

Clinical case

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**EXPERIENCE OF MANAGEMENT OF THE PATIENT
WITH THE RESYNCHRONIZATION BIVENTRICULAR PACING
WITHOUT DESTRUCTION OF ATRIO-VENTRICULAR NODE
SUFFERING FROM CHRONIC HEART FAILURE
AND PERMANENT ATRIAL FIBRILLATION**

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The case of cardiac biventricular resynchronization without destruction of the atrio-ventricular node in patients with chronic heart failure (CHF) and permanent atrial fibrillation (AF) is described. The observation period was 14 months. The case demonstrates that biventricular resynchronization for severe heart failure with atrial fibrillation and significant atria size with theoretical and practical impossibility of its' transforming into the long-term persistent atrial fibrillation is a reasonable alternative of atrio-ventricular pacing. Though the destruction of the atrio-ventricular node can be delayed for a significant period of time, it should be done at the earliest opportunity. Pacemaker implantation does not cancel medical therapy, with the necessity for the latter to be according to the conducted biventricular pacing.

KEY WORDS: chronic heart failure, permanent pacing, atrio-ventricular ablation

**ДОСВІД ВЕДЕННЯ ПАЦІЄНТА З РЕСИНХРОНІЗУЮЧОЮ ДВОШЛУНОЧКОВОЮ
ЕЛЕКТРОКАРДІОСТИМУЛЯЦІЄЮ БЕЗ РУЙНУВАННЯ АТРІО-ВЕНТРИКУЛЯРНОГО
З'ЄДНАННЯ З ПРИВОДУ ХРОНІЧНОЇ СЕРДЦЕВОЇ НЕДОСТАТНОСТІ
ТА ПОСТІЙНОЮ ФОРМОЮ ФІБРИЛЯЦІЇ ПЕРЕДСЕРДЬ**

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Наданий клінічний випадок ресинхронізуючої двошлуночкової електростимуляції без руйнування передсердно-шлуночкового вузла у пацієнта з хронічною серцевою недостатністю (ХСН) і постійною формою фібриляції передсердь (ФП). Термін спостереження 1 рік 2 місяці. Випадок демонструє, що ресинхронізує двошлуночкова електростимуляція при важкій ХСН з ФП і значних розмірах передсердь з теоретичної та практичної неможливості переходу останньої в довгостроково персистируючу фібриляцію передсердь є обґрунтованою альтернативою передсердно-шлуночкової електростимуляції. Притому, що руйнування передсердно-шлуночкового вузла може бути відстрочено на тривалий проміжок часу, при найближчій можливості воно має бути виконано. Імплантація ЕКС не скасовує медикаментозної терапії, яка повинна знаходитись відповідно до проведеної двошлуночкової електростимуляції.

КЛЮЧОВІ СЛОВА: хронічна серцева недостатність, постійна електрокардіостимуляція, атріо-ventрикулярна абляція

ОПЫТ ВЕДЕНИЯ ПАЦИЕНТА С РЕСИНХРОНИЗИРУЮЩЕЙ ДВУХЖЕЛУДОЧКОВОЙ ЭЛЕКТРОКАРДИОСТИМУЛЯЦИЕЙ БЕЗ РАЗРУШЕНИЯ АТРИО-ВЕНТРИКУЛЯРНОГО СОЕДИНЕНИЯ ПО ПОВОДУ ХРОНИЧЕСКОЙ СЕРДЕЧНОЙ НЕДОСТАТОЧНОСТИ И ПОСТОЯННОЙ ФОРМЫ ФИБРИЛЛЯЦИИ ПРЕДСЕРДИЙ

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Представлен клинический случай ресинхронизирующей двухжелудочковой электростимуляции без разрушения предсердно-желудочкового узла у пациента с хронической сердечной недостаточностью (ХСН) и постоянной формой фибрилляции предсердий (ФП). Срок наблюдения 1 год 2 месяца. Случай демонстрирует, что ресинхронизирующая двухжелудочковая электростимуляция при тяжелой ХСН с ФП и значительных размерах предсердий с теоретической и практической невозможностью перехода последней в длительно персистирующую фибрилляцию предсердий является обоснованной альтернативой предсердно-желудочковой электростимуляции. Притом, что разрушение предсердно-желудочкового узла может быть отсрочено на продолжительный промежуток времени, при ближайшей возможности оно должно быть выполнено. Имплантация ЭКС не отменяет медикаментозной терапии, которая должна находиться в соответствии с проводимой двухжелудочковой электростимуляцией.

КЛЮЧЕВЫЕ СЛОВА: хроническая сердечная недостаточность, постоянная электрокардиостимуляция, атрио-вентрикулярная абляция

Chronic heart failure (CHF) and permanent atrial fibrillation (AF) are common clinical syndromes in cardiology practice predetermining and burdening the development of each other [1–3].

Resynchronization therapy is an effective treatment for such patients, and can be done by setting pacemaker modes by atrio-ventricular (with the possibility of transition from permanent to long-persistent AF) or biventricular (permanent AF without the possibility of transition to long-term persistent) pacing with ablation of the atrio-ventricular node [4], followed by well-organized medication support [5, 6].

Destruction (ablation) of the AV node is a component of mandatory cardiac resynchronization therapy for these patients, providing a full replacement of biventricular pacing, together with a positive effect on the contractile function of the heart and health of the patient at a whole, as well as reducing the need for additional medical treatment. [7]

The patient is 75 years old, retired, villager; was hospitalized in the cardiac surgery department of SI IGES NASU for placing of cardio-resynchronization device during the period of 25.11.2011–08.12.2011.

On admission, the patient complained for combined dyspnea, that appeared during mild exercise, and in the horizontal position, palpitation, weakness, and falling asleep dysfunction.

Exertional dyspnea (climbing the stairs to the second floor, walking about 500 m) came to be felt in 2000. The patient has neither been examined, nor treated for 7 years. The deterioration progressed: exercise tolerance decreased, dyspnea became noticeable during even mild exercise and in supine position. In January of 2008 patient have been admitted to the cardiac hospital for the first time, where he was diagnosed with ischemic heart disease (ICD): myocardial (unknown date) and atherosclerotic cardiosclerosis, permanent atrial fibrillation, eusystolic form. CHF II B, II FC (reduced systolic function of the left ventricular ejection fraction — 30 %). Since that time, the patient has been undergoing the hospital treatment every year.

In September 2011 there was a acute deterioration of overall condition with dyspnea during mild physical activity and activities of daily living disability appeared. Therefore, the patient was directed to SI IGES NASU for consultation, and later was hospitalized.

From the past medical history: since 1997 the patient is suffering from urolithiasis, chronic pyelonephritis, since 2003 — duodenal ulcer (DU), (in 2009 — acute gastrointestinal bleeding (AGIB) from duodenal ulcer). Allergic history is absent, tuberculosis and venereal diseases are actively denied.

On the admission to SI IGES NASU, patient's general condition is characterized as of

an average severity: clear conscience; pale skin color; peripheral edema on the feet; during auscultation — rough breath over the whole lungs surface with respiratory rate (RR) — 20 times/min; heart sounds are muffled at all points of auscultation and arrhythmic; systolic murmur at the apex; heart rate (HR) — 78 beats/min; pulse (Ps) — 68 beats/min; pulse deficiency — 10 beats/min; blood pressure (BP) — 110/70 mm Hg on the right arm, 126/70 mm Hg — on the left arm; borders of the relative cardiac dullness extended (right is in intercostal space III up to 1,5 cm outside from L.parasternalis dextra, upper — in intercostal space III on L. parasternalis sinister, left — in intercostal space V up to 1,5 cm laterally to L. clavicularis media.); soft and painless abdomen in all sections; liver is enlarged for 4 cm under the costal margin, firm consistency, painless; spleen is not palpable; Pasternatskiy syndrome is slightly positive on the both sides; normal stool and urine output.

Clinical blood analysis (CBA): hemoglobin (HGB) — 126 g/l, red blood cells count (RBC) — $4,0 \times 10^{12}$ / liter, color index — 0,9, white blood cells count (WBC) — $7,5 \times 10^9$ / l, stab leukocytes (SL) — 13 %, segmentonuclear leukocyte (SNL) — 72 %, eosinophils (EOS) — 4%, lymphocytes (LYM) — 9 %, monocytes (MONO) — 2 %, erythrocyte sedimentation rate (ESR) — 8 mm/h.

Clinical urine analysis (CUA): relative density — 1,017, pH — 6,0, protein — 0,033 g/l, red blood cell — 2–4 on visual field (v/f), white blood cell — on all v/f.

Biochemical blood analysis (BBA): total protein — 74,4 g/L, total bilirubin — 23,4 mmol/L, conjugated bilirubin — 6,1 mmol/L, urea — 11,6 mg/day, creatinine — 0,122 umol/L, AST — 0,76 mmol/l × h, ALT — 0,77 mmol/l × h, alkaline phosphatase — 7,1 mmol/l × h, glucose — 5,4 mmol/l.

Antibodies to viral hepatitis B, C: not found.

Coagulogram: clotting time — 11 min., recalcification time — 120 s, prothrombin index — 94,7 %, prothrombin ratio — 1,05, fibrinogen — 3,1 g/g

Chest fluoroscopy (CF): Lungs — without focal lesions. Roots are expanded, sinuses are free. Heart all chambers are increased, but left ventricle is the most. There are signs of mitral regurgitation, hearts sounds and myocardial contractility are significantly reduced.

Electrocardiogram (ECG): irregular rhythm, HR — 83 min., atrial fibrillation, complete left bundle branch block, QRS complex — 188 ms.

Ultrasound (US) of the heart: Aortic atherosclerosis. Fibrosis of the aortic and mitral valves. Dilatation of the cavities. Hypo- and akinesia of interventricular septum. Reduction of left ventricular contractile function (25 %). I degree aortic regurgitation. II degree mitral regurgitation. II degree tricuspid regurgitation.

Clinical diagnosis: Ischemic heart disease: myocardial (unknown date) and atherosclerotic cardiosclerosis. Permanent atrial fibrillation, eusystolic form. EHRA II. CHF III, III FC (reduced left ventricular systolic function EF — 25 %).

Duodenal ulcer.

Urolithiasis. Chronic pyelonephritis

02.12.2011 — implantation of Medtronic Syncra CRT–P — for cardiac resynchronization therapy with the installation of right ventricular electrode in the interventricular septum (IVS) and left ventricular electrode — on the lateral wall of the left ventricle. The device provides interventricular and intraventricular resynchronization via mode VVDRV (trigger stimulation of the left ventricle (LV) in response to the detection of the right ventricle (RV) with a base frequency of 75 imp/min. Interventricular delay time — 10 ms.

After 2 days after operation the patient noted improvement in general condition: dyspnea reduced; exercise tolerance increased; skin returned to normal color, edema disappeared; rough breath is auscultated over the whole lungs surface with respiratory rate (RR) — 20 times/min; heart sounds are muffled at all points of auscultation; systolic murmur at the apex; HR — 76 beats/min; Ps — 73 times/min; pulse deficiency — 3. BP — 100/70 mm Hg on the right arm, 110/70 mm Hg — on the left arm; soft and painless abdomen in all departments; liver enlarged 4cm under the costal margin, of solid consistency, painless; spleen is not palpable; Pasternatskiy syndrome slightly positive on the both sides; normal stool, urine output.

ECG: pacemaker works on base frequency of ventricular pacing 75 imp/min, atrial fibrillation, QRS 152 ms.

US of the heart: the results before and during the observation stages after implantation of resynchronization device are presented in

Table 1. After installing the pacemaker, improvement is marked in myocardial contractility with a tendency to reduce the dilation of the cavities.

Table 1
Echocardiographic parameters before and during observation stages after implantation of resynchronization device

	28.11. 2011 before surgery	05.12. 2011 after surgery	24.01. 2013 follow-up visit	Normal value
ESV, cm	7,2	6,5	6,2	3,5–4,2
EDV, cm	8,1	7,8	7,5	3,7–5,5
LA, cm	5,2	4,9	4,9	0,95–2,05
RV, cm	3,8	3,6	3,6	1,85–3,3
RA, cm	6,2	6,0	4,6	3,8–4,6
EF, %	25	33	33	More than 55

The patient was discharged in a satisfactory condition with recommendations concerning work and rest, diet number 10, taking carvedilol 3,125 mg 2 times a day, acetylsalicylic acid 75 mg at night, spironolactone 100 mg in the morning, digoxin 0,25 mg 2 times a day, lisinopril 2,5 mg once in the morning, dispensary observation by cardiologist in the place of residence is recommended.

In 14 months after the setting of pacemaker patient is in satisfactory condition: have a clear conscience, normal skin color, edema is absent; rough breath is auscultated over the whole lungs surface with RR — 20 min; heart sounds are muffled at all points of auscultation; heart rate — 75 beats/min; pulse — 75 times/ min; pulse deficiency — 0; BP — 110/70 mm Hg on the right arm, 120/70 mm Hg — on the left arm; border of the relative cardiac dullness (right — in intercostal space III up to 1,0 cm

laterally from L.parasternalis dextra, upper — in intercostal space III on L. parasternalis sinister, left — intercostal space V up to 1,0 cm outwards from L.clavicularis media); soft, painless abdomen in all departments; liver is enlarged about 2 cm under the costal margin, of firm consistency, painless; spleen is not palpable; Pasternatskiy syndrome is slightly positive on the both sides; stool, urine output normal.

US of the heart: (Table 1) on the background on the continuing decrease in ejection fraction further dilatation of the cavities is observed.

The information obtained from cardiac resynchronization device showed a decrease in the frequency of stimulated ventricular complexes in September 2012, resulting from the ceasing of drugs intake on his part (Table 2, Fig. 1). During that period, the patient's heart rate had a tendency to increase (Fig. 2). Return to drug therapy helped to return it to the original levels. These results explain the long-term effectiveness of cardiac resynchronization biventricular pacing without destroying the atrioventricular node.

Table 2
Drug therapy and total ventricular pacing (cumulative ventricular pacing, CumVP)

Month	February 2012	September 2012	January 2013
Cumulative ventricular pacing, CumVP	96	73	94
Drugs	Carvedilol Digoxin	None	Carvedilol Digoxin

Recommendations:
medical therapy, additional intake of statins, AB — ablation

	Prior to Last Session 22-Feb-2012 to 04-Sep-2012 6 months		Since Last Session 04-Sep-2012 to 05-Oct-2012 31 days	
% of Time	AS-VS	4.9 %		36.6 %
	AS-VP	95.1 %		63.4 %
	AP-VS	0.0 %		0.0 %
	AP-VP	0.0 %		0.0 %
	VP	96.0 %		73.1 %
	VSR Pace	3.9 %		< 0.1%
	VS	< 0.1%		26.9 %

Fig. 1. Effectiveness of cardiac resynchronization therapy in the patient with and without drug therapy

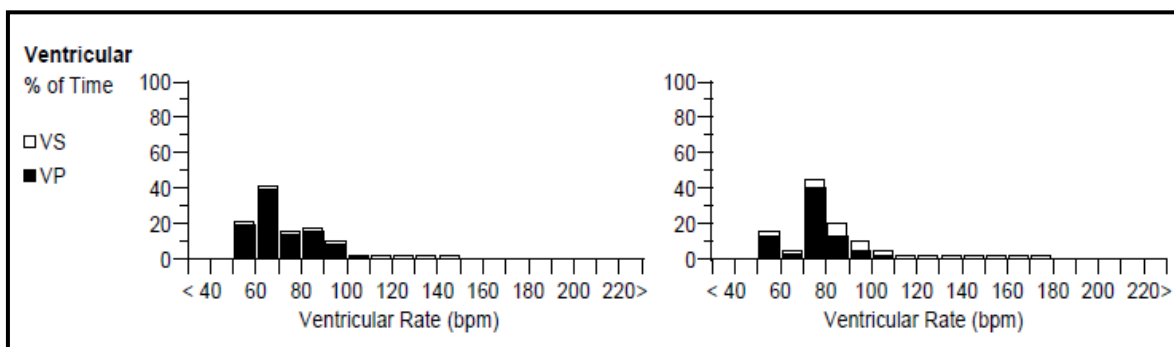


Fig. 2. Histograms of ventricular rate in patients with (left) and without (right) drug therapy

The clinical case illustrates the effectiveness of long-term biventricular pacing without destroying the atrio-ventricular node in the patient with severe heart failure and atrial fibrillation. The history of the disease makes it easy to understand that the results would have been much better if the surgery had been performed just after patient's first visit to the cardiology department (2008).

Biventricular pacing in patients with severe heart failure and atrial fibrillation with signifi-

cant atrial size with theoretical and practical impossibility switch to a long persistent atrial fibrillation serves as a reasonable alternative to atrio-ventricular pacing.

Despite the fact that the destruction of the atrio-ventricular node can be delayed for a long period of time it should be done at the earliest opportunity.

Pacemaker implantation does not substitute medical therapy which should be in line with the biventricular pacing.

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