

Transient Atrial-His Block during Wide QRS-Complex Tachycardia with 1:1 Ventriculoatrial Relationship: What is the Diagnosis?

Takashi Nakashima¹, Nicolas Welte², Ghassen Cheniti³, Nicholas Derval⁴, Pierre Jais⁵, and Josselin Duchateau⁵

¹University of Bordeaux

²Service de Rythmologie, Hôpital Cardiologique du Haut-Lévêque

³Hôpital Cardiologique du Haut Lévêque

⁴Hopital du Haut Leveque/LIRYC, Bordeaux

⁵Centre Hospitalier Universitaire de Bordeaux

October 16, 2020

Transient Atrial-His Block during Wide QRS-Complex Tachycardia with 1:1 Ventriculoatrial Relationship: What is the Diagnosis?

Short title; AH block during wide QRS tachycardia

Takashi Nakashima, MD; Nicolas Welte, MD; Ghassen Cheniti, MD; Nicolas Derval, MD; Pierre Jais, MD; Josselin Duchateau, MD

LIRYC, University of Bordeaux, CHU de Bordeaux, Bordeaux France

Correspondence to Takashi Nakashima, MD

Service de Rythmologie, Hôpital Cardiologique du Haut-Lévêque (Centre Hospitalier Universtaire de Bordeaux)

Avenue de Magellan, 33604, Bordeaux-Pessac, France

Tel: +33 5 57 65 68 63 19, Fax: +33 5 57 65 68 96 20

Email: takashin727jw@yahoo.co.jp

ORCID: 0000-0002-8538-9259

Conflicts of interest : none

Funding : none

Key words

Wide QRS-complex tachycardia; ventriculoatrial relationship; differential diagnosis; atrial tachycardia; supra-ventricular tachycardia

Case presentation

A 78-year-old man was referred for the electrophysiologic (EP) study for sustained wide QRS-complex tachycardia (WCT). Transthoracic echocardiography revealed diffuse severe hypokinesia with an ejection fraction (EF) of 33%. He was referred for radiofrequency catheter ablation (RFCA). An electrocardiogram (ECG) at the beginning of the procedure showed WCT with a cycle-length of 520 ms and a left bundle

branch block (LBBB) pattern, a concentric pattern with the earliest atrial activation site at His and a septal VA interval of 36 ms, an HH interval preceding a VV interval with a fixed HV interval of 75 ms, and 1:1 VA conduction (Figure 1B). The ECG during sinus rhythm (SR) showed the same QRS morphology during WCT, and AH and HV intervals were 204, and 72 ms, respectively (Figure 1A). Catheter manipulation or any stimulation easily induced the WCT. Therefore, antegrade and retrograde dual atrioventricular (AV) nodal (AVN) physiology were not confirmed. During WCT, a transient VA perturbation following AH block was observed (Figure 2). What is the diagnosis?

Discussion

The differential diagnoses of WCT with LBBB morphology similar to that during SR, an HH interval preceding a VV interval, and presenting with 1:1 VA conduction include bundle-branch reentry ventricular tachycardia (BBR-VT), any supraventricular tachycardia (SVT) with LBBB such as AVN reentrant tachycardia (AVNRT), orthodromic reciprocating tachycardia (ORT) with AV accessory pathway (AP), ORT with node-fascicular/node-ventricular (NF/NV) AP, junctional tachycardia (JT), and atrial tachycardia (AT). Antidromic reciprocating tachycardia, pathway-to-pathway tachycardia, and any SVT with a bystander AP were unlikely because His deflection preceded the QRS onset with the HV interval identical to that during SR (Figure 1). During WCT, AH block and the subsequent VA perturbation followed without termination (Figure 2). This finding could exclude ORT with AV AP, ORT with NF/NV AP, JT, and BBR-VT because these tachycardias include the ventricle or His as a part of the circuit. AVNRT with infra-Hisian block also was an unlikely diagnosis because there was VA perturbation without termination of the tachycardia (Figure 2). Although we did not confirm the dual pathway physiology of the AVN by an extra pacing maneuver, gradual prolongation of AH leading to the fixed AH interval after AH block during WCT (Figure 2) was not inconsistent with the transition of the antegrade pathway from the fast to the slow pathway. Based on these findings, AT was diagnosed.

VA relationships were interrupted by atrial pacing from the two different sites of the right atrium without termination of the tachycardia.^{1, 2} Mapping was performed during WCT, and the earliest atrial activation site was near the His region. RFCA was performed and the WCT was terminated. This was complicated by complete AV block. Before ablation, the patient was informed of the potential risk of AV block with the necessity for a pacemaker and of being the potential candidate for cardiac resynchronization therapy (CRT) because of class 2 congestive heart failure with an impaired EF and LBBB; therefore, CRT was implanted.

We described a case of AT presenting with a wide QRS-complex, 1:1 VA conduction, HH variability preceding VV variability and short VA. The differential diagnoses of WCT with 1:1 AV conduction are challenging, and some pacing maneuvers should be encouraged. However, in our case, only one ECG tracing, a transient VA perturbation following AH block during WCT, immediately ruled out other SVT and VT, which is the most important differential diagnosis.

An observation of the spontaneous phenomenon during EP study is occasionally sufficient to make a diagnosis.

References

1. Knight BP, Ebinger M, Oral H, Kim MH, Sticherling C, Pelosi F, Michaud GF, Strickberger SA, Morady F. Diagnostic value of tachycardia features and pacing maneuvers during paroxysmal supraventricular tachycardia. *J Am Coll Cardiol.* 2000;36:574-82.
2. Maruyama M, Kobayashi Y, Miyauchi Y, Ino T, Atarashi H, Katoh T, Mizuno K. The VA relationship after differential atrial overdrive pacing: a novel tool for the diagnosis of atrial tachycardia in the electrophysiologic laboratory. *J Cardiovasc Electrophysiol.* 2007;18:1127-33.

Figure legends

Figure 1. (A) The surface and intracardiac electrograms during sinus rhythm. (B) Those during wide QRS complex tachycardia (WCT). Note that the QRS morphology during WCT is identical to those during SR. The numbers represent HH intervals.

Figure 2. Transient AH block and the subsequent VA perturbation without AA interval perturbation. The second QRS after AH block (asterisk) is the fusion QRS with the premature ventricular contraction. Note the gradual prolongation of AH leading to the fixed AH interval after AH block, suggestive of the transition from the antegrade fast to the slow pathway.

Figures

Figure 1

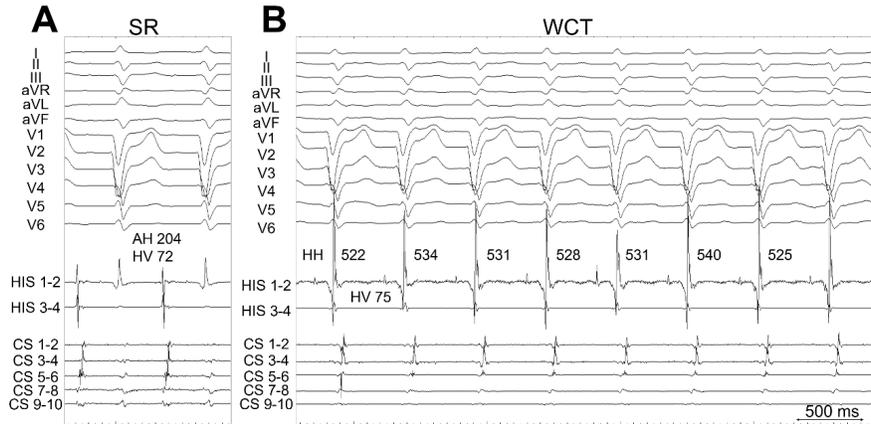


Figure 2

