CASE REPORT

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Radiofrequency ablation of anteroseptal accessory pathway – A challenge to the electrophysiologist

Radiofrekventna ablacija anteroseptalnog aksesornog puta – izazov za elektrofiziologa

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Abstract

Introduction. Anteroseptal accessory pathways (APs) are located in the apex of the triangle of Koch's connecting the atrial and ventricular septum in the region of the His bundle. Ablation of anteroseptal pathway locations remains a challenge to the electrophysiologist due to a very high risk of transiet or permanent atrioventricular (AV) block. **Case report.** A male, 18-year-old, patient was hospitalized due to radiofrequency (RF) ablation of APs. He was an active football player with frequent palpitations during efforts accompanied by dyspnea and lightheadedness, but without syncope. Electrocardiography on admission showed intermittent preexcitations. Intracardiac mapping showed the earliest ventricular activation that preceded surface electrocardiographic delta wave in anteroseptal region very close to the AV node and His bundle. Using a long vascular sheath for stabilization of the catheter tip, RF energy was delivered at the target site starting at very low energy levels and because of the absence of either PR prolongation, as well as accelerated junctional rhythm during the first 15 sec, the power was gradually increased to 40W, so after application RF energy preexcitation was not registered. **Conclusion.** Despite this proximity to the His bundle and very high risk of transiet or permanent AV block anteroseptal APs can still be ablated successfully.

Key words:
heart conduction system; arrhythmias, cardiac; catheter ablation; treatment outcome.

Apstrakt

Uvod. Anteroseptalni aksesorni put nalazi se u vrhu Koch-ovog trougla i spaja pretkomorski i komorski septum u predelu Hisovog snopa. Ablacija u ovoj regiji predstavlja izazov za elektrofiziologa zbog visokog rizika od privremenog ili stalnog atrioventrikularnog (AV) bloka. **Prikaz bolesnika.** Bolesnik star 18 godina, hospitalizovan je zbog radiofrekventne (RF) ablacije aksesornog puta. Aktivno se bavio fudbalom. Žalio se na povremene palpitacije u toku napora, praćene osećajem kratkoga daha i omaglicama, ali bez sinkope. U elektrokardiogramu na prijemu registrovana je povremena preekscitacija. Intrakardijalni maping pokazao je najraniju komorsku aktivaciju u anteroseptalnoj regiji, neposredno uz AV čvor, odnosno Hisov snop. Upotrebom dugog vaskularnog uvodnika isporučena je RF energija niske snage i zbog odsustva produženja PR intervala odnosno nodalnog ritma tokom 15 sekundi, snaga je postepeno pojačana na 40 W, nakon čega nije registrovana preekscitacija. **Zaključak.** Uprkos blizine Hisovog snopa i visokog rizika privremenog ili trajnog AV bloka, ablacija anteroseptalnog aksesornog puta može biti uspešno urađena, ali zahteva veliku opreznost u toku procedure.

Ključne reči:
srce, provodni sistem; aritmija; ablacija preko katetera; lečenje, ishod.

Introduction

Anteroseptal accessory pathways (APs) are thin fibers composed of typical myocardial cells that allow electrical communication between atrium and ventricle. Symptoms may range from none to occasional or severe palpitations accompanied by dyspnea, chest discomfort, lightheadedness and even syncope or cardiac arrest due to rapidly conducted atrial fibrillation.

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Anteroseptal APs comprise 6% to 7% of all APs and about 80% of these APs exhibit anterograde conduction while 20% are only retrograde conducting (“concealed”) [1].

Ablation of anteroseptal pathway locations remains a challenge because of the proximity to the normal cardiac conduction system [atrioventricular (AV) node and His bundle]. Inadvertent injury to these structures resulting in the need for permanent pacing.

Herein we reported a young male in whom successful radiofrequencz (RF) ablation of APs was performed.

Case report

A male, 18-year-old, patient was hospitalized due to frequent palpitations during efforts accompanied by dyspnea and lightheadedness, but without syncope. He used to be active football player. Electrocardiography (ECG) on admission showed intermittent preexcitation referring to anteroseptal accessory pathways (Figure 1).

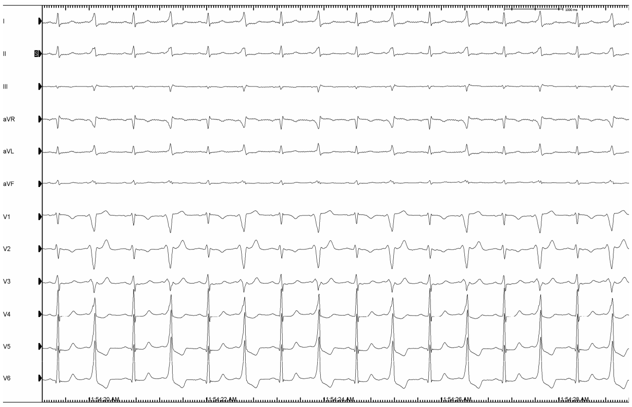

Fig. 1 – Electrocardiography (ECG) on admission showed intermittent positive delta waves in the inferior leads (DII, DIII, and aVF) and the precordial leads (V1 through V6) as well as negative delta waves in aVR.

According to basal ECG, intracardiac mapping expectedly showed the earliest ventricular activation that preceded surface ECG delta wave in anteroseptal region very close to the AV node and His bundle (preceded by 42 msec). It was also recorded incorporating atrial-AP-ventricular components as well as sharp QS deflection on the unipolar electrogram of the ablation electrode. Intracardiac recording in the periods without manifest preexcitation presented a sharp potential between atrial and ventricular electrograms referring to His deflection (Figure 2). Fluoroscopically, it was expected very close to the His bundle recording site (Figure 3).

Using a long vascular sheath for stabilization of the catheter tip, RF energy was delivered at the target site starting at very low energy levels (10 W) and because of the absence of either PR prolongation, as well as accelerated junctional rhythm during the first 15 sec, the power was gradually increased to 30 W, with the target temperature of 40° for 60 sec. During RF delivery preexcitation can be lost, but unfortunately after it was again returned. Another aplication with same characteristics was repeated, but without prolonged effects. We decided to increase the power to 40 W, so after RF energy application for 60 sec preexcitation was not registered (Figure 4). During RF delivery, the impedance was continuously monitored, and it was stable.

Fig. 2 – The earliest ventricular activation was close to the atrioventricular node and His bundle with continuous recording of atrial-accessory pathway-ventricular components, as well as sharp QS deflection on the unipolar electrogram during preexcitation, and in the periods without preexcitation was presented the sharp potential between atrial and ventricular electrograms referring to His deflection.

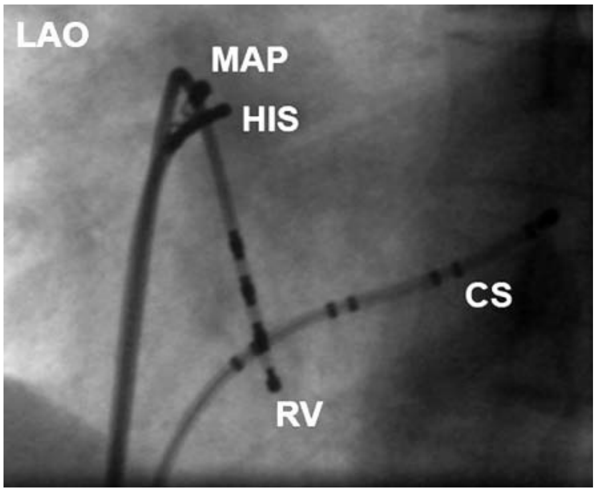

Fig. 3 – Position for ablation was expected very close to the His bundle recording site in the left anterior oblique views.

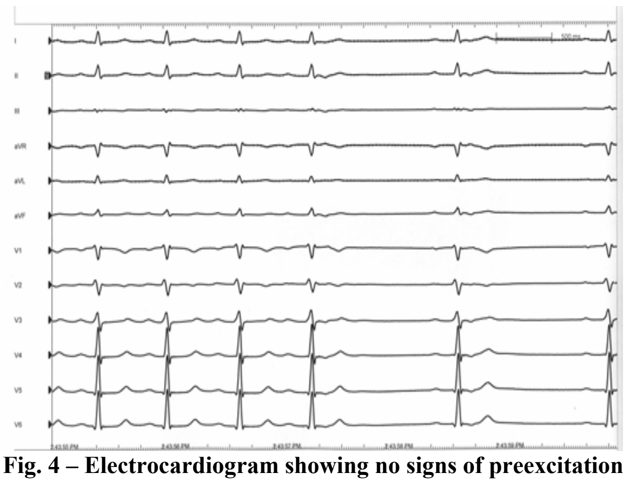

Fig. 4 – Electrocardiogram showing no signs of preexcitation after adenosine application.

Discussion

Anteroseptal APs are located in the apex of the triangle of Koch connecting the atrial and ventricular septum in the region of the His bundle.

Ablation of anteroseptal AP remains a challenge to the electrophysiologist due to a very high risk of transient or permanent AV block [1]. Studies assessing RF ablation of anteroseptal APs in children and adults report primary success rates > 90%, recurrence rates of 12–25% and risk for inadvertent AV block of 2–10% [2, 3]. It is recommended delivering as less as possible applications of RF energy to minimize the risk of damage as much as possible [1]. However, this is associated with a greater incidence of recurrences of arrhythmia [4, 5]. Accordingly, after successful ablation, patients were observed for a 30-min waiting period. The possibility of recurrence was assessed using pacing maneuvers, as well as orciprenaline or adenosine.

The target site of RF energy aplication in the presented patient was the leading one for the recommended electrophysiological characteristics: earliest ventricular activation that precede the surface ECG delta wave was 42 millisec, sharp QS deflection on the unipolar electrogram of the ablation electrode and incorporating atrial-AP-ventricular components during preexcitation [1].

During mapping this area in the presented patient, catheter was gently moved due to possible mechanical block of pathway conduction, significant for the anteroseptal APs, which was not registered [6]. The long vascular sheath helped in stabilizing the catheter tip to the target position, preventing movement of the catheter and potential very serious complications. The internal jugular vein approach may allow reliable catheter stability, especially if the attention payed to ablate from the ventricular aspect of the tricuspid annulus. It would be our next option if either PR prolongation as well as accelerated junctional rhythm occurred [1]. Although it is recommended that the APs can be safely ablated if the His deflection is less than 0.2 mV in amplitude, in the presented patient it was significantly higher referring to high risk of transiet or permanent AV block [1]. According to this, at first low power of RF energy was delivered with gradually increased level, so damage of normal cardiac conduction system was not recorded, as well as change of impedance, because the drop in impedance is a better indicator of tissue temperature than is the tip electrode temperature [1]. It is recommended that unsuccessful energy applications should be stopped after no more than 15 sec, because of possible AV node or His bundle damage.

Anteroseptal APs could be ablated over the left ventricular outflow tract and the non-coronary sinus (NCC) of the aortic valve [7, 8]. This is required in rare cases, if the catheter ablation from the right atrium fails. The left side of the anteroseptal region is a membranous structure and defined by the aortic annulus and NCC is directly related to the septum. Location and dynamic motion of the NCC leads to difficulties of access as well as keeping a stable position of the catheter, so in one case, transesophageal echocardiogram was used for assistance [9]. However, intracardiac echocardiography could be a better and more advantageous tool for precise imaging of anatomical structures and guide to successfully manage the position of the catheter tip at NCC of the aortic valve [10].

Catheter ablation based on electroanatomical mapping and contact force technology appears to be an effective treatment modality for patients with pathways close to the AV junction. Namely, the use of three-dimensional mapping systems may be helpful to denote the target sites for ablation, as well as due to the increased precision of point applications. The contact between the tip electrode of the ablation catheter and the myocardial tissue affects both the accuracy of maps and the efficacy of energy delivery [11].

Cryothermal ablation may be an alternative to RF ablation to reduces the risk of permanent block in septal arrhythmia substrates [12–16]. Due to its safety profile, cryoablation is used increasingly in pediatric patients. The advantages of cryothermal energy is reversibility of lesions during cryomapping and increased catheter stability [12–16]. The target was usually identified using a steerable quadripolar electrophysiology catheter, marked as a point on the three-dimensional mapping system. The mapping catheter was then exchanged for a cryoablation catheter with limited maneuverability, especially in younger children. Cryomapping usually was performed at -30°C at the previously marked location. If AP block was achieved, ablation was continued for 240–360 ms at -70°C to -80°C to achieve the freeze effect [12–16].

Conclusion

Our experience in the ablation of anteroseptal accessory pathways shows that despite the proximity to the His bundle and very high risk of transiet or permanent atrioventricular block, these accessory pathways still can be ablated successfully, but it requires great carefulness.

R E F E R E N C E S

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