success rate. During a median follow-up of 364 days, 63% of patients were free from arrhythmia recurrences. The authors concluded that pre-procedural MRI is not an essential prerequisite for subsequent successful laser balloon-based PV isolation.

The main message of this article, however, is that anatomy did not impact acute ablation success using the endoscopic ablation system. But is it reasonable to renounce cardiac imaging?

For that, one has to analyse the key characteristics of the ablation procedure: safety, efficacy, and clinical outcome. The authors report an incidence of major complications of almost 6% (two pericardial effusions, one phrenic nerve palsy). Mean procedure duration was $237 \pm 60$ min despite a significant reduction with increasing experience; and after a median follow-up of 364 days, 37% of patients experienced arrhythmia recurrences. Overall, in this cohort of ‘healthy, small atria, paroxysmal atrial fibrillation’ patients, the rates of complications were higher, the procedure duration longer; and the clinical success rates lower compared with a conventional point-by-point radio-frequency ablation approach.

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In the publication of Metzner et al., more than a quarter of the patients had atypical PV anatomies with common ostia, additional middle right-sided PVs, and oval-shaped, short common trunk and low inserted PVs, respectively. It would have been interesting to separate procedural and outcome data under that aspect. In addition, as there is no control group without pre-procedural MRI, one might speculate that the procedure would have been even more time consuming, less successful, and more complicated if information on cardiac anatomy had not been available.

Nowadays, a wide range of ablation techniques and strategies for treatment of atrial fibrillation are available. Individualized, patient-tailored therapy may be part of the puzzle for competitive procedural and clinical results in the future. Therefore, pre-procedural strategy and technology planning is increasingly expected. Next to clinical findings, an individual substrate description and anatomy assessment will play an important role. In the end, all that needs cardiac imaging.

Conflict of interest: none declared.

References

Corrigendum

The names of the EHRA reviewers were inadvertently omitted from the paper. The following reviewer names should have been included:

Andreas Löher (Germany), Milos Taborsky (Czech Republic), Antonio Curnis (Italy), and Marc Dubuc (Canada).

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