

CASE REPORT

Percutaneous valve in valve in the tricuspid position in a patient with Tetralogy of Fallot

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SUMMARY

Here, we describe a case of a successful percutaneous insertion of a transcatheter 29 mm Edwards Sapien XT valve into a tricuspid valve in a patient with repaired tetralogy of fallot.

Similar procedures have been performed with the Edwards Sapien valve and Melody valves; however, this is the first case described in the literature of an Edwards Sapien valve used in a patient with Tetralogy of Fallot. With procedural safety being demonstrated, this case illustrates an important alternative treatment option for patients with congenital heart disease. Although long-term data is required to compare its efficacy with surgically replaced valves, percutaneous procedures can serve as a delay to surgical valve replacement which over a patients' lifetime with congenital heart disease, can minimise the amount of invasive surgeries and potential complications.

BACKGROUND

Tricuspid valve disease is a relatively uncommon occurrence, with a higher prevalence in individuals with congenital heart abnormalities.¹ In the tricuspid position, bioprosthetic valves are generally preferred over mechanical valves, given high valve failure rates as well as anticoagulation and thrombotic complications of mechanical heart valves in the tricuspid position.¹ However, these bioprosthetic valves undergo gradual degeneration, with valve longevity without reintervention at 83% and less than 60% at 10 and 15 years, respectively.²⁻⁵

Particularly in the context of congenital abnormalities, patients are often required to have multiple tricuspid valve operations secondary to degeneration of pre-existing bioprosthesis. The surgical management of such patients is often complicated by multiple previous sternotomies,^{5,6} which makes a percutaneous approach an appealing option.

Here, we describe a case of a successful percutaneous insertion of a transcatheter aortic valve device into a tricuspid valve in a patient with repaired Tetralogy of Fallot.

CASE PRESENTATION

A 26-year-old woman with a history of Tetralogy of Fallot which was repaired at birth, presented with severe right-sided heart failure. She had multiple hospital admissions in the previous year for recurrent ascites with early cirrhotic changes on liver ultrasound. Physical examination revealed a diastolic murmur audible at the left sternal edge

with significant peripheral oedema. Transthoracic echocardiography (TTE) showed severe tricuspid stenosis with a mean gradient of 15 mm Hg secondary to bioprosthetic valve degeneration with concomitant mild tricuspid regurgitation.

Previous treatment for her tricuspid valve dysfunction included a Cosgrove ring (Edwards Lifesciences, Irvine, California) at age 15, and subsequently a surgical tricuspid valve replacement with a 31 mm Mosaic valve (Medtronic, Minneapolis, Minnesota) 8 years later for progressive valvular dysfunction.

TREATMENT

The percutaneous tricuspid valve in valve procedure was performed under general anaesthesia. The femoral vein was accessed with a 16Fr sheath and a Safari wire placed in the distal left pulmonary artery. A 40mmx20mm balloon was used for tricuspid valvuloplasty, which decreased the gradient to 5 mm Hg. A 20 mm Ensemble Delivery system was used to deploy 29mm Edwards Sapien XT (Edwards Lifesciences, Irvine, California) percutaneous valve onto the pre-existing Mosaic valve (see online supplementary video 1), which further reduced the tricuspid gradient to 4 mm Hg (see [figure 1](#)). Transesophageal echocardiography was utilised throughout the procedure (see online supplementary video 2 and 3).

OUTCOME AND FOLLOW-UP

The patient had an uncomplicated inpatient admission of 4 days and on follow-up 3 months after the procedure, had complete resolution of ascites and pedal oedema with successful diuresis of 15 kg. TTE 3 months postoperatively revealed a well-functioning Sapien valve with trivial paravalvular regurgitation and a gradient of 7 mm Hg.

DISCUSSION

This case study demonstrates that percutaneous insertion of a transcatheter aortic valve device into a surgically repaired tricuspid valve is a viable treatment option in patients with Tetralogy of Fallot.

To date, two valves have been used for such procedures, the Edwards Sapien and Melody valves, which have been described to have similar results regarding valve safety and performance.^{7,8} The valve chosen tends to be based on size of the tricuspid landing zone, with Sapien valves used for patients



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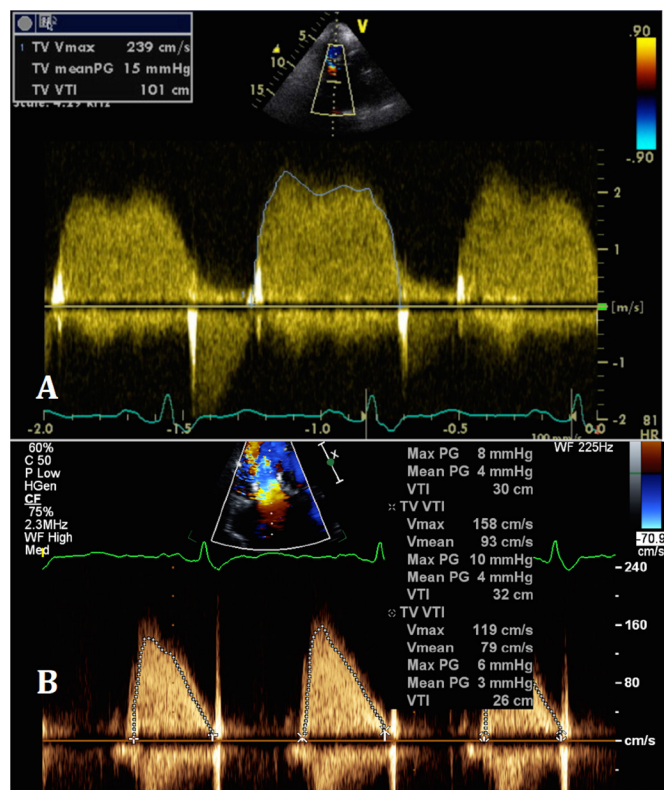


Figure 1 Preprocedural gradient (A) and postprocedural gradient (B).

with larger diameter landing zones,^{9,10} which was the reason for its use over a Melody valve in this case.

The use of percutaneous tricuspid valve in valve procedures has increased in recent years, with procedural safety demonstrated in the literature. A review by Godart *et al* analysed 71 patients with percutaneous tricuspid valve in valve procedures with Sapien and Melody valves in patients with New York Heart Association (NYHA) class I and II. The study showed an improvement in symptoms and reduction in mean gradient, with complications including embolisation of valve in four patients, death in two patients and endocarditis in one patient.¹¹

McElhinney *et al* performed an international multicentre study with 152 patients undergoing the percutaneous procedure. In this study, 94 Melody valves and 58 Sapien valves were used. All but two procedures were successful, and 22 patients died within 1 year of the procedure, all of which had baseline NYHA class of III and IV.⁸ Furthermore, Sevimli *et al* presented a similar case report with a percutaneous tricuspid valve in valve procedure with a Sapien valve; however, in the context of a previously surgically repaired Ebsteins anomaly.¹²

There have been multiple publications of percutaneous insertion of bioprosthetic tricuspid valves in patients with congenital heart disease, but this is the first case described in the literature of an Edwards Sapien valve used in a patient with Tetralogy of Fallot. Roberts *et al* describes 15 patients with congenital heart disease with successful percutaneous tricuspid valve in valve using Melody valves, one patient having Tetralogy of Fallot.¹

Procedural safety of percutaneous tricuspid valve in valve procedures has been demonstrated by this case and the literature

for a variety of indications including patients with congenital heart disease. Long-term data are required to adequately assess its efficacy when compared with surgically replaced valves. Importantly, the percutaneous procedure offers patients with the option of delaying surgical tricuspid valve replacements, which over a patient with congenital heart disease lifetime, would lead to less surgical procedures that will minimise risk of surgical complications as well as extended hospital admissions.

Learning points

- ▶ Patients with congenital heart disease with tricuspid valve replacements often require multiple surgical valve replacements throughout their lifetime.
- ▶ Percutaneous valve insertion has been established and routinely performed in the aortic region; however recently, procedural safety has been demonstrated in the tricuspid position.
- ▶ Percutaneous insertion of a tricuspid valve provides patients with congenital heart disease to prolong the lifespan of their surgically replaced valve, thereby allowing for few surgical procedures and associated risks of cardiac surgery.

Contributors AC, the first author has written the literature review and case report. RM and DW elaborate on specifics of procedure and reviewed case report with corrections on valvular information and procedural events.

Competing interests None declared.

Patient consent Obtained.

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