

Combination of cryotherapy with radiofrequency energy sources during hybrid atrial fibrillation ablation- impact on lesion quality and outcomes

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Background: Whereas pulmonary vein isolation lays the groundwork of endocardial atrial fibrillation (AF) ablation, it leaves patients undertreated. Additional substrate modification of the left atrium is often required, but lesion gaps and non-transmurality limit restoration of sinus rhythm. Moreover, some low voltage areas and conduction abnormalities are located exclusively on the epicardial aspect, and endocardial ablation alone does not address these issues. Our hybrid endo-/epicardial ablation strategy overcomes all these shortcomings.

Purpose: To test if the combination of epicardial cryo and radiofrequency (RF) ablation (dual) further improves the quality of ablation lines, and if the combined endo-/epicardial ablation can treat intractable cases of AF.

Methods: Twenty-six patients (13 paroxysmal, 13 long-persistent; 20 patients with 1–5 prior endocardial AF ablations) first underwent epicardial, total thoracoscopic beating heart ablation (TTA). Lesion sets included bilateral PVI, left atrial appendage closure, as well as superior (roof) and inferior (floor) interpulmonary vein lines. Roof and floor lines were alternately ablated by dual energy or RF only. Three months post TTA, endocardial mapping with optional gap closure completed this two-stage hybrid concept.

Results: Intraoperatively, 24 of 40 (60%) previous left or right endocardial PVIs were found incomplete. Apart from two post-TTA pacemaker inser-

tions and one mini-thoracotomy for bleeding, respectively, no major morbidity was observed during follow up. The full protocol of the hybrid concept was applied in 24 patients. Forty-five of 47 (96%) epicardial PVIs were found gap-less during endocardial mapping, and the remaining 2 PVIs were readily re-ablated. In contrast, only 32 of 46 (70%) roof and floor lines were complete, and endocardial touch up was required in one of three patients. Of note, dual energy lines were more likely to be complete than RF only lines (17 of 22, 77%, vs. 15 of 24, 62%; p NS). Among 19 patients with continuous monitoring, only 4 (21%) had any AF burden including two patients within blanking period and before endocardial gap closure. The remaining 7 patients without continuous monitoring never experienced any symptoms related to recurrent AF, and serial Holter EKG were without pathology.

Conclusions: Hybrid ablation and dual energy provides a strong armamentarium for extra-pulmonary venous triggers of AF. Linear ablation lines were more likely to be gap-less and transmural, if dual energy sources were used. Dual energy TTA is highly efficient to restore sinus rhythm in patients with prior failed endocardial AF ablation. However, one of three patients will require endocardial gap closure to realize the full benefit of our two-stage hybrid concept. Further study will evaluate if dual energy lines outside the box can improve outcome in these challenging cases of intractable AF.