EP CASE REPORT

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Pulsed-field ablation of recurrent right atrial tachycardia: expanding the use of electroporation beyond atrial fibrillation

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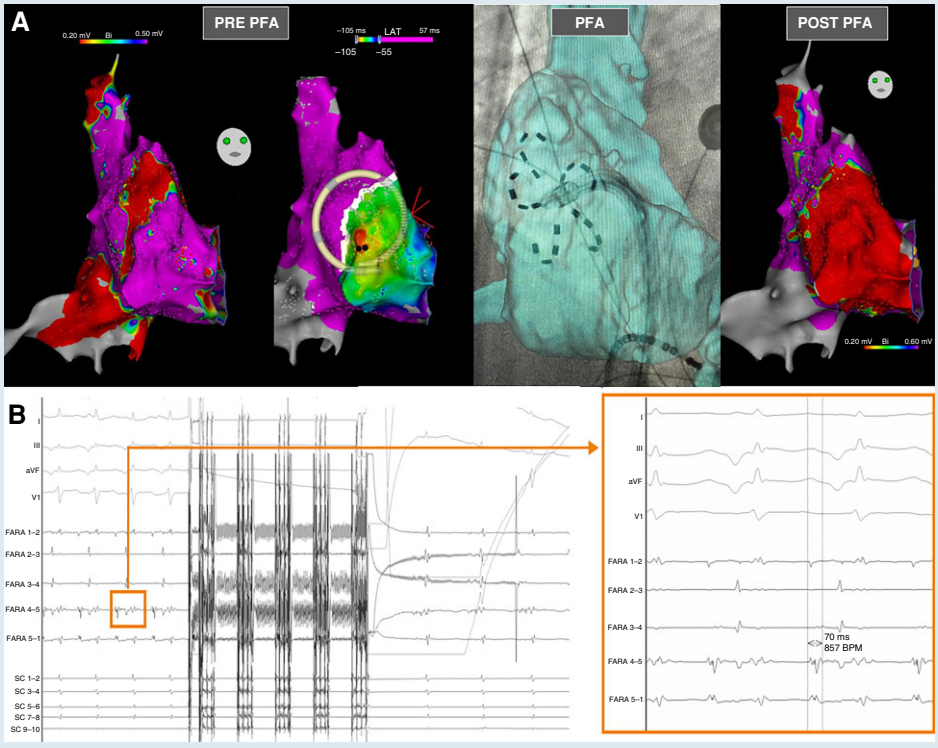

A 68-year-old woman without relevant medical history presents with symptomatic recurrent focal atrial tachycardia arising from the right atrium (RA) refractory to four previous ablation procedures performed under the guidance of a 3D navigation system. The first procedure revealed a tachycardia originating from the right lateral atrial appendage, with acute failure of endocardial ablation due to a constant downward migration of the tachycardia focus. For the second procedure, a cryo-ablation approach was chosen, again with a downward focus-shift phenomenon and suspicion of epicardial origin. In the third ablation attempt, an epicardial approach was intended, achieving acute success of the procedure for the first time (speaking in favour of an epicardial origin), but with tachycardia recurrence within the first 24 h. The fourth ablation procedure was approached with a radiofrequency catheter using half-normal saline irrigation, again with immediate successful outcome but early recurrence with persistence of symptoms. The patient was referred to our institution and a fifth procedure was scheduled with pulsed-field ablation (Farapulse®, Boston Scientific) with the guidance of a 3D-navigation system (CARTO®, Biosense-Webster). The patient arrived to the cath-lab in atrial tachycardia, with negative P-wave in all precordial leads, biphasic morphology in inferior leads with a slightly positive onset but a predominantly negative second component, and positive in DI-aVL. The RA electroanatomical map was performed with the PentaRay® multipolar catheter. The voltage map showed a low-voltage area spreading down from the right appendage to the lateral wall, secondary to the previous ablations targeting a migrant tachycardia focus (*Panel A* , left image). The activation map showed the earliest activation at mid-height of the lateral RA, anterior to the low-voltage area, with a wavefront advancing first downward and then upward behind the scar (thus explaining the biphasic P-wave morphology in inferior leads; *Panel A*, left image; Supplementary material online, *Video S1*). Ablation was performed with the 35 mm Farawave® catheter in flower position. Since it was known from previous procedures that the tachycardia focus had migrated downward from one procedure to another, the 35 mm catheter was preferred over the 31 mm one to cover a larger area. This catheter can be connected and visualized in the CARTO® navigation system as a circular catheter instead of the real 'flower' configuration (*Panel A*, left image, Pre PFA), but due to technical incompatibility, energy deliveries cannot be performed with direct visualization of the Farawave® catheter. To overcome this, we merged a 3D computed tomography scan reconstruction with the fluoroscopy image using the CARTO UNIVU map as reference, allowing for a very accurate anatomical guidance (*Panel A*, middle image, PFA). The first delivery succeeded in terminating the tachycardia with return to sinus rhythm. At the successful site, the atrial signal recorded by the bipole 'FARA 4-5' showed a precocity of −70 ms compared with the onset of the P-wave (*Panel B*). According with the 'optimized biphasic' protocol,[1] a second consolidation application was performed at this same site. Following the same protocol, up to five additional 'double applications' were delivered in the surrounding area to homogenize the scar in the lateral wall, thus allowing to avoid a new migration of the tachycardia focus and

the apparition of potential scar-related reentrant tachycardias (*Panel A*, right image, Post PFA). Right phrenic nerve function was assessed by pacing in the superior vena cava, and as expected according to previous data,[1] no peri-procedural phrenic nerve injury was observed. Since applications were delivered at a safe distance from the sinus node (mid-to-low lateral RA wall), no sinus node dysfunction was detected as assessed by a systematic 24 h Holter monitoring performed immediately after the procedure. In addition, high-density map allowed to identify accurately the His bundle for preventing collateral damage to this sensible structure, and conduction system damage was not observed either. Although recent data have described occurrence of right coronary artery spasm when applying pulsed-field energy in the cavo-tricuspid isthmus,[2] this complication was not observed in our case when applying in the lateral RA wall. The short-term follow up by clinical assessment and Holter monitoring was reassuring, confirming the stability of the sinus rhythm during the first month, unlike the four previous attempts showing a recurrence of the atrial tachycardia during the first 24 h after the procedure, before hospital discharge.

A previous publication from our group proved the efficacy of electroporation to ablate a left atrial flutter.[3] In this case, the extension and transmurality of the lesions provided by the Farapulse® system were keys to eliminate this tricky tachycardia epicardial trigger in the RA without complications.

Supplementary material

Supplementary material is available at *Europace* online.

Conflict of interest: S.B. is consultant for Medtronic, Boston Scientific, Microport, and Zoll.

Data availability

Data available on request from the corresponding author.

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