SCHEINMAN/PETER ECG CORNER

Atrioventricular block after COVID-19: What is the mechanism, site of block, and treatment? 2

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Case presentation

A 49-year-old healthy woman presented with exertional shortness of breath and palpitations of 3 months’ duration. Baseline electrocardiogram (ECG) was normal. Figure 1 shows selected tracings recorded during treadmill stress testing. Transthoracic echocardiogram showed no structural abnormalities. Cardiac positron emission tomogram showed normal myocardial perfusion and no abnormal fluordeoxyglucose uptake. Antibody titers for Lyme disease were undetectable. Figure 2 shows selected tracings from an invasive electrophysiological (EP) study. What is the mechanism of the block? What are treatment options?

Commentary

In Figure 1, the ECG is notable for worsening atrioventricular (AV) block with increasing heart rate, but fixed and normal PR interval and narrow QRS during conducted beats. Exercise-induced high-grade AV block with normal PR interval raised suspicion for intrahisian disease, which was confirmed at EP study. There was marked intrahisian delay during sinus rhythm (Figure 2A) and at slower atrial pacing rates. There was intrahisian block with slightly faster atrial pacing (Figure 2B) that could be overcome with high-output parahisian pacing distal to the site of delay/block (Figure 2C). Given symptomatic chronotropic incompetence due to intrahisian AV block, a dual-chamber pacemaker was implanted, with a permanent His-bundle pacing lead (Medtronic 3830; Medtronic Inc, Minneapolis, MN) positioned distal to the site of intrahisian delay/block (see Supplemental Text and Supplemental Figures 1, 2, and 3).

This case highlights the approach to managing a young patient with symptomatic exercise-induced AV block.

Intrahisian block is a rare form of infranodal AV block, often presenting with normal PR interval and narrow QRS for conducted beats, as demonstrated by the treadmill study. The diagnosis is confirmed by EP study, which revealed intrahisian delay during conducted beats and intact proximal His signal with absence of distal His during blocked beats. A multipolar catheter with close interelectrode spacing (eg, 2-2-2 duodecapolar catheter) can be used both to delineate the site of intrahisian block and to confirm intact distal His-Purkinje conduct at rapid pacing rates. It then can serve as a potential fluoroscopic landmark should the decision be made to proceed with permanent conduction system pacing.

Retrospective evidence suggests that the clinical presentation of intrahisian block can be fleeting in nature, but large case series are lacking. Intrahisian block is most commonly diagnosed in women older than 60 years, with aortic and/or mitral annular calcifications observed by echocardiography in nearly two-thirds of patients. 1 Our patient was an otherwise healthy 49-year-old woman with no echocardiographic evidence of structural heart abnormalities or valvular calcifications and no evidence of inflammatory cardiomypathy (eg, sarcoidosis).

Notably, the patient had traveled abroad several weeks before exertional symptoms started, and she suffered a severe fullike syndrome with negative influenza nasal swab after returning to the United States in early 2020. At the time of intrahisian block diagnosis, nasopharyngeal swab for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) RNA was negative, but serological testing was positive for immunoglobin G antibodies, suggesting previous infection. Acute cardiac injury has been described in coronavirus disease 2019 (COVID-19) infections, including ST-segment elevation, acute heart failure, cardiac arrest, AV block, and atrial arrhythmias. 2 In an autopsy series, viral presence in myocardium without influx of inflammatory cells was observed in nearly two-thirds of patients. 3 Long-term cardiac impacts of COVID-19 infection in recovered patients remain unknown. It is possible that the symptomatic intrahisian block was a subacute manifestation of previous COVID-19 myocarditis, the first such case reported to our knowledge. At 6 months postimplant, ventricular pacing burden

KEYWORDS Atrioventricular block; COVID-19; His-bundle pacing; Intrahisian block; Myocarditis (Heart Rhythm 2021:18:489–490)

Funding sources: The authors have no funding sources to disclose. Disclosures: The authors have reported that they have no relationships relevant to the contents of this paper to disclose. Address reprint requests and correspondence: Dr Joshua D. Moss, Division of Cardiovascular Medicine, University of California, San Francisco, 500 Parnassus Ave, MUE 432, San Francisco, CA 94143. E-mail address: Joshua.Moss@ucsf.edu.

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remained low at 4%, and exercise-associated symptoms were resolved.

Appendix

Supplementary data

Supplementary data associated with this article can be found in the online version at https://doi.org/10.1016/j.hrthm.2020.10.020.

Figure 1  Electrocardiography (lead II) during exercise. By 5:49 minutes into exercise, there is 5:4 and 3:2 atrioventricular (AV) block with normal PR and QRS duration. By peak exercise, there is 2:1 block, then 3:1 AV block persisting 1:00 minute into recovery.

Figure 2  Findings during electrophysiological study. A: Baseline intracardiac signals recorded from a duodecapolar catheter with 2-mm interelectrode spacing show His and right bundle branch conduction with intrahisian delay. Proximal (solid double-headed arrow) and distal (open double-headed arrow) His signals are seen on His 8,9. B: High right atrial pacing at 530 ms with 2:1 intrahisian block. C: Parahisian pacing from distal His (His 3,4) at 300 ms with 1:1 distal His–Purkinje capture as evidenced by relatively narrow QRS complex.

References