

Case Report

Spontaneous Transition from Atrial Fibrillation to Typical Atrial Flutter during Catheter Ablation of the Pulmonary Vein

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Abstract. A 71-year-old male patient was admitted for catheter ablation of the pulmonary veins to treat paroxysmal atrial fibrillation. Atrial fibrillation originating from the left superior pulmonary vein was induced after a pause of atrial pacing under isoproterenol infusion and became sustained. Spontaneous transition from atrial fibrillation to typical atrial flutter was noted after complete isolation of the pulmonary vein focus from the left atrium. Subsequently linear ablation of the cavotricuspid isthmus was created with completely bidirectional isthmus conduction block. We hypothesized that ectopic pulmonary vein focus played an important role in the spontaneous conversion of atrial fibrillation to typical atrial flutter, and complete isolation of the pulmonary vein could stop the spontaneous transition between the two atrial tachyarrhythmias.

Key Words. atrial fibrillation, atrial flutter, pulmonary vein, catheter ablation

Case Report

A 71-year-old male patient had many episodes of paroxysmal atrial fibrillation (AF) with rapid ventricular response. He was admitted for catheter ablation of AF after ineffective treatment with antiarrhythmic drugs. AF was initiated by ectopic activity after a pause of atrial pacing and isoproterenol infusion. The ectopic focus was located in the left superior pulmonary vein (LSPV). Radiofrequency catheter ablation of the arrhythmogenic PV was performed during AF. Spontaneous transition from AF to typical atrial flutter (AFL) was noted after eight applications of radiofrequency energy for sequential isolation of the PV from the left atrium (Fig. 1). Then linear ablation of the cavotricuspid isthmus during typical AFL was achieved with bidirectional conduction block. Complete isolation of the LSPV from the left

atrium was confirmed after successful ablation, and AF or typical AFL could not be induced again by using the same induction methods (atrial pacing plus isoproterenol infusion) before ablation.

Discussion

Several investigators have reported on the possible mechanisms of spontaneous transition between typical AFL and AF, however, the true mechanism is still unclear [1–4]. Recently, AF was considered to be initiated by ectopic foci. Most of them originated from the PVs [4,5]. This interesting finding supported the hypothesis that AF could be maintained by ectopic foci, rather than by multiple wavelets. In addition, several evidences were reported to explain the possible onset mechanism of spontaneous transition between typical AFL and AF [4,6,7]. All of them emphasized the importance of ectopic AF foci to initiate the spontaneous AF. Our previous study reported that spontaneous conversion of typical AFL to AF was triggered by ectopic foci [4]. Elimination of these ectopic foci could stop the spontaneous transition from typical AFL to AF. However, there is no clear evidence to explain the possible mechanism that spontaneous transition from AF to typical AFL was caused by termination of rapid depolarization of ectopic AF foci.

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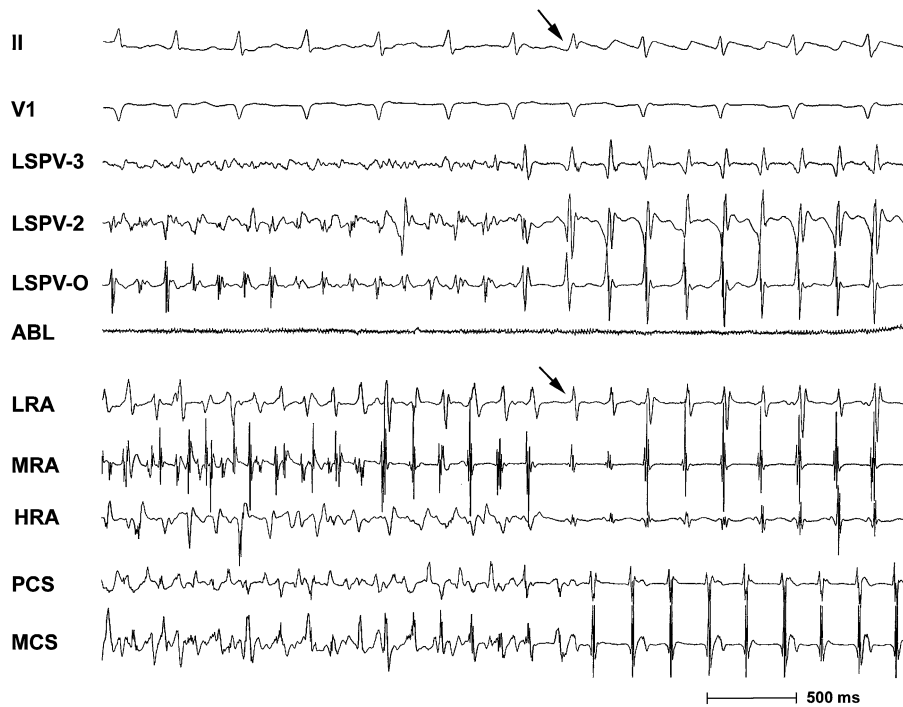


Fig. 1. Radiofrequency catheter ablation of the left superior pulmonary vein by sequential isolation technique was performed in one patient during atrial fibrillation. After eight applications of energy, spontaneous transition from atrial fibrillation to typical atrial flutter was noted (arrow). Displayed from top to bottom are ECG lead II, V1, left superior pulmonary vein (LSPV) from ostium (O) to distal portion (3), low right atrium (LRA), middle right atrium (MRA), high right atrium (HRA), proximal coronary sinus (PCS), middle coronary sinus (MCS), and ablation catheter (ABL).

In this case, spontaneous conversion of AF to typical AFL was noted after elimination of the arrhythmogenic PV. It suggested that ectopic foci also played an important role in maintenance of AF. Therefore, eradication of firing from ectopic foci could convert AF to typical AFL. Of course, we could not completely exclude the possibility of coexistence of AF in the left atrium and typical AFL in the right atrium [8,9]. Furthermore, AFL may coexist frequently with AF spontaneously or during programmed stimulation [10,11]. However, disorganized atrial potentials in the right atrium during AF did not support such coexistence (Fig. 1). On the other hand, the evidence of the PVs in the maintenance of AF was not good enough by only using several mapping catheters in both atria and it could be the major limitation in this case. In addition, right atrium was also very important in the initiation of AF and recurrences of AF after PV isolation [12]. Therefore, combined linear ablation of the right atrium and isolation of the PVs could be an effective therapy in patients with AFL and AF [4,13]. Finally, we also could not exclude the possibility that spontaneous conversion of AF to typical AFL occurred only by chance, not affected by catheter ablation of the arrhythmogenic PV.

In conclusion, spontaneous conversion of AF to typical AFL was noted after elimination of the arrhythmogenic PV. This finding may further support the importance of ectopic AF foci in spontaneous transition between AF and typical AFL.

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