INTERESTING ELECTROCARDIOGRAM

COMPLEX CASE STUDY

Malpositioned Pacemaker Lead Presenting as a Peculiar 12-Lead ECG

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Introduction

Proper pacing lead position and implant complications are most often recognized within the first 24 h of a procedure using a combination of history, physical examination, electrocardiogram/programmer interrogation, and chest X-ray. We present a patient with a 10-year history of atypical signs and symptoms who presented to our institution for a pacemaker generator replacement.

Ecg Description

A 63-year-old male with a history of dual-chamber pacemaker implant (St. Jude Medical, St Paul, MN, 5330L Affinity DR) 10 years prior presented to our institution for a routine generator replacement. He had symptoms of dyspnea with exertion and a decreased sense of well-being. The dual-chamber pacemaker, presumably with leads in the right atrium and ventricle, was functioning properly. Typically, pacing in the right ventricle leads to a left bundle branch block (LBBB)-like configuration with a widened QRS duration. However, this can be differentiated from a true LBBB in the lateral leads where an RSR' pattern is seen in true LBBB, whereas the QRS morphology is not significantly changed in ‘pacing induced LBBB.’ The axis, especially in the inferior leads may be variable depending on the placement of the right ventricular (RV) lead due to the variable ‘distance’ from the inferior leads from a lead in the apex, septum, or outflow tract. Pacing in the left ventricle, via a coronary sinus (CS) lead, typically demonstrates a right bundle branch block-like configuration with a large R wave in lead V1.

The electrocardiogram (ECG) (Figure 1) shows a fully atrial and ventricular-paced rhythm. However, the ECG does not demonstrate features of a ‘pacer induced LBBB.’ Rather, the QRS complex is wide with a large R wave in lead V1, suggestive of a right bundle branch block-like pattern. Furthermore, the QRS axis is significantly rightward, suggesting pacing from a left-sided source.

Points to ponder

The differential diagnosis of the 12-lead ECG presented included cardiac resynchronization therapy (CRT) pacing (which was not possible given the known dual-chamber nature of the implanted system), perforation of the RV lead into the LV chamber, or pacing from an alternative site that was stimulating the LV chamber. However, examination of the chest X-ray and left anterior oblique view fluoroscopy make the diagnosis apparent. Of note, this was his second generator change, likely due to high thresholds from inappropriate placement.

The above patient presentation raises the following dilemma. Extract the RV/CS lead and risk traumatic injury to the CS and other contiguous cardiac structures versus placing a new RV apical lead and “upgrade” the system to a CRT-P and potentially improve the patient’s functional status. The possibility that the RV/CS lead could fail in the long term in this pacemaker-dependent patient argued that pacing stability was of the utmost
importance. Thus, the latter choice was made given the suboptimal anatomic position of the RV/CS lead and the probability of dyssynchronous LV/RV contraction.

Placement of a DDD pacer is a safe procedure. Proper pacing lead position and implant complications are most often recognized within the first 24 h of a procedure using a combination of history, physical examination, ECG/programmer interrogation and chest X-ray.

The use of X-ray fluoroscopy (Figure 2) has been a standard tool for accurate lead placement. Normal anatomic and electrical lead placement was assumed at the time of the original implant. However, closer examination of the X-ray and the ECG suggest otherwise. It is theorized that a single plane imaging system was used, and no attempt to confirm RV lead position was made in the LAO projection. It is also theorized that multiple surface ECG leads were not in place at the time of implant. QRS morphology and axis would have been an additional set of parameters that could have been confirmatory as to correct lead position.

Clinically, the patient has done well and reports less dyspnea and improved functional capacity since his pacing system was “upgraded” and he was provided the “safety net” of an RV apical lead. From our review of the literature, we are unaware of a similar report such as this, with an isolated malpositioned RV/CS lead remaining in a stable anatomic position for 10 years, resulting in symptoms, albeit mild.

Figure 1: Twelve-lead electrocardiogram demonstrating bizarre QRS axis from inappropriately placed pacemaker lead (see text).
References


Figure 2: Left anterior oblique view of the original implant demonstrating positioning of the right ventricle lead in the coronary sinus, presumably at the origin of the posterolateral vein.