

# Fluoroless cryo-ablation of para-Hisian accessory pathway

## Krioablacija parahisarne akcesorne poti brez uporabe rentgenske diaskopije

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### Abstract

We present a case of para-Hisian accessory pathway ablation in a patient with Wolff-Parkinson-White syndrome, which was performed with cryoablation to reduce the possibility of collateral damage to the conduction system of the heart. We also used fluoroless approach to exclude possible harm from radiation exposure, using only intracardial electrograms and three-dimensional (3D) electro-anatomic mapping system to navigate the catheters in the heart.

### Izvleček

Predstavljamo primer ablacije parahisarne akcesorne poti, ki smo jo opravili pri bolniku s sindromom Wolff-Parkinson-White. Opravili smo krioablacijo, da bi čim bolj zmanjšali možnost poškodbe prevodnega sistema srca med ablacijo. Za usmerjanje katetrov na ustrezna mesta v srcu smo uporabili le znotraj srčne elektrokardiogramne in sistem za tridimenzionalno (3D) mapiranje. Rentgenske diaskopije nismo uporabili, s čimer smo izključili možnost škodljivih vplivov rentgenskega sevanja.

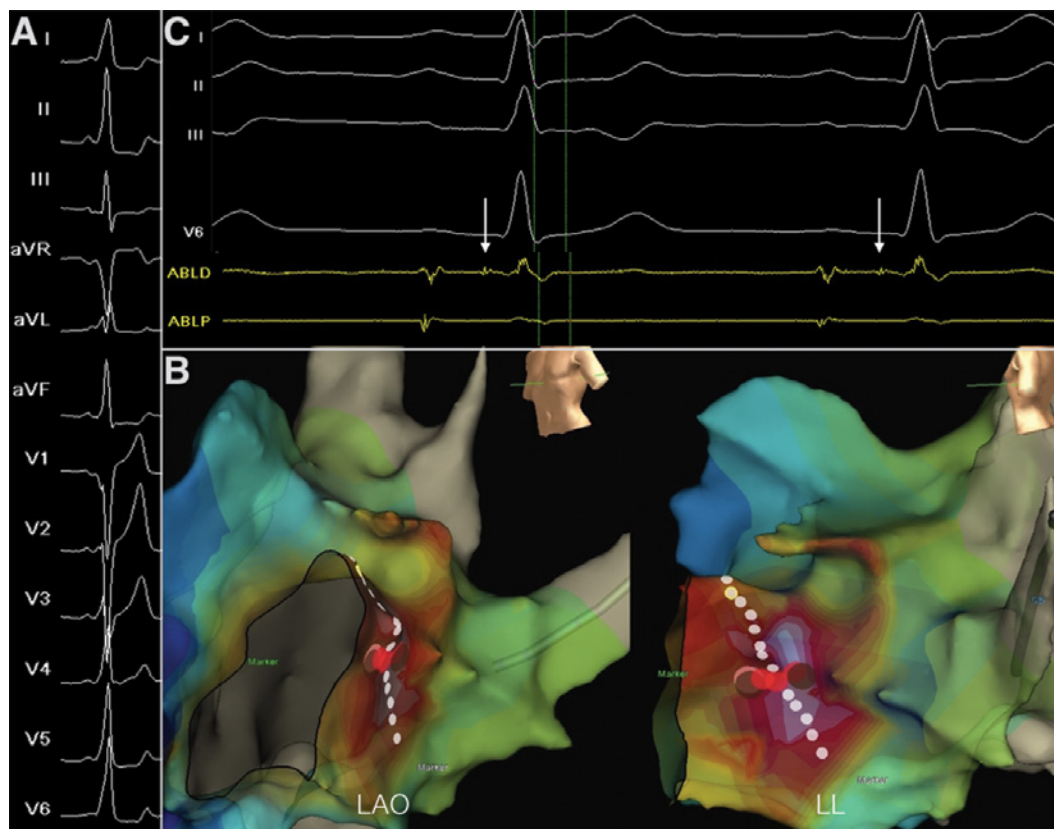
## Background

Thirty-three years old male patient was diagnosed with the Wolff-Parkinson-White (WPW) syndrome. A 12-lead electrocardiogram revealed the delta wave pattern consistent with the presence of a mid-septal accessory pathway (Figure 1A). He had monthly attacks of fast heart rate that lasted 2 to 3 minutes. He was otherwise healthy and had structurally normal heart. Due to the presumed accessory pathway location, close to the conduction system of the heart, we chose cryo-ablation as a treatment option. The cryo-ablation approach is based on the tissue cooling instead of heating as in the radiofrequency ablation. It enables the operator to first perform the cryo-

-mapping (at minus 30°C, creating reversible tissue damage) at different sites of interest to check for possible collateral damage. When the cryo-mapping results in a favorable response, it is followed by cryo-ablation (at minus 70°C, creating irreversible tissue damage). The procedure was performed completely without the use of fluoroscopy.

## Case presentation

The patient was awake during the whole procedure. We performed a percutaneous femoral vein puncture and inserted a 10-polar electrophysiology catheter into the coronary sinus, a 4-po-



**Figure 1:** (A) An ECG of a patient before the ablation showing a delta wave pattern consistent with the presence of a mid-septal accessory pathway. (B) Partial 3D colour-coded activation map of the right atrium. White colour indicates the area of the earliest activation of the ventricle. Tricuspid annulus is marked with white dots. Brown dots depict the location of the earliest activation of ventricle in the septal region. Cryo-ablation was performed where the red dots are. (C) Endocardial electrocardiogram after the ablation. Arrows mark the far field signal of the His bundle on the distal pole of the cryo-ablation catheter at the location of a successful cryo-ablation.

lar electrophysiology catheter into the high right atrium and an ablation catheter into the right ventricle. Ventricular pacing demonstrated non-decremental atrio-ventricular and ventriculo-atrial conduction indicating conduction over an accessory pathway. The ablation catheter and the EnSite/NavX™ (St. Jude Medical) 3D electro-anatomic mapping system were used for the reconstruction of a partial 3D model of the right atrium. Mapping near the area of the tricuspid annulus during sinus rhythm revealed the earliest activation of the ventricle in the septal region. After narrowing the field of interest, the cryo-mapping at the earliest ventricular activation was performed with the Freezor Xtra™ (Med-

tronic) catheter (Figure 1B). Three cryo-ablations at minus 70°C, each lasting 4 minutes, were performed at the site where cryo-mapping at minus 30°C revealed block of conduction over the accessory pathway and normal conduction over the atrio-ventricular node. We detected a far field signal of the His bundle on the distal pole of the cryo-ablation catheter immediately after the first cryo-ablation (Figure 1C) indicating the presence of a true para-Hisian accessory pathway. We did not detect any ventricular pre-excitation (no delta wave) on the 12-lead ECG thirty minutes after the cryo-ablation. After a six-month follow-up, the patient was free of ventricular pre-excitation and symptoms of tachycardia.

## Discussion

Guidelines for the treatment of the WPW syndrome recommend the catheter ablation as a first line treatment (1). This is also the treatment of choice for para-Hisian accessory pathways.

In our case, a true para-Hisian nature of the septal accessory pathway was revealed after the initial cryo-ablation. There are some advantages of cryo-ablation of accessory pathways close to the conduction system compared to radiofrequency ablation. Firstly, the possibility of cryo-mapping, which enables the confirmation of successful and safe ablation target before definitive and irreversible cryo-ablation. Secondly, improved stability of catheter tip because of its adherence to tissue during cryo-ablation, compared to radiofrequency ablation. Such stability provides more precise and smaller lesions with a similar depth as lesions created by radiofrequency ablation. Thirdly, complications such as a prolonged PR interval as well as AV blocks during cryo-mapping are completely reversible and are not permanent (2,3), compared to radiofrequency ablation of antero-septal accessory pathways, in which the risk of permanent AV block is reported to be up to 2.7 % (4). Although the acute procedural success rate of cryo-ablation is lower than that of radiofrequency ablation (69 % vs. 93 %), it is preferable to use cryo-ablation when the possibility of permanent AV block is more probable (5). In the case of para-Hisian accessory pathway ablation, cryo-ablation was demonstrated to be safe with no

long-term complications (6,7). When the cryo-ablation procedure is successful, its long-term success rate is 91 %, which is comparable to radiofrequency ablation (5).

The procedure was performed without the use of fluoroscopy and only with the aid of intracardiac electrograms and the 3D electro-anatomic mapping system. The procedural duration of accessory pathway ablation with the aid of the 3D electro-anatomic mapping system seems to be less than when fluoroscopy alone is used ( $177.06 \pm 62.189$  vs  $242.45 \pm 99.07$  minutes) (8). In procedures where fluoroscopy is used, the mean duration exposure time is  $47 \pm 33$  minutes, which translates to  $1.9 \pm 3.2$  mGy of radiation exposure. The lifetime risk for patients of developing fatal malignancy is 0.08 % and the risk for developing hereditary effects is 20 per million cases (9). The use of fluoroscopy is also linked to a higher incidence of brain (particularly on the left side of the brain associated with proximity of x-ray machine) and neck tumors among electrophysiologists and other physicians performing interventional procedures (10). Also, ablation of accessory pathways with the aid of the 3D electro-anatomic mapping system has higher success rate compared to ablation done with fluoroscopy alone (97 % vs. 91 %) with no significant difference in recurrence (5 % vs. 9 %) or complication rate (0.3 % vs. 0.4 %) (11). Fluorless ablation with the aid of the 3D electro-anatomic mapping system is thus a more attractive alternative for both, the patient and the physician.

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