



## The importance of bipolar bidirectional radiofrequency in surgical AF ablation



In this multicenter report [1], the authors report on 175 patients with persistent and longstanding persistent atrial fibrillation (AF) undergoing a staged hybrid ablation procedure. First, via a right thoracoscopic approach, the pulmonary veins (PV) and the posterior left atrial (LA) wall were isolated using a flexible ablation device that allows unipolar and bipolar ablation modalities by gently sucking the atrial wall into the device. The second stage consisted of a transvenous catheter ablation, performed at least two months after the index procedure. During this endocardial procedure, conduction gaps in the epicardial ablation line were identified and ablated and additional lines such as cavo-tricuspid isthmus or mitral isthmus lines were added at the discretion of the operator. At 18 months, such a 'single' hybrid approach (so counting the two stages, but not including redo catheter ablation) resulted in an AF freedom of 56% without the use of anti-arrhythmic drugs. This is a very acceptable result in such a difficult to treat patient population, but is this technique also the best hybrid approach we can offer to our patients?

The surgical technique of the hybrid procedure performed in this study [1] has a few drawbacks. First, bipolar transmural ablation of the myocardium will only be successful if the full thickness of atrial wall can be retracted into the device. Therefore, the myocardium should be adequately denuded from epicardial fat, a surgical maneuver that requires advanced thoracoscopic skills and carries the risk of perforation. Furthermore, the thickness of the atrial wall is quite variable throughout the atrium, but especially at Bachmann Bundle [2,3], which corresponds to the atrial roof, the myocardium is very thick and potentially precludes the creation of transmural lesions when using such a suction-assisted ablation device. This might explain why, at the end of the surgical procedure, only 54.4% of patients had an isolated posterior left atrial wall. At the start of the endocardial procedure, this number decreased even further to 25%.

Second, a continuous ablation line that isolates the posterior wall and the PVs has the downside that its completeness is determined by its weakest link, and as such one gap will result in no isolation at all.

Finally, since patient characteristics are not specified, it is not clear why only 39% (69/175) of patients had their left atrial appendage (LAA) closed. One can argue that the appendage only needs to be addressed if the CHADSVASC score > 1, but in a population of patients with (longstanding) persistent AF and LA dilatation, it is to be expected that the number of patients with a CHADSVASC > 1 exceeds 39%. And eventually, most patients will reach the age of 75 and thus will have a CHADSVASC score of at least 2. But besides its potential reduction in stroke risk [4,5], epicardial LAA occlusion

also results in electrical isolation and as such can lead to a higher AF freedom [6]. Of course, it can only be speculated if a higher LAA closure rate would have resulted in a higher AF freedom in this study [1]. Another explanation for the low LAA closure might be that a right thoracoscopic approach limits the possibility of addressing the left atrial appendage, although clipping of the atrial appendage via the transverse sinus has been reported [7].

In patients with persistent AF, hybrid AF ablation is associated with better outcomes than catheter ablation alone [8]. To date, there are 3 so-called 'hybrid approaches' that combine surgical and endocardial ablation to address AF: (1) the technique using the Cobrafusion, as described in this manuscript [1]; (2) a sub-iphoid approach that combines surgical ablation of the posterior wall with endocardial isolation of the PVs [9] and (3) a bilateral or unilateral left-sided thoracoscopic approach with bipolar bidirectional PV isolation and bipolar but unidirectional creation of the so-called floor and roof line combined with endocardial touch-up and additional ablation [10]. Although a lot of progress has been made in the technical aspects of AF ablation and new potential AF promoting factors, such as epicardial fat [11], are being investigated, the pathophysiological mechanisms underlying AF are still not fully understood and isolation of the PVs remains the gold standard [12–14]. Long-lasting transmural PV isolation can be obtained with bipolar clamps that use bipolar bidirectional radiofrequency [15], and therefore a thoracoscopic approach that implements the use of such bipolar bidirectional clamps remains probably the best option that we can offer to patients with persistent or longstanding persistent AF that undergo heart-beating AF ablation.

### References

- [1] G.A. Haywood, R. Varini, P. Osmancik, M. Cireddu, J. Caldwell, M. Chaudhry, et al, European multicentre experience of staged hybrid atrial fibrillation ablation for the treatment of persistent and longstanding persistent atrial fibrillation, *Int. J. Cardiol. Heart Vasc.* 26 (2020) 100459, <https://doi.org/10.1016/j.ijcha.2019.100459>.
- [2] M.J. van Campenhout, A. Yaksh, C. Kik, P.P. de Jaegere, S.Y. Ho, M.A. Allesie, et al, Bachmann's bundle: a key player in the development of atrial fibrillation?, *Circ. Arrhythmia Electrophysiol.* 6 (2013) 1041–1046.
- [3] P.C. Dolber, M.S. Spach, Conventional and confocal fluorescence microscopy of collagen fibers in the heart, *J. Histochem. Cytochem.* 41 (1993) 465–469.
- [4] K.P. Phillips, T. Santoso, P. Sanders, J. Alison, J.L.K. Chan, H.N. Pak, et al, Left atrial appendage closure with WATCHMAN in Asian patients: 2year outcomes from the WASP registry, *Int. J. Cardiol. Heart Vasc.* 23 (2019) 100358.
- [5] C. van Laar, N.J. Verberkmoes, H.W. van Es, T. Lewalter, G. Dunnington, S. Stark, et al, Thoracoscopic left atrial appendage clipping: a multicenter cohort analysis, *JACC Clin. Electrophysiol.* 4 (2018) 893–901.
- [6] J. Romero, G.F. Michaud, R. Avendano, D.F. Briceño, S. Kumar, J. Carlos Diaz, et al, Benefit of left atrial appendage electrical isolation for persistent and

- long-standing persistent atrial fibrillation: a systematic review and meta-analysis, *Europace* (2018).
- [7] N. Ad, P.S. Massimiano, D.J. Shuman, G. Pritchard, S.D. Holmes, New approach to exclude the left atrial appendage during minimally invasive cryothermic surgical ablation, *Innovations (Phila)* 10 (2015) 323–327.
- [8] C.A.J. van der Heijden, M. Vroomen, J.G. Luermans, R. Vos, H. Crijns, S. Gelsomino, et al, Hybrid versus catheter ablation in patients with persistent and longstanding persistent atrial fibrillation: a systematic review and meta-analysis, *Eur. J. Cardiothorac. Surg.* (2019).
- [9] K. Zannis, W. Alam, F.A. Sebag, T. Folliguet, C. Bars, M. Fahed, et al, The convergent procedure: a hybrid approach for long lasting persistent atrial fibrillation ablation, the French experience, *J. Cardiovasc. Surg. (Torino)* (2019).
- [10] B. Maesen, L. Pison, M. Vroomen, J.G. Luermans, K. Vernoooy, J.G. Maessen, et al, Three-year follow-up of hybrid ablation for atrial fibrillation, *Eur. J. Cardiothorac. Surg.* 53 (2018) i26–i32.
- [11] A. Sepehri Shamloo, N. Dages, B. Dinov, P. Sommer, D. Husser-Bollmann, A. Bollmann, et al, Is epicardial fat tissue associated with atrial fibrillation recurrence after ablation? A systematic review and meta-analysis, *Int. J. Cardiol. Heart. Vasc.* 22 (2019) 132–138.
- [12] P. Kirchhof, S. Benussi, D. Kotecha, A. Ahlsson, D. Atar, B. Casadei, et al, 2016 ESC Guidelines for the management of atrial fibrillation developed in collaboration with EACTS, *Eur. J. Cardiothorac. Surg.* 50 (2016) e1–e88.
- [13] A. Verma, C.Y. Jiang, T.R. Betts, J. Chen, I. Deisenhofer, R. Mantovan, et al, Approaches to catheter ablation for persistent atrial fibrillation, *N Engl. J. Med.* 372 (2015) 1812–1822.
- [14] B. Maesen, I. Van Loo, L. Pison, M. La Meir, Surgical ablation of atrial fibrillation: is electrical isolation of the pulmonary veins a must?, *J. Atrial Fibrill.* 9 (2016) 54–61.
- [15] V. Velagic, C. de Asmundis, G. Mugnai, G. Irfan, B. Hunuk, E. Stroker, et al, Repeat procedures after hybrid thorascopic ablation in the setting of longstanding persistent atrial fibrillation: electrophysiological findings and 2-year clinical outcome, *J. Cardiovasc. Electrophysiol.* 27 (2016) 41–50.

Bart Maesen <sup>a,\*</sup>Vanessa Weberndörfer <sup>b</sup>Elham Bidar <sup>a</sup>Dominik Linz <sup>b,c,d</sup><sup>a</sup> *Department of Cardiothoracic Surgery, Maastricht University Medical Center, Maastricht, the Netherlands*<sup>b</sup> *Department of Cardiology, Maastricht University Medical Center, Maastricht, the Netherlands*<sup>c</sup> *Department of Cardiology, Radboud University Medical Centre, Nijmegen, The Netherlands*<sup>d</sup> *Centre for Heart Rhythm Disorders, University of Adelaide and Royal Adelaide Hospital, Adelaide, Australia*

\* Corresponding author at: Maastricht University Medical Center, Postbus 5800, 6202 AZ Maastricht, The Netherlands.

*E-mail address:* [b.maesen@mumc.nl](mailto:b.maesen@mumc.nl) (B. Maesen).

Received 22 January 2020

Received in revised form 23 January 2020

Accepted 24 January 2020

Available online 1 February 2020