

# Implantation of mitral, aortic, and tricuspid bioprostheses due to infective endocarditis with necessary reimplantation of the bioprosthetic aortic valve



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## Abstract

The patient was admitted to the Department of Cardiac Surgery of the J. Strus City Hospital in Poznan due to infective endocarditis involving the aortic, mitral, and tricuspid valves. Implantation of three biological valve prostheses proceeded without complications. Starting on day 23, the patient's general condition deteriorated, with high fever. Despite postoperative antibiotic therapy, transesophageal echocardiography revealed the presence of vegetation on the bioprosthetic aortic valve. On the 46<sup>th</sup> day after the initial surgery, the patient required replacement of the aortic bioprosthesis, which exhibited the presence of numerous vegetations. The bioprosthetic mitral and tricuspid valves were not affected by the degenerative process. On the 12<sup>th</sup> day after the reimplantation of the bioprosthetic aortic valve, the patient was discharged from the hospital in good general condition.

**Key words:** infective endocarditis, valve bioprosthesis implantation.

## Introduction

Infective endocarditis (IE) is a disease caused by infection of the inner layer of the heart wall, i.e., the endocardium. It develops in the heart valves (most frequently in the aortic valve), ventricles, and atria [1, 2]. Infective endocarditis related to an implanted foreign body (a stimulator electrode or a cardioverter-defibrillator) should also be mentioned when discussing this matter [3]. Congenital heart defects, previous rheumatic diseases, and mitral valve prolapse syndrome constitute factors predisposing to IE [1, 2]. Individuals dependent on intravenous drugs or subjected to medical procedures requiring long-term vascular access (chronic hemodialysis, chronic parenteral nutrition, prolonged intensive care unit (ICU) stay) are at risk of developing IE [4, 5]. Infective endocarditis simultaneously affecting the left and right side of the heart occurs in approximately 1–5% of cases [6]. Patients after artificial valve implanta-

## Streszczenie

Pacjent został przyjęty do oddziału kardiochirurgii Wielospecjalistycznego Szpitala Miejskiego im. J. Strusia w Poznaniu z powodu infekcyjnego zapalenia wsierdza obejmującego zastawkę aortalną, mitralną oraz trójdzielną. Operacja polegająca na implantacji trzech biologicznych protez zastawkowych przebiegła bez powikłań. W 23. dobie stan ogólny pacjenta się pogorszył, towarzyszyła wysoka temperatura. Pomimo zastosowania pooperacyjnie antybiotykoterapii w przezprzetykowym badaniu echokardiograficznym stwierdzono obecność vegetacji na bioprotezie zastawki aortalnej. W 46. dobie po pierwotnej operacji pacjent ponownie trafił na salę operacyjną w celu wymiany bioprotezy zastawki aortalnej, na której obecne były liczne vegetacje. Bioproteza zastawki mitralnej i trójdzielnej nie były objęte procesem degeneracyjnym. W 12. dobie po ponownej implantacji bioprotezy zastawki aortalnej pacjent w stanie ogólnym dobrym został wypisany z oddziału. **Słowa kluczowe:** infekcyjne zapalenie wsierdza, implantacja protez zastawkowych.

tion are at an especially high risk of IE. Prosthetic valve endocarditis (PVE) constitutes 10–40% of the total number of IE cases [1, 2, 7]. This paper presents the case of a patient requiring implantation of aortic, mitral, and tricuspid valve bioprostheses as a result of IE and reimplantation of the aortic valve bioprosthesis on the 46<sup>th</sup> day after the initial surgery due to IE recurrence.

The aim of this study is to present the case and assess the treatment results of a patient requiring implantation of three valve bioprostheses due to IE; the procedure was complicated by the necessity to replace the aortic valve prosthesis because of PVE.

## Case report

A 19-year-old patient was admitted to a toxicology ward with significant sleepiness and unclear speech in the middle of a drinking bout which had lasted for the previ-

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ous 3 months; he had been addicted to alcohol for the past 5 years as a result of – as he claimed – mitigating the symptoms of Tourette syndrome. After several days, the patient started exhibiting clinical symptoms of pneumonia with rapid deterioration of his general condition; he required intubation and continued mechanical ventilation. Echocardiographic examination revealed the presence of numerous vegetations on the heart valves. The patient was transferred to the intensive care unit of the Józef Struś City Hospital in Poznan. After admission, he was intubated, mechanically ventilated, and sedated with a continuous infusion of midazolam and fentanyl. Transthoracic echocardiography (TTE) revealed grade 4 mitral insufficiency, the presence of 1.2 × 1.6 cm vegetation on the anterior cusp with rupture of the tendinous cords of this cusp, and vegetation 1.0 cm in length on the posterior cusp. The cusps of the aortic valve exhibited features of marginal thickening with the presence of vegetation and grade 1 insufficiency. The tricuspid valve was insufficient with a grade 1 central regurgitation jet and suspected vegetation. Empiric antibiotic therapy was applied (imipenem, vancomycin, clindamycinum), even though bacteriological analysis of venous blood, urine, and bronchial secretions showed them to be sterile. Dental consultation revealed the presence of numerous inflammatory foci in the oral cavity, which resulted in the extraction of 8 carious teeth. After 7 days of antibiotic therapy, due to the presence of mobile vegetations on the valves and the associated risk of embolization, the patient was transferred to an operating room at the cardiac surgery ward. The surgical procedure was performed using extracorporeal circulation (ECC) via a median sternotomy. The ascending aorta was cannulated; venous cannulas were placed in the caval veins via the right atrium. After aortic cross-clamping and the administration of a crystalloid cardioplegic solution into the coronary ostia, the right ventricle was opened, and the tricuspid valve was removed. Subsequently, the interatrial septum was incised, and the bicuspid valve was removed; the aortic valve was removed through the incision in the aorta. All three removed valves exhibited features of dysfunction in the form of insufficiency, cusp perforation, and vegetation. During the next stage of the operation, single sutures on Teflon pledgets were used to implant the valve bioprostheses: Medtronic Hancock II Porcine 29 in the mitral position, Edwards Lifesciences C-E Perimount 21 in the aortic position, and Medtronic Hancock II Porcine 33 in the tricuspid position. According to the literature, PVE occurs as frequently on biological as on mechanical prostheses [3, 8], but because of the patient's alcoholism and the resulting high risk of non-adherence to anticoagulation therapy, a decision was made to implant biological valve prostheses. Aortic cross-clamping time was 161 minutes, ECC time was 224 minutes, and total surgery time was 340 minutes. The patient was transferred to a recovery room in good general condition, hemodynamically stable, requiring moderate doses of catecholamines. On the third postoperative day, after the mediastinal drains were removed, the intubated and mechanically ventilated patient was transferred to the intensive care unit. Anti-

otic therapy was continued. The cultures from blood (drawn twice) and from all the valves removed during surgery were sterile, but antibiotic therapy was continued regardless. On the 14<sup>th</sup> day of ICU stay, the patient was extubated. On the 23<sup>rd</sup> postoperative day, the patient's general condition deteriorated, with high fever. The patient was transferred to the cardiology ward, where he was diagnosed with sepsis confirmed by numerous bacteriological tests. *Pseudomonas aeruginosa* (> 1000 000 colony forming unit (CFU)/ml) was cultured from the tip of the central venous catheter, urine, and bronchial secretions. Similar results were obtained in the culture tests of peripheral venous blood (drawn several times). Targeted antibiotic therapy was applied with maximum doses of imipenem and Brulamycin. No clinical improvement of the patient's condition was achieved; the fever and weakness did not subside. Transesophageal echocardiography (TEE) revealed the presence of vegetation on the aortic valve bioprosthesis. Computed tomography (CT) of the chest, head, and abdomen as well as X-ray of the chest did not show any features of inflammatory lesions or metastatic abscesses. After echocardiographic examination and cardiac surgical consultations, a decision was made to replace the previously implanted aortic valve bioprosthesis. On the 46<sup>th</sup> day after the initial surgery, the patient was once again transferred to an operating room. After connecting the patient to ECC, aortic cross-clamping, and the administration of cardioplegia to the coronary ostia, the right atrium and the interatrial septum were opened in order to check the condition of the mitral and tricuspid bioprostheses; no vegetation was found. After the aorta was opened, a conglomerate of vegetation was revealed on the non-coronary cusp of the subsequently removed aortic valve bioprosthesis. An Edwards Lifesciences C-E Perimount 21 aortic valve bioprosthesis was reimplanted in its stead. Aortic cross-clamping time was 92 minutes, and ECC time was 140 minutes. The patient was then transferred to a recovery room in stable condition, where he was extubated after 19 hours. Antibiotic therapy was continued. *Pseudomonas aeruginosa* was cultured from the aortic valve bioprosthesis removed during surgery, while bacteriological tests of blood drawn several times in the postoperative period were sterile. On the 12<sup>th</sup> day after reoperation, the patient was transferred in good condition to a cardiac rehabilitation hospital with a recommendation to continue oral anticoagulation for 3 months and antibiotic therapy. Control echocardiographic examination, conducted on the 30<sup>th</sup> day after leaving the cardiac surgery ward, revealed normal function of all the bioprostheses.

## Discussion

The described patient presented with absolute indications for cardiac surgery. The so-called Modified Duke Criteria are applied for diagnosing IE [1, 2, 9]. The criteria are divided into major and minor. The major criteria include positive blood cultures and an echocardiogram supportive of endocardial involvement. The minor criteria include the existence of a heart condition or other causes predisposing

to IE (drug addiction, chronic hemodialysis, prolonged ICU stay), fever over 38°C, vascular phenomena (arterial emboli, septic pulmonary infarcts), and immunological phenomena (Osler's nodes, Roth's spots, glomerulonephritis, hemorrhages). In order to diagnose IE, two major, one major and three minor, or five minor criteria need to be met; however, TEE still remains the conclusive examination, with a sensitivity and specificity of approximately 95%. The patient was in the small group of cases with lesions in three heart valves requiring surgical treatment. The authors have experience in conducting this type of procedure [10]. There were no complications during or directly after surgery. Unfortunately, so-called early left-sided prosthetic valve endocarditis (PVE within the first postoperative year) occurred some days after the operation. Patients reoperated due to PVE constitute 10–40% of all cases of IE [1, 2, 7]. Perioperative mortality in multiple-valve procedures ranges from 6.5% to 9.6% [11]. The risk increases to 15–20% if the multiple-valve defect is caused by IE [6, 12, 13]. In 2013, there were 111 procedures involving three valves in Poland, with a hospital mortality of 13.51% [14]. This is why echocardiographic assessment (mainly TEE) is so important in cases of IE, as a decision concerning the implantation of more than one prosthetic valve is of great importance for the patient.

## Disclosure

Author reports no conflict of interest.

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