

OPTIMIZATION OF MYOCARDIAL PROTECTION METHODS DURING RADICAL CORRECTION IN CHILDREN WITH SEPTAL HEART DEFECTS

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Abstract. *The number of patients with congenital heart disease (CHD) is constantly growing all over the world and remains the most common pathology. Statistics of recent years indicate an increase in the number of children with septal heart defects and an increase in mortality. This article discusses the optimization of myocardial protection methods during radical correction in children with septal heart defects.*

Keywords: *septal heart defects, congenital heart disease, pathology, mortality.*

Introduction. The issues of effective surgical care for patients with diseases of the heart and blood vessels are relevant for the practical health care of the Republic of Uzbekistan.

The number of patients with congenital heart disease (CHD) is constantly growing all over the world and remains the most common pathology. Statistics of recent years indicate an increase in the number of children with septal heart defects and an increase in mortality.

Surgical methods for the treatment of congenital heart disease remain leading today, and the problem of myocardial protection poses new challenges for researchers.

Improvement of surgical technique, methods of cardiopulmonary bypass and assisted circulation, and myocardial protection have made it possible to significantly expand the indications for surgery and significantly increase the number of operated patients with CHD with hypervolemia of the pulmonary circulation and high pulmonary hypertension. Similar trends in the development of pediatric cardiac surgery determine the need not only to improve the quality of radical correction, but also to develop optimal options for the tactics of surgical interventions, as well as adequate ways to protect the myocardium.

To date, the concept of cardioprotection in operations with cardiopulmonary bypass considers several areas, the leading one of which is local myocardial protection. Cardioplegia is the only generally recognized method of local myocardial protection [1,2,3,4]. Improving the effectiveness of myocardial protection contributes to the optimization of cardioplegia parameters.

In recent years, a lot of work has been presented in the relevant literature regarding the comparison of the effectiveness of myocardial protection using pharmacological cold cardioplegia (PCC) intracellular "Custodiol" and extracellular crystalloid cardioplegia. In recent years, FHKP intracellular "Custodiol" has been increasingly used and now there is already evidence of its successful use in almost all types of heart surgery. As can be seen from the above, the question of

choosing the method of myocardial protection in the world literature remains debatable, which determines the scientific and practical relevance of this study, its purpose and objectives [5].

In connection with the above, we would like to raise the issue of the effectiveness of the use of intracellular "Custodiol" and extracellular crystalloid cardioplegia in patients with congenital heart disease, FHKP and the possibility of using this technique in patients with septal heart defects.

Purpose of the study:

Optimization of myocardial protection methods during radical correction in children with septal heart defects.

Materials and methods of research: 69 patients with septal heart defects were examined in the Department of Cardiovascular Surgery in patients of the ODMC of the Samarkand region for the period from 2020 to 2021. There were 33 females (47.8%), males 36 (52.2%). At the time of admission to the hospital, the average age of patients was 2.1 ± 1.3 years, body weight -10.8 ± 2.1 kg, height -81.4 ± 7.9 cm. The average arterial oxygen saturation was $91 \pm 4\%$. The hemoglobin level at admission averaged 133.4 ± 24.6 g/l.

The analysis of the metabolic and functional state of the heart and coronary vessels, as well as the clinical characteristics of patients was carried out.

According to EchoCG data, an ejection fraction of more than 65% was recorded in 37 (53.6%) patients, less than 65% in 32 (46.4%) patients.

Depending on cardioplegic protection, patients were divided into two groups:

- Group I (n = 32) - where antegrade intracellular crystalloid cardioplegia "Custodiol" was used with a temperature of $5-8^{\circ}\text{C}$. The heart is perfused for 6-8 minutes with the height of the perfusion capacity above the level of the heart initially about $140\text{ cm} = 100\text{ mm Hg.Art.}$ and at the rate of 40 ml/kg;

- II group (n = 37) - where antegrade intermittent crystalloid extracellular cardioplegia was used with a temperature of $5-8^{\circ}\text{C}$;

The duration of myocardial ischemia in group I was 25.4 ± 6.12 minutes, in group II 28.1 ± 7.17 minutes. The ratio to EC time in group I was 1.88 ± 0.17 , in group II 1.9 ± 0.13 ($p > 0.05$).

Results of the study: The nature of cardiac arrest during the period of cardioplegia induction was studied. The onset of asystole through the development of intracardiac blockade was considered optimal from the point of view of energy saving. In the majority of operated patients (91.3%), blockade was the predominant mechanism of asystole (n = 69). In group 1, in 2 (6.2%) cases, cardiac arrest was noted due to ventricular fibrillation, in the second group, fibrillation was observed in 4 (10.8%) patients.

An analysis of the occurrence of spontaneous electrical activity during the main stage of the operation revealed the absence of significant differences in both groups.

The frequency of administration of a crystalloid cardioplegia solution during induced total myocardial ischemia in group I was 1 time. allows to provide effective protection of the heart in conditions of general moderate hypothermia during cardiac ischemia lasting up to 180 minutes after a single injection. FHKP "Custodiol" contains a histidine buffer, which allows you not to resort to peroxygenation. The hyposodium buffer determines the intracellular mechanism of tissue protection. The use of FHKP "Custodiol" makes it possible to increase the resistance of tissues of the myocardium, kidneys, liver of other internal organs to hypoxia due to the presence in its composition of balanced components that determine the metabolic protection of cells and their

ionic balance; in group II, the frequency of administration of cardioplegia was 3 ± 1 times. Therefore, FHKP "Custodiol" cardioplegic protection was not accompanied by an increase in the need for a cardioplegia component, which, in combination with EC time indicators, indicates a predominant role of Custodiol in the development of reversible cardiac arrest than crystalloid cardioplegia.

Favorable recovery of cardiac activity after removal of the clamp from the aorta was considered the appearance of sinus rhythm through transient intracardiac blockade in the absence of ventricular fibrillation. In group I, electrical defibrillation was required in 2 (6.3%) patients, in the second group 3 (8.2%) patients ($p < 0.01$).

When analyzing electrocardiographic data, after removing the clamp from the aorta in both groups, by the end of the extracorporeal bypass, there were no signs of myocardial ischemia in the form of ST segment shift on the ECG.

Cardiac weakness in the immediate postoperative period was observed in 1 (3.1%) patient of group I and in 5 (13.5%) patients of group II ($p > 0.05$), who on the first day after surgery were prescribed dopamine at a dose of 3 up to 6 mcg / kg / min.

To assess the adequacy of myocardial protection, we observed hemodynamic parameters after cardioplegia and restoration of cardiac activity, which is one of the important dynamic criteria for adequate cardioprotection according to world literature. The hemodynamic parameters obtained by us (systolic and diastolic pressure) indicate that in all groups in the early postoperative period, the heart was able to provide adequate hemodynamics. Also, an important criterion for the normalization of cardiac activity and stabilization of hemodynamics was the early appearance of sinus rhythm.

Thus, based on the results obtained using hemodynamic control, it seems possible to state that the majority of patients with septal heart disease were performed under conditions of adequate cardioplegia.

The duration of postoperative mechanical ventilation- BB L was estimated. In group I, this period was 4.7 ± 1.5 hours, in group II - 4.9 ± 1.7 hours ($p > 0.05$). On the first day, the levels of serum enzymes - AST, CPK, CPK-M B were studied. Signs of myocardial damage were considered to be an increase in the MB fraction of more than 10% of CPK. Blood samples were examined 6, 12, 24 hours after the patient's admission to the ICU.

In the postoperative period, the level of CPK increased in both groups of patients. Despite the fact that this enzyme is not cardiospecific, in II d py pp e the smallest increase was noted with a significant difference after 12 and 24 hours ($p < 0.05$).

When assessing the level of CPK-M B in both groups, an increase in this isoenzyme was noted during the first 12 hours with a tendency to a subsequent decrease, and in group II its level was higher than in group I ($p > 0.05$). Analysis of the dynamics of the percentage of the isoenzyme to total CPK did not reveal significant intergroup differences ($p > 0.05$), however, in the group I there was an increase in this indicator from 12 to 24 hours of the postoperative period, while in group II, at the same time, a decrease in the proportion of CPK-M B was registered. The percentage of CPK-M B after 24 hours in group II was characterized by a significantly higher level than in group I.

The dynamics of the content of this enzyme in group I is characterized by a gradual increase during the first 12 hours of the postoperative period, stabilization of its concentration in the second half of the first day. Group II did not differ from group I, where there was also a gradual increase

during the first 12 hours of the postoperative period and stabilization of its concentration in the second half of the first day.

On the fifth day of the postoperative period, according to EchoCG data, in group I (n = 32) the volume of pericardial exudate averaged 50.0±12.0 ml, in group II (n =37) this figure averaged 70.0±17.0 ml (p <0.05 vs group I). These results confirm the negative effect of cardioplegic protection and EC duration on the state of local immunity manifested by a significantly large amount of pericardial exudate in the postoperative period. Two patients of group II (4.16%), due to excessive production of exudate (more than 100 ml), with the ineffectiveness of conservative therapy, needed to evacuate excess fluid. In group I, there was no need for puncture (p <0.05).

In the study of the incidence of atrial fibrillation in the early postoperative period in operated patients, in group I, the occurrence of atrial fibrillation paroxysm with the need for medical correction in the postoperative period was noted in 1 (3.1%) patient, in group II, these rhythm disturbances were observed in 5 (13.5%) of patients (p >0.05 relative to group I). The obtained results indicate a lesser influence of the used thermal method of cardioplegic protection on the frequency of occurrence of cardiac arrhythmias in the postoperative period.

Conclusions: Thus, in a comparative analysis of the effectiveness of two methods of myocardial protection based on FHKP "Custodiol" and crystalloid cardioplegia, it was revealed that in clinical conditions myocardial protection during ASD and VSD operations provides reliable cardioprotection. FHKP "Custodiol" is not only not inferior to the crystalloid cardioplegia technique, but also surpasses it in providing intraoperative electromechanical stability of the myocardium, preventing the occurrence of reperfusion arrhythmias, is characterized by less damage to enzymatic cellular structures and less pronounced manifestations of postpericardiotomy syndrome in the postoperative period.

The FHKP method "Custodiol" is the method of choice for protecting the myocardium, which allows you to evenly reduce the rate of metabolic processes during ischemia and not cause irreversible changes in cells and anoxia period, which allows you to avoid dangers in patients with left ventricular hypertrophy, during complex and traumatic operations, with clamping of the aorta for long periods.

According to the percentage of self-recovery of cardiac activity and the percentage of exit from EC with cardiotoxic support, as well as taking into account laboratory data (there was no increase in the level of specific cardiac enzymes in the blood) and electrofunctional research methods (data before and after surgical ECG and EchoCG), we can say that this method is effective for protecting the myocardium during operations with EC. But at the same time, it should be noted that the question of developing the most optimal method of intraoperative myocardial protection is still open, and further study of this technique is required.

The use of FHKP "Custodiol" for intraoperative protection of the myocardium does not have a cardiodepressive effect during septal operations and provides effective protection of the myocardium in children. The use of FHKP "Custodiol" can significantly reduce the number of postoperative rhythm and conduction disturbances in comparison with the available literature data.

This method of protecting the myocardium FHKP "Custodiol" is technically not complicated and can be used when performing major reconstructive operations on the heart.

Conflict of interests: Authors declare none conflict of interests.

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