

Experience of Successful Surgical Correction of Paraprosthetic Mitral Valve Fistula

Turgunov A. I.¹, Aliev Sh. M.², Kasimov A. L.¹, Turgunov B. A.¹, Mansurov Sh. Sh.¹, Mamadiev X. M.¹

¹Andijan State Medical Institute, Andijan, Uzbekistan

²The Republican Specialized Scientific and Practical Medical Center for Surgery named after Academician V. Vakhidov, Uzbekistan

Abstract The authors of this scientific article present a case of successful surgical correction of paraprosthetic fistula of the mitral valve. For adequate and complete elimination of paraprosthetic fistula of the mitral valve, a method of plastic surgery with a xenopericardial patch was used. This method allows to reduce intraoperative complications and the risk of re-formation of paraprosthetic fistula. To diagnose paraprosthetic fistula of the mitral valve, it is necessary to use informative and high-tech research methods (MSCT, EchoCG), which make it possible to perform timely correction of paraprosthetic fistulas. This method may be promising, but further improvement of the surgical technique is required, as well as a study of the remote results of repeated operations.

Keywords Paraprosthetic mitral valve, Surgical correction, Heart valve diseases, MSCT, EchoCG

1. Introduction

Every year in the world valve replacement hearts is being carried out approximately 210 thousand patients. As the number of operations increases, so does the number of prosthesis dysfunctions due to valve-dependent complications. One of them is paraprosthetic fistulas.

It is believed that the formation of paraprosthetic fistula non-infectious genesis in most cases, it is associated with technical errors during the initial operation. Frequency their occurrence, according to literature data, ranges from 3 to 12.5% [1]. At the same time, hospital mortality still remains quite high. high - from 11 to 25% [1]. There is no consensus regarding the dependence of the frequency of fistula formation on localization. Some authors indicate that the formation of paraprosthetic fistulas is happening more often V aortic positions (4.9%), how V mitral (2%) [2]. Other researchers have found no differences in the incidence of of this complications at sick With mitral and aortic prostheses. After mitral valve replacement (MV), fistulas most often form in the area septal cusp, due to the fact that the surgeon, fearing to involve the aortic valve cusp in the stitch, can capture less tissue. In the aortic position, the fistula is more often localized in the region of the left coronary and non-coronary cusps: the reason is the fear of involving the septal cusp of the mitral valve in the stitch. In addition, a certain role is played by the desire to avoid injuries atrioventricular node. When using MK prosthetics, it is

especially dangerous areas, adjacent To external and internal commissaries, So How V these areas of the coronary arteries are maximally approached To fibrous ring. Hence, overlay deep sutures in these areas of the fibrous ring increase the risk of damage to the coronary arteries, What Maybe bring To lethal from the course on operating table. Frequency this formidable complications makes up 1-3%. State fibrous rings plays an important role role V emergence paraprosthetic fistulas. Presence of valve calcification With transition on fibrous the ring is predisposing factor for education paraprosthetic regurgitation in the postoperative period. Imposition seams on calcified areas of the fibrous ring may lead to damage to the suture material. To prevent this complication, it is necessary to carry out careful decalcification before suturing the fibrous ring. However, it should be noted that What radical decalcification may lead to damage to the fibrous rings And anatomical formations located in close proximity from him, A Also walls left ventricle (LV) with subsequent bleeding, formation aneurysms or defect interventricular partitions.

Besides calcinosis fibrous rings predisposition To education a pair of prosthetic fistulas is observed in the presence of degenerative changes fabrics fi broznogo rings, characteristic For valve prolapse and Marfan syndrome, with sharp changes in valve structures, rupture of chords, weakness of the fibrous ring.

The reliability of the prosthesis attachment is significantly reduced if it is incorrectly selected. size. Implantation prosthesis a smaller size causes tension on the fixing sutures, and a prosthesis that is too large injures the endocardium, leading to tears And hemorrhages - V In both cases there is a risk of fistula formation [4].

Also, the cause of fistulas may be poor quality of suture material, incorrect placement of sutures or insufficient number of sutures [3].

Mainly the formation of paraprosthetic fistula is happening V first months after operations [5]. TO indications For repeat operations relate detection fistulas And progression cardiac insufficiency as a result increases left sections hearts, availability hemolysis. The question of reoperation should be decided strictly individually, depending on the degree and rate of increase of signs of circulatory failure [1,2,3].

Currently, in most cases, clinically significant paraprosthetic Regurgitation is eliminated surgically using the method of complete correction of the fistula, but the risk of recurrent fistula formation and complications associated with it is significantly higher than the risk of treating paraprosthetic fistulas by plastic surgery using a patch - an alternative treatment method introduced into clinical practice relatively recently. In the domestic literature, we did not find reports on the closure of paraprosthetic fistulas with a patch, in connection with which we present our own observation - a clinical case of successful closure of a paraprosthetic fistula of the mitral valve using this method.

2. Clinical Case

We present a case of clinical observation: Patient H., 59 years old (case history No. 1789/1126), was hospitalized on June 23, 2022 Department of Cardiac Surgery of the Altai State Medical Institute on a planned basis with the diagnosis: **Main:** "Chronic rheumatic heart disease. Mitral heart defect. Condition after the operation of closed commissurotomy of the mitral valve (2002), prosthetics of the mitral valve with the biological valve Epic TM Supra Valve #29 (2021).

Complications: CHF stage II B. FC III according to NYHA. AF paroxysmal form. Paravalvular 3rd degree

regurgitation. State of acute cerebrovascular accident with left-sided hemiparesis (2021).

Associated diseases: Type 2 diabetes mellitus, moderate severity in the decompensation stage. Nodular goiter.

Upon admission, she complained of palpitations, shortness of breath and a feeling of lack of air, occurring with little physical exertion and at rest, thirst, loss of appetite, rapid fatigue, general weakness and decreased ability to work. It was established that the patient had been suffering for several years, was treated in a hospital and outpatient setting, and was also under the supervision of a cardiologist, cardiac surgeon, neurologist and endocrinologist at her place of residence. In recent years, the patient was treated by a neurologist and endocrinologist and was also under dispensary supervision. From the anamnestic information, the patient underwent ZMK in 2002, mitral valve replacement in 2021, thrombectomy from the left atrium. Recently, the general condition of the patient gradually began to deteriorate, and complex treatment measures did not lead to a noticeable improvement and were not crowned with success. Despite the intensive complex treatment measures, the above-mentioned subjective sensations progressively increased and did not tend to decrease. In this regard, the patient was hospitalized in the specialized department of cardiovascular surgery of the ASMI clinic. Upon admission, the general condition of the patient was assessed by us as severe due to the increase in heart failure. The patient's motor activity is reduced, the skin is pale with periodic cyanosis. Respiratory rate is 20-25 times per minute. Auscultation reveals harsh breathing in the lungs. Heart sounds are muffled and the borders of the heart are dilated. Heart rate is 143 beats / min. Pulse 125-130 beats / min. Hepatomegaly, liver + 3 cm from the edge of the costal arch. Spontaneous diuresis is 1-1.5 liters per day. A comprehensive examination was carried out in the clinic using instrumental and laboratory research methods.

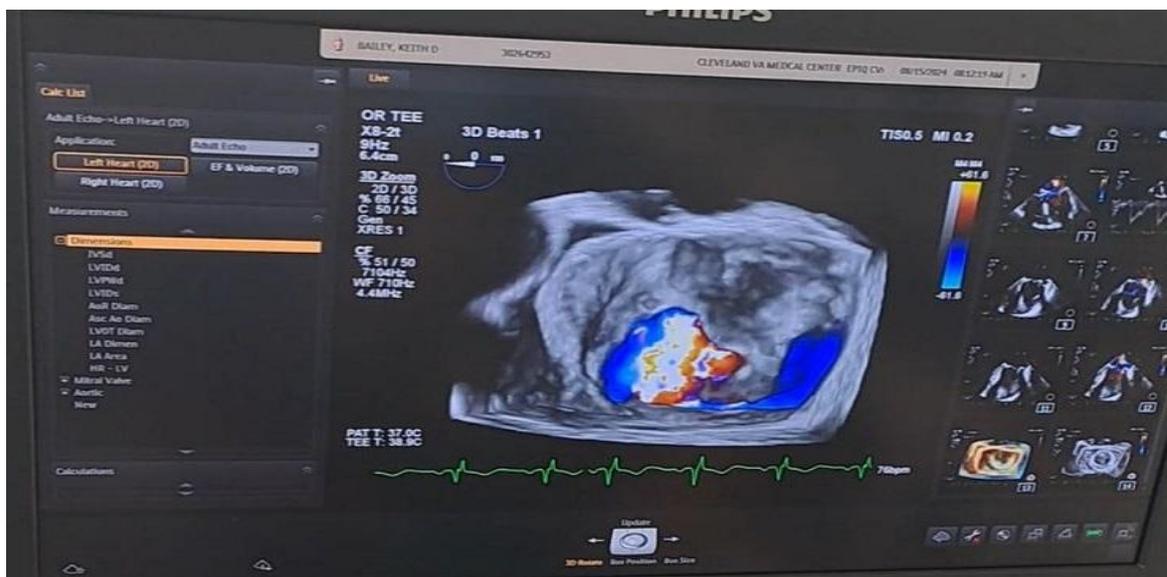


Figure 1. Paraprosthetic fistula in transesophageal echocardiographic examination

In transesophageal EchoCG: biological valve functions, paravalvular fistula is detected around the mitral valve A 1, A 2. Dilatation of the left atrium. No left ventricular hypokinesia was detected, myocardial contractility is preserved. No separation of pericardial leaflets. EDV-150 ml, ESR-51 ml, EF-57%. Condition after repeated mitral biological valve replacement surgery. Paravalvular 3rd degree regurgitation. 3rd degree tricuspid valve insufficiency (Fig. 1).

ECG: atrial fibrillation. Heart rate - 110-145 beats / min. Incomplete right bundle branch block. Metabolic changes.

With Holter ECG monitoring: within 20 hours and 45 minutes, atrial fibrillation was detected. Average heart rate 72 beats/min. Maximum heart rate 143 beats/min., minimum heart rate 55 beats / min. Longest phase - 1516 ms. A total of 42 supraventricular extrasystoles were detected during the day. The longest period consisted of 9 contractions. No significant ST segment shift was detected.

Results of the coronary examination: the LCA and RCA systems are patent throughout their entire length, without hemodynamically significant stenosis.

Chest X-ray revealed signs of cardiomegaly, venous congestion in the lungs, darkening of the costophrenic angle with left-sided moderate hydrothorax.

Ultrasound results: moderately diffuse liver changes with hepatomegaly due to the right lobe (venous congestion). Thickening of the gallbladder wall with signs of dyskinesia.

Laboratory examination of the general blood test: hemoglobin - 81 g/l, erythrocytes - 3.9×10^{12} /l, leukocytes - 6×10^9 /l, ESR - 45 mm/h, hematocrit - 30%, platelets - 196×10^9 /l.

biochemical blood test showed urea level of 16 mmol / l, creatinine of 117 mmol / l, total bilirubin of 18.0 mmol / l, ALT of 17.8 mmol / l, AST of 18.7 mmol / l, blood glucose of 7 mmol / l. Coagulogram: PTI-106%, fibrinogen according to Rubert - 3996, thrombotest-5-6 Art.

When examining urine analysis: protein-traces, leukocytes: 8-9-10 in the field of view, epithelium: 10-12-13 units.

In the clinic, taking into account the progressive deterioration of the patient's general condition, as well as taking into account the results of clinical and instrumental research methods and the ineffectiveness of conservative treatment methods, it was decided to perform an operation to correct the paraprosthesis fistula of the mitral valve using a newly developed method. In this regard, after appropriate preoperative preparation of the patient in On July 5, 2022, an open surgical operation was performed to correct a paraprosthesis fistula.

Under general endotracheal anesthesia, the patient underwent surgery on July 5, 2022 - correction paraprosthesis fistula by the method **“Plastic of paraprosthesis fistula with xenopericardial patch”** (operation protocol No. 548).

Under general endotracheal anesthesia, longitudinal sternotomy was performed. The pericardium was opened. There was an adhesion process in the pericardium. The heart was isolated in stages, the ascending aorta and then the right atrium and diaphragmatic surface. Then, cannulation of the aorta, cannulation of the superior and inferior vena cava were performed. Start of artificial circulation. Clamp on the aorta,

antegrade crystalloid pharmacological cardioplegia. Atriotomy was performed, left suction was inserted into the left atrium. Opening of the right atrium and interatrial septum. Fistula revision: biological valve No. 29 was identified. (Fig. 2).

A large fistula was visualized at site A2, and calcification was also detected along the edges of the fistula. The site of calcification formation was directed toward the fibrous ring of the aorta, so the fistula was closed with a 2.5x2.6 cm xenopericardial patch. (Fig. 3).

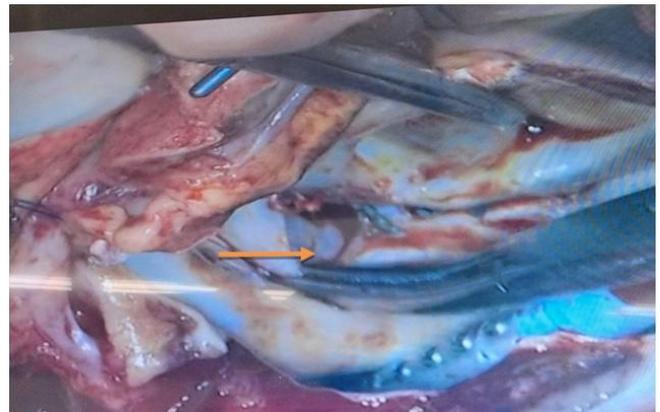


Figure 2. Intraoperative photographic drawing fistulas mitral valve

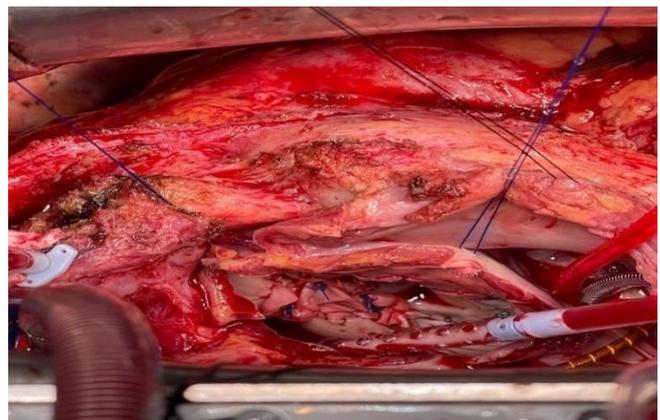


Figure 3. Closing paraprosthesis fistulas mitral valve using a xenopericardial patch

The function of the prosthesis is satisfactory. Suturing of the interatrial septum wall. Prevention of air embolism. Suturing of the right atrium wall. The clamp was removed from the aorta. Exit from artificial circulation without any peculiarities. An electrode is sewn onto the right ventricle. Wound hemostasis. Mediastinal drainage. Sternum suturing with #7 stylus, wound sutured layer by layer. Aseptic dressing.

In the early postoperative period, the patient's condition stabilized and she was transferred from the intensive care unit to the department. In the early postoperative period, an echocardiogram was performed in dynamics, and the ejection fraction (EF) of the left ventricle was 60%. The patch was completely sealed. Peak gradient 8.7 mm.p.t.st., average - 6.2 mmHg Reser not found on the patch.

The patient was discharged from the hospital in satisfactory condition. The patient was examined 3 and 6 months after the operation and her condition was assessed as satisfactory.

Currently, the duration of observation after correction of paraprosthetic mitral valve fistula using patches is 2 years. No negative dynamics in the patient's condition have been noted.

Correction of the paraprosthetic fistula with a patch was the least safe solution for the patient in this clinical case, which allowed improving the condition and avoiding complications in the postoperative period.

3. Conclusions

Thus, for correction of paraprosthetic fistula there are a number of contraindications, these are such as How availability infective endocarditis, valve thrombosis and the risk of prosthesis detachment. When a large paravalvular fistula is detected and calcification occurs around the fibrous ring of the valve after its excision, there is little surrounding material left to perform fistula correction by suturing the edge of the fistula into the cuff of the mechanical valve. For adequate and complete elimination of this situation, it is recommended to use the method **“Plastic with a xenopericardial patch”**. Using this method, it is possible to avoid intraoperative trauma to dangerous surgical areas, while the application of strong sutures in such clinical situations creates significant technical difficulties. The use of the plastic method with a xenopericardial patch can prevent these technical difficulties and thereby reduce the risk of re-formation of a paraprosthetic fistula. In repeated heart surgeries, MSCT allows one to assess the degree of adhesion formation and a more accurate anatomical location of the fistula, as well as the formation of calcifications around the fibrous ring of the valve. An integrated approach to solving such clinical situations can significantly reduce the risk of developing intraoperative complications using MSCT and transesophageal EchoCG.

In general, this case of clinical observation indicates that the diagnosis and surgical treatment of paraprosthetic fistula in repeated operations seems to be quite complex due to the risk of intraoperative complications, as well as the repeated risk of formation of paraprosthetic fistula. In terms of diagnosis

of paraprosthetic fistula of the mitral valve and the purpose of improving the quality of technical stages of repeated surgery, it is necessary to use informative and high-tech research methods in the preoperative period (echocardiography, transesophageal EchoCG and MSCT), which make it possible to perform timely and adequate correction of paraprosthetic fistulas. The use of plastic surgery with a xenopericardial patch for paraprosthetic fistula using high-tech diagnostic methods in combination may be a promising method, but further improvement of the surgical technique is required, as well as a study of the remote results of repeated operations.

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