To guard the rhythm of the heart: Constructing a wall of ice with surgical endocardial cryo-maze.

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Abstract

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Case Report

To guard the rhythm of the heart: Constructing a wall of ice with surgical endocardial cryomaze.

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Abstract

Surgical atrial fibrillation (AF) ablation is a valid option in cases of concomitant cardiac surgery. Electroanatomical mapping before and after the procedure can assess the substrate and verify durable lesion formation. It is likely that a routine combined cardiosurgical and electrophysiological approach may yield the greatest benefit for such patients.

Keywords: atrial fibrillation, electroanatomical mapping, surgical ablation,

Case presentation

Sinus rhythm maintenance has been shown to be superior to rate control in atrial fibrillation (AF) regarding not only symptom control but prognosis as well¹. Surgical ablation is a valid and effective option superior to pharmacotherapy in achieving long-term rhythm control in patients requiring concomitant cardiac surgery^{2,3}.

Herein we present the case of a 53-year-old female patient with a neglected large septum secundum defect that presented to our clinic with symptoms of deteriorating right heart failure, as well as long standing persistent AF. Surgical plan involved a thoracoscopic cryothermic biatrial Cox-Maze IV procedure, along with tricuspid annulus and atrial septal repair, as well as left atrial appendage exclusion.

Per hospital protocol regarding surgical and hybrid ablations, three-dimensional substrate electroanatomical mapping – 3D-EAM (Carto 3v.7, J&J, New Brunswick, NJ, U.S.A.) of both atria was acquired in the operating room immediately prior to the surgery and following successful cardioversion to sinus – patient was on amiodarone for the preceding month. Unexpectedly, voltage mapping revealed normal atrial substrate. Ablation lines involved are depicted in Figure 1 and involved (online video) lesions along the crista terminalis, at the base of both appendages, along the coronary sinus and the left isthmus, as well as the formation of a box lesion encompassing the posterior left atrial wall. An AtriClip PRO-V device (AtriCure, Mason, OH. U.S.A.) was used to occlude the left appendage, bovine pericardium was used to correct the interatrial septum defect, whilst the tricuspid annulus was plicated using a standard technique.

During the first two-and-a-half months of the blanking period, patient suffered a persistent left atrial tachycardia spontaneously converted to sinus. A repeat 3D-EAM procedure was performed in the context of standard hospital protocol to evaluate ablation lesion durability, as well as, in view of patient's course, to potentially ablate the tachycardia circuit. Notably, persistent isolation of arrhythmogenic foci was evident since the (ablated) posterior atrium (posterior wall and pulmonary vein antra) was fibrillating while the septum and anterior wall were on sinus (Figure 2 – appendage was inaccessible postoperatively). Despite burst atrial pacing from sites on sinus rhythm, no arrhythmia was induced. Finally, on the right atrium, a line of block was detected along the crista terminalis lesion (Figure 3– dual-timed electrograms along the mapping catheter arms) along with superior vena cava isolation and cavotricuspid isthmus block.

Our case highlights the feasibility of combining 3D-EAM and thoracoscopic surgical AF ablation, which may improve success rates by providing immediate assessment of effective lesion formation, as well as the importance of a thorough surgical procedure (complete set of lesion lines) to ensure sinus rhythm maintenance, even by containing AF in an enclosed portion of the atrium. Indeed, the observed spontaneous conversion to sinus is a testament to a lege artis procedure. Remapping the atria postoperatively, in a sequential hybrid approach, is advisable to ascertain effective lesion formation, as well as to assess/ablate any remaining arrhythmogenic substrate.

References

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Figure 1.



Box and ridge lines as well as right atrial appendage line as part of the thoracoscopic cryothermic biatrial Cox-Maze IV procedure

Figure 2.



A pentaspline catheter is located at the fibrillating posterior wall proving persistent isolation of the posterior wall and the pulmonary vein antra was while the decapolar catheter inside the coronary sinus depicts sinus rhythm

Figure 3.



A line of block is detected along the crista terminalis lesion on the right atrium, based on the presence of dual-timed electrograms along the pentaspline mapping catheter arms.