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CLINICAL CASE
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Specificity of long-term management of a woman patient of reproductive age after surgical mitral valve repair against the background of infective endocarditis

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As a clinical case, we present the "portrait" of a woman patient with acquired mitral valve (MV) defect against the background of infective endocarditis which was diagnosed during the third trimester of pregnancy. The patient underwent mitral valve replacement surgery with biological prosthesis "KemKor" followed by two successful deliveries. In 18 years after the correction of the mitral valve defect, she developed valve prosthesis dysfunction therefore, she underwent endovascular transcatheter implantation of bioprosthesis by method "prosthesis-into-prosthesis" in the mitral position.

This clinical case is unique in terms of the reasoning the biological prosthesis choice to correct acquired MV defect in a patient of reproductive age, the long-term period of the bioprosthesis functioning and the correction of further developed valve dysfunction using the techniques of transcatheter implantation.

Keywords: heart valve bioprosthesis, mitral valve, infective endocarditis, prosthesis-into-prosthesis.

Relationships and Activities: none.

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Key messages

- This clinical case demonstrates the uniquely long period of the biological mitral valve prosthesis functioning in a woman patient of reproductive age against the background of infective endocarditis.
- The use of the techniques of transcatheter implantation by the method "prosthesis-into-prosthesis" to correct the heart valve dysfunction.

The prevalence of acquired heart defects in general population is from 2 to 5%, with regular increase in the frequency of their detection with age [1]. The mitral valve (MV) lesion which can occur as isolated or combined defect, is one of the main causes of interventions in cardiosurgery. The traditional methods of treating MV defects is valve replacement or plasty under conditions of artificial blood circulation [2].

According to the data of Russian researches, the proportion of patients with an infectious lesion of MV requiring surgical correction, increased by 2 times over the period from 2015 to 2020 [3, 4].

Infectious endocarditis (IE) in pregnant women occurs quite rare (0,006% of cases) [5], has mainly a secondary nature and subacute course, develop on the valves which are initially damaged by rheumatic process, or in congenital valve defects, and is usually detected in III trimester of pregnancy [6].

In case of the presence of a MV defect requiring surgical correction in women of reproductive age, the implantation of biological prostheses (BP) of heart valves with low thrombogenicity is the most preferable due to the absence of the need for lifelong anticoagulant therapy (ACT). This allows not to increase the risk of uterine bleedings during pregnancy and childbirth, and also to carry a healthy baby [7]. However, low durability of BP xenogenic tissue further leads to severe valve dysfunction. Xenogenic tissue of the prosthesis undergoes calcification which is accompanied by infiltration of recipient cells with subsequent repopulation and remodeling of valve structures [8, 9].

Currently, the search of the causes of BP dysfunction continues. This is important from the view of the modification of the BP dysfunction risk factors, that will allow to prolong the time of the prosthesis functioning. There are several theories of the dysfunction formation — natural aging (wearing) of BP, prosthesis-related dysfunctions (fatigue strength, bioinertness, resistance to mineralization), recipient-associated factors (modified/unmodified), prosthetic endocarditis. But recently the role of the traditional for atherosclerosis risk factors of BP dysfunction — dyslipidemia, obesity — has been actively discussed. It is known that adipose tissue is a source of pro-inflammatory mediators (interleukin-16, tumor necrosis factor-alpha), and in this regard, obesity can contribute to the limitation of the valve service life too [10].

In repeated surgical interventions for the correction of prosthesis dysfunction, the perioperative risks are much higher than in initial valve reconstruction. Therefore, the use of minimally invasive approaches for the correction of prosthesis dysfunction is actively discussed. Endovascular MV replacement is an alternative method of treatment in patients with high surgical risk including patients who have already undergone MV prosthetics under conditions of artificial blood circulation [11].

The present clinical case demonstrates a long period of BP life in a young woman patient of reproductive age as well as the use of transcatheter technologies to correct the dysfunction of the prosthesis that has occurred.

Description of clinical case

A woman patient L. consulted a cardiologist for the first time in 1998 at the age of 21 years, being on 7th month of pregnancy, after a respiratory viral infection. In that period for the first time the patient developed the symptoms of heart failure (HF) (complaints of shortness of breath during physical activity (PA) (NYHA III), increased fatigue). The patient had not had any cardiovascular diseases before. Of concomitant diseases she had autoimmune thyroiditis (compensated) and mild chronic iron deficiency anemia.

IE with MV lesion was diagnosed — the rupture of the anterior mitral leaflet with formation of severe regurgitation (degree IV) and the presence of mobile vegetation on the posterior leaflet. The patient was followed up by a cardiologist, cardiosurgeon and gynecologist during the entire pregnancy; in 39th week of pregnancy she delivered a healthy baby by caesarean section, and further she was actively treated for HF with suppression of septic process in cardiosurgical department. After discharge from the hospital, the patient continued to be monitored by a cardiosurgeon with dynamic echocardiographic (EchoCG) examination. In 2000, 2 years after delivery, the patent underwent MV replacement surgery with BP "KemKor-30" (epoxytreated). The choice of the valve prosthesis was agreed with the patient and was caused by her desire to have children in the future. After the operation, the symptoms of HF regressed and PA tolerance (PAT) restored at a high level. It should be noted that at the time of surgical intervention performance, the patient`s weight was 46 kg with the height of 168 cm (body mass index (BMI) =16,3 kg/m^2).

In 6 months after surgical intervention, against the background of good functioning of the prosthesis, the absence of cardiac rhythm disturbances and HF symptoms as well as other indications for the use of ACT, indirect anticoagulant phenylin was cancelled.

In 2001 and 2002, the patient had unplanned pregnancies despite she used barrier methods of contraception. The pregnancies were terminated by medical abortion. In 2002 (2 years after the operation), the patient had her 4th pregnancy. At that time

Table 1

Parameters of transthoracic EchoCG in the dynamics from 2013 to 2022

Parameters according to EchoCG data	06.2013	07.2014	09.2015	12.2016	2017	2018	05.2019	09.2019	03.2020	03.2020 after surgery	03.2020 before discharge	10.2021	08.2022	11.2022
Trans-prosthetic regur-gitation (degree)	II	II	II	II	II	I-II	II-III	III-IV	III (according to TO EchoCG III-IV)	0-I	I	0-I	I	I
OA LV (cm^2)	2,3	3	–	2,7	2,5	2,3	2,6	2,7	1,8	1,6	1,75	1,65	1,7	1,5
Vmean (cm/sec)	114	120	128	131	136	146	134	165	124	108	152	122	176	163
Vmax (cm/sec)	165	180	–	210	–	229	192	–	244	161	194	207	222	214
Pmax (mm Hg)	11	13	–	18	–	21	15	–	24	10,4	15	17	20	18
Pmean (mm Hg)	6	6,2	7	8	8	9	8	12	8	5,2	10	7	13	11
LV EF (%)	70	72	72	78	75	72	74	79	85	64	66	69	71	67
LA (cm)	3,6	3,6	3,8	3,6	3,9	3,7	3,8	4,3	4,5	–	4	4,2	4,1	4,1
LV EDV (ml)	108	88	97	135	108	113	102	130	124	88	88	124	102	66
LV ESV (ml)	32	25	27	30	27	35	27	27	18	32	30	38	30	22
LV SV (ml)	76	63	70	105	81	81	75	103	106	56	58	86	72	44
RVOT prox. (cm)	2,2	2,4	2	2,2	2,1	1,9	1,6	2,2	2	–	–	1,5	2,5	2,9
RA (4AC) cm×cm	4,2×4,2	3,6×4,1	4,2×4,9	4,1×4,5	4,4×4,5	3,7×4,4	4,2×4,3	4,1×4,3	3,9×5	–	4,3×4,6	4,7×4,8	4,2×5,0	4,3×5,3
PAPsyst (mm Hg)		25	28	22	30	28	28	55	60	20	45	34	38	41
PAP mean (mm Hg)	12	15	–	–	–	–	–	–	–	–	–	23	26	26
Degree of regurgi-tation on TV	–	–	–	–	–	I	–	II-III	I	0-I	–	I	I	I

Abbreviations: RVOT prox. — proximal size of the right ventricular outflow tract, PAPsyst/mean — systolic/mean pulmonary artery pressure, EDV — end-diastolic volume, ESV — end-systolic volume, LV — left ventricle, LA — left atrium, MV — mitral valve, RA — right atrium size, TV — tricuspid valve, SV — stroke volume, TO EcoCG — transoesophageal echocardiography, EF — ejection fraction, EchoCG — echocardiography, OA — orifice area, Vmean — mean mitral valve flow velocity, Vmax — maximum mitral valve flow velocity, Pmax — maximum transmitral gradient, Pmean — mean transmitral gradient.

the examination results showed no contraindications for pregnancy. During the entire pregnancy, the patient was monitored by a team included cardiosurgeons, cardiologists and obstetricians-gynecologists. In 2003 she delivered a healthy baby by caesarean section.

After delivery the patient underwent annual control examination in particular to exclude the disorder of BP function. The patient`s state remained stable, PAT was high, shortness of breath and heartbeat in PA did not worry her.

In 2010, 10 years after MV replacement, transthoracic EchoCG revealed moderate degenerative changes in the form of thickening of prosthetic valve leaflets. This is natural and expected process for BP heart valves. In dynamic examination of the patient, the EchoCG parameters met to the criteria of the normal function of the prosthetic valve, however, a moderate decrease in the effective orifice area, the increased mean diastolic gradient and blood flow velocity on the BP were observed (Table 1).

At 34 years of age (2011), the patient became pregnant for the fifth time, and despite informing her about the risks of prosthetic complications, taking into account >10 years functioning of the prosthesis, the patient wished to carry the pregnancy. During the entire pregnancy she was under observation, and neither cardiac rhythm disturbances or HF

symptoms were noted. The patient`s coagulogram parameters were within normal values, and there was no need to prescribe her an additional ACT.

During pregnancy, there was noted the increase in sizes and volumes of the left cardiac chambers due to an increased volume of circulating blood and increased pre-loading. On the 8th week of pregnancy, as a result of the mechanism described above, the central regurgitation on MV BP occurred. By the time of the delivery transprosthetic regurgitation increased by 2 times. There were no significant changes in the indicators of blood flow velocity and diastolic gradient on the prosthetic valve during pregnancy, that reflected a good functional condition of the prosthesis (Table 1). Thus, the morphological and functional parameters of cardiac remodeling underwent physiological changes throughout pregnancy.

During the pregnancy the patient gained 7 kg in weight. The pregnancy proceeded against the background of mild anemia of a pregnant woman, with the courses of taking iron medications. A term healthy boy was born by caesarean delivery. According to the data of control EchoCG performed before the discharge, intracardiac hemodynamics has returned to normal with a decrease in the regurgitation on MV BP up to I degree.

The dynamic EchoCG examination in the period from 2011 to 2013 showed transprosthetic regurgitation of II degree, and the areas of thickening of the prosthetic valve leaflets (Table 1). PAT remained sufficient. Since 2014 a moderate MV BP dysfunction has been revealed; the regurgitation on the prosthesis was close to II degree (directed obliquely), and the dynamics showed the growth of pressure gradient on MV. In May 2019 a planned EchoCG detected a moderate dysfunction of BP; transprosthetic regurgitation on MV has increased up to moderate-severe (II-III degrees) (Table 1).

It is important to note that since 2013 the patient has begun to gain in weight, and by 2019 her weight was 78 kg (the weight gain was 32 kg from the time of the surgical intervention), BMI was 27,6 kg/m^2.

Starting from September 2019, the patient began to complain of palpitations both at rest and PA, interruptions in the work of the heart, the appearance of inspiratory shortness of breath when walking with acceleration, climbing to the 2nd floor. EchoCG showed an increase in orifice area of MV, non-uniform leaflets with the areas of thickenings on BP, severe transprosthetic regurgitation — up to III-IV degree, the increase in the velocity of transmitral flow and in pulmonary artery pressure compared to May 2019г (Table 1). The physical examination showed — heart rate 90 beats/min, systolic-diastolic murmur at the point of MV auscultation, BMI =28,9 kg/m^2. According to electrocardiography — sinus rhythm, single ventricular extrasystole; according to multispiral computed tomography with angiopulmonography — no data for pulmonary embolism. Laboratory examination revealed mild iron deficiency anemia (hemoglobin 111 g/l; hematocrit 34,6%; red blood cells 4,27*10^{12}, ferritin 80 μg/l, iron level 5,8 μmol/l), hyperbilirubinemia 27,1 μmol/l (direct bilirubin 12,2 μmol/l; indirect bilirubin 14,9 μmol/l).

Taking into account increasing BP dysfunction and HF progression, collegially with a cardiosurgeon and roentgenendovascular surgeon, a decision on the need to correct the dysfunction of the prosthesis was made. In a high surgical risk, endovascular MV prosthesis is a method of treatment alternative to "open surgery" and is suitable in particular for patients who have already undergone MV prosthetics under conditions of artificial circulation (techniques "prosthesis-into-prosthesis"). Open re-replacement of implanted biological MV, especially in individuals with severe concomitant pathology, is associated with high lethality [11]. To assess morphometry of BP and interatrial septum (IAS) and to detect the additional factors (calcinosis etc) with the aim to consider the possibility of endovascular MV reimplantation, in November 2019 the patient underwent multispiral computed tomography of heart with contrast and electrocardiographic synchronization, which detected calcifications at the periphery of the MV BP [11, 12]. Taking into account a high surgical risk of repeated open intervention — EuroScore II — 5,6% (at the time of examination, the age of the patient was 43 years, the patient had pulmonary hypertension (systolic pulmonary artery pressure was 55 mm Hg), functional class III according to NYHA, cardiosurgical intervention in the anamnesis), due to patient`s refusal from a repeated intervention on an open heart under conditions of artificial blood circulation and from lifelong ACT, at that moment a decision was made to perform a planned transcatheter endovascular MV prosthetics (prosthesis-into-prosthesis) with application of endovascular constructions used for the aortic valve prosthesis.

As a medical treatment, it was recommended to take: acetylsalicylic acid 75 mg, pantoprazole 20 mg 1 time/day, torasemide 5 mg in the morning, metoprolol succinate 12.5 mg in the morning, ivabradine 5 mg 2 times/day, spironolactone 25 mg in the lunch time, oral iron drugs.

In March 2020 the patient was admitted to the hospital for a planned surgical treatment.

In March 12, 2020, under conditions of roentgen operating room, endovascular implantation of transcatheter valve Edwards SAPIEN XT 26 mm was performed in the mitral position (prosthesis-into-prosthesis) using right transfemoral approach. The

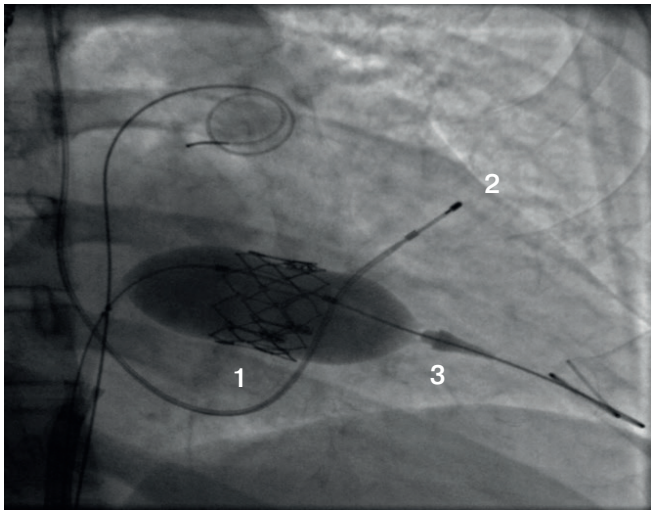

Figure 1. Transcatheter endovascular implantation "Edwards SAPIEN XT 26 mm" in mitral position (prosthesis-into-prosthesis) 2020. Full balloon inflating of the implanted prosthesis in the MV position.
Note: 1 — the straightened frame of the prosthesis, 2 — the electrode of the pacemaker in the right ventricle; 3 — the delivery system.

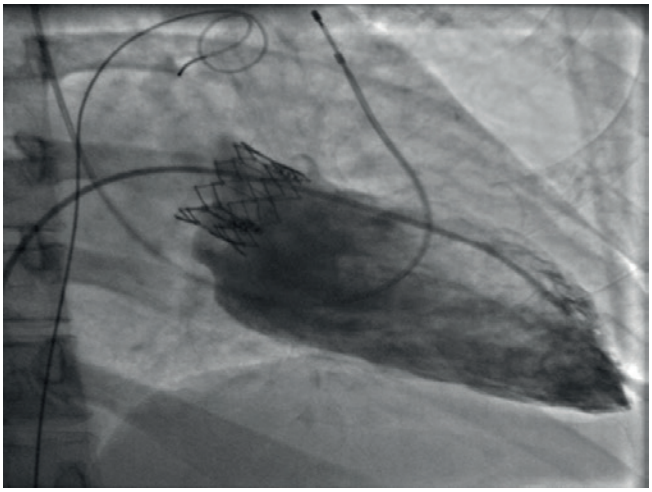

Figure 2. Competent work of the implanted transcatheter valve Edwards SAPIEN XT 26 mm in the MV position using the technique prosthesis-into-prosthesis.

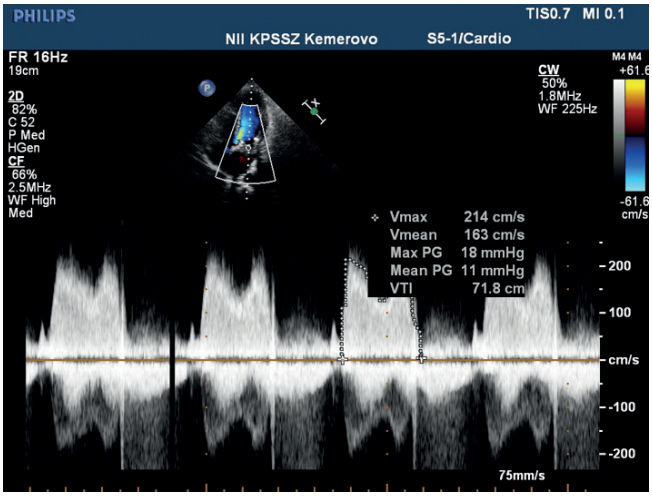

Figure 3. Velocity indicators and pressure gradient on MV (November 2022).

course of the operation: using right jugular approach, the electrode of the temporary pacemaker was installed into the right ventricle. Under conditions of artificial lung ventilation with the use of intravenous anesthesia, puncture access was provided (common femoral vein). Transseptal puncture was performed, through the left atrium and prosthesis in the mitral position the first super-rigid conductor was installed, in the left atrium the second conductor was installed, a balloon catheter with a diameter of 10 mm, then 16 mm was installed along the conductor, and IAS pre-dilation was performed. The attempts to pass with the conductor through IAS and BP in the mitral position were technically difficult (due to rigidity of IAS), the introducer was installed into the common femoral vein 18F, under conditions of ultra-frequent stimulation (180 per minute), the Edwards SAPIEN XT balloon-expandable transcatheter valve with a size of 26 mm was positioned into the position of the BP in the mitral position with a volume of liquid in a high-pressure syringe of 24 ml (Figures 1, 2).

Postoperative EchoCG control from 12.03.2020 — there is a correct position of the valve, no atrioventricular conduction disorders and compromise of paravalvular structures; peak and mean gradient, the degree of regurgitation and blood flow velocity of MV diminished (Table 1). The data of multispiral computed tomography from March, 17, 20202, before the discharge: the state after transcatheter MV implantation (prosthesis-into-prosthesis), the prosthesis is installed in MV position, diameter up to 24 mm, height ~19,5 mm. There is a IAS defect, up to 4,5 mm in width.

The patient was discharged in a stable condition, she had no any complaints; the medications recommended: torasemide 10 mg, warfarin 2,5 tablets (6,25 mg) under the control of an international normalized ratio (target values 2,5-3,5) for 3 months, spironolactone 25 mg in the morning and lunch time, ivabradine 5 mg 2 times/day. The patient was regularly observed in the cardiology dispensary polyclinic.

29 months after the surgical intervention (August, 2022), she once again consulted the doctors of the cardiology center, complaining of reduced PAT, the occurrence of heaviness in the precardial region and shortness of breath in PA (NYHA III).

The additional examination showed the hemoglobin level 92 g/l, ferritin — 78 μg/l, iron level in blood — 7,8 μmol/l. The EchoCG data — the prosthesis function is satisfactory, transprosthetic regurgitation is of 0-I degree, Vmax — 214 cm/sec, Vmean — 163 cm/sec, Pmax — 18 mm Hg, Pmean — 11 mm Hg on MV, stroke volume of the left ventricle (LV) — 44 ml, LV ejection fraction — 67%, LV end-diastolic volume — 66 ml, LV end-systolic volume — 22 ml, discharge into the right atrium through the IAS defect is 0,15 cm (Figure 3). Transoesophageal EchoCG from November, 01, 2022 — no data for degenerative changes of the prosthesis. Thus, the EchoCG data allowed to assume the development of prosthesis-patient mismatch in the patient, without any structural changes on the bioprosthesis.

Bioimpedance analysis was performed: weight — 79 kg, height 168 cm, the content of fat in the body is higher than in norm — 36% (N<32%), percentage of water content in the body 41% — below the norm (N 45-60%), muscle mass 43,9% — the norm, physical development 2 — indicates obesity; bone mass 2,3 kg — the norm, the level of visceral fat in the body 8 — the norm.

Since December 2021, the patient started taking combined oral contraceptives according to the recommendation of a gynecologist due to abundant *mensis*, which was accompanied by a decrease in hemoglobin to 87 g/l. The patient herself associated the worsening of her condition with taking hormonal medications since when they were canceled, she noted a positive tendency (she herself canceled the use of combined oral contraceptives in April 2022).

After the consilium, taking into account the satisfactory function of the prosthesis, the reduction of the patient's weight, compensation for existing anemia and subsequent dynamic monitoring were recommended. Upon discharge from the hospital, hemoglobin has increased in dynamics and was maintained at the level of 115 g/l against the background of taking iron drugs (iron (III) hydroxide polymaltosate 100 mg 2 times/day) for 10 days.

The patient was discharged from the hospital with the clinical diagnosis:

Acquired valve defect. Replacement of MV by BP "KemKor" from 2000. MV prosthetic dysfunction, insufficiency (severe transprosthetic regurgitation, degree II-III). Transcatheter endovascular implantation "Edwards SAPIEN XT 26 mm" in the mitral position (prosthesis-into-prosthesis) from 2020. Defect of IAS. Tricuspid valve insufficiency, degree I. Ventricular extrasystole, gradation III according to Lown. Chronic HF, stage IIA. Pulmonary hypertension. Functional class II.

Concomitant diseases: autoimmune thyroiditis, euthyroidism. Chronic gastritis, remission. Chronic iron deficiency anemia of mild severity.

Recommendations for taking medications are given: acetylsalicylic acid 75 mg in the morning, bisoprolol 5 mg in the morning, ramipril 2,5 mg in the evening, spironolactone 25 mg in the morning, torasemide 2,5 mg in the morning. It is recommended to compensate for iron deficiency anemia by course taking of iron drugs (iron (III) hydroxide polymaltosate 100 mg 2 times/day) for 2-3 months, monitoring of total blood count, iron and ferritin levels in dynamics after 1 month, gynecologist consultation, weight loss, annual transthoracic echocardiography, observation by a cardiologist in a place of residence.

Discussion

There are the data indicating that the risk of BP dysfunctions correlates with age and the dysfunctions more frequently occur in young patients. The study performed by Astapov D.A., et al. [13] established that the implantation of BP in younger age is associated with more likelihood of an adverse outcome in dynamic monitoring. It seems, the reproductive age of women is one of a small number of exclusions used as an argument for the implantation of BP in young individuals. The period of normal functioning of heart valve BP is within the limits of 8-15 years but there are the observations of a longer period of BP service life without the signs of its dysfunction [14-16].

The publication of Kondyukova N.V., et al. from 2015 [17] described a case of MV re-replacement with the use of BP to a young man, where at 33 years of age the patient developed hemodynamically significant mitral regurgitation (degree IV) against the background of IE, and he underwent xenoaortic BP "KemKor-32" implantation. At that moment, the choice of the prosthesis was caused by the presence of sinus rhythm, the possibility of refusal from lifelong anticoagulant treatment, and the presumed resistance of the prosthesis to calcium degeneration. However, after the surgical intervention, due to satisfactory well-being and low compliance, according to the patient, he did not visit a cardiosurgical clinic to control the function of BP during 11 years. 11 years later, due to an increase in HF symptoms, the patient came to the clinic where the BP dysfunction was revealed and then he underwent the re-replacement of MV with implantation of BP "Uniline-28" with the use of implantation technique "valve-in-valve". In this case there were no prosthetic complications due to the chosen type of implanted valve because BP does not require lifelong anticoagulant treatment and monitoring the effectiveness of medi-

cal hypocoagulation. A personalized approach is needed to choose an implanting prosthesis, taking into account a patient compliance too, because this affects the long-term prognosis, patient life quality and the reduction of the risk of prosthetic complications.

In the case of our patient, when in 2019 the BP dysfunction was detected, to determine the further tactics, the scale EuroScore II was calculated; taking into account the presence of pulmonary hypertension (systolic pulmonary artery pressure — 55 mm Hg), cardiosurgical intervention in the anamnesis, NYHA III functional class and the patient`s age of 43 at the time of the examination, the risk according to EuroScore II was 5,6%. And also due to patient`s refusal from "open" surgery and lifelong taking warfarin in mechanical valve implantation, the decision was made to perform the planned transcatheter endovascular MV replacement (prosthesis-into-prosthesis) with application of endovascular constructions used for aortic valve replacement.

Low-traumatic technique of re-replacement has a number of advantages over traditional repeated surgical intervention due to the preservation of the fibrous rings. In favor of the preferred use of BP was a long period of the previous valve functioning (19 years). While choosing a type of prosthesis, it is also necessary to consider the opinion of a potential recipient upon condition of his full awareness about possible risks of the use of this or that valvular prosthesis.

As for the frequency of the repeated operations on prosthetic valves according to the study of Chiang YP, et al. [18], the patients with BP more frequently underwent re-implantation due to prosthetic valve dysfunction compared to mechanical valves. It was showed that 15-year total frequency of repeated operations in the group of patients with BP significantly prevails over the number of re-operations in the group of patients with mechanical prostheses (12,1% vs 6,9%, respectively). But for the patients with BP, the lower likelihood of the development of bleedings (6,6%) is typical compared to the patients with mechanical prostheses (13%) [19].

Currently, the influence of dyslipidemia on the rate of the progression of calcification and degenerative changes in BP valves is investigated [20-23]. For example, in the study of Farivar RS, et al. [20], the patients who developed calcium-associated dysfunction of xenovalves, had an increased level of cholesterol in blood. The study of Mahjoub H, et al. [22] established an increase of the ratio ApoB/ApoA-1 which reflects the qualitative composition of pro-antiatherogenic lipoprotein particles, as an independent factor of BP degenerative changes. Thus, there are the complicated, mutually-mediated interactions between prosthesis and recipient, which affect the BP function. A change in patient`s body physique may affect the prosthetic structural changes and contribute to the progression of its dysfunction.

In case of young reproductive age of a woman patient with acquired MV defect requiring surgical correction, preference is given to BP of the heart valves due to their low thrombogenicity and the absence of the need for long ACT therapy. In turn, the risks associated with the need for ACT therapy are reflected by hemorrhagic complications and possible embryopathy during pregnancy [24]. In this regard, despite the limited service life and the need for repeated operations in future, many specialists are inclined to implantation of valve BP to women of reproductive age [24]. The choice of BP for our patient allowed her to carry and deliver two healthy babies. In addition, the unique period of successful functioning of the BP — 19 years draws attention.

The causes of prosthetic dysfunction can be anatomical and functional; currently, a role of obesity and dyslipidemia in the dysfunction is actively discussed. The study of Kim S, et al. showed that an increase in BMI by one unit is accompanied by an increase in the risk of the chronic HF development in males and females by 5% and 7%, respectively [25]. Obesity itself and resulting increase of body area can cause prosthesis-patient mismatch that is associated with a decrease in survival after MV replacement and with pulmonary hypertension. It is also known that adipose tissue produces adipokines having pro-inflammatory (leptin, interleukins and tumor necrosis factor-α) effects, and with an increase in BMI, adipose tissue starts to become a metabolically dysfunctional phenotype. In this condition adipocytes are forced to produce higher concentrations of pro-inflammatory adipokines which contribute to inflammation and damage to open tissues [26]. Metabolic disorders lead to the processes such as chronic non-specific inflammation and lipid peroxidation which in turn cause calcium degeneration of BP [9].

In our patient, excess body weight occurred before the prosthesis–into-prosthesis implantation, with a dynamic increase in weight almost 2 times since the initial correction of the defect. Additional development of prosthetic calcification and twofold increase of patient`s body weight collectively created the conditions resulted in BP structural changes and appearance of prosthesis-patient mismatch (severe prosthesis-patient mismatch: prosthetic orifice area 1,5/body surface area (1,9) =0,78).

Long existing iron deficiency anemia in the anamnesis also contributed to lower PAT and hemodynamic disorders. Anemia is one more of

the most common causes complicating the course of chronic HF and leading to its aggravation. There are the data indicating that anemia is an independent factor worsening life quality, increasing the risk of repeated hospitalization and mortality in chronic HF [27-29]. It is known that compensation of tissue hypoxia which is developed as a result of anemia occurs with the help of hemodynamic mechanisms. Low hematocrit causes a decrease in blood viscosity and in post-loading, anemia is accompanied by an increase in venous return (pre-loading) that leads to volume overload of heart, and enhanced sympathetic tone results in myocardial contractility and heart rate increase. Due to increased myocardial contractility and heart rate, work overload occurs. These mechanisms lead to myocardial hypertrophy, increasing dilation of heart chambers and development of relative insufficiency of heart valves [30]. Accordingly, the correction of an additional factor such as anemia in this patient is a key moment to compensate the symptoms of chronic HF and to improve life quality.

Currently, there are the alternative to open surgery approaches to correct BP dysfunction [12, 31]. Transcatheter endovascular prosthesis is used for patients with high surgical risk and BP dysfunction, who have already undergone MV replacement under condition of artificial circulation. In this method of surgical correction, transcatheter valves designed for aortic position and specially designed valves are used [11, 12]. The existing register observations in most cases are based on off-label application of SAPIEN valves. The use of a series of SAPIEN constructions initially designed for aortic valves demonstrate good results when they are installed by a method prosthesis-into-prosthesis in interventions on degenerative changed BP in the mitral position [31].

A key aspect in the success of transcatheter prosthesis-into-prosthesis method is a complex assessment of morphometric features of valve, patient`s concomitant pathology, perioperative risk in the use of open or endovascular intervention, and certainly, a detailed planned course of the transcatheter procedure. Thus, transcatheter technologies can become a serious alternative to open surgery for repeated interventions in dysfunction of previously installed prosthetic valves, including those in the mitral position.

The uniqueness of the presented clinical case lies in the long period of MV BP functioning in a young woman, that improved the life quality of the patient and allowed her to successfully carry and deliver two babies. One more childbirth, in turn, contributed progression of transprosthetic regurgitation that required endovascular valve re-implantation "prosthesis-into-prosthesis" 20 years after the initial valve replacement. The persistence of complaints of shortness of breath in PA, insignificant regurgitation after the intervention with prosthesis-into-prosthesis implantation is not a criterion for repeated interventions, however, it requires changes in lifestyle, correction of concomitant anemia and a decrease in the patient's body weight because of the development of the "prosthesis-patient" mismatch.

Conclusion

Thus, the presented clinical case is unique and relevant from the point of view of investigating the course of the disease in women patients of reproductive age who underwent surgical correction of acquired MV defect, whose life quality is improved due to modern diagnostics, correction of therapy and surgical intervention. The use of heart valve BP in this cohort of patients is caused mainly by the absence of the need for ACT therapy that improves the prognosis of childbearing and childbirth. BP installed to the woman patient at the age of 23, for the correction of MV defect of infectious genesis, worked during 19 years, and only 19 years after initial intervention, significant dysfunction of prosthesis occurred, requiring valve re-implantation "prosthesis-into-prosthesis". The long life period of the prosthesis allowed the patient during this time to endure two deliveries against the background of a satisfactory condition. The persistence of insignificant regurgitation after endovascular intervention with implantation "prosthesis-into-prosthesis" is cause by "prosthesis-patient" mismatch against the background of twofold dynamic increasing in patient`s body weight from the time of initial BP implantation and the presence of iron deficiency anemia that requires changes in the life style, decrease in the patient`s body weight and thorough dynamic observation with correction of anemia.

Relationships and Activities: none.

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