Cavo-tricuspid isthmus ablation using a novel mapping catheter with mini electrodes to enhance signals quality

A CASE REPORT

Caputo ML., Conte G., Regoli F., Auricchio A.

Fondazione CardioCentro Ticino, Lugano, Switzerland

Abstract

A 77-year-old man with a non-ischaemic dilated cardiomyopathy developed a typical atrial flutter and a paroxysmal atrial fibrillation, thus he was scheduled for pulmonary veins isolation and ablation of the Cavo-Tricuspid isthmus (CTI). Right atrial electroanatomical map (RHYTHMIA™ navigation system) done during atrial flutter, confirmed a macro-reentrant circuit with a slow conduction area in the CTI. **Mapping of this area using the mini-electrodes embedded in the IntellaNav MiFi™ XP catheter allowed precise location of continuous fragmented signals, which correspond to the area of slow conduction along the CTI**. After few applications of radiofrequency (RF), the arrhythmia was interrupted with sinus rhythm recovery but pacing from CS documented residual conduction across the line. Again, mapping at this area using the mini-electrodes embedded in the IntellaNav MiFi™ XP catheter, allowed precise location of the residual gap in the previous area of ablation. A single application of radiofrequency energy at that point was sufficient to complete CTI block. Bidirectional block of conduction at the CTI was confirmed with the differential pacing manoeuvres. The patient remained asymptomatic 12 months after CTI ablation.

Case report

We present a case of a cavo-tricuspid isthmus (CTI) ablation in a 77-year-old man with a non-ischaemic dilated cardiomyopathy. The patient developed multiple episodes of atrial fibrillation conducted at high ventricular rate and typical atrial flutter resulting in acute heart failure. Pulmonary veins isolation and CTI ablation were therefore scheduled.

Right atrial electroanatomical map (RHYTHMIA™ navigation system) performed during atrial flutter allowed a rapid identification of a macroreentrant circuit with a slow

conduction area in the region of the CTI (figure 1 - panels A and B). Mapping at the CTI area showed continuous fragmented signals (figure 1, panel C). After few applications of RF, the arrhythmia was interrupted with sinus rhythm recovery (figure 1, panel D). A 10-pole catheter (**Steerable catheter EP-XT 10 pole, Boston Scientific**) **was placed on right atrium free wall to test the block of conduction across the line**. However, pacing from proximal CS demonstrated residual conduction throughout the CTI (figure 2, left panel). **Mapping at this area using the mini-electrodes embedded in the IntellaNav MiFi™ XP catheter allowed precise location of the residual gap in the previous area of ablation** (figure 2, central panel). In this catheter, bipolar signals can be recorded between the three 0.8 mm-wide electrodes that are arranged radially 2 mm from the end of the catheter, alongside the standard distal and proximal bipolar recordings. **A single application of RF energy at that point was sufficient to complete the CTI block**. Bidirectional block of the conduction across the CTI was confirmed with differential pacing manoeuvres from CS and from the 10-pole catheter placed on right atrial free wall (figure 2, right panel). The efficacy of the procedure was confirmed after 20 minutes of continuous monitoring. Total radiological exposure time for CTI ablation was of 2.4 minutes. The patient remained asymptomatic 12 months after CTI ablation.

Discussion

Radiofrequency ablation of typical atrial flutter is a very successful procedure with reported acute success rates of 90-95%. The conventional ablation technique requires creation of a complete line of conduction block across CTI, from the tricuspid valve to the inferior vena cava. This approach has a high overall success rate but results in variable, sometimes lengthy procedure times, mainly due to anatomic variation (1-4). Right atrial enlargement and anatomic challenges of the CTI region may, in fact, significantly prolong the time of ablation and the radiological exposure, and also lay to recurrences of the arrhythmia during follow up (4). In these patients, the use of mapping systems allows to rapidly map the cycle length of the arrhythmia and to confirm the diagnosis of CTI-dependent flutter. Moreover, in patients with recurrence of the arrhythmia as well with residual conduction across the line after ablation, **the mini-electrodes of the IntellaNav MiFi™ XP catheter may enhance signal interpretation across the line** (5). In this catheter, bipolar signals can be recorded between the three 0.8 mm-wide electrodes that are

arranged radially 2 mm from the end of the catheter, alongside the standard distal and proximal bipolar recordings. **The use of the IntellaNav MiFi™ XP radiofrequency ablation catheter has been suggested to improve mapping resolution with a more precise localization of the target points for ablation, potentially allowing fewer and more precise RF applications** (6). The critical gap that perpetuates the tachycardia usually displays slow conduction, represented by fragmented and continuous electrograms that can be easily recorded on the mini-electrodes of the IntellaNav MiFi™ XP catheter. In our patient, **a single application of radiofrequency energy in that area determined the block of the conduction throughout the CTI line, thus resulting in a significant shortening of the procedural time and, thanks to the RHYTHMIA™ mapping, of the radiological exposure time as well**.

Conclusions

We showed a successful case of CTI ablation using the novel IntellaNav MiFi™ XP catheter with mini electrodes within the ablation tip and with RHYTHMIA™ mapping in a patient with a typical atrial flutter.

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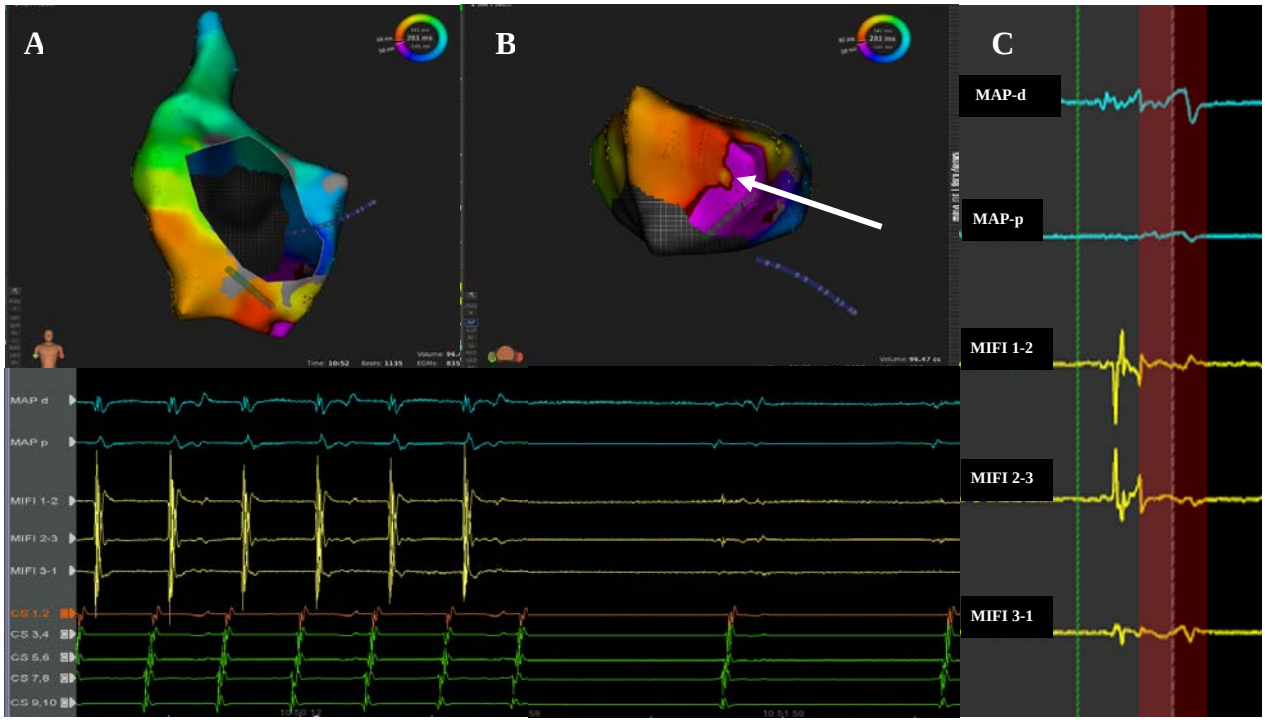

Figure 1. A and B: electroanatomical map of the tachycardia (AP and AP tilted-up view of the right atrium), on RHYTHMIA™ mapping system. C: the local signals on the IntellaNav MiFi™ XP ablation catheter on the CTI before ablation. A linear radiofrequency application (70W, 65°C) at the CT isthmus terminated the tachycardia (white arrow, panel D). MAP-d: local electrograms on the distal dipole of the ablation catheter; MAP-p: local electrograms on the proximal dipole; MIFI 1-2, MIFI 2-3 and MIFI 3-1: local EGMs on the mini-electrode dipoles (IntellaNav MiFi™ ablation catheter); CS: local EGMs on 10-poles catheter in coronary sinus.

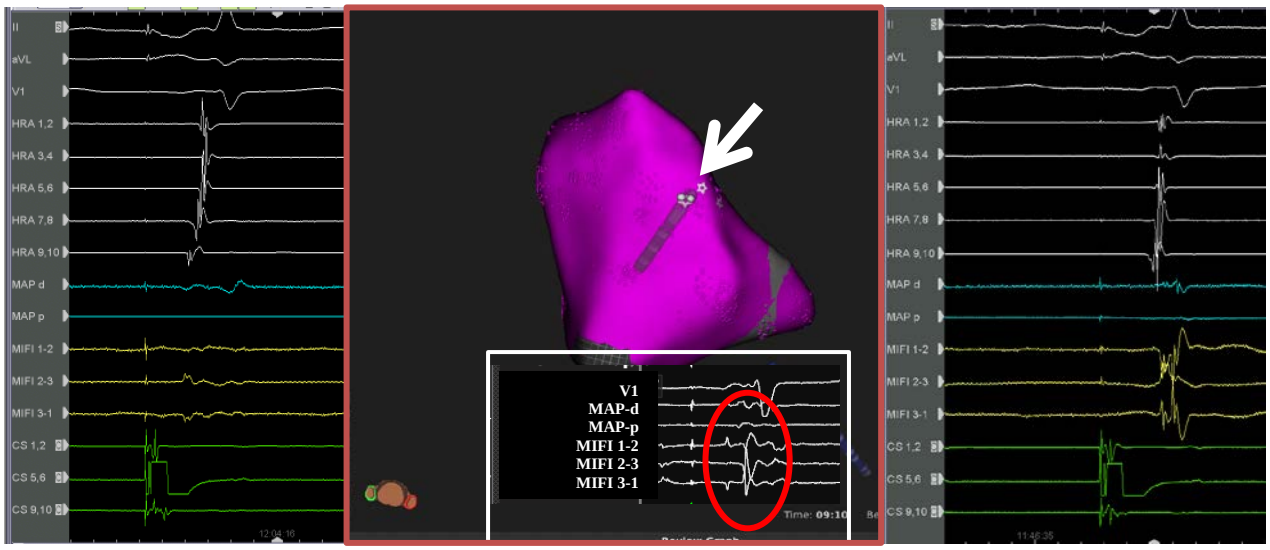

Figure 2. Left panel: Pacing from CS demonstrated incomplete isthmus block after ablation. Central panel: Activation map of the RA during continuous pacing from CS. The red arrow indicates the point the gap in isthmus line, which corresponds to the continuous fragmented signal on the MIFI). Right panel: isthmus line block confirmed with pacing from CS. II, aVL, V1: electrocardiographic reference; HRA: local EGMs on 10-poles catheter on right atrial free wall; MAP-d: local electrograms on the distal dipole of the ablation catheter; MAP-p: local electrograms on the proximal dipole; MIFI 1-2, MIFI 2-3 and MIFI 3-1: local EGMs on the mini-electrode dipoles (IntellaNav MiFi^{TM} XP catheter); CS: local EGMs on 10-poles catheter in coronary sinus.