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CASE REPORT

His bundle lead placement: Is His bundle captured?

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Abstract

A 59-year-old female underwent a dual-chamber pacemaker implantation for intermittent complete heart block. A baseline electrocardiogram showed normal sinus rhythm with first-degree atrioventricular (AV) block and right bundle branch block. A His bundle lead placement was attempted. An intracardiac electrogram from the His bundle lead demonstrated atrial-His, and His-ventricular intervals were 186 and 110 ms, respectively. Pacing was performed from the His bundle lead with a decremental pacing output to assess for the His bundle capture threshold. However, there were no significant QRS morphology changes during the pacing. Is the His bundle captured? The tracing evaluation demonstrated the fascinating physiology of activation wavefront in His Purkinje system that could be applied in the use of conducting system pacing technologies.

KEYWORDS
His bundle pacing, infra-Hisian conduction delay

1 | CASE

A 59-year-old female underwent a dual-chamber pacemaker implantation for intermittent complete heart block. A baseline electrocardiogram showed normal sinus rhythm with first-degree AV block and right bundle branch block. An intracardiac electrogram from the His bundle lead demonstrated atrial-His, and His-ventricular (HV) intervals were 186 and 110 ms, respectively. Pacing was performed from the His bundle lead with a decremental pacing output to assess for the His bundle capture threshold (Figure 1). However, there were no significant QRS morphology changes during the pacing. Is the His bundle captured?

2 | COMMENTARY

Figure 2 shows paced ventricular complexes during pacing from the His bundle lead with a decremental pacing output at a sweep speed of 50 mm/s. These complexes are either nonselective His bundle capture, which is the fusion between the His bundle conduction and local myocardial tissue capture, or pure local myocardial capture since there is no isoelectric interval between pacing stimulus and QRS. Nonselective His bundle capture is usually differentiated from pure local myocardial capture by a narrower QRS complex when there is a change in QRS morphology during pacing with a higher pacing output.[1] However, there are no significant changes in QRS morphology in all paced ventricular complexes to allow the differentiation between His bundle capture and loss of His capture. A sharp potential is noted following the third, fourth, and fifth ventricular electrogram (arrow) on the His bundle lead channel when the pacing output was decreased to 1.2 V @ 1.0 ms and is absent on the first and second complexes when the pacing output was higher at 1.4 V @ 1.0 ms. This potential represents a retrograde His bundle activation from ventricular depolarization when the His bundle is not captured. It is absent on the first and second complexes because the His bundle is captured and refractory for retrograde activation. Retrograde His potential that is usually buried within the ventricular electrogram is easier to see in this patient because it is much later due to delayed retrograde infra-Hisian conduction. Based upon the absence and presence of retrograde His bundle activation, nonselective His bundle capture can be determined on the first and second paced complexes and local myocardial capture without His capture on the third, fourth, and fifth paced complexes. The

FIGURE 1 Decremental pacing output from the His bundle lead [Color figure can be viewed at wileyonlinelibrary.com]

unchanged QRS morphology with His capture and loss of His capture in this patient is due to a significantly prolonged infra-Hisian conduction with an HV interval of 110 ms, which allows the majority of the ventricular myocardial tissue to depolarize before the conduction from the His bundle to exit Purkinje fibers. Therefore, QRS morphology is not different between His capture and loss of His capture. This change was reproducible when the pacing output was decreased to 1.2 V @ 1.0 ms. The change in stimulation to His interval has been described in para-Hisian pacing maneuver,[2] which is a useful pacing maneuver in electrophysiological studies to differentiate retrograde septal accessory pathway conduction from retrograde AV node conduction.

In summary, His bundle capture might be difficult to recognize using a change in paced QRS morphology when the infra-Hisian conduction is significantly prolonged. Retrograde His bundle activation may be helpful to differentiate nonselective His bundle capture from pure local myocardial capture in patients with significantly prolonged HV interval. However, the benefit of His bundle capture in these patients is unknown.

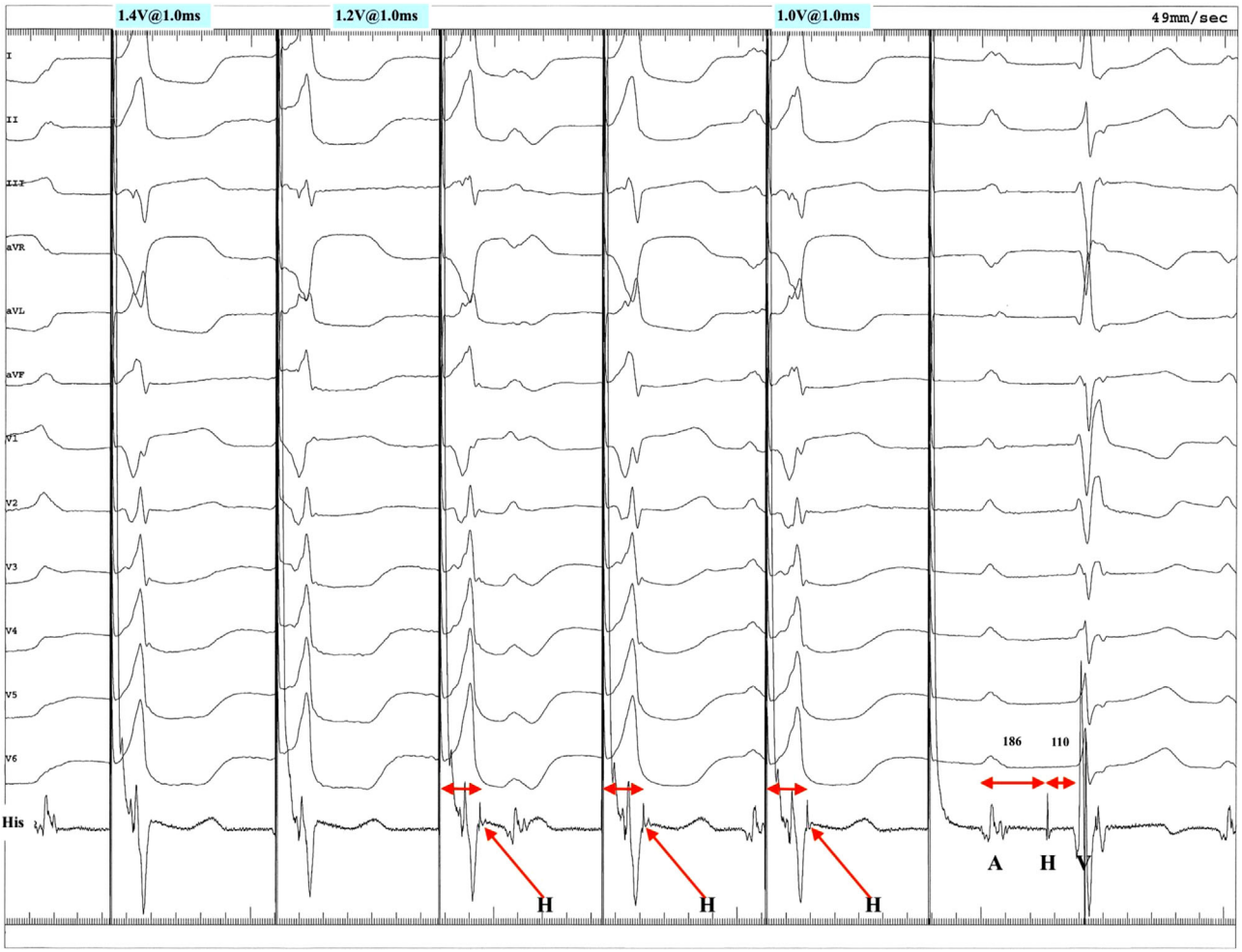

FIGURE 2 Retrograde His potential (arrow) [Color figure can be viewed at wileyonlinelibrary.com]

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest that could be perceived as prejudicing the impartiality of the research reported.

AUTHOR CONTRIBUTIONS

All authors had access to the data and a role in writing the manuscript.

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