Simplified mapping and ablation of a scar-related atrial tachycardia using magnetic resonance imaging tissue characterization

Felipe Bisbal*, David Andreu, and Antonio Berruezo

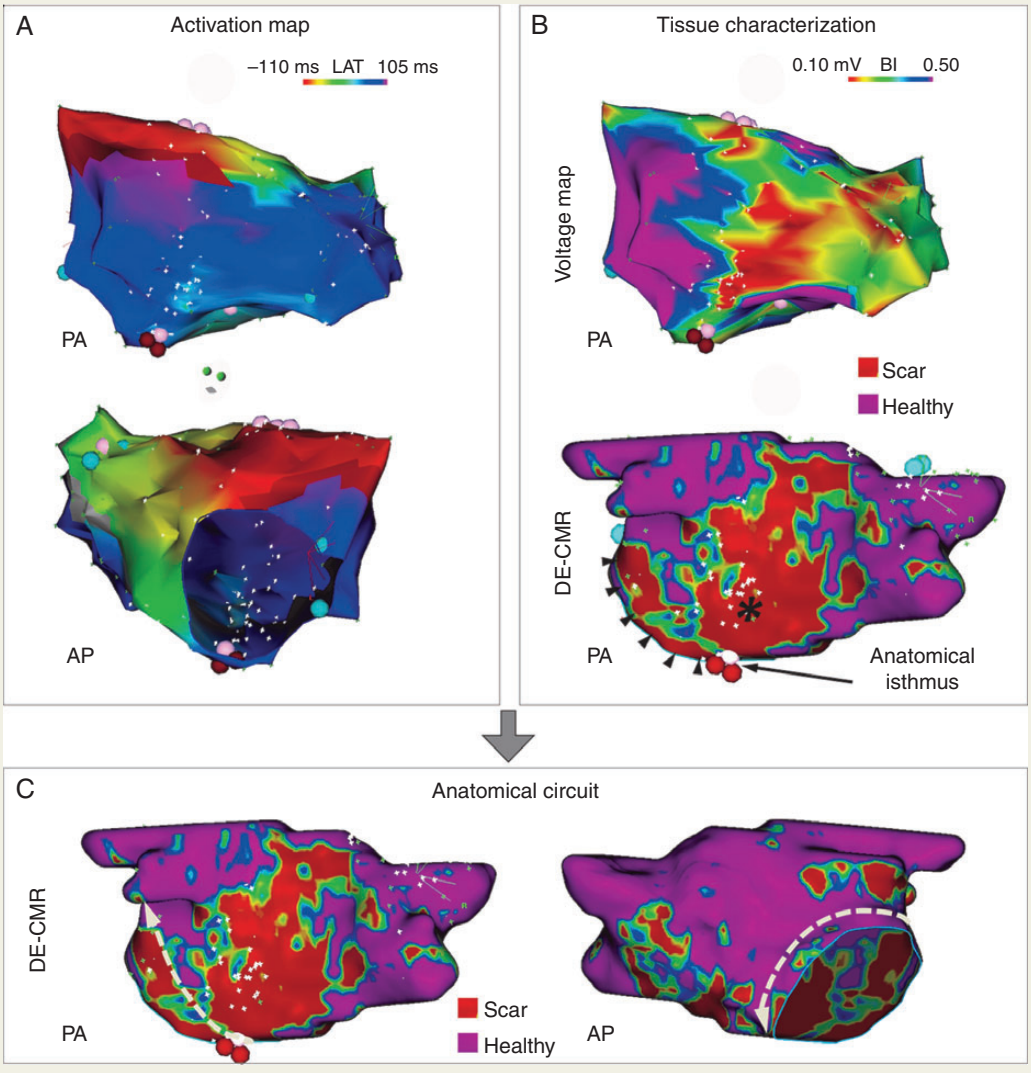
Arrhythmia Section, Cardiology Department, Thorax Institute, Hospital Clínic, C/ Villarroel 170-08036, Barcelona, Catalonia, Spain

* Corresponding author. Tel: +34 93 2275551; fax: +34 93 4513045; *E-mail address*: f.bisbalvb@gmail.com

A 32-year-old woman with atypical atrial flutter underwent magnetic resonance imaging (MRI)-guided ablation. A counterclockwise peri-mitral macroreentry was identified. The MRI substrate characterization allowed the identification of the critical isthmus between a large scarred area at the posterior wall and the inferior mitral annulus. The integration of MR images allowed limited mapping at this site, where a single radiofrequency application terminated the arrhythmia.

Delayed-enhancement cardiac magnetic resonance (DE-CMR) allows the identification of healthy and fibrotic atrial myocardium,[1,2] and can successfully guide the ablation of gaps in prior atrial fibrillation ablation lines.[2] However, no data have yet been reported on direct guidance with DE-CMR to ablate macroreentrant atrial tachycardias.

A 32-year-old female patient with prior surgical closure of interatrial septal defect (pericardial patch) was referred to our lab due to symptomatic atypical atrial flutter. The echocardiogram revealed normal biventricular size and function, and a left atrial diameter of 37 mm. A preprocedural DE-CMR was performed, as previously described.[2,3] The three-dimensional reconstruction of the right and left atria (CMR model) depicting the healthy (purple) and scarred myocardium (red) was imported into the navigation system (CARTO 3®; Biosense Webster).



The patient underwent the ablation procedure during ongoing tachycardia. A duodecapolar diagnostic catheter and a 4 mm irrigated-tip mapping catheter were placed into the right atrium. An activation map identified a septal macroreentrant tachycardia around the interatrial patch. Ablation lines were deployed from the septal patch to the superior vena cava and tricuspid annulus, leading to conversion into sinus rhythm. A burst pacing induction protocol repeatedly induced a new sustained atypical flutter. Entrainment maneuvers obtained an optimal post-pacing interval from the distal coronary sinus, suggesting a left-sided origin. After a double transseptal puncture, a counterclockwise perimitral activation sequence was identified by entrainment maneuvers and activation mapping (*panel A*).

The substrate characterization provided by DE-CMR facilitated the identification of an anatomical isthmus at the inferior aspect of the left atrium (*panels B* and *C*), between a large scarred area at the posterior wall (asterisk) and the inferior mitral annulus (black arrowheads). These structures were insufficiently defined by voltage mapping (upper *panel B*). The integrated CMR model allowed catheter positioning and limited mapping at this site; a continuous, fractionated signal—highly suggestive of a protected, slow-conducting isthmus—was identified. Radiofrequency application at this site (red dots in *panels A, B,* and *C*; 120 s) led to termination of the arrhythmia. No further arrhythmias could be induced.

The standard ablation approach of a perimitral flutter includes extensive ablation at the mitral isthmus to create a line of block; in patients without prior atrial fibrillation ablation, additional encircling lesions around the left-sided pulmonary veins are required. In this case, DE-CMR was crucial in identifying the critical isthmus of the circuit; this allowed limited mapping to the area of interest and limited energy delivery.

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Conflicts of interest: D.A. is employed by Biosense Webster.

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