RELATO DE CASO

CYCLIC PSEUDO-FUSION IN A DUAL CHAMBER PACEMAKER

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ABSTRACT

Studies have shown that avoidance of right ventricular pacing results in a decrease in the incidence of atrial fibrillation and congestive heart failure. Newer algorithms which promote intrinsic conduction and decrease the frequency of ventricular pacing have been developed. However some of these new pacing algorithms are complex and can create potential pitfalls for the clinician. Additionally, these features may not be applicable to a reasonable amount of patients. We describe an example of a pacemaker pseudo-malfunction caused by one of these new algorithms.

Keywords: Cardiac pacemaker; pacemaker malfunction; fusion beats

CASE PRESENTATION

A 80-year-old male with a history of intermittent Mobitz type II AV block (Figure 1) and underlying first degree AV block, with a PR interval of 250 msec underwent implantation of a dual-chamber pacemaker (St. Jude XL DR Model 5826, St. Jude Medical Inc., St. Paul, Minnesota, USA). The device was programmed to DDD mode with a lower rate interval of 60 bpm, paced AV delay of 180ms and sensed AV delay of 150ms. During the first 12 hours post-operatively, telemetry in the cardiac unit revealed intermittent triples of pseudo-fusion beats, despite normal pacemaker function. The electrophysiology team was consulted for possible pacemaker malfunction.

Figure 1 - The 12-lead electrocardiogram before pacemaker implantation. The first beat is a sinus beat with first degree AV block. The following tracing shows baseline second degree AV block with 2:1 conduction.
Figure 2 - Telemetry recordings after pacemaker implantation showing regular cycles of three consecutive pseudo-fusion beats. Note that, during the pseudo-fusion complexes, the AV interval is higher than programmed AV pacing interval.

DISCUSSION

Figure 2 demonstrates the periodic occurrence of PR prolongation, followed by pseudo-fusion beats during three consecutive beats. The sensed AV interval is longer than the programmed interval during the pseudo-fusion. A possible diagnosis is intermittent loss of atrial sensing resulting in inappropriate atrial paced beats. If that is the case, then each paced beat should be followed by a ventricular pacing stimulus, which is not evident. Since the pacemaker is functioning normally, it is more likely that there is an intrinsic conduction search algorithm in action. These sequences occur for three consecutive beats every 30 seconds and they are preceded and followed by normal ventricular paced beats. This occurs because the VIP™ mode was turned on. The algorithm extends the sensed AV interval (programmable from 100ms to 200ms; nominal 100ms) for 1 to 3 beats at a predetermined interval (from 30 seconds to 30 minutes). In the present case, this feature was programmed to extend AV delay by 100ms for 3 beats every 30 seconds. Due to late sensing R-waves during these extended AV interval periods, a pacing stimulus is delivered, despite a conducted ventricular beat resulting in pseudo-fusion. The extension of the sensed AV interval in VIP™ mode to 150ms decreased the number of pseudo-fusion beats, but increased significantly the AV interval (PR of 330ms). Subsequently, the feature was turned off.

It is important to emphasize that the VIP™ mode will work only if the patient persists in first degree AV block with a reasonable AV interval. Additionally, it is equally important to test the amount of late sensing of the R waves, which can contribute for pseudo-fusion. In the present case, one could argue that the use of such feature is at least controversial, since the intrinsic conduction will be promoted with a very long AV delay. The paranoia of intrinsic conduction has sometimes generated aberrant programming and misuse of modern algorithms, paradoxically resulting in non physiological pacing. There are new algorithms developed by different manufacturers, which are very effective in promoting intrinsic AV conduction in patients who have preserved AV conduction (3). The SafeR™ (ELA Medical, France) and the MVP™ (Medtronic Inc., USA) are innovative types of pacing modes, both designed to combine the benefits of AAI and the safety of DDD pacing. Operating primarily in AAI(R) mode, these pacing algorithms are able to switch to DDD(R) in case of significant AV blockage. Additionally, they can automatically converting back to AAIR mode when stable AV conduction is detected. Contrary to VIP™, SafeR™ and MVP™ do not promote progressive PR interval prolongation (3).

In conclusion, the present case demonstrates the delicate balance of promoting intrinsic conduction with adequate pacemaker programming. The new pacing algorithms should be used in accordance with patient’s characteristics. Nominal settings pre-programmed by the manufacturers should be avoided.

REFERENCES


