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ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии

საქართველოს სამედიცინო სიახლენი

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გამოიცემა თბილისის სახელმწიფო სამედიცინო უნივერსიტეტთან
თანამშრომლობითა და მისი პატრონაჟით

ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

ТБИЛИСИ - НЬЮ-ЙОРК

GMN: Georgian Medical News is peer-reviewed, published monthly journal committed to promoting the science and art of medicine and the betterment of public health, published by the GMN Editorial Board and The International Academy of Sciences, Education, Industry and Arts (U.S.A.) since 1994. **GMN** carries original scientific articles on medicine, biology and pharmacy, which are of experimental, theoretical and practical character; publishes original research, reviews, commentaries, editorials, essays, medical news, and correspondence in English and Russian.

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GMN: Медицинские новости Грузии - ежемесячный рецензируемый научный журнал, издаётся Редакционной коллегией и Международной академией наук, образования, искусств и естествознания (IASEIA) США с 1994 года на русском и английском языках в целях поддержки медицинской науки и улучшения здравоохранения. В журнале публикуются оригинальные научные статьи в области медицины, биологии и фармации, статьи обзорного характера, научные сообщения, новости медицины и здравоохранения.

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GMN: Georgian Medical News – საქართველოს სამედიცინო სიახლენი – არის ყოველთვიური სამეცნიერო სამედიცინო რეცენზირებადი ჟურნალი, გამოიცემა 1994 წლიდან, წარმოადგენს სარედაქციო კოლეგიისა და აშშ-ის მეცნიერების, განათლების, ინდუსტრიის, ხელოვნებისა და ბუნებისმეტყველების საერთაშორისო აკადემიის ერთობლივ გამოცემას. GMN-ში რუსულ და ინგლისურ ენებზე ქვეყნდება ექსპერიმენტული, თეორიული და პრაქტიკული ხასიათის ორიგინალური სამეცნიერო სტატიები მედიცინის, ბიოლოგიისა და ფარმაციის სფეროში, მიმოხილვითი ხასიათის სტატიები.

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При представлении в печать научных экспериментальных работ авторы должны указывать вид и количество экспериментальных животных, применявшиеся методы обезболивания и усыпления (в ходе острых опытов).

4. К статье должны быть приложены краткое (на полстраницы) резюме на английском, русском и грузинском языках (включающее следующие разделы: цель исследования, материал и методы, результаты и заключение) и список ключевых слов (key words).

5. Таблицы необходимо представлять в печатной форме. Фотокопии не принимаются. **Все цифровые, итоговые и процентные данные в таблицах должны соответствовать таковым в тексте статьи**. Таблицы и графики должны быть озаглавлены.

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2. Size of the article, including index and resume in English, Russian and Georgian languages must be at least 10 pages and not exceed the limit of 20 pages of typed or computer-printed text.

3. Submitted material must include a coverage of a topical subject, research methods, results, and review.

Authors of the scientific-research works must indicate the number of experimental biological species drawn in, list the employed methods of anesthetization and soporific means used during acute tests.

4. Articles must have a short (half page) abstract in English, Russian and Georgian (including the following sections: aim of study, material and methods, results and conclusions) and a list of key words.

5. Tables must be presented in an original typed or computer-printed form, instead of a photocopied version. **Numbers, totals, percentile data on the tables must coincide with those in the texts of the articles.** Tables and graphs must be headed.

6. Photographs are required to be contrasted and must be submitted with doubles. Please number each photograph with a pencil on its back, indicate author's name, title of the article (short version), and mark out its top and bottom parts. Drawings must be accurate, drafts and diagrams drawn in Indian ink (or black ink). Photocopies of the X-ray photographs must be presented in a positive image in **tiff format**.

Accurately numbered subtitles for each illustration must be listed on a separate sheet of paper. In the subtitles for the microphotographs please indicate the ocular and objective lens magnification power, method of coloring or impregnation of the microscopic sections (preparations).

7. Please indicate last names, first and middle initials of the native authors, present names and initials of the foreign authors in the transcription of the original language, enclose in parenthesis corresponding number under which the author is listed in the reference materials.

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ავტორთა საყურადღებოდ!

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1. სტატია უნდა წარმოადგინოთ 2 ცალად, რუსულ ან ინგლისურ ენებზე,დაბეჭდილი სტანდარტული ფურცლის 1 გვერდზე, 3 სმ სიგანის მარცხენა ველისა და სტრიქონებს შორის 1,5 ინტერვალის დაცვით. გამოყენებული კომპიუტერული შრიფტი რუსულ და ინგლისურენოვან ტექსტებში - **Times New Roman (Кириллица)**, ხოლო ქართულენოვან ტექსტში საჭიროა გამოვიყენოთ **AcadNusx.** შრიფტის ზომა – 12. სტატიას თან უნდა ახლდეს CD სტატიით.

2. სტატიის მოცულობა არ უნდა შეადგენდეს 10 გვერდზე ნაკლებს და 20 გვერდზე მეტს ლიტერატურის სიის და რეზიუმეების (ინგლისურ, რუსულ და ქართულ ენებზე) ჩათვლით.

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6. ფოტოსურათები უნდა იყოს კონტრასტული; სურათები, ნახაზები, დიაგრამები - დასათაურებული, დანომრილი და სათანადო ადგილას ჩასმული. რენტგენოგრამების ფოტოასლები წარმოადგინეთ პოზიტიური გამოსახულებით **tiff** ფორმატში. მიკროფოტოსურათების წარწერებში საჭიროა მიუთითოთ ოკულარის ან ობიექტივის საშუალებით გადიდების ხარისხი, ანათალების შეღებვის ან იმპრეგნაციის მეთოდი და აღნიშნოთ სურათის ზედა და ქვედა ნაწილები.

7. სამამულო ავტორების გვარები სტატიაში აღინიშნება ინიციალების თანდართვით, უცხოურისა – უცხოური ტრანსკრიპციით.

8. სტატიას თან უნდა ახლდეს ავტორის მიერ გამოყენებული სამამულო და უცხოური შრომების ბიბლიოგრაფიული სია (ბოლო 5-8 წლის სიღრმით). ანბანური წყობით წარმოდგენილ ბიბლიოგრაფიულ სიაში მიუთითეთ ჯერ სამამულო, შემდეგ უცხოელი ავტორები (გვარი, ინიციალები, სტატიის სათაური, ჟურნალის დასახელება, გამოცემის ადგილი, წელი, ჟურნალის №, პირველი და ბოლო გვერდები). მონოგრაფიის შემთხვევაში მიუთითეთ გამოცემის წელი, ადგილი და გვერდების საერთო რაოდენობა. ტექსტში კვადრატულ ფჩხილებში უნდა მიუთითოთ ავტორის შესაბამისი N ლიტერატურის სიის მიხედვით. მიზანშეწონილია, რომ ციტირებული წყაროების უმეტესი ნაწილი იყოს 5-6 წლის სიღრმის.

9. სტატიას თან უნდა ახლდეს: ა) დაწესებულების ან სამეცნიერო ხელმძღვანელის წარდგინება, დამოწმებული ხელმოწერითა და ბეჭდით; ბ) დარგის სპეციალისტის დამოწმებული რეცენზია, რომელშიც მითითებული იქნება საკითხის აქტუალობა, მასალის საკმაობა, მეთოდის სანდოობა, შედეგების სამეცნიერო-პრაქტიკული მნიშვნელობა.

10. სტატიის ბოლოს საჭიროა ყველა ავტორის ხელმოწერა, რომელთა რაოდენობა არ უნდა აღემატებოდეს 5-ს.

11. რედაქცია იტოვებს უფლებას შეასწოროს სტატია. ტექსტზე მუშაობა და შეჯერება ხდება საავტორო ორიგინალის მიხედვით.

12. დაუშვებელია რედაქციაში ისეთი სტატიის წარდგენა, რომელიც დასაბეჭდად წარდგენილი იყო სხვა რედაქციაში ან გამოქვეყნებული იყო სხვა გამოცემებში.

აღნიშნული წესების დარღვევის შემთხვევაში სტატიები არ განიხილება.

Содержание:

НАУКА

SURGICAL METHODS OF TREATMENT OF END-STAGE HEART FAILURE

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In the developed countries, chronic heart failure (CHF) is one of the most common pathologies. Currently, there are more than 23 million people worldwide suffering from CHF, and this number is constantly growing [1,2]. At present, in the United States alone, 5,800,000 Americans suffer from heart failure, and by 2030 the figure could rise to 7,250,000. Annually, more than 600,000 new cases are reported in Europe. Worldwide, people with HF number 76,000,000, and one in five HF patients dies within 12 months after this diagnosis is made. The incidence rate shows that over the next 20 years, the number of patients with CHF will grow twice as much [3-6]. Standard drug therapy aimed at reducing the symptoms of CHF is able to ensure a sufficient quality of life for patients with minimal degrees of heart failure and remains ineffective at its end-stages. According to statistics from the American College of Cardiologists/American Heart Association (ACC/AHA), the five-year mortality of patients with FC IV after NYHA amounts up to 80% [7,8]. These data allow infer that the treatment of CHF and improving the quality of life of patients will not lose its relevance, on the contrary, they will continue growing rapidly [9-14]

Heart failure is a pathological process observed in a large number of patients, the pumping function of heart being unable to supply sufficient blood circulation to meet the needs of the body. Management of cardiac patients with chronic heart failure has recently been expanded from medical treatment to the use of the supplementary blood circulation systems strategy [15-20].

Currently, heart transplant is the "gold standard" of the treatment of the end-stage CHF resistant to drug therapy [9]. However, the major factor limiting the number of operations performed under the situation of shortage of donor organs [15]. According to the International Society of Heart and Lung Transplantation [16], 5,200 HTs were registered worldwide in 2019, more than a half of which were made in the United States (Fig. 1).

Currently, the mechanical support of blood circulation before heart transplantation is used in every fourth recipient (Fig. 2).

Auxiliary circulatory systems are used for the following purposes:

- bridge-to-transplantation (BTT): enlisted on a waiting list are the patients with severe hemodynamic abnormalities that would not allow them to expect a transplant without mechanical circulation support;
- bridge to candidacy (BTC): patients with multiple organ failure or high pulmonary hypertension which does not allow them to be put on a waiting list;
- destination therapy (DT): patients with heart failure refractory to medical treatment, though have contraindications or restrictions for heart transplantation like age being over 65-70 years (50% of patients are disqualified from the waiting list due to age).

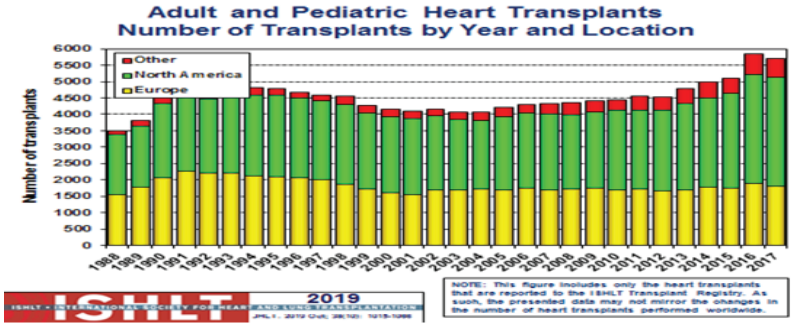

Fig. 1. Number of heart transplants by year according to the International Society of Heart and Lung Transplantation

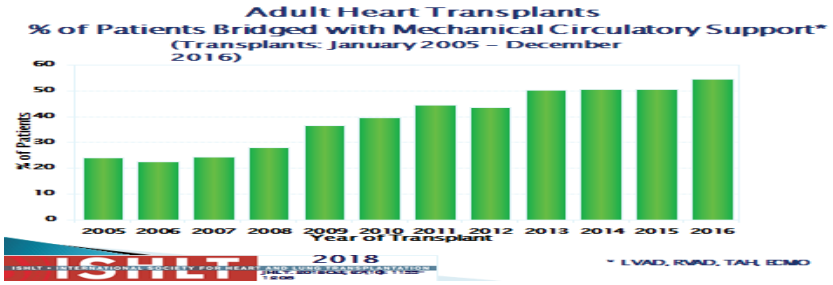

Fig. 2. According to the International Society of Heart and Lung Transplantation, 50% of patients are waiting for a HT being connected to a long-term MCS

- bridge to recovery (BTR): patients with potentially reversible cardiomyopathy though with severe hemodynamic disorders that will not allow them to survive without mechanical circulatory support;

- bridge to decision (BTD) which concept has been introduced since 2010: patients with heart and/or multiple organ failure, with severe hemodynamic disturbances, but the decision on the need for transplantation cannot be made now;

- bridge to bridge (BTB).

The aim of the study is to establish the effectiveness of mechanical support of blood circulation of patients with end-stage heart failure depending on the method of surgical correction.

Material that methods. The results of the study are based on the 73 patients' (median age 44 (16-69) years, men 68 patients, women 5 patients) survey and dynamic monitoring who were treated within 2008-2019 at the "Cardiology" Republican Research and Practical Centre, Minsk, Republic of Belarus and in the Cardiac Surgery Center on the basis of the State Executive Secretariat Clinical Hospital "Feofania", Kyiv, Ukraine. Patients were examined during the primary inspection, after 3 months and in 1 year.

After establishing compliance with the criteria of inclusion / expulsion depending on the presence of chronic heart failure with surgical treatment conducted, after receiving the data of instrumental and laboratory methods of the study the division of patients into groups was carried out:

Therefore, based on the criteria outlined in our study, all patients were divided into groups:

Group 1 - are patients who were administrated direct heart transplantation primary OHT (n=26); group 2 are patients who were administrated implantation of left ventricular bypass LVAD therapy, bridge to the OHT (Bridge-to-transplant therapy) (n=39); group 3 are patients who have been administrated the implantation of biventicular circulatory support BIVAD-therapy, bridge to the OHT (Bridge-to-transplant therapy) (n=8).

Groups of patients were compared based on age and social status. Verification of the diagnosis was performed as follows: CHF - taking into account the recommendations of ESH/ESC (2012, 2016).

The distribution of patients depending on the functional class of heart failure according to NYNA is presented on Fig. 3.

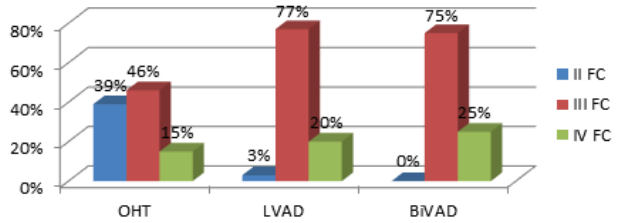

Fig. 3. Distribution of patients according to functional classes of heart failure according to NYNA

As for the functional class of heart failure according to NYNA among patients, the group of OHT II FC according to NYNA consisted of 39% of patients, III FC according to NYNA - 46% of patients, IV FC according to NYNA - 15% of patients.

As for the group of LVAD II FC according to NYNA consisted of 3 % of patients, III FC according to NYNA – 77 % of patients, IV FC according to NYNA – 20 % of patients. As for the group of BiVAD III FC according to NYNA - 75% of patients, IV FC according to NYNA - 25% of patients.

The distribution of patients depending on the inadequate blood flow is presented on Fig. 4.

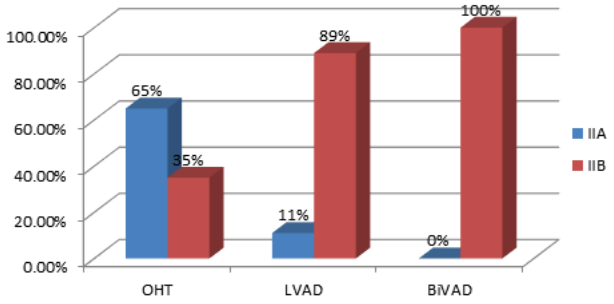

Fig. 4. Distribution of patients depending on the inadequate blood flow

Assessing the inadequate blood flow (IBF) among patients with CHF, in the group with OHT 65% of patients were characterized by the IBF IIA and 35% of patients were characterized by IBF II B.

As for the group with LVAD, 11% of patients were characterized by IBF IIA, and 89% of patients – by IBF IIB.

As for the group with BiVAD, 100% of patients were characterized by IBF II B.

Distribution of patients depending on the INTERMACS status are given on Fig. 5.

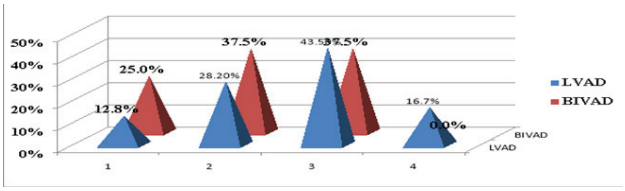

Fig. 5. Distribution of patients according to the INTERMACS status

The INTERMACS scale (Interdepartmental Register for Mechanical Assistance in Blood Support) helps to assign patients with advanced cardiac insufficiency (CI) to seven levels, according to the hemodynamic profile and the level of the target group organ's damage. This classification was defined within the context of a multicenter registry of ventricular assist devices to combine criteria for describing the clinical condition of patients with progressive CHF, optimizing perioperative risk forecasting, and refining instructions for each of the available alternative treatments.

Results and discussion. Currently, there are systems of mechanical auxiliary IR (bridge of choice or bridge to transplant) for ventricular discharge for the treatment of patients with severe heart failure, refractory to drug therapy, provided there are no contraindications to their implantation. The use of mechanical heart support systems results in reduced consumption and increased delivery of oxygen to the myocardium and other organs by improving coronary and systemic perfusion.

Therefore, based on the criteria outlined in our study, all patients were divided into groups:

Group 1 - are patients who were administrated direct heart transplantation primary OHT (n=26); group 2 are patients who were administrated implantation of left ventricular bypass LVAD therapy, bridge to the OHT (Bridge-to-transplant therapy) (n=39); group 3 are patients who have been administrated the implantation of biventicular circulatory support BIVAD-therapy, bridge to the OHT (Bridge-to-transplant therapy) (n=8).

Table 1 presents the results of structural and functional indicators of the left and right ventricles for groups 1-3 patients with

Table 1. The results of structural and functional indicators of the left and right ventricles for groups 1-3 Patients with CHF

Index	Mean observation			F-criterion	*p*-level	Van der Waerden criterion (χ^2)	*p*-level
	Group 1 Patients with CHF on OHT (n=26)	Group 2 Patients with CHF on LVAD (n=39)	Group 3 Patients with CHF on BIVAD (n=8)				
RV EDV	94,5 [185;36]	103 [162;30]	161 [258;80]	17.2337	<.0001	27.5086	<.0001
RV ESV	61 [138;18]	67,5 [120;14]	125 [171;91]	15.0504	<.0001	23.6480	<.0001
LVEF (B-mode)	21 [41;10]	19,5 [40;12]	16,7 [24;10]	8.8203	0.0004	15.7125	0.0004
LV ESV (M-mode)	218 [309;102]	248 [410;130]	300 [410;219]	5.0684	0.0086	8.6819	0.0130
LV EDV (M-mode)	278 [414;147]	327 [630;174]	370 [472;304]	4.9031	0.0099	8.7838	0.0124
LV ESV (B-mode)	236 [367;93]	255 [443;100]	258 [410;19]	4.0150	0.0220	6.8787	0.0321
TAPSE	11,5 [19;7]	10,6 [17,8;6]	8,4 [11;6]	3.0021	0.0556	5.1455	0.0763

CHF, it should be noted: evaluating the structural and functional indicators of the right ventricle – the RV EDV, the average value is higher among group 3 patients with CHF on BiVAD161 [258; 80] than in group 2 patients with CHF on LVAD103 [162; 30], and in group 1 patients with CHF for direct OHT 94.5 [185; 36] while (p<0001).

The increase in the volume of the RV EDV indicates dilatation of the right ventricle in case of the biventricular insufficiency.

The index of RV ESV the average value is higher in group 3 patients with CHF on BiVAD125 [171;91] than in group 1 patients with CHF for direct OHT 61 [138;18], and in group 2 patients with CHF on LVAD (n=39) 67.5 [120;14], while (p<0001).

An increase in the RV ESV volume ncreas indicates the biventricular insufficiency.

This indicator of LV EF to (B-mode) - the average value is higher in group 1 patients with CHF for direct OHT 21 [41;10] than in group 2 patients with CHF on LVAD19.5 [40;12] and group 3 patients with CHF on BIVAD16.7 [24;10], while (p<0001).

Decreased LV EF indicates the progression of left ventricular insufficiency. LV ESV (M-mode) - the average value is higher in group 3 patients with CHF fo BIVAD 300 [410; 219] than in group 2 patients with CHF on LVAD248 [410; 130], and in group 1 patients with CHF for direct OHT 218 [309; 102], while (p<0001). An increase in LV ESV indicates the progression of left ventricular insufficiency. As for such an index as LV EDV (M-mode), the average value is higher in group 3 patients with CHF on BiVAD370 [472; 304] than in group 1 Patients with CHF for direct OHT 278 [414; 147] and in group 2 patients with CHF on LVAD327 [630; 174], while (p<0001).

An increase in LV EDV indicates progression of left ventricular insufficiency. LV ESV (B-mode) - the average value is higher in group 3 patients with CHF on BiVAD258 [410; 194] than in group 2 patients with CHF on LVAD255 [443; 100], and in group 1 patients with CHF for direct OHT 236 [367; 93], while (p<0001).

Thus, the following functional indexes of the left and right ventricles in the examined patients were established:

In group 1 of patients with CHF for direct OHT in this group, we observe a decrease in LV EF, which indicates the progression of left ventricular insufficiency.

In group 2 patients with CHF on LVAD- in this group we observe an increase in left ventricular volume.

In group 3 patients with CHF on BIVAD- in this group we observe an increase in LV ESV and an increase in LV EDV, which indicates the progression of left ventricular insufficiency.

An increase in the RV EDV volume, an increase in the RV ESV volume indicate the progression of biventricular insufficiency.

All potential heart transplant recipients should be probed in the right compartments of heart. Catheterization of the heart right depatrments and the study of central hemodynamics with determination of the rate of cardiac output (CB), cardiac index (CI), pressure in the heart cavities, pulmonary artery pressure (PAP), central venous pressure (CVP), pulmonary vascular resistance (PVS), transpulmonary pressure gradient (TPG), are presented in Table 2.

Let's analyze Table 2, based on the indexes of pulmonary artery tonometry: PVR-Wood index - the average value was higher in group 2 patients with CHF fo LVAD 5.5 [8,2; 2.4] and in group 3 patients with CHF on BIVAD5.4 [7; 2.7] than in group 1 patients with CHF for direct OHT 3.5 [5; 1.7], while (p<0001). The high value of pulmonary vascular resistance, refractory to drug therapy, is a contraindication for direct heart transplantation. In case of such patients, mechanical circulatory support devices are used.

As for the PAP index, the average value is significantly higher in group 2 patients with CHF on LVAD 46.9 [85; 35] and in group 3 patients with CHF on BiVAD 44.5 [56; 29], than in 1 group of patients with CHF for direct OHT 37 [52; 19], while (p<0001).

As for the TPG index, the mean value is higher in group 2 patients with CHF on LVAD15 [22; 10] than in group 1 patients with CHF for direct OHT 11.8 [19; 7] and in group 3 patients with CHF on BIVAD10.8 [15; 7], while (p<0001).

Table 2. The results of direct tonometry of the pulmonary artery for patients with CHF in groups 1-3

Index	Mean observation			F-criterion	*p*-level	Van der Waerden criterion (χ^2)	*p*-level
	Group 1 Patients with CHF on OHT (n=26)	Group 2 Patients with CHF on LVAD (n =39)	Group 3 Patients with CHF on BIVAD (n=8)				
Wood	3.5 [5; 1,7]	5,5 [8,2;2,4]	5.4 [7; 2,7]	36.7722	<.0001	40.8302	<.0001
PAP	37 [52;1 9]	46,9 [85; 35]	44,5 [56; 29]	17.6052	<.0001	27.7535	<.0001
TPG	11,8 [19; 7]	15 [22; 10]	10,8 [15; 7]	13.3210	<.0001	23.0940	<.0001

Table 3. The results of structural and functional parameters of the left and right ventricles for patients with CHI after a month after the direct OHT

Index	Mean observation	F-criterion	*p*-level	Van der Waerden criterion (χ^2)	*p*-level
	Group 1 Patients with CHI after OHT (n=24)				
LV EF (B-mode)	67 [83;59]	8.8203	0.0004	15.7125	0.0004
LV ESV (M-mode)	33 [54;11]	5.0684	0.0086	8.6819	0.0130
LV EDV (M-режим)	96 [123;66]	4.9031	0.0099	8.7838	0.0124

The results of treatment of patients with CHI on direct OHT. As for this group of patients, 26 patients underwent direct heart transplantation. Out of them, 24 patients were treated with a positive result, which stands for 92%. 2 patients died, that is, 8%, 1 patient was diagnosed the case of acute cerebrovascular accident, intraoperative complication, accounting for 4%, the patient died 2 months after the intervention. 1 patient was diagnosed the case of iliac passion, which stands for 4%, the patient died 2.5 months after the intervention.

The results of structural and functional parameters of the left and right ventricles for patients with CHI after the direct OHT after 1 month presented in Table 3: the end-diastolic volume of the left ventricle 96 [123;66] milliliters, after the direct OHT the EDV size is within normal limits, while (p<0001).

The end-systolic volume of the left ventricle 33 [54; 11] milliliters, the ESV (M-mode) size is within normal limits, while (p<0001).

The left ventricular ejection fraction 67 [83;59]%, after the direct OHT, the left ventricular fraction ejection is within the age norm, with (p<0001).

One month later, 24 patients who underwent the direct OHT, were assessed for the heart failure's functional class according to the NYHA: I FC by NYHA for 38% of patients, and II FC by NYHA for 63% of patients.

Data on the severity of the patients' condition before and after surgical treatment according to the HF functional class according to the NYHA are presented in Fig. 6.

Fig. 6 presents the assessment of the HF functional class according to the NYHA before OHT - II FC according to NYHA – 39 % of patients, III FC according to NYHA – 46 % of patients, IV FC according to NYHA – 15 % of patients, after a month after OHT - I FC according to NYHA - 38% of patients, and II FC according to NYHA - 62% of patients.

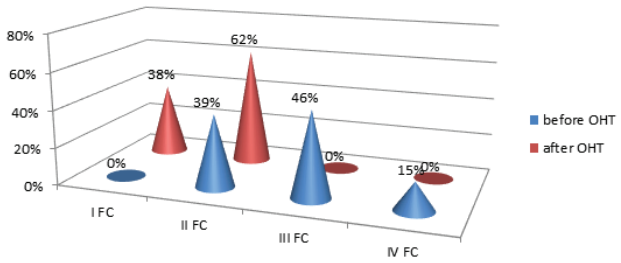

Fig. 6. Data on the severity of the patients' condition before and after surgical treatment according to the HF functional class

Data on the severity of the patients' condition before and after the surgical treatment of circulatory inefficiency (CI) are presented in Fig. 7.

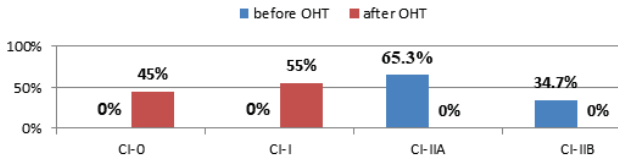

Fig. 7. Data on the severity of the patients' condition before and after the surgical treatment of CI

Fig. 7 shows the data on the severity of the patients' condition before and after surgery for circulatory inefficiency: CI IIA for 65.3% of patients, CI IIB for 34.7% of patients, after a month after OHT: CI o for 45% of patients, CI I for 55% of patients.

Table 4. The results of structural and functional parameters of the left and right ventricles for patients on mechanical support of circulation among group 2 patients with CHI on LVAD

Index	Mean observation:		F-criterion	*p*-level	Van der Waerden criterion (χ^2)	*p*-level
	Group 2 Patients with CHI before LVAD (n =39)	Group 2 Patients with CHI on LVAD 3 months (n =39)				
RV EDV	103 [162;30]	76,7 [162;36]	17.2337	<.0001	27.5086	<.0001
RV ESV	67,5 [120;14]	46,6 [101;19]	15.0504	<.0001	23.6480	<.0001
LV EF (B-mode)	19,5 [40;12]	24,6 [47;12]	8.8203	0.0004	15.7125	0.0004
LV ESV (M-mode)	248 [410;130]	159,3 [385;35]	5.0684	0.0086	8.6819	0.0130
LV EDV (M-mode)	327 [630;174]	228,1 [496;80]	4.9031	0.0099	8.7838	0.0124
LV ESV (B-mode)	255 [443;100]	156 [240;38]	4.0150	0.0220	6.8787	0.0321
TAPSE	10,6 [17,8;6]	11,2 [16;6]	3.0021	0.0556	5.1455	0.0763

Thus, after the direct OHT performed,92% of patients were treated with a positive result, 2 patients died, which stands for 8%. All parameters of structural and functional parameters of the heart after the orthotopic heart transplantation were within normal limits, an increase in maximum oxygen consumption by the myocardium by 58%, and an increase in exercise tolerance by 71% were noted. The HF functional class according to the NYHA after a month after OHT - I FC according to NYHA - 38% of patients, and II FC according to NYHA - 63% of patients. CI after a month after OHT: CI 0 for 45% of patients, CI I for 55% of patients.

Results of the lvad therapy as a mechanical bridge to the OHT. As for this group of patients, 39 patients underwent the left ventricular bypass LVAD therapy implantation as a bridge to the OHT. Out of them, 18 patients underwent secondary OHT, which stands for 46%. Patients continuing LVAD therapy - 18 patients, which stands for 46%. Patients who died on LVAD - 3 patients, this is 8%. The cause of death in 3 cases is purulent-septic lesions (100%).

The results of the left and right ventricle structural and functional parameters for patients on LVAD therapy are shown in Table 4: the end-diastolic volume of the right ventricle for group 2 patients with CHI on LVAD 76.7 [162; 36], a decrease in RV EDV by 25.5%, with (p<0001). The end-systolic volume of the right ventricle for group 2 patients with CHI on LVAD 46.6 [101; 19], a decrease in RV ESV by 31%, with (p<0001).

Left ventricular ejection fraction for group 2 patients with CHI on LVAD 24.6 [47; 12], an increase in LV EF by 21%, with (p<0001).

The end-systolic volume of the left ventricle (M-mode) for group 2 patients with CHI on LVAD 159.3 [385; 35], reduction of ESV (M-mode) by 36%, with (p<0001).

The end-diastolic volume of the left ventricle (M-mode) for group 2 patients with CHI on LVAD 228.1 [496; 80], reduction of LV EDV (M-mode) by 30%, with (p<0001).

The end-systolic volume of the left ventricle (B-mode) for group 2 patients with CHI on LVAD 156 [240; 38], reduction of LV ESV (B-mode) by 31%, with (p<0001).

TAPSE tricuspid systolic excursion for group 2 patients with CHI on LVAD 11.2 [16; 6], an increase in TAPSE by 5%, with (p<0001).

While studying the structural and functional parameters of the heart for group 2 patients with CHI on LVAD therapy, the decrease/increase of the following parameters is determined: RV EDV by 25.5%, RV ESV by 31%, an increase in LV EF by 21%, a decrease in LV EDV (M-mode) by 36%, decrease in LV EDV (M-mode) by 30%, decrease in LV ESV (B-mode) by 31%, increase in TAPSE by 5%.

The use of LVAD therapy has led to positive changes in the normalization of intracardiac hemodynamics. Hemodynamic unloading of the ventricle can completely change and in some cases normalize several aspects of the structure and function of the heart. In our study, we showed a decrease in the left ventricular cavity by 30%, as well as a decrease in the right ventricular cavity by 25.5%, an increase in the left ventricle ejection fraction by 21%.

The results of direct pulmonary artery tonometry indexes for group 2 patients with CHI on LVAD therapy for 3 months are presented in Table 5. According to the direct pulmonary artery tonometer after 3 months of LVAD-therapy the following was noted: Wood's ratio is 3.65 [6;1.7], a decrease in pulmonary vascular resistance according to Wood by 34%, with (p<0001).

Pulmonary artery pressure 35.6 [56;27], reduction of PAP by 24%, while (p<0001).

Transpulmonary gradient for group 2 patients with CHI on LVAD 11.9 [17;8], a decrease in TPG by 21%, with (p<0001).

Data on the severity of patients in group 2 patients with CHI

Table 5. The results of direct pulmonary artery tonometry for group 2 patients with CHI on LVAD on mechanical support of the blood circulation

Index	Mean observation:		F-criterion	*p*-level	Van der Waerden criterion (χ^2)	*p*-level
	Group 1 Patients with CHF on OHT (n=26)	Group 2 Patients with CHF on LVAD (n =39)				
Wood	3.5 [5; 1,7]	5,5 [8,2;2,4]	36.7722	<.0001	40.8302	<.0001
PAP	37 [52;1 9]	46,9 [85; 35]	17.6052	<.0001	27.7535	<.0001
TPG	11,8 [19; 7]	15 [22; 10]	13.3210	<.0001	23.0940	<.0001

on LVAD: before LVAD therapy, on LVAD therapy and after OHT by a functional class of HI according to NYHA are presented in Fig. 8.

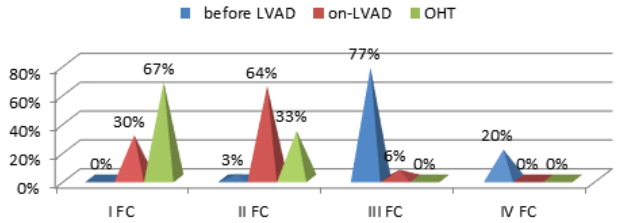

Fig. 8. Data on the severity of patients in group 2 patients with CHI on LVAD

Assessment of functional class of heart failure according to NYHA before LVAD-therapy - II FC according to NYHA - 2.5% of patients, III FC according to NYHA - 76.91% of patients, IV FC according to NYHA - 20.5% of patients, for LVAD therapy I FC according to NYHA - 30.5% of patients, II FC according to NYHA - 64% of patients, III FC according to NYHA - 5.5%, after UOHT I FC according to NYHA - 67% of patients, II FC according to NYHA - 33% of patients (Fig. 8).

Data on the severity of patients before LVAD-therapy, LVAD-therapy, after OHT because of circulatory inefficiency are shown on Fig. 9.

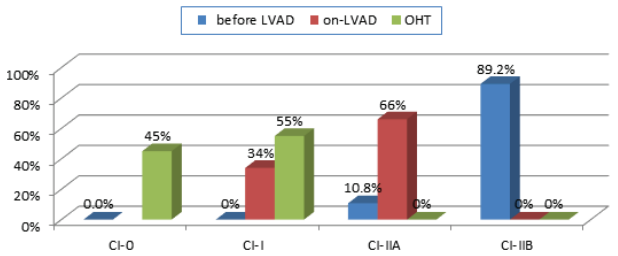

Fig. 9. Data on the severity of patients before LVAD-therapy, LVAD-therapy, after OHT because of circulatory inefficiency

Fig. 9 shows the assessment of the severity of patients before LVAD-therapy, LVAD-therapy, after OHT according to circulatory inefficiency: CI IIA - 10.8% of patients, CI II B - 89.2% of patients, LVAD-therapy CI I - 34% patients, CI IIA - 66% of patients, after OHT: CI 0 - 45% of patients, CI I - 55% of patients.

In the last decade, long-term left ventricular bypass (LVB) systems have been implanted, which have become the leading method of mechanical circulatory support (MCS) in patients with terminal congestive heart inefficiency (CHI), which allows them to survive to bridge transplantation. According to the register of the International Society for Heart and Lung Transplantation (ISHLT) in 2018, more than 55% of THs were performed for recipients with pre-transplantation MCS by the method of implantable long-term LVB. Thus, out of the 39 patients who were on LVAD therapy as a bridge to the OHT, in 3 months there was a decrease in the left ventricular cavity by 30%, with (p<0001), a decrease in the pancreatic cavity by 25.5%, while (p<0001), increasing the fraction of LV emissions by 21%, while (p<0001). According to the direct tonometer of the pulmonary artery when using LVAD-therapy, we observe a decrease in pulmonary vascular resistance "Wood" by 34%, with (p<0001), a decrease in PAP by 24%, while (p<0001), a decrease in TPG on 21%, with (p<0001). The results of changes in functional parameters in patients on LVAD therapy after 3 months: an increase in maximum myocardial oxygen consumption by 6%, with (p<0001), as well as an increase in exercise tolerance by 15%. In this case (p<0001). Assessment of functional class of heart failure according to NYHA on LVAD therapy I FC according to NYHA - 30.5% of patients, II FC according to NYHA - 64% of patients, III FC according to NYHA - 5.5%. Estimation of the severity of the condition of patients on LVAD-therapy by circulatory insufficiency of CI I in 34% of patients, NCI IIA in 66% of patients. Patients were prepared for the second stage of surgical treatment of secondary heart transplantation. Of these, 18 patients underwent secondary OHT - 18 patients, which is 46%. Patients who continue LVAD therapy - 18 patients, which is 46%. Patients who died on LVAD - 3 patients, which is 8%. The cause of death in 3 cases of purulent-septic lesions 100%. Assessment of functional class of heart failure by NYHA after secondary OHT after 1 month I FC according to NYHA - 67% of patients, II FC according to NYHA - 33% of patients. Assessment of the severity of the patients' condition after secondary OHT after 1 month CI 0 - 45% of patients, CI I - 55% of patients.

Results of BiVAD therapy as a mechanical bridge to the OHT. As for this group of patients, 8 patients underwent implantation of biventricular bypass: BiVAD therapy as a bridge to the OHT. Out of these patients, secondary OHT was performed for 4 patients, which stands for 50%. Patients who died on BIVAD - 4 patients, which stands for 50%. The cause of death in 2 cases - purulent-septic lesions, which stands for 50%. Ascending cable infection. In addition, 2 more cases are multi-organ insufficiency, which stands for 50%.

The high value of the rate of pulmonary vascular resistance refractory to drug therapy is a contraindication for direct heart transplantation. Such patients use devices to mechanically support blood circulation.

Table 6. The results of structural and functional parameters of the left and right ventricles for group 3 patients with CHI on BiVAD

Index	Mean observation:		F-criterion	p-level	Van der Waerden criterion (χ^2)	p-level
	Group 3 Patients with CHI before BIVAD (n=8)	Group 3 Patients with CHI on BIVAD (n=4) 3 months				
RV EDV	161 [258;80]	151,7 [220;110]	17.2337	<.0001	27.5086	<.0001
RV ESV	125 [171;91]	112,5 [144;80]	15.0504	<.0001	23.6480	<.0001
LVEF (B-mode)	16,7 [24;10]	24,8 [46;10]	8.8203	0.0004	15.7125	0.0004
LV ESV (M-mode)	300 [410;219]	191,1[279;51]	5.0684	0.0086	8.6819	0.0130
LV EDV (M-mode)	370 [472;304]	259,4 [367;102]	4.9031	0.0099	8.7838	0.0124
LV ESV (B-mode)	258 [410;194]	199,7 316;51]	4.0150	0.0220	6.8787	0.0321
TAPSE	8,4 [11;6]	10,7 [14;8]	3.0021	0.0556	5.1455	0.0763

Table 7. The results of direct tonometry of the pulmonary artery for group 3 patients with CHF on BIVAD on mechanical support of circulation

Index	Mean observation:		F-criterion	*p*-level	Van der Waerden criterion (χ^2)	*p*-level
	Group 3 Patients with CHI before BIVAD (n=8)	Group 3 Patients with CHI on BIVAD (n=4)				
Wood	5.4 [7; 2,7]	4,2 [5;2,7]	36.7722	<.0001	40.8302	<.0001
PAP	44,5 [56; 29]	37,7 [56;27]	17.6052	<.0001	27.7535	<.0001
TPG	10,8 [15; 7]	9,3 [10;6]	13.3210	<.0001	23.0940	<.0001

Biventricular support is required for patients with high central venous pressure, increased pulmonary vascular resistance, or with malignant arrhythmia resistant to drug therapy.

The analysis of Echo-CG data presented in table 6 was performed to study the condition of patients on BiVAD therapy as a mechanical bridge to the OHT.

The results of structural and functional parameters of the left and right ventricles for group 3 patients with CHIon BiVAD therapy after 3 months are shown in table 6: the end-diastolic volume of the left ventricle 151.7 [220;110] milliliters, reduction of EDV by 6%, with (p<0001). The end-systolic volume of the left ventricle 112.5 [144; 80] milliliters, reducing ESV (M-mode) by 10%, while (p<0001). Left ventricular ejection fraction 24.8 [46; 10]%, increase in the left ventricular ejection fraction by 33%, while (p<0001), the end-systolic volume of the left ventricle (M-mode) 191.1 [279; 51], reduction of ESV (M-mode) by 36.3%, with (p<0001), the end-diastolic volume of the left ventricle (M-mode) 259.4 [367; 102], reduction of EDV (M-mode) by 30%, while (p<0001), the end-systolic volume of the left ventricle (B-mode) 199.7 [316; 51], reduction of ESV (B-mode) by 22.5%, while (p<0001) TAPSE tricuspid systolic excursion 10.7 [14; 8], increase in TAPSE by 21.4%, while (p<0001).

The study of structural and functional parameters of the heart revealed changes in group 3 patients on BiVAD, due to mechanical support of blood circulation: reduction of RV EDV of the pancreas by 6%, reduction of RV ESV of the pancreas by 10%, increase of LV EF by 33%, decrease of LV ESV (M-mode) by 36.3%, decrease in LV EDV (M-mode) by 30%, decrease in LV ESV (B-mode) by 22.5%, increase in TAPSE tricuspid systolic excursion by 21.4%.

As it has been indicated, one of the important results of long-term MCS is the creation of conditions for myocardial remodeling at the background of mechanical unloading of the heart. We have shown that patients receiving BiVAD therapy have shown effective myocardial unloading and decreased end-diastolic ventricular volume (LV).

The results of direct pulmonary artery tonometry for group 3 patients with CHI on BIVAD on mechanical support of blood circulation after 3 months are presented in table 7: Wood's ratio is 4.2 [5; 2.7], a decrease in pulmonary vascular resistance according to Wood by 22%, with (p<0001).

PAP average value 37.7 [56; 27], reduction of PAP by 15%, with (p<0001).

Transpulmonary TPG gradient 9.3 [10; 6], a decrease in TPG by 14%, with (p<0001).

Data on the severity of the condition of group 3 patients with CHI on BiVAD: before BiVAD-therapy, on BiVAD-therapy and after OHT according to the functional class of CI according to NYHA are presented in Fig. 10.

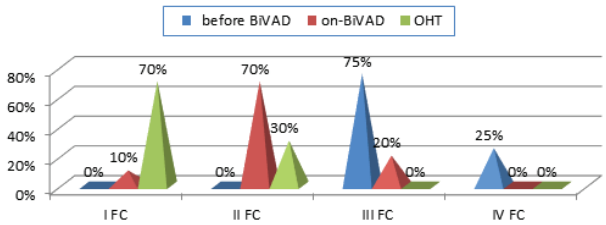

Fig. 10. Data on the severity of the condition of group 3 patients with CHI on BiVAD

Assessment of the functional class of heart failure according to NYHA before BiVAD therapy - III FC according to NYHA - 75% of patients, IV FC according to NYHA - 25% of patients, on BiVAD therapy I FC according to NYHA - 10% of patients, II FC according to NYHA - 70% of patients III FC according to NYHA - 30%, after OHT I FC according to NYHA - 70% of patients, II FC according to NYHA - 30% of patients (Fig. 10).

Data on the severity of the condition of patients before BiVAD-therapy, on BiVAD-therapy and after OHT according to circulatory failure, presented in Fig. 11.

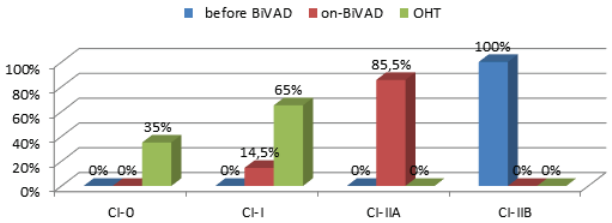

Fig. 11. Data on the severity of the condition of patients before BiVAD-therapy, on BiVAD-therapy and after OHT according to circulatory failure

Assessment of the severity of the patients' condition according to the circulatory failure before BiVAD - therapy: CI IIB in 100% of patients, on BiVAD - CI I in 14.5% of patients, CI IIA in 85.5% of patients, after UOHT: CI 0 in 35% of patients, CI I in 65% of patients. Implantation of the BiVAD system for patients with severe dilatation and critical decrease in systolic function of both right and left compartments of the heart allows not only to survive to heart transplantation, but also to improve hemodynamic parameters, achieve regression of heart failure, restore functional disorders of organs and systems, and as a consequence, reduce the risk of complications after transplantation (Fig. 11).

Thus, out of the 8 patients who were on BiVAD therapy as a bridge to the OHT, after 3 months there was a decrease in the cavity of the RV EDV by 6%, with (p<0001), a decrease in RV ESV by 10%, while (p<0001), an increase in LV EF by 33%, with (p<0001), a decrease in LV ESV (M-mode) by 36.3%, with (p<0001), a decrease in LV EDV (M-mode) by 30%, with (p<0001), a decrease in LV ESV (B-mode) by 22.5%, with (p<0001), an increase in tricuspid systolic excursion "TAPSE by 21.4%, with (p<0001). According to the direct tonometers of the pulmonary artery when using BiVAD-therapy: a reasonable solution of pulmonary vascular resistance of Wood by 22%, while (p<0001), the PAP decrease by 15%, while (p<0001), the TPG decrease by 14%, while (p<0001), patients are prepared for the second stage of surgical treatment of secondary heart transplantation.

The results of the dynamics of changes in functional parameters in patients on BIVAD-therapy after 3 months: an increase in maximum myocardial oxygen consumption by 46%, as well as an increase in exercise tolerance by 5%. Assessment of functional class of heart failure according to NYHA before BiVAD-therapy - NYHA III FC according to NYHA - 75% of patients, IV FC according to NYHA - 25% of patients, on BiVAD therapy I FC according to NYHA - 10% of patients, II FC according to NYHA 70% of patients, III FC according to NYHA - 30%. Estimation of the severity of the condition of patients with circulatory insufficiency before BiVAD - therapy of CI IIB in 100% of patients, and on BiVAD - CI I in 14.5% of patients, CI IIA in 85.7% of patients. In the group of 3 patients with CHI on BiVAD therapy as a mechanical bridge to the UTS, patients who underwent secondary - OHT - 4 patients, which is 50%.

Patients who died on BIVAD - 4 patients, which is 50%. The cause of death in 2 cases - purulent-septic lesions, which is 50%. Ascending cable infection. And 2 more cases - multiorgan insufficiency that makes 50%. Assessment of functional class of heart failure according to NYHA before BiVAD-therapy - NYHA III FC according to NYHA - 75% of patients, IV FC according to NYHA - 25% of patients, on BiVAD therapy I FC according to NYHA - 10% of patients, II FC according to NYHA - 70% of patients, III FC according to NYHA - 30%, after OHT: I FC according to NYHA - 70% of patients, II FC according to NYHA - 30% of diseases. Estimation of the severity of the condition of patients with circulatory insufficiency before BiVAD - therapy of CI IIB in 100% of patients, and on BiVAD - CI I in 14.5% of patients, CI IIA in 85.7% of patients, after OHT CI 0 in 35% of patients, CI I in 65% of patients.

Conclusions. 1. Indications for direct heart transplantation are the following criteria: left ventricular ejection fraction (LVEF) is <20%, (p<0001); pulmonary artery occlusion pressure (PAWP) is from 25 mm Hg up to 35 mm Hg (p<0001); peak myocardial oxygen consumption is <14 ml/kg/min at the background of maximum drug therapy (p<0001); pulmonary vascular resistance (PVR) is <5 in Wood units (p<0001); transpulmonary gradient (TPG) is up to 15 mm Hg (p<0001).

2. Indications for LVAD-therapy are the following criteria: left ventricular ejection fraction (LVEF) is <20%, (p<0001); pulmonary artery occlusion pressure (PAWP) is >35 mm Hg (p<0001); pulmonary vascular resistance (PVR) is >5 in Wood units (p<0001); transpulmonary gradient (TPG) is >15 mm Hg (p<0001). The three-months connection of LVAD resulted in a decrease in the left ventricular atrium by 30% (p<0001); a decrease in the LV atrium is by 25.5%, (p<0001); an increase in the LV ejection fraction is by 21%, (p<0001). According to the direct tonometry of the pulmonary artery when using LVAD therapy, there was a decrease of the Wood index of pulmonary vascular resistance by 34%, (p<0001); a decrease in PAP was by 24%, (p<0001); a decrease in TPG was by 21%, (p<0001). The results for the changes in functional parameters in patients on LVAD therapy after 3 months are the next: the maximum oxygen consumption by the myocardium increased by 6% (p<0001) and exercise tolerance increased by 15% (p<0001).

3. Indications for BiVAD-therapy are the following criteria: biventricular insufficiency, (p<0001); pulmonary artery occlusion pressure (PAWP) is >35 mm Hg (p<0001); pulmonary vascular resistance (PVR) is >5 in Wood units (p<0001); transpulmonary gradient (TPG) is > 15 mm Hg (p<0001).

After three-months BiVAD connection there was a decrease in the atrium of the RV EDV by 6% (p<0001), a decrease in RV ESV was by 10% (p<0001), an increase in LVEF was by 33%, (p<0001), a decrease in LV ESV (M-mode) was by 36.3%, (p<0001), decrease in LV EDV (M-mode) was by 30%, (p<0001), decrease in LV ESV (B-mode) was by 22.5%, (p<0001), increase in tricuspid systolic excursion (TAPSE) was by 21.4%, (p<0001). According to the direct tonometry of the pulmonary artery when using BiVAD-therapy the data were the following: reduction of the Wood index of pulmonary vascular resistance was by 22%, (p<0001) in Wood units, reduction of DLA by 15%, (p<0001), reduction of LNG by 14%, (p<0001).

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SUMMARY

SURGICAL METHODS OF TREATMENT OF END-STAGE HEART FAILURE

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The aim of the study is to establish the effectiveness of mechanical support of blood circulation of patients with end-stage heart failure depending on the method of surgical correction.

The results of the study are based on the data of examination and dynamic observation of 73 patients (median age 44 (16-69) years, men 68 patients, women 5 patients) who were treated from 2008-2019 in the following medical institutions: Republican Scientific and Practical Center «Cardiology», Minsk, Republic of Belarus; in the Center of Cardiac Surgery on the Basis of KL «Feofania» DUS. Patients were examined during the initial examination, after 3 months and after a year.

The results of surgical treatment of patients with critical heart disease insufficiency: after direct UTS: 24 (92%) patients were treated with positive result, 2 (8%) patients died. There were 18 (46%) patients performed secondary UTS, patients who were on LVAD therapy. 18 (46%) patients who continue LVAD therapy. On LVAD-therapy 3 (8%) patients died. The cause of death is purulent-septic lesions. Which patients were on BiVAD - therapy: secondary UTS performed 4 patients (50%). 4 (50%) patients died on BIVAD therapy. The cause of death in 2 (50%) cases of purulent-septic lesions, and in 2 (50%) cases it is an organ field insufficiency. Analysis of the results of the differential approach to surgical treatment patients with heart failure III-IV FC according to NYHA: patients with critical heart failure in the presence of contraindications to direct transplantation heart rate, it is advisable to consider the use of long-term mechanical circulatory support based on LVAD therapy (p<0001) and BiVAD - therapy (p<0001) as a mechanical bridge to heart transplantation. Applied long-term mechanical support of blood circulation in patients with high indicators of pulmonary hypertension (p<0001), allows to normalize the pressure in the pulmonary artery and consider performing a secondary heart transplant.

Keywords: chronic heart failure, LVAD-therapy, BiVAD - therapy, orthotopic heart transplantation.

РЕЗЮМЕ

ХИРУРГИЧЕСКИЕ МЕТОДЫ В ЛЕЧЕНИИ ТЕРМИНАЛЬНОЙ СТАДИИ СЕРДЕЧНОЙ НЕДОСТАТОЧНОСТИ

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Цель исследования - оценка эффективности механической поддержки кровообращения у пациентов с терминальной сердечной недостаточностью в зависимости от метода хирургической коррекции.

Результаты исследования основаны на данных обследования и динамического наблюдения за 73 пациентами (средний возраст 44 года), из них 68 мужчин, 5 женщин), которые лечились с 2008-2019 гг. в Республиканском научно-практическом центре «Кардиология», Минск и в Клинической больнице "Феофания" Государственного управления внутренними делами, Киев. Пациенты обследованы при первичном осмотре и спустя 3 месяца и 1 год.

Показаниями к хирургическому лечению пациентов с терминальной сердечной недостаточностью являются: фракция выброса левого желудочка (ФВ ЛЖ) <20%, (p<0001); давление легочной артерии (ДЛА) от 25 до 35 мм.рт.ст (p<0001); пиковое потребление кислорода миокардом <14 мл/кг/мин на фоне максимальной медикаментозной терапии (p<0001); легочно-сосудистое сопротивление (ЛСС) <5 единиц по Вуду (p<0001); транспульмональный градиент (ТПГ) до 15 мм.рт.ст. (P<0001). Показаниями к терапии LVAD являются: ФВ ЛЖ <20% (p<0001); ДЛА >35 ммрт.ст. (p<0001); ЛСС >5 единиц по Вуду (p<0001); ТПГ> 15 мм рт. Ст. (P<0001). На фоне терапии LVAD спустя 3 месяца произошло уменьшение полости левого желудочка на 30%, (p<0001), полости поджелудочной железы - на 25,5%, (p<0001), увеличение фракции ЛЖ - на 21% (p<0001). По данным прямой тонометрии легочной артерии с терапией LVAD отмечалось снижение ЛСС по Вуду на 34%, (p<0001), ДЛА - на 24%, (p<0001), ТПГ - на 21% (p<0001). Показаниями к применению BiVAD-терапии являются: бивентрикулярная недостаточность (p<0001); ДЛА >35 мм.рт.ст., (p<0001); ЛСС >5 единиц по Вуду (p<0001); ТПГ >15 мм рт. ст. (p<0001).

Анализ результатов дифференциального подхода к хирургическому лечению пациентов с сердечной недостаточностью III-IV ФК по NYHA выявил, что пациентам с критической сердечной недостаточностью при наличии противопоказаний к прямой трансплантации целесообразно рассматривать возможность применения длительного лечения, механической поддержки кровообращения на основе LVAD-терапии (p<0001) и BiVAD-терапии (p<0001) в качестве механического моста к трансплантации сердца. Применяется длительная механическая поддержка кровообращения у пациентов с высокими показателями легочной гипертензии (p<0001), что позволяет в короткие сроки (недели) нормализовать давление в легочной артерии, обеспечивая возможность проведения вторичной трансплантации сердца.

რეზიუმე

ქირურგიული მეთოდები გულის უკმარისობის ტერმინალური სტადიის მკურნალობაში

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კლინიკური საავადმყოფო "ფეოფანია", კიევი, უკრაინა; რესპუბლიკური სამეცნიერო-პრაქტიკული ცენტრი "კარდიოლოგია" მინსკი, რესპუბლიკა ბელარუსი

კვლევის მიზანს წარმოადგენდა სისხლის მიმოქცევის მექანიკური მხარდაჭერის ეფექტურობის შეფასება პაციენტებში გულის ტერმინალური უკმარისობით ქირურგიული კორექციის მეთოდზე დამოკიდებულებით.

კვლევის შედეგები ეფუძნება 73 პაციენტის (საშუალო ასაკი – 44 წ., 68 – მამაკაცი, 5 – ქალი) გამოკვლევის და დინამიკური დაკვირვების შედეგებს, რომლებიც მკურნალობდნენ რესპუბლიკურ სამეცნიერო-პრაქტიკულ ცენტრში "კარდიოლოგია" (მინსკი) და კლინიკურ საავადმყოფოში "ფეოფანია" (კიევი). პაციენტები გამოკვლეულია პირველადი გასინჯვის ეტაპზე, 3 თვის და 1 წლის შემდეგ.

ჩვენებას ქირურგიული ჩარევისათვის პაციენტებში გულის ტერმინალური უკმარისობით წარმოადგენს: მარცხენა პარკუჭის განდევნის ფრაქცია – < 20% (p<0001), წნევა ფილტვის არტერიაში – 25-35 მმ ვწყ. სვ. (p<0001), მიოკარდიუმის მიერ ჟანგბადის პიკური მოხმარება - < 14 მლ/კგ/წთ მაქსიმალური მედიკამენტური თერაპიის ფონზე (p<0001), ფილტვ-სისხლძარღვოვანი წინაღობა - < 5 ერთეულზე ვუდის მიხედვით (p<0001), ტრანსპულმონური გრადიენტი – 15 მმ ვწყ. სვ.-მდე (p<0001). ჩვენებას LVAD თერაპიისათვის წარმოადგენს: მარცხენა პარკუჭის განდევნის ფრაქცია – <20% (p<0001), წნევა ფილტვის არტერიაში – >35 მმ ვწყ. სვ. (p<0001), ფილტვ-სისხლძარღვოვანი წინაღობა - > 5 ერთეულზე ვუდის მიხედვით (p<0001), ტრანსპულმონური გრადიენტი – > 15 მმ ვწყ. სვ.-მდე (p<0001).

გულის უკმარისობის III-IV ფუნქციური კლასის (NYHA) მქონე პაციენტების ქირურგიული მკურნალობისადმი დიფერენციული მიდგომის შედეგების ანალიზით გამოვლინდა, რომ პაციენტებში გულის კრიტიკული უკმარისობით პირდაპირი ტრანსპლანტაციის უკუჩვენებების არსებობისას მიზანშეწონილია განხილულ იქნას ხანგრძლივი მკურნალობის გამოყენების შესაძლებლობა, სისხლის მიმოქცევის მექანიკური მხარდაჭერა LVAD-თერაპიის (p<0001) და BiVAD-თერაპიის (p<0001) საფუძველზე მექანიკური ხიდის სახით გულის ტრანსპლანტაციისაკენ. სისხლის მიმოქცევის ხანგრძლივი მექანიკური მხარდაჭერა გამოიყენება პაციენტებში ფილტვის ჰიპერტენზიის მაღალი მაჩვენებლებით (p<0001), რაც იძლევა ფილტვის არტერიაში წნევის მოკლე ვადაში (კვირის განმავლობაში) ნორმალიზების საშუალებას და ამით უზრუნველყოფს გულის მეორადი ტრანსპლანტაციის განხორციელების შესაძლებლობას.