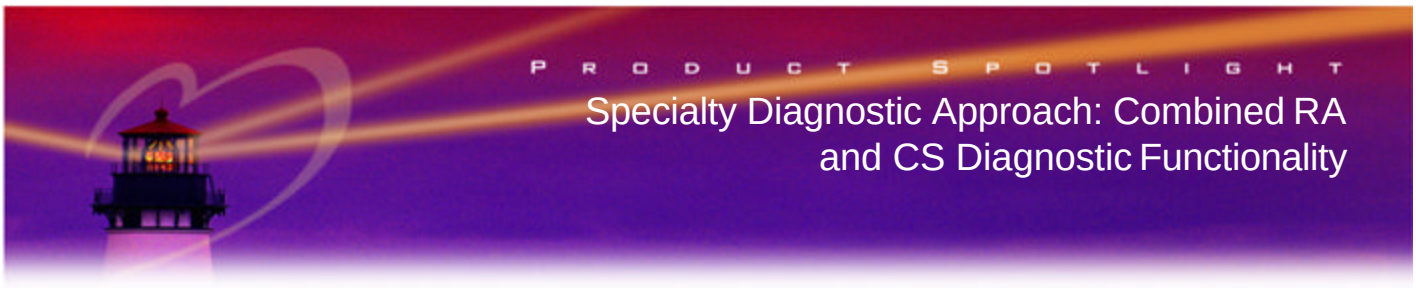

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Introduction
As methods for ablation continue to evolve, new techniques are important for continued improvement of procedural methods.

The purpose of this paper is to highlight a specialty approach for performing diagnostic recording, mapping and pacing protocols in the High Right Atrium (HRA) and Coronary Sinus (CS) currently utilized for Pulmonary Vein Antral Isolation (PVAI) ablations and Supraventricular Tachycardias (SVTs).

Methods of PVAI ablation
The technique most commonly employed at the Cleveland Clinic for PVAI ablation utilizes four different catheters from four separate sheaths placed in the central veins. As we employ two of the catheters to perform the ablation and we use an intracardiac ultrasound catheter, we highly value the ability of the 4th catheter to simultaneously record Electrograms (EGM's) from multiple sites. We utilize a 20-pole catheter which simultaneously provides HRA and CS EGM's for this purpose.

Specialty Electrode Spacing
Our preference is to have the distal 10 poles positioned from the CS ostium (electrode pair 9-10) to the lateral Mitral annulus (electrode pair 1-2). The proximal 10 poles are positioned from the Superior vena cava (SVC)/HRA junction (electrode pair 19-20) to the low lateral RA (electrode pair 11-12).

There are several procedural factors and device attributes which are important to note when considering utilizing this specialty catheter configuration;

- *The frequent occurrence of typical and atypical flutters during ablation of atrial fibrillation* – We have noticed this phenomenon in patients having their first ablation, but it is much more common in the type of patient referred here either because of high risk characteristics or because of a failed ablation.

  The ability to quickly localize the flutter based on activation sequence in the HRA to the CS as well as the response to multi-site pacing maneuvers often allows us to avoid moving catheters out of the left atrium prematurely, which would necessitate another transseptal puncture. Likewise, if we can see that an atypical flutter is clearly not left-sided, we can pull sheaths back out of the left side earlier than we might if we had to take additional time placing catheters in additional sites to confirm this.

- *Stability* - This catheter is used as a reference point for the 3-dimensional mapping system which is usually used, thus it is critical that this catheter be stable.

- *Ability to minimize venous punctures* - We believe that reversing the patient's anticoagulation for the procedure exposes them to an increased risk of peri-procedural thromboembolic events, thus we usually perform the procedure with a therapeutic International Normalized Ratio (INR) of 2-3. This translates into a small increased risk of hemorrhagic complications, particularly at the sites of venous access; therefore, we want to minimize the number of venous punctures.

- *Ability to place from an inferior approach* - We have usually placed the HRA/CS catheter via a sheath placed in the right internal jugular (IJ) vein. The vascular access in the neck with a therapeutic INR creates an additional challenge as this is a site less amenable to compression in the event of a bleeding complication. This position is less comfortable for the patient and creates some logistical issues such as the cables having to be stretched across the field to the upper torso, and the catheter having to be reflected down to the right side of the patient.

  With these issues in mind, as well as the tremendous positive response received from patients who appreciate the effort to avoid the IJ access, I have been placing all of the sheaths and catheters from the femoral veins.

Catheter Selection
All of the previously available 20-pole catheters have been disappointing in their stability or spacing of the leads. Only a few of the commercially available catheters

have spacing between the proximal 10 poles and the distal 10 poles, as most are designed for recording along the tricuspid annulus. Also, most 20-pole catheters require two separate cables to record the all poles.

I had temporarily abandoned this approach until I tried the Conforma™ catheter, a 20-pole diagnostic catheter with two separate sets of 10 electrodes with 2,8,2mm spacing with a 60mm gap (Bard Electrophysiology, Lowell MA). I have been quite pleased to encounter the Conforma catheter, and have now used it for diagnostic purposes on approximately 20 ablation procedures. The catheter has been extremely stable in the CS, and provides excellent fidelity EGM's through a single cable.

Placement Technique

The catheter is placed in the CS by first looping the catheter in the RA and then applying counter-clockwise torque while at the same time allowing the curve to open slightly. One has to avoid catching the Right atrial appendage as this will hold the tip and keep it from looping, thus the tip may need to be allowed to cross the Tricuspid annulus while allowing the loop to prolapse up into the HRA. After forming the loop, the counter-clockwise torsion advances the catheter tip towards the Septum and CS ostium as the loop is slightly opened.

In a number of cases, I have found that placing the catheter via a long (45 cm) sheath allows improved support with which to advance the catheter into the CS, as it prevents proximal stored torque from moving the catheter in the opposite direction from where it is being directed.

Since I switched to the Conforma catheter I have yet to have to abandon the femoral approach in favor of an IJ approach for either lack of ability to properly place the catheter or instability of the catheter after placement.

Application for Other Indications

I have expanded my use of this catheter to Supraventricular tachycardia (SVT) cases in which I benefit from having simultaneous right and left atrial EGM's such as atrial flutter and atrial tachycardia.

In atrial flutter, the stable position allows for instant recognition of the change in atrial activation seen when bidirectional block is achieved across the Cavo-Tricuspid Isthmus, as well as pacing from multiple sites to measure conduction times prior to and after ablation.

The catheter has performed well in both right and left atrial tachycardia cases by providing a stable reference for 3-dimensional mapping as well as for diagnostic maneuvers such as overdrive pacing from multiple sites and for reflecting changes in atrial activation patterns.

Conclusion

Optimal diagnostic techniques are a critical component of a successful ablation procedure. We have the found this specialty diagnostic approach can provide the opportunity to improve procedural efficiencies, patient comfort and reduced potential for complications.

Disclosure

The opinions and clinical experiences presented herein are for informational purposes only. The results from this case study may not be predictive for all patients. Individual results may vary depending on a variety of patient specific attributes. The physician has been compensated by Bard Electrophysiology for the time and effort in preparing the above case study for its further use and distribution.