

EP CASE REPORT

An unusual atrial tachycardia resulting from two levels of conduction block within the arrhythmogenic superior vena cava

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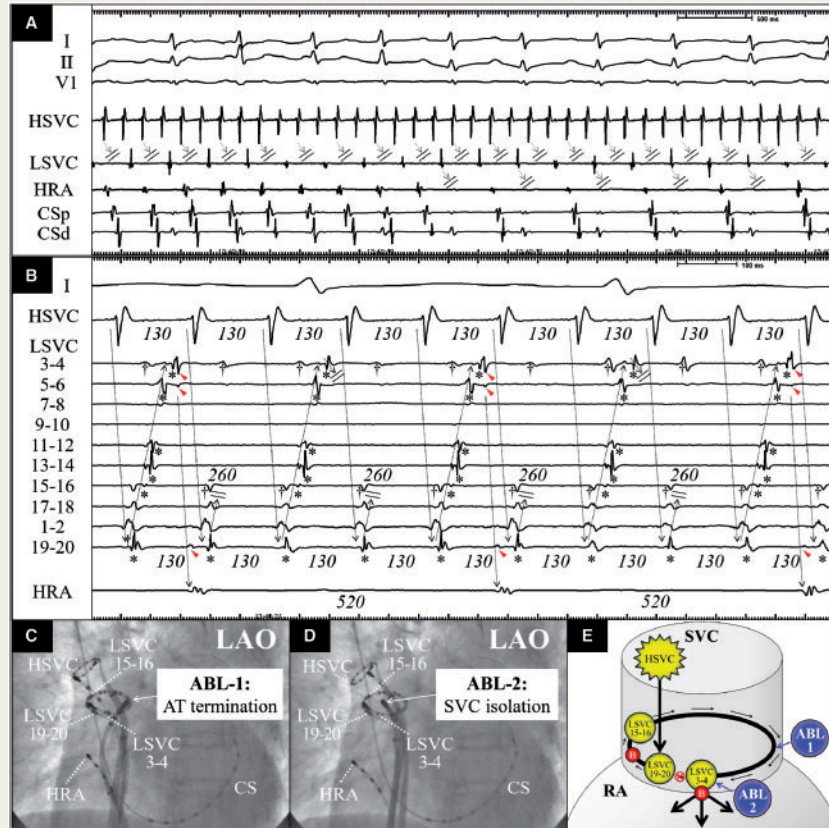


Figure 1 (A) Body surface ECG (I, II, and V1) and intracardiac electrograms at sweep speed of 25 mm/s, showing AT and sudden prolongation of AT cycle length (CL) from 260 to 520 ms. Note the regular and rapid tachycardia (CL = 130 ms) within the HSVC with two different sites of 2:1 block between the HSVC and right atrium (RA). The constant P-wave morphology and atrial activation sequence indicated that there was only a single electrical connection between the SVC and the RA. (B) Body surface ECG (I, II, and V1) and intracardiac electrograms at sweep speed of 100 mm/s. The earliest atrial activation was identified at the LSVC 3-4, suggesting the site of electrical breakthrough in the cavoatrial junction. Note the unidirectional activation around the LSVC and the sites of 2:1 block in the LSVC located between LSVC 19-20 and 15-16, and at LSVC 3-4. Red arrowheads indicate far-field atrial signal; asterisks, near-field SVC signal; daggers, far-field SVC signal. The italic numbers denote cycle length (ms). (C) LAO fluoroscopic view of catheter location during the first radiofrequency application (ABL-1) resulting in AT termination. (D) LAO fluoroscopic view of catheter location during the second radiofrequency application (ABL-2) resulting in SVC isolation. (E) A schematic diagram of the SVC and RA demonstrating postulated activation pattern during the AT. 'B' in red circle indicates the site of 2:1 block; 'ABL' in blue circle, site of ablation. ABL, ablation; AT, atrial tachycardia; CS d, coronary sinus distal; CS p, coronary sinus proximal; HRA, high right atrium; HSVC, high superior vena cava; LAO, left anterior oblique; LSVC, low superior vena cava.

A 60-year-old woman was referred for catheter ablation of atrial tachycardia (AT), which occurred shortly after pulmonary vein (PV) isolation for paroxysmal atrial fibrillation (AF). Atrial tachycardia with a cycle length (CL) of 260 ms occurred spontaneously during electrophysiology study. The atrial CL suddenly became prolonged from 260 to 520 ms although the P-wave morphology and atrial activation sequence remained unchanged (Figure 1A). The site of earliest activation was identified in the high superior vena cava (SVC) where a regular and rapid tachycardia (CL, 130 ms) was observed, suggesting 2:1~4:1 exit block between the SVC and right atrium (RA). The constant P-wave morphology and atrial activation sequence indicated that there was only a single electrical connection (breakthrough) between the SVC and RA. Activation sequence in the low SVC (LSVC) was unidirectional (lateral→ posterior→ septal→ anterior) and there were two different sites of 2:1 block (at the lateral and at the anterior wall of the LSVC) (Figure 1–BE). The first radiofrequency application at the septal cavoatrial junction (CAJ) (Figure 1C and E) terminated the AT and the second application at the breakthrough (anterior CAJ) (Figure 1D and E) successfully isolated the SVC. After isolation of the SVC, the SVC tachycardia was no longer induced with burst pacing from the SVC or isoproterenol injection. The mechanism of the rapid SVC tachycardia was unclear, since entrainment pacing from the distal SVC resulted in termination of the SVC tachycardia. The patient is currently asymptomatic 10 years after the procedure, with no evidence of AT/AF recurrence.

In the present case, SVC tachycardia with a single electrical breakthrough in the CAJ led to the 'focal' AT. Moreover, the two different sites of 2:1 block within the SVC resulted in the atrial rate reduction to 115 b.p.m., which mimicked conversion to sinus rhythm. A few cases of PV tachycardia/fibrillation with two levels of intra-PV conduction block have been described in an electrically isolated PV¹ or in a partially isolated PV.² Superior vena cava tachycardia with two levels of 2:1 block within SVC is a newly observed phenomenon that may provide insights into the electrophysiologic properties of the SVC muscular sleeves.

Conflict of interest: none declared.

References

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