

Hybrid minimally invasive epicardial and endocardial 3D-mapping-guided cryoablation for symptomatic pre-excitation syndrome after previous four failed catheter ablations

ABSTRACT

Minimally invasive hybrid approach for the treatment of Wolff Parkinson-White syndrome is seldom. We report a case of minimally invasive no-x-ray 3D-guided epicardial ablation of accessory pathway in a 23-year-old Caucasian sportsman with pre-excitation and very frequent palpitations with documented symptomatic narrow QRS tachycardia and previous 4 failed percutaneous radiofrequency ablations.

Key words: Wolff-Parkinson-White syndrome

Kardiol. Inwazyjna 2016; 11 (5): 37–39

STRESZCZENIE

Małoinwazyjne, hybrydowe podejście do leczenia zespołu Wolff Parkinsona-White'a jest rzadko stosowane. W pracy przedstawiono przypadek małoinwazyjnej, hybrydowej, 3D-mapowanej nasierdziowej ablacji dodatkowej drogi przewodzenia bez zastosowania skopii u 23-letniego kaukaskiego sportowca z cechami preekscytacji, bardzo częstymi kołataniem oraz z udokumentowanym objawowym częstoskurczem z wąskimi zespołami QRS, leczonym czterokrotną nieskuteczną przezskórną ablacją.

Słowa kluczowe: zespół Wolffa-Parkinsona-White'a

Kardiol. Inwazyjna 2016; 11 (5): 37–39

Case report

Initially elimination of accessory pathway to treat the Wolff-Parkinson-White (WPW) syndrome was introduced as a surgical technique. Recently it has been replaced by the catheter-based approach [1]. However, in some cases the endocardial approach may be unsuccessful in achieving complete ablation of the epicardial accessory pathway [2]. We report an unusual case of hybrid minimally invasive no-x-ray endo- and epicardial 3D-guided cryoablation of accessory pathway in a patient after previous 4 failed percutaneous RF ablations in experienced electrophysiologic centers.

A 23-year-old Caucasian sportsman was referred for electrophysiologic heart-team consultation (including cardiac surgery, cardiologist, cardiac electrophysiologist and interventional cardiologist). The patient presented with documented rapid symptomatic narrow QRS tachycardia due to right-sided anterior persistent pre-excitation and very frequent (every 1–2 weeks) palpitations. In the last 3 years the patient had undergone 4 failed percutaneous RF ablations, which revealed right accessory pathway located close to the proximal segment of right coronary artery. Several unsuccessful applications were performed on atrial and ventricular side of tricuspid annulus. During the last procedure coronary angiography was performed. The proximity of RCA prevented from effective RF application and ablation of the

Anna Witkowska¹, Artur Baszko³,
Karol Deutsch⁴, Janusz Sledz⁴,
Sebastian Stec^{4, 5}, Piotr Suwalski^{1, 2}

¹Department of Cardiac Surgery, Central Clinical Hospital of the Ministry of Interior, Warsaw, Poland

²Pulaski University of Technology and Humanities, Radom, Poland

³Poznan University of Medical Science, Poland

⁴ELMedica, EP-Network, Kielce, Poland

⁵Chair of Electroradiology, Department of Medicine, University of Rzeszow, Poland

pathway. The patient was referred for hybrid approach — simultaneous surgical epicardial ablation with epi-endocardial electrophysiological mapping and pacing with support of non-fluoroscopic 3D electro-anatomic EnsiteNavX Velocity system (St. Jude Medical, St Paul MN USA).

Under general anesthesia the patient was placed in supine position with elevated right side of the chest. Modified three dimensional endocardial and epicardial mapping was performed to guide non-fluoroscopic intracardiac catheter navigation as well as cryoablation. Modified twelve lead electrocardiogram (ECG), intracardiac ECG (iECG) as well as epicardial ECG (eECG) were simultaneously recorded. Right jugular venous access was used for dynamic positioning of decapolar catheter in right atrium, right ventricle and then after baseline electrophysiological study in coronary sinus. No-fluoroscopy was used and navigation was performed by using 3D-mapping system. Basic EP study revealed pre-excitation with antegrade refractory period below 290 msec. During general anesthesia no arrhythmia was induced in baseline state however retrograde conduction via right-sided accessory pathway was also confirmed.

A 4 cm incision on the anterolateral chest wall at the level of the third intercostal space was performed. Several scars after failed epicardial ablation from pericardial puncture approach were visible on the antero-lateral region of tricuspid annulus with significant amount of fat tissue in atrioventricular groove. The second segment of the right coronary artery (RCA) was carefully dissected and pulled up with rubber slings. After elevation of RCA, intermittent pre-excitation disappearance was observed. Epicardial mapping (Figure 1) revealed under the proximal region of second segment of RCA the activation of pre-excitation by 40 msec. Mechanically performed premature atrial complexes from right atrial appendage showed maximal pre-excitation. The liquid nitrogen cryoablation system (Medinice SA, Kielce, Poland) was used with 2 minutes application with minimum temperature of minus 190°C (Figure 2). After the first cryoapplication, pre-excitation com-

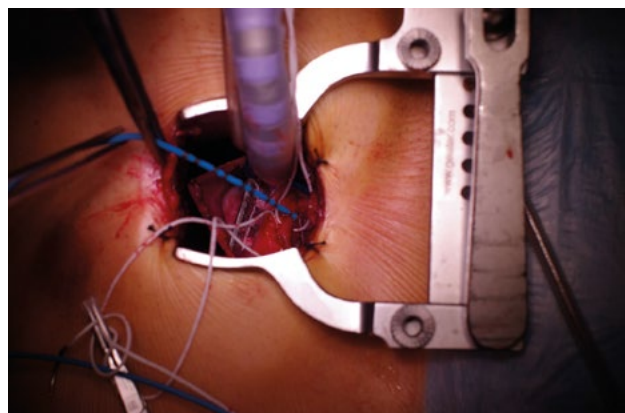


Figure 1. Dissected right coronary artery and epicardial mapping

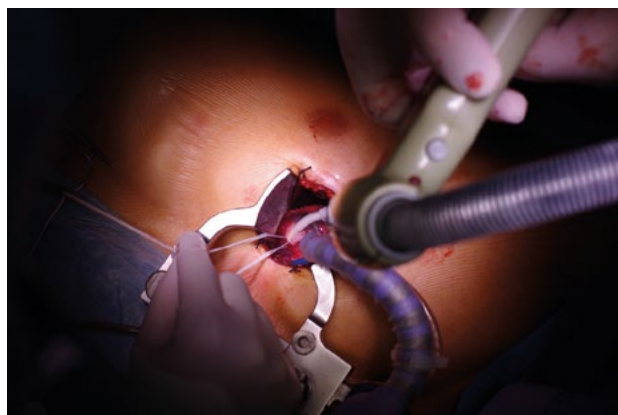


Figure 2. Cryoablation. RCA elevated on the rubber slings

pletely disappeared. Bonus 2 cryoapplications were performed. Using epicardial ventricular pacing and coronary sinus pacing no arrhythmia was inducible after several isoproterenol challenge and atropine administration. Subsequently, the slings were withdrawn, pericardial sack approximated and 1 drainage tube installed. The wound was closed in atypical manner using cosmetic intracutaneous resorbable suture. The patient was extubated 1 hour later, drainage was withdrawn in the first postoperative day and the patient discharged home on the fifth postoperative day. Within intra-hospital monitoring no recurrences of pre-excitation or orthodromic tachycardia was observed. Further twelve-month follow-up was uneventful. Several Holter monitorings and ECG confirmed no pre-excitation. After 1-month patient come back to sport and body-building.

Comment

Nowadays the catheter approach for pre-excitation and WPW syndrome is highly effective; however, in some cases it is not possible to reach an epicardially located accessory pathway.

It was showed that right ventricle location site is more likely to result in a lengthy or failed ablation procedure [3]. The descriptions of hybrid approach to WPW are seldom and just mentioned as a choice of treatment in current guidelines. To our knowledge, this is the first description of surgical attempt after failed epicardial percutaneous ablation [4]. The revealed scar-tissue was wide and still a few centimeters away from the ablated pathway, what can depict the difficulties in precise navigation and ablation in this location on beating heart and value of the hybrid approach.

In the reported case the accessory pathway was thought to exist in the middle part of right atrioventricular groove. This is a suitable anatomic region for the minimally invasive approach; however, the intermittent disappearance of pre-excitation already during dissection and elevating the RCA can suggest that the muscle fibers of the accessory pathway were

not only under the artery in the groove but were also crossing it more epicardially, what would be difficult and unsafe for catheter ablation.

The electroanatomical system with epi- and endocardial guidance was very useful in localizing and destroying the accessory pathway and the novel approach using non-fluoroscopy utilizing EnsiteNavx system significantly simplifies the procedures, especially the hybrid ones [5].

Despite some criticism on the use of unipolar energy sources epicardially on beating heart, the novel liquid nitrogen based cryotherapy system, showed its efficacy of permanent ablation at least in the AV-groove in this anatomical location [6].

Conclusion

Hybrid epicardial and endocardial non-fluoroscopic approach with 3D mapping system and cryoablation may be indicated after failed percutaneous catheter ablation procedures. WPW syndrome may require EP-Heart Team for successful treatment and atypical location of accessory pathways. In current guidelines the role of Heart Team is underlined also in the field of arrhythmia [7–9].

References

1. Cox J.L., Gallagher J.J., Cain M.E. Experience with 118 consecutive patients undergoing operation for the Wolff-Parkinson-White syndrome. *J. Thorac. Cardiovasc. Surg.* 1985; 90: 490–501.
2. Bouboulis N., Dougenis D., Campbell R.W., Hilton C.J. Surgical implications in the current treatment of Wolff-Parkinson-White syndrome. *World J. Surg.* 2002; 26: 122–128.
3. Morady F., Strickberger A., Man K.C. *et al.* Reasons for prolonged or failed attempts at radiofrequency catheter ablation of accessory pathways. *J. Am. Coll. Cardiol.* 1996; 27: 683–689.
4. Tanoue M., Sakamoto S., Miyauchi Y., Usuda J., Nitta T. Treatment of Wolff-Parkinson-White Syndrome with a thoracoscopic surgical procedure. *Ann. Thorac. Surg.* 2015; 100: e11–3.
5. Stec S., Sledź J., Mazij M. *et al.* Feasibility of implementation of a “simplified, No-X-Ray, no-lead apron, two-catheter approach” for ablation of supraventricular arrhythmias in children and adults. *J. Cardiovasc. Electrophysiol.* 2014; 25: 866–874.
6. Suwalski P., Suwalski G., Kurowski A. *et al.* Use of new liquid nitrogen cryocatheter in the surgical treatment of atrial fibrillation: clinical experience, mid- and long-term results. *Comput. Biol. Med.* 2007; 37: 1409–1413.
7. Writing Committee Members, Page R.L., Joglar J.A., Caldwell M.A. *et al.* 2015 ACC/AHA/HRS guideline for the management of adult patients with supraventricular tachycardia: a Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Rhythm Society. *Heart Rhythm* 2016; 13: e136–221.
8. Brugada J., Blom N., Sarquella-Brugada G. *et al.* Pharmacological and non-pharmacological therapy for arrhythmias in the pediatric population: EHRA and AEPC-Arrhythmia Working Group joint consensus statement. *Europace* 2013; 15: 1337–1382.
9. Kirchhof P., Benussi S., Kotecha D. *et al.* 2016 ESC Guidelines for the management of atrial fibrillation developed in collaboration with EACTS. The Task Force for the management of atrial fibrillation of the European Society of Cardiology (ESC) Developed with the special contribution of the European Heart Rhythm Association (EHRA) of the ESC Endorsed by the European Stroke Organisation (ESO). *Eur. Heart J.* 2016; doi:10.1093/eurheartj/ehw210 [Epub ahead of print].

Address for correspondence:

Lek. Anna Witkowska
 Centralny Szpital Kliniczny MSWiA w Warszawie
 ul. Wołoska 137, 02–507 Warszawa
 tel.: (22) 508 12 60, (22) 508 12 69; faks: (22) 508 12 70
 e-mail: anna.witkowska@cskmswia.pl