MINIMAL FLUOROSCOPY RADIATION APPROACH OF AVNRT ABLATION WITH RHYTHMIA HDx™ MAPPING SYSTEM AND INTELLANAV™ ST ABLATION CATHETER

1. Dimitrios L. Tsiachris M.D., PhD, EP Lab director, Athens Heart Center, Athens Medical Center, Athens, Greece
2. Evripidis Mikos M.Sc., Rhythmia Field Clinical Specialist, Boston Scientific, Greece
3. Christodoulos Stefanadis, Director, Athens Heart Center, Athens Medical Center, Athens, Greece

Introduction

Atrio-Ventricular Nodal Re-entry Tachycardia (AVNRT) constitutes the most common supraventricular tachycardia and the elimination of the slow pathway is considered a curative treatment according literature.

Traditionally, AVNRT ablation procedures are performed under continuous fluoroscopy guidance for visualization of the catheters. The risks associated with this radiation can be divided in two types: stochastic (non-threshold biological effect that is probabilistic and proportional to the exposure and the dose and may result in cancer development and genetic effect) and deterministic (direct and dose-dependent effect responsible for skin necrosis, lens opacities and cataract and may impact fertility)[1]. With the advance of technology in the recent years, the use of 3D cardiac mapping systems have contributed to a decrease in the use of fluoroscopy.

In this case report, we present how the use of the **RHYTHMIA HDx™ Mapping System (Boston Scientific, Massachusetts) with the INTELLANAV™ ST Ablation Catheter (Boston Scientific, Massachusetts) helped to almost eliminate the use of fluoroscopy in AVNRT procedures.**

Case Presentation

A female patient, 66 years old, suffering repetitive episodes of AVNRT and resistant to antiarrhythmic therapy underwent an EP Study and ablation procedure to improve her quality of life.

Materials

The procedure was scheduled to be performed with the RHYTHMIA HDx™ Mapping System. Additionally, the following electrophysiology catheters were used:

- Dynamic XT™ (Boston Scientific) 10-pole steerable catheter for the coronary sinus (CS)
- VIKING™ Quadripolar catheter (Boston Scientific) placed in the right ventricle
- INTELLANAV™ ST (Boston Scientific), the new solid 4 mm tip nav-enabled ablation catheter (standard curve)

Methods

The RHYTHMIA HDx™ Mapping system, based on hybrid technology, allows users to track and visualise both impedance and magnetic based tracking catheters. Hybrid technology utilizes the positioning of a backpatch with an embedded magnetic sensor and the impedance values of 6 ECG Leads (Figure 1). Most extended usage of the mapping systems relies on fluoroscopy guidance for cannulating and positioning the CS catheter.

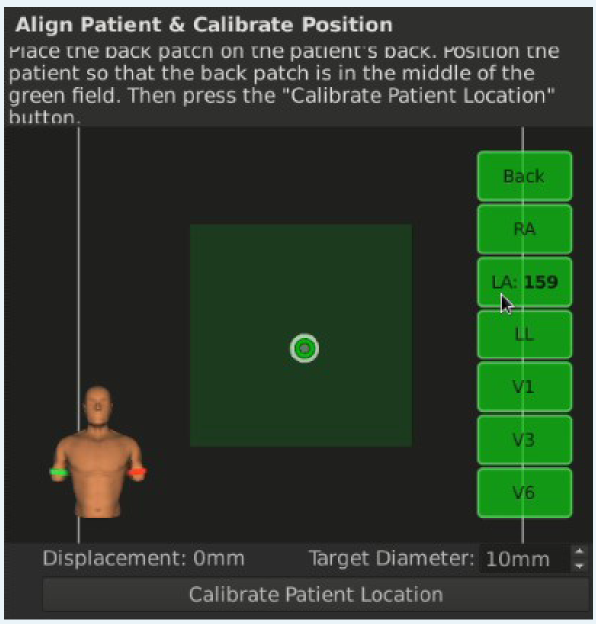

Figure 1: RHYTHMIA™ screen used to calibrate the backpatch position and check ECG leads

In order to minimize x-ray exposure, we developed a new strategy in which we connected a RF ground patch from the patient's back[2] (Figure 2) to A1 of RHYTHMIA HDx™ pinbox, via the INTELLATIP MiFi™ (Boston Scientific) filter cable (Figure 3).

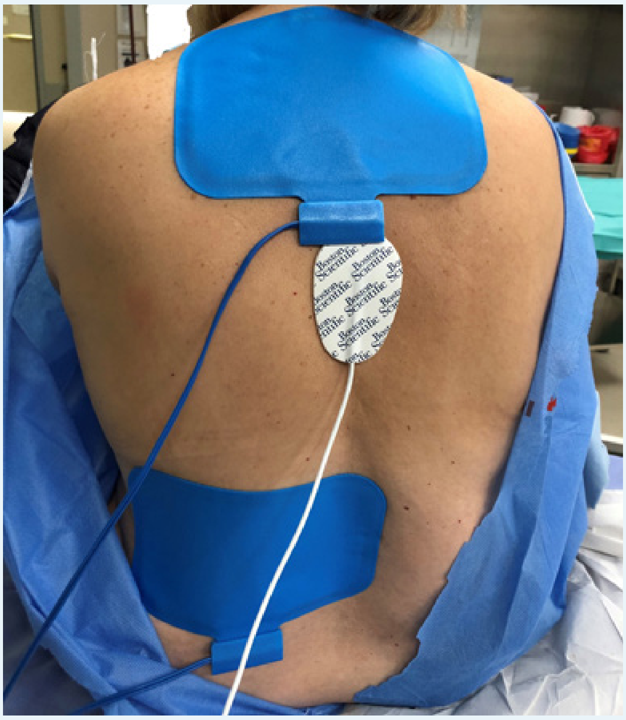

Figure 2: Position of the second RF grounding patch placed between the patient's shoulders used as the system reference

Figure 3: Connection of RF back patch used as system reference to PIN A1 via INTELLATIP MiFi™ filter cable

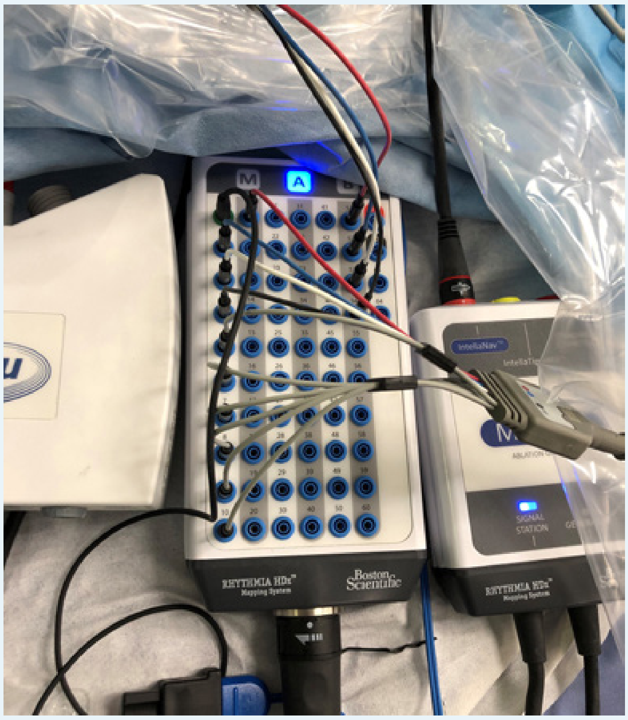

Figure 4: Connections of the diagnostic catheters in RHYTHMIA HDx™ pin box A. The distal pole of the Dynamic XT ™catheter was connected to A11 and the remaining poles could be pinned anywhere in the pinbox. In our case we connected the remaining pins into A2-A10 as it facilitates the return to standard connectology if needed at any time. The same connection channels have to be used in the recording system, for the proper EGMs readings

The magnetically enabled INTELLANAV™ ST is the first catheter to be inserted into the patient to create the field map. The catheter is moved all around the chamber of interest in order to create a proper field map and make the visualization of any impedance catheter on the RHYTHMIA HDx™ screen feasible (Figure 5).

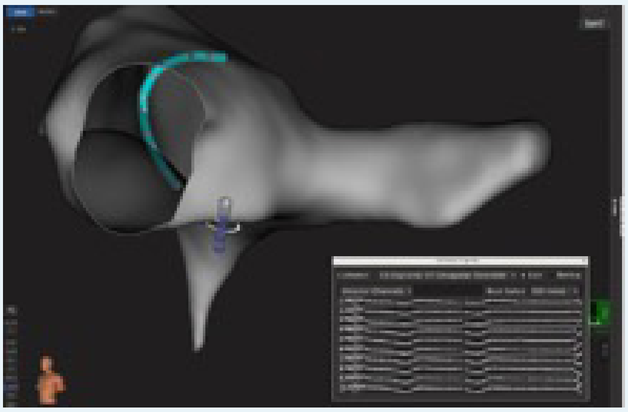

Figure 5: CS catheter visualisation enabled by the field map created with INTELLANAV™ ST

The system allows visualisation of the field map status in any area of the chamber so the user can decide whether or not to update the field map with the INTELLANAV™ ST (Figure 5). The tracking quality (TQ) value displayed for the unipolar signals of an impedance tracked catheter is representative of how well the catheter model fits the measured signals (Figure 6). The TQ value for impedance catheters, like CS catheter, can be impacted by a poor field map, so it can be used as an indicator that a better field map needs to be created or that tracking quality for that catheter is poor.

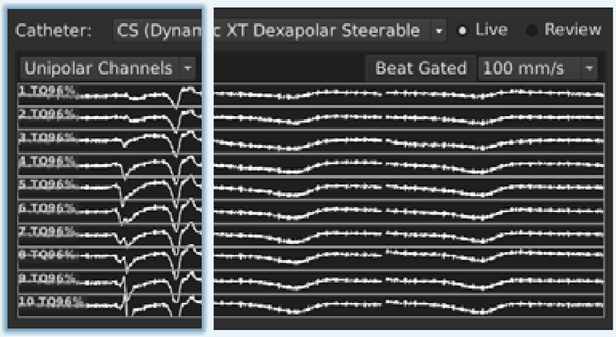

Figure 6: Tracking quality monitored by Dynamic XT™ catheter

In the present case, the right atrium as well as the inferior and superior vena cava were recognized based on the respective presence and absence of an atrial electrogram. The field map was created in the area between inferior vena cava and tricuspid valve, CS ostium and the triangle of Koch, using the INTELLANAV™ ST catheter. The same catheter was used to identify HIS potentials at the anterior-inferior end of the interatrial septum (Figure 7). Dynamic XT™ and VIKING™ catheters were then located in the CS and right ventricle respectively.

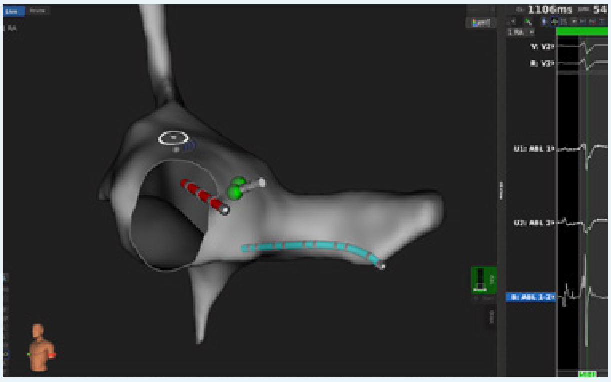

Figure 7: HIS potential cloud in green

Pacing maneuvers confirmed the clinical tachycardia while RHYTHMIA HDx™ and clear and sharp signals on INTELLANAV™ ST located slow pathway potentials in the base of the triangle of Koch (Figure 8).

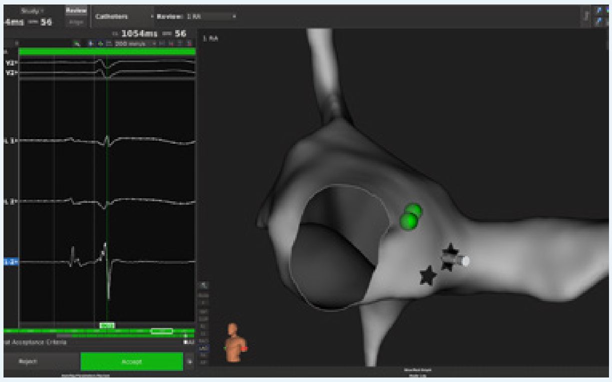

Figure 8: Identification of slow pathway potentials with INTELLANAV™ ST

Radiofrequency (30W, 60°C) was delivered by MAESTRO 4000™ RF Generator (Boston Scientific) in temperature mode. Complete elimination of slow conduction pathway required less than 4 minutes RF time and nearly-zero use of x-rays (Figure 9).

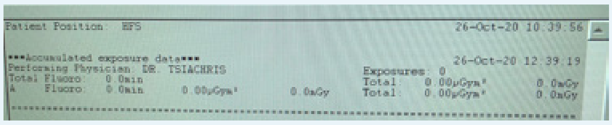

Figure 9: Nearly-zero use of fluoroscopy according to angiography system

Conclusions

For years, mapping systems were mainly used for complex atrial and ventricular tachycardias only. However, recent developments have triggered the EP community to utilize these systems for SVT treatments as well, because of their new and safer workflows.

In this context, the **RHYTHMIA HDx™ Mapping system allows to identify critical areas, such as the HIS potentials cloud. When combined with the nav-enabled INTELLANAV™ ST ablation catheter, operators benefit from clear and sharp signals for overall safer procedures thanks to the precise micro-movements, torque and tip stability of the catheter and minimal fluoroscopy exposure related to this new workflow.**

References

1. Radiation protection in the cathlab and interventional cardiology, Prof. Hilde Bosman, KU Leuven.
2. A minimal Fluoroscopic Approach to AVNRT Ablation with Rhythmia HDx, Stefano Bianchi, Francesco Piccolo, Pietro Rossi, Luigi Iaia, Filippo Cauti, EP-627803-AA.

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