Revisiting anatomic macroreentrant tachycardia after atrial fibrillation ablation using ultrahigh-resolution mapping: Implications for ablation

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BACKGROUND Anatomic macroreentrant atrial tachycardias (MATs) are conventionally reported to depend on the cavotricuspid isthmus, the mitral isthmus, or the left atrial roof, and are commonly seen following catheter ablation for atrial fibrillation.

OBJECTIVES To define the precise circuits of anatomic MAT with ultrahigh-resolution mapping.

METHODS In 57 patients (mean age, 62 years; 10 female) who developed ≥1 anatomic MAT, we analyzed 88 MAT circuits including 16 peritricuspid, 42 perimitral, and 30 roof-dependent circuits, using high-density mapping and entrainment.

RESULTS Of 16 peritricuspid atrial tachycardias (ATs), 8 (50.0%) showed a circuit not limited to the tricuspid annulus. However, cavotricuspid isthmus ablation terminated the tachycardia in all patients. Similarly, 26 of 42 perimitral ATs (61.9%) showed a circuit not limited to the mitral annulus, and a low-voltage zone <0.1 mV around the mitral annulus was associated with nontypical perimitral ATs ($P < .0001$). The practical isthmus was not in the mitral isthmus in 13 of these 26 perimitral ATs (50%). Finally, 22 of 30 roof-dependent ATs (73.3%) had a circuit not rotating around both pairs of pulmonary veins. Brief assessment of the activation direction on the posterior wall in relation to that on the septal, anterior, and lateral wall helped deduce the circuit of roof-dependent AT in 27 of 30 (90.0%). Practical isthmus was not in the roof in 8 of 22 (36.4%). Practical isthmuses mapped with the system were significantly shorter than the usual anatomic isthmuses (16.1 ± 8.2 mm vs 33.7 ± 10.4 mm) ($P < .0001$).

CONCLUSIONS High-density mapping successfully identified the precise circuits and the practical isthmus of anatomic MATs in patients with prior atrial fibrillation ablation.

KEYWORDS Atrial fibrillation; Atrial flutter; Atrial tachycardia; Catheter ablation; Macroreentrant tachycardia

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Anatomic macroreentrant atrial tachycardias (MATs) are usually reported to be dependent on stereotyped isthmuses, at the cavotricuspid isthmus (CTI), mitral isthmus (MI), and left atrial roof. These arrhythmias are commonly seen following catheter ablation of atrial fibrillation (AF).[1–4] Although the incidence of these anatomic MATs after AF ablation has been reported to be as high as 58%–100%,[2,5–7] the precise circuits of these MATs have not been described systematically. Entrainment and activation mapping are the fundamental techniques for identifying the critical path of the reentrant circuit.[8] However, after multiple AF procedures, tachycardia circuit frequently follows a complicated course between prior ablation scars or fibrotic areas, and it is not easy to demonstrate the entire atrial tachycardia (AT) circuit

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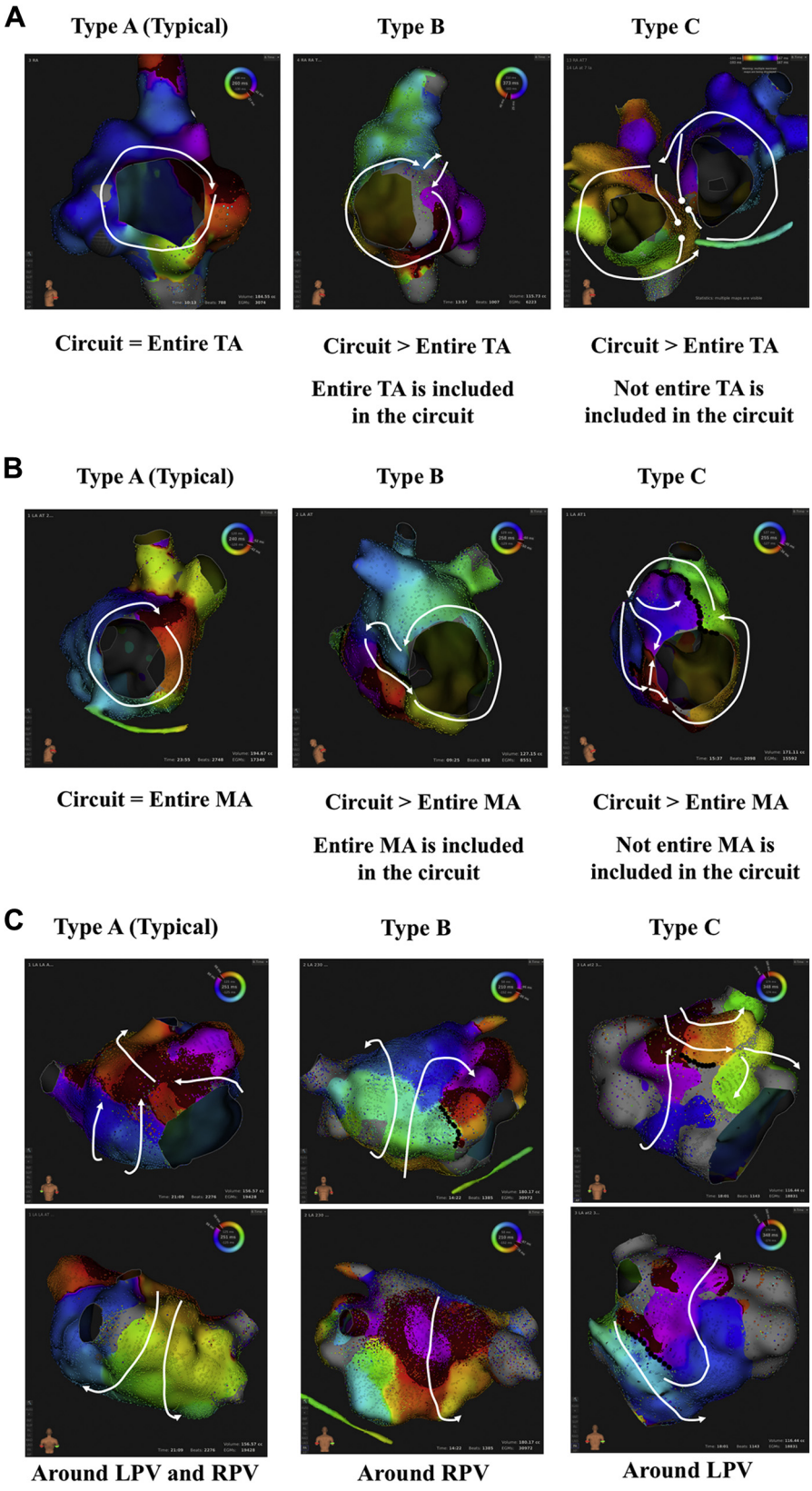

Figure 1 **A:** Three types of peritricuspid atrial tachycardia (AT). A typical circuit proceeded around the tricuspid annulus (TA) and is defined as type A. A circuit of type B includes the entire TA and some additional track, and a type C circuit uses part of the TA but also depends on an extra path to return to the cavotricuspid isthmus (CTI). **B:** Three types of perimitral AT. Perimitral AT circuits are classified into 3 types in a similar manner to those of peritricuspid AT. **C:** Three types of roof-dependent AT. Typical roof-dependent macroreentrant atrial tachycardia (MAT), rotating around both pairs of pulmonary veins (PVs), is defined as type A, whereas type B rotates only around the right PVs and type C only around the left PVs. Black points indicate manual annotation of the lines of block; a line of block is defined as the lesion where the activation is completely stopped on the front, detouring around the lesion.