

INSTRUMENTAL EXAMINATION METHODS IN ASSESSING THE IMMEDIATE RESULTS OF CORRECTION OF ABNORMAL PULMONARY VEIN DRAINAGE

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Abstract

In this article, the clinical material consisted of 221 patients with various types of ADPV. The age of the operated patients ranged from 1 month to 45 years (on average $13,3 \pm 0,26$ years). The study of patients with ADPV included electrocardiography and radiography on various days after surgery. The analysis of the features of the course of the immediate postoperative period, depending on the type of defect. The dynamics of anatomical and functional parameters of operated patients with abnormal pulmonary venous depression were studied. Changes in heart parameters after correction using electrocardiography and radiography were analyzed. The aim of the study was to study the ECG and X-ray cardiometric parameters of patients with abnormal pulmonary venous depression in the immediate postoperative period. **Keywords:** congenital heart disease, abnormal pulmonary vein drainage, pulmonary hypertension, electrocardiography, radiography, evaluation of results.

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Introduction

The relevance of the problem

One of the urgent tasks of modern heart surgery is the correction of complex congenital heart abnormalities, including abnormal pulmonary vein drainage (ADPV), which occurs in 0,3–0,6% of all congenital heart defects [5,6,12,15,16,17]. The reversibility of a number of electrocardiographic and radiological parameters of the defect after surgical treatment has been the subject of study by a number of researchers [2,7,9,14,18]. It should be noted that there are few reports on the study of ECG and X-ray cardiometric parameters in the immediate period after correction of ADPV. Most studies contain information on the functional capacity of the myocardium, parameters of the electrical function of the heart and X-ray patterns after surgery in patients with ADPV, little is described in the existing literature [1,3,5,8,10]. This determines the



need to study ECG and X-ray parameters in the postoperative period to determine the processes of adaptation of the myocardium to new circulatory conditions, which allows us to assess the advantage of certain methods of surgical correction of ADPV.

The aim of the study was to study the ECG and X-ray cardiometric parameters of patients with abnormal pulmonary venous depression in the immediate postoperative period.

The clinical material consisted of 221 patients with various types of ADPV. The age of the operated patients ranged from 1 month to 45 years (on average 13.3 ± 0.26 years). Males accounted for 109 (49,3%) patients, and females for 112 (50,7%). The study of patients with ADPV included general clinical and radiological research methods: anamnesis collection, examination, anthropometry, auscultation, radiography, electrocardiography, transthoracic echocardiography, angiocardiology with catheterization of the heart cavities, as well as multislice spiral computed tomography, in order to assess the severity of intracardiac hemodynamic disorders. Based on the data of clinical and instrumental examination, total ADPV was detected in 72 (32,5%) patients and partial ADPV in 149 (67,5%) patients.

Results and discussion.

An electrocardiogram with total ADPV has a characteristic appearance: the electrical axis of the heart is deflected to the right; hypertrophy of the right parts of the heart with overload is determined; in isolated cases, there may be hypertrophy of the left atrium; in thoracic leads, the ECG has a higher voltage character than with isolated atrial septal defects (ASD); there is a more pronounced hypertrophy of the right and left parts of the heart with diastolic overload [2,4,13]. The electrocardiographic picture for partial ADPV (PADPV) is nonspecific and reflects hypertrophy of the right atrium (RA) and right ventricle (RV), sometimes it is possible to detect an overload of the pancreas. The degree and magnitude of these changes depend on the magnitude of left-right blood discharge through ASD and from abnormally draining pulmonary veins (PV), as well as the duration of the defect [2,4,10,13]. With total ADPV (TADPV), an ECG picture can reveal overload and hypertrophy of the PP, pancreas and is often manifested by a deviation of the electric axis to the right in standard leads. This indicates a load in the right parts of the heart, which is characteristic of this defect. Due to hypertrophy of the right parts of the heart, blockages of the right leg of the Gis bundle are noted on the ECG [1,6,13].

In our studies before surgery in patients with TADPV ECG, signs of hypertrophy of PP and pancreas were noted in 70 (97,2%); hypertrophy of the left ventricle (LV) were noted in 2 (2,8%); patients. In 70 (97,2%) cases, patients had a deviation of the electrical axis of the heart (EAH) to the right and 2 (2,8%) patients had a horizontal position of the EAH. The majority of 59 (81,9%) patients retained sinus rhythm, only 3 (4,2%) patients registered nodal rhythm. 69 patients (95,8%) had incomplete blockage of the right leg of the Gis bundle. The heart rate depended on the age of the patients and averaged $121,4 \pm 4,1$ beats per minute.

Analyzing our own material, we tried to assess the adequacy of the performed operation based on the ECG (table 1). For this, the ECG picture was considered before and at various times after the operation. Thus, indirect signs of hypertrophy of the right heart after correction of the defect remained, practically in all cases, especially in patients with pulmonary hypertension (PG) - III degree. In isolated cases, hypertrophy of the left heart was observed in patients with TADPV. In the postoperative period, cardiac arrhythmias and conduction disorders associated with surgical



aggression and manipulation near the pathways or vessels feeding them were also observed. The study of the electrocardiogram in the near term after surgery showed a positive trend, consisting in a decrease in the degree of hypertrophy and overload of the right heart.

Blockade of the right leg of the Gis bundle (incomplete in 182 patients, complete in 6 patients), which was observed in 188 (42,5%) patients before surgery, persisted in all patients in the immediate postoperative period. Atrioventricular block of varying degrees after correction of ADPV occurred in 7 (3,2%) patients (it was not present before surgery). Cardiac arrhythmias (ventricular rhythm, bigemina and migration of rhythm) associated with surgery in the immediate period after correction were noted in 14 (6,3%) patients (table 1). After elimination of arteriovenous blood discharge, the minute volume of the large circulatory circle increases and, accordingly, after surgery, the work of the left heart increases. Therefore, in our observations, 36 (16,3%) ECG patients showed signs of overload of the left heart, which had not been present before the operation. ECG studies have found that in the immediate postoperative period, arrhythmias occur in 6,5% of those operated on.

Table 1 Changes in ECG signs in patients with ADPV

ECG signs	Deadlines Researches	Type of ADPV		In total
		PADPV	TADPV	
Sinus Rhythm	before the operation	137(61,9%)	59 (26,6%)	196(88,6%)
	after the operation	142(64,2%)	70(31,6%)	212(95,9%)
Transient arrhythmias	before the operation	12(5,4%)	13(5,9%)	25(11,3%)
	after the operation	9(4,0%)	5(2,2%)	14(6,2%)
Metabolic changes	before the operation	27(12,2%)	10(4,5%)	37(16,7%)
	after the operation	17(7,6%)	6(2,7%)	23(10,3%)
Incomplete blockade of the right leg of the Gis bundle	before the operation	121(54,7%)	61(27,6%)	182(82,3%)
	after the operation	38(17,1%)	34(15,3%)	72(32,5%)
Complete blockade of the right leg of the Gis beam	before the operation	4(1,8%)	2(0,9%)	6(5,04%)
	after the operation	1(0,8%)	-	1(0,8%)

Radiological changes in patients with ADPV with conventional radiation examination, it is possible to identify similar signs as, in ASD, SCS hypervolemia, an increase in the parameters of the right heart and pulmonary artery (AP) of varying severity. In some cases, for example, with the infracardial variant of PADPV, an abnormally draining pulmonary vein can be detected in the direct projection, which is called scimitar syndrome [4,7,8]. With complete ADPV, especially in stagnant or obstetric forms, such radiological signs as increased pulmonary pattern and pancreatic dilation are revealed [9,11,12], and the cardiothoracic index can reach large sizes [9,12,14]. Various variants of complete abnormal drainage of the pulmonary veins are characterized by certain radiological symptoms. Abnormal drainage through the left unnamed vein in the X-ray picture is revealed as a darkening in the form of an "eight" or "snow woman" [5,7,10], these changes are formed by the transverse vein, vertical vein and superior vena cava (SVC) on the right.



In the immediate postoperative period, according to clinical data, 183 (82,8%) patients showed radiographic signs indicating a good result of ADPV correction. Thus, in this group of patients, there was a noticeable positive dynamic on the part of the small circle of blood circulation (SCS), i.e., a decrease in arterial hypervolemia (table.2) and X-ray cardiometric parameters (decrease in cardiothoracic index (CtI), heart volume, Moore index).

Table 2 Changes assessment of radiological signs of operated patients with ADPV depending on the degree of pulmonary hypertension

Degree of PG	Hypervolemia of the SCS						Enlargement of the RA			
	No		moderate		pronounced		moderate		pronounced.	
	A	B	A	B	A	B	A	B	A	B
I degree.	1	30	46	22	-	-	33	-	-	-
II degree.	-	32	89	5	5	-	145	15	5	-
III degree.	-	26	75	4	4	-	34	20	4	-
Total	1	88	210	31	9	-	212	35	9	-

Note: A - moderate; B - pronounced.

However, the degree of decrease in these cardiometric parameters corresponded to the severity of the defect and the severity of hemodynamic disorders in SCS. In patients with initial PG (I grade), complete normalization of these parameters was noted; in patients with grade II PG, there was a significant decrease in signs of malformation, and in patients with grade III PG, there was only a slight dynamic of cardiometric parameters, despite a noticeable decrease in the degree of SCS hypervolemia.

Of the 221 operated patients, 139 (59 with TADPV and 80 with PADPV) radiographically revealed an increase in the left heart sections in the near term after surgery, which indicates the elimination of left-right discharge and an increase in the load on the left heart sections. A study of the pulmonary pattern of 221 operated patients, only 6 (2,7%) showed that there was stagnation in the SCS; one of them was re-operated, the other was cured with medication. Moreover, one patient had a shock lung after surgery, and the other had signs of pneumonia. In 22 (9,9%) patients, signs of heart failure (exudate in the pleural cavities, slight stagnation in the SCS) were detected in the first 2-3 days, which were stopped by medication.

Conclusion:

1. Analysis of ECG changes in the postoperative period after ADPV correction showed that the most common ECG signs that undergo changes after an adequately performed operation are a decrease in hypertrophy of the PP and pancreas, as well as a deviation of the electric axis to the right, but it is more pronounced in the long term.
2. The decrease in signs of PP hypertrophy in the pancreas occurs mainly after the first month after surgery and beyond.
3. We did not observe a significant decrease in signs of incomplete blockade of the right leg of the Gis bundle in the immediate postoperative period.



4. Radiologically, an increase in the left parts of the heart is detected in the near future after surgery, which indicates the elimination of left-right discharge and an increase in the load on the left parts of the heart.

5. In the immediate postoperative period, there was a noticeable positive dynamics on the part of SCS, i.e. a decrease in arterial hypervolemia and X-ray cardiometric parameters (decrease in CT, heart volume, Moore index).

It should be noted that the improvement of ECG parameters and the degree of decrease in cardiometric parameters corresponded to the severity of the defect and the severity of hemodynamic disorders in SCS. The results obtained indicate the need to study the long-term results of the operation to determine the effectiveness of one or another method of correcting ADPV.

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