BRITISH MEDICAL JOURNAL

British Medical Journal

Volume 4, No.1, May 2024

Internet address: http://ejournals.id/index.php/bmj
E-mail: info@ejournals.id
Published by British Medical Journal
Issued Bimonthly
3 knoll drive. London. N14 5LU United Kingdom
+44 7542 987055

Requirements for the authors.

The manuscript authors must provide reliable results of the work done, as well as anobjective judgment on the significance of the study. The data underlying the work shouldbe presented accurately, without errors. The work should contain enough details andbibliographic references for possible reproduction. False or knowingly erroneous statementsare perceived as unethical behavior and unacceptable.

Authors should make sure that the original work is submitted and, if other authors'works or claims are used, provide appropriate bibliographic references or citations. Plagiarismcan exist in many forms - from representing someone else's work as copyright to copying orparaphrasing significant parts of another's work without attribution, as well as claimingone's rights to the results of another's research. Plagiarism in all forms constitutes unethicalacts and is unacceptable. Responsibility for plagiarism is entirely on the shoulders of theauthors.

Significant errors in published works. If the author detects significant errors or inaccuraciesin the publication, the author must inform the editor of the journal or the publisher aboutthis and interact with them in order to remove the publication as soon as possible or correcterrors. If the editor or publisher has received information from a third party that thepublication contains significant errors, the author must withdraw the work or correct theerrors as soon as possible.

CHIEF EDITOR

Dr. Fiona Egea

EDITORIAL BOARD

OPTIMIZATION OF THE DIAGNOSTIC PROTOCOL FOR CONGENITAL HEART DEFECTS ACCOMPANIED BY EMERGENCY CONDITIONS BASED ON THE ANALYSIS OF HOSPITAL MORTALITY

Akilov Habibulla Ataullaevich
Medecine Doctor, Professor, Director of the Center for the Development of Professional qualifications of Medical Workers
Pirnazarov Jamshidjon Tulkinovich
MD, Head of the Department of Pediatric Cardiac Surgery at AKFA Medline University Hospital.
doctorjamshid85@gmail.com
Alimov Amonjon Baxtiyarovich
Philosophie Doctor, cardiac surgeon in the Department of Pediatric Cardiac Surgery
"National Children's Medical Center of Uzbekistan"
Akbarkhonov Bunyod Jamoliddin o'g'li
Philosophie Doctor, pediatric cardilogy in the Department of Outpatient "National Children's Medical Center of Uzbekistan"
Zokirov Nodirjon Komiljon o'g'li
MD, Cardiologist and functional diagnostics at AKFA Medline University Hospital

Abstract: The article is devoted to the optimization of the diagnostic protocol based on the analysis of the results of surgical treatment of patients with congenital heart defects accompanied by emergency conditions, used in 106 patients.

The research work analyzed the results of surgical correction of heart defects for the period from 2018 to 2022 at the Akfa Medline multidisciplinary medical center among young patients with congenital heart defects accompanied by emergency conditions. These patients underwent both palliative and radical surgical interventions with different clinical outcomes. In the process of analyzing the immediate results with an emphasis on studying the factors that led to death in both study groups, the authors of the article identified factors and patterns that were not obvious at first glance and had a significant impact on the unfavorable outcome and specific postoperative complications with high statistical reliability.

Keywords: surgical treatment, mortality analysis, heart defects with emergency conditions, enriched and depleted pulmonary blood flow.

Introduction. The incidence of congenital heart defects is about 30% of all congenital anomalies. The greatest threat to newborns is precisely heart defects, since in the natural course, 30% of children with congenital heart disease die within the first month, and no more than a quarter of patients survive 1 year of age, and a significant part of them are in an inoperable state at this time.

According to most authors, the incidence of congenital heart defects (CHD) is 8-10 cases per 1000 newborns. In connection with the development of diagnostic methods and registration of live-born children, in recent years there has been an increase in the number of children with (CHD) [1,2,3].

The purpose of this work was a retrospective analysis of the immediate results of surgery in emergency conditions caused by congenital heart defects, during which the causes of mortality during surgical treatment of patients were separately analyzed. Based on the data obtained, prognostic factors influencing the outcome of surgical treatment

were identified and an algorithm was developed for optimizing treatment and tactical measures in emergency conditions caused by congenital heart defects to assess the risk of surgical treatment in order to predict the outcome of treatment.

Material and methods. To the Department of Pediatric Cardiac Surgery of the multidisciplinary clinic " Akfa" Medline " for the period from August 2018 to September 2022. 106 patients with emergency conditions caused by congenital heart disease were operated on.

The average age of operated patients in the studied groups varied from 12 days to 3 years (on average 1.0±0.7 years). Males accounted for 52 (55.9%) patients, females 41 (44.0%), with a sex ratio of 1.27:1.

Depending on the type of congenital heart disease in relation to pulmonary blood flow, patients were divided into 2 groups: group 1, patients with emergency conditions caused by depleted pulmonary blood flow, 88 (83.0%) patients; Group 2: patients with emergency conditions caused by enriched pulmonary blood flow 18 (17.0%). The distribution of patients by gender and age in groups is presented in tables 1. and 2

Table 1. Distribution of patients by age and gender in group 1 (n-88)

Floor	Age (years)			Total n (%)
	0-1 year	1-2 years	2-3 years	
Men	21(23.9%)	20 (22.7%)	7 (8.0%)	**48 (54.55%)**
Women	23 (26.1%)	13 (14.8%)	2 (2.3%)	**40 (45.45%)**
Total n (%)	44(50.0%)	33(37.5%)	9(10.2%)	**88(100%)**

Table 2. Distribution of patients by age and gender in group 2 (n-18)

Floor	Age (years)			Total n (%)
	0-1 year	1-2 years	2-3 years	
Men	14(77.8%)	1 (5.6%)	0 (0%)	**15 (83.33%)**
Women	3 (16.7%)	0 (0%)	0 (0%)	**3 (16.67%)**
Total n (%)	17(94.4%)	1(5.6%)	0	**18 (100%)**

The structure of patients' complaints by group was manifested by the following symptoms, in group 1: shortness of breath 88 (100%), palpitations 88 (100%), cyanosis 88 (100%), progressive weakness 87 (98.8%); in group 2: shortness of breath 18 (100%), palpitations 18 (100%), cyanosis 17 (94.4%), weakness 18 (100%).

During the physical examination, the auscultatory picture of the defect in the groups was taken into account. In group 1 : systolic -diastolic murmur in the II m/r was noted in 26 (29.5%), systolic murmur in the III-IV m/r in 66 (75.0%), weakening of the second sound above the LA in 88 (100%) patients.

In the 2nd group, the auscultatory picture of the heart defect due to the specificity of congenital heart disease was presented: systole -diastolic murmur in the II m/r was noted in 12 (66.7%), systolic murmur in the II-III m/r in 18 (100.0 %), strengthening of the second tone over the LA in 18 (100%) patients. The severity of the defect was assessed according to the NYHA classification. According to our observations, more than 90% of patients had NYHA functional class III-IV and are presented in Table 3.

Table 3 . NYHA Patient Distribution

NYHA Functional Classes	Group 1		Group 2	
	n	%	n	%
Functional class I	0	-	0	-
Functional class II	12	11.3	0	-
Functional class III	69	65.1	0	-
Functional class IV	7	6.6	18	17.0
Total:	**88**	**83.0**	**18**	**17.0**

According to preoperative instrumental studies characterizing the function of external respiration and the general somatic severity of the condition of patients presented by pulse oximetry in group 1, saturation varied from 20 to 84% and averaged 49.4 ± 14.7%. In group 2, saturation varied from 48 to 90% and averaged 69.3±12.0%.

The research work carried out a comparative analysis of the involved radiation research methods to assess their effectiveness.

In the process of comparative analysis of the sensitivity, specificity and overall accuracy of ASD and VSD between EchoCG and MSCT, respectively, it was found that EchoCG is characterized by a sensitivity of 100%, specificity of 90.9%, overall accuracy of 93.3% for ASD and sensitivity of 100%, specificity 100%, overall accuracy 100% for VSD.

According to our observations, echocardiography demonstrates the greatest diagnostic effectiveness in relation to the surpacardial form of TADLV with a sensitivity of 100%, specificity of 100%, overall accuracy of 100% , and to a lesser extent in the cardiac form with sensitivity of 100%, specificity of 93.8%, overall accuracy of 94.4% and infracardial form with sensitivity 50%, specificity 100%, overall accuracy 94.4%

We assessed the reliability of angiocardiography in diagnosing ASD, VSD and SPA in relation to the results of intraoperative revision. The correspondence of the presence of septal defects or pulmonary artery stenosis was confirmed by the results of intraoperative revision. We found that ACG is characterized by a sensitivity of 100%, specificity of 100%, and overall accuracy of 100% for ASD and VSD.

When analyzing the MSCT method for diagnosing ASD and VSD and the level of confluence of the TADLV, when comparing the data with intraoperative observations, the results we obtained were similar to ACG and equaled 100%.

In radical correction of congenital heart disease complicated by emergency conditions, the main goal of the intervention was complete correction of the heart defect to normalize intracardiac hemodynamics and pulmonary blood flow.

In palliative surgical correction, the main goal was to improve pulmonary blood flow in order to compensate for the patient's oxygen consumption and prepare the small circle and left ventricle of the heart for subsequent radical correction in those patients in whom anatomical correction of the heart defect is possible or to prepare patients for subsequent hemodynamic interventions in patients with FVS.

In our study, out of 106 observed patients, 15 (14.1%) underwent radical correction of the defect, 64 (60.4%) patients underwent the application of an MAA, 1 (0.9%) underwent unifocalization of the branches of the pulmonary arteries, 2 (1.8) cases, reconstruction of the RVOT was performed without closure of the VSD; in 6 (5.6%) patients, Glenn's operation was performed ; Radical correction of TADLV was performed in 18 (16.9%).

Table 6. Range of surgical interventions performed for TADLV

Spectrum of surgical interventions	**n**	**%**
Radical correction of the defect in group 1 (total)	**15**	**14.2**
Radical correction of DOMS for pancreas with SLA	2	1.9
Radical correction of tetrad Fallot	13	12.3
Palliative correction of defects in group 1 (total)	**73**	**68.9**
Interarterial anastomosis	64	60.4
Covapulmonary anastomosis	6	5.7
Reconstruction of the RVOT without VSD closure	2	1.9
Unifocalization of the right pulmonary artery	1	0.9
Radical correction of the defect in group 2 (total)	**18**	**16.9**
Operation Cooley	7	6.6
Operation Tucker	9	8.5
Operation Banson	2	1.9
Additional interventions for correction	**23**	**21.7**
Ligation of patent ductus arteriosus	8	7.5
Tricuspid valve repair	12	11.3
Closing of ASD/LLC	3	2.8

Congenital heart defects accompanied by critical conditions are in most cases combined with other anomalies of the heart and great vessels.

In the 1st group of patients, out of 88 patients, 23 (21.7%) were found to have concomitant anomalies of the cardiovascular system. Surgical correction of concomitant anomalies was carried out in combination with elimination of the main defect and was represented by the following interventions: tricpipid valve plastic surgery 12 (11.3%); suturing of atrial septal defect and/or open oval window in 3 (2.8%); ligation of the patent ductus arteriosus in 8 (7.5%) patients.

In the 2nd group of patients, out of 18 patients, 2 (1.9%) patients had a patent ductus arteriosus, which was immediately ligated.

Immediate results and their forecasting

In the immediate postoperative period, the functional state was studied in 97 (91.5%) of 106 operated patients. The outcome data were assessed according to the following groups: good, satisfactory and unsatisfactory.

In patients of the 1st group who underwent hemodynamic correction with good results, there was a significant improvement in the subjective state, positive dynamics of EchoCG data : 1) absence of visual stenosis at the level of the interarterial or cavopulmonary shunt; 2) laminar flow on cavopulmonary or GSD up to 0.8 mmHg; 3) volemic unloading of the EVC during DCPA, determined by the degree of contraction of the IVC from 40 to 50% relative to its diameter during the cardiac and respiratory cycle. 4) saturation indicators both with DCPA and with MAA $\geq$85%.; 5) Improvement in NYHA functional class by 2 orders of magnitude or higher at the time of discharge from the hospital [7].

The group with satisfactory results included patients according to the following criteria: 1) absence of visual stenosis at the level of the interarterial or cavopulmonary shunt; 2) flow on DCPA with an acceptable GSD from 0.8 to 1.5 mmHg ; 3) volemic unloading of the EVC during DCPA, determined by the degree of contraction of the IVC from 30 to 40% relative to its diameter during the cardiac and respiratory cycle. 4) saturation indicators vary both with DCPA and with MAA from 75 to 85%.; 5) Improvement in NYHA functional class by 1 order of magnitude at the time of discharge from hospital [8].

Patients were classified into the group with unsatisfactory results according to the following criteria: 1) the presence of visual stenosis at the level of the interarterial or cavopulmonary shunt; 2) flow on the DCPA with an acceptable GSD of 1.5 mmHg . and higher; 3) volemic unloading of the EVC during DCPA, determined by the degree of contraction of the IVC less than 30% relative to its diameter during the cardiac and respiratory cycle. 4) saturation indicators vary both with DCPA and with MAA $\leq$75%.; 5) No changes or decrease in NYHA functional class at the time of discharge from the hospital [8].

In patients of the 2nd group with good results, there was a significant improvement in the subjective state, positive dynamics of EchoCG indicators: 1) Laminar flow in the area of the pulmonary veins; 2) Reduction of regurgitation on the tricuspid valve to the 1st degree due to a significant decrease in LH; 3) Improvement in volume-linear parameters of the heart, i.e. an increase in EDV by more than 50% compared to the initial values 4) Significant improvement in the NYHA functional class at the time of discharge from the hospital [9].

In the group with satisfactory results, there was a relative improvement in the subjective state, positive dynamics of EchoCG data indicators: 1) Laminar flow in the area of the pulmonary veins; 2) Reduction of regurgitation on the tricuspid valve to the 2nd degree due to a moderate decrease in LH; 3) Relative improvement in volume-linear parameters of the heart, i.e. an increase in EDV from 30 to 50% compared to initial values 4) Relative improvement in the NYHA functional class at the time of discharge from the hospital [9].

In the group with unsatisfactory results, there was a lack of significant dynamics in the subjective state and echocardiographic indicators: 1) Turbulent flow in the area of the pulmonary veins; 2) Maintaining the original values of regurgitation on the tricuspid valve or its aggravation ; 3) Absence or sluggish dynamics of volume-linear parameters of the heart, i.e. an increase in

EDV to 30 or unchanged this indicator compared to the initial values 4) Deterioration or unchanged NYHA functional class at the time of discharge from the hospital [10].

Thus, for patients in group 1, good results were observed in 54 (61.3%) patients, satisfactory results in 26 (29.5%) patients, and unsatisfactory results in 2 (2.7%) patients.

For patients in group 2, good results were observed in 13 (72.2%) patients, satisfactory results in 2 (11.1%), and there were no unsatisfactory results. Data for both groups are presented in summary table 7.

Table 7. Immediate results of surgical treatment (n=82)

	Group 1				Group 2			
Index	**Good. n-54**	**Udov. n-26**	**Unsuccessful n-2**	**R ***	**Good. n-13**	**Udov. n-2**	**Unsuccessful n-0**	**R ***
Avg. age (l)	1.4±0.09	0.86±0.1	4.0±3.9	>0.05	0.63±0.1	0.34±0.17	-	>0.05
IR time (min)	86.4±6.5	-	-	<0.05	94.1±8.8	65.0±12.0	-	<0.05
CP time (min)	58.7±6.5	-	-	<0.05	50.6±5.5	33.0±1.0	-	<0.05
Ventilation time (hour)	15.1±5.4	91.7±32.0	7.7±4.2	>0.05	90.8±60.2	33.0±15.0	-	>0.05
Carditonics (hour)	42.4 ±11.7	83.1±23.1	8.3 ±2.2		76.1±24.6	77.4 ±33.2	-	
K/d in ICU (days)	1.5 ±0.12	4.2±1.3	1.5 ±0.5	<0.05	6.5 ±3.6	3.5±1.5	-	<0.05
K/d after surgery.	7.0 ±0.3	11.7 ±2.7	7.0±2.0	<0.05	13.5 ±4.1	8.0 ±1.0	-	<0.05
*- Comparison of subgroups of patients with good and satisfactory results								

Analysis of hospital mortality and its prognostic criteria

Postoperative mortality in the studied series of patients was 8.4% (9 people). In the course of sorting the data when analyzing hospital mortality, we noted that all patients in both study groups were under the age of 1 year, while the vast majority of deaths (7 out of 9 cases) in both groups were under the age of 6 months. Thus, in the 1st group of patients, the total 2/3 of those who died were under the age of 6 months, and in the 2nd group, all the deaths were under the age of 6 months.

In this regard, we conducted a comparative analysis between groups of patients according to age, LV EDI, saturation and related indicators in the postoperative period in order to determine the causes of mortality. Tables 9 and 10 show comparative indicators for the characteristics under study and an assessment of the reliability of their differences.

Table 9. Comparative analysis of postoperative mortality

Index	I group 6 of 88		R
	Dead	Survivors	
Average age (years)	0.49±0.14	1.2±0.08	<0.05
Initial saturation (%)	39.6±6.3	50.1 ±1.6	<0.05
Saturation after (%)	61.8±11.9	87.2 ±0.8	<0.05
LV ECD initial (ml/m ^{2})	25.9±5.9	36.0 ±2.9	<0.05
Initial knurling (mm/m ^{2})	82.6±17.8	116.3 ±8.0	<0.05
McGoon initial (mm ^{2}/mm ^{2})	0.9 ±0.2	0.8 ±0.06	<0.05

Table 5.1 Comparative analysis of postoperative mortality

Index	II group 3 of 18		R
	Dead	Survivors	
Average age (years)	0.2±0.1	0.5±0.1	<0.05
Saturation after (%)	82.0±9.0	96.6±0.4	<0.05
LV ECD after (ml/m ^{2})	26.0±6.4	51.0±3.5	<0.05
IR (min)	179.6±53.2	90.2±8.1	<0.05
KP (min)	80.6±22.4	48.3±5.0	>0.05
Temperature (degrees)	26.6±0.6	29.7±0.4	<0.05

During the analysis of mortality in group 1, we noted that the greatest difference among the deceased in relation to the surviving patients was noted in such characteristics as age, saturation before and after surgery, the initial value of LV EDI and the Nakata and McGoon indices . The majority of deceased patients were young children, which in our opinion is due to natural selection due to the underdevelopment of physiological mechanisms for compensating for the defect, which is characterized by high mortality.

When analyzing mortality in group 2, significant differences in predictive indicators were identified for such characteristics as age, saturation and end-diastolic index after surgical correction of bypass and perfusion temperature. With regard to age criteria, this group also noted a significant prevalence of deaths among younger patients, which in our opinion is due to the same reasons as in the first group.

Conclusion. Thus, based on the results obtained in the process of analyzing the results of surgical treatment of patients with congenital heart defects accompanied by emergency conditions, we formulated the following conclusions:

1.In the process of comparative analysis of the sensitivity, specificity and overall accuracy of ASD and VSD between EchoCG and MSCT, respectively, it was found that EchoCG is characterized by a sensitivity of 100%, a specificity of 90.9%, an overall accuracy of 93.3% for ASD and a sensitivity of 100% , specificity 100%, overall accuracy 100% for VSD.

2.Echocardiography demonstrates the greatest diagnostic effectiveness in relation to the surpacardial form of TADLV with a sensitivity of 100%, specificity of 100%, overall accuracy of 100% , and to a lesser extent in the cardiac form with sensitivity of 100%, specificity of 93.8%, overall accuracy of 94.4% and infracardial form with sensitivity 50%, specificity 100%, overall accuracy 94.4% .

3.It has been established that ACG is characterized by a sensitivity of 100%, specificity of 100%, and overall accuracy of 100% for ASD and VSD . High rates of diagnostic efficiency are due to the possibility of targeted delivery of a contrast solution to the area of interest and software algorithms for processing the resulting medical images.

4.With regard to the factors influencing the postoperative outcome in group 1, we noted a clear relationship based on such characteristics as age, saturation before and after surgery, the initial value of LV EDI and the Nakata and McGoon indices . The prevailing majority of deceased patients among younger children, in our opinion, is due to the fact that this contingent is at the stage of natural selection and, due to the underdevelopment of physiological mechanisms and compensation of the defect, is characterized by a much higher risk of death with a reliability of $p<0.05$.

5.With regard to the risk factors influencing the postoperative outcome in group 2, we noted a relationship according to the degree of initial compromise of the LV according to which in the group with a satisfactory result, LV EDV in all patients increased 2.7 times from 4.0±0.5 ml up to 11.0±1.0 ml · ($p <0.05$). While the average dynamics of the increase in LV EDV in the group with a good result was only a 1.9-fold increase in LV EDV from 9.2±1.5 ml to 17.8±1.8 ml ($p <0.05$) with significance ($p <0.05$), which allows us to state that the group with satisfactory results included patients with an initially compromised LV, which in our opinion is associated with the size of the intracardiac communication at the time of surgical treatment.

References:

1.Anderson R.H., Becker A.E., Freedom R.M. [et al.] // Sequential segmental analysis of congenital heart disease / Pediatr. Cardiol. - 1984. - Vol. 5. - P. 281- 287

2.Gorbatykh Yu.N., Volkov A.M., Khapaev T.S., et al. Dynamics of structural changes in pulmonary vessels in patients with congenital heart defects of the cyanotic type depending on age, type of systemic-pulmonary anastomoses and the timing of their functioning // Pathology circulatory and cardiac surgery. - 2008. - No. 2. - P. 3-7

3.Doronina, T.N. Features of the epidemiology of congenital heart defects in young children / T.N. Doronina, N.S. Cherkasov // Medical almanac. - 2012. - No. 3. - P. 175-176

4.Kawashima Y., Kitamura S., Matsuda H. et al. Total cavopulmonary shunt operation in complex cardiac anomalies: a new operation // J. Thorac. Cardiovasc. Surg. - 1984. - V. 87. - P. 74-81

5.Gorbatykh Yu.N., Khapaev T.S., Naberukhin Yu.L., Zhalnina E.V. Staged approach in the surgical treatment of congenital heart defects with univentricular hemodynamics // Siberian Medical Journal. - 2007. - T. 22, No. 2 - P. 93-97

6.Mirolyubov L.M., Petrushenko D.Yu., Kalinicheva Yu.B., Sabirova D.R. Diagnosis and treatment of congenital heart defects in newborns. Kazan Medical Journal 2015; 96(4): 628-632.

7.McElhinney D.B., Marianeschi S.M., Reddy V.M. Additional pulmonary blood flow with the bidirectional Glenn anastomosis: does it make a difference? // Ann. Thorac. Surg. - 1998. - V. 66. - P. 668-672

8.Kondratyev, V.A. Congenital heart defects before and after surgery / V.A. Kondratiev // Tauride Medical and Biological Bulletin. - 2005. - T. 8, No. 2. - P. 76-82

9.Zelenikin M.M. Justification of the principle of a multi-stage approach to the surgical treatment of complex congenital heart defects using the method of hemodynamic correction: dis . Dr. med. Sci. - Moscow, 2002

10.Ujjwal K. Chowdhury, K. Ganapathy Subramaniam, Kishore Joshi, Saurabh Varshney, Guresh Kumar, Rajvir Singh and Panangipalli Venugopal.Rechanneling of total anomalous pulmonary venous connection with or without vertical vein ligation: Results and guidelines for candidate selection. J Thorac Cardiovasc Surg. 2007;133:1286-1294.