

# MID-SEPTAL RIGHT ACCESSORY PATHWAY WITH FAST JUNCTIONAL BEATS DURING ABLATION. SAFETY AND ACCURACY WITH RHYTHMIA HDx™ and INTELLANAV™

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## Introduction

Accessory Pathways are fibers that allow electrical connection between the atria and ventricles. These fibers are composed of typical myocardial cells and are extrinsic to the normal conduction system.

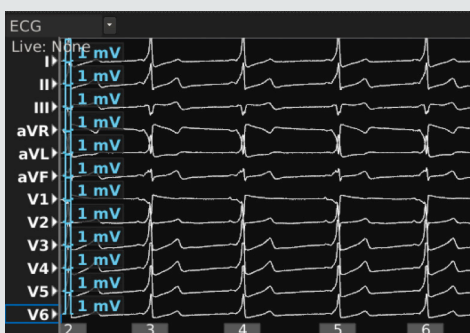
Accessory pathways are often diagnosed in young patients having several clinical expressions, from an abnormal ECG to a macro-reentrant circuit involving the atria, ventricles, AV node and His bundle. Here the accessory pathway can function as a bypass circuit to the intrinsic conduction system transmitting rapid atrial tachyarrhythmias to the ventricles.

## Case Presentation

A 31-year-old female smoker, with no other clinical conditions reported recurrent sudden palpitations since childhood. The basal ECG (Figure 1) shows pre-excitation syndrome. Echocardiography showed no significant structural cardiomyopathy.

The RHYTHMIA HDx™ (Boston Scientific, Massachusetts) mapping system was installed at our lab in December 2017. We rely not only on the high-density mapping capabilities of the system for diagnosing complex arrhythmias but also the sub-millimeter navigational catheter location accuracy provided by RHYTHMIA HDx™ for wider EP procedures. Mapping guidance has significantly reduced x-ray exposure for patients and the catheter lab team. This is a particularly important consideration when treating younger patients. For the EP study and ablation strategy we elected to use the 4 mm solid tip ablation catheter INTELLANAV™ ST (Boston Scientific, Massachusetts) with magnetic navigation sensor.

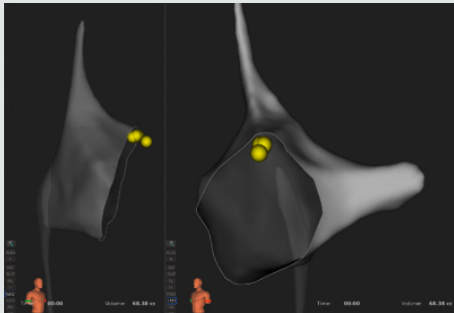
We employ a RHYTHMIA HDx™ workflow that minimizes reliance on fluoroscopy. An additional indifferent electrode is placed on the upper back as the system impedance reference. It is positioned above the RHYTHMIA back patch as described in the case report from Ospedale San Giovanni Calibita, Rome, Italy<sup>1</sup>. This approach enables us to reconstruct anatomy using a single INTELLANAV™ ablation catheter without the need for an internal diagnostic catheter.



**Figure 1:** Basal ECG: Transition of delta wave in V2 suggests a septal right accessory pathway.

## Vascular Access and Reconstruction of the right atrial geometry

Vascular access was achieved using a double femoral puncture. The magnetic ablation catheter (INTELLANAV™ ST) was visible from the point of vascular access up through the inferior vena cava and used to perform anatomical reconstruction of the right atrium and coronary sinus. Guided by electro-anatomical mapping and EGM interpretation, different regions were well defined, such as the tricuspid annulus, inferior and superior vena cava, coronary sinus and Hisian region (Figure 2).



**Figure 2:** Right Atrial (RA) anatomy. The yellow tags indicate the His activation

Navigated within the reconstructed anatomy, a diagnostic quadripolar catheter (Viking™, Boston Scientific, Massachusetts) was placed in the lateral right atrium for pacing manoeuvres during radiofrequency application.

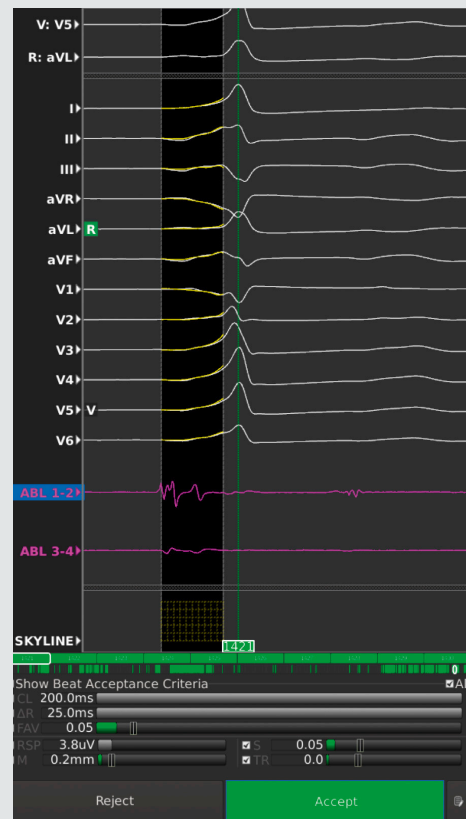
The diagnostic catheter was also used as a timing reference to build an activation map determining the earliest ventricular activation on the tricuspid annulus.

Our EP study demonstrated the presence of an accessory pathway (AP) with bidirectional conduction.

The following RHYTHMIA HDx™ beat acceptance criteria was used: Favourite Beat (0.05), Respiration (10.9), Motion (1.0), Tracking (3.0) and Stability (0.25).

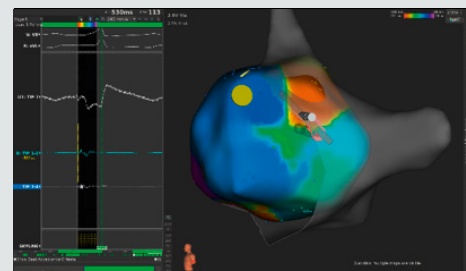
The ECG with delta wave was the selected pattern morphology. This avoided annotations on beats without pre-excitation and provided a timing reference for ventricular activation.

The mapping window was set to map the delta wave, excluding and P wave activation so we were able to discriminate only accessory pathway potentials and the earliest ventricular activation.



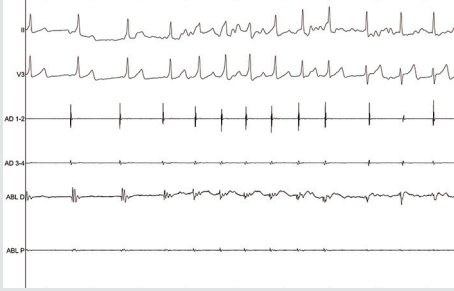
**Figure 3:** Beat with preexcitation selected as a template for favourite beat. Mapping window set to map delta wave.

The earliest ventricular activation was determined in mid-septal region, 4.5mm from the area of Hisian activation.



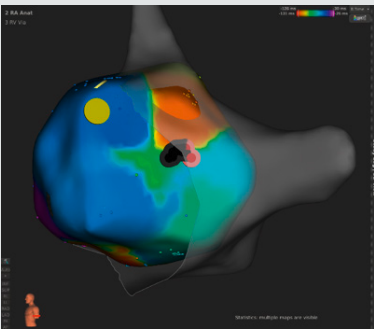
**Figure 4:** The red tags indicate the earliest activation in the TA. The EGM in this region is shown in the roving probe to be 15ms earlier than the reference.

Radiofrequency applications were delivered at this point of earliest activation. Immediately fast junctional beats were seen. Concerned we were ablating too close to the His area, we came off ablation to avoid any damage to the intrinsic conduction system.



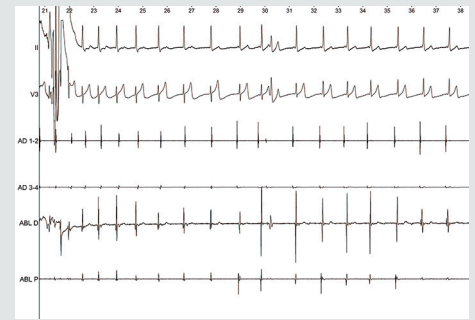
**Figure 5:** Fast junctional beats during first RF delivery.

After the first application, a junctional beat without a delta wave was noted. A few seconds later the patient returned to sinus rhythm but with the same pre-excitation as seen in the initial diagnosis



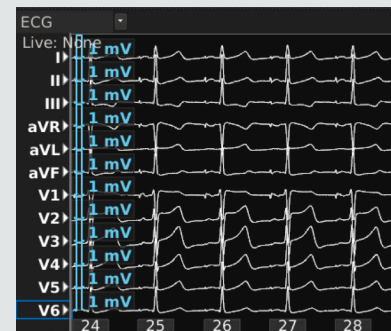
**Figure 6:** The black tags indicates RF applications.

Figure 7 shows these rapid junctional beats. Numerous short RF applications were delivered as longer continuous RF times risk causing atrioventricular block.



**Figure 7:** After the first RF delivery the accessory pathway recovered. The delta wave appears as before RF delivery.

After several RF applications at the same location, fast right atrium pacing was performed to analyze the AV conduction during ablation. A total of 34 radiofrequency applications were delivered in the same region which resulted in block of the accessory pathway. After 30 minutes post ablation monitoring, complete block of the accessory pathway was determined.



**Figure 8:** ECG post-ablation showed an ECG without a delta wave. Atrial pacing is being performed to confirm intrinsic AV conduction post ablation.

## Discussion

Mapping of mid-septal accessory pathways is a strategy to accurately locate the site of earliest anterograde ventricular activation between the coronary sinus ostium and the recorded His location. The earliest anterograde ventricular activation-to-delta wave interval (15-20ms pre-delta).

RHYTHMIA HDx™ and INTELLANAV™ ST helped to determine the precise location of the accessory pathway, in its ventricular slope in this case.

- Ablation for this kind of AP with a high risk of damage to the intrinsic conduction system is greatly improved when using the RHYTHMIA HDx™ mapping system allowing accurate delivery of RF applications with location confidence away from the His.
- Specifically in this case, the need to repeat short and effective RF applications in the same location was possible due to the <1mm navigational accuracy of RHYTHMIA HDx™ and INTELLANAV™ ST.
- The fluoroscopy time for this procedure was zero with a total ablation time of 292 seconds. The procedure including post ablation monitoring was completed in 2 hours and 14 minutes.
- In this case RHYTHMIA HDx™ guidance reduced the procedure time as we did not need to reconfirm the catheter position using pacing maneuvers or x-ray.
- To date we have performed more than 30 regular supraventricular tachycardias using this approach with RHYTHMIA HDx™ and INTELLANAV™ ST. The procedure time is predictable and comparable to our previous technique relying on x-ray guidance only.

1. Stefano Bianchi, Francesco Piccolo, Pietro Rossi, Luigi Iaia, Filippo Cauti, Ospedale San Giovanni Calibita, Rome Italy, 'A minimal fluoroscopic approach to AVNRT ablation with RHYTHMIA HDx™' (Boston Scientific, 2019, EP-627803-AA).

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