

SPOTLIGHT

Peri-mitral flutter with epicardial bypass after surgical maze procedure

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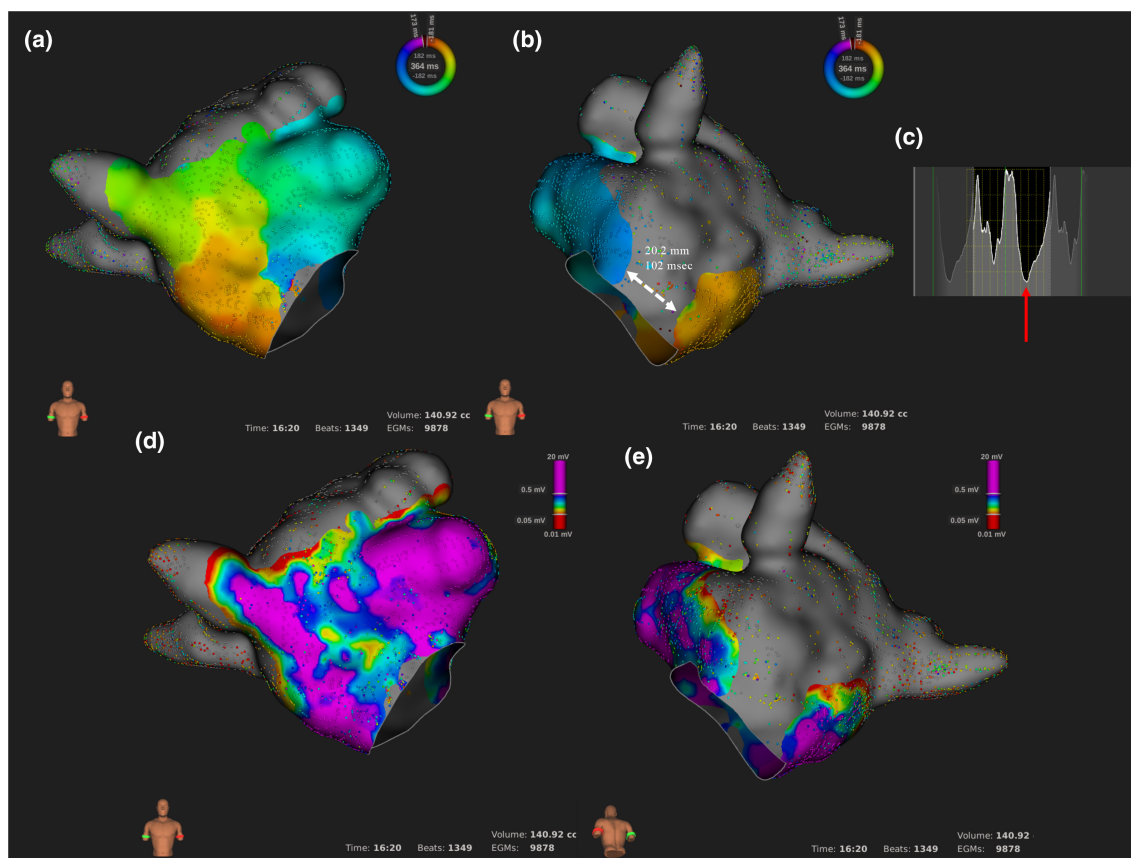


FIGURE 1 (A and B) Activation map of LA (the confidence mask level was 0.03 mV). Skyline showed a valley pattern, which indicated the uncovered activation gap (C). (D and E) Voltage maps of LA. Low voltage zone was defined as ≤ 0.5 mV. Pulmonary vein isolation, left posterior isolation, and mitral isthmus line appeared all maintained in this map. The distance and activation gap of mitral isthmus were 20.2 mm and 102 ms, respectively

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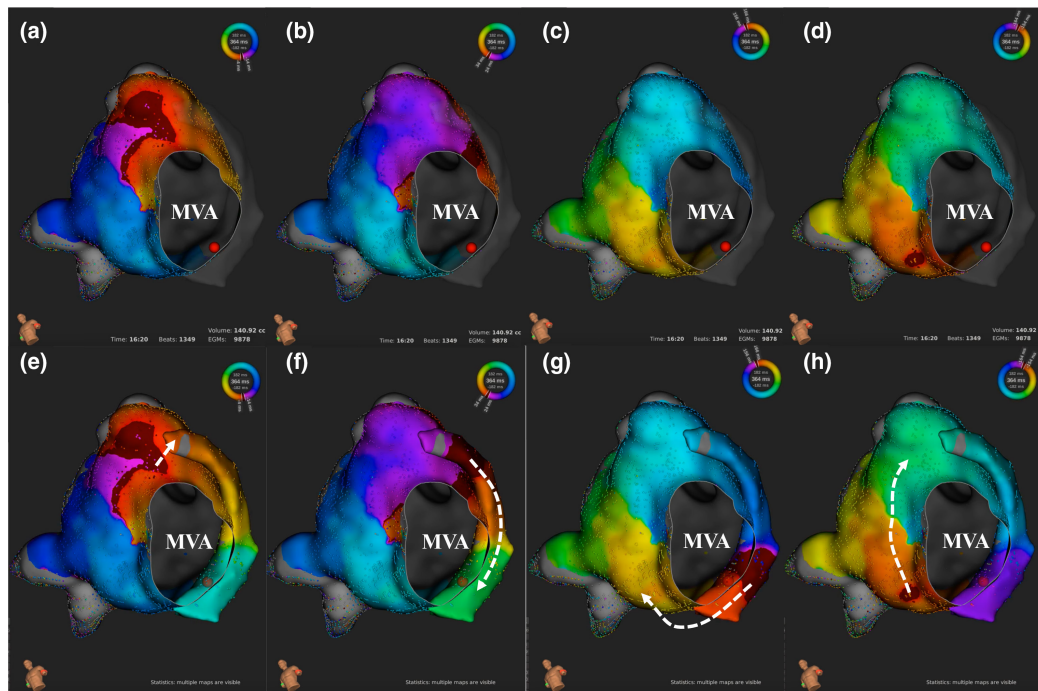


FIGURE 2 (A-D) and (E-F) Activation map with and without CS. The tachycardia turns around the mitral annulus with epicardial bypass involving CS. The red tag shows the ablation site. MVA, mitral valve annulus

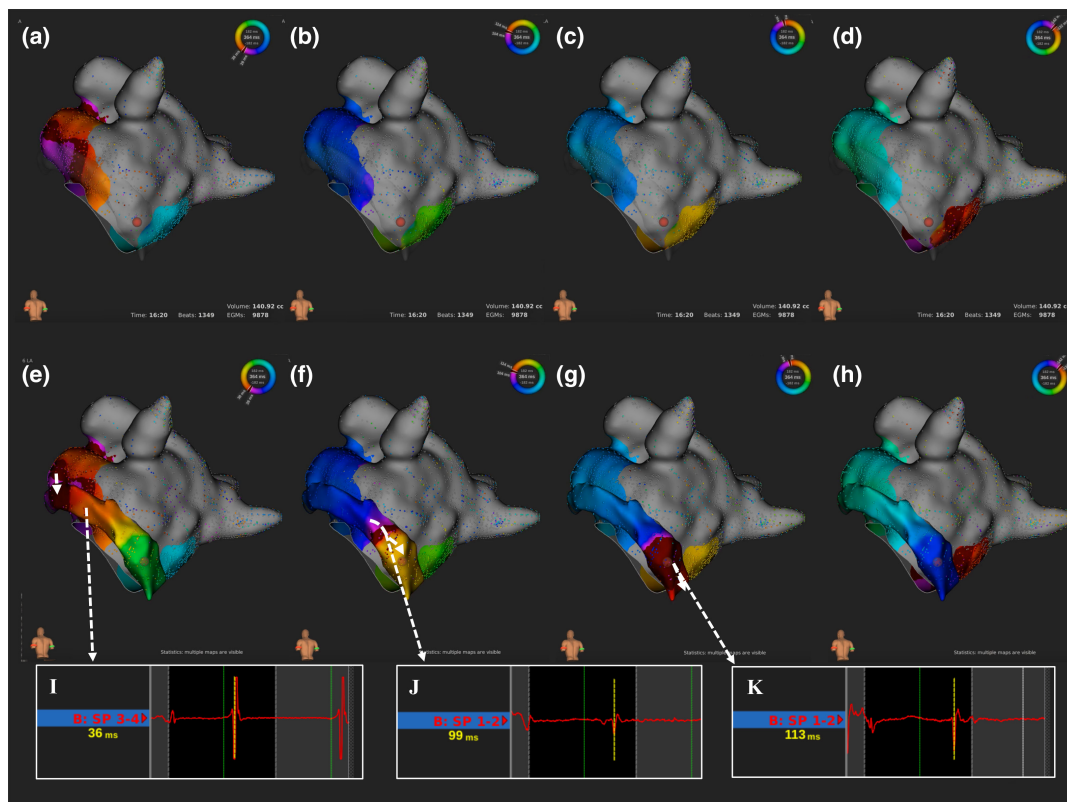


FIGURE 3 (A-D) and (E-F) Activation map with and without CS from posterior angle. (I-K) Local potential in CS and (K) local potential at the ablation site. These panels demonstrated that CS conducted the excitation of AT when the endocardial myocardium did not

Although maze procedure has been used as a surgical treatment of atrial fibrillation (AF), the incidence of arrhythmia recurrence is relatively high and peri-mitral flutter (PMT) is a common cause of the recurrence.¹ The reconnection of peri-mitral block line has been observed in many cases after the surgical maze procedure and is related to the arrhythmia recurrence.² Thus, the ablation target for this PMT after maze procedure is the residual conduction in the mitral isthmus area. We experienced a rare case of PMT after the surgical maze procedure in which the reentrant circuit bridged over the peri-mitral isthmus block through an epicardial bypass via the coronary sinus.

A 72-year-old woman was referred to our hospital for radiofrequency catheter ablation (RFCA) of a drug resistance atrial tachycardia (AT). She underwent an open-heart surgery for the treatment of atrial septal defect, partial anomalous pulmonary venous connection, and AF when she was 70 years old. Cryothermal maze procedure was performed as a part of the surgery. AT was firstly noted 2 years after the maze procedure.

AT was sustained at the beginning of RFCA. The tachycardia cycle length (TCL) slightly varied in a range between 356 and 364 ms. Post-pacing intervals (PPIs) at lateral aspect of the right atrium and at posterior wall of left atrium (LA) were 538 ms and 395 ms, respectively, and PPIs at the distal part and proximal part of CS equaled to the TCL. These findings indicated that the tachycardia originated from LA. A 3D map created by an ultra-high-density mapping system (Rhythmia™ Mapping System, Boston Scientific, Maple Grove, MN) demonstrated that the total activation time in LA was 364 ms, also suggesting that the tachycardia originated from LA (Figure 1A-E). Pulmonary vein isolation, left posterior isolation, and mitral isthmus (MI) line appeared all maintained in this map. Although the total activation time satisfied the tachycardia cycle length, Skyline showed a “valley” pattern (Figure 1C), which indicated the presence of an activation gap. The gap was identified at mitral isthmus and spatial and temporal gaps were 20.2 mm and 102 ms, respectively. Additional mapping of coronary sinus (CS) by IntellaNav Stable Point (Boston Scientific, Maple Grove, MN) filled the gap of the LA map, resulting in completion of the entire tachycardia circuit (Figures 2 and 3, supplemental video 1, 2). Although we did not perform the CS venography to confirm the presence of the vein of Marshall, the PPIs at the three different sites in CS were equal to the TCL. These findings led us to diagnose that the tachycardia was a PMT with epicardial bypass involving CS. Ablation was performed to the CS fiber within CS on the opposite side of the mitral isthmus scar (Figures 2 and 3, red tag) and the tachycardia was terminated immediately after the initiation of energy delivery. Creation of complete block line in the CS causes the CS stenosis and the arrhythmia induction was performed after the ablation. Any tachycardia was not induced by atrial pacing and the procedure was ended.

To the best of our knowledge, this is the first to report a PMT with CS bypass after the surgical maze procedure. After the transcatheter RF MI ablation, residual myocardial connections in the LA may be present and become the cause of arrhythmia recurrence.³ Epicardial bypass through the vein of Marshall sometimes causes arrhythmia recurrence after the MI ablation or maze procedure.^{4,5} Our case demonstrates that the similar phenomenon across the CS can occur after the surgical maze procedure in which residual myocardial connections in the LA did not exist. The high-density mapping was useful to show the detail tachycardia circuit.

CONFLICT OF INTEREST

The authors have no conflicts of interest to disclose.

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SUPPORTING INFORMATION

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