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FUNCTIONAL CLASS OF CHRONIC HEART FAILURE AND DYNAMIC OF HEMODYNAMIC PARAMETERS IN PATIENTS WITH IMPLANTED PACEMAKERS AT THE ANNUAL STAGE OF SUPPORTIVE DRUG THERAPY

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162 patients (89 men and 73 women) aged 69 ± 10 years were observed at the annual stage of supportive drug therapy after implantation of pacemakers in DDD/DDDR, VVI/VVIR and CRT-P/CRT-D modes. Changes of hemodynamic parameters were taken in consideration according to the functional class of chronic heart failure (CHF FC). Pacemakers implantation and supportive drug therapy led to transference of patients to the lower CHF FC with more significant results in CRT-P/CRT-D mode, normalization of heart rate (HR) in all CHF FC and stimulation modes, systolic (SBP) and diastolic blood pressure (DBP) in DDD/DDDR and CRT-P/CRT-D modes, end-systolic and diastolic volumes (EDV and ESV LV), left ventricular ejection fraction (LVEF) in CHF FC II in all stimulation modes and CHF FC III in DDD/DDDR and VVI/VVIR modes and size of the left atrium (LA) in CHF FC II in all stimulation modes and CHF FC I in VVI/VVIR mode. In thickness of posterior wall and interventricular septum of the left ventricle (LV PW and IVS), the sizes of the right atrium (RA) and right ventricle (RV) significant changes in any of CHF FC were not noticed, which requires drug therapy amplification.

KEY WORDS: permanent pacing, cchronic heart failure, functional class of cchronic heart failure, hemodynamic parameters, annual stage, drug therapy

ФУНКЦІОНАЛЬНИЙ КЛАС ХРОНІЧНОЇ СЕРЦЕВОЇ НЕДОСТАТНОСТІ ТА ДИНАМІКА ГЕМОДИНАМІЧНИХ ПОКАЗНИКІВ У ПАЦІЄНТІВ З ЕЛЕКТРОКАРДІОСТИМУЛЯТОРАМИ НА РІЧНОМУ ЕТАПІ ПІДТРИМУЮЧОЇ МЕДИКАМЕНТОЗНОЇ ТЕРАПІЇ

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Спостерігали 162 пацієнта (89 чоловіків і 73 жінки) у віці 69 ± 10 років на річному етапі підтримуючої медикаментозної терапії після імплантації електрокардіостимуляторів (ЕКС) в режимах DDD/DDDR, VVI/VVIR і CRT-P/CRT-D. Враховувалися зміни гемодинамічних показників з урахуванням функціональних класів хронічної серцевої недостатності (ФК ХСН). Імплантація ЕКС і підтримуюча медикаментозна терапія приводили до переходу пацієнтів у більш низькі ФК ХСН з більш значущими результатами в режимі CRT-P/CRT-D, нормалізації частоти серцевих скорочень (ЧСС) у всіх ФК ХСН і режимах стимуляції, систолічного (САТ) і діастолічного артеріального тиску (ДАТ) в режимах DDD/DDDR і CRT-P/CRT-D стимуляції, кінцевого систолічного (КСО ЛШ) і діастолічного обсягу лівого шлуночка (КДО ЛШ), фракції викиду лівого шлуночка (ФВ ЛШ) в II ФК ХСН у всіх режимах і в III ФК ХСН в режимах DDD/DDDR і VVI/VVIR і розмірів лівого передсердя (ЛП) в II ФК ХСН у всіх режимах стимуляції і в I ФК ХСН - в режимі VVI/VVIR. У товщині задньої стінки (ТЗС ЛШ) і міжшлуночкової перегородки лівого шлуночка (ТМШП ЛШ), розмірах правого передсердя (ПП) і правого шлуночка (ПШ) не спостерігалось значущих змін ні в одному з ФК ХСН, що вимагає посилення медикаментозної терапії.

КЛЮЧОВІ СЛОВА: постійна електрокардіостимуляція, хронічна серцева недостатність, функціональний клас хронічної серцевої недостатності, гемодинамічні показники, річний період, медикаментозна терапія

ФУНКЦИОНАЛЬНЫЙ КЛАСС ХРОНИЧЕСКОЙ СЕРДЕЧНОЙ НЕДОСТАТОЧНОСТИ И ДИНАМИКА ГЕМОДИНАМИЧЕСКИХ ПОКАЗАТЕЛЕЙ У ПАЦИЕНТОВ С ИМПЛАНТИРОВАННЫМИ ЭЛЕКТРОКАРДИОСТИМУЛЯТОРАМИ НА ГОДОВОМ ЭТАПЕ ПОДДЕРЖИВАЮЩЕЙ МЕДИКАМЕНТОЗНОЙ ТЕРАПИИ

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Наблюдали 162 пациента (89 мужчин и 73 женщины) в возрасте 69 ± 10 лет на годовом этапе поддерживающей медикаментозной терапии после имплантации электрокардиостимуляторов (ЭКС) в режимах DDD/DDDR, VVI/VVIR и CRT-P/CRT-D. Учитывались изменения гемодинамических показателей с учетом функциональных классов хронической сердечной недостаточности (ФК ХСН). Имплантация ЭКС и поддерживающая медикаментозная терапия приводили к переходу пациентов в более низкие ФК ХСН с более значимыми результатами в режиме CRT-P/CRT-D, нормализации частоты сердечных сокращений (ЧСС) во всех ФК ХСН и режимах стимуляции, систолического (САД) и диастолического артериального давления (ДАД) в режимах DDD/DDDR и CRT-P/CRT-D стимуляции, конечного систолического (КСО ЛЖ) и диастолического объема левого желудочка (КДО ЛЖ), фракции выброса левого желудочка (ФВ ЛЖ) во II ФК ХСН во всех режимах и в III ФК ХСН в режимах DDD/DDDR и VVI/VVIR и размеров левого предсердия (ЛП) во II ФК ХСН во всех режимах стимуляции и в I ФК ХСН - в режиме VVI/VVIR. В толщине задней стенки (ТЗС ЛЖ) и межжелудочковой перегородки левого желудочка (ТМЖП ЛЖ), размерах правого предсердия (ПП) и правого желудочка (ПЖ) не наблюдалось значимых изменений ни в одном из ФК ХСН, что требует усиления медикаментозной терапии.

КЛЮЧЕВЫЕ СЛОВА: постоянная электрокардиостимуляция, хроническая сердечная недостаточность, функциональный класс хронической сердечной недостаточности, гемодинамические показатели, годовой период, медикаментозная терапия

INTRODUCTION

Permanent pacing has proved effectiveness in improvement of quality and lifetime, morbidity and mortality reduction in patients with arrhythmias and ventricular dyssynchrony associated with chronic heart failure (CHF) [1, 2]. However, it does not cancel, but modifies supportive drug therapy.

An important factor in verification of the drug therapy effectiveness in patients with permanent pacing is hemodynamic parameters as they relate to functional class (FC) of CHF that is still not reflected in the literature.

OBJECTIVE

The aim of the study is to estimate hemodynamic parameters in CHF FC in patients with implanted pacemakers stage at the annual stage of supportive drug therapy for enhancement its effectiveness.

MATERIALS AND METHODS

162 patients (89 men and 73 women) aged 69 ± 10 years, who were subject to permanent pacing, were examined at the department of ultrasonic and instrumental diagnostics with miniinvasive interventions of SI «Zaytsev V.T. Institute of General and Urgent Surgery NAMS of Ukraine». Among the indications for pacemaker implantation were atrio - ventricular block (AV block) – 89 patients (55 %) and sick sinus node syndrome (SSNS) - 32 people (20 %) with pacing DDD/DDDR mode,

permanent bradysystolic atrial fibrillation (AF) – 25 patients (15 %) with pacing VVI/VVIR mode, dilated cardio-myopathy - 16 patients (10 %) with pacing CRT-P and CRT-D modes.

Inclusion criteria were pacemakers and CHF. Exclusion criteria were the stimulation of the right or left ventricle less than 50 % over the annual period of observation and age less than 40 years.

Before implantation, in the early postoperative (3-5 days), semi-annual and annual periods after implantation, depending on the CHF FC systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate (HR), end-systolic and diastolic volumes (EDV and ESV LV), left ventricular ejection fraction (LVEF), thickness of posterior wall and interventricular septum of the left ventricle (LV PW and IVS), the size of the left atrium (LA), the size of the right atrium (RA) and the size of the right ventricle (RV) were estimated.

SBP and DBP were measured by the Korotkov's method using Microlife BP AG1-20 tonometer after 5 minutes of rest.

HR was measured using CardioLab 2000 electrocardiography.

Echocardiography was done using ultrasound Toshiba Aplio 400, Siemens Cypress and Esaote MyLab Alfa equipment. Sizes of the LA, RA, RV and LV PW and IVS were measured. Calculation of EDV and ESV LV made with the Teichholz (Teichholz L.E., 1976) [3] formula: $EDV = 7 * (EDS)^3 / (2.4 + EDS)$, $ESV = 7 * (ESS)^3 / (2.4 + ESS)$. LVEF

calculation was made with the formula $EF = (EDV-ESV) / EDV * 100 \%$.

Hardware and drug optimization were carried out at each stage of the research. Angiotensins converting enzyme inhibitors, beta-blockers, antiplatelet agents, anticoagulants of direct action, statins, anti-arrhythmic drugs were used in the drug optimization.

Patients were divided into 4 groups - CHF FC I, II, III and IV. For CHF FC diagnosis used the recommendations of the Association of Cardiologists of Ukraine (2012) [4]. In each group of patients at each stage of the study SBP, DBP, HR, EDV and ESV LV, LVEF, LV PW and IVS statistics, the sizes of the LA, RA, RV were determined.

The obtained results were processed after forming the database. Statistical evaluation was carried out with using Microsoft Excel (for parametric data: M - mean value, sd - standard deviation; for nonparametric data: absolute (n, the number) and relative (p, %) for the unit). The accuracy of differences between groups was determined using the nonparametric U - Mann -Whitney test. The expected result was determined by level of accuracy $p < 0.05$ and $p < 0.01$.

RESULTS AND DISCUSSION

Table 1 shows the hemodynamic parameters in CHF FC groups in patients with pacemakers in DDD/DDDR mode.

Table 1

Hemodynamic parameters of patients before and after pacemakers' implantation in DDD/DDDR mode depending on CHF FC (M ± sd)

Hemodynamic parameters	CHF FC															
	FC I				FC II				FC III				FC IV			
	Before pacing	3-5 days	6 month	1 year	Before pacing	3-5 days	6 month	1 year	Before pacing	3-5 days	6 month	1 year	Before pacing	3-5 days	6 month	1 year
SBP (mmHg)	149 ± 21	141 ± 11	137 ± 10	131 ± 10	150 ± 15	142 ± 19	137 ± 10	135 ± 13	153 ± 15	145 ± 18	140 ± 21	135 ± 7	162 ± 10	157 ± 15	155 ± 21	-
DBP (mmHg)	84 ± 12	84 ± 6	83 ± 5*	81 ± 7	90 ± 8	85 ± 8	85 ± 7*	81 ± 10	93 ± 7	88 ± 7	85 ± 12	85 ± 14	95 ± 6	93 ± 6	90 ± 7	-
HR (beats/min)	47 ± 8	64 ± 9	62 ± 6	62 ± 11	45 ± 7	59 ± 19	61 ± 12	64 ± 5	46 ± 13	59 ± 17	64 ± 11	66 ± 5	44 ± 3	60 ± 7	62 ± 4	-
EDV LV (ml)	123 ± 32	117 ± 13	114 ± 18	104 ± 33	139 ± 36	135 ± 32	130 ± 28	115 ± 31	152 ± 53	146 ± 59	140 ± 28	135 ± 40	182 ± 41	161 ± 21	154 ± 42	-
ESV LV (ml)	55 ± 21	53 ± 12	51 ± 5	48 ± 7	69 ± 37	68 ± 30	63 ± 25	59 ± 25	74 ± 33	70 ± 49	68 ± 22	60 ± 19	80 ± 27	73 ± 12	69 ± 21	-
LVEF (%)	53 ± 8	51 ± 10	55 ± 3	62 ± 8	50 ± 7	54 ± 10	55 ± 4	60 ± 7	46 ± 8	50 ± 5**	53 ± 3	61 ± 17	38 ± 11	41 ± 7**	47 ± 13	-
LV PW (cm)	1,2 ± 0,2	1,2 ± 0,2	1,2 ± 0,1	1,1 ± 0,2	1,2 ± 0,2	1,2 ± 0,2	1,1 ± 0,3	1,1 ± 0,2	1,3 ± 0,2	1,3 ± 0,2	1,2 ± 0,2	1,2 ± 0,2	1,3 ± 0,2	1,3 ± 0,2	1,2 ± 0,2	-
LV IVS (cm)	1,2 ± 0,2	1,2 ± 0,2	1,2 ± 0,1	1,1 ± 0,2	1,2 ± 0,2	1,2 ± 0,2	1,1 ± 0,3	1,1 ± 0,2	1,3 ± 0,2	1,3 ± 0,2	1,2 ± 0,2	1,2 ± 0,2	1,3 ± 0,2	1,3 ± 0,2	1,2 ± 0,2	-
LA (cm)	4,2 ± 1	4,2 ± 1*	4 ± 1	3,7 ± 1	4,3 ± 1	4,3 ± 1*	4 ± 1	3,8 ± 1	4,6 ± 1	4,6 ± 1	4,5 ± 1	4,3 ± 1	4,7 ± 1	4,7 ± 1	4,5 ± 1	-
RA (cm)	3,8 ± 1	3,8 ± 1	3,6 ± 0,5	3,3 ± 0,5	4,1 ± 1	4,1 ± 1	4 ± 1	3,7 ± 1	4,3 ± 1	4,3 ± 1	4,1 ± 1	3,8 ± 0,5	4,8 ± 1	4,8 ± 1	4,6 ± 1	-
RV (cm)	4,1 ± 2	4,1 ± 2	4 ± 1	3,6 ± 1	4,2 ± 1	4,2 ± 1	4,1 ± 1	3,8 ± 1	4,2 ± 1	4,2 ± 1	4,1 ± 1	3,8 ± 0,5	4,6 ± 0,5	4,6 ± 0,5	4,5 ± 0,5	-

* $p < 0,05$ ** $p < 0,01$ - in current values between the groups

Before implantation SBP was within 1 degree of arterial hypertension (AH) in CHF FC I, II, III groups and 2 degree in the CHF FC IV group. Six months after implantation there was decrease to norm in the first three groups and the tendency to decrease in CHF FC IV group. Before implantation DBP was not higher than 1 degree of AH in all CHF FC groups, but after the implantation it normalized at the early stage in the first three groups, and six months later - in CHF FC IV group.

Before implantation HR in all CHF FC groups was significantly below normal and after implantation it normalized.

EDV and ESV LV exceeded norm in CHF FC II, III, IV groups before implantation. In six months after implantation normalization noticed in CHF FC II, III groups and tendency

to decrease - in CHF FC IV group. Before implantation LVEF was significantly reduced in CHF FC III, IV groups, but in six months after implantation it fully normalized in CHF FC III group and had tendency to normalization in CHF FC IV group.

LV PW and IVS exceeded the norm in all CHF FC groups before implantation. After one year implantation led to some reduction.

The size of the LA, RA and RV exceeded the norm in all CHF FC groups before implantation. A year later after implantation the size of the LA fully normalized in CHF FC I, II group, in the other groups was only tendency to reduction.

Table 2 shows the hemodynamic parameters in CHF FC groups in patients with pacemakers in VVI/VVIR mode.

Table 2

Hemodynamic parameters of patients before and after pacemakers' implantation in VVI/VVIR mode depending on CHF FC (M ± sd)

Hemodynamic parameters	CHF FC															
	FC I				FC II				FC III				FC IV			
	Before pacing	3-5 days	6 month	1 year	Before pacing	3-5 days	6 month	1 year	Before pacing	3-5 days	6 month	1 year	Before pacing	3-5 days	6 month	1 year
SBP (mmHg)	143 ± 10	138 ± 15	135 ± 17	130 ± 14	148 ± 20	144 ± 17	137 ± 14	133 ± 5	150 ± 20	145 ± 22	143 ± 7	-	160 ± 28	155 ± 21	145 ± 20	-
DBP (mmHg)	85 ± 13	82 ± 12	80 ± 12	80 ± 14**	90 ± 10	85 ± 7	86 ± 5	83 ± 5**	93 ± 8	87 ± 10**	84 ± 11	-	95 ± 7	97 ± 4**	95 ± 3	-
HR (beats/min)	52 ± 10	64 ± 16	63 ± 5	64 ± 5**	48 ± 12	60 ± 14	62 ± 5	67 ± 3**	46 ± 13	61 ± 17	63 ± 15	-	44 ± 4	60 ± 10	60 ± 4	-
EDV LV (ml)	130 ± 47	129 ± 43	127 ± 25	122 ± 10	138 ± 32	135 ± 23	133 ± 16	124 ± 13	142 ± 37	135 ± 39	130 ± 34	-	156 ± 46	151 ± 39	148 ± 7	-
ESV LV (ml)	53 ± 29	50 ± 24	50 ± 10	48 ± 10	65 ± 36	63 ± 12	56 ± 9	53 ± 9	70 ± 36	68 ± 34	63 ± 28	-	82 ± 13	78 ± 6	72 ± 6	-
LVEF (%)	48 ± 3	51 ± 4	56 ± 9	60 ± 10	45 ± 8	49 ± 7	54 ± 7	58 ± 15	41 ± 4	47 ± 7**	51 ± 9	-	39 ± 4	43 ± 3**	47 ± 10	-
LV PW (cm)	1,2 ± 0,2	1,2 ± 0,2	1,2 ± 0,2	1,1 ± 0,2	1,2 ± 0,2	1,2 ± 0,2	1,2 ± 0,2	1,1 ± 0,5	1,3 ± 0,2	1,3 ± 0,2	1,2 ± 0,2	-	1,3 ± 0,2	1,3 ± 0,2	1,3 ± 0,1	-
LV IVS (cm)	1,2 ± 0,2	1,2 ± 0,2	1,2 ± 0,2	1,1 ± 0,2	1,2 ± 0,2	1,2 ± 0,2	1,2 ± 0,2	1,1 ± 0,5	1,3 ± 0,2	1,3 ± 0,2	1,2 ± 0,2	-	1,3 ± 0,2	1,3 ± 0,2	1,3 ± 0,1	-
LA (cm)	3,9 ± 1	3,9 ± 1	3,8 ± 1	3,6 ± 0,6	4,4 ± 1	4,4 ± 1	4,2 ± 0,5	4 ± 0,5	4,5 ± 1	4,5 ± 1	4,2 ± 1	-	4,7 ± 1	4,7 ± 1	4,4 ± 0,5	-
RA (cm)	4,1 ± 0,5	4,1 ± 0,5	4 ± 0,6	3,65 ± 0,5	4,5 ± 0,5	4,5 ± 0,5	4,3 ± 1	4,1 ± 1	4,7 ± 1	4,7 ± 1	4,5 ± 1	-	4,9 ± 0,5	4,9 ± 0,5	4,5 ± 0,5	-
RV (cm)	4,1 ± 1	4,1 ± 1	4 ± 1	3,6 ± 0,5	4,3 ± 1	4,3 ± 1	4,1 ± 1	3,9 ± 0,6	4,4 ± 1	4,4 ± 1	4,2 ± 1	-	4,6 ± 0,5	4,6 ± 0,5	4,2 ± 0,5	-

*p < 0,05 ** p < 0,01 - in current values between groups

Before implantation SBP was within 1 degree of AH in the first three CHF FC groups and 2 degree in CHF FC IV group. After implantation in the early period it normalized in CHF FC I group and six months later - in CHF FC II group, in the other groups was only tendency to decrease in all observation periods.

Before implantation DBP was within 1 degree of AH in all CHF FC groups except FC I. Decrease to norm was noticed in CHF FC II, III groups by the early period of observation.

Before implantation HR was significantly below normal in all CHF FC groups, but at the early stage after implantation increased to normal.

EDV and ESV LV before implantation exceeded the norm in CHF FC II, III, IV groups. The normalization observed in CHF FC II, III groups and tendency to decrease in CHF FC IV group in six months after

implantation. Before implantation LVEF was below normal in all CHF FC groups. It normalized in CHF FC I group at the early stage after implantation and after six months - in CHF FC II group.

LV PW and IVS exceeded the norm in all CHF FC groups before implantation and implantation after one year led only to a slight decrease of the indicators.

Size LA exceeded the norm in CHF FC II, III, IV groups. Normalization was noticed only in CHF FC II group with a tendency of normalization in the other CHF FC group one year after implantation.

The size of the RA and RV was significantly higher than normal in all CHF FC groups and tendency to decrease was noticed only in a year after implantation.

Table 3 shows the hemodynamic parameters in CHF FC groups in patients with pacemakers in CRT-P/CRT-D mode.

Table 3

Hemodynamic parameters of patients before and after pacemakers' implantation in CRT-P/CRT-D mode depending on CHF FC (M ± sd)

Hemodynamic parameters	CHF FC															
	FC I				FC II				FC III				FC IV			
	Before pacing	3-5 days	6 month	1 year	Before pacing	3-5 days	6 month	1 year	Before pacing	3-5 days	6 month	1 year	Before pacing	3-5 days	6 month	1 year
SBP (mmHg)	-	-	-	-	151 ± 25	143 ± 17	138 ± 17	133 ± 6	145 ± 13	142 ± 12	140 ± 14	135 ± 7	155 ± 7	150 ± 14	140 ± 5	-
DBP (mmHg)	-	-	-	-	87 ± 14	83 ± 7	82 ± 13	83 ± 6	87 ± 7	87 ± 9	85 ± 7	85 ± 7	95 ± 7	89 ± 2	87 ± 3	-
HR (beats/min)	-	-	-	-	56 ± 20	71 ± 13	64 ± 6	64 ± 7	58 ± 9	73 ± 7	64 ± 17	64 ± 6	58 ± 3	74 ± 17	64 ± 6	-
EDV LV (ml)	-	-	-	-	141 ± 30	137 ± 27	131 ± 42	128 ± 39	188 ± 55	181 ± 52	151 ± 22	140 ± 7	212 ± 28	195 ± 47	161 ± 6	-
ESV LV (ml)	-	-	-	-	85 ± 45	80 ± 35	61 ± 17	57 ± 8	95 ± 40	90 ± 27	68 ± 4	64 ± 7	98 ± 14	90 ± 9	83 ± 7	-
LVEF (%)	-	-	-	-	42 ± 20	47 ± 22	56 ± 8	61 ± 5	41 ± 8*	47 ± 8	48 ± 8	55 ± 6	38 ± 4	40 ± 4	44 ± 4	-
LV PW (cm)	-	-	-	-	1,3 ± 0,2	1,2 ± 0,2	1,1 ± 0,1	1 ± 0,1	1,3 ± 0,2	1,2 ± 0,2	1,2 ± 0,1	1,1 ± 0,2	1,3 ± 0,1	1,3 ± 0,2	1,2 ± 0,1	-
LV IVS (cm)	-	-	-	-	1,3 ± 0,2	1,2 ± 0,2	1,1 ± 0,1	1 ± 0,1	1,3 ± 0,2	1,2 ± 0,2	1,2 ± 0,1	1,1 ± 0,2	1,3 ± 0,1	1,3 ± 0,2	1,2 ± 0,1	-
LA (cm)	-	-	-	-	4 ± 0,9	4 ± 1	3,8 ± 0,6	3,6 ± 0,5	4,9 ± 0,7	4,8 ± 1	4,3 ± 0,8	4 ± 1	4,9 ± 0,6	4,85 ± 1	4,3 ± 0,3	-
RA (cm)	-	-	-	-	4,25 ± 0,4	4,2 ± 0,2	3,8 ± 0,6	3,5 ± 0,5	5 ± 0,5	4,9 ± 0,2	4,4 ± 0,2	4,1 ± 0,2	5,1 ± 1	5,1 ± 1	4,3 ± 0,3	-
RV (cm)	-	-	-	-	4,1 ± 0,2	4 ± 0,3*	3,6 ± 0,2	3,5 ± 0,3	4,6 ± 1	4,6 ± 0,3*	3,8 ± 0,3	3,6 ± 0,4	4,8 ± 0,1	4,8 ± 0,1	4,1 ± 0,2	-

*p ≤ 0,05 ** p ≤ 0,01 - in current values between the groups

Before implantation SBP was within 1 degree of AH in all CHF groups, in six months after implantation it normalized in CHF FC II group and one year later - in CHF FC III one. Before implantation DBP was higher than normal in CHF FC IV group at the level 1 degree of AH and after implantation it normalized.

HR was below normal in all CHF FC groups and after implantation it increased to the norm.

Before implantation EDV and ESV LV were higher than normal, but LVEF - below normal in all CHF FC groups, but in six months after implantation it normalized in CHF FC II group, in the other groups were only the tendency to normalization.

LV PW and IVS exceeded the norm in all CHF FC groups before implantation. The slight decrease was noticed only in a year after implantation.

Before implantation LA size was higher than normal in all CHF FC groups and in six months after implantation normalization was noticed in CHF FC II group, in the other groups was the tendency to decrease. The size of the RA and RV was significantly higher than normal before implantation, but at all stages after implantation there was a tendency to the slight decrease.

Before implantation pacemakers' patients were examined in all CHF FC groups except CHF FC I one in CRT-P/CRT-D mode. One year after implantation in all stimulation modes patients' transference changed from higher to lower CHF FC, so that they disappeared in the CHF FC IV in all modes and in CHF FC III in VVI/VVIR mode.

The research has proved that at the annual stage pacemaker leads to a full HR normalization in all CHF FC groups and stimulation modes, SBP and DBP in DDD/DDDR and CRT-P/CRT-D modes, ESV LV, EDV LV, LVEF in CHF FC II group in all modes and in CHF FC III group in DDD/DDDR and VVI/VVIR modes, that

confirms by the data [1, 5-8]. LV PW and IVS during the entire observation period in all stimulation modes were not changed significantly. Normalization of LA size was notice in CHF FC II group in all modes, and in CHF FC I group in VVI/VVIR mode. RA and RV sizes significantly exceeded the norm in all stimulation modes and one year later there was only a slight decrease. These results are not reflected in the literature.

Also, pacemakers' implantation led to the patients' transference from higher to lower CHF FC that was confirmed in researches [2, 5].

CONCLUSIONS

1. Supportive drug therapy of patients with implanted pacemaker at the annual stage leads to the patients' transference from higher to lower CHF FC with more significant results in CRT-P/CRT-D mode than in other stimulation modes.

2. Supportive drug therapy of patients with implanted pacemaker at the annual stage of observation leads to fully HR normalization in all CHF FC groups and stimulation modes, SBP and DBP in DDD/DDDR and CRT-P/CRT-D stimulation modes, ESV LV, EDV LV, LVEF in CHF FC II group in all modes and in CHF FC III group in DDD/DDDR and VVI/VVIR modes with the normalization of the LA size in CHF FC II group in all modes and in CHF FC I – in VVI/VVIR mode.

3. Absence of significant effect of supportive medical therapy in patients with implanted pacemaker at the annual stage on LV PW, LV IVS and sizes of RA and RV in any CHF FC do not require its amplification.

PROSPECTS FOR FUTURE STUDIES

It seems appropriate to study supportive drug therapy in patients with implanted pacemakers in different modes at the annual stage of observation depending on the CHF FC.

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