

Valve-In-Valve-In-Valve Transcatheter Aortic Valve Implantation: A Matryoshka TAVI

Kapak İçi Kapak İçi Kapak Transkateter Aortik Valve İmplantasyonu: Bir Matruşka TAVI

Abstract:

Introduction: After its first definition, transcatheter aortic valve implantation(TAVI). continues to use it in a wide range. High surgical risk patients are still the definitive candidate for TAVI to avoid procedural risks. However, complication events and coping with these events may cause other problems for these TAVI patients.

Case: 70-year-old male, severe aortic stenosis and operated coronary by-pass surgery was decided for TAVI. After successful TAVI procedure on 2th day, hemodynamic instability and lung oedema occurred. New developing paravlvüler severe aortic regurgitation was observed on echocardiography. And valve dislocation to the left ventricular outflow tract was thought. valve-in-valve TAVI performed but the second valve dislocated to ascending aorta above the desired location. Then a third valve implanted between these two valves and hemodynamic stability was provided.

Conclusion: The positioning of the second valve in the valve-in-valve procedure may be difficult and the procedure performed as a solution may result as a complication. In our knowledge, our case is the first presentation of usage of three vales as valve-in-valve-in-valve TAVI procedure. So it must keep in mind that in some situations multiple valve-in-valve procedures can be a management option.

Key words: dislocation; transcatheter aortic valve implantation; TAVI; migration; valve-in-valve

Özet:

İlk tanımından sonra, transkateter aort kapağı implantasyonu (TAVI) işlemi geniş bir yelpazede kullanmaya devam etmektedir. Yüksek cerrahi riskli hastalar halen TAVI'nin prosedür risklerinden kaçınmaları için kesin adaydır. Bununla birlikte, TAVI komplikasyonları ve bu olaylarla başa çıkmak, bu hastalar ve işlem yapan hekimler için başka sorunlara neden olabilir.

Vaka: Opere koroner by-pass ameliyatı öyküsü olan ciddi aorta darlığı tanılı hasta TAVI işlemi yapıldı. Başarılı TAVI işleminin postop 2. gününde hastada hemodinamik instabilite ve akciğer ödemi kliniği izlendi. Ekokardiyografide yeni gelişen paravlvüler aort yetersizliği görülmesi üzerine, TAVI kapağının sol ventrikül çıkış yoluna migrasyonu düşünüldü. Kapak içi kapak TAVI hastaya ikinci seansta gerçekleştirildi, ancak ikinci kapağın istenen konumun üstüne disloke olması nedeniyle iki kapağın arasına üçüncü bir kapak yerleştirilip hemodinamik stabilite sağlandı.

Sonuç: İkinci kapağın kapak-İçi-kapak prosedüründe konumlandırılması zor olabilir ve bir çözüm olarak gerçekleştirilen prosedür bir komplikasyon olarak sonuçlanabilir. Bizim bilgimize göre sunduğumuz olgumuz, kapak-İçi-kapak TAVI prosedürü olarak üç kapağın ilk kullanımınıdır. Bu nedenle, bazı durumlarda çoklu kapak-İçi-kapak prosedürünün bir yönetim seçeneği olabileceği unutulmamalıdır.

Anahtar kelimeler: dislokasyon; transkateter aort kapağı implantasyonu; TAVI; migrasyon; kapak-İçi-kapak

Received/Geliş : 31.03.2021

Accepted/Kabul: 28.04.2021

Publication date: 30.04.2021

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Introduction:

Since transcatheter aortic valve implantation(TAVI) was first described by Criber et al.(1) in 2002, it has become the most successful treatment option for moderate-severe aortic stenosis for patients at high risk of surgical aortic valve replacement (SAVR). Therefore, with newly developing technology, the number of TAVI applications is increasing every year(2). Although the TAVI procedure has a high success rate, the procedure may also lead to life-threatening complications. The case is here presented of a valve dislocation complication treated with a valve-in-valve-in-valve procedure which resulted in three nested valves.

Case Report:

A 70-year old male with symptomatic severe AS who had 69/39mmHg transaortic gradient and 0.8cm² aortic valve area on transthoracic echocardiography(TTE). On coronary angiography, the RCA was occluded, the RCA-saphenous graft was occluded, CX had instent 40% lesion, LAD occluded and the LIMA-LAD graft was patent. For coronary artery disease, medical follow-up, and for serious AD TAVI procedure decided at the cardiovascular surgery-cardiology council.

After providing written and verbal consent, under anesthesia and sedation, a transient

cardiac pacemaker lead was positioned in the right ventricle(RV) from a 6-F sheath in the left femoral vein, and two Perclose-ProGlide® closure devices (Abbott Vascular Medical, St.Paul,MN, USA) were placed through a 8-F sheath from the right femoral artery for the TAVI system, and a 6-F sheath was placed in the left femoral artery to mark the aortic root.

After transesophageal echocardiography(TEE) and computed tomography(CT) were performed, the valve parameters were calculated; the aortic annulus perimeter was 84.8mm , mean annulus diameter was 27mm, aortic annulus area was 559.4mm², and the LVOT perimeter was 26.7mm. According to these results, it was decided to implant a no.29 Portico™ (St. Jude Medical Inc.,St.Paul,MN,USA)(Figure 1A-B).

Balloon pre-dilatation of 20mm was performed to the stenotic aort valve under rapid RV pacing, after which a no.29 Portico™ prosthetic TAVI valve was successfully implanted. Aortography revealed second-degree paravalvular aortic regurgitation(PAR). The TAVI valve was post-dilated with a 25-mm balloon. After the post-dilatation, mild PAR and 4mmHg gradient were observed on TEE and good hemodynamic condition, so the procedure was completed with these conditions (Figure 1C-H). During the follow-up period, a permanent cardiac pacemaker

was implanted due to total atrioventricular block.

On the 2nd day after the TAVI procedure, severe PAR was observed on TTE together with lung edema and diastolic TA decrease, which suggested that the mildly low implanted TAVI valve had dislocated to the left ventricular outflow tract(LVOT) side. Due to the hemodynamic instability of the patient, it was decided to treat the dislocation with a valve-in-valve TAVI procedure.

The valve dislocation to LVOT was confirmed on angiography in the second procedure. A transient cardiac pacemaker lead was positioned from the left femoral vein. A 6-F sheath was placed via the right radial artery to place a pigtail catheter to mark the aortic root. The TAVI valve could not pass via the pigtail catheter and so a diagnostic MP catheter was used to access the valve, and the catheter was exchanged. A second no.29 Portico™ prosthetic TAVI valve was opened in a controlled manner proximal to the first valve. However, due to the patient's sedation and pacing problem during controlled release, it was observed that after the complete release of the valve, that this TAVI was dislocated to the aorta(pop-up) and PAR continued as severe(Figure 2A-D). Subsequently, a third no.29 Portico™ valve was placed inside the

other two valves as valve-in-valve-in-valve due to the diastolic blood pressure deficiency of the patient. Minimal PAR was observed after placement of the third valve(Figure 2E-F). Diastolic blood pressure increased to 68mmHg and the hemodynamics improved. The patient was discharged after the first week with a 14/8mmHg gradient and without PAR on TTE (Figure 2G-I). The patient had no clinical complaints during the 8-month follow-up period.

Discussion:

TAVI valve malposition is a serious complication of the procedure, which must be managed by avoiding such complications. Malpositioning can be classified as 1)infra-annularly, 2)supra-annularly, 3)supra-sinutubular junction(3).

The frequency of dislocation is not fully known. In a previous study, it has been reported as 3.2-3.9%(4).

Migration of valve is often antegrade to the aorta due to the pressure of blood flow. Migration and dislocation occur for similar reasons, including under-expanded valve, lack of annulus calcification, undersized valve selection, and bicuspid valve anatomy/function(5-6).

In the current case, the size selected was not small for the annulus and calcification was sufficient for the procedure. For the

first valve, the implantation zone was slightly low, and post-dilatation was performed because of PAR. As a result of this, the valve may have dislocated to the LVOT with the movement of heartbeats. However, in the second valve, the complication was thought to have resulted because 1)the operator was afraid of re-inserting the valve deeply again due to the deep placement of the previous valve; 2)there was an accompanying sedation-RV pacing problem.

The management of dislocation complication depends on clinic stability and the dislocation status. Overlapping another TAVI procedure can be a solution for these patients who are at high surgical risk which was the initial reason for performing TAVI. However, in some cases surgical treatment can be a solution(7).

New generation TAVI valves can overcome some of the limitations of older generation valves (6).Portico™ (St.Jude Medical Inc.,St.Paul,MN,USA) is a self-expanding TAVI valve, which can be repositioned or recaptured, so there are advantages to this valve when valve-in-valve positioning is suboptimal.

Despite these procedures, the second trial for valve-in-valve in this patient was complicated as it dislocated to the ascending aorta from the desired position. So a third TAVI valve implantation was

needed. To the best of our knowledge, this is the first case of three valves implanted valve-in-valve.

This report presents the feasibility of a valve-in-valve procedure with three TAVI valves in a case complicated by dislocation and migration. This case may be of valuable guidance in the treatment of dislocation/migration or malpositioning.

Conclusion:

Despite the technological improvements, it must be kept in mind that there may still be unexpected problems in TAVI and complications to be managed.

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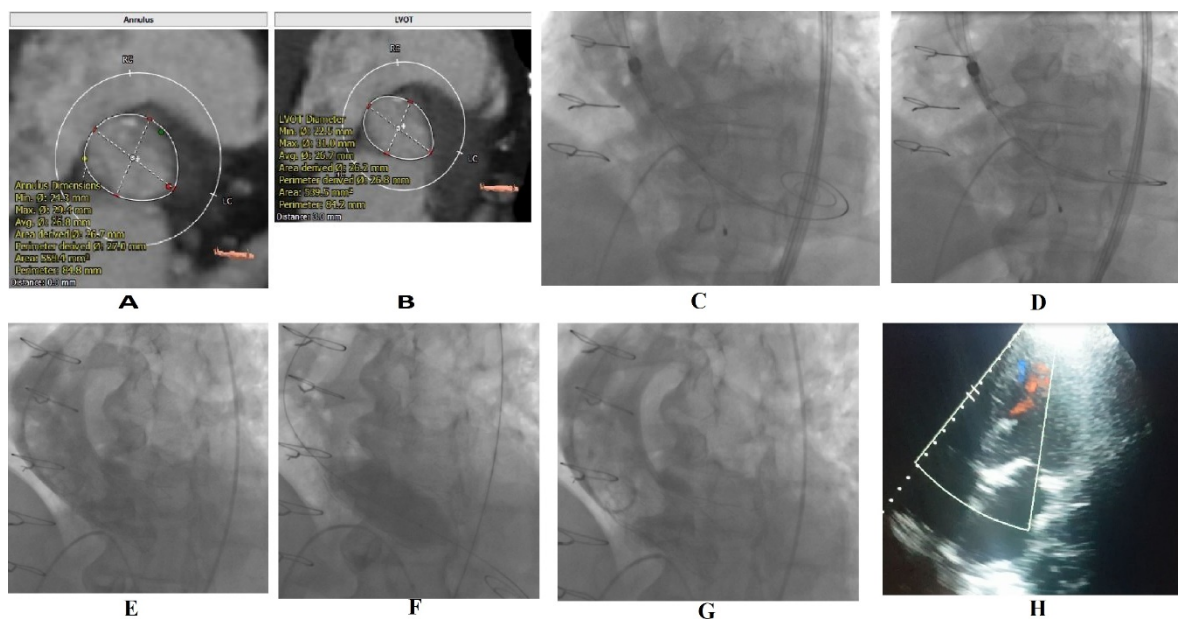


Figure 1 – On CT, the calculations showed the suitability of the 29 no Portico TAVI valve(A-B), first the TAVI valve is positioned over the Safari wire, under aortography guidance and the pigtail is positioned on the aortic root(C-D); moderate-paravalvular aortic regurgitation(PAR) seen on aortography after release of the first TAVI valve (E); balloon post-dilatation performed on the valve (F); mild PAR on aortography (G) and on transeosophageal echocardiography after post-dilatation(H).

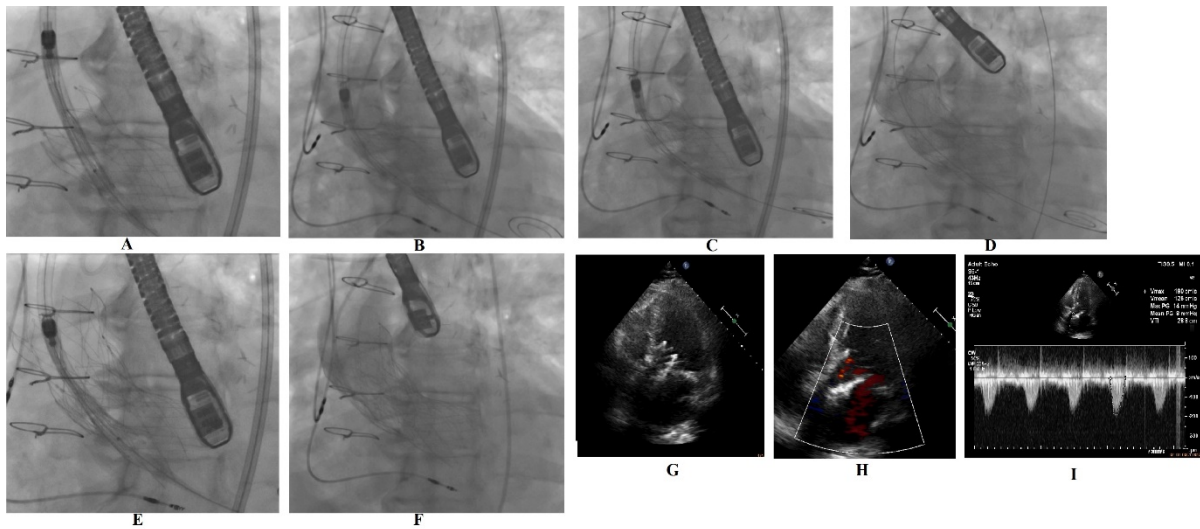


Figure 2: A second TAVI valve positioned over the Safari wire helped by the pigtail on the aortic root in the first valve as valve-in-valve (A-B-C); still moderate paravalvular aortic regurgitation (PAR) due to dislocation of the second valve seen on aortography after release of the second TAVI valve (D); the third TAVI valve is positioned over the Safari wire helped by the pigtail on the aortic root in the first two-valve as valve-in-valve-in-valve (E) and implanted successfully and there is minimal PAR on aortography after the third valve implantation (F); the valves draw attention due to the heavy metallic echogenicity on echocardiography (G); no paravalvular aortic regurgitation on transthoracic echocardiography before hospital discharge (H); and transaortic 14/8 mmHg gradient detected on TAVI valve