



Pulmonary veins isolation in a patient with atrial fibrillation and pronounced vagal response: Is it enough?

Izolacija plućnih vena kod bolesnika sa fibrilacijom pretkomora i naglašenim vagalnim odgovorom: Da li je to dovoljno?

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Abstract

Introduction. Pulmonary vein isolation (PVI) by antral circumferential ablation is the standard procedure for patients with symptomatic and drug-refractory paroxysmal atrial fibrillation (AF). In some patients addition of ganglionated plexi (GP) modification in anatomic locations to PVI confers significantly better outcomes than PVI alone.

Case report. We reported a patient with paroxysmal, symptomatic AF and severe bradycardia a month prior to ablation. The patient was treated with antiarrhythmic drugs without success. Because of severe bradycardia the patient was implanted with a temporary pace maker two days before PVI. During PVI the decision was made to also do a modification of the left GP. Three months after the procedure the patients was in stable sinus rhythm without any symptoms. **Conclusion.** In selected patients with paroxysmal AF and pronounced vagal response PVI by circumferential antral ablation combined with GP modification during single ablation procedure can produce higher success rates than PVI or GP ablation alone.

Key words:

atrial fibrillation; pulmonary veins; catheter ablation; vagotomy.

Apstrakt

Uvod. Izolacija plućnih vena (PVI) antrumskom cirkumferentnom ablacijom je standardna metoda za bolesnike sa simptomatskom i na lekove refraktornom atrijalnom fibrilacijom (AF). Kod pojedinih bolesnika dopunska modifikacija anatomske lokacije autonomnih gangliona *ganglionated plexi* (GP) dovodi do značajno boljeg ishoda od onih kojima je učinjena samo PVI. **Prikaz bolesnika.** Prikazali smo bolesnika sa paroksizmalnom AF i epizodama teške bradikardije koje je imao u poslednjih mesec dana. Bolesnik je lečen antiaritmijom bez značajnijeg uspeha. Zbog teške bradikardije bolesniku je implantiran privremeni vodič srčanog ritma dva dana pre elektrofiziološkog ispitivanja i radiofrekventne ablacije. Tokom radiofrekventne ablacije zbog izraženog vagalnog odgovora odlučeno je da se učini i modifikacija anatomske lokacije GP sa leve strane. Tri meseca kasnije bolesnik je bio u stabilnom sinusnom ritmu i bez simptoma. **Zaključak.** Kod pojedinih bolesnika sa paroksizmalnom AF i naglašenim vagalnim odgovorom, PVI cirkumferentnom antrumskom ablacijom udruženo sa modifikacijom GP, može imati veći uspeh od PVI ili modifikacije GP samostalno.

Ključne reči:

fibrilacija pretkomora; vv. pulmonales; ablacija preko katetera; vagotomija.

Introduction

The most common sustained arrhythmia is atrial fibrillation (AF) and the main concern is that this arrhythmia is associated with significant morbidity and mortality¹. Many mechanisms have been considered to contribute to the creation of AF, among them the autonomic nervous system (ANS) plays an important role, because in general opinion AF results from the interplay between trigger, substrate and ANS

in each patient¹. The ANS of the heart consists of extrinsic and intrinsic ganglia². The vagus nerve with parasympathetic components is the part of extrinsic cardiac nervous system. The sympathetic components beside the vagus nerve originate primarily from the cervical spinal cord³. The mechanisms by which autonomic activation is arrhythmogenic are complex and different for specific arrhythmias. In AF simultaneous sympathetic and parasympathetic activations are the most common trigger. In

contrast to some other arrhythmias, like ventricular tachycardia, where sympathetic activation is proarrhythmic, parasympathetic activation is antiarrhythmic. PVI is the standard catheter ablation procedure for patients with recurrent, symptomatic or drug-refractory paroxysmal AF. Adjunctive ablation such as performing linear lesions, ablating complex fractionated atrial electrograms or ganglionated plexi (GP) are still used only for improving procedural efficacy in selected patients⁴.

Case report

A 37-year old man with severe sinus bradycardia (pulse under 40/min), was admitted to our Clinic, complaining to headache, dizziness and postural instability. One month prior to admission, the patient was admitted to another hospital because of paroxysmal AF and bradycardia. He was treated briefly with antiarrhythmics (amiodaron, beta blockers) but due to profound bradycardia, pulse under 35/min, they were discontinued. His CHA₂DS₂-VASc score (Birmingham stroke risk stratification algorithm) was 0, but regarding preparation for the radiofrequency (RF) ablation the patient was commenced onto warfarin therapy. Transesophageal echocardiography was performed to rule out the presence of left atrial or left atrial appendage thrombus. Left ventricular ejection fraction and the left atrial diameter were normal and no significant valvular

lesions were found. Subsequent Holter monitoring revealed episodes of short paroxysmal AF not longer than 5 min triggered by atrial premature beats (APBs) with episodes of bradycardia (minimal frequency on Holter was 35/min). On the third hospital day, due to bradycardia, a temporary pace maker was implanted through femoral vein. On the fourth hospital day the patient underwent electrophysiological study. In terms of analgesedation through the right femoral vein a decapolar electrode catheter was inserted and positioned at the distal coronary sinus. The transseptal access was achieved under fluoroscopic guidance applying the standard technique. Intravenous unfractionated heparin was administered till the end of the procedure (a starting dose of 70 IU/kg and then 1,000 IU *per* hour). Then, spiral computed tomography was performed and the resulting image of the left atrium (LA) was integrated with the electroanatomic map of the LA. PVI was performed using the Ensite Velocity electroanatomic mapping system (St Jude Medical, Minnesota, USA). First RF application in the posterosuperior part of circumference around left veins produced profound bradycardia which was then followed by AF initiation. Ablation was carried out at the antral part of all four pulmonary veins (PVs). They were successfully isolated and sinus rhythm was restored spontaneously (Figure 1). After that, ablation was carried out near the areas of anatomic location of GP (Figure 2) As an endpoint for GP ablation we selected abolition of inducibi-

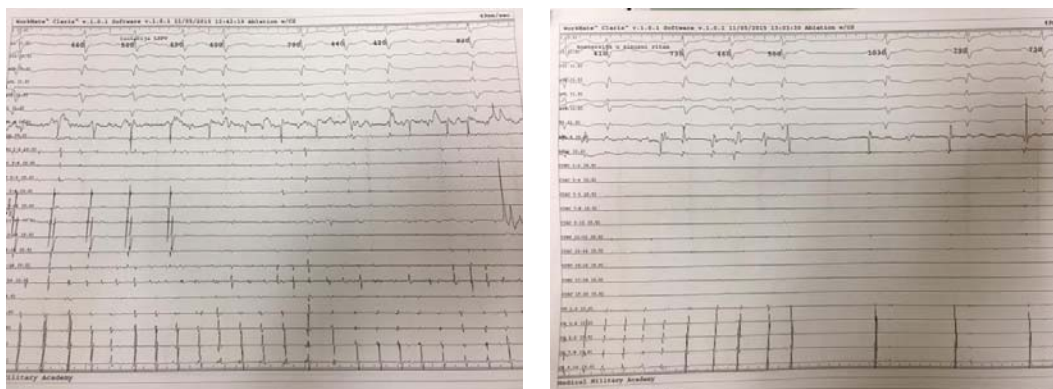


Fig. 1 – Spontaneous termination of atrial fibrillation after ablation of all four pulmonary veins.

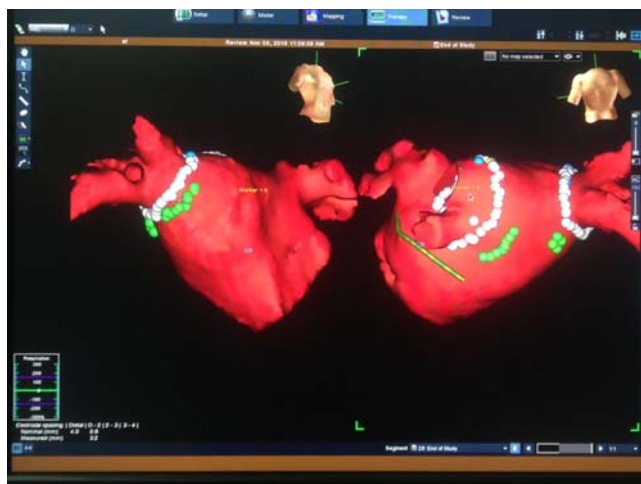


Fig. 2 – Ablation lines shown in white represent pulmonary vein isolation and the lines in green the location of ganglionated plexi ablations.

le vagal response (induction of AF and/or bradycardia and/or atrioventricular (AV) block. Presumed locations of the four major left atrial GP were ablated outside the junctions of PVs and LA at the following sites: left superior GP (SLGP), left inferior GP (ILGP), right anterior GP (ARGP) and right inferior GP (IRGP) and ligament of Marshall⁵. The procedure was performed without complications. During a 3-month follow-up period the patient was in stable sinus rhythm without episodes of atrial fibrillation or sinus bradycardia.

Discussion

In published studies the success rate of GP ablation alone was not significantly superior to pulmonary vein isolation alone, but GP ablation plus PVI significantly increased freedom from AF after a combine procedure both in paroxysmal and persistent AF⁶⁻¹³. Regarding pronounced vagal response in the presented patient the decision was made to do PVI plus GP ablation⁶. We decided to ablate the four major left atrial GP according to their anatomic locations. We did not use GP ablation guided by high frequency stimulation (HFS) because recent studies demonstrated that the outcome was inferior to that guided by the anatomic locations of the GP⁷. PVI by antral circumferential ablation eliminates the triggers in the PV antrum and ensures that PV firing cannot conduct into the atrium to initiate AF but at the same time during conventional PVI we also transected the SLGP, the ligament of Marshall, ARGP, and a part of the IRGP, as well as many small clusters of autonomic ganglia and nerves localised around PV. More complete autonomic denervation by GP ablation in combination with PVI can be an additional step

forward to better outcome. Another possibility is that ablation in the GP area also results in elimination of the complex electrical activity located at parts of the LA localised near GP or PV antrum¹². Regarding fractionated electrograms some studies show that they are usually found in the areas of GP and that is consistent with the possibility that GP ablation may target both autonomic neural elements and fractionated electrograms⁴. Pacemaker implantation in the patient with AF because sinus node dysfunction for some time may not be clinically apparent until conversion to sinus rhythm¹⁴. The patient presented here had a temporary pace maker implanted before ablation and during a follow-up period was in stable sinus rhythm without indication for pace maker. The risk for permanent pace maker implantation after ablation is similar to cardioversion, suggesting that patients require pacing due to a common underlying electrophysiologic substrate, rather than the ablation itself^{14,15}. Longer ablation time and large number of RF application delivered have a higher risk for complications and ablation-induced proarrhythmia, but we did not have such problems in the presented patient¹⁶.

Conclusion

PVI by circumferential antral ablation with GP modification performed in a single ablation procedure in selected patients with paroxysmal AF and pronounced vagal response has higher success rates than PVI or GP ablation alone. A short follow-up period in the presented patient is the major disadvantage regarding this conclusion. The long-term benefit and risk in patients with PVI and GP modification ablation deserve further evaluation.

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