UDC: 616.12-008.313.2:616.141-089.819.1-085.849.11

HEART RATE VARIABILITY IN PAROXISMAL ATRIAL FIBRILLATION BEFORE AND AFTER CATHETER ABLATION AT AN EXAMPLE OF CLINICAL CASE

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Changes in heart rate variability (HRV) before and after catheter radiofrequency ablation (RFA) of pulmonary veins in paroxysmal atrial fibrillation (AF) are considered at an example of clinical case. Initially low HRV in patients after ablation halved, which can lead to increased frequency and extension of AF paroxysms. In the accompanied medication, which included bisoprolol, valsartan, atorvastatin and rivaroxaban, to increase HRV were proposed increasing the dose of bisoprolol or search for more effective beta blocker.

KEY WORDS: heart rate variability, catheter radiofrequency ablation, paroxysmal atrial fibrillation

ВАРІАБЕЛЬНІСТЬ СЕРЦЕВОГО РИТМУ ПРИ ПАРОКСИЗМАЛЬНІЙ ФІБРИЛЯЦІЇ ПЕРЕДСЕРДЬ ДО ТА ПІСЛЯ КАТЕТЕРНОЇ АБЛАЦІЇ НА ПРИКЛАДІ КЛІНІЧНОГО ВИПАДКУ

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Зміни варіабельності серцевого ритму (ВСР) до та після виконання радіочастотної катетерної абляції (РЧА) легеневих вен при пароксизмальній фібриляції передсердь (ФП) розглядаються на прикладі клінічного випадку. Початково низька ВСР у пацієнтки після абляції знизилася вдвічі, що може призвести до збільшення частоти та подовження пароксизмів ФП. В медикаментозному супроводі, що включив бісопролол, валсартан, аторвастатин та рівароксабан, для збільшення ВСР запропоноване ступеневе збільшення дози бісопрололу або пошук більш дієвого бета блокатора.

КЛЮЧОВІ СЛОВА: варіабельність серцевого ритму, радіочастотна катетерна абляція, пароксизмальна фібриляція передсердь

ВАРИАБЕЛЬНОСТЬ СЕРДЕЧНОГО РИТМА ПРИ ПАРОКСИЗМАЛЬНОЙ ФИБРИЛЛЯЦИИ ПРЕДСЕРДИЙ ДО И ПОСЛЕ КАТЕТЕРНОЙ АБЛАЦИИ НА ПРИМЕРЕ КЛИНИЧЕСКОГО СЛУЧАЯ

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Изменения вариабельности сердечного ритма (ВСР) до и после выполнения катетерной радиочастотной аблации (РЧА) легочных вен при пароксизмальной фибрилляции предсердий (ФП) рассматриваются на примере клинического случая. Изначально низкая ВСР у пациентки после аблации снизилось вдвое, что может привести к увеличению частоты и удлинению пароксизмов ФП. В медикаментозном сопровождении, включавшем бисопролол, валсартан, аторвастатин и ривароксабан, для увеличения ВСС предложено ступенчатое увеличение дозы бисопролола или поиск более эффективного бета блокатора.

КЛЮЧЕВЫЕ СЛОВА: вариабельности сердечного ритма, катетерная радиочастотная аблация, пароксизмальная фибрилляция предсердий

INTRODUCTION

Atrial fibrillation (AF) represents a major cause of stroke, heart failure, sudden death and cardiovascular morbidity in the world. Whatever form it takes a risk of thromboembolic complications are equally high, so special attention should be given anticoagulant therapy for their prevention [1–6].

The strategy of patients management in case of paroxysmal AF is maintenance of sinus rhythm or transfer to permanent AF at obligatory minimization of thromboembolic complications risks. In some cases, antiarrhythmic therapy is contraindicated due to possible arrhythmogenic, organic toxic effects and threat of thromboembolic accidents, such patients should be offered radiofrequency ablation (RFA) [5].

Development and progression of paroxysmal AF affected by autonomic nervous system (ANS), firstly, drop the parasympathetic power level [7]. After RFA further reduction of HRV total power spectrum and violation ratio of its frequency components is observed [1, 4], which can lead to relapses and worsening of AF [7].

Existing research of HRV changes after RFA in patients with AF treated within 24 hours [1], while the ANS is rapidly changing process that may assess only a short record of a heart rate [7–8].

Given this, presented clinical case demonstrates changes of HRV before and after RFA in patients with paroxysmal AF, and allows predicting results of RFA.

OUR PATIENT

Woman 63 years, retired, city resident. The diagnosis on admission: ischemic heart disease (IHD), unstable angina (progressive tension). Condition after coronary ventriculography (CVG) and stenting (06.06.16). Atrial fibrillation, persistent form (10.18.16). Arterial hypertension (AH) III st., 3 deg. Heart failure II-a st. with preserved left ventricular (LV) ejection fraction. Risk IV (very high).

COMPLAINTS

Heartbeat and feeling of heart outages, that stops during one day after taking

450 mg propafenone. Burning pain in the heart, that irradiates the left arm, and disappears after taking 1–2 doses of nitroglycerin during 3 minutes. Shortness of breath with little exertion. Headache in the occipital region associated with an increasing blood pressure (BP) up to 140/90 mm Hg. Recurring pain in the cervical spine, pain and numbness in both upper extremities.

ANAMNESIS MORBI

For many years the patient has been suffering from hypertension with a maximum elevation of BP to 180/100 mm Hg. Chronic IHD about 4 years. In November 2013 – complaints of palpitations and a feeling of heart outages, first emerged AF was diagnosed. She was treated by amiodarone under the scheme with recommendations for further management. Since May 2014 a tendency to increase the frequency of episodes of paroxysmal AF was observed. She didn't follow the recommended regimen; the drug was carried out «on request». In June 2016 stenting of the left descending coronary artery due to its 90 % occlusion was performed. There was pain in the left heart, but BP is not rise above 140/95 mm Hg. In connection with increasing of heart pain, CVG was repeated in September 2016 with satisfactory results. The same time ultrasound revealed presence of 10.7 mm node in the left thyroid gland (TG). Thyroid hormones were investigated – TSH – 0,23 mkMEd/ml, T4 – 28.9 pmol/l. Patient was consulted by endocrinologist, diagnosed of nodular hyperthyroidism, tiamazol therapy was prescribed by scheme. At this time, the frequency of AF episodes increases to daily attacks, their tolerance deteriorates, and therefore she appealed to the cardiac arrhythmias expert. RFA of pulmonary veins was recommended, which was appeared in October 28, 2016. Treatment before RFA: propafenone, valsartan, bisoprolol, lercanidipine, aspirin, clopidogrel, rivaroksaban.

ANAMNESIS VITAE

Has a satisfactory living conditions. By profession an engineer, working conditions associated with emotional stress frequently. She adheres diet with restricted intake of salt to 3 g/day. Bad habits denied. Allergic anamnesis is not burdened. Tuberculosis, viral hepatitis, diabetes, mental and venereal diseases, trauma and surgery denied. During life she marks acute respiratory infections (3–4 times a year). Heredity is burdened by disease cardiovascular system, such as IHD and AH.

OBJECTIVE STATUS

General condition is moderately satisfactory, consciousness is clear, situation is active. Proper body constitution, high nutrition, body mass index – 29.7 kg/m2. Skin and visible mucous membranes are clean, pale pink, cyanosis is not defined. Pastosity of lower extremities. Lymph nodes are available for palpation, not increased. The thyroid gland is not visually determined by palpation – node in the left lobe of about 1 cm. Painless, not soldered to surrounding tissues. Musculoskeletal system normal, moderate tenderness paravertebral points in the cervical spine. Respiratory system is without pathological changes. Cardiovascular system: arrhythmic heart activity, tones are muted, heart rate (HR) = 115 ≠ Ps, forked first tone, accent of II tone above the pulmonary artery, mild systolic murmur on aorta, BP in both upper extremities 120/80 mm Hg. Belly regular shape, slightly increased by developed subcutaneous fat. Superficial palpation is painless, no peritoneal signs. Liver increased by 1.5 cm, painless, its margin is smooth, rounded. Effleurage symptom in lumbar is painless.

PRELIMINARY DIAGNOSIS

Main: IHD, stable exertional angina, III FC. AH, III st., 3 deg., risk is very high. Nodular hyperthyroidism. Atrial fibrillation, paroxysmal form tachysystolic variant. HF IIA st., III FC.

Concomitant: cervical spine osteochondrosis with brachialgic and cephalgic syndromes. Overweight.

DIAGNOSTIC TESTS RESULTS

Clinical analysis of blood – relative lymphocytosis, urine – oxalatrium. Biochemical analysis of blood characterized by increased levels of transaminases and alkaline phosphatase. Increased levels of free thyroxine (T4 free) were determined in the study of thyroid hormones. Chest X-ray revealed signs of hypertrophy and initial LV dilatation, hardening and calcinosis of aorta. Attack of paroxysmal AF was recorded by electro-cardiography (ECG) before RFA, presence of tachysystolic form of AF with HR=106, LV hypertrophy, disturbance of repolarization, systolic LV overload were shown, recorded HRV reflected higher spectrum total power (TP) with a predominance of low-frequency part of the spectrum. The same study was performed on a background of sinus rhythm, before RFA. It was ECG signs of none complete left bundle branch block and HRV reflected monomodal distribution of R-R intervals and low HRV TP range with a predominance of low-frequency part of the spectrum. Echocardiography revealed moderate LV hypertrophy, mitral valve prolapse with mitral regurgitation 1–2 st., aortic regurgitation 2 st., EF= 61 . Complete pulmonary veins isolation was made during RFA. The analysis of HRV after that characterized monomodal distribution of R – R intervals and critical reduction of TP range with prevalence of its very low-frequency (VLF) component. Comparing data of HRV before and after RFA followed next results: a sharp decline TP 46 %, increase in VLF activity doubly. These changes indicate a strong neurocardiopathy.

CLINICAL DIAGNOSIS:

IHD, stable exertional angina FC III, post CVG and upper descending artery - segment of the left coronary artery stenting (06.06.16). Atherosclerotic cardiosclerosis, mitral and aortic regurgitation 2 st. AH III st., 3 deg., risk is very high. LV hypertrophy, none complete left bundle branch block. Nodular hyperthyroidism. CHA2DS2 -VASc 4 points, HAS-BLED – 2 points, EHRA III. Condition after pulmonary veins isolation RFA (28.10.16). HF IIA st., III FC with preserved LV ejection fraction. Oxalatrium. Osteo-chondrosis of the cervical spine.

In the hospital received treatment: enoxaparin, rivaroksaban, propafenone, bisoprolol, valsartan, clopidogrel, meloxicam.

OUR RECOMMENDATION:

Lifestyle modifications – changing the daily routine and diet. Cyclical breathing, which is achieved when walking, swimming, using metronome, etc. [9].

Drug therapy: bisoprolol 5 mg/day – dose titration under HR and parameters of HRV control (if not the growth of TP spectrum of HRV - increasing the dose or search for another beta blocker), valsartan 80 mg/day in the morning, atorvastatin 5 mg to sleep. rivaroksaban 20 mg. Local on cervical spine – nimesulide gel 3 times daily over 10 days. [5–7]

Re-execution of clinical and biochemical blood analysis, urinalysis, determination of thyroid hormones (T3, T4, TSH), electrolyte composition of blood (K, Na, Mg), ECG,

echocardiography dynamics, ultrasound of the thyroid gland and abdominal organs, consulting endocrinologist and a neurologist, clinical observation of HRV were recommended.

TELEPHONE VISITS

The patient lives far away from the Hospital; it makes it impossible for her physical visits. Communication was supported by telephone visits.

A month after the RFA marked decrease in the frequency of attacks of paroxysmal AF to 7 times per month; paroxysms were stopped after taking 600 mg propafenone.

Tiamazol didn't receive, a dose of bisoprolol increased up to 5 mg/day.

CONCLUSIONS

The initial low TP spectrum of HRV in patients after RFA reduced by half, which can lead to increased frequency and extension of paroxysmal AF [1–2, 4].

In the accompanied medication, which included bisoprolol, valsartan, atorvastatin and rivaroksaban, to increase HRV were proposed increasing of bisoprolol dose and with no results – search for another beta blocker.

EPILOGUE

By the time the article was completed during a telephone visit, the patient reported a new paroxysm of AF lasting for 4 days, that's were not stopped after taking usual dose of propafenone. Given the results of her HRV it is a forecasted results. It is recommended to add sotalol 80 mg twice daily. If paroxysm were not stopped, electrical cardioversion is indicated, after which the issue will be to transfer the patient to a permanent form of AF.

REFERENCES

1. Dinamika pokazateley variabelnosti serdechnogo ritma do i posle radiochastotnoy ablatsii legochnyih ven i levogo predserdiya u patsientov s fibrillyatsiey predserdiy/ N. V. Sichinava [et al.]// Annalyi aritmologii. – 2009. – № 2.-P.63–73
2. Martimyanova L. A. General cardiovascular risk and the clinical condition of patients with atrial fibrillation / Martimyanova L. A. // The Journal of V. N. Karazin Kharkiv National University. Series «Medicine». – 2015. –- 1154 (Issue 29). – P. 45–48
3. Yabluchanskiy M. I. Internal diseases: the time of global somatic risk. / M. I. Yabluchanskiy, A. M. Yabluchanskiy, O. Y. Bychkova [et al.] // The Journal of V. N. Karazin Kharkiv National University. Series «Medicine». – 2013. – 1044 (Issue 25). – P. 5–7.
4. Long-term changes in heart rate variability after radiofrequency catheter ablation for atrial fibrillation: 1-year follow-up study with irrigation tip catheter. / Kang KW [et al.]//Journal of Cardiovasc Electrophysiology. – 2014. – № 25(7). – P. 693–700.
5. Sychev O. S. Fibrillyatsiya predserdiy. Sovremennyie podhodyi k lecheniyu i profilaktike oslozhneniy u patsientov s soputstvuyuschey patologiey serdtsa/ Sychev O. S. // Ukrainskiy meditsinskiy zhurnal – 2011. – 6 (86) XI–XII.
6. 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)// European Heart Journal. – 2016. – P. 90.
7. Yabluchanskiy N. I. Heart rate variability for the practitioner [electronic resource] / N. I. Yabluchanskiy, A. V. Martynenko // Access mode: http://dspace.univer.kharkov.ua/handle/123456789/1462.
8. Heart rate variability. Standards of Measurement, Physiological Interpretation and Clinical Use. – Circulation. – 1996. – № 93. p. 43–65.
9. Implementation of biofeedback in a closed loop of heart rate variability and paced breathing in patient with arterial hypertension/ O. L. Kulik [et al.] // The Journal of V. N. Karazin Kharkiv National University. Series «Medicine». – 2014. – 1108 (Issue 27). – P. 10–15.