CASE IMAGE

Electrogram-guided mapping after visualization of the tricuspid valve annulus for His bundle pacing

His hüzmesi uyarımı için triküspit kapak anulusunun görüntülenmesi sonrası elektrogram kılavuzluğunda haritalama

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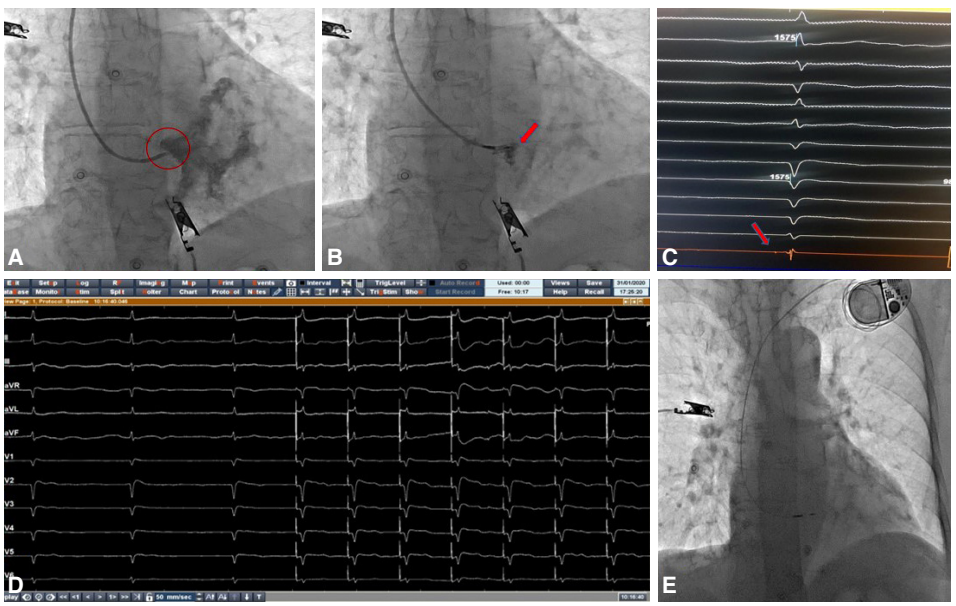
A 78-year-old woman with a diagnosis of atrial fibrillation and symptomatic bradycardia was referred to our clinic for pacemaker implantation. A physiologic His bundle pacing (HBP) procedure was performed. First, we visualized the tricuspid valve annulus (TVA) and septal leaflet (SL) by injecting contrast through the sheath (C315His, SelectSite; Medtronic, Minneapolis, MN, USA) using the anteroposterior projection (Fig. A). Once the His region was identified, the His bundle (HB) potential was mapped in 35 seconds in a unipolar mode with the HBP lead connected to the electrophysiology recording system (EnSite NavX; St. Jude Medical Inc., St. Paul, MN, USA) using sterile cables with alligator clips at a sweep speed of 100 mm/second) with only electrogram (EGM) guidance and without fluoroscopy (Fig. C). Capture threshold testing was done with a 12-lead electrocardiogram to clearly see the transitions from non-selective HBP (Ns-HBP) to selective-HBP (S-HBP) and myocardial capture. We started with high-output pacing (at 5V @ 1 millisecond) and also measured the QRS width. We obtained both His (S-HBP/Ns-HBP) and right ventricular (RV) myocardial capture thresholds. Once the S-HBP was confirmed (paced QRS morphology identical to the native QRS complex with an isoelectric interval in all 12 leads (Fig. D) with acceptable sensing (7.8 mV) and threshold (2.2V@1millisecond) parameters, the pacing lead (3830 SelectSecure; Medtronic, Minneapolis, MN, USA) was fixed. Contrast injection before slitting the sheath showed that the HBP lead tip was at the distal His bundle location (Fig. B). A chest X-ray was taken before discharge to confirm the appropriateness of the HBP lead position (Fig. E). Targeting the HB with a standard mixed fluoroscopic and electrophysiological approach might necessitate excessive fluoroscopy time due to the small anatomic target. The HB lies in the membranous atrioventricular septum and penetrates into the posterior site of the basal interventricular septum just inferior to the tricuspid SL. The TVA and the root of the SL can be used as a landmark for the HB region. Once in the His area, fluoroscopy can't help enough to find a better lead position because minimal movements are required to locate the HB. EGM-only guided mapping can be more helpful and shorten the fluoroscopy time. S-HBP is a pure HB pacing whether the pacing spike is followed by an isoelectric in-terval (equivalent to the HV interval) without QRS widening (Fig. D). Ns-HBP is a capture of both the HB and the basal ventricular septum in which the stimulus-ventricular capture is shorter than the HV interval. A sudden change in the QRS (which becomes wider and notched) during a capture threshold test demonstrates the transition from Ns-HBP to the pure RV myocardial capture. There are 3 anatomic HB variations, and different responses are seen in each, depending on the pacing outputs. While S-HBP will be seen at lower outputs in Type 1 and 3, if HB capture is obtained, it will likely be Ns-HBP in Type 2. A large atrial potential nearly as large as the ventricular would cause atrial oversensing, but it is rare in atrial fibrillation patients due to low-amplitude fibrillatory signals. A large His potential will cause double counting, requiring lowering the sensitivity or switching the polarity. The biggest concern about HBP is the high rate of lead revision or threshold increase compared to RV pacing; however, with increasing operator experience and technical developments, improvement in thresholds and lead stability is highly expected.



Figures– (A) Visualization of the tricuspid valve annulus (TVA) by injecting contrast through the sheath in anteroposterior projection (His bundle region is indicated by the red circle); **(B)** Fluoroscopic image showing pacing lead tip (arrow) on the ventricular side of the TVA; **(C)** Electrogram (EGM) demonstrating the His bundle potential (red arrow); **(D)** A 12-lead electrocardiogram and EGM during selective His bundle pacing; **(E)** Post-procedure roentgenogram demonstrating the final lead position.