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Clinical case

Acute dislocation of a Perceval valve treated with TAVI valve-in-valve: a literature review and case report

Dislocación aguda de una válvula Perceval tratada con una válvula en válvula TAVI: una revisión de la literatura y reporte de caso

Julieta D Morales-Portano,* JL Zaldívar-Fujigaki,‡ JF García-García,* EA Madrid-Dour,* R Muratalla-González,* JA Merino-Rajme*

* Department of Cardiology.
‡ Clinical Research.

National Medical Center, 20 de Noviembre ISSSTE, Mexico City, Mexico.

ABSTRACT. Dislocation of a Perceval valve is an extremely rare situation, with only a handful of proven cases entailing migration or dysfunction of the valve. A 76-year-old male with severe dyspnea with a severe aortic stenosis revealed by transthoracic echocardiography (TTE); surgical procedure with a Perceval valve was made without any complications. Within the first 24-hours in the Intensive Care Unit, the patient presented acute heart failure. The transesophageal echocardiography (TEE) showed severe paravalvular leak, then a fluoroscopy confirmed the dislocated and dysfunctional Perceval valve. An emergency transcatheter aortic valve-in-valve procedure with a CoreValve 29 mm was performed to correct the dislocated valve. To the best of our knowledge, this is the first documented case in the world of an acute dislocated Perceval valve treated with a TAVI valve-in-valve.
Keywords: Perceval valve, valve-in-valve, dislocation.

RESUMEN. *La dislocación de una válvula Perceval es una situación extremadamente rara, unos pocos casos probados que implican migración o disfunción de la válvula. Varón de 76 años con disnea severa y estenosis aórtica severa revelada por ecocardiografía transtorácica (ETT); el procedimiento quirúrgico con una válvula Perceval se realizó sin complicaciones. En las primeras 24 horas en la Unidad de Cuidados Intensivos, el paciente presentó insuficiencia cardiaca aguda. La ecocardiografía transesofágica (ETE) mostró una fuga para-valvular severa, luego una fluoroscopia confirmó la dislocación y disfunción de la válvula Perceval. Se realizó un procedimiento de emergencia de válvula aórtica transcatéter con una válvula CoreValve de 29 mm para corregir la válvula dislocada. Hasta donde sabemos, éste es el primer caso documentado en el mundo de una válvula Perceval aguda dislocada tratada con una válvula en válvula TAVI.*
Palabras clave: *Válvula ascendente, válvula en válvula, dislocación.*

Corresponding author:
JA Merino-Rajme
Departamento de Cardiología.
Centro Médico Nacional 20 de Noviembre ISSSTE.
Av. Félix Cuevas Núm. 540,
Col. Del Valle,
Benito Juárez,
03100, Ciudad de México, México.
E-mail:
jamerino75@mac.com

INTRODUCTION

Aortic stenosis is the most prevalent valvular heart condition in the world, and its prevalence has constantly increased over the years.[1,2] Surgical aortic valve replacement (SAVR) stands as the «gold standard» treatment for patients with aortic valve stenosis (AVS).[3] SAVR with sutureless Perceval valve has emerged as the new biological aortic valve bearing easy implantation potential, reduced myocardial ischemic time, surgical trauma; moreover, it has proven safe and compares favorably to conventional SAVR[3] with a less invasive approach for high-risk patients.[4] Its safety and efficacy have been reported in intermediate-risk population in a 1-year follow-up.[5]

An alternative to SAVR is the transcatheter aortic valve implant (TAVI) that has recently become widely accepted for patients with

intermediate-high risk for conventional SAVR.[6] TAVI is emerging above AVS as a valuable procedure in patients with dysfunctioning biological aortic valves, who are deemed inoperable using conventional surgery as a valve-in-valve (ViV) procedure.[7,8] There are no reports regarding the use of TAVI as an emergency procedure to treat an acute dislocation of a Perceval valve.

CASE REPORT

A 76-year-old male with history of hypertension presented with severe dyspnea (NYHA-III), without fever, syncope or chest pains. A transthoracic echocardiography (TTE) revealed a severe aortic stenosis with a left ventricle ejection fraction (LVEF): 62%, aortic valve area (AVA): 0.59 cm2, mean gradient (MG): 25 mmHg; peak velocity (PV): 3.5 m/s; paradoxical low flow low gradient; coronary arteries not compromised, STS score 4%. The patient was assessed by our multidisciplinary cardiology team, and it was determined that he was suitable for surgical aortic valve replacement (SAVR) with a Perceval valve.

A surgical procedure was carried out with a medium size Perceval (Sorin, Saluggia, Italy) valve based on surgical technique for sizing, placed without any complications, MG: 12 mmHg. The patient was transferred to the intensive care unit, but twenty-four hours after the procedure, the patient presented acute heart failure and his clinical condition deteriorated rapidly despite inotropic support. A transesophageal echocardiography (TEE) was performed documenting severe paravalvular leak; therefore, the heart team assessed the patient in a cath lab. A fluoroscopy was performed to confirm the situation of the dysfunctional Perceval valve seen in the TEE, and a dislocation of the Perceval valve was found (*Figure 1*, *Video 1* [Supplementary File]). A TEE confirmed the dislocation and the severe paravalvular leak (*Figure 2*); as a result of which, an emergency TAVI-ViV procedure with a CoreValve 29 mm was placed (*Videos 2 to 4* [Supplementary File]). The fluoroscopy confirmed proper release and functioning of the valve (*Video 5* [Supplementary File]) and TEE: MG: 10 mmHg, PV: 2.2 m/s, LVEF: 52%, without central or paravalvular leak. The clinical status of the patient improved rapidly, and the patient was discharged without any complications one week after procedure.

DISCUSSION

The data from three European prospective multicenter trials (Pilot, Pivotal and CAVALIER), reported that major paravalvular leak occurred in 1.4 and 1% within the 1st to 5th year follow-up. There were only 3 cases of explants due to miss-sizing, but no cases of valve migration or dislocation after surgery were reported.[9]

There are previous reports of failure of a Perceval bioprosthesis rescued with TAVI-ViV, but in a scenario of 3-year early failure, probably

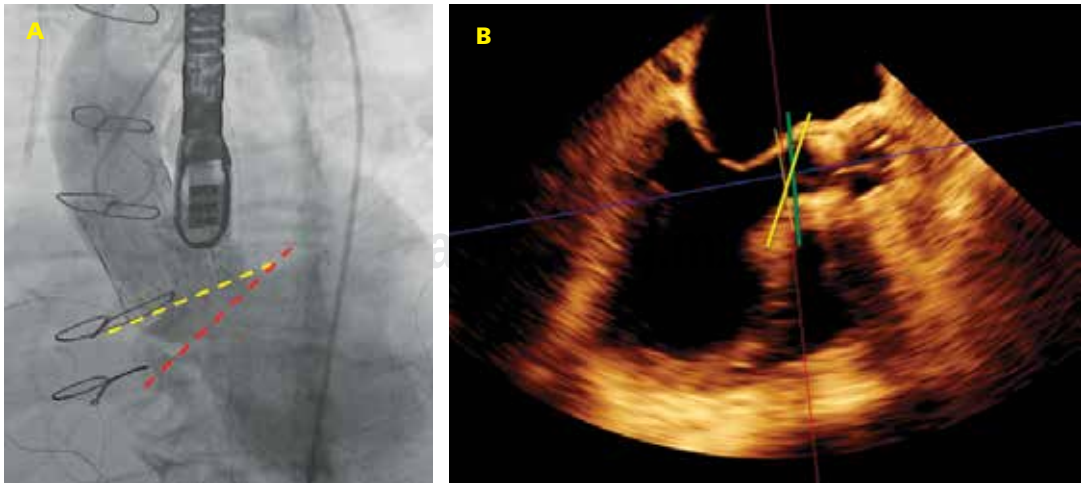


Figure 1:
A) Fluoroscopy. Red line: aortic annulus. Yellow line: prosthesis upward dislocation. **B)** Two-dimensional echocardiography of the migrated prosthesis into the ascending aorta. Green line: aortic annulus. Yellow line: prosthesis upward dislocation.

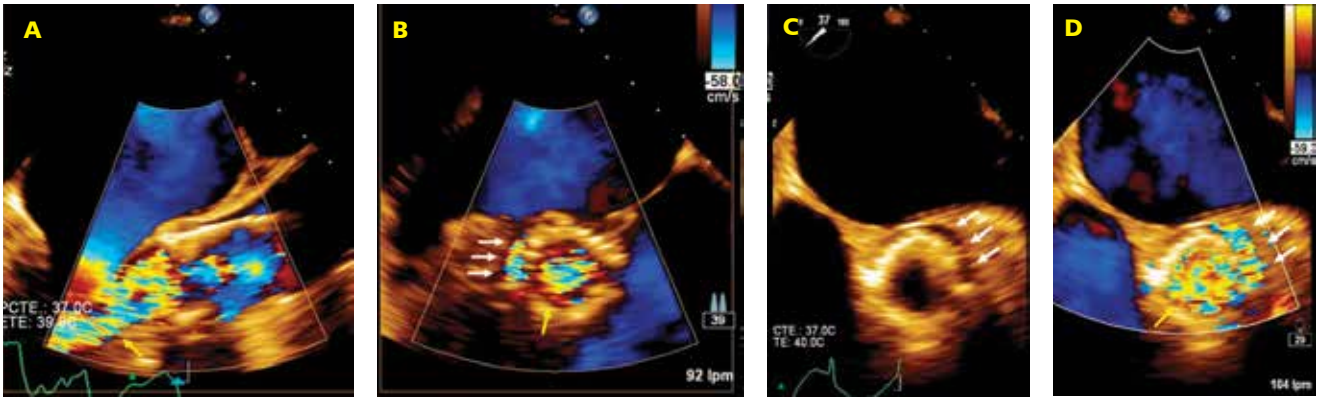
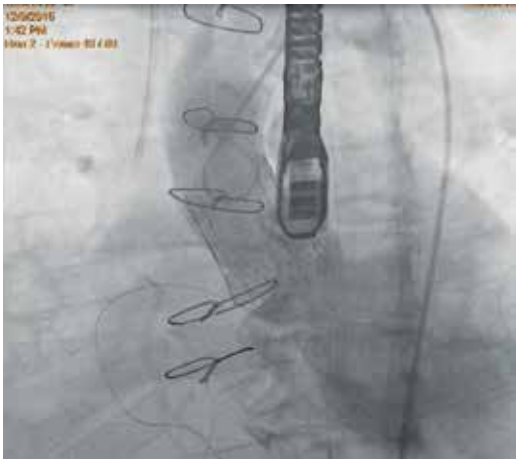


Figure 2: Transesophageal echocardiogram. **A)** Long axis: severe central aortic regurgitation (yellow arrow). **B)** Short-axis: severe central aortic regurgitation (yellow arrow) and paravalvular leak (white arrow). **C)** Short-axis view: dehiscent valve corresponding with the dislocated valve (white arrow). **D)** Short axis: severe paravalvular leak (yellow arrow) and central aortic regurgitation (white arrow).

Video 1:

Fluoroscopy diagnosis of Perceval valve dislocation.



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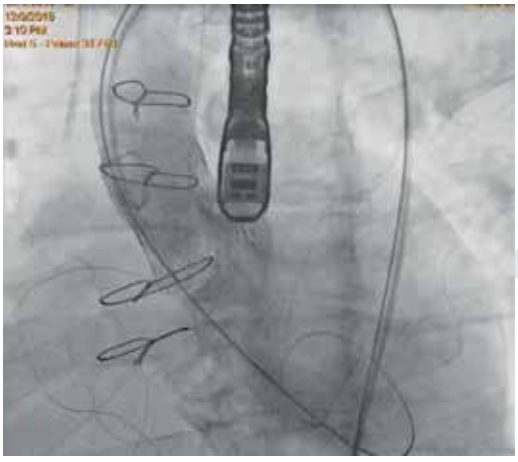
Video 2:

Super stiff guidewire throw the Perceval valve inside the left ventricle.



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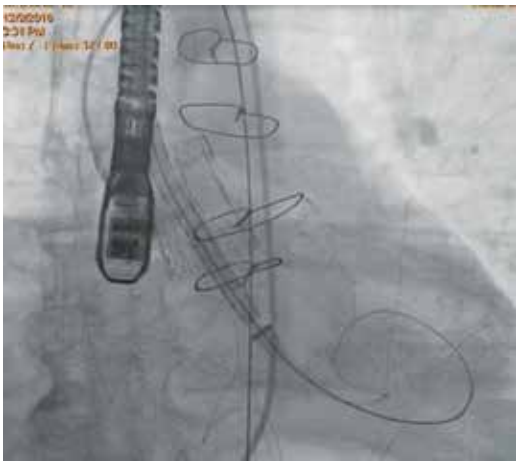
due to a sudden tearing of a leaflet.[10] Another case exhibited a degenerated prosthesis with stenosis and severe aortic regurgitation without paravalvular regurgitation for 5 years after SAVR,[11] both of which were treated with an expandable Edwards SAPIEN 3 TAVI-ViV procedure.

Although migration of a Perceval prosthesis had been described, reports showed late migration after surgery (3 and 15 months), caused by a displacement at the Valsalva left sinus and a distorted and displaced valve. Both cases were dealt with a reoperation either by preserving the valve with pledgeted stitches[12] or by replacing the standard aortic valve after a complete calcium debridement.[13] Several hypotheses could explain the delayed migration such as inadequate sizing of a non-uniformly decalcified annulus.

Since the stability of these prostheses rely on radial forces, correct sizing and proper annular decalcification are crucial to avoid displacement. There is evidence that excessive oversizing of the Perceval valve is detrimental, however still there is no consensus on how to size properly the valve to be implanted, although some authors recommend surgical sizers (such as this case), others rather do sizing based on the friction of the white obturator while going through the annulus; others propose the cardiac CT as a simple solution that had proved their role with the TAVI procedure[14] and when hesitating between two sizes it is proposed by Baert et al[15] to choose the smaller size.



Video 3:

Move forward of the 29 mm CoreValve towards the aortic annulus.

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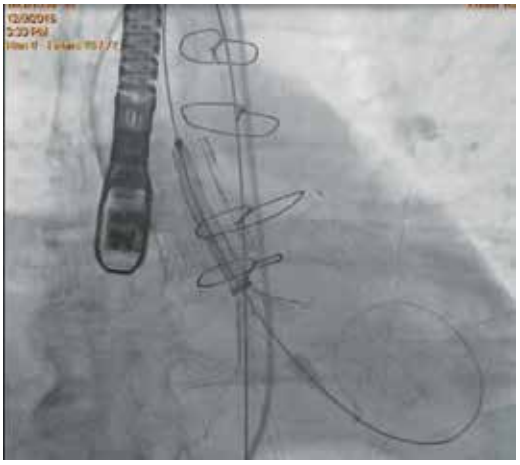

Video 4:

Release of 29 mm CoreValve.

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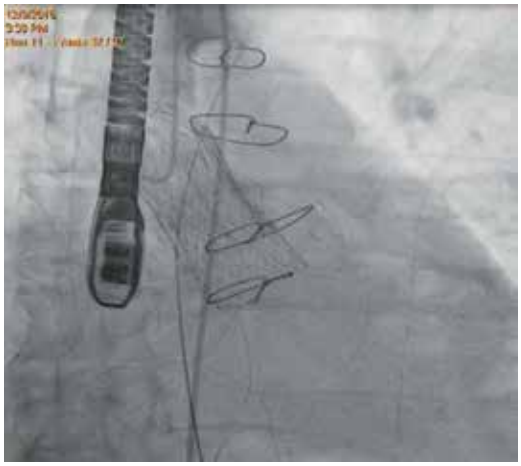
In our case although the surgeon was familiarized with the surgical technique, we cannot assure whether or not the cause of the dislocation could be related to the valve undersizing or to a high positioning of the prosthesis. For the size selection of the ViV strategy, the valve-in-valve aortic app (version 2.0) recommends CoreValve 26 mm for a medium Perceval (true internal diameter of 19.5-21 mm). However, due to the lack of a clear view of the dislocated aortic annulus, it was necessary for us to assess a new evaluation; hence, a 3D annular size measured with transesophageal echocardiography was made to determine the «new» left ventricle outflow tract a CoreValve 29 mm was selected for the implant.



Video 5: Functional TAVI-ViV of the CoreValve 29 mm.
www.medigraphic.com/videos/ciu/192_5

CONCLUSIONS

We can conclude that this case clearly illustrates the unusual dislocation of a Perceval valve and the successful TAVI-ViV procedure as an emergency treatment notwithstanding the fact that similar procedures in patients with sutured, stented, or stentless aortic valve prostheses and even in patients with dysfunction of a Perceval valve[10,16] had been reported. On the one hand, there is no data reported on the feasibility of the TAVI-ViV procedure in an acute dislocated sutureless aortic valve prosthesis. On the other hand, this case demonstrates that the TAVI-ViV procedure with a CoreValve is feasible, it can be performed easily and quickly in an urgent dislocated Perceval sutureless bioprosthetic valve with a beneficial outcome, the appropriate method to determine the proper size of the valve for a TAVI-ViV should be done with a 3D transesophageal echocardiography, and the utility of the app should be avoided in acute cases since the anatomy can be distorted.

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Conflict of interest statement

The authors have no conflicts of interest to declare.