

# Dynamics of Echocardiographic Parameters in the Immediate Postoperative Period in Patients with Anomalous Pulmonary Vein Drainage

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**Abstract:** One of the highly informative non-invasive methods of investigation in cardiac surgery is echocardiography (ECHO), which provides objective information about the state of intracardiac and central haemodynamics in patients with anomalous pulmonary vein drainage (ADLV) before and after surgical correction of the malformation.

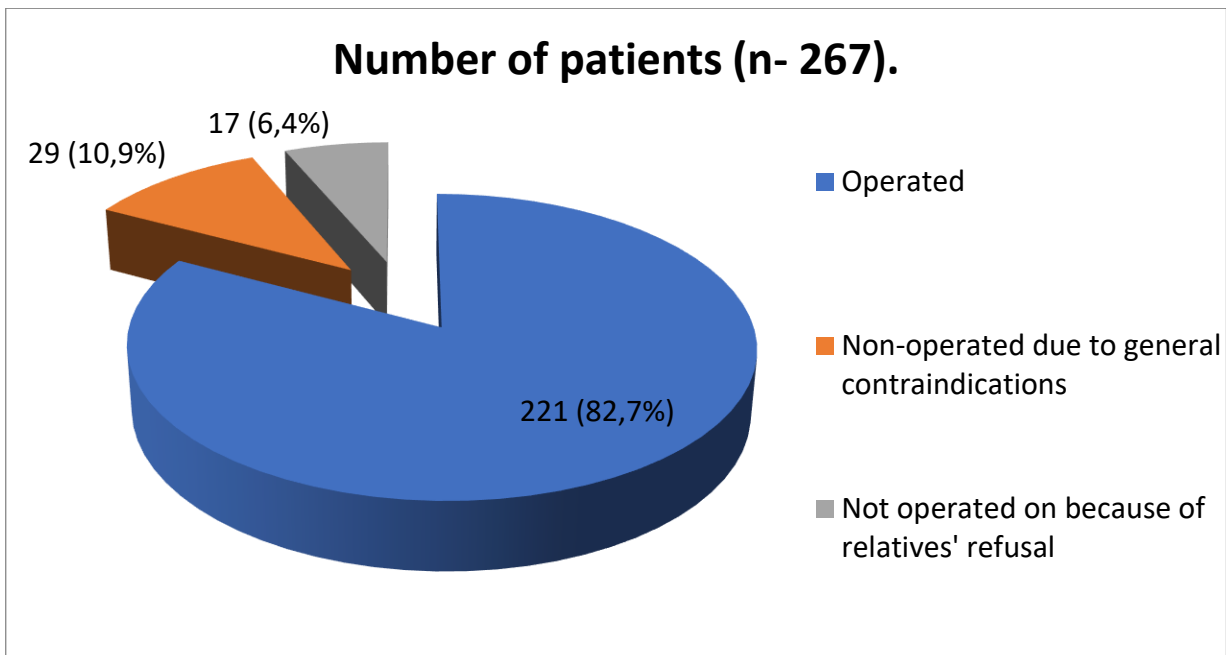
**Keywords:** congenital heart disease, abnormal pulmonary vein drainage, echocardiography, evaluation of the results of surgery.

**Introduction.** Application of echocardiography with Dopplerography in the programme of examination of operated patients helps to determine an individual system of rehabilitation measures [1,4,9,14]. The use of methods of mathematical processing and analysis of echocardiograms allows to correct functional indices of left and right heart sections in dynamics before and after the operation [2,3,5,12]. Simplicity and safety, absence of contraindications allow us to recommend this noninvasive method as one of the main methods of investigation in patients with ADLV.

The quality and effectiveness of cardiac surgery correction can be determined by echocardiography, and it is also possible to study the results of surgery, in the nearest time, which determine the reliability of indicators of the appropriateness of a particular method of surgical treatment [6,7,8,9,11,13]. Studies on the results of surgical treatment of ADLV in the literature are covered in single scientific papers and most often in a small number of observations. In most cases, they are investigated together with other research methods. [5,10].

**Purpose of the study:** to investigate the dynamics of echocardiographic parameters after surgical treatment of anomalous pulmonary vein possession.

**Materials and methods of the study:** In the department of CHD surgery of the State Institution RSNPMCH named after Acad. V. Vakhidov and in the cardiac surgery department of ASMI 267 patients were observed for - ADLV from 2001 to 2021. Surgical correction of the malformation was performed in 221 (82.7%) patients; the majority of them were operated on in the V. Vakhidov RSNPMCH. Acad. V. Vakhidov (Fig. 1).



**Figure 1. Distribution scheme of patients with ADLV**

Among the operated ADLV patients, 109 (49.3%) were men and 112 (50.7%) were women. The age of the patients ranged from 1 month to 45 years, averaging  $13.3 \pm 0.26$  years (Table 2.1).

Echocardiographic study was performed on ultrasound Doppler-echocardiograph "Toshiba" (Japan) and on Logiq-P6 device "General Electric Healthcare" (USA) and included one- and two-dimensional scanning of heart structures. The obtained echocardiographic data were analysed in the form of absolute values and their ratio to the norm (in %) relative to the patient's body surface area. The data recommended by N.M.Mukharlyamov [5] and E.F.Lukashkina [4] were taken as normal values. All linear parameters of the heart before and after the operation were studied.

All 221 (100%) operated patients before correction and in 208 (94.1%) patients in different terms after the operation echocardiographic study was performed. In addition, contrast echocardiographic study was performed in 17 patients. The following parameters were measured: 1) end-systolic and end-diastolic size of the left ventricle; 2) end-systolic and end-diastolic size of the right ventricle (RV); 3) left ventricular (LV) volume indices were calculated on the basis of the obtained data [4,5,14].

Echocardiography also allows to determine the integrity of the cardiac septa. An atrial septal defect (ASD) in patients is often combined with an abnormal pulmonary vein depression, which can be detected only by transesophageal echocardiography. Transesophageal echocardiography is a highly sensitive investigation method for identification and localisation of the VSD and can also be effective in detecting abnormal pulmonary vein drainage into the EPO or into the right atrium [4,5,12]. Thus, all patients had a PADD, the presence of which is vital in all patients with total anomalous pulmonary vein drainage (TADLV), that is, the severity of the patient directly depends on the size of the PADD.

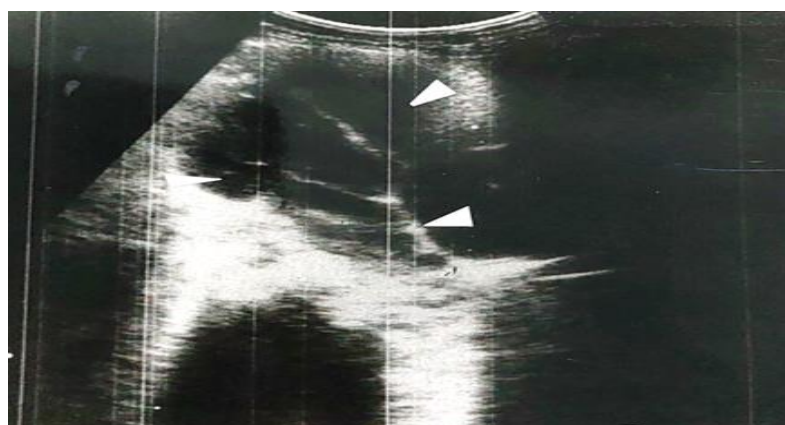
Analysing our own material, we tried to evaluate the adequacy of the performed operation on the basis of EchoCG. For this purpose, the echocardiographic picture was considered before and at different terms after the operation. Doppler echocardiography of the heart is a very valuable method in assessment of the immediate results of patients with ADLV. In comparison with preoperative echocardiographic criteria, the following results were obtained in the immediate postoperative period

Thus, there was a decrease in the linear size of the right heart, disappearance of volume overload; signs of left heart enlargement appeared; and in patients with TADLV there were signs of left atrial overload. The majority of patients had increased ejection fraction (109% of normal), stroke volume (110% of normal) and cardiac index ( $3.94 \text{ l/min/cm}^3$ ). Myocardial contractility in 73.7% of patients was within normal limits. EchoCG measurements of pressure in the heart cavities indicated that after the operation

in the nearest terms the pressure in the right heart cavities immediately starts to decrease, but not to normal values; this proves that pulmonary hypertension in ADLV often has hypervolemic character. The data of postoperative echocardiography prove that in the nearest postoperative period the sizes of the right sections decrease, however, the dynamics is insignificant. A gradual increase in the size of the left heart sections is revealed; the indices of myocardial functional capacity increase. Dopplerographic study revealed no pathological flows, and complete integrity of the interatrial septum was established in all patients (Figure 2 a.b).



**Fig 2.a. EchoCG of patient X, 12 years old, preoperatively, incompleteness of the atrial septum, dilated right heart of the atrial septum, dilated right heart.**



**Fig 2.b. EchoCG of the same patient, 10 days after surgery, fullness of the atrial septum, reduced LV, enlarged left heart.**

Thus, the examination of the patients in the nearest time after ADLV correction revealed the following results: in 198(89.5%) good, in 10(4.5%) satisfactory and in 13(5.9%) unsatisfactory

**Conclusions:** it should be emphasised that good and satisfactory results were obtained in those patients who had I and II degree of pulmonary hypertension before surgery and, importantly, the operated patients were under 18 years of age. Thus, complex echoCG made it possible to evaluate the effectiveness of ADLV correction in the immediate postoperative period taking into account the changes in the size of heart cavities and intracardiac haemodynamics. The improvement of echocardiometric data and the degree of reduction of pathological cardiac parameters corresponded to the severity of the malformation and the severity of haemodynamic disturbance in the small circle of circulation. The obtained results testify to the necessity of studying the long-term results of the operation to find out the effectiveness of this or that method of ADLV correction, however, the results of our studies prove once again that surgical correction of ADLV is quite justified, as it returns health to many patients.

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