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Successful Balloon Valvuloplasty in a Patient with Severe Bioprosthetic Tricuspid Valve Stenosis: Case Report

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Abstract

Resistant right heart failure is observed in patients with the dysfunction of the bioprosthetic tricuspid valve. Re-surgery and valve balloon valvuloplasty are the preferred treatment options. However, re-surgery cannot be performed in most patients because it carries a high risk. We presented a case in which balloon valvuloplasty was performed for severe stenosis of the bioprosthetic tricuspid valve.

Keywords: Bioprosthetic tricuspid valve stenosis, balloon valvuloplasty, prosthetic valve degeneration

Introduction

The most urgent problem with bioprosthetic heart valves is valve degeneration that develops in the long term. There are many reasons for this degeneration, such as calcification, thrombus formation, and pannus development, etc. in the bioprosthesis tissue[(1)]. When degeneration develops in the bioprosthesis valve, its function is impaired. Frequently, dysfunction occurs in the form of a decrease in the valve movements that

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results in the development of valve stenosis. Stenosis and insufficiency can be observed together. When stenosis develops in the bioprosthetic valve located in the tricuspid position, signs of right heart failure are observed. The shortness of breath with exertion, fatigue, swelling of the legs, and ascites are the most common complaints. Severe stenosis is considered when the mean gradient of the valve is >5 mmHg and/or the valve area is <1 cm^2[2]. We presented a case of balloon valvuloplasty in a patient with bioprosthetic tricuspid valve stenosis with a high risk of re-surgery.

Case Report

The patient, who underwent mitral (mechanical) and tricuspid (bioprosthetic) valve replacement due to infective endocarditis in 2008, presented with complaints of shortness of breath, fatigue, abdominal distension, and swelling of the legs. His New York Heart Association (NYHA) was NYHA functional class III-IV. The patient was hospitalized, and his treatment was arranged. On the physical examination, severe edema in both legs, ascites in the abdomen, and neck venous engorgement were observed. Diuretic therapy was administered to the patient for the signs and symptoms of right heart failure. Coronary angiography was performed. No significant stenosis was observed in his coronary arteries. Doppler echocardiographic examination revealed that the mechanical prosthetic valve located in the mitral position had normal function. Valve movements were good, and the calculated gradient was normal. Severe stenosis and mild to moderate insufficiency were observed in the bioprosthetic tricuspid valve. Bioprosthetic valve leaflet movements were severely limited. The mean gradient was 11.1 mmHg (Figure 1). The patient was evaluated by a heart team consisting of a cardiologist and cardiovascular surgeon. Tricuspid valve replacement surgery was found to be a high risk because the patient had a refractory heart failure and platelet count was <50.000 10^3/uL. Therefore, the patient was informed about balloon valvuloplasty for the valve, and the decision of balloon valvuloplasty was made.

Procedure

The right femoral vein was entered using the Seldinger technique, and a 10-French sheath was placed. It was advanced to the right atrium using a multipurpose catheter. After a few attempts, the tricuspid valve could not be passed by the multipurpose catheter. Therefore, the Swan-Ganz catheter was used as described by Rana et al.[3]. It has progressed to the right atrium. The balloon of the catheter was inflated, and the right ventricle was easily passed toward blood flow. The balloon was directed to the right pulmonary artery without deflating. A 0.14-inch 300 cm guide wire was advanced through this catheter. The Swan-Ganz catheter balloon was deflated and retrieved. MPA over 0.014 wire was positioned in the right pulmonary artery. An Amplatz stiff long wire was advanced up to the distal right pulmonary artery. The Tyshak 25-40 mm balloon was brought to the tricuspid valve over this wire and inflated twice in the appropriate position - centering the ring of the bioprosthesis valve (Figure 2). The mean gradient was calculated as 5.6 mmHg with moderate regurgitation by echocardiography (Figures 3 and 4). No additional balloon inflation was performed. Local bleeding control was achieved after removing the vessel sheath. He was uneventfully discharged after treatment was arranged.

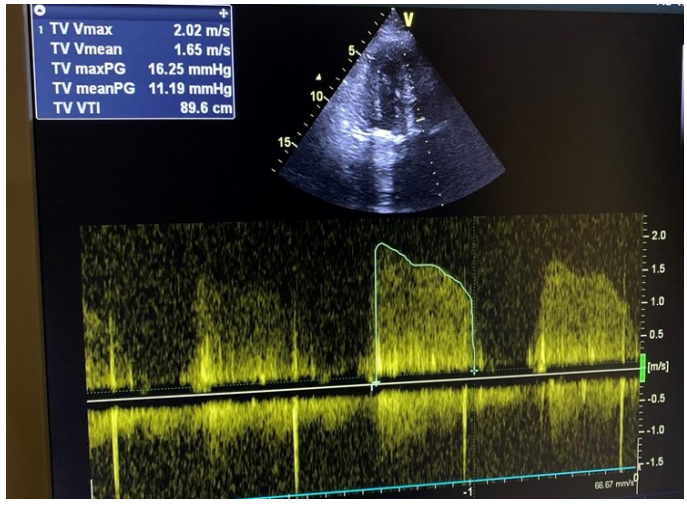

Figure 1. Pre-procedural Doppler echocardiographic image

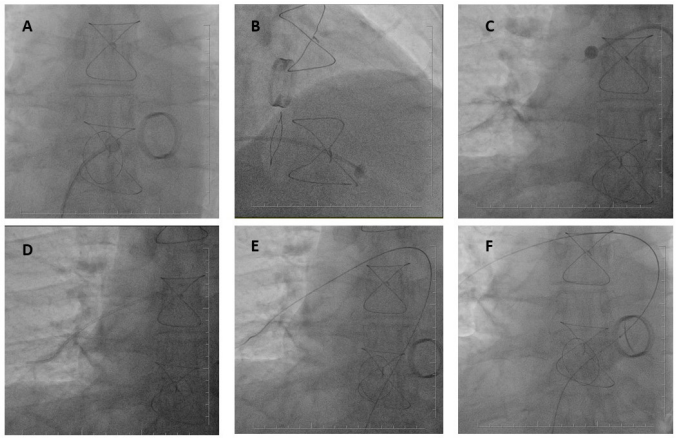

Figure 2. Step-by-step demonstration of the valvuloplasty procedure performed on the severely stenosed bioprosthetic tricupid valve. **A)** A Swan Ganz catheter -with inflated balloon at the tip- is right atrium. **B)** It was passed through the stenosed bioprosthetic tricupid valve into the right ventricle. **C)** Swan Ganz catheter was directed to the right pulmonary artery and a long 0.014 inch guidewire was advanced up to the distal right pulmonary artery to pass over the multipurpose catheter. **D)** Multipurpose catheter was advanced into the right pulmonary artery. **E)** An Amplatz stiff wire was placed at the distal right pulmonary artery through the multipurpose catheter. **F)** Positioning and inflating the Tyshak balloon inside the bioprosthetic valve

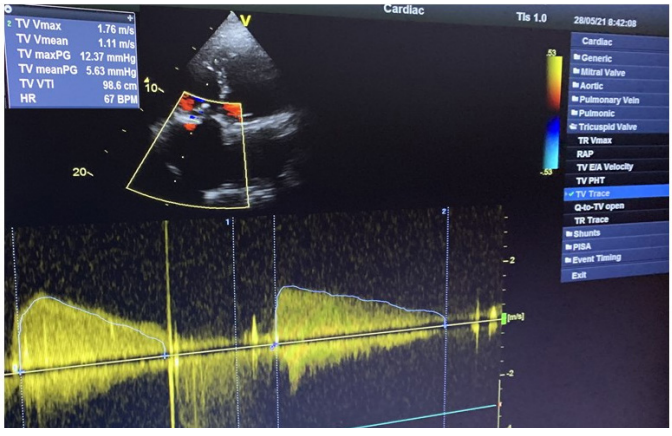

Figure 3. Post-procedure Doppler echocardiographic image

Discussion

Medical therapy is of limited use in patients with severe bioprosthetic tricuspid valve stenosis. There are three options for the treatment of these patients with signs of right heart failure despite medical treatment. 1. Changing the valve with surgery (Re-do surgery), 2. placing the valve inside the bioprosthetic valve percutaneously

Figure 4. Post-procedural Doppler echocardiographic image

(valve-in-valve implantation), and 3. expanding the valve by performing balloon valveloplasty. Of these methods, surgery is preferred in the first place. In patients at high risk of surgery, percutaneous insertion of a bioprosthesis valve into the valve seems to be the most appropriate approach. If this not be performed, balloon valvuloplasty can be considered as a third option. Because the surgery was a high risk in our patient and the patient had thrombocytopenia, the surgery was considered high risk for the patient by the cardiac team. Thus, percutaneous treatment was recommended. It was thought that widening the valve with valveluloplasty would be beneficial for at least a while and could be a bridge to the valve-in-valve procedure or valve replacement surgery. The fact that the procedure could be technically performed using low risk was another reason for our preference for this method. When we search the current literature, we find that this method is used in very few patients, mostly in the form of case reports. Rana et al.[3] presented three cases that they performed at their center. We performed the procedure using the technique described previously. A literature search yielded less than 20 case reports. To our knowledge, this is the first case report from Turkey. In addition, symptomatic improvement was reported in all patients

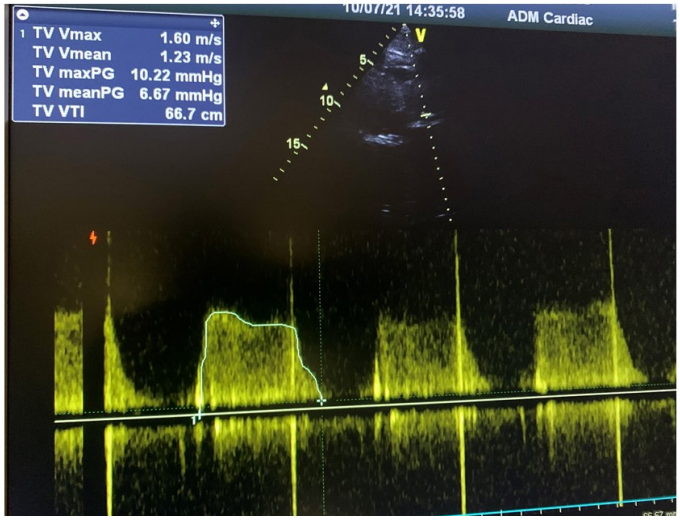

Figure 5. Post-procedural 45th day Doppler echocardiographic image

after balloon valvuloplasty. Significant improvements in the echo findings were noted. In the cases presented by Rana et al.[3], the mean gradient decreased from 12 to 7. In our patient, the desired decrease in the mean gradient was achieved by inflating the balloon twice, and the procedure was terminated because of moderate valve insufficiency. The balloon was inflated once, and in some cases more than once in the current literature. It is rare to develop severe valve insufficiency after balloon valvuloplasty. In this case, after balloon inflation twice, moderate valve regurgitation was observed. The most important problem with this method is the development of re-stenosis in the valve in the short and medium term. It has been reported that stenosis develops between 6 and 16 months[4,5]. Wren and Hunter's[4] case underwent surgery at 6 months, and Slama et al.'s[5] case 16 months due to restenosis. It was reported that calcification was observed in the pathology report of both cases. Our patient was clinically well when he came for follow-up on the 45th day. In the echocardiographic examination, there was no increase in the gradient of the bioprosthesis valve compared with the post-procedure (Figure 5).

In conclusion, the balloon valvuloplasty procedure for the bioprosthetic tricuspid valve with severe stenosis is technically low risk, and symptomatic benefit can be obtained in the short-medium term. We believe that the balloon valvuloplasty method should be considered as a bridge treatment for the valve-in-valve procedure in patients at high risk for surgery.

Ethics

Informed Consent: The patient provided written informed consent for the publication of this report and images.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: Bozbaş H, Asfour M, Çelebi AS, Amasyalı B, Onuk BE, Aybek T, Concept: Bozbaş H, Asfour M, Çelebi AS, Amasyalı B, Onuk BE, Aybek T, Design: Bozbaş H, Asfour M, Çelebi AS, Amasyalı B, Onuk BE, Aybek T, Data Collection and/or Processing: Bozbaş H, Asfour M, Çelebi AS, Amasyalı B, Onuk BE, Aybek T, Analysis and/or Interpretation: Bozbaş H, Asfour M, Çelebi AS, Amasyalı B, Onuk BE, Aybek T, Literature Search: Bozbaş H, Asfour M, Çelebi AS, Amasyalı B, Onuk BE, Aybek T, Writing: Bozbaş H, Asfour M, Çelebi AS, Amasyalı B, Onuk BE, Aybek T.

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References

1. Dvir D, Bourguignon T, Otto CM, et al. Standardized Definition of Structural Valve Degeneration for Surgical and Transcatheter Bioprosthetic Aortic Valves. Circulation 2018;137:388-99.
2. Nishimura RA, Otto CM, Bonow RO, et al. 2014 AHA/ACC guideline for the management of patients with valvular heart disease: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. J Am Coll Cardiol 2014;63:e57-185. Erratum in: J Am Coll Cardiol 2014;63:2489.
3. Rana G, Malhotra R, Sharma A, Kakouros N. Percutaneous Valvuloplasty for Bioprosthetic Tricuspid Valve Stenosis. Tex Heart Inst J 2017;44:43-9.
4. Wren C, Hunter S. Balloon dilatation of a stenosed bioprosthesis in the tricuspid valve position. Br Heart J 1989;61:65-7.
5. Slama MS, Drieu LH, Malergue MC, et al. Percutaneous double balloon valvuloplasty for stenosis of porcine bioprostheses in the tricuspid valve position: a report of 2 cases. Cathet Cardiovasc Diagn 1993;28:142-8.