Isolation of the arrhythmogenic vein of Marshall in a patient with atrial fibrillation

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**Introduction**: The electrical pulmonary vein (PV) isolation by catheter ablation has been established as an curative treatment for the paroxysmal atrial fibrillation (AF). The durability of the PV isolation has much improved recently with the progression of the modality. In such milieu, significance of the non-PV foci has been highlighted with regard to the AF recurrence since the reconnection of PVs has decreased. The vein of Marshall (VOM) is known as one of the important non-PV foci of AF which exists on the epicardium of the left atrium. But little is known how to approach arrhythmogenic VOM. The ethanol infusion is one of the treatment option, but accompanies some limitations. We describe an AF patient who had an arrhythmogenic VOM which was electrically isolated successfully by the radiofrequency (RF) catheter ablation.

**Methods**: A-68-year-old man with longstanding persistent AF was referred for catheter ablation. The initial ablation consisted of PV isolation, left posterior atrium isolation, mitral isthmus (MI) ablation and cavotricuspid isthmus ablation. After the initial ablation, the patient suffered from recurrent symptomatic paroxysmal AF. Then the patient underwent the second ablation procedure.

**Result**: Electrical isolation of the PV and the left atrial posterior wall were confirmed. Perimital atrial flutter (PMF) was induced. According to the previous study, the assessment of electrical conduction through the VOM by inserting a 2Fr electrode catheter could clarify the existence of an incomplete conduction block of MI and contribute to an easier MI ablation. Therefore, we inserted a 2Fr electrode catheter to VOM. During MI linear ablation, PMF was terminated. After that, frequent premature atrial contractions from the distal VOM were observed. Although VOM potentials could not be observed by the endocardial ablation catheter, we anatomically ablate the VOM from the endocardium in the guidance of the catheter inserted to the VOM. After endocardial RF deliveries were performed along the VOM electrode catheter, the ablation catheter was inserted into the coronary sinus (CS). Finally, the electrograms of the VOM recorded by the VOM catheter were disappeared by RF application at the branching portion of the VOM in the CS (figure). The infusion of the isoproterenol provoked automatic activity of the VOM. Pacing from the VOM electrodes with adjusting the output could exclusively capture the VOM with the exit block. No tachycardias were induced after the procedures.

**Conclusion**: In the previous study, the VOM said to have electronic connections to left atrium and CS musculature. The present case suggested that radiofrequency application at all these connection might isolate the VOM. The VOM isolation is the definite endpoint for treating arrhythmogenic vein of Marshall. We experienced the AF patient with the automaticity of the VOM and successfully isolated the
VOM by RF catheter ablation.