

Original method of posterior aortoplasty for aortic valve replacement in cases with narrow aortic ostium

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132 patients with isolated aortic valve disease with narrow aortic ostium who underwent surgery in the Institute from 1 May 2009 to 01 Jan 2019 are included in the study group. Among 132 patients, 6 died at the hospital stage (hospital mortality – 4.5%). There were no negative remarks to the surgical technique in any case. Changes in echo data during the hospital stay: systolic pressure gradient across the left ventricular outflow tract (LVOT) before operation was 105.1 ± 11.5 mmHg, with 25.9 ± 4.1 mmHg on the aortic prosthesis upon discharge. Reconstruction of the root and ascending aorta according to the proposed method in cases of aortic hypoplasia and aortic valve replacement (AVR) is highly effective intervention.

The purpose of this research is to study possibilities of a new approach to the reconstruction of the root and ascending aorta in AVR.

Key words: narrow aortic ostium, dilatation of the root and ascending aorta, aortic valve replacement, cardiopulmonary bypass.

The problem of the aortic ostium enlargement during aortic valve replacement is relevant. These operations are accompanied with an increased risk of bleeding, heart failure. At the same time, implantation of small-diameter prostheses is accompanied with increased mortality, poor long-term outcomes. The technique of posterior aortoplasty described in this work has shown its high efficacy both during hospital stay and in the long-term period.

The purpose of this research is to study possibilities of reconstruction of the aortic ostium and ascending aorta (RAOAA) during aortic valve replacement (AVR) in patients (pts) with a narrow aortic ostium.

Material and methods. 132 patients with isolated aortic valve disease and narrow aortic ostium who underwent surgical treatment in the department of acquired heart diseases in the Institute from 01 May 2009 to 01 Jan 2019 are included in the study group. There were 74 males (55.7%) and 58 females (44.3%). The age of patients varied from 23 to 72 years (average 54.5 ± 9.7 years). 23 (17.3%) patients belonged to functional class III of heart failure according to the NYHA classification, 109 (82.7%) – to class IV. The main aetiological factor of the disease was rheumatism and its combination with lipoidosis. Aortic valve calcification, degree 3+, was observed in 122 (92.3%) patients. In two cases, aortic root plasty was performed after previous aortic valve replacement and in two cases – after open aortic valvotomy. In 27 (20.4%) patients, mitral valve disease was corrected by mitral valve replacement.

Aortic valve replacement in combination with reconstruction of the root and ascending aorta was performed in all cases according to the original method of posterior aortoplasty (V.V. Popov). The method essence consists in the

following: after the start of cardiopulmonary bypass and aorta clamping, the ascending aorta is dissected by slanting incision with the continuation to the fusion of the coronary and non-coronary cusps with the following dissection of the fibrous annulus to the depth of up to 5 mm. After that the second incision of the aorta with the continuation to the fibrous annulus and with displacement to the right fibrous trigone (Fig. 1, 2).

The aorta between the fusion of coronary and non-coronary cusps is dissected. The aortic valve cusps are dissected too. Aortic prosthesis is sutured with the help of 13-15 U-shaped sutures in a ventricle-aortic position, including 7-8 sutures in the non-coronary cusp projection which were implanted with the help of 2-0 Prolene through a Vascutek synthetic patch of 4x3 cm in size. Dissection of the ascending aorta was closed with a patch fixed by 4-0 Prolene and strengthened along the edges with teflon stripes. Bileaflet prostheses (Carbomedics, Saint Jude Medical, On-X, bio-prostheses) were implanted in sizes: 21 mm (16 patients), 23 mm (113 patients), and 25 mm (3 patients).

All operations were performed in the setting of cardiopulmonary bypass and moderate hypothermia (32°C). Myocardial protection was performed in the setting of retrograde pharmacological cardioplegia using Custodiol solution in combination with external cooling of the heart.

Blood loss in 124 (94.2%) operations was within 450 ml. In 23 (17.3%) patients, donor blood and its components were not used during the whole period of operation and further postoperative period.

Results and discussion. Among 132 patients, 6 patients died (4.5% hospital mortality) during the hospital period (30 days after operation). Causes of death include: brain

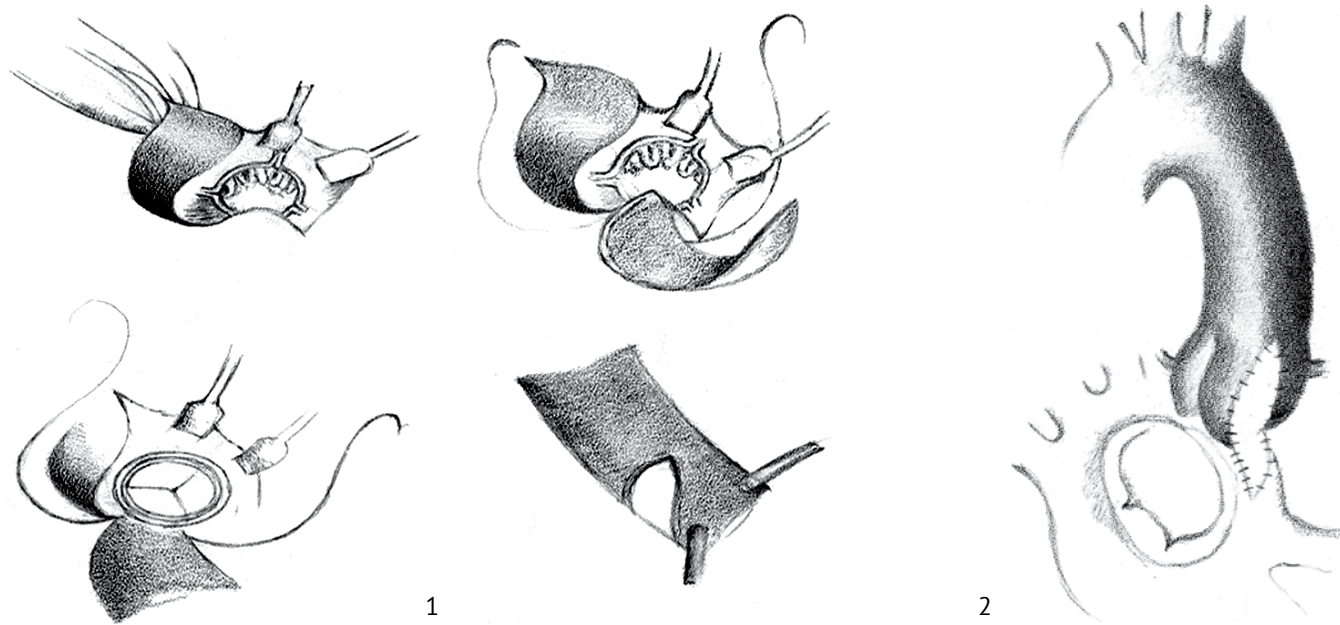


Fig. 1, 2. Stages of posterior aortoplasty

damage (1), MOF (1), cancer intoxication (1), coagulopathy (1), thromboembolism of the pulmonary artery (1), heart failure (1). During the last 4 years no hospital mortality was reported ($n=38$). There were no negative remarks to the surgical correction. Inotropic support (dobutamine) during the early postoperative period was $3-4 \mu\text{g}/\text{min}/\text{kg}$ during the first 48 hours. Postoperative artificial pulmonary ventilation was on average 8.5 ± 2.4 hours. Stay in the intensive care unit was within 73.5 ± 3.45 hours. Patients were discharged on average on day 13-14 after operation without clinically significant complications. Changes in echo data during the hospital period: systolic pressure gradient across the left ventricular outflow tract before operation was 105.1 ± 11.5 mmHg, with 25.9 ± 4.1 mmHg on the aortic prosthesis upon discharge, end-systolic index (ml/m^3) before operation was 57.3 ± 7.4 and 48.3 ± 5.5 after operation, left ventricular ejection fraction was 0.46 ± 0.03 (before operation) and 0.54 ± 0.05 (after operation).

Conclusion. In cases of concomitant aortic valve disease, aortic ostium hypoplasia is serious problem and is associated with high hospital mortality [1–5]. It is associated with frequent development of cardio-vascular failure, because implantation of a small-diameter aortic valve prosthesis causes development of a high transprosthetic gradient and progressing heart failure [2–6]. Absence of LV hypertrophy regression causes conditions for dangerous arrhythmia both during the hospital stay and in the long-term period. Quality of life, survival, stability of good results are not high in this group.

At the same time reconstructive procedures on the aortic root (posterior aortoplasty) with the aim of its widening

and implantation of a prosthesis of the appropriate size during aortic valve replacement are associated with high risk of blood loss, despite this it allows radically improving morphometric indexes and quality of life in the long-term period [6–16]. Reconstruction of the ascending aorta root in aortic valve replacement is a highly effective procedure providing good direct results. The method diminishes a possibility of bleeding from the correction zone and development of clinically significant heart and circulatory insufficiency. It allows improving significantly haemodynamics, contractility, morphometric indexes of the left heart chambers by implantation of an aortic prosthesis of the appropriate size and excluding mismatch in the postoperative period.

It is important to study middle- and long-term results of the proposed method.

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Оригінальний метод задньої аортопластики при протезуванні аортального клапана при вузькому гирлі аорти

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Метою цієї роботи є дослідження можливостей реконструкції гирла аорти і висхідної аорти під час заміни аортального клапана у пацієнтів із вузьким устям аорти. У досліджувану групу було включено 132 хворих із вадами аортального клапана та вузьким коренем аорти, прооперованих в Інституті з 01.05.2009 р. до 01.01.2019 р. Протезування аортального клапана та розширення гирла і висхідної аорти проводили в усіх випадках за оригінальною методикою, згідно з якою розріз аорти проводили всередині некоронарної стулки, а потім до центрального фіброзного тіла правого трикутника на глибину до 5 мм. Висікали сегмент аорти шириною 1 см у проекції некоронарної стулки. Латка Vascutek 4x3 см імплантувалася від основи некоронарного синуса і висхідної аорти. Цей спосіб дозволив імплантувати протез адекватного діаметру в аортальну позицію.

Запропонована методика знизила ризик інтраопераційної кровотечі та зменшила загальну крововтрату. У 17,3% (n=23) пацієнтів компоненти донорської крові не були використані протягом усього госпітального періоду. При виконанні цієї методики не було відзначено випадків значущої серцевої недостатності в ранньому післяопераційному періоді.

З-поміж 132 оперованих 6 (4,5%) пацієнтів померли під час госпітального етапу (30 днів). Жоден летальний випадок не був пов'язаний з хірургічною технікою. За останні 4 роки не було загиблих на госпітальному етапі (n=38/0). Піковий систолічний градієнт на вихідному тракті лівого шлуночка перед операцією становив 105,1+11,5 мм рт. ст., а на протезі клапана при виписці – 25,9+4,1 мм рт. ст.

Реконструкція вузького гирла аорти і висхідної аорти під час протезування аортального клапана за запропонованим методом задньої аортопластики є високоефективним втручанням.

Ключові слова: протезування аортального клапана, вузьке гирло аорти, реконструкція кореня аорти, штучний кровообіг.