



Percutaneous closure of paravalvular leak in the treatment of anemia of mixed etiology in a patient with diabetic complications and chronic inflammation

Magdalena Pelczarska¹, Maciej Lewandowski¹, Jarosław Gorący¹, Andrzej Wojtarowicz¹,
Robert Sabiniewicz², Grzegorz Wójcik^{3,*}, Zdzisława Kornacewicz-Jach¹

¹Department of Cardiology, Pomeranian Medical University in Szczecin, Poland

²Department of Pediatric Cardiology and Congenital Heart Diseases, Medical University in Gdańsk, Poland

³The Establishment of Clinical Interventions and Disaster Medicine, Pomeranian Medical University in Szczecin, Poland

J Geriatr Cardiol 2016; 13: 866–868. doi:10.11909/j.issn.1671-5411.2016.10.006

Keywords: Hemolytic anemia; Infective endocarditis; Mitral regurgitation; Paravalvular leak

Hemolytic anemia after implantation of an artificial mitral valve is a rare but recognized complication of surgery.^[1,2] The presence of paravalvular leak after surgery and the necessity of using oral anticoagulants causes that anemia emerges as a severe and potentially fatal issue.^[3]

Here, we present a case of 51-year-old patient with diabetic foot, nicotine and alcohol dependence treated for recurrent anemia.

In May 2013, the patient was taken to the Internal Medicine Ward because of suspected sepsis. Laboratory tests revealed increased inflammatory markers, features of hepatotoxicity, prolonged clotting times, normocytic anemia (hemoglobin: 7.1 mmol/L). MRI of the head revealed a vast area in the brain enforcing the presence of the stroke changes in sub-acute phase. Based on blood cultures and echocardiographic findings, streptococcal endocarditis with mitral valve destruction was diagnosed. The patient was consulted by a cardiac surgeon and qualified for an urgent mitral valve replacement.

After a treatment with a broad-spectrum antibiotic therapy (ciprofloxacin, cefotaxime, clindamycin, vancomycin and phenoxymethylpenicillin), in July 2013, the surgery of the implantation of a mechanical mitral valve prosthesis was performed (Medtronic ATS 29 mm). The postoperative course was complicated due to the need to use prolonged analog-sedation and mechanical ventilation; there were also several episodes of convulsions. After being discharged from the ICU, the patient was kept in the Department of Cardiac Surgery and then, in the Department of Cardiac Rehabilitation. In October of 2013, he was sent home.

In November 2013, the patient was again hospitalized in

the Department of Internal Medicine due to suspected infective endocarditis on the artificial mitral valve and recurring anemia, requiring transfusion of packed red blood cells (PRBCs, hemoglobin: 5.10 mmol/L).

The transesophageal ultrasound revealed the presence of the paravalvular leak of the mitral valve prosthesis (Figure 1). Conservative treatment was recommended then, and also an exclusion of other potential causes of anemia (especially gastrointestinal bleeding).

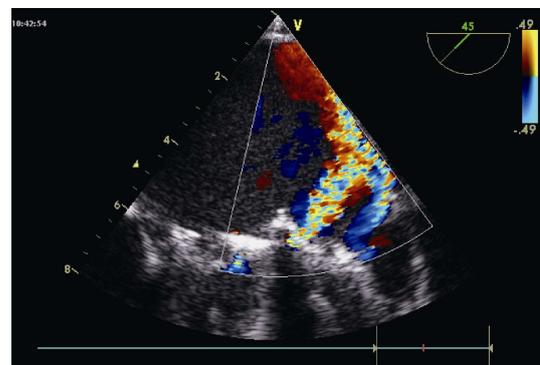


Figure 1. Paravalvular leak of artificial mitral valve prosthesis.

Due to the persistence of anemia, and after exclusion common reasons for it, in March 2014, it was decided to perform the percutaneous closure of paravalvular leak. In preparation for the operation, the transesophageal echocardiography (TEE) was repeated. The study confirmed the presence of paravalvular leak at the posterolateral part of the ring (near the auricle) on a length of about 10 mm, with a maximum width of 3 mm, the opening of the artificial mitral valve was normal, with small waves of “structural” regurgitation, no impairments of left ventricular contractility were observed. Patient was twice hospitalized at the Cardiology

*Correspondence to: grzegorz.wojcik@pum.edu.pl

Clinic with 8 units of PRBCs were transfused, to obtain an improvement in red cell parameters.

During the stay, non-healing ulcers were found in the parts of the plantar forefoot and around the lateral malleolus on the right. In the culture collected from the wound, *E.coli* ESBL⁺ (extended-spectrum beta-lactamases positive) was cultivated. In laboratory tests, there were correct parameters of inflammation and negative blood cultures. After consulting the hospital microbiologist, it was established that inflammation is only a local process and the result is not a contraindication to the planned operation.

In June 2014, a percutaneous closure of the leak was performed, in a typical antibiotic prophylaxis (cefazolin, *i.v.*). Through the right femoral vein, a transseptal puncture was made to access the left atrium. Initially, there was an unsuccessful attempt to enter the left ventricle through the leak. Finally, there was a change in the procedure strategy: a guide and a catheter were introduced transaortally (the femoral access) into the left ventricle, and then into the left atrium through the cavity forming an arteriovenous loop (Figure 2). Subsequently, through the intravenous access, via left atrium, the set Amplatzer Vascular Plug III 14 × 5 mm was implanted (Figure 3) to completely close the leak (confirmed in TEE).

After two months from the procedure (08/2014), in laboratory studies, there could be found persistent moderate normocytic anemia (HGB: 6.3 mmol/L), but not requiring transfusion of PRBCs. The control transesophageal ultrasound showed that the occluder was in the correct location, without paravalvular leak (Figure 4).

The paravalvular leak is the abnormal backflow of blood around the perimeter of the valve prosthesis, between the

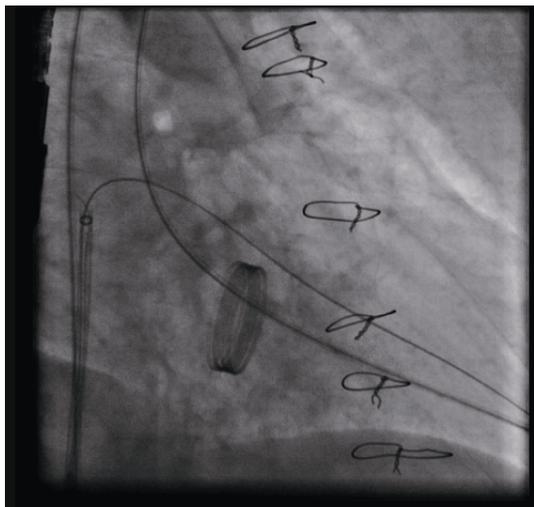


Figure 2. Paravalvular leak closure procedure: arteriovenous loop.

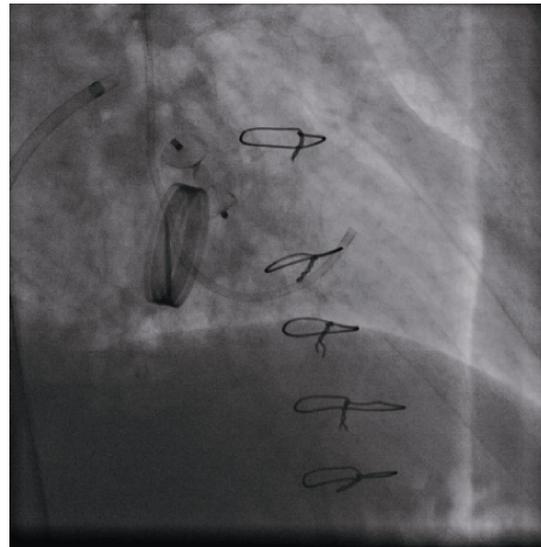


Figure 3. Paravalvular leak closure procedure: final position of the occluder.

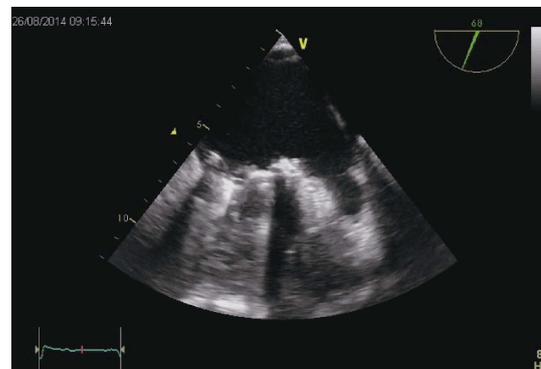


Figure 4. Transesophageal echocardiography: final position of the occluder.

surgical suture and ring of the native valve.^[4,5] It is a rare but serious complication, occurring in patients undergoing implantation of cardiac valvular prosthesis. Its prevalence is estimated at 2%–3%; about 60% occur in the first year after the operation.^[6] About 40% of paravalvular leaks are asymptomatic. Clinical symptoms of mitral paravalvular leaks (PVLs) depend largely on the size of the leak: small PVLs cause hemolysis, while large PVLs are more likely to cause symptoms of heart failure.^[5,6]

In the case of small PVLs without significant hemolysis, the method of choice is the conservative treatment, regular monitoring of laboratory parameters and ultrasound evaluation. In the case of the hemodynamically significant PVL, the method of choice is a cardiac surgery. However, it is burdened with high risk of complications, such as high mortality rate and hospitalization for over 14 days.^[5-8] Paravalvular leak invasive treatment (percutaneous or an opera-

tion) is the method of choice in the case of hemolytic anemia.^[3,4,5,9] Accordingly, more and more attempts are made to close the paravalvular leaks by percutaneous interventions, using an occluder.^[6,9] The advantages of percutaneous treatment include reducing the risk of re-operation, as well as shorter hospitalization. It is especially recommended for patients with multiple chronic diseases, of a worse functional status, as well as in patients affected with the high risk, associated with cardiac surgery reoperation. Also, lack of acceptance of surgical treatment in a patient supports the decision of percutaneous closure. The disadvantages of percutaneous treatment include technical difficulties related to the location of the leak, and thus prolonged procedure and exposing the patient to ionizing radiation and a higher dose of contrast. The negative consequences of percutaneous treatment also include residual paravalvular leak, resulting from the shape of the PVL, embolization of the occluder or thromboembolic complications.^[5,6,9,10] Also, one cannot forget about the local complications in the puncture site, damage of one of the vessels, damage of the structures of the heart, damage of the esophagus during the TEE or life-threatening arrhythmias at the moment of the establishment of the occluder.

Because of the affected medical history, recurrent, symptomatic anemia of mixed etiology (PVL, chronic inflammation, warfarin usage) requiring transfusions of PRBCs, and a high risk of mortality resulting from reoperation, in the described case, it was decided to perform the percutaneous closure of the paravalvular leak. Analyzing the case, one should pay attention to uncontrolled diabetes, which also hindered the healing of ulcers. It is known from the interview that the patient, despite the recommendations, did not follow a diabetic diet, and during stays, due to hyperglycemia, he repeatedly received ad hoc insulin. An additional, extraordinary problem in the patient was a non-healing ulcer of the right forefoot. It is one of the causes of recurrent anemia (particularly with the absence of regular inspection of international normalized ratio), also it is the source of infection, and can cause another infective endocarditis. Particularly important during the procedure was the application of the perioperative protocol of the isolation of the ulcer, a special method of cleaning the wound and the perioperative antibiotic therapy.

It has to be emphasized that the PVL is not the only one

reason for anemia in such patients. The etiology of anemia is mixed and requires cautious investigation and treatment of any component. Invasive treatment of the PVL must be taken into account but only after meticulous diagnosing and treatment of other, more obvious reasons like bleedings, iron deficiency and chronic inflammatory state. Leak elimination improved the anemia only partially because some of reasons cannot be fully corrected.

The presented case shows multiple problems in a treatment of a patient with infective endocarditis. Only an interdisciplinary approach to the patient and the complex care of specialists enables to obtain satisfactory results.

References

- 1 Feld H, Roth J. Severe haemolytic anaemia after replacement of the mitral valve by a ST Jude prosthesis. *Br Heart J* 1989; 62: 475–476.
- 2 Inoue M, Kaku B, Kanaya H, et al. Reduction of hemolysis without reoperation following mitral valve repair. *Circ J* 2003; 67: 799–801.
- 3 Malerba M, Radaeli A, Ragnoli B, Faggiano P. Severe intravascular haemolysis as delayed manifestation of paravalvular leak in patients with mitral valve replacement: a report of two cases. *J Biol Regul Homeost Agents* 2009; 23: 269–272.
- 4 Messer S, Saxena P, Mickelburgh M, et al. Mitral valve replacement in calcified annulus following ring annuloplasty. *Asian Cardiovasc Thorac Ann* 2008; 16: 488–489.
- 5 Świątkiewicz I, Chojnicki M, Woźnicki M, et al. Percutaneous closure of mitral paravalvular leak. *Kardiologia Pol* 2009; 67: 762–764.
- 6 Hein R, Lang K, Wenderlich N. Percutaneous closure of paravalvular leaks. *J Intervent Cardiol* 2006; 19: 73–77.
- 7 Acharya D, McGiffin DC. Hemolysis after mitral valve repair. *J Card Surg* 2013; 28: 129–132.
- 8 Cerfolio RJ, Orszulak TA, Daly RC, Schaff HV. Reoperation for hemolytic, anaemia complicating mitral valve repair. *Eur J Cardiothorac Surg* 1997; 11: 479–484.
- 9 Sivakumar K, Shahani J. Transcatheter closure of paravalvular mitral prosthetic leak with resultant hemolysis. *Int J Cardiol* 2007; 115: 39–40.
- 10 Kulik A, Labinaz M, Beauchesne LM. Hybrid repair of mitral. Paravalvular leak: Open surgical placement of a percutaneous occlude device. *J Thorac Cardiovasc Surg* 2006; 132: 1469–1470.