

Should right heart catheterization be realized in patients with a mechanical tricuspid valve?

A 36-year old man with history of combined mechanical mitral and tricuspid valve replacement was referred for cardiogenic shock. The patient was considered for cardiac transplantation. To investigate the feasibility, a right heart catheterization was performed to obtain transpulmonary pressure gradient. A 7 F Swan-Ganz catheter (Edwards Lifesciences, CA, USA) was introduced inside an 8 F Fast-Cath™ Ramp guiding introducer (St Jude Medical, MN, USA) positioned in front of the tricuspid mechanical prosthesis through the right femoral vein. A 0.025 inch Starter™ guidewire (Boston Scientific, MA, USA) was introduced in the Swan-Ganz catheter and pushed through the prosthesis, permitting the guiding of the Swan-Ganz catheter through the valve then the ascent in the pulmonary artery with the inflated balloon. There was no complication of the procedure.

KEYWORDS: mechanical tricuspid valve • right heart catheterism • transpulmonary pressure

Patients with mechanical prosthetic valves often need a hemodynamic evaluation. If echocardiography is generally enough to assess valve status, the measure of the transpulmonary gradient requires heart catheterization. In the case of mechanical tricuspid valve, right heart catheterization usually requires a surgical procedure that increases the risk of procedural complication.

Case

We report the case of a 36-year old man referred to our intensive care unit for cardiogenic shock. He had a 25-year past medical history of polytrauma with high-grade traumatic mitral and tricuspid insufficiencies treated by combined mechanical mitral prosthesis and tricuspid bioprosthesis replacements. After 10 years, he developed tricuspid bioprosthesis degeneration, which was treated by mechanical tricuspid valve replacement.

At admission, he presented a clinical and biological cardiogenic shock with evidence of multi-visceral deficiency associated with severe renal and liver failure. Echocardiography found functional mitral and tricuspid mechanical prosthesis with no evidence of regurgitation and 8 and 5 mmHg transvalvular mean gradients, respectively. Left ventricular ejection fraction was 40% and right ventricular function was severely decreased, with a tricuspid annular plane systolic excursion of 6 mm. Owing to the refractory right heart failure, the patient was considered for cardiac transplantation because of a poor amelioration despite treatment based on inotropic support.

Current European and American guidelines recommend assessing transpulmonary pressure gradient before heart transplantation in order to ensure that transplanted hearts will not work against high resistances. The patient presented a cardiogenic shock with predominant right heart failure and moderate left ventricular dysfunction because of valvular heart disease, without segmental wall motion abnormalities. He was young, without cardiovascular risk factor and presented a stage 3 chronic kidney disease. Consequently, the indication of coronary angiography was not retained and to investigate the feasibility of cardiac transplantation, we decided to perform a right heart catheterization to obtain transpulmonary pressure gradient. A 7 F Swan-Ganz catheter (Edwards Lifesciences, CA, USA) was introduced inside a 8 F Fast-Cath™ Ramp guiding introducer (St Jude Medical, MN, USA) positioned in front of the tricuspid mechanical prosthesis through the right femoral vein (FIGURE 1A). Then, a 0.025 inch Starter™ guidewire (Boston Scientific, MA, USA) was introduced in the Swan-Ganz catheter and pushed through the prosthesis (FIGURE 1B), permitting the guiding of the Swan-Ganz catheter through the valve then the ascent in the pulmonary artery with the inflated balloon (FIGURE 1C). There was no complication of the procedure.

Finally, mean pulmonary artery pressure and transpulmonary gradient were 40 and 18 mmHg without reversibility, respectively. The patient was contraindicated for cardiac transplantation and died 5 days later without possibility for cardiac assistance.

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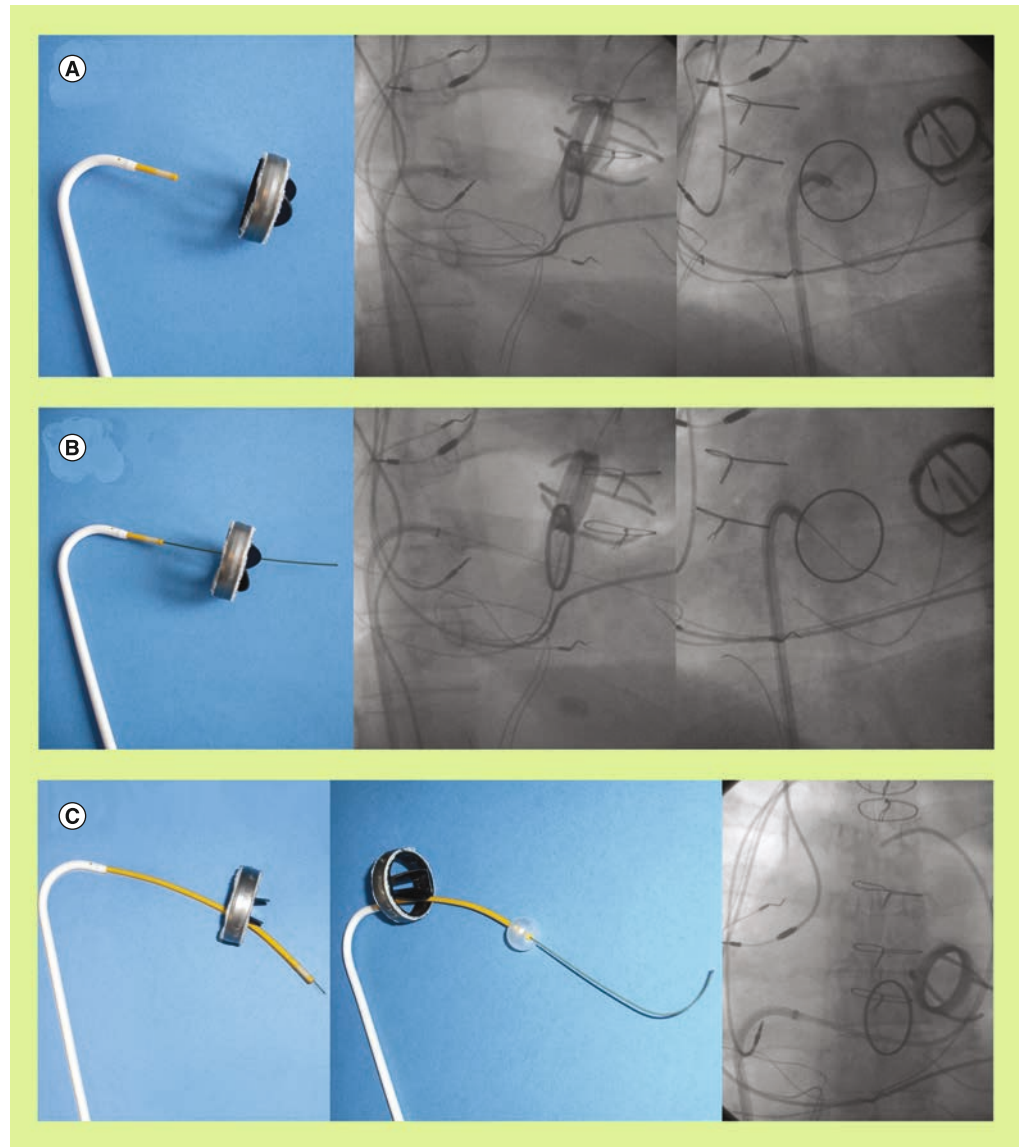


Figure 1. Steps of right heart catheterization through a tricuspid mechanical prosthesis under fluoroscopic guidance. (A) Extracorporeal reproduction and fluoroscopic view of a 7 F Swan-Ganz catheter (Edwards Lifesciences, CA, USA) introduced inside a 8 F Fast-Cath™ Ramp guiding introducer (St Jude Medical, MN, USA) positioned in front of the tricuspid mechanical prosthesis through the right femoral vein. **(B)** Extracorporeal reproduction and fluoroscopic view of a 0.025 inch Starter™ guidewire (Boston Scientific, MA, USA) introduced in the Swan-Ganz catheter and pushed through the tricuspid mechanical prosthesis. **(C)** Extracorporeal reproduction and fluoroscopic view of the guiding of the Swan-Ganz catheter through the tricuspid mechanical prosthesis and the ascent in the pulmonary artery with the inflated balloon.

Discussion

Mechanical prosthetic valves are usually not crossed during cardiac catheterization. Echocardiographic techniques are not validated in patients with mechanical tricuspid valve [1]. These echocardiographic techniques usually use the tricuspid regurgitation that could not be used in the context of mechanical prosthesis. Alternative techniques use ventricular puncture to investigate heart pressures [2,3]. Some cases report cardiac retrograde catheterization through

aortic mechanical prosthesis [4], but there is no report about right heart catheterization through a tricuspid mechanical prosthesis. With this case, we show that right heart catheterization is feasible through a tricuspid mechanical prosthesis. The potential complications of this kind of catheterism are different between the right and the left heart. The common complication is the catheter entrapment, but the main risk of right heart catheterism across a mechanical tricuspid valve is the thrombosis. This first experience

does not prove the safety of the technique and cannot exclude the possibility of catheter entrapment or valve thrombosis that need surgical requirement.

Conclusion

Right heart catheterization through a mechanical tricuspid valve is feasible and avoids surgical management; however, the safety of the procedure requires further study.

Future perspective

Tricuspid valve replacement is often associated with left-sided valve replacement, leading to the need of frequent hemodynamic evaluation. Right heart catheterism through mechanical tricuspid valve could be an alternative to surgical procedure and decrease morbidity associated

with surgical procedure in the context of valvular heart disease.

Informed consent disclosure

The authors state that they have obtained verbal and written informed consent from the patient for the inclusion of their medical and treatment history within this case report.

Financial & competing interests disclosure

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Executive summary

Background

- Mechanical tricuspid prosthesis often requires hemodynamic evaluation and poses a number of challenges to the treating physician. Echocardiography is generally not enough to assess the transpulmonary gradient, which usually requires a surgical procedure that increases the risk of procedural complication.

Case

- The case of a 36-year old man with mechanical mitral and tricuspid prosthesis referred for cardiogenic shock is reported. The patient was considered for cardiac transplantation, which requires transpulmonary pressure gradient evaluation. The authors decided to perform a right heart catheterization. There was no complication of the procedure.

Discussion

- Mechanical prosthetic valves are usually not crossed during cardiac catheterization. Usual techniques use ventricular puncture to investigate heart pressures. There is no report about right heart catheterization through a tricuspid mechanical prosthesis. The authors show that right heart catheterization through a tricuspid mechanical prosthesis is feasible; however, the safety of the technique has to be confirmed.

Conclusion

- Right heart catheterization through a mechanical tricuspid valve is feasible and avoids surgical management; however, the safety of the procedure requires further study.

Future perspective

- Right heart catheterism through mechanical tricuspid valve could be an alternative to surgical procedure.

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