Case Report

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Symptomatic Refractory Pacemaker Mediated Tachycardia, Cause and its Management

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Abstract

Device programming itself may cause tachycardias and sometimes pro-arrhythmic. PMTs are one of them. These non-physiological heart rate may cause symptoms as dyspnea, palpitation and decompensated heart failure. Careful programming and monitoring to be done especially during post implant hospital stay and prior to discharge

Keywords: Tachycardia; Atrial fibrillation; Arrythmia; Syncope; Pacemaker

Abbreviations: PMT: Pacemaker Mediated Tachycardia; PVARP: Post Ventricular Atrial Refractory Period; AF: Atrial Fibrillation; BS: Boston Scientific; MDT: Medtronic; BTK: Biotronic; RNRVAS: Repetitive Non-Reentrant VA Synchrony

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Introduction

Endless loop tachycardia or pacemaker mediated tachycardia is a reentry arrythmia which occur in dual chamber pacemakers. When AV synchrony is uncoupled the next ventricular event may result in retrograde atrial excitation if retrograde VA conduction is intact. A ventricular output is delivered on termination of AVI and MTR and continues until interrupted. Different pacemakers have their own Algorithm for prevention of PMT. Here we are presenting an interesting troublesome case of PMT were device programming itself was causing continuous symptomatic tachycardia.

Case Report

An 83-year-old gentleman presented with episodes of syncope with underlying diffuse conduction system disease and intermittent complete heart block. Previously he had anterior wall myocardial infarction and PTCA with stenting to LAD was done 10 years back. His ejection fraction was 40%. Dual chamber pacemaker implantation was done with good pacing and sensing parameters. Next day in the morning he complained of restlessness overnight. ECG was done which revealed recurrent episodes of PMT. PVARP was extended for 325 ms, despite this, he continued to have PMT. Although PMT response broke tachycardia, but it again restarted, and it was almost continuous. Due to symptomatic episodes we switched the mode to VVI. Re Interrogation was done next day revealed that rate responsive PVARP was on by default which was reducing PVARP with tachycardia and resultant retrograde sensing of P and thus PMT continued. By putting it off, tachycardia terminated with no recurrence **(Figures 1-4).**

Discussion

As shown in **Figure 1** ECG tracing there is ongoing PMT post implant of dual chamber pacemaker. Although PMT response (St Jude's PMT algorithm) is seen in **Figures 2 and 3** but tachycardia again restarted and was almost continuous. PVARP was increased to 325 ms, but there was no change and episodes continued.

Figure 1 **1** ECG showing PMT.

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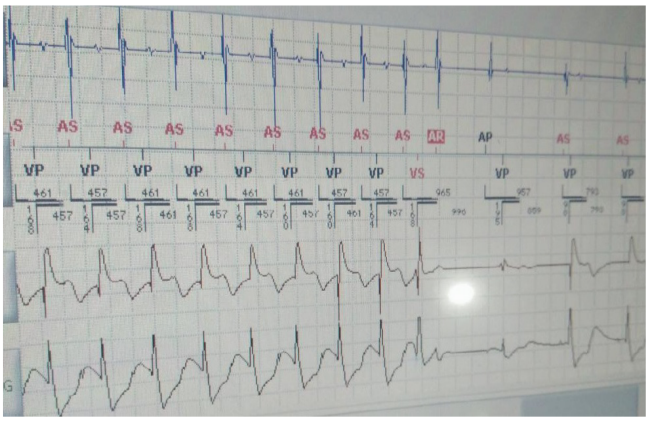

Figure 2 Monitor shows PMT response with breaking of tachycardia and again recurrence.

Figure 3 Monitor shows PMT response with breaking of tachycardia and again recurrence.

Mode Changed to VVI which abolished tachycardia but on long term he might develop Atrial fibrillation. So, next day again interrogation was done there was a feature called "rate responsive PVARP" which was on. During tachycardia PVARP reduced due to this feature, again and again PMT occurred with no sustain effect of PMT algorithm. By switching off rate responsive PVARP, PMT terminated and patient became comfortable as in **Figure 4**. So, device programming was itself causing deleterious effect on patient. PMT can only occur in DDD OR VDD modes. It is re-entrant arrhythmia that occurs only in those patients with intact VA conduction where the device senses a retrograde P regardless of trigger. In turn trigger may be [A]-PVC; [B]-Failure to Atrial capture during AV sequential pacing; [C]-At the end of ventricular

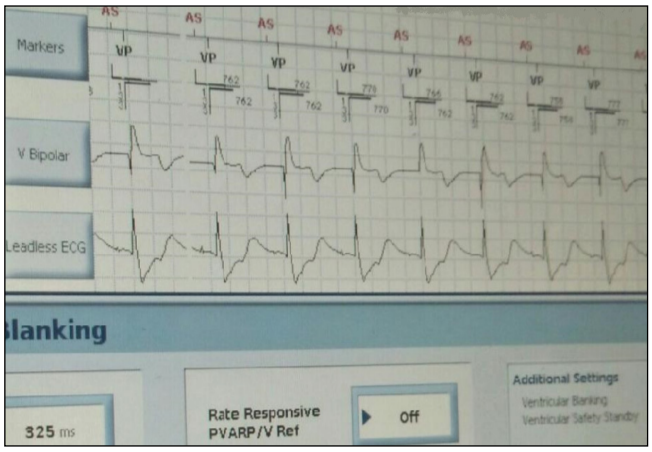

Figure 4 Rate responsive PVARP switched to off no recurrence of PMT.

threshold testing in VVI mode, where the device switches immediately to DDD pacing mode sensing retrograde P wave; [D]-Inappropriate large PVARP [RNRVAS] [1-5]. In modern pacemakers there are different algorithms for PMTS like PMT response in St Jude's, PMT protection in biotronics, PMT intervention in Medtronic's, PMT termination in Boston scientific, PVC response in BS,MDT,SJM,BTK [1-3]. Further As long AV interval permits recovery of AV refractory period and facilitates retrograde VA conduction, using algorithms like VIP [ST Jude's] can lead to Pacemaker mediated tachycardia and should be avoided in such patients [4]. Also automated threshold testing may also need to turn off. Further there are some far-field Pacemaker mediated tachycardia that can be initiated without VA conduction. In such cases far-field atrial sensing of ventricular electrical activity (the terminal portion of the QRS or the T wave) can be tracked and trigger an AV interval and ventricular pacing without any relation to P waves which are sustained. Programming long PVARP also prevent this type of arrhythmia [6]. Overall our patient improved and then discharged with no PMTS recorded and is on routine follow up.

Conclusion

PMTS can occur in dual chamber pacemakers and if recurrent may be symptomatic. Despite PMT algorithms, although rare, it may occur. In-built programming needs to be thoroughly set, and these devices related tachycardia's should be interrupted.

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