

# Catheter ablation of atrial tachycardia originated from the ostium of anomalous drainage between left interior pulmonary vein and left atrial appendage

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## Abstract

Atrial tachycardia from the left atrium is well recognized, the common origin was identified at mitral annulus, left atrial appendage (LAA) and pulmonary vein (PV). However, there is no report about AT in patient with anomalous pulmonary venous drainage. We report one case with focal AT originating from the ostium of anomalous drainage between left interior PV and LAA.

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**Short title:** AT originated from the anomalous drainage between LIPV and LAA

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## Catheter ablation of atrial tachycardia originated from the ostium of anomalous drainage between left interior pulmonary vein and left atrial appendage

Atrial tachycardia (AT) from the left atrium are well recognized. In most cases, such arrhythmias usually occur in patients without structural heart disease; the common origin was identified at mitral annulus, left atrial appendage (LAA) and pulmonary vein (PV)<sup>1,2</sup>. However, there is no report about AT in patient with anomalous pulmonary venous drainage. We report one case with focal AT originating from the ostium of anomalous drainage between left interior PV (LIPV) and LAA.

## Case report

An 18-year-old man with paroxysmal AT for six months was referred to our center for catheter ablation. The echocardiogram did not suggest any evidence of malformation or structural heart disease and showed a normal

left ventricular ejection fraction. The 24-Holter monitoring reveal high burden of AT (84.6%) with prolonged sinus pauses (5.38sec) following the self-termination of AT. The P wave of 12-lead electrocardiogram (ECG) during the AT is shown in *Figure 1B*. This patient's imaging was obtained by multidetector computed tomography, and using retrospective electrocardiographic gating (Somatom Definition and Force, Siemens Medical System, Germany), the axial CT imaging show the anomalous drainage between LIPV and LAA, and the dilatation of distal LIPV and the stenosis of proximal LIPV were also observed (*Figure 1A*).

The electrophysiology study was performed in the fasting state under conscious sedation with administration of intravenous fentanyl. The coronary sinus (CS) activation sequence demonstrated the AT originated from left atrium (LA) using a 6F decapolar catheter (Diag, St. Jude Medical Inc., St. Paul, MN, USA); After transseptal puncture, intravenous heparin was administered to maintain an activated clotting time of 250 to 350 seconds, an irrigated catheter (Navi-star, Biosense Webster) was inserted into the LA for mapping and ablation using a CARTO system. An activation map of the LA revealed that the site of earliest activity during tachycardia was broad at the LAA ridge and LIPV inferior ostium; however, the activation time at proximal ABL catheter was earlier than the distal ABL catheter. We drag back the ABL catheter to site of ABL34 and mapped the earliest activity with low contact force (3g, *Figure 1C*). The target activation preceded P wave by 39ms (*Figure 2, left panel*), the AT elimination was achieved by ablation at the site of earliest activity after 4 sec (*Figure 2, right panel*). Further inducibility testing with programmed stimulation and burst pacing from the CS was unable to induce any atrial arrhythmia after successful ablation. The restructure of LA geometry showed the anomalous drainage between the LIPV and LAA using CARTO system after the ablation procedure (*Figure 3A*). CARTO merge showed the ABL catheter was located at edge of anomalous drainage between the LIPV and LAA (*Figure 3B*). During six months follow-up, the patient had no recurrence, regular 24-Holter monitoring did not showed any sinus pauses.

## Discussion

Some studies have reported that left AT can originated from at mitral annulus, left atrial appendage (LAA) and pulmonary vein (PV)<sup>1,2</sup>. This is the first case of report AT originated from the ostium of anomalous drainage between the LIPV and LAA.

Focal AT showed circumscribed "hot spot" area; however, in this case, the high-density map demonstrated a broad zone of almost identical activation times at the site of LAA ridge and LIPV inferior ostium using 3-D mapping, radiofrequency catheter ablation in this region failed to terminate the tachycardia. When the ABL catheter was dragged back and floated within the LA, the earliest activity was mapped with low contact force, the AT elimination was achieved by ablation at the site of earliest activity.

In conclusion, if a broad zone of almost identical activation times were mapped in patient with focal AT, the adjacent structure should be obtained simultaneously; the restructure of heart geometry may be helpful to demonstrate the anomalous structure and to guide the mapping and ablation procedure and precisely identify the origin site of AT.

## Reference

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Figure1

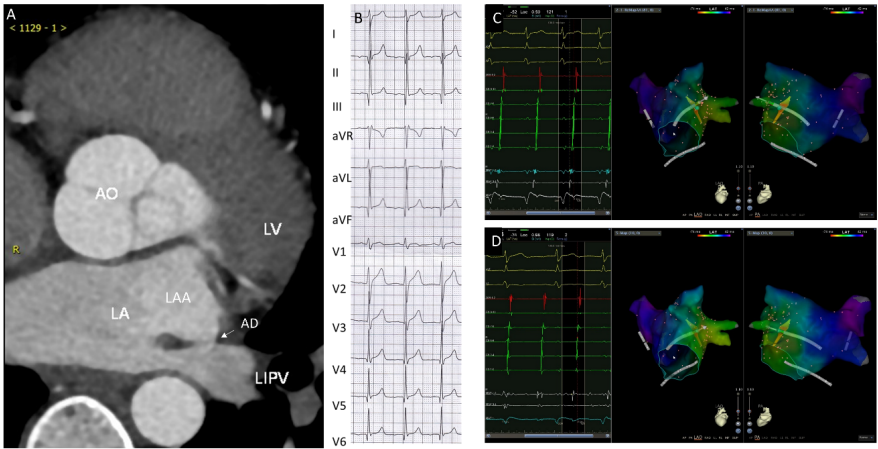
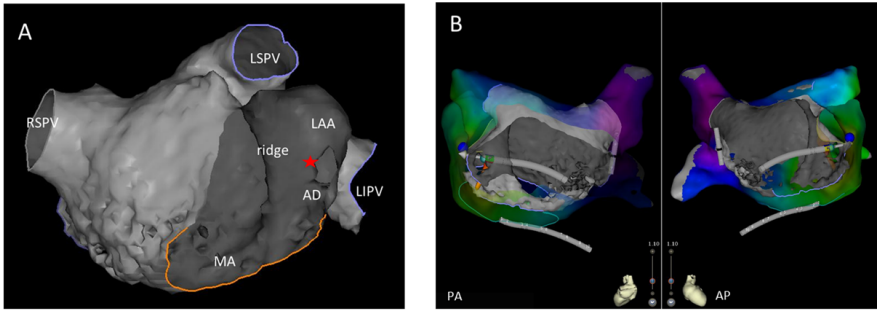


Figure2



Figure3



Legend to Figures

**Figure 1** **A** , The CT imaging show the AD between LIPV and LAA. **B** , the P wave of AT showed negative wave with negative polarity in inferior leads and V4-V6, positive polarity and V1 –V3 and iso-electric in leads I, aVL; **C and D** , activation map of the LA revealed that the site of earlier activity during tachycardia was broad at the LAA ridge; however, the activation time at proximal ABL catheter was earlier than the distal ABL catheter. ABL catheter was dragged back to site of ABL34 and mapped the earliest activity with low contact force. ECG, electrocardiogram; AT, atrial tachycardia; ABL, ablation catheter; AP, anterior-posterior view; PA, posterior-anterior view.

**Figure 2** The target site preceded earliest activation of the P wave by 39 ms and the AT was terminated during radiofrequency energy delivered. CS, coronary sinus; HRA, high right atrium.

**Figure 3 The reconstruction of LA and CARTO merge.****A** , Anomalous drainage was revealed between the LIPV and LAA using CARTO system. Red star showed the origin site of AT. **B** , CARTO merge showed the ABL catheter was located at edge of anomalous drainage between the LIPV and LAA. LIPV, left inferior pulmonary vein; LA, left atrium; LV, left ventricle; LAA, left atrial appendage; AD, anomalous drainage; AO, aorta, LSPV, left superior pulmonary vein; RSPV, right superior pulmonary vein; MA, mitral annulus; AP, anterior-posterior view; PA, posterior-anterior view.