

## Introduction

Ventricular septal defect (VSD) is a common congenital heart disease. Open surgical repair with cardiopulmonary bypass (CPB) and sternotomy is the classic treatment.

Percutaneous device closure is a minimally invasive alternative in treating selected VSDs, but it is limited by vascular access as well as radiation exposure especially in pediatric patients. Hybrid perventricular device closure of VSDs was designed to combine the advantages of both approaches allowing direct access to the defect without CPB[2-5].

## Objective

We report our experiences and midterm results of transthoracic device closure of VSDs without cardiopulmonary bypass (CPB) in infants before to one year of life, with occluder of various types  
Conduct a statistical analysis of techniques for correcting defects of the interventricular septum:  
Perventricular \ CPB .

The main task is to analyze the results perventricular closing of the observation stages:

1. Operation.
2. Postoperative period.
3. Evaluation of long-term results.

## Materials and Methods

In the department of surgery of congenital heart diseases of the federal center of cardiovascular surgery Astrakhan from 2014 to 2017 were operated 50 patients with VSD with use of a method of perventricular closing of defect without use of artificial blood circulation under control of TEE.

Age of patients - from 2,1 to 11,8 months  $\pm$ 8,6.  
Of which: children under 6 months of age - 9 (30%)

Body weight - from 3,9 to 9,8, kg. $\pm$ 8,4.

Defects size from 4,5 to 8,5 mm.

Localization: the subaortal – 17(34%) cases, in aneurism – 10(20%) cases, subtrikuspidal – 16 (32%) cases, muscular-7(14%) cases.

The Qp/Qs index from 1,6 to 2,5.

Size of used occluder: from 5 to 9 mm.

CHF of patients of the I-IIb FC on NYHA.

High pulmonary hypertension - 4 children (more than 70% of systemic blood pressure.)

## Periventricular closing of VSD

The child referred for hybrid procedure is prepared for a classic cardiac procedure under general anesthesia in a routine fashion, with extracorporeal circulation ready Fast and safe start bypass in case of conversion.

Small subxiphoid incision made a good cosmetic result.



Type of the VSD occlusion device ( MemoPart Occlusion Device; Lepu Medical Tehnology, Shanghai Shape Memory Alloy Co., Ltd., Shanghai, China.)

The results of TEE are decisive in the choice of the type and size of the occlude:  
Defect diameter + 1 (2) mm - for peremembranous VSD  
Defect diameter + 2 mm - for muscular VSD  
The choice of an occluder with a diameter larger than the diameter of a VSD of 2 mm is dangerous because of the development of the AV block.

Symmetry -32 (64%).  
SQFDQ II - with symmetrical discs for peremembranous VSD.



Asymmetry-11 (22%).  
SQFDQ II - asymmetric occluder with an elongated upper edge of the left disk for closing subaortic VSD.



Muscular - 7 (14%).  
SQFDQ I - with an elongated neck for closing muscle VSD.



## Results

### Intraoperative data

Done	53 attempts, successfully 50
Duration of procedure	28 - 68 min. (on average 40 min.).
Blood loss	0,6-4,3 ml/kg $\pm$ 1,1.
Intraoperative shunt (TEE)	from 1 to 2 mm at 12 patients (24%)
Frequency of conversion	3 (6%) it is connected with underestimation of the sizes and localizations of defect. (converted to bypass).

There were no intraoperative rhythm disorders.

### Postoperative period.

Mechanical ventilation	2-12 hours $\pm$ 4,1
Mean hospital stay	6,73 $\pm$ 2 days
Cardiotonic support	10-21 hours $\pm$ 2,3 (4 patients with pulmonary hypertension)
Postoperative shunt (TTE) .	from 1 to 2 mm at 11 patients (22%). Freedom from shunts in 3 months of 90%, the tricuspid, aortic and mitral regurgitation didn't exceed 0-1 degrees.
Valve incompetence	
Rhythm disorders	One patient has late complete atrioventricular block two month after operation with implanted pacemaker.

### Evaluation of long-term results.

The group of follow-up of long-term follow-up (3 months-2 years) - 25 children.

Freedom from residual shunts 1-2mm. after the closure of peremembranous VSD:

3 months - 4 children (8%)

1 year -1 child (98%)

Hemodynamically insignificant residual discharges 1-2 mm. were observed in patients with muscular defects - 2 (93%).

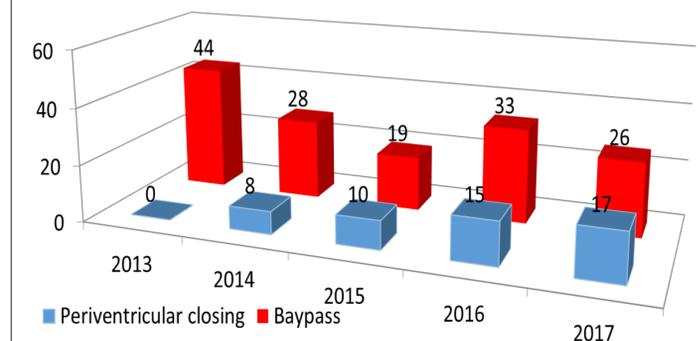
Freedom from rhythm disturbances - 98%.

Absence of deformations of the thoracic cage in the long-term postoperative period.

## Conclusion

The technology of perventricular closing of VSD suitable for the different anatomical localization. Provides less trauma good cosmetic effect, fast rehabilitation of patients, takes a certain place in surgical treatment of VSD along with traditional techniques (with use of artificial circulation, transkateter closure). [1,6].

### Statistics of methods for correcting VSD 2013-2017: Perventricular \ CPB



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