Abstract: P1199

An unusual pacemaker-induced tachycardia

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Topic(s):
Antibradycardia Pacing

Citation:
A 29 year-old female patient with double inlet left ventricle, ventricle septal defect, malposition of the great arteries and subpulmonary obstacle, submitted to a modified Fontan procedure at 9 years of age, presented with severely symptomatic brady-tachy syndrome (palpitations and syncope). Since venous access to the right ventricle was absent (due to the flow of systemic venous blood from the right atrium to the pulmonary artery bypassing the ventricles), and the AV conduction was good, it was decided to implant an AAI permanent pacemaker. A single lead was placed in the right atrium lateral wall because of suboptimal pacing threshold in the conventional positions. A generator with a ventricular port plug was used.

The day after, the patient complained of palpitations. The ECG in Figure 1A shows a repetitive cycle of an atrial paced beat (Ap) and an atrial intrinsic beat (Ai), both followed by a ventricular intrinsic beat (Vi). The Ap-Ap and Ai-Ai intervals are 1000 ms, with a ventricular rate of 120 bpm. Device interrogation revealed that it was programmed in DDD instead of AAI mode. Parameters were: lower rate limit (LRL) 60 bpm; upper tracking rate 120 bpm; post-ventricular atrial refractory period (PVARP) 280 ms; paced AV delay 220 ms. Figure 1B depicts the intracardiac electrograms and pacing intervals overlaying the ECG. In the atrial channel, an Ap is followed by an atrial intrinsic beat in the refractory period (Ar), followed again by an Ap. As mentioned before, the ventricular port on the generator was plugged and it was not possible neither to sense nor to pace the ventricle. As such, the ventricular paced beats (Vp) are inconsequential with respect to actual ventricular activation.

This unusual kind of "pacemaker-induced tachycardia" is only possible because of the simultaneous occurrence of a set of conditions. Firstly, a pacemaker with a single atrial lead was programmed in a DDD mode. This mode initiated an AV delay and a PVARP after the Ap. The next Ai is then sensed during the refractory period and does not reset the pacing intervals. Secondly, the absence of a ventricular lead also precludes the Vi after the Ar to be sensed and reset the VA interval. Thirdly, the patient’s intrinsic rhythm during this period is timed to occur before the end of the programmed PVARP so that this interval prevents it from being sensed outside the refractory period. Lastly, the patient’s intact AV conduction allows all Ap and Ar to be conducted to the ventricle and the rate to rise to 120 bpm. Careful programming and deep understanding of pacing functions is crucial to the management of these patients.
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This unusual kind of “pacemaker-induced tachycardia” is only possible because of the simultaneous occurrence of a set of conditions. Firstly, a pacemaker with a single atrial lead was programmed in a DDD mode. This mode initiated an AV delay and a PVARP after the Ap. The next Ai is then sensed during the refractory period and does not reset the pacing intervals. Secondly, the absence of a ventricular lead also precludes the Vi after the Ar to be sensed and reset the VA interval. Thirdly, the patient’s intrinsic rhythm during this period is timed to occur before the end of the programmed PVARP so that this interval prevents it from being sensed outside the refractory period. Lastly, the patient’s intact AV conduction allows all Ap and Ar to be conducted to the ventricle and the rate to rise to 120 bpm. Careful programming and deep understanding of pacing functions is crucial to the management of these patients.