

SPOTLIGHT

Contrast injection into the right atrial appendage apex using an external irrigation catheter for focal atrial tachycardia ablation

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A 30-year-old woman with palpitations and dyspnea was referred for catheter ablation of incessant atrial tachycardia (AT) that was refractory to antiarrhythmic drugs. The patient had undergone unsuccessful ablation attempts for the AT at another hospital. After the failed attempt, her left ventricular ejection fraction (LVEF) progressively decreased, and preprocedural echocardiography showed the LVEF of 29%. During the AT, electroanatomic mapping was performed using the Rhythmia system (Boston Scientific, Cambridge, MA) with a multielectrode catheter (IntellaMap Orion, Boston Scientific). The activation map revealed a centrifugal pattern from the septal portion of the proximal superior vena cava, but where radiofrequency ablation was ineffective. Preprocedural cardiac computed tomography showed anteromedial and posterolateral lobes of the right atrial appendage (RAA), the latter of which was immediately adjacent to the failed ablation site (Figure 1A). After defining the anatomy of these lobes by right atrial angiography, further activation mapping in the posterolateral RAA was attempted with the Orion catheter supported by a deflectable sheath (Agilis, Abbott Medical, St Paul, MN). However, the apex of the posterolateral RAA was too small to introduce the mapping catheter into its endocardial cavity. Therefore, an external irrigation catheter (IntellaNav MiFi OI, Boston Scientific) was gently advanced into the posterolateral RAA apex, with manual contrast injection through the external irrigation lumen using a 5-ml syringe (Figure 1B; Movie S1). A total of 15 ml of undiluted contrast medium was injected using this technique, and finally, the earliest activation site (EAS) was identified in the RAA tip (Figure 2). Immediately after complete washout of the contrast medium from the irrigation lumen, the contrast medium was still

suspended in the posterolateral RAA apex. Under fluoroscopic guidance with the remaining contrast medium, radiofrequency energy was applied to a site just proximal to the EAS using power-control mode at 15 W with the temperature limit of 41°C and normal saline irrigation flow (Movie S1), resulting in prolongation of the AT cycle length followed by termination of the AT. Additional ablation around the site rendered any AT non-inducible. No complications occurred. At 12 months of follow-up of the patient, 24-hour Holter monitoring showed no evidence of recurrent AT without antiarrhythmic drugs, and the LVEF improved to 53%.

The right and left atrial appendage can provide arrhythmogenic sources of focal ATs. These ATs are often refractory to catheter ablation because of complex atrial appendage anatomy and risk of cardiac tamponade, especially when the apex of the atrial appendage serves as their focal source. Moreover, unsuccessful ablation attempts to eliminate such ATs can fail to resolve tachycardia-induced cardiomyopathy. Therefore, even in younger patients with tachycardia-induced cardiomyopathy because of these ATs refractory to ablation, elimination of their sources sometimes requires surgical atrial appendectomy.

In this case, although right atrial angiography delineated the structure of the anteromedial and posterolateral lobes of the RAA, the external irrigation catheter could not be introduced into the latter lobe because of the small size of its cavity. Therefore, we performed mapping in the posterolateral RAA apex with manual contrast injection through the external irrigation lumen, which allowed real-time display of its cavity while the catheter was gradually moved in the direction of the EAS during the AT. In general,

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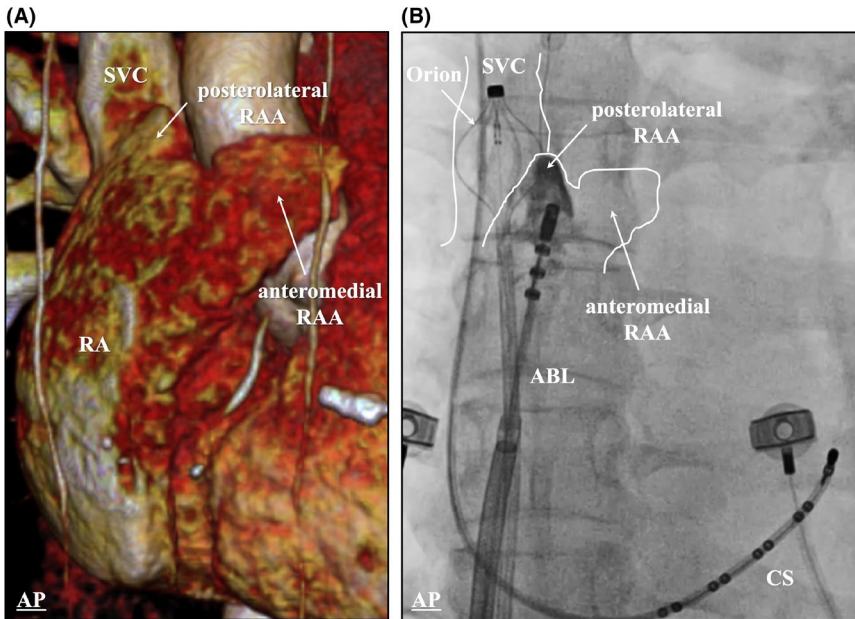


FIGURE 1 Three-dimensional computed tomography of the right atrium (RA) (A) and contrast venography of the apex of the posterolateral right atrial appendage (RAA) (B). ABL, ablation catheter; AP, anteroposterior; CS, coronary sinus; d, distal; EAS, earliest activation site; p, proximal; SVC, superior vena cava

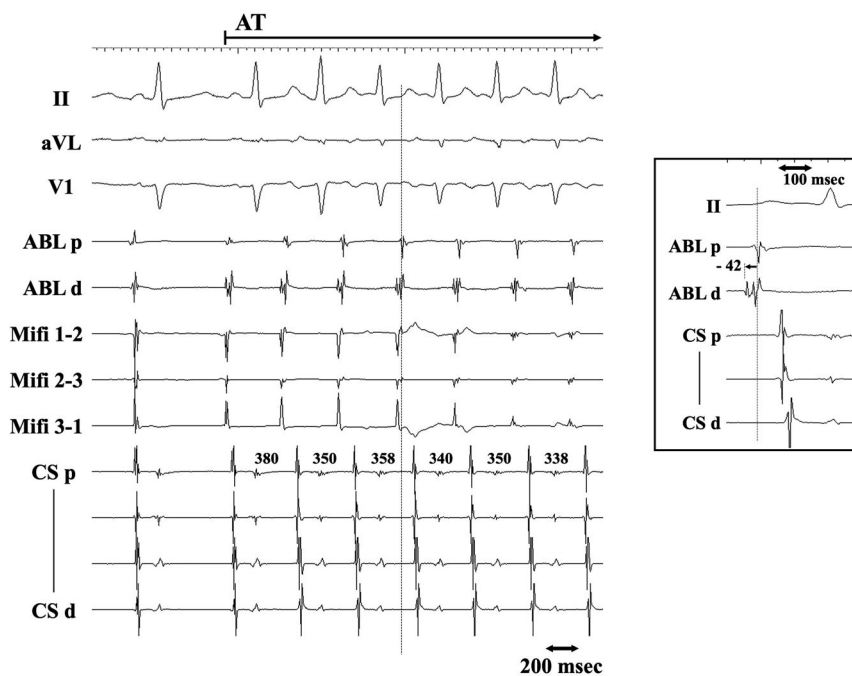


FIGURE 2 Cardiac tracings exhibiting the successful ablation site of the atrial tachycardia (AT) originating from the tip of the posterolateral RAA. ABL, ablation catheter; AT, atrial tachycardia; CS, coronary sinus; d, distal; p, proximal

when mapping focal ATs originating from the RAA apex, atrial angiography is useful for defining the position of the catheter relative to the RAA apex. However, this relative position can be confirmed only during atrial angiography. To make matters worse, respiration continuously changes the distance between the endocardial surface and the tip of the catheter. In fact, inspiration induced craniocaudal movement of the cardiac chambers, thereby reducing the distance between the tip of the RAA and that of the mapping catheter, as shown in Movie S1. Furthermore, deep inspiration may rapidly induce such a large movement of the RAA cavity, resulting in excessive contact force between the tissue-catheter interface. In this case, the closer the tip of the external irrigation catheter was to the AT source, the more likely its relative position to the RAA tip was to be affected by deep inspiration. However, during

mapping and ablation of the AT source, fluoroscopic guidance with manual contrast injection through the external irrigation lumen and that with the remaining contrast in the cavity of the posterolateral RAA apex allowed for a direct appreciation of the distance between the tip of the RAA and that of the catheter. Thus, with a combined use of contact force-guided mapping, a direct visualization of the RAA lobe by this technique might have a potential to reduce a risk of RAA perforation associated with a respiratory fluctuation and improve the efficacy of catheter ablation of focal AT sources in the RAA apex, especially at its tip.

In summary, using external irrigation catheters, contrast injection into the RAA apex can facilitate mapping of focal ATs originating from the RAA apex and may provide safe and effective radiofrequency energy applications to their sources even in the RAA tip.

CONFLICT OF INTEREST

Authors declare no Conflict of Interests for this article.

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SUPPORTING INFORMATION

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