Electrophysiology
Technique Spotlight

Making the Case for a Deflectable Catheter at the His Bundle Position During Atrial Fibrillation Ablation

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Case History

This case involves a 65-year-old Caucasian woman with a one year history of paroxysmal atrial fibrillation, who presented to our institution for curative ablation. Previously, she was rhythm controlled with amiodarone and anti-coagulated with warfarin. The patient had failed other anti-arrhythmic agents, declined long-term treatment with amiodarone and thus had begun to have recurrent atrial fibrillation. Subsequently, she was referred to our institution for radiofrequency ablation of atrial fibrillation. A transesophageal echo-cardiogram was performed prior to ablation which revealed a normal left atrium, right atrium, left ventricular size and ejection fraction, and normal pulmonary vein anatomy. A redundant atrial septum without shunting was appreciated. Normal configuration of the four pulmonary veins was exhibited by cardiac CT. The patient was in normal sinus rhythm at the onset of the procedure and amiodarone was stopped several weeks prior to the procedure. Pulmonary vein isolation was the selected approach to curative ablation of her atrial fibrillation.

Procedure

A circular twenty-pole catheter was used to map pulmonary vein potentials at the pulmonary vein ostia. A cooled tip and an 8mm tip catheter were used as our radiofrequency ablation catheters. Two Polaris Dx™ Deflectable Catheters *(Boston Scientific, San Jose, CA*) were used for right ventricular apex recordings and for the His bundle and coronary sinus recordings (Figures 1 and 2).

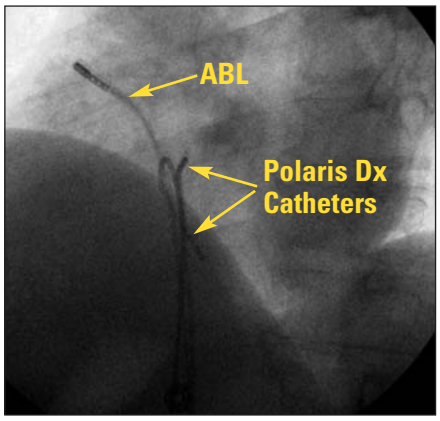

Figure 1

Left anterior oblique fluoroscopic image demonstrating the position of the Polaris Dx Catheter at the His bundle, a second Polaris Dx Catheter at the RVA, and ablation (ABL) catheter in the HRA.

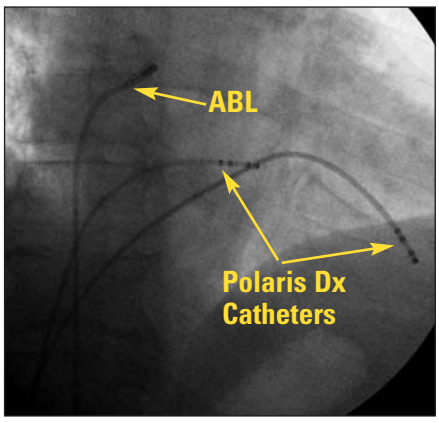

Figure 2

Right anterior oblique fluoroscopic image demonstrating the position of the Polaris Dx Catheter at the His bundle, a second Polaris Dx Catheter at the RVA, and ablation (ABL) catheter in the HRA.

Placement at the His Bundle

In keeping with the preferred technique, the tip of one of the Polaris Dx Catheters was first placed at the His bundle. To achieve this placement, the Polaris Dx Catheter was deflected and advanced from the inferior vena cava to the right atrium. The tip was relaxed and clockwise torque was applied as the catheter was advanced to the right ventricle along the superior aspect of the tricuspid valve annulus. The catheter was then retracted (with the tip relaxed) until an atrial electrogram, His bundle potential, and ventricular electrogram was appreciated on the Polaris Dx Catheter recordings.

The ability to adjust the catheter's curve shape allows one to accommodate the variable chamber geometry of the right atrium and the soft tip prevents movement away from the selected recording site. These features enhance catheter stability and help achieve high quality His bundle electrograms (Figure 3).

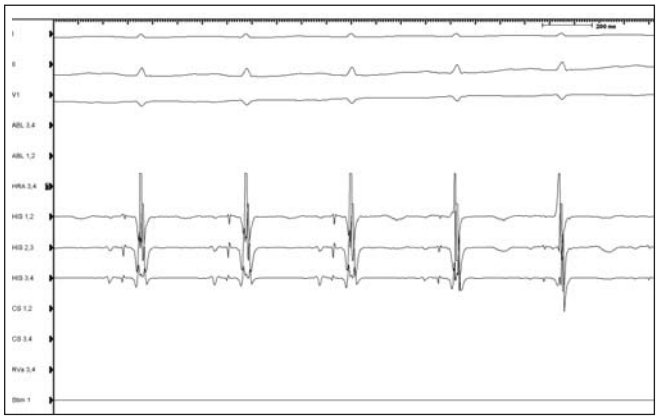

Figure 3

Note the fidelity of the His bundle recordings on the distal (His 1,2), mid (His 2,3) and proximal (His 3,4) bipoles of the Polaris Dx Catheter

The baseline electrophysiology study failed to demonstrate sinus node or AV node dysfunction and the patient was found to have normal infranodal conduction without evidence of dual AV nodal physiology or accessory pathway conduction.

Cannulation of the Coronary Sinus

To access the coronary sinus, the Polaris Dx Catheter was rotated posteriorly (clockwise) from the His bundle into the coronary sinus ostium while using fluoroscopic imaging in the LAO view for guidance. The catheter curve was relaxed when the tip was engaged in the ostium; it was then advanced with continuous clockwise rotation. The deflectable curve allowed placement in the distal coronary sinus with navigation away from posterior branches of the coronary sinus by employing the deflectable tip (Figure 4).

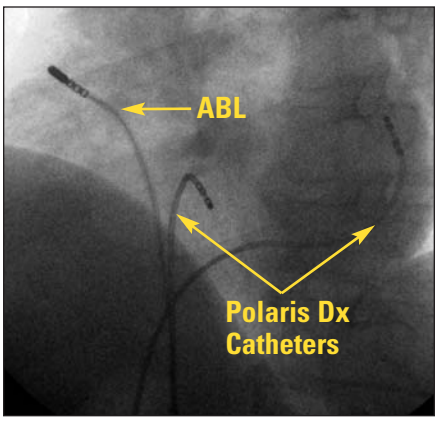

Figure 4

Left anterior oblique fluoroscopic image demonstrating the position of the Polaris Dx Catheter in the distal CS, a second Polaris Dx Catheter at the HIS bundle & ablation (ABL) catheter in the HRA.

Throughout the procedure the patient suffered recurrent bouts of atrial fibrillation with drivers mapped to the left superior and inferior pulmonary veins. Complete pulmonary vein isolation, which terminated the recurrent bouts of atrial fibrillation, was achieved in the left superior pulmonary vein and left inferior pulmonary vein. Given the higher recurrence rate noted with targeting only the culprit veins, the other pulmonary vein ostia were targeted.[1]

Use of pre-operative cardiac CT and ingestion of barium contrast during the procedure identified the esophageal location directly adjacent to the right superior and inferior pulmonary vein ostia. Therefore, only partial pulmonary vein isolation was achieved in the right superior and inferior pulmonary veins in an effort to avoid the possible complication of atria-esophageal fistula. Significant slowing of conduction from the right pulmonary vein ostia to the left atrium was achieved which was felt to be an adequate endpoint.[2] Right atrial ablation of the tricuspid-caval isthmus was successful in establishing bidirectional block.

Post-ablation, the patient underwent an infusion of high dose isoproterenol along with rapid atrial overdrive pacing and atrial extrastimulation with no induction of sustained atrial fibrillation, although two sites of repetitive non-sustained atrial tachycardia were mapped and ablated.

Value of the Steerable Catheter in the Coronary Sinus

Throughout the electrophysiology study and ablation, the Polaris Dx Catheter proved to be invaluable. Placement of the Polaris Dx Catheter out to the distal aspect of the coronary sinus allowed pacing from the left atrium in order to differentiate left atrial signals from pulmonary vein signals on the circular twenty pole catheter (Figure 5).

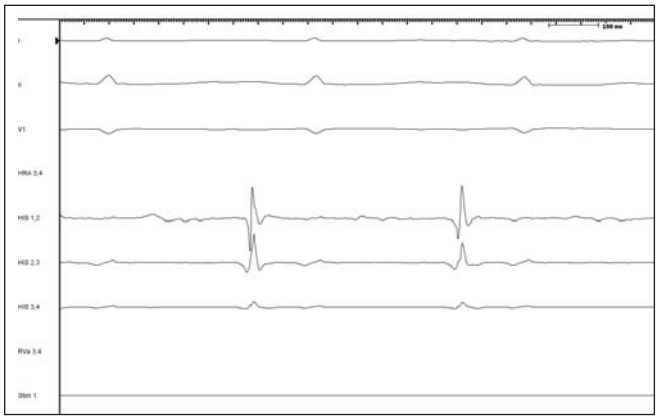

Figure 5

Note the large atrial electrograms and small ventricular electrograms on His 1,1 2,3 and 3,4. This reflects ideal positioning of the Polaris Dx Catheter in the distal coronary sinus for pacing to allow discrimination of left pulmonary vein potentials.

When attempting to discern the origin of the pulmonary vein tachycardias triggering atrial fibrillation, we were quickly able to assess earliest sites of activation by placing the Polaris Dx Catheter in the distal coronary sinus near the left superior pulmonary vein ostium. The ablation catheter was placed in the left inferior pulmonary vein ostium and the twenty pole circular catheter was placed in the right superior pulmonary vein ostium. The Polaris Dx Catheter at the His bundle was deflected and torqued to the coronary sinus ostium; this allowed us to quickly confirm the presence of bidirectional block after the patient's atrial flutter ablation.

During post-ablation testing on high-dose isoproterenol, the Polaris Dx Catheter was moved in relation to the other intra-cardiac catheters to map the coronary sinus, right atrium and superior vena cava to determine the most likely region of origin of the remaining non-sustained tachycardias prior to ablation.

The patient was discharged the following day in normal sinus rhythm on enoxaparin as a bridge to re-establishing anticoagulation with warfarin. She was restarted on amiodarone for a period of one month and warfarin was continued until the follow-up CT six months later revealed no evidence of pulmonary vein stenosis.

Conclusion

The Polaris Dx Deflectable Quad Catheter is an ideal diagnostic catheter for His bundle and CS recordings during atrial fibrillation ablations as demonstrated by its wide-ranging applications during this procedure. It tracks easily up the inferior vena cava for quick positioning. The deflectable curve allows one to advance the catheter through the IVC with full deflection, which prevents it from advancing into side branches. Furthermore, its pushability and one-to-one torque response lead to responsive handling which allow ease of placement at the His bundle and other sites of interest such as the coronary sinus, patent foramen ovale, atrial flutter isthmus, and the superior vena cava.The handle of the catheter is comfortable to hold. The steering action allows for precise curve deflection. The steering mechanism retains the curve, reducing the need to physically "hold" the curve in place. The direction of deflection is defined by the directional dimple on the handle which decreases reliance on fluoroscopy to evaluate the plane of deflection.

Polaris Dx Catheter Deflectable Quad

While a fixed curve catheter may be adequate for recording the His bundle potential, the use of a deflectable catheter with premier steerability affords the operator an additional catheter with which to map premature atrial contractions and paroxysmal atrial tachycardias, and to help assess the adequacy of bidirectional block in the atrial flutter isthmus. The added flexibility afforded the operator with this catheter is ideal for complex ablation procedures.

References

1 Dilling-Boer D, Van Der Merwe N, Adams J, Foulon S, Goethals H, Willems R, et al. J Cardiovasc Electrophysiology 2004; 15(2): 200-5.

2 Karch Martin R, Zrenner B, Deisenhofer I, Schreick J, Ndrepepa G, Dong J, et al. Freedom from Atrial Tachyarrhythmias after Catheter Ablation of Atrial Fibrillation. Circulation 2005; 111:2875-2880.

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