Successful catheter ablation of atrial tachycardia with concealed low-voltage activity using high density mapping

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Introduction: Improvement in the high-density, high-resolution mapping technology was known to help clinical in identifying micro-reentry, rapid remapping, and better substrate characterizing. Recent reports suggested that using high density mapping technology may detected residual atrial activity after pulmonary vein isolation. Here we presented a case that the arrhythmia focus was identified inside heavy scar.

Methods: A 58-year-old female, who received tricuspid and pulmonary valve replacement surgery with right atriotomy and pulmonary arteriotomy due to carcinoid syndrome 12 years before, admitted for recurrence of atrial flutter and atrial tachycardia. Previous catheter ablation was performed at the right atriotomy scar but this patient suffered from recurrence of symptomatic tachyarrhythmia.

Result: Catheter ablation was performed with micro-basket IntellaMap Orion™ catheter and Rhythmia™ mapping system. The initial arrhythmia was found to be cavo-tricuspid isthmus dependent atrial flutter. The arrhythmia changed in cycle length and changed into atrial tachycardia with slower cycle length. The 2nd arrhythmia was found to originate from septal side of low cristae terminalis where previous right atriotomy scar was located. With the standard mapping setting (figure), only a large scar could be identified at low cristae and the no atrial activity could be identified with large pole electrode (ablation catheter). However, while lowering the confidence level of electroanatomical mapping system, a zone of concealed low-voltage atrial activity could be found by the micro-basket high-resolution mapping catheter. Fractionated potential preceding the atrial activation could be identified inside this concealed atrial activity area. The entrainment maneuver from ablator could not capture this concealed atrial activity but was out-of-circuit while pacing from free-wall side of lower cristae terminalis. We delivered radiofrequency at the central of concealed atrial activity area and terminated the sustained arrhythmia into sinus rhythm immediately. A further inducibility test showed another 3rd arrhythmia at septal side of upper cristae which was also mapped with high density mapping method and ablated smoothly. The 4th arrhythmia shared a similar cycle length with the 2nd arrhythmia and was activated from the septal side of the low cristae terminalis which presented with a scar area after the ablation attempt during 2nd arrhythmia ablation. The arrhythmia was terminated at the breakout point linking the concealed atrial activity zone. No more arrhythmia could be inducible during the final electrophysiology test even stressed with Isoprenaline.

Conclusion: The true arrhythmogenic focus might be concealed low-voltage activity hidden in dense scar. High-density, high-resolution mapping method with small inter-electrode space might unmask the critical electrical activity.