High precision Gap identification using Mini-Electrodes and Rhythmia Mapping System during repeated Atrial Fibrillation Ablation

A CASE REPORT

Short title: Usefulness of mini-electrode catheter in gap identification in Redo AF procedures

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Introduction

Pulmonary vein reconnection is a common cause of atrial fibrillation (AF) recurrences after a previous pulmonary vein (PV) isolation procedure.[1] Gap identification in the previous ablation line and reablation is the common practice nowadays in repeated atrial fibrillation ablation procedures.[2] New ablation catheters with embedded mini-electrodes (ME) on the tip are able to identify the local electrograms more accurately, and can help to place the catheter tip more precisely.[3]

This case report shows how **ME-obtained electrograms help to identify precisely a gap in a previous ablation line and to position the ablation catheter tip on the gap** to isolate both PV in less than 2 seconds of RF therapy.

Case report

A 55-year-old male with a history of paroxysmal atrial fibrillation underwent a cryoballoon pulmonary vein isolation in November 2015. Documented episodes of AF were observed 9 months after the ablation. The patient was admitted for a second AF ablation on November 2017.

The procedure was carried out under deep sedation with propofol and morphine. A reference 24-pole catheter was placed in the coronary sinus and along the RA lateral wall. Double transseptal puncture was performed to access the LA. A multi-electrode mapping catheter (Orion, Boston Scientific, Cambridge, MA, USA), was progressed through a deflectable sheath (Direx, Boston Scientific, Cambridge, MA, USA). An ablation catheter with embedded ME (IntellaTip MiFi OI, Boston Scientific) was advanced through a fixed sheath. An electroanatomical map of the LA during pacing from the distal CS was obtained automatically according to a defined *beat* *acceptance criteria* using the Rhythmia Mapping System (Boston Scientific, Cambridge, MA, USA), (Figure 1). In the propagation map a large delay in the activation of the left inferior PV was observed. Propagation map (Video 1) showed clearly how the activation front entered into the LSPV through a gap in the anterior segment, propagated across the lateral segment of the LSPV and finally activated the LIPV. Detailed electrogram analysis showed a clear gap electrogram (Figure 2). The Orion catheter was placed in the LIPV and delayed electrograms were observed in every spline (Figure 3). The ablation catheter was positioned close to the gap and smooth maneuvers of the catheter were made until the observation in the ME of a clear gap signal (Figure 4). Once a clear gap signal was observed, RF therapy was applied. **Less than two seconds of RF therapy were necessary to isolate the two veins, demonstrated by the disappearance of the signals in Orion catheter** (Video 2). Pacing maneuvers inside the vein demonstrated the exit block by means of achieving local capture in both pulmonary veins (Figure 5).

Conclusions

ME embedded on the tip of the ablation catheter provide an extra grade of precision in positioning the tip of the ablation catheter. This may result in better and more effective RF lesions in repeated procedures of atrial fibrillation.

REFERENCES

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Figure 1. Voltage (Panel A1, posterior view; Panel A2, anterior view) and Activation (Panel B1, posterior view; Panel B2, anterior view) maps. Pacing was performed from distal CS. The activation map shows a delayed conduction inside left pulmonary veins. Voltage map shows high voltage in the anterior and superior area of the left veins.

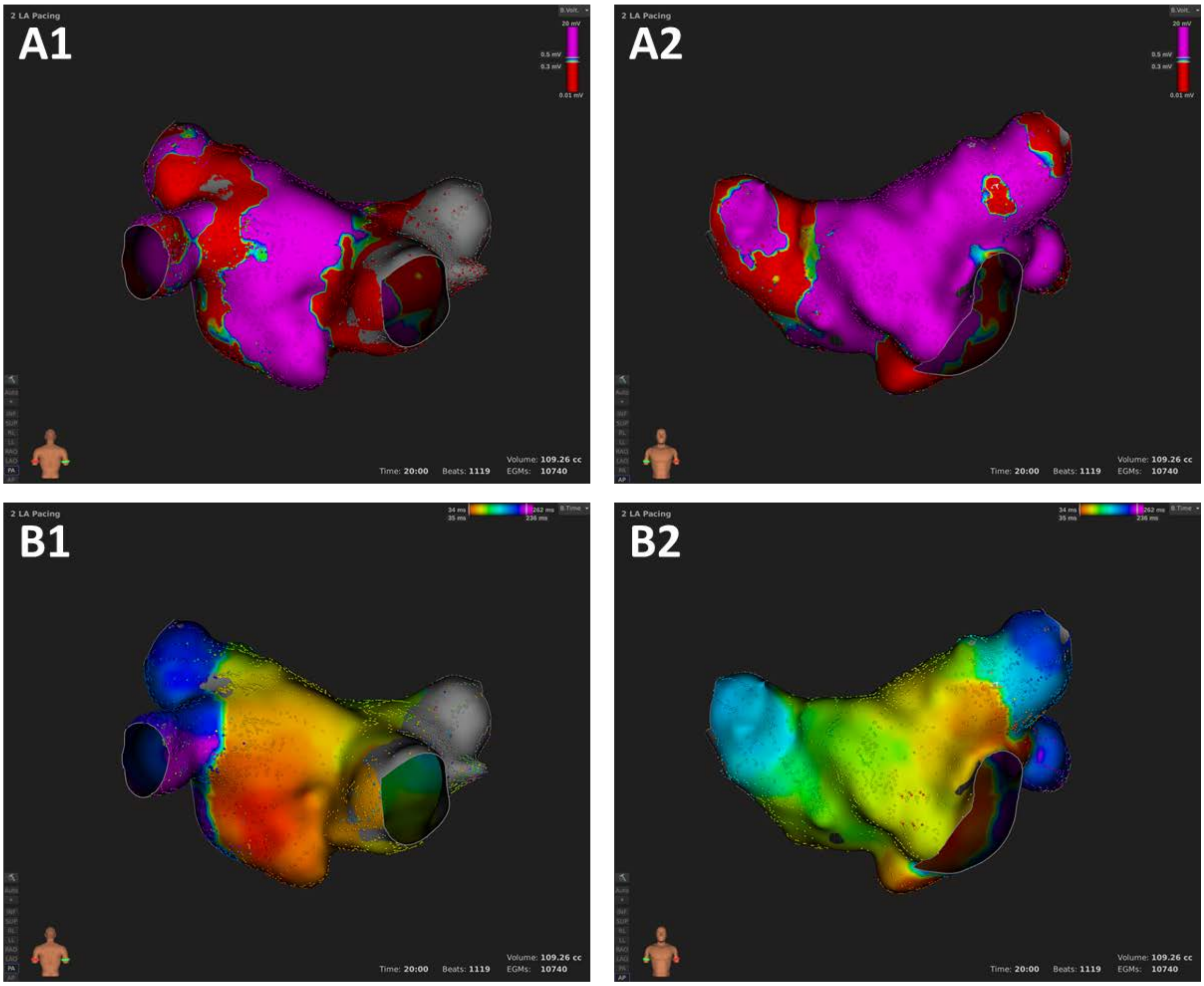


Figure 2. Electrogram in the gap of the previous ablation lesion.

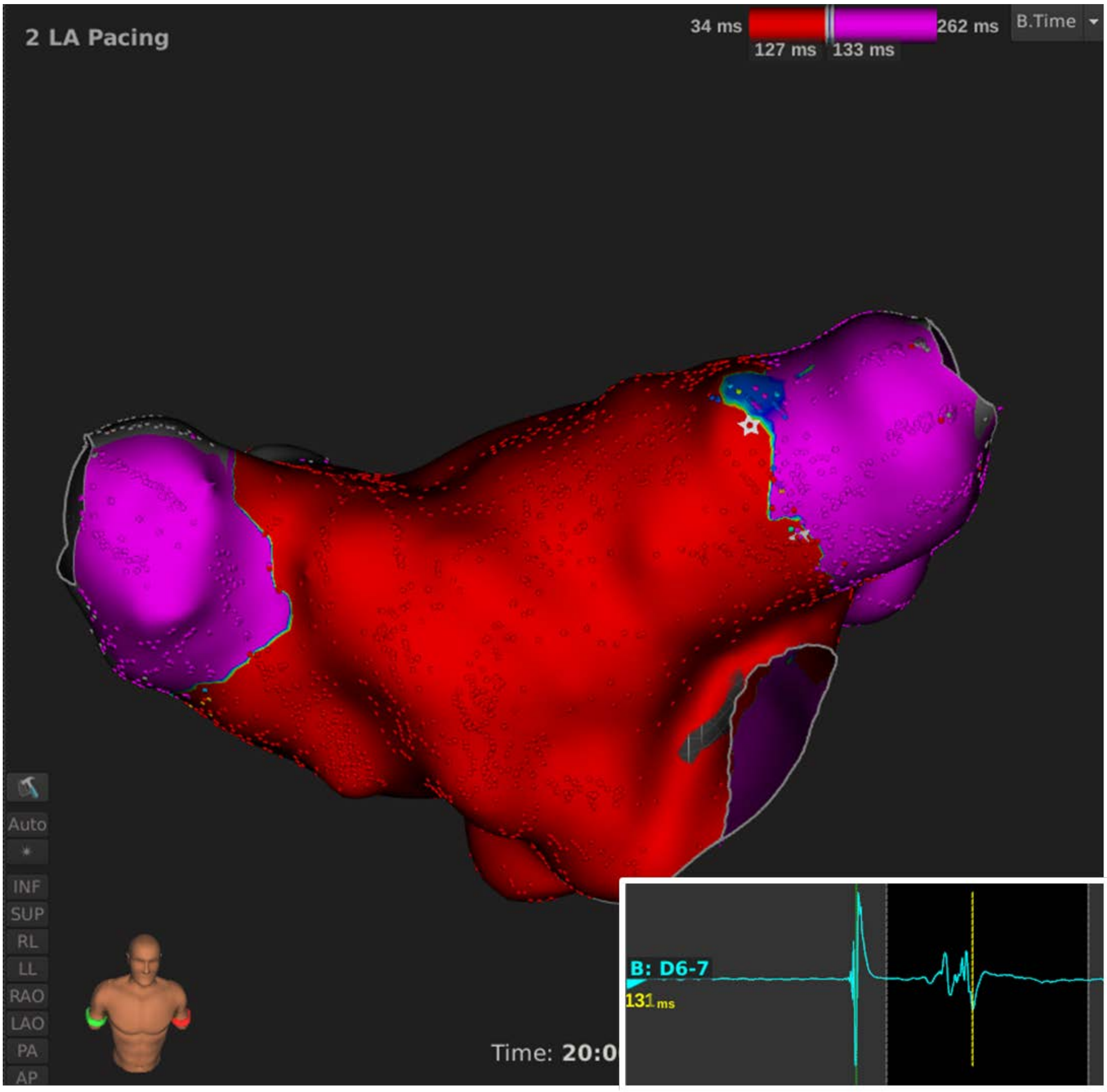


Figure 3. Delayed electrograms inside left inferior pulmonary vein. Electrograms in Orion catheter showed a delayed conduction

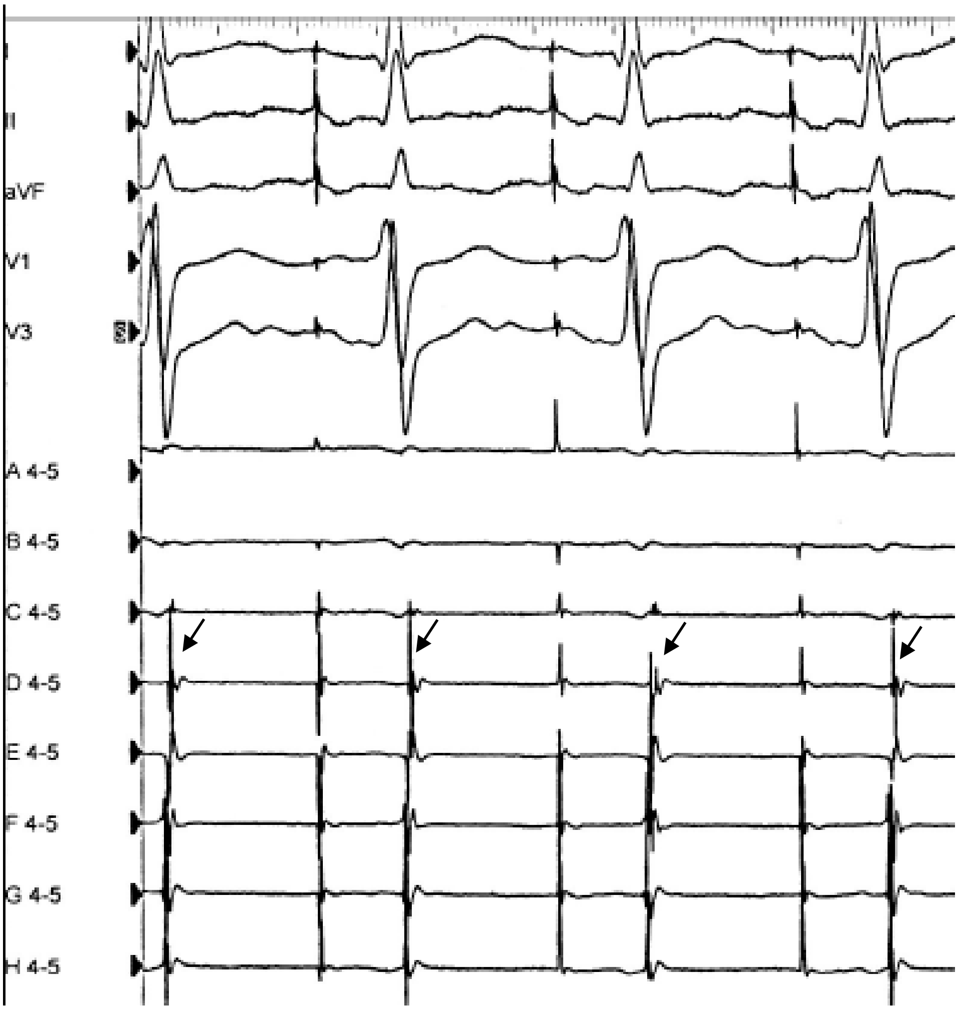


Figure 4. MiFi electrogram in the gap of the previous ablation lesion. Panel A shows the electrogram in MiFi catheter close to the gap whereas Panel B shows the electrogram in the catheter just on the gap. It is possible to see how the conventional dipole shows similar electrogram morphologies (double potential in both cases) whereas the signal in the ME is different (double potential in A and continuous signal – gap in B).

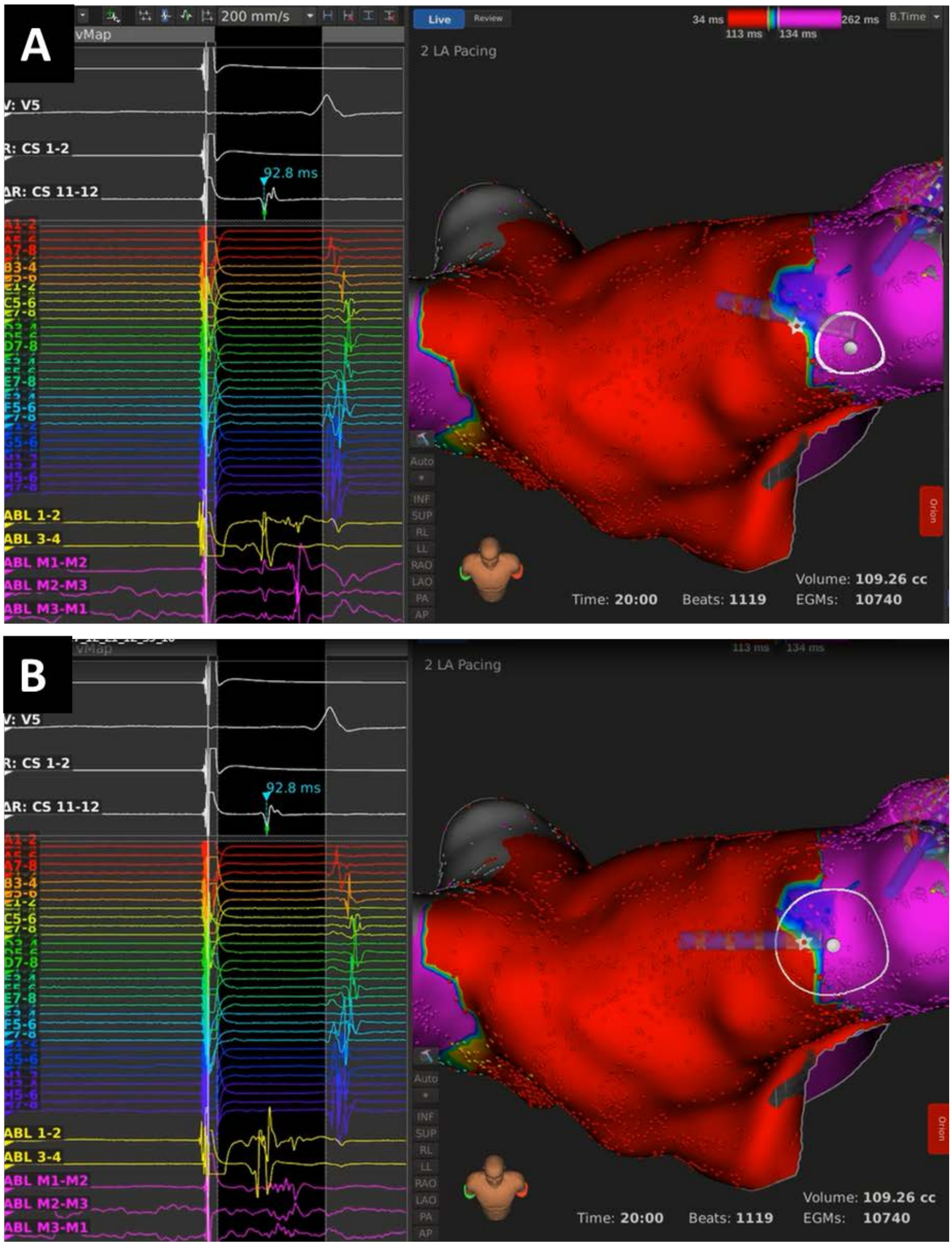
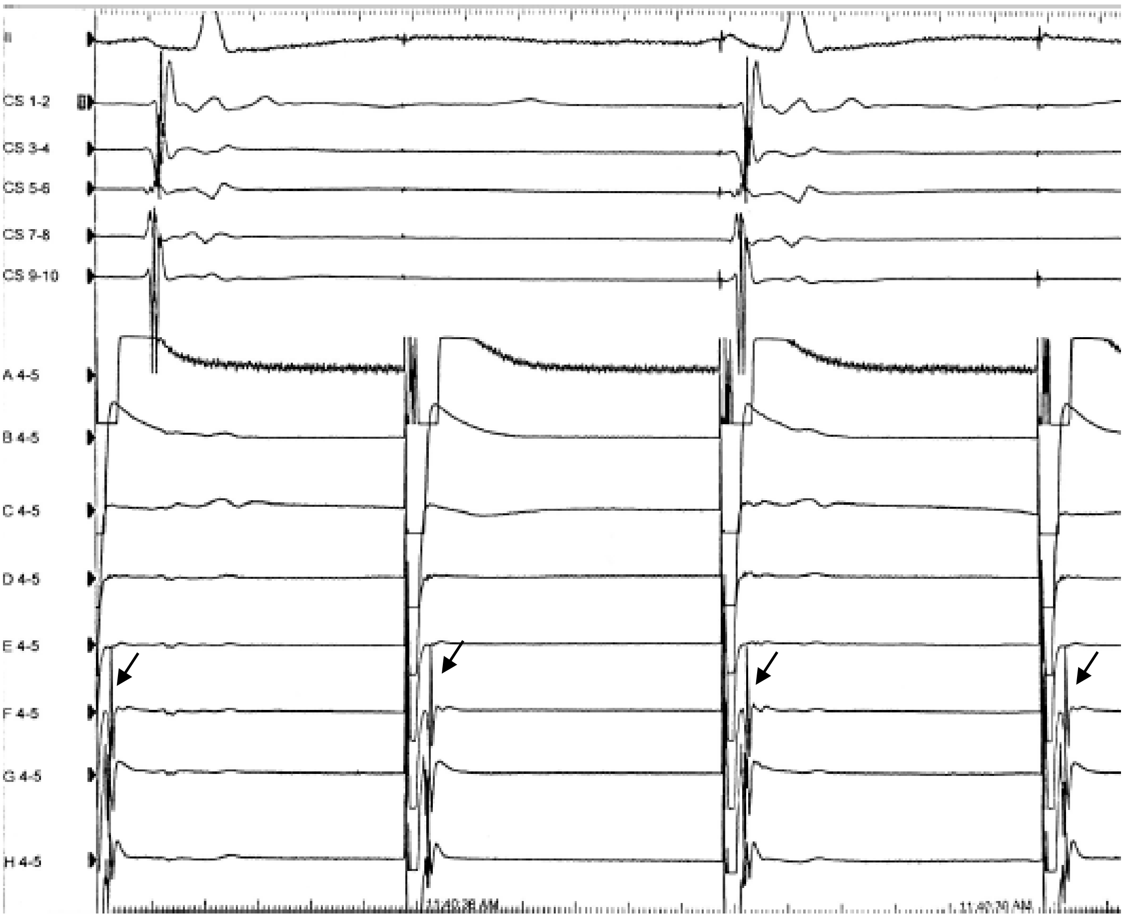


Figure 5. Local capture showing exit block after 30 seconds RF deliver. Pacing was performed from dipole A 4-5 from Orion catheter. Myocardium was capture inside the vein (splines D to H) but it was not transmitted to the left atrium.



Video 1. Propagation map of left atrium (LA) activation. Pacing was made from distal CS. The wavefront activated the LA ridge from inferior to superior and reached the gap (star). Then the wavefront travelled from superior to inferior inside the pulmonary veins.

Video 2. Radiofrequency ablation of the gap. Orion was placed in the LIPV. It is possible to see the complete elimination of the electrograms in Orion (left part of the screen) two seconds after the beginning of RF (upper screen, ablation window. Time 0:45). MiFi electrograms (magenta traces, left screen) showed a very fragmented signal in this position just before the beginning of the RF application.