

Percutaneous transhepatic and transseptal dilatation of a surgically implanted Melody® Valve in the mitral position in a 2-year-old child

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ABSTRACT

The use of the Melody® (Medtronic, Minneapolis, MN, USA) biological prosthesis in mitral position has shown acceptable short-term results. Furthermore, it allows its expansion with a balloon when the patient grows up, and this procedure can be performed by a venous catheterization through transseptal approach through an interatrial communication or puncturing the septum. Patients with complex congenital heart disease undergoing multiple surgical and percutaneous interventions may present with vascular complications such as thrombosis of the femoral venous system that make percutaneous access impossible. In this situation, the transhepatic approach is a very useful alternative to access the heart.

Keywords: Children, congenital heart disease, prosthesis, thrombosis

INTRODUCTION

Mitral valve replacement in newborns or infants is limited by the lack of availability of an implantable valve of adequate size to their mitral annulus. In this situation, the implant, using a hybrid procedure, of the biological prosthesis Melody® (Medtronic, Minneapolis, MN, USA) in mitral position has shown acceptable short-term results.^[1] However somatic growth of these patients warrant redilatation of this valve by a transseptal catheterization. This procedure can be performed by a venous catheterization through a transseptal approach through an interatrial communication or puncturing the septum.

Patients with complex congenital heart disease undergoing multiple surgical and percutaneous interventions may present with vascular complications when groin venous access is compromised due to bilateral iliofemoral venous occlusions, transseptal catheterization can be performed through transhepatic access.^[2]

This report describes the first case to our knowledge of

a patient with a Melody® valve (Medtronic, Minneapolis, MN) implanted in the mitral position, in which a valvuloplasty was subsequently performed by transhepatic and transseptal approach.

CASE REPORT

A male infant antenatally diagnosed with critical aortic stenosis, pansystolic mitral regurgitation and severe left ventricular systolic dysfunction underwent three different surgeries including a Ross operation, a mitral valvuloplasty, and a mitral valve replacement with a mechanical prosthesis (St. Jude Medical Regent® 17-mm) in supramitral position complicated by premature prosthetic valve thrombosis. He underwent a Melody® valve (Medtronic, Minneapolis, MN) implantation in mitral position performed with a 16 mm × 30 mm Tyshak II® balloon (NuMED, Cornwall, ON) at the age of 6 months [Figures 1 and 2]. The postoperative progress was uneventful.

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How to cite this article: De La Torre LA, Vázquez BT, Linde DH, Soto AM, Torres EG. Percutaneous transhepatic and transseptal dilatation of a surgically implanted Melody® Valve in the mitral position in a 2-year-old child. *Ann Pediatr Card* 2022;15:183-6.

Access this article online

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DOI:

10.4103/apc.apc_200_21

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Submitted: 04-Oct-2021

Revised: 17-Dec-2021

Accepted: 08-May-2022

Published: 19-Aug-2022

During follow-up, the patient developed severe stenosis of the Melody valve with a mean gradient of 10 mmHg. Therefore, a percutaneous balloon valvuloplasty of the prosthesis was performed at the age of 2 years and 9 months (weight 10.5 kg). Due to a previous complete thrombosis of both venous femoral systems and the presence of an intact interatrial septum, a transhepatic procedure with transeptal puncture was chosen as a feasible approach for this patient.

A 22G Chiba needle was guided using ultrasound into the middle hepatic vein, then a 0.018" guidewire and a 4Fr Check-Flo Performer® sheath (Cook Medical, Bloomington, IN) were advanced into the right atrium. A long Emerald® 0.035" guidewire (Cordis, Miami Lakes, FL) was then implanted into the superior vena cava and progressive dilators were advanced. Finally, an 8F Swartz® Transseptal sheath and a BRK-1® needle (St. Jude Medical, Minneapolis, MN) were advanced to the superior vena cava.

Subsequently, under transesophageal echocardiography and fluoroscopic guidance, the transeptal puncture was performed [Figure 3]. Heparin was then administered.

With the help of a 5F Internal Mammary Glidecath® catheter (Terumo Europe, Leuven, Belgium) and a

HiWire® 0.035" hydrophilic guidewire (Cook Medical, Bloomington, IN), the Melody prosthesis was probed, and through the left ventricle, the guidewire was advanced to the descending aorta.

An exchange of this guide was made for an EMERALD® 0.035" Amplatz type Super Stiff Guidewire (Cordis, Miami Lakes, FL). Two balloons for angioplasty were successfully advanced over this guide, first, an 18 mm × 40 mm Cristal Balloon® (Balt Extrusion, Montmorency, France) and then a 20 mm × 30 mm Tyshak II® balloon (NuMED, Cornwall, ON) with which the valvuloplasty was performed obtaining a good anatomical and hemodynamic results [Figure 4].

Hemostasis of the transhepatic access was achieved embolizing the tract with a 6-mm Amplatzer™ Vascular Plug IV (St. Jude Medical, Minneapolis, MN) and with manual external compression of the skin at the puncture site [Figure 5].

Abdominal ultrasound was performed after the procedure with neither evidence of any hepatic nor peritoneal hematoma. There were no complications and the patient could be discharged the next day. On the predischarge echocardiography, the mean gradient across the valve had decreased down to 6 mmHg without an increase in the degree of the valve regurgitation.

DISCUSSION

Since the first description by the group of the Boston Children's Hospital,^[1] the implantation of a Melody® prosthesis in a mitral position using a hybrid procedure has been reported by different groups with good results.^[3,4]

However, this is a technique that is not exempted from complications, such as AV block, paravalvular leaks, endocarditis, obstruction of the left ventricular outflow tract,^[3] compression of the circumflex coronary artery, or stent fracture.^[5]

Fortunately, in our patient, the procedure was uneventful.

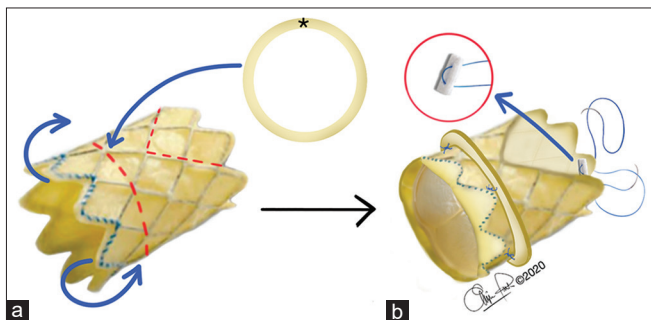


Figure 1: Melody valve (Medtronic, Minneapolis, MN) preparation for surgical implantation (a) Triangular cut at the ventricular end to avoid obstruction in the left ventricular outflow tract. Pericardial crown sutured around the stent. End of the stent folded on the atrial side. (b) Stitch to direct the stent

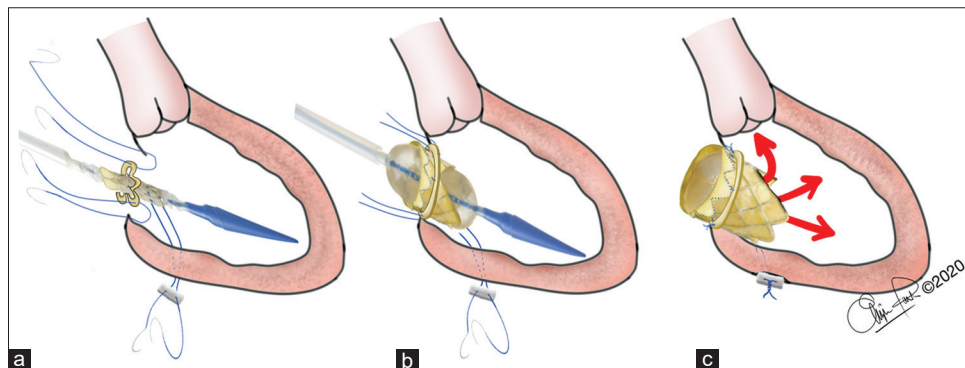


Figure 2: Melody valve (Medtronic, Minneapolis, MN) implantation. (a) Stitches from the pericardial crown to the mitral annulus. (b) Balloon stent expansion. (c) Sutures attached to anchor the Melody valve

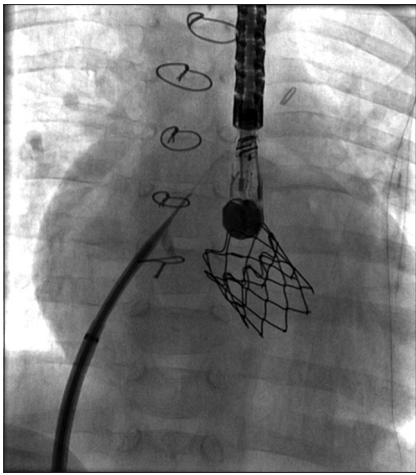


Figure 3: Transseptal puncture with an 8F Swartz® transseptal sheath and a BRK-1® needle (St. Jude Medical, Minneapolis, MN)

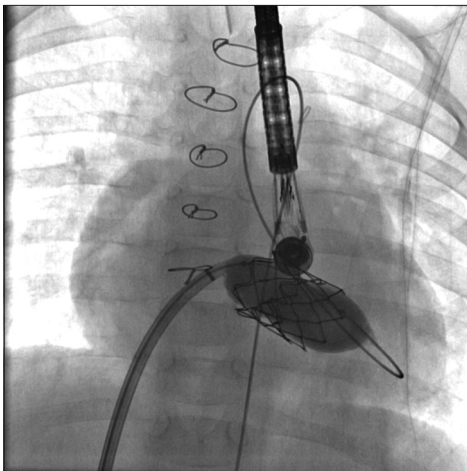


Figure 4: Melody dilatation performed with a 20x30 mm Tyshak II® balloon (NuMED, Cornwall, ON)

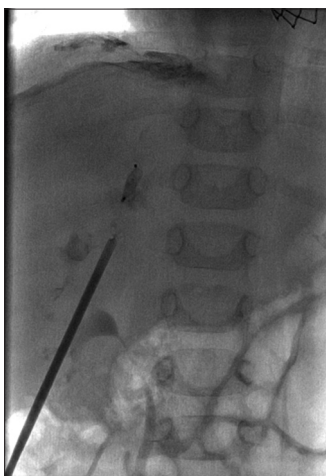


Figure 5: Embolization of the transhepatic access with a 6 mm Amplatzer Vascular Plug IV (St. Jude Medical, Minneapolis, MN)

One of the main advantages of this valve is the possibility of being dilated percutaneously up to a diameter of 22 mm–24 mm, being essential in this situation an

homogenous dilation of the Melody valve to avoid stenosis of the distal end.^[6]

In our case, the stenosis of the prosthesis caused by the patient’s growth was successfully treated by percutaneous balloon expansion 27 months after its implantation.^[3]

To facilitate subsequent percutaneous catheter access to the left atrium,^[3] it is recommended during the surgical implant to leave a fenestration in the interatrial septum or in the closure patch of the atrial septal defect.

However, it is common for these fenestrations to close spontaneously, as in our case, making transeptal perforation necessary.^[6]

Some pediatric series have reported higher complication rates of transseptal puncture, varying between 3.3% and 4%,^[7,8] while other groups perform this technique without complications.^[9] There were no complications in this patient.

In addition, the transhepatic approach is a useful alternative to access the heart when there is venous thrombosis, although it is a technique with a rate of major adverse events of 8%, mainly due to bleeding and atrioventricular block.^[10] We guided the procedure with abdominal ultrasound, which allowed us to introduce the needle into a suprahepatic vein of good size for posterior catheter access. This was also an uneventful procedure.

CONCLUSIONS

The transhepatic approach used in this patient due to the thrombosis of his iliofemoral venous system allowed a percutaneous valvuloplasty of the Melody prosthesis in an efficient and uneventful way.

The presence of an intact interatrial septum required its perforation with a needle. However, this procedure was also effective and free of complications.

The use of abdominal ultrasound was very useful for achieving a transhepatic approach, and the use of transesophageal echocardiography was essential to guide transseptal puncture.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Abdullah I, Ramirez FB, McElhinney DB, Lock JE, del Nido PJ, Emani S. Modification of a stented bovine jugular vein conduit (melody valve) for surgical mitral valve replacement. *Ann Thorac Surg* 2012;94:e97-8.
2. McLeod KA, Houston AB, Richens T, Wilson N. Transhepatic approach for cardiac catheterisation in children: Initial experience. *Heart* 1999;82:694-6.
3. Quiñonez LG, Breitbart R, Tworetzky W, Lock JE, Marshall AC, Emani SM. Stented bovine jugular vein graft (Melody valve) for surgical mitral valve replacement in infants and children. *J Thorac Cardiovasc Surg* 2014;148:1443-9.
4. González Rocafort Á, Aroca Á, Abelleira C, Carnicer H, Labrandero C, Villagrà S. Stented bovine jugular vein graft (Melody Valve) in mitral position. Could be an alternative for mechanical valve replacement in the pediatric population? *Rev Esp Cardiol (Engl Ed)* 2017;70:675-7.
5. Morriscal BD, Dearani JA, Cabalka AK. Melody valve in mitral position: Complete fracture causing acute mitral stenosis in a child. *Catheter Cardiovasc Interv* 2019;93:E101-4.
6. Sullivan PM, Wong PC, Kim R, Ing FF. Further percutaneous dilation of a Melody® valve in the mitral position to accommodate somatic growth in a small child: Lessons learned. *Cardiol Young* 2019;29:235-7.
7. Friedman RA, Walsh EP, Silka MJ, Calkins H, Stevenson WG, Rhodes LA, *et al.* NASPE Expert Consensus Conference: Radiofrequency catheter ablation in children with and without congenital heart disease. Report of the writing committee. *North American Society of Pacing and Electrophysiology. Pacing Clin Electrophysiol* 2002;25:1000-17.
8. Aiyagari R, Saarel EV, Etheridge SP, Bradley DJ, Dick M 2nd, Fischbach PS. Radiofrequency ablation for supraventricular tachycardia in children <or=15 kg is safe and effective. *Pediatr Cardiol* 2005;26:622-6.
9. Yoshida S, Suzuki T, Yoshida Y, Watanabe S, Nakamura K, Sasaki T, *et al.* Feasibility and safety of transeptal puncture procedures for radiofrequency catheter ablation in small children weighing below 30 kg: Single-centre experience. *Europace* 2016;18:1581-6.
10. Qureshi AM, Prieto LR, Bradley-Skelton S, Latson LA. Complications related to transhepatic venous access in the catheterization laboratory – A single center 12-year experience of 124 procedures. *Catheter Cardiovasc Interv* 2014;84:94-100.