CLINICAL VIGNETTE

Selective and nonselective His bundle pacing unmasks pathological Q waves on the electrocardiogram

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The electrocardiographic diagnosis of acute and chronic ischemia during right ventricular pacing is challenging, because nonphysiological pacing disturbs the sequence of ventricular depolarization and repolarization leading to major changes in QRS morphology and ST-segment displacement. Permanent His bundle pacing (HBP) maintains or restores the physiological, or nearly physiological, activation of the ventricles. Therefore, the classic interpretation of ischemic changes can be possible, although it has never been systematically studied. Recently, Curila et al[1] showed that HBP allows for the diagnosis of acute ischemia. In this case report, we present the impact of HBP on the diagnosis of old ischemic changes.

A 79-year-old man presented with a history of remote myocardial infarction of the inferolateral wall, heart failure, permanent atrial fibrillation, advanced atrioventricular block, and an implanted single-chamber ventricular pacemaker. Echocardiography demonstrated a dilated left ventricle, impaired left ventricular ejection fraction of 40%, and akinesia of the inferior wall with transmural fibrosis. Angiography showed chronic total occlusion of the right coronary artery. Due to the high burden of ventricular pacing with wide paced QRS complexes, it was likely that pacing-induced cardiomyopathy contributed to the patient's symptoms and the development of heart failure. Therefore, he was scheduled for an upgrade to physiological pacing with permanent HBP. During the follow-up, clinical and echocardiographic improvement was observed.

In this case, the His bundle could be paced both selectively (threshold of 1.25 V at 1 ms) and nonselectively (myocardial threshold of 2.5 V at 1 ms) (FIGURE 1). Interestingly, previously concealed electrocardiographic features of old myocardial infarction were revealed both during selective and nonselective His bundle capture. During selective capture, which completely restores physiological conduction, pathological Q waves reappeared in all inferolateral leads, while during nonselective capture, characterized by some direct nonphysiological depolarization of the septal myocardium, pathological Q waves were present only in leads III, aVF, and V_6. This explicitly illustrates that the degree of nonphysiological depolarization plays a crucial role in obscuring pathological Q waves.

It is difficult to diagnose remote myocardial infarction by electrocardiography during ventricular pacing, as pathological Q waves present during the intrinsic rhythm usually disappear. Notching of the upstroke of the S wave in leads V_3 through V_5 (Cabrera sign), notching of the upstroke of the R wave in leads I, aVL, or V_6 (Chapman sign), and qR complexes are the most commonly cited criteria for the diagnosis of remote myocardial infarction in paced patients. However, these markers are neither sensitive nor specific and not useful in localizing myocardial infarction.[2-4] Of note, neither Cabrera nor Chapman signs were present in our patient during any type of pacing, while qR in lead I and QS complexes in lead aVL observed during right ventricular pacing were nondiagnostic because of outflow tract lead position.[5]

In conclusion, the presented case showed that restoring the physiological depolarization of the ventricles by HBP may not only mitigate pacing-induced cardiomyopathy but also

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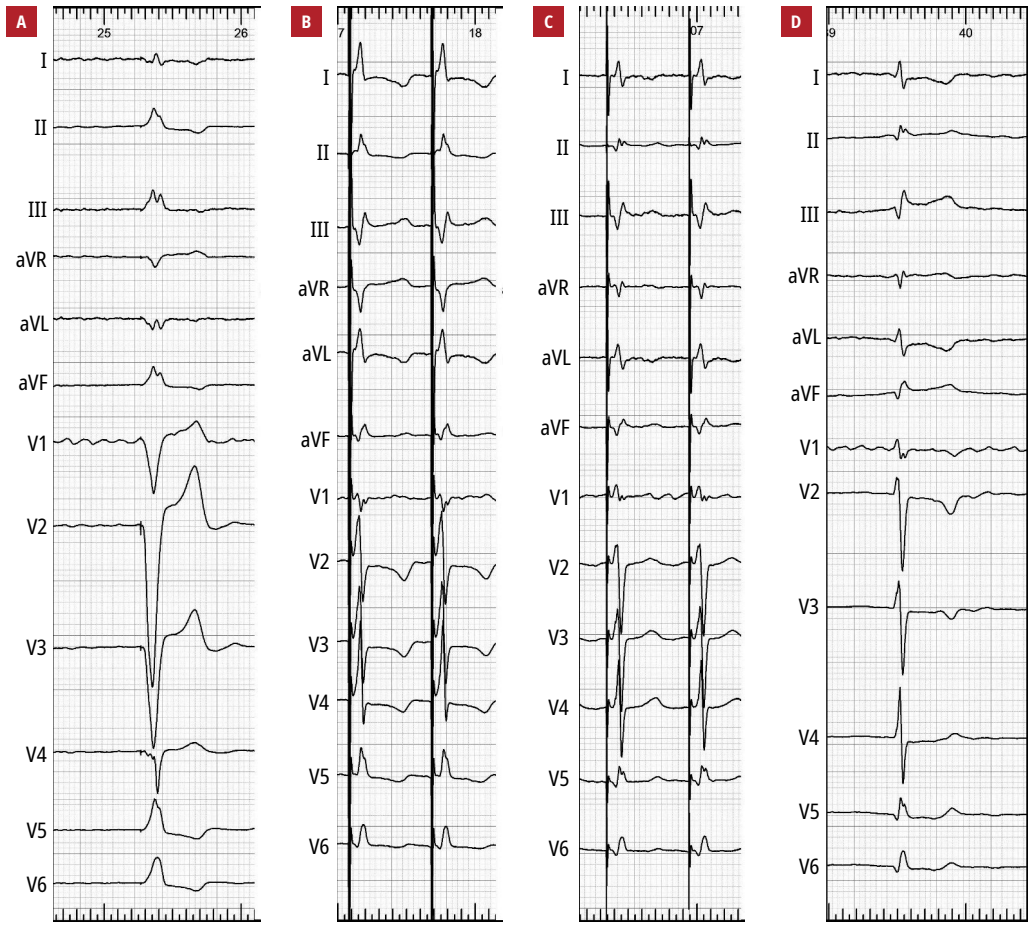

FIGURE 1 QRS morphology during ventricular depolarization of various types in the same patient: **A** – right ventricular outflow tract pacing: no pathological Q waves are present in inferior leads, but qR morphology can be seen in lead I and the QS complex in lead aVL; **B** – nonselective His bundle pacing: pathological Q waves are present in leads III, aVF, and V_6; **C** – selective His bundle pacing: pathological Q waves are present in leads II, III, aVF, V_5, and V_6; **D** – intrinsic QRS complex: pathological Q waves are present in leads II, III, aVF, V_5, and V_6.

enable the application of the classic criteria for the diagnosis of old myocardial infarction, which were developed for narrow, nonpaced QRS rhythms, in patients with His bundle paced QRS complexes.

ARTICLE INFORMATION

CONFLICT OF INTEREST None declared.

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