Heart Failure and Pulsus Alternans
An Unusual Presentation of First-Degree Heart Block

Pradeep Kumar Kandaswamy, MD; Ajith Anantha, MD, DM; Jayaraman Balachander, MD, DM; Raja J. Selvaraj, MD, DNB

Pacemaker syndrome is the development of fatigue and dyspnea in patients with ventricular pacing caused by VA conduction and the resultant atrial contraction against a closed AV valve. First-degree AV block with a very prolonged PR interval has also been reported to present with symptoms of pacemaker syndrome and has sometimes been described as pseudopacemaker syndrome or pacemaker-like syndrome. We report a case of pacemaker-like syndrome who presented with florid heart failure and alternans that were abolished with AV pacing.

Case Report
A 65-year-old woman presented with few months history of dyspnoea on exertion gradually progressing to New York Heart Association class IV. She was admitted twice at the emergency department over a period of a month with decompensated congestive cardiac failure. On examination, she had sinus tachycardia and an elevated jugular venous pressure. Echocardiographic assessment showed mild left ventricular systolic dysfunction with an ejection fraction of 45% with moderate mitral and tricuspid regurgitation. There was no aortic regurgitation and no left ventricular hypertrophy. ECG showed sinus tachycardia with a PR interval of 400 ms and a narrow QRS complex (Figure 1).

Treatment with conventional heart failure therapy resulted in some improvement, but she continued to have New York Heart Association class III symptoms. Coronary angiogram showed normal epicardial coronaries. Pulsus alternans was noted in the arterial pressure tracing in sinus rhythm and with atrial pacing (Figure 2A). This was significantly attenuated and mean arterial pressure improved with temporary AV pacing with a physiological AV delay (Figure 2B).

On the basis of these findings, we performed a dual-chamber pacemaker implantation. Aortic flow by Doppler confirmed the presence of alternans in unpaced state and significant attenuation with pacing (Figure 3). Patient improved symptomatically and sinus rate slowed down. At 3-month follow-up, the patient was found to have consistent atrial-synchronous ventricular pacing and was comfortable with no signs or symptoms of failure.

Discussion
First-degree AV block with very prolonged PR interval, where the P wave occurs close to the preceding QRS complex, can significantly alter hemodynamics. There is not only the loss of AV synchrony but also the atrium contracts against a closed AV valve, which significantly reduces the cardiac output and may result in heart failure. This condition described as the pacemaker-like syndrome is an indication for dual-chamber pacemaker implantation. We consistently found pulsus alternans in our patient in the unpaced state, which to our knowledge has not been reported before in pacemaker syndrome. Abolition of alternans with pacing proves the importance of AV synchrony with improvement in hemodynamics and clinical status, despite the loss of ventricular synchrony.

This case reiterates the fact that first-degree AV block may not always be benign. It can present with severe symptoms, significant hemodynamic alterations, and pose unique challenges during management. Pulsus alternans documented by direct pressure measurements and Doppler echocardiography is an unusual finding in our patient.

Disclosures
None.

References

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Figure 1. ECG at presentation shows sinus tachycardia at a rate of 110 bpm with a PR interval of 400 ms.

Figure 2. Arterial pressure tracing during temporary atrial and sequential AV pacing. Shown are 3 ECG leads, atrial and ventricular electrograms and femoral arterial pressure recording during temporary pacing. **A**, Pulsus alternans is seen during atrial pacing with a prolonged PR interval. **B**, Abolition of pulsus alternans with sequential AV pacing and a physiological AV delay.

Figure 3. Aortic flow pulse Doppler envelope shows pulsus alternans with the pacemaker turned off (**A**), which is attenuated with sequential AV pacing (**B**).
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