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REOPERATIONS AFTER TOTAL CORRECTION OF FALLOT TETRALOGY

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In the article presented our experience and analysis of the results of 63 reoperations in 59 patients after total correction of Fallot tetralogy in the long term observations period from 1981 to 2013. The interval between the total correction and reoperation ranged from 1 month to 30 years (average 8,54±6,3 years). All patients were divided into groups depending on the predominance of one or other complications and their causes: 1) with residual lesions – 42,4%; 2) with right ventricular dysfunction – 38,9%; 3) with valve pathology – 8,5%; 4) Other rare complications – 10,1%. The most frequent complications that required second surgical correction were: recanalization of ventricular septal defect (34 cases – 37,0%), tricuspid valve incompetence (13 – 13,4%), right ventricular aneurysm (19 – 19,5%), the residual obstruction of the right ventricle outflow tract (9 – 9,3%), pulmonary valve insufficiency (6 – 6,1%). Hospital mortality was 6,7%. All discharged patients revealed a positive dynamics of volume and functional parameters of the right and left ventricles of the heart.

Key words: *tetralogy of Fallot, total correction, reoperations, complications, long-term postoperative period.*

Tetralogy of Fallot (TF) is the most studied congenital anomaly of the heart and has a half-century history of radical correction. But the study of patients in remote periods after radical correction of pathology in a sufficiently large number of cases observed complications such as residual effects of congenital and acquired

abnormalities of the heart, requiring re- adjustment. The number of patients is increasing every year due to the increasing number of patients who underwent correction of TF and longer intervals of observation. According to J. Monro et al [9] the probability of life without re-operation in the later periods in 10 years is 91 %, 20 years after radical correction of TF - 89 %. The most common complication is a residual stenosis of the output of the right ventricle (RV) and ventricular septal defect recanalization, which is the cause of repeated interventions in 60-70% of cases after radical correction of FT [3]. Lack valve pulmonary artery (PA) is an inevitable consequence of transannulyarnoyi plastic and pulmonary valveectomy the correction of FT, particularly in terms of long-term follow-up. The efficiency of the patient depends on the severity of pulmonary regurgitation. This is due to the peculiarities of anatomy flaws, most of which are hypoplastic right ventricular outflow tract , pulmonary regurgitation as observed in about 80-90 % of patients [2]. Only 5-10 % of the original tract has infundibular valve chamber with an intact aircraft. Valve insufficiency progresses over time, increase the size of the right ventricle, there is a lack of tricuspid valve. Expansion is accompanied by ventricular tricuspid insufficiency, atrial and ventricular arrhythmias, leading to sudden death. Children and adolescents have the worst prospects due to higher tensile young myocardium in the remote period. The only way to improve the condition of the patient with pulmonary regurgitation and extend their life - a prosthetic valve. Significant aortic regurgitation, which occurred after radical correction of FT is quite rare term complications, morphological substrate which is expansion of the fibrous ring of the ascending aorta and iatrogenic damage to the valve leaflets . The list of complications found after radical correction may continue stenosis implanted conduit between RV and LA , aortic aneurysm , infectious complications,andothers.

The purpose of this post - to give the existing experience and results of reoperation in the later periods after radical correction of FT.

Material and methods .

The study included 59 patients after radical correction of FT, 63 who underwent

reoperation in the later periods of observation in the period from 1981 to 2013 Palliative interventions in a variety of systemic - pulmonary anastomoses to the radical phase correction TF were performed 41 (69.4 %) patients. The age of patients at the time of radical correction ranged from 8 months. to 40 years (mean 9,16 ± 7,23 years). The average age of patients at the time of reoperation - 15,6 ± 8,02 years (from 9 months to 53 years). The interval between radical correction of FT and reoperation averaged 8,54 ± 6,3 years (from 1 month to 30 years). Two patients underwent reoperatsiyi two , one - three times.

On admission to hospital the status of all patients corresponded III-IV functional class (NYHA). Signs of circulatory failure stage 2A were observed in 29 (49.1 %) patients , stage 2B - 18 (30.5 %), stage 3 in 12 (20.3 %).

The standard scheme for evaluation of patients included a general clinical examination , electrocardiography, chest radiography, ECHO, cavities of the heart catheterization and angiography. Some patients, if necessary, refine the diagnosis, performed Holter monitoring, computed tomography and magnetic resonance imaging .

In 34 (57.6 %) patients had documented arrhythmias as frequent ventricular premature beats (n = 15), paroxysmal supraventricular tachycardia and atrial flutter (n = 8), permanent atrial fibrillation (n = 4), paroxysmal ventricular tachycardia (n = 4), atrioventricular block I c. (n = 3).

X-ray of the heart and lungs consisted of chest radiography in 3 standard projections (anteroposterior, left and right oblique projections) and performance X-ray . Slight cardiomegaly (CTI within 50-55 % of the heart volume is 100 - 140 % of the age of normal) occurred in 10 (16.9 %) patients. Moderate cardiomegaly (CTI within 56-60 % volume of the heart is 140-180 % of the age norm) - in 42 (71.1%), significant cardiomegaly (CTI more than 60% , the amount of heart ponad180 % of age standards) - in 7 (11.8 %). Visually assessed pulmonary pattern and size of cavities of the heart. Measured width of the roots of the lungs and degree arc blast flying . Determined by the presence or absence of calcifications in patches and conduit , and if calcification was assessed his degree.

Basically diagnosis of complications in patients after correction of TF , requiring further

surgical intervention was carried out using ECHO . When Doppler in patients with valve regurgitation grade pathology determined the prevalence of the jet and reverse current flow area index was measured and indexed to normal size in the fibrous ring of the heart valves .

Based on these parameters in 10 (16.9%) patients with tricuspid valve insufficiency was responsible - II - III degree , and in 3 (5.0%) patients - IV degree. Regurgitation on flap LA III - IV degree was observed in 6 (10.1 %) patients, 40 (67.8 %) patients also took place, but did not exceed grade II . The total aortic insufficiency was detected in 2 (3.4%) patients, even in 3 (5.0%) in line II - III degree. In one patient revealed mitral insufficiency IV degree.

Particular attention echocardiography performed at the stage of examination of patients was determined contractile capacity and volume indices of right and left ventricular (LV). In the group of patients with right-sided valvular pathology ejection fraction was 34-55 % of the pancreas (an average group of 46 ± 6%), right ventricular end-diastolic volume indexed to body surface area , ranged from 120 to 168 ml/m2 and average was 155 ± 26 ml/m2 . EDV. Addicted to LV end- diastolic pressure averaged 1,55 ± 0,33. In four patients with stenosis of the conduit gradient between RV systolic pressure and the aircraft was in the range 62 - 104 mm. Hg. century. , the ratio of systolic pressure in the ventricles of the heart more than 1.0 . In patients with insufficiency of the aortic and mitral valves EDV indexed to body surface area , equal to 144 ml/m2 and 152 ml/m2 , LV ejection fraction was 49 % and 55 %. Before you readjust all patients in order to clarify the diagnosis and determine the output path morphologists RV catheterization was performed cavities of the heart, angiography and CT with contrast . Residual defects diagnosed during echocardiography, and in all cases were confirmed in the performance of the left or right ventricle . Selective angiography was performed in patients with aortic pathology. All patients with valve insufficiency aircraft during angiocardiography noted aneurism expansion trunk aircraft. Aneurysm size aircraft ranging within 5.5 - 9.5 cm in diameter , the average was 7,0 ± 2,2 cm in the presence of interventricular defect recanalization membrane RV pressure was 50-90 % of the system (average 56 % ± 16%).

All patients are divided into the following groups according to the predominance of a particular complication and its root causes. 1. Patients with residual defects (25 - 42.4 %): the recanalization of ventricle septal defect (16), with residual obstruction of pulmonary blood flow (5), stenosis of the conduit (4). 2. Patients with RV dysfunction (23 -38.9 %): comorbidity of right (pulmonary regurgitation, failure LC, LA and RV aneurysm , recanalization of ventricle septal defect) - 20 RV aneurysm of ventricle septal defect (2), aneurysm LA (1) . 3. Patients with disabilities valve (5 - 8.5 %): TC of pathology (3), MC (1) AC (1). 4. Other rare complication (6 - 10.1 %).
In Group I included 16 patients with advanced recanalization ventricle septal defect and interventricular defects that were not closed in radical correction of defects , 5 Number of acquired ventricle septal defect (lead patches) that has developed as a result of infective endocarditis, 5- pin Number of stenoses Department pancreas, valve LA , trunk and branches flying and 4 s with stenosis of bypass conduit implanted after radical correction of FT .
In the P group included 23 patients with RV dilatation and dysfunction that developed as a result of long-existing pulmonary regurgitation. In 2 patients pulmonary regurgitation and right ventricular aneurysm with ventricle septal defect were isolated , and 20 had concomitant complications. In the 15 patients in this group was recanalization of ventricle septal defect .
By the III group included 5 patients with acquired mitral and tricuspid valves (in 2) and iatrogenic aortic injury (1) and tricuspid (2) valves with radical correction disabilities.
IV group consisted of patients with rare complications that occurred in the late period after radical correction of FT, namely aneurysm of the ascending aorta in 2 patients, aorto- right ventricular fistula (2), subaortic stenosis (1), thrombosis of the right atrium (1) .
Repeated surgical interventions in 59 patients were removed 97 surgical complications. During reoperation underwent correction of other complications 11 patients , two complications - 10 patients , three complications - 18 four - 3. Type and method of correction of reoperation in the later periods after radical correction FT in the table.

The most frequent complications that required open surgical correction were ventricle septal defect (34 cases - 37.0 %), tricuspid valve insufficiency (13 - 13.4 %), right ventricular aneurysm (19 - 19.5%) , residual obstruction of RV outflow Department (9 - 9.3%), valve insufficiency LA (6 - 6.1%), aneurysm LA (5 - 5.1%). All patients completed operations under artificial circulation and hypothermia. Resternotomy responsible step of re-operation , the surgeon requires maximum care , accuracy, and compliance with certain preparations for the possible occurrence of complications in this phase of the operation. When performing re-sternotomy considered the fusion of the anterior surface of the heart and great vessels of the posterior surface of the sternum. The presence or absence of a safe space between the heart and the sternum was determined by the analysis of X-rays and CT scans . Prerequisite performance resternotomy femoral vessels were preparing for the possibility of emergency cannulation. Another prerequisite was the start of sternotomy willingness lung machine prior to perfusion).

Results and discussion.

Intraoperative complications include damage to structures dominated by various kinds of heart and cardiac arrhythmias . When complete transverse blockade in 3 (4.7 %) cases needed stimalator implantation . When performing median sternotomy (63 cases), damage to the structures of the heart bleeding occurred in 5 (7.9%) patients: in 3 cases was damaged pancreas, in the 1st case - PP, and even in the 1st case - unnamed vein . All of these patients was performed emergency cannulation femoral vessels connecting lung machine and subsequent correction of defects. At the hospital stage 4 deaths (6.7%) patients.

All discharged patients with echocardiography - evaluation revealed a positive trend volumetric and functional parameters of RV and LV .

Reintervention in the later periods after radical correction of TF require from 5 to 14 % of patients [4]. The main problems of remote postoperative period is different cardiac arrhythmias and residual gain and excitation. The most frequent complications that

require surgical intervention after radical correction of FT include residual obstruction of RV outflow Department , ventricle septal defect, tricuspid valve insufficiency and aircraft. A relatively rare but significant complications that have a significant impact on the results of surgical treatment of patients with FT is the origin and progression of aortic regurgitation, coronary ventricular fistulae and others. In addition to the variety of complications that occur in later periods after radical correction of FT , there are a variety of reasons for their occurrence. In other words, the same complications can be caused by various factors. One of the most frequent complications requiring reoperation in our study was the presence of interventricular defect. In 36 (45.6 %) patients were found ventricle septal defect , and in 2 of these patients was detected in primary correction of unclosed additional ventricle septal defect . Our data coincide with data T. Danilov [1] V.P.Podzolkova , I.V.Koksheneva [4], which are also found in their research that the residual ventricle septal defect after correcting defects is one of the most frequent complications which require correction. The most common cause of recanalization ventricle septal defect (31 cases) in our study were surgical error of closure of the defect. In addition, in 5 patients the cause of fragmentation and patch formation interventricular defect was infectious endokarditis . Residual obstruction of pulmonary blood flow in our study was found only in 9 (15.2%) patients, and in 4 - due to conduit stenosis. Average age at the time of radical correction of defects was 16,2 ± 4,1 years. This problem was not the most common cause reoperation . Studies B.Faidutti et al. [6] , residual obstruction of pulmonary blood flow was the reason for reoperation in 65 % of patients, whose average age at the time of radical correction of TF was 5,3 ± 4,0 years. Contrary to the published P. Presbitero et al. [10], which in the later periods after radical correction of defects found moderate obstruction of pulmonary blood flow only in 1st with 40 (2.5%) patients who were operated on in adulthood. Differences in data on the frequency of this complication due to more moderate obstruction of RV outflow Division in patients who survived to adulthood , and consistent with our data . According to C. Alexiou et al. (2002), one of the risk factors residual obstruction of right ventricular outflow Department is applying for removal infundibular stenosis transatrium access. The study

of these authors reoperations on obstruction of RV outflow Division were performed 16 (23.2%) patients who underwent radical correction using transatrium access, and only 3 (3.3%) patients after a ventriclotomy . In our study, these patients were not. However, the use transatrium access, albeit indirectly, may be considered a risk factor for residual obstruction of the right ventricular outflow Department. Among other causes of residual stenosis of RV outflow tract secrete desire to preserve the pulmonary valve surgeon and skip the transannular plastic, which apparently caused the residual obstruction of pulmonary blood flow in 5 of our patients .
Tricuspid failure is a frequent complication in patients in the late period . incidence of moderate and severe tricuspid insufficiency, according to foreign authors, varies from 11-19 % [8,9]. In our study, the lack of TC was found in 13 (16.4%) patients. Incompetence TC in 3 (23.1 %) patients in our study was due to iatrogenic injury while performing valvular plasty of ventricle septal defect during radical correction. Improper suturing , patch for fixing interventricular defect led to a rough strain septal and anterior leaflets of the valve , and in some cases - to the separation section of the wings of the fibrous ring and recanalization ventricle septal defect . In the 1st patient was due to incompetence TC tension, shortening and fixation chords septal svorki one of the seams, fixing patch on ventricle septal defect . One can only assume that more precise surgical technique and precision when performing a radical correction of defects would allow to avoid these complications. These patients were performed prosthetic valve.
The secondary character tricuspid regurgitation was confirmed in 10 (76.9%) patients in our group. Incompetence of the LC in these patients was due to dilatation of its fibrous ring at the unaltered wings and saved hordo-papillyar valve apparatus. The reasons for the expansion of the fibrous ring TV in these patients were RV dilatation and severe pulmonary regurgitation (in 3 cases) and hemodynamic RV overload , caused by residual obstruction of pulmonary blood flow (in 4 cases). Even in 3 patients with severe pulmonary regurgitation and right ventricular dilatation conclude secondary character tricuspid failure can only conditionally, because in addition to dilatation of the fibrous ring TV in these patients were morphological changes valvular iatrogenic nature.

Significant aortic regurgitation, which occurred after progressive or radical correction of FT and requires correction, is quite rare complication remote postoperative period. According to VP Podzolkova and IV Koksheneva [4] the most common morphological substrate of aortic regurgitation that developed in the later periods after correction of TF is iatrogenic damage AK and dilatation of the ascending aorta and root . In our patients change AK were secondary and were iatrogenic in nature, as confirmed intraoperatively . Surgical correction of aortic insufficiency was made by us in 2 - patients , and in one case used a plastic valve, and the second - the prosthesis as a surgical treatment of aneurysms of the ascending aorta by the method of Bentall-de Bono, followed by the aortic valve and ascending aorta replaced vascular prosthesis containing a prosthetic valve and orifice of the coronary arteries of transplanted vascular prosthesis. Severe valve insufficiency LA in our study was the reason for the implementation of re-operation - namely prosthesis biovalve in 6 (6.1%) patients. The most common cause of pulmonary regurgitation and progression is transannular expansion of the RV outflow tract . According to M. Hazekamp et al. [7] in 80% of patients who required correction of pulmonary regurgitation , with radical correction of defects was performed transannulyarna plastic pin RV Division . F. Ruijter et al. [11] , evaluating transannulyarnuyu correction TF showed in his study that severe pulmonary regurgitation and right ventricular dilatation were observed mainly in patients operated with this technique. In our group of patients 100 % of the mitral valve was performed after flying transannular plastic pin RV Division confirming data from other researchers. It is necessary to clarify that pulmonary regurgitation, in varying degrees , in the late period is expressed in the vast majority of patients who have undergone plastic pin transannulyarnoy Department RV , LA valvulotomii valve and indications for its correction based on the presence of signs of RV dysfunction However, correction of TF in early childhood has its own characteristics , which mainly related to the need for high frequency performance transannular plastic pin RV Division . Thus , the study J.Caspi et al. [5] transannulyarna plastic in radical correction of TF was needed 65.8 % of patients younger than 1 year. At the same time, according to P.Presbitero et al. [10] , the frequency of having to perform transannular plasticity in adult patients does not

exceed 40 %. Transannulyarne Extension Department pin RV can be considered a kind of lack of correction of defects as well as the application of this technique in almost all patients complicated by the development of pulmonary regurgitation varying degrees of severity. PREVENTIVE aneurismatic output expansion and development department RV severe pulmonary regurgitation , according J.Caspi et al. [5] may be limited ventriculotomy and relatively narrow application transannular patch. We believe that a compromise is delay sensitive full correction of defects in the 1- 2 -year-old age to form a moderate hypertrophy of the pancreas.
However, transannular plastic pin department pancreas is not the only cause of progression and pulmonary regurgitation. Important role in the failure of the valve play LA residual defects (residual stenosis of the branches of the aircraft, and features VSD correcting defects (incision in the pancreas, resection infundibular stenosis), changes in the pancreas caused by the defect (marked hypertrophy of the pancreas, conduction abnormalities) , and others. All of these various factors were in our patients with pulmonaryinsufficiency. .

Conclusion.

Thus, the most frequent complications that required further surgical correction were recanalization of ventricle septal defect (34 cases - 37.0 %), tricuspid valve insufficiency (13 - 13.4 %), right ventricular aneurysm (19 - 19.5%), residual obstruction RV outflow Division (9 - 9.3%), valve insufficiency LA (6 - 6.1%) and aneurysm LA (5 - 5.1%). The need for correction tricuspid insufficiency in later periods after radical correction of FT was due to iatrogenic damage to the valve apparatus during radical correction, dilatation of the fibrous ring TK, which developed as a result of volume overload and hemodynamic RV . Causes of severe pulmonary regurgitation can be considered features of correcting defects (transannular plastic pin RV Division), residual defects, anatomical features of the defect and surgical errors committed by radical correction of defects. To reduce complications (aneurysm RV , lack TK, RV dilation , arrhythmias) associated with the failure of the valve aircraft that emerged in the late period after correction of FT required implantation of a valve in the pulmonary

position, which is one of the stages of complete correction of defects, aimed at improving the quality of life.

Literature:

1. Данилов Т. Ю. Повторные операции в отдаленные сроки после радикальной коррекции тетрады Фалло / Т. Ю. Данилов // Дисс… док. мед. наук. – М., 2011.

2. Зиньковский М.Ф. Врожденные пороки сердца: монография / М. Ф. Зиньковский. – К., 2010. – 1200 с.

3. Подзолков В. П., Кокшенев И. В., Пурсанов М. Г. и др. Результаты повторных операций в отдаленные сроки после радикальной коррекции тетрады Фалло и реконструкции путей оттока правого желудочка / В. П. Подзолков, И. В. Кокшенев, М. Г. Пурсанов и др. // Грудная и сердечно-сосудистая хирургия. – 2007. – № 4. – С. 11–17.

4. Подзолков В. П., Кокшенев И. В. Тетрада Фалло: монография / В. П. Подзолков, И. В. Кокшенев. – М., 2008.

5. Caspi J., Zalstein E., Zucker N. et al. Surgical management of tetralogy of Fallot in the first year of life / J. Caspi, E. Zalstein, N. Zucker [et al] // Ann. Thorac. Surg. – 1999. – Vol. 68. – P. 1344–1348.

6. Faidutti B., Christenson J. T., Beghetti M. et al. How to diminish reoperation rates after initial repair of tetralogy of Fallot? / B.Faidutti, J.T. Christenson, M. Beghetti [et al.] // Ann. Thorac. Surg. – 2002. – Vol. 73 (1). – P. 96–101.

7. Hazekamp M. G., Kurvers M. M., Schoof P. H., et al. Pulmonary valve insertion late after repair of tetralogy of Fallot / M. G. Hazekamp, M. M. Kurvers, P. H. Schoof [et al.] // Eur. J. Cardio Thorac. Surg. – 2001. – Vol. 19. – P. 667–670.

8. Kobayashi J., Kawashima Y., Matsuda H., et al. Prevalence and risk factors of tricuspid regurgitation after correction of tetralogy of Fallot / J. Kobayashi, Y. Kawashima, H. Matsuda [et al.] // J Thorac. Cardiovasc. Surg. – 1991. – Vol. 102. – P. 611–616.

9. Monro J.L., Alexiou C., Salmon A.P., Keeton B.R. Reoperations and survival after primary repair of congenital heart defects in children / J.L. Monro, C. Alexiou, A.P.

Salmon, B.R. Keeton // J. Thorac. Cardiovasc. Surg. – 2003. – Vol. 126 (2). – P. 511–520.

10. Presbitero P., Demarie D., Aruta E., et al. Results of total correction of tetralogy of Fallot performed in adults / P. Presbitero, D. Demarie, E. Aruta [et al.] // Ann. Thorac. Surg. – 1988. – Vol. 46. – P. 297–301.

11. Ruijter F. H., Weenink I., Hitchcock F. J. et al. Right ventricular disfunction and pulmonary valve replacement after correction of tetralogy of Fallot / F. H. Ruijter, I. Weenink, F. J. Hitchcock [et al.] // Ann. Thorac. Surg. – 2002. – Vol. 73. – P. 1794–1800.

ПОВТОРНЫЕ ОПЕРАЦИИ ПОСЛЕ РАДИКАЛЬНОЙ КОРРЕКЦИИ ТЕТРАДЫ ФАЛЛО

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В роботе представлен наш опыт и анализ результатов 63 повторных хирургических операций у 59 пациентов после радикальной коррекции тетрады Фалло в отдаленном периоде наблюдения за период с 1981 по 2013 годы. Интервал между радикальной коррекцией и повторной операцией составил от 1 мес. до 30 лет (в среднем 8,54±6,3 года). Все больные разделены на группы в зависимости от преобладания того или иного осложнения и причины его возникновения: 1) с резидуальными пороками – 42,4%; 2) с дисфункцией правого желудочка – 38,9%; 3) с патологией клапанов – 8,5%; 4) с другими редкими осложнениями – 10,1%. Наиболее частыми осложнениями, требующими повторной хирургической коррекции, были реканализация дефекта межжелудочковой перегородки (34 случая – 37,0%), недостаточность трехстворчатого клапана (13 – 13,4%), аневризма правого желудочка (19 – 19,5%), остаточная обструкция выводного отдела правого желудочка (9 – 9,3%), недостаточность клапана легочной артерии (6 – 6,1%). Госпитальная летальность составила 6,7%. У всех выписанных пациентов выявлена

положительная динамика объемных и функциональных показателей правого и левого желудочков сердца.

Ключевые слова: *тетрада Фалло, радикальная коррекция, повторные операции, осложнения, отдаленный послеоперационный период.*

ПОВТОРНІ ОПЕРАЦІЇ ПІСЛЯ РАДИКАЛЬНОЇ КОРЕКЦІЇ ТЕТРАДИ ФАЛЛО

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Атаманюк М.Ю.[1], Піщурін О.А.[1]

В роботі представлений наш досвід і аналіз результатів 63-х повторних хірургічних операцій у 59-ти пацієнтів після радикальної корекції тетради Фалло у віддаленому періоді спостереження за період з 1981 по 2013 роки. Інтервал між радикальною корекцією і повторною операцією склав від 1 міс. до 30 років (в середньому 8,54±6,3 року). Всі хворі розділені на групи залежно від переважання того або іншого ускладнення та причини його виникнення: 1) з резидуальними вадами – 42,4%; 2) з дисфункцією правого шлуночка – 38,9%; 3) з вадами клапанів – 8,5%; 4) з іншими рідкісними ускладненнями – 10,1%. Найбільш частими ускладненнями, які потребували повторної хірургічної корекції, були: реканалізація дефекту міжшлуночкової перегородки – 34 випадки (37,0%), недостатність тристулкового клапана – 13 (13,4%), аневризма правого шлуночка – 19 (19,5%), залишкова обструкція вивідного відділу правого шлуночка – 9 (9,3%), недостатність клапана легеневої артерії – 6 (6,1%). Госпітальна летальність склала 6,7%. У всіх виписаних пацієнтів виявлена позитивна динаміка об'ємних і функціональних показників правого і лівого шлуночків серця.

Ключові слова: *тетрада Фалло, радикальна корекція, повторні операції, ускладнення, віддалений післяопераційний період*