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Surgical Treatment Of Congenital Heart Diseases In Children At The Modern Stage

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Abstract*— *Pediatric cardiac surgery, like surgery in general, is steadily developing. From year to year, one can observe how more and more new procedures and treatment methods are being developed and introduced. Thanks to this rapid progress, the number of favorable outcomes in the surgical treatment of children is increasing every year. Statistics show that out of 1000 children with congenital heart defects, 8-10 are born, most of them need qualified surgical care.

Keywords— surgery, congenital heart disease, congenital heart disease, children, treatment.

1. INTRODUCTION

Congenital heart defects (CHD) are one of the most common developmental abnormalities in children and rank third in the structure of intrauterine diseases after pathologies of the musculoskeletal system and the nervous system. Annually in Russia about 10 thousand cases of birth of children with congenital heart disease are recorded, many of which require surgical intervention [8]. Cardiovascular surgery is a dynamically developing field of medicine, therefore, new or existing methods of treatment are constantly being developed or existing methods of treatment are being improved, thanks to which, over the past decade, outstanding results have been achieved in helping children with even the most complex heart defects [4].

2. MAIN PART

Congenital heart defects is a group concept that combines anomalies of the position and morphological structure of the heart and large vessels. They form the pathological conditions of intracardiac and general hemodynamics [7]. The most common heart defects are: ventricular septal defect (15-23%), transposition of great vessels (9-20%), tetrad of Fallot (8-14%), coarctation of the aorta (6-15%), patent ductus arteriosus (6- 18%), atrial septal defect (2.5-16%), aortic stenosis (2-7%), pulmonary artery stenosis (6.8-9%) [8].

Currently, surgeons strive to correct CHD in the neonatal or early childhood period in order to minimize long-term adverse consequences, however, it is necessary to take into account the basic principle in pediatric surgery - operations should be performed taking into account the subsequent growth of the child [4]. For the treatment of congenital heart defects, as well as other cardiovascular pathology, within the framework of the national project "Health", seven federal centers of cardiovascular surgery were built [1].

Patent ductus arteriosus (PDA) is a communication between the aorta and the pulmonary artery, belongs to the "pale" type of defects. Normally, the duct functions in utero in the fetus and closes functionally on the first day of life. This congenital heart disease is observed in premature babies and can be combined with other defects - more often with a defect of the interventricular or interatrial septum. In such patients, an attempt is first made to pharmacological closure of the duct by intravenous administration of indomethacin. In the absence of an effect, the PDA is closed surgically [8]. Currently, almost any PDA can be closed endovascularly. The only contraindication is early childhood and low weight of the child [2]. In such cases, surgical procedures are indicated - ligation or clipping of the duct. Surgical correction is performed by access through a left thoracotomy and the imposition of two ligatures or clipping with titanium staples or video-thoracoscopic application of metal clips [8].

Atrial septal defect (ASD) is a constant communication between the atria. The indications for ASD closure are symptoms of heart failure on the background of regular drug therapy. Surgical closure of the ASD is performed by access through the right atrium and, if the defect is small, it is sutured. If the defect is large in diameter, it is closed with an auto- or xenopericardium or a synthetic patch. The development of technologies for percutaneous transcatheter closure makes it possible to treat this defect without a wide dissection of tissues, using an Amplatzer-type device. The procedure is not performed in young children, as well as in cases of venous sinus defect and primary ASD [8].

Ventricular septal defect (VSD) is a constant communication between the ventricles of the heart. There are several types of this CHD: the first is subarterial - located in the outflow tract of the right ventricle; the second - perimembranous (most frequent - 80%) - is located in the membranous septum and adjoins the septal cusp of the tricuspid valve, which can fuse with the defect and lead to partial or complete closure of the defect; the third - the inflow VSD is located in the inflow part of the right ventricle and is adjacent to the tricuspid valve; the fourth, muscular, is usually located in the center, apically or at the border of the septum and the free wall of the right ventricle [2, 5]. The main operation for VSD, as in ASD, involves suturing it or closing it with a patch made of a biological or synthetic material, while access in most cases is through the right atrium [5]. Endovascular defect closure can also be performed. The procedure is indicated when the defect is located at a sufficient distance from the tricuspid and aortic valves [8].

Transposition of great vessels (TMS) - congenital heart disease, in which the aorta departs from the anatomically right ventricle, and the pulmonary trunk - from the anatomically left ventricle, belongs to the "blue" type. Depending on the combination with concomitant developmental anomalies, there are three main types of this defect: TMS with an intact interventricular septum, TMS with VSD, TMS with VSD and pulmonary stenosis [2]. The presence of transposition of the main arteries in a child is an absolute indication for surgery, since in such children there are two disconnected circuits of blood circulation, moreover, venous blood circulates largely, and arterial blood is small. Such a situation can be compatible with life only if there is communication between the circles of blood circulation at the level of the atria, ventricles, or extracardially through the PDA. If it is impossible to correct the defect, it is immediately possible to perform the palliative endovascular Rashkind procedure, the essence of which is the expansion of the foramen ovale using a balloon - atrioseptostomy [8]. To do this, a catheter with a balloon is inserted through the femoral vein, passed to the right atrium, and then through the oval window into the left atrium, after which the balloon is inflated and returned to the right atrium. In this case, the opening of the valve of the oval opening occurs, due to which a stable communication is formed between the circles of blood circulation [3]. The "gold standard" in the treatment of newborns with TMA and an intact ventricular septum is an arterial switch operation in the first 2 weeks of life [6]. For this, the trunk of the aorta and the pulmonary artery is crossed, the orifices of the coronary arteries are isolated and implanted into the wall of the former pulmonary artery. The pulmonary artery trunk is moved anteriorly from the aorta and the vessels are reconstructed.

3. CONCLUSION

Coarctation of the aorta - congenital segmental narrowing of the aorta, located in the area of its isthmus. Treatment is aimed at restoring full patency of the descending thoracic aorta, which cannot be achieved with drugs. Currently, there are two main methods for eliminating this defect: surgery and endovascular correction. The "gold standard" is the operation to resect the narrowed portion of the aorta and apply an end-to-end anastomosis, or its prosthetics using a synthetic vascular prosthesis. Currently, in children older than 1 month, the procedure of choice in the treatment of coarctation of the aorta is X-ray endovascular balloon angioplasty, and surgical treatment is carried out in case of unsuccessful attempts to balloon. This method is also used to eliminate re-narrowing of the aorta and can be combined with subsequent stenting. Balloon angioplasty involves puncture of the femoral artery, through which a catheter with a balloon at the end is passed into the narrowed area of the aorta and inflated, thereby eliminating coarctation. In children of the first year of life, the use of the femoral artery for puncture is impossible due to its small diameter, so they have a catheter pass through the left subscapularis artery. Contraindications to the endovascular procedure are hypoplasia of the aortic arch and extended coarctation [3]. Thus, it can be noted that at present the correction of the most common CHD in children can be carried out by two main methods: surgery and endovascular procedures. The choice of this or that technique depends on the nature of the defect itself, the presence of concomitant pathologies, the patient's age, the severity of clinical manifestations, and the experience of the operating surgeon.

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