



Hybrid Video Thoracoscopic Cryoablation and Mapping with 3D-Mapping System of WPW Syndrome after 4 Failed Percutaneous Catheter Ablations - Case Report

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Abstract

We present a case of 38-year-old woman, active runner, with Wolff-Parkinson-White syndrome after prior four failed percutaneous radio frequency ablations and cryoablations in different reference centers. Then the patient underwent successful hybrid video thoracoscopic procedure with 3D-electroanatomic mapping system with deep epicardial cryoablation applications.

Introduction

Wolff-Parkinson-White (WPW) syndrome is associated with decrease in quality of life, risk of recurrent tachyarrhythmia, syncope, development of cardiomyopathy and in most malignant scenario – sudden cardiac death. Therefore, it is a highly valuable to perform complete elimination of Accessory Pathway (ACP) and risk of complications of WPW especially in severely symptomatic patients or aborted SCD.

Significant progress in the percutaneous Catheter Ablation (CA) of Supraventricular arrhythmias (SVT) and WPW over the last 3 decades has resulted in almost complete elimination of surgical treatment of those arrhythmias [1,2]. However, CA for WPW can be challenging and the repeat procedure is effective only in 90% of cases even in very experienced centers [3,4].

There are however several case reports or rare indications reported by guidelines (e.g. patients after complications or with concomitant structural heart disease such as Ebstein anomaly) that confirm the need for development individualized approach in patients with pre-excitation after several failed procedures.

We present case of hybrid Minimal Invasive Cardiac Surgery Ablation (MICSA) of WPW as a choice of treatment in patient after several failed percutaneous CA.

Case Presentation

A 38-year-old woman with WPW syndrome has been referred for HEART-TEAM consultation after three failed radiofrequency ablations and one cryoablation in different reference centers. Patient had no structural heart disease and any other chronic diseases or conditions. Transthoracic echocardiography showed normal function. She was active leisure time runner up to 10 km three times a week. For last 3 years patient has been suffering from several episodes of palpitations, paroxysmal tachycardia with ineffective drugs treatment. During the last percutaneous procedure, intermittent disappearance of pre-excitation and inducibility of orthodromic tachycardia (OAVRT) was achieved at the bottom of right atrial appendage just above 1st segment of right coronary artery (RCA) (Figure 1A,1B). The further applications were stopped due to risk of right atrial appendage perforation or RCA injury. Other atypical location such as aortic sinuses cusps, anterior tricuspid annulus below 1st segment of RCA and Right Atrial Appendage (RAA) to Right Ventricle Outflow Tract (RVOT) connection were primarily excluded or ineffective from previous ablations. Within next month after last procedure permanent pre-excitation appeared again with recurrence of

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Received Date: 12 Jul 2018

Accepted Date: 13 Aug 2018

Published Date: 16 Aug 2018

Citation:

Stec S, Witkowska A, Śledź J, Choundhary S, Stec P, Deutsch K, et al. Hybrid Video Thoracoscopic Cryoablation and Mapping with 3D-Mapping System of WPW Syndrome after 4 Failed Percutaneous Catheter Ablations - Case Report. Clin Surg. 2018; 3: 2067

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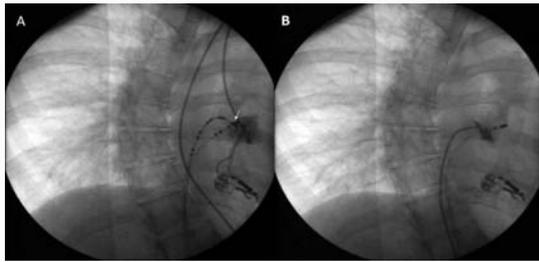


Figure 1: Fluoroscopy during the last percutaneous catheter ablation. A) Zero-fluoroscopy ablation approach modified to fluoroscopy to perform combined position of distal tip of ablation catheter in right atrial appendage bottom (arrow) and the first segment of right coronary artery. B) Contrast dye infused into the right atrium showing position of the distal tip ablation catheter into right atrial appendage. Intermittent pre-excitation disappearance was achieved from this point but due to the risk of coronary artery injury only 60 sec RF application were performed. Pre-excitation reappeared 60 mins after procedure.

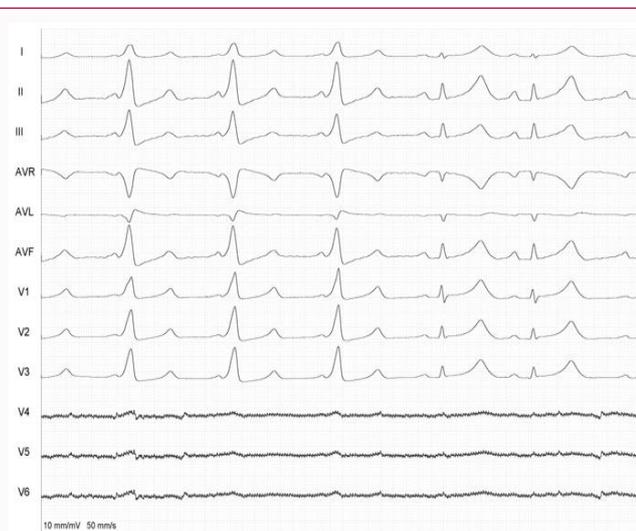


Figure 2: Modified 12-lead ECG during epicardial mapping. Standard limb lead and modified V1-V3 lead on left chest and unplugged V4-V6 lead. In fourth sinus beat sudden intermittent disappearance (forth QRS complex) of preexcitation caused by Octopus placement in atrioventricular groove.

symptomatic OAVRT. Patient was put on amiodarone as the only drug effective (propafenone, sotalol, beta-blockers) for prevention of arrhythmic events especially in active runner.

Then, the patient and Heart-Team accepted a minimally invasive hybrid video thoracoscopic procedure with 3D-electroanatomic mapping (Ensite Velocity, St Jude Medical, St. Paul, MN, USA) and mobile EP-system (EP-Tracer, Cardio-Tek, Maastricht, the Netherlands) as a choice of treatment. Three months after withdrawal of amiodarone patient underwent hybrid procedure. The surgical access was obtained through 4 cm incision in the fourth right intercostal space laterally to sternum. Scars after endocardial procedures at the bottom of RAA were observed epicardially with the close proximity (less than 0.5 cm) of RCA. Ligation of RAA excluded connection through RAA to RVOT. Then, the first segment RCA was dissected and pulled up with rubber slings. *Octopus* Tissue Stabilizer (Medtronic, Minneapolis, MN, USA) was used to expose the area of pre-excitation pathway. After detailed mapping deep cryoablation (up to -180°C , Cryoapplicator, Medicine, Warsaw, Poland) applications (total time: 640 sec) were performed under atrioventricular groove. Then periprocedural detailed endocardial mapping from jugular

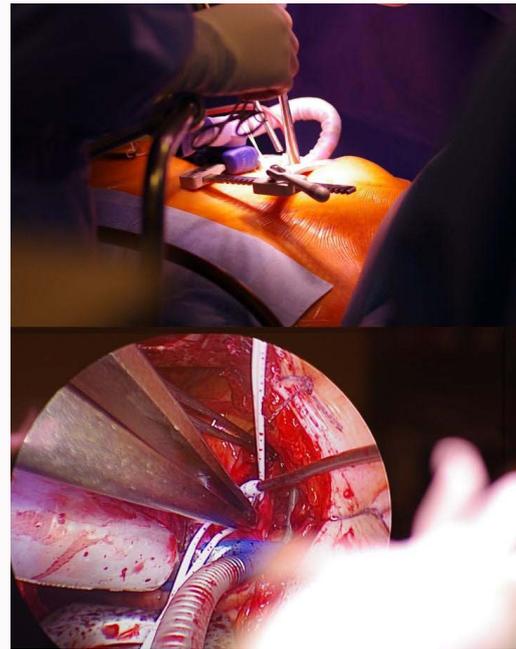


Figure 3: Minimal invasive hybrid procedure. Cryoapplicator inserted into the epicardial position after endo and epicardial mapping.

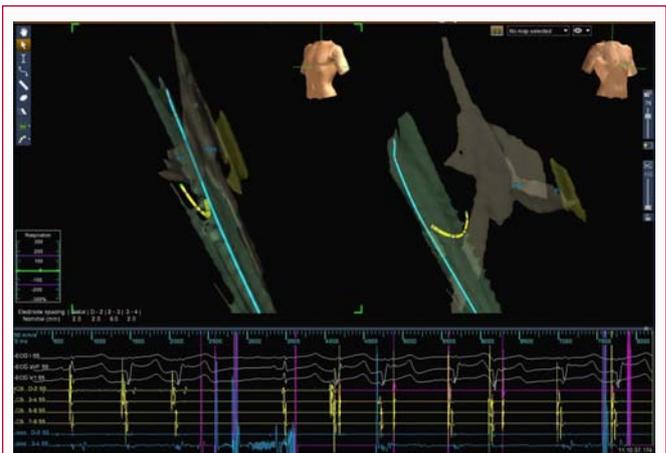


Figure 4: Minimal invasive hybrid procedure. 3D- electroanatomical map with intercardiac decapolar (yellow one) catheter and epicardial decapolar catheter (blue one) and ECG recorded from both catheters (white epithoracic ECG, yellow intercardiac potentials, and blue epicardial potentials). First and fourth QRS complexes are conducted without pre-excitation.

and femoral veins were performed by electrophysiologist to confirm successful procedure. Pacing and mapping confirmed of complete and persistent loss of pre-excitation and retrograde conduction through accessory pathway with isoproterenol and adenosine challenge (Figure 2-5). Patient follow-up was uneventful. Three months later patient underwent invasive electrophysiological study with zero-fluoroscopy approach. It confirmed persistent loss of pre-excitation, non-inducibility of tachycardia and bidirectional block through accessory pathway during infusion of isoproterenol and adenosine challenge. Six months after procedure patient has returned to 6 km to 12 km runs twice a week and she is preparing for half-marathon run.

Discussion

Percutaneous CA is well-established standard indication for patients with WPW. CA for ACP using radiofrequency energy or

cryoablation is supported by a high success rate of 95% combined with a low recurrence and complication rate [1,2].

Although antiarrhythmic cardiac surgery for supraventricular arrhythmias was introduced and developed in the late 60-ties of XX century, current guidelines and practice have not reported cardiac surgery as a method of treatment of symptomatic pre-excitation in patients without Adult Congenital Heart Disease (ACHD). Moreover, some of the ACHD cases (ex. Ebsteinanomaly) may be challenging even for cardiac surgery approach [1,2].

Several reasons may play role in failed percutaneous procedure for WPW syndrome but even in advanced centers and repeated procedures including epicardial access up to 5% to 10% redo procedures are still ineffective [3].

Implementation of "Heart-Team idea" for management of atrial fibrillation, zero-fluoroscopy experience for mapping and navigation, new cardiac surgery technologies encourage reactivation of indication for hybrid cardiac surgery procedures in supraventricular arrhythmias [3-5]. In our large registry data base of percutaneous catheter ablation procedures for WPW syndrome performed between 2008-2018 in more than 800 patients this approach was necessary for 4 cases (approx.. 0.5%).

Therefore, our case emphasizes rare, but constant requirement for hybrid procedures in patients with WPW syndrome and epicardially located accessory pathway, in which percutaneous catheter ablation failed or is risky for coronary arteries or other structures. Therefore, it is valuable to consider such approach as a choice of treatment after a failed procedure (s) performed by experienced operators.

The development of hybrid approaches for valvular heart diseases, coronary artery diseases, as well as a trial fibrillation encourage the use of "Heart-Team idea" for very challenging and uncured patients with WPW.

EP-HEART-TEAM should consider consultation and hybrid thoracoscopic minimally invasive approach for patients with supraventricular arrhythmias other than AF and in patients without ACHD and concomitant cardiovascular surgery.

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