

Uncommon Sense: What Does This Aberrant Pacing Spike Indicate?

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A 76-year-old woman with a history of coronary artery disease, end-stage renal disease, and intermittent 2nd-degree (Mobitz II) atrioventricular (AV) block was admitted after an unwitnessed fall. She reported no symptoms during the episode. She had an Accent™ DR RF dual-chamber pacemaker (model PM2210) with Tendril™ STS Model 2088TC atrial and ventricular bipolar leads (all from St. Jude Medical, part of Abbott). The pacemaker was set in DDDR mode (pacing rate, 60–120 beats/min). Its programmed paced AV interval was 200 ms, and the sensed interval, 190 ms. Its Ventricular AutoCapture™ Pacing System, atrial and ventricular SenseAbility™ AutoSense function, and ventricular safety pacing were activated. The patient had an abnormal rhythm overnight, and her telemetry results were atypical (Fig. 1). Interrogation revealed normal device function and no aberrant event stored in memory.

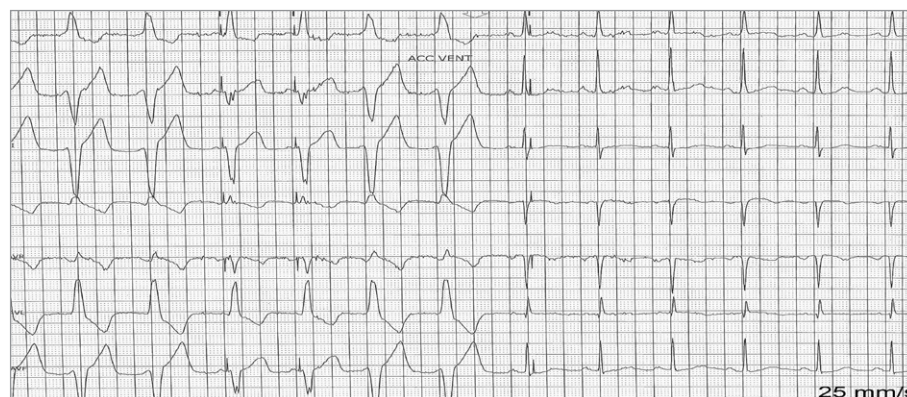


Fig. 1

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What most likely caused the atypical tracing?

- A) Device threshold search
- B) Oversensing
- C) Ventricular safety pacing
- D) Accelerated idioventricular rhythm with ventricular undersensing
(in the 6th complex from right of the tracing)

See next page for the answer, as well as a link to the Focus on ECGs blog, where you can participate in a moderated discussion.

FOCUS ON ECGs: ANSWER #21

Answer

A) Device threshold search

The rhythm strip shows 3 distinct QRS morphologies (Fig. 2). The first, in QRS complexes 1 through 3 and 6 through 7, is a wide-complex QRS without a preceding P wave, and it signifies ventricular paced beats. Of note, no pacing spikes are seen, because this is bipolar pacing and output is at the lowest limit of capture. The morphology of QRS 4 through 5 is narrower and is preceded by a P wave and a pacing stimulus. The PR interval is very short, and the QRS complex is timed to the pacing spike. Because there was no ventricular capture for QRS 4, a back-up pulse was delivered at approximately 5 V with an AV delay of 25 ms (arrowhead). The intrinsic P wave also conducted, denoting fusion. The same occurred in QRS 5, whereas in QRS 6 through 7, a ventricular paced rhythm resumed. Finally, the morphology of QRS 8 through 13 is narrow and is preceded by a P wave, denoting sinus rhythm. Of note, a stimulus after QRS 8 (arrow) resembles the pacemaker stimuli of complexes 4 and 5 and is most likely an artifact.

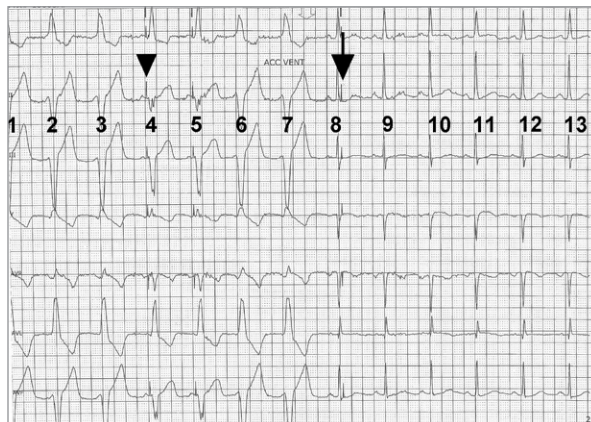


Fig. 2

The tracing sequence is consistent with a threshold search, a feature of the pacemaker's AutoCapture algorithm, which adjusts output to the lowest voltage that will maintain capture.^{1,2} The overall function of AutoCapture is to reduce current-drainage and prolong battery life. These self-checks occur during a suspected threshold increase, manually when a programmer is used, and in other circumstances. In addition, they are programmed to occur every 8 or 24 hours. During a threshold search, pacing output is reduced stepwise by 0.25 V until loss of capture, and then a back-up pulse is delivered with a short AV delay (QRS 4). After 2 consecutive capture losses, output increases by 0.125 V, until 2 successive capture events occur (QRS 6–7).³

What caused the pacing stimulus after QRS 8 (arrow) is not clear. Given normal device function and no other reasons for undersensing, however, we conclude that it was a benign threshold test with an artifact, not a transient undersensed event.⁴

Knowledge of this pacemaker and its intrinsic algorithms may mitigate clinical concerns in the presence of a similar tracing.

References

1. Duru F, Bauersfeld U, Schuller H, Candinas R. Threshold tracking pacing based on beat by beat evoked response detection: clinical benefits and potential problems. *J Interv Card Electrophysiol* 2000;4(3):511-22.
2. Clarke M, Liu B, Schuller H, Binner L, Kennergren C, Guerola M, et al. Automatic adjustment of pacemaker stimulation output correlated with continuously monitored capture thresholds: a multicenter study. *European Microny Study Group. Pacing Clin Electrophysiol* 1998;21(8):1567-75.
3. Kam R. Automatic capture verification in pacemakers (autocapture)--utility and problems. *Indian Pacing Electrophysiol J* 2004;4(2):73-8.
4. Lloyd MS, El Chami MF, Langberg JJ. Pacing features that mimic malfunction: a review of current programmable and automated device functions that cause confusion in the clinical setting. *J Cardiovasc Electrophysiol* 2009;20(4):453-60.

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