Ventricular-side His bundle pacing using a mapping system

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Introduction: Permanent His-bundle pacing (HBP) has emerged as a promising approach to delivering physiological pacing, maintaining long-term ventricular synchrony. According to anatomic site of HB, the pacing site can be divided into two sides, the atrial-side and ventricular-side HBP (v-HBP). At present, there is no approach reported for purposely guiding v-HBP in the course of implantation.

Methods: (1) The construction of 3-dimensional (3D) right atrium (RA) geometry and tagging of the ventricular HB potential: three orthogonal pairs of electrode patches were placed on patients' skins, in order to create the required three-dimensional electrical navigation field. Surface patches were used as reference. Under local anesthesia, right femoral vein was punctured and a short 6F sheath was advanced into the vein. Using a quadripolar mapping catheter (Model 410443, St. Jude Medical, Inc., St. Paul, MN, USA) connected by NavX system, the three-dimension electroanatomic map of the superior vena cava (SVC), inferior vena cava (IVC), RA appendage (RAA), tricuspid valve annulus (TVA) and right ventricular were created (Figure 1 A/B). Then, the ventricular HB potential was mapped and tagged using the following criteria: mapping at the TVA toward the HB region, only His (H)-ventricular (V) potential but without atrial (A) potential was recorded by intra-cardiac electrogram (EGM) of Ensite NavX system (Figure 1C). (2) Implantation of HB lead guided by NavX system: under local anesthesia, the left subclavian vein was punctured and a short 8F sheath (Model HLS-1008M, Medtronic, Inc.) was advanced over a guidewire to retain access. The C315 His sheath (Medtronic, Minneapolis, MN, USA) was advanced into the RA via the guidewire. Then, the Select Secure pacing lead (Model 3830-69cm, Medtronic, Minneapolis, MN, USA) was advanced to the tip of the sheath. The tip and the ring of the HB lead were required to be beyond the terminal part of the sheath a little (otherwise the shape of lead was deformed due to the proximal electrode within the sheath) in order to provide bipolar connections for HB potential recording (bipolar fashion). The lead was guided by NavX system to the tagged HB, and was screwed in the region of HB using 4–5 clockwise rotations when EGM showed H-V potential without A potential.

Result: The final pacing parameters in this location were as follows: HB capture threshold was 0.7V at 1.0ms; local myocardial capture threshold was 2.8V at 1.0ms, R-wave amplitude was 5.8mV (Figure 2). Finally, contrast medium was injected through His sheath to show the v-HBP site under fluoroscopy (Figure 3A).

Conclusion: The achieved v-HBP not only had the advantage of a lower and more stable HBP capture threshold, and a higher ventricular sensing amplitude, but also extremely-low fluoroscopy exposure. Nevertheless, long-term follow-up and more further researches are needed to be implemented.