Cardiology in the Young

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Percutaneous tricuspid valve implantation: an alternative in critically ill patients

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Abstract

Tricuspid valvulopathy has gained a lot of attention in recent years, especially due to the advances in percutaneous management. CHD can present with primary or secondary malfunction of the tricuspid valve, often not addressed due to high surgical risk after several interventions. We present two cases of adults with complex congenital heart malformations and borderline clinical situations who successfully underwent percutaneous tricuspid replacement.

Brief Report

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Tricuspid valvulopathy has gained a lot of attention in recent years. Earlier management seems to be important and percutaneous treatment has proved to be an effective and low-risk alternative. CHD patients usually need several interventions to solve their residual lesions. They can present with primary or secondary malfunction of the tricuspid valve at any point of their disease, but it's often not addressed due to high surgical risks.

We present our experience with two cases of complex CHD that underwent successful implantation of percutaneous tricuspid valves in critical situations when no other therapeutic options were available:

Case 1

A 19-year-old male with a history of aortic stenosis (valvar and subvalvar) was treated in infancy with a Ross-Konno procedure: a 18-mm conduit (bovine jugular heterograft) was placed between the right ventricle and pulmonary artery. He developed progressive calcification and stenosis of the conduit that produced significant right heart dilation and dysfunction, as well as severe secondary tricuspid regurgitation with annular dilation. Initially, percutaneous management of the conduit was dismissed due to calcification and close relation to the left coronary artery, so surgery was planned.

He underwent conduit replacement (Contegra 20 mm) and tricuspid annuloplasty with a Contour 3D 34 mm annulus, with immediate good result, improving the degree of tricuspid regurgitation. However, he had a torpid post-operative course with haemodynamic instability

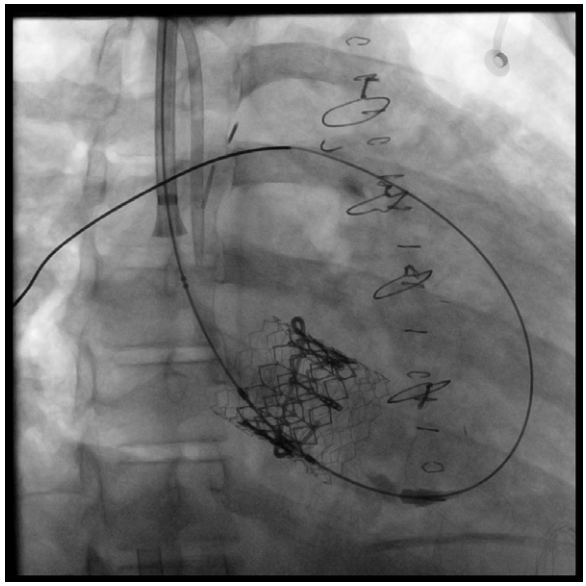

Figure 1. Sapien 29 prosthesis implantation intra-stent over a large tricuspid annulus.

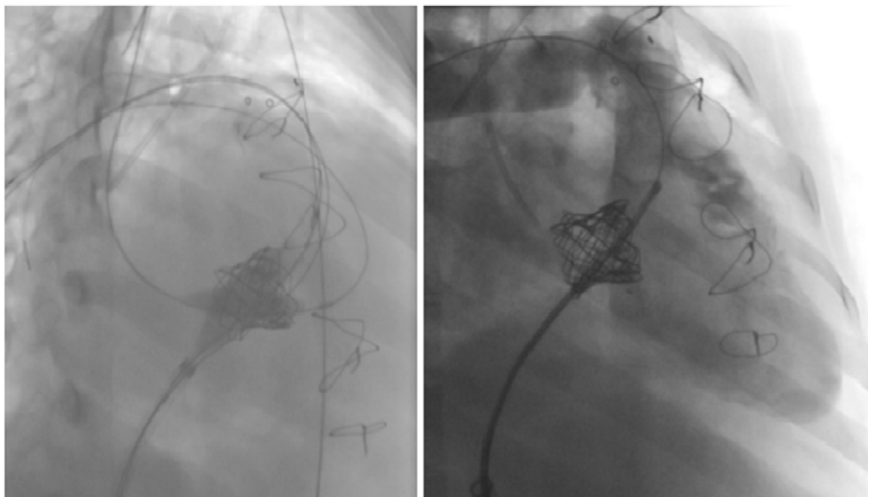

Figure 2. Malfunctioning prosthesis dilation with double-balloon technique and transhepatic Melody 22 tricuspid implantation.

due to right ventricular dysfunction and progressive deterioration of tricuspid regurgitation becoming massive. He progressed to a low output state with venous congestion and severe hepatic dysfunction (coagulopathy, hyperbilirubinemia . . .), so circulatory support was initiated with peripheral ECMO and haemofiltration. Due to the ominous prognosis and high surgical risk, a palliative "valve-in-ring" percutaneous tricuspid prosthesis implantation was performed.

Right internal jugular access was used. Because of the annulus size and morphology, a large pre-stent was implanted (Andrastent XXL 47 mm over a 30 mm BIB balloon) with adequate anchorage. Then, a Sapien 29 mm prosthesis was safely implanted intra-stent (Fig 1). Adequate position and function were checked, with a moderate periprostetic leak in the open area of the surgical ring (figure 3, supplementary material). The improvement of the tricuspid regurgitation was significant and allowed weaning from ECMO, vasoactive, and respiratory support in the next days. Unfortunately, the patient deteriorated due to a septic process and eventually died.

Case 2

A 23-year-old woman had several surgical and percutaneous procedures in childhood due to critical pulmonary stenosis and underdevelopment of the right ventricle. She had residual moderate double lesions of the pulmonary and tricuspid valves with a restrictive right ventricle, and hypoplasia of the left pulmonary artery with preferential flow to the right one.

In her last surgery, two bioprosthesis were implanted: pulmonary Mosaic 23 and tricuspid Mosaic 25. Latter tricuspid severe degenerative stenosis required percutaneous implantation of an Edwards XT 23 valve with clinical improvement. Anyhow, rapid tricuspid stenosis progressed despite percutaneous dilations. Due to deterioration in functional capacity, congestive hepatopathy, and cyanosis, a new surgical replacement was proposed and dismissed for her high surgical risk. Therefore, a palliative aggressive interventionist procedure was performed: "valve-in-valve-in-valve".

The patient had bilateral chronic femoroiliac thrombosis, so two central accesses were used: right internal jugular vein, that could no't provide enough stability in previous caths and transhepatic (figure 4, supplementary material). High support guidewires were lodged in the distal right pulmonary artery. The malfunctioning tricuspid prosthesis were redilated using two high pressure balloons simultaneously, accomplishing maximum expansion and an internal diameter of 22 mm (Fig 2). Due to suboptimal jugular port (excessive curve and instability), transhepatic access was used to implant a Melody 22 prosthesis over an Ensemble system, with no periprocedural complications and adequate angiographic results (Fig 2). Haemostasis was assured with an occlusion device (Vascular Plug II 10 mm). After procedure, the patient required 2-day observation in ICU due to a retroperitoneal bleeding (probably related to the hepatic puncture) that only required one red cell transfusion. No other complications occurred and after discharge she has clearly improved her functional status with a stable hepatic function.

Discussion

Tricuspid valvulopathy can be managed in three ways: medically, surgically, and percutaneously. There is currently a great amount of experience with two commercialised percutaneous prosthesis (Melody and Edwards Sapien) for tricuspid implantation, with no evidence in favour of any of both.[1] High-risk patients require procedures that prove to be more complex and anatomically unpredictable. Our report is an example of the technical feasibility of percutaneous implantation in impaired patients, even in cardiopulmonary support, in whom there is a high surgical comorbidity. We want to highlight the usefulness of transhepatic[2] access in cases where transjugular implantation is no't an option. Pre-stenting is always an option to consider, even though its not mandatory its use over surgical rings may help in large annulus to prevent embolisation.[3] In summary, our cases support percutaneous options for complex cases that merit for replacement of the tricuspid valve (both in surgical annulus and as "valve-in-valve"), with technical difficulties but adequate results.

Supplementary material. To view supplementary material for this article, please visit https://doi.org/10.1017/S1047951122000269

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Conflicts of interest. None.

Ethical standards. We received approval from our local Ethics Committee to review the data retrospectively and publish our findings. We collected Informed Consent from our patients to collect the clinical data and publish it. Confidentiality was assured.

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