

## Retrograde approach for percutaneous closure in a patient with ruptured sinus of Valsalva

### Sinüs Valsalva yırtılması olan bir hastada perkütan kapama için geriye doğru yaklaşım

Erdogan İlkay, M.D., Özlem Özcan Çelebi, M.D., Fehmi Kaçmaz, M.D.,# Kutluk Pampal, M.D.\*

Department of Cardiology, Medicana International Ankara Hospital, Ankara;

#Department of Cardiology, TOBB ETU Hospital, Ankara;

\*Department of Anesthesiology, TOBB ETU Hospital, Ankara

**Summary**– In this report, we present a 37-year-old male with ruptured right sinus of Valsalva. He was treated by percutaneous closure of the rupture using the retrograde approach. The procedure was performed successfully within 26 minutes. We think this approach may be used in future instead of the antegrade approach.

Sinus of Valsalva rupture is a rare entity, and occurs in the presence of sinus of Valsalva aneurysms (SoVAs). SoVAs are most commonly congenital in origin and occur in cases of infections, such as syphilis or endocarditis, and degenerative and inflammatory processes such as Marfan's and Behçet's disease.<sup>[1,2]</sup> The aneurysms most commonly arise from the right coronary sinus of Valsalva and most frequently rupture into the right ventricle. It is estimated that rupture of SoVAs occurs in 40%-76% of patients.<sup>[3,4]</sup> The traditional treatment for ruptured SoVAs is surgery. However, they are also amenable to percutaneous transcatheter closure.<sup>[5]</sup> Although the antegrade approach has been commonly used for closure of SoVAs, in this case involving a 37-year-old male, we closed the ruptured right sinus of Valsalva (SoV) without aneurysm formation using an Amplatzer duct occluder (ADO).

#### CASE REPORT

A 37-year-old male presented with complaints of dyspnea, palpitation, and atypical chest pain over a

**Özet**– Biz bu yazıda sinüs valsalva yırtılması olan 37 yaşında erkek hastayı sunduk. Hasta yırtığın geriye doğru yaklaşımıyla kapatılması ile tedavi edildi. İşlem 26 dakika içinde başarıyla sonuçlandırıldı. Biz gelecekte geriye doğru yaklaşımın öne doğru yaklaşım yerine kullanılabileceğini düşünmekteyiz.

period of 2 months. On physical examination, a harsh continuous murmur was noted at the left sternal border without radiation to any

regions. A two-dimensional (2D) with color Doppler echocardiography was performed and a ruptured SoV into the right ventricle detected. Then, a transesophageal echocardiography (TEE) was planned to evaluate the ruptured SoV and its relation to cardiac chambers. This TEE verified the signs noted on the 2D echocardiography (Figure 1a). We searched for the underlying clinical situation for rupture of SoV without aneurysm formation in the patient. However, no history of infective endocarditis, syphilis, Marfan's disease, or Behçet's disease was found.

#### Procedure

The patient was taken to the catheterization laboratory for evaluation of the ruptured SoV and a selec-

#### Abbreviations:

2D	Two-dimensional
ADO	Amplatzer Duct Occluder
RUD	Rushkind umbrella device
SoV	Sinus of Valsalva
SoVAs	Sinus of Valsalva aneurysms
TEE	Transesophageal echocardiography

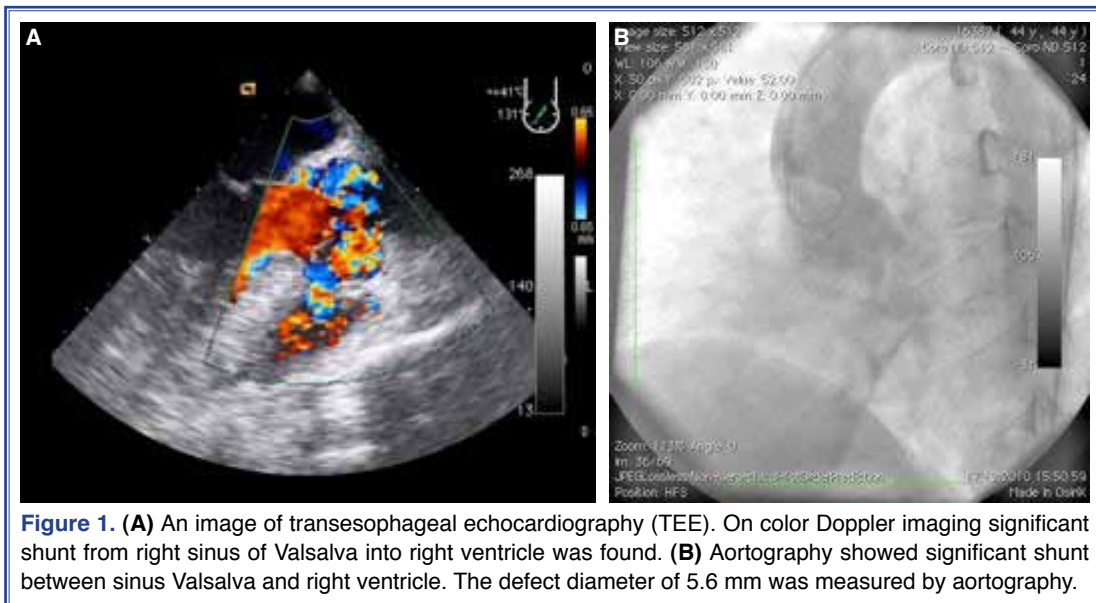
Received: May 13, 2014 Accepted: September 11, 2014

Correspondence: Dr. Özlem Özcan Çelebi, Medicana International Ankara Hastanesi, Kardiyoloji Kliniği, Söğütözü, Ankara.

Tel: +90 312 - 292 92 92 e-mail: drozlemoz79@yahoo.com

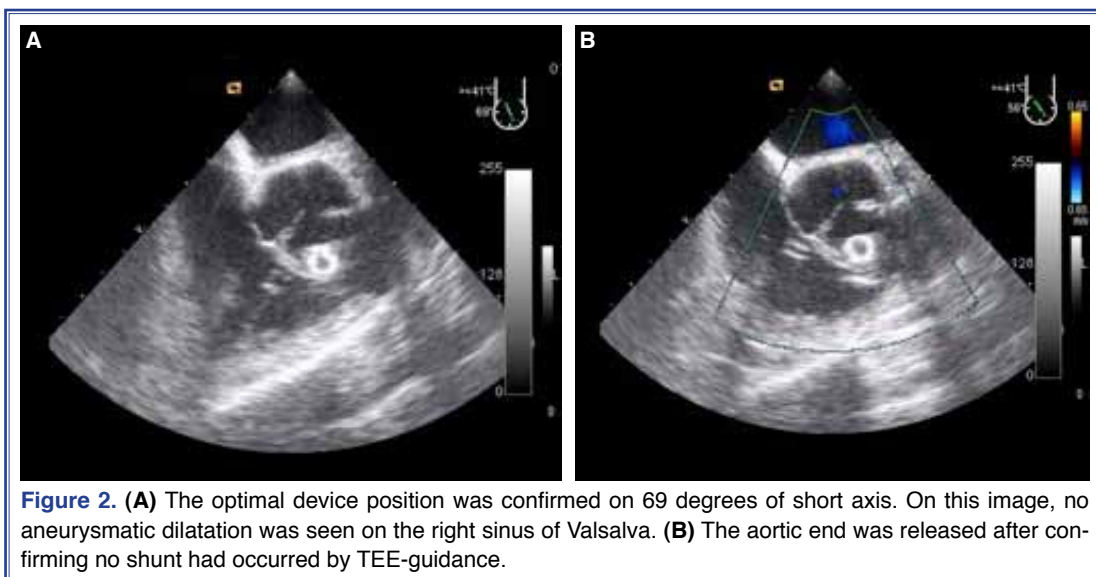
© 2014 Turkish Society of Cardiology





tive coronary angiography was performed. Normal coronary artery morphology was detected. Then, an aortography was performed to confirm echocardiographic findings, and a ruptured right SoV draining to the right ventricle was detected (Figure 1b). After taking angiograms, we attempted closure of the ruptured SoV. The procedure was performed under sedation using diprivan. After sedation, the TEE probe was introduced and the procedure performed under TEE-guidance. Firstly, a 6 Fr JR catheter was passed into the right ventricle using a hydrophilic guide wire (Terumo Corp., Tokyo, Japan). In the second step, the hydrophilic guide wire was exchanged for a 0.038

inch x260 cm guide wire for a 9 Fr delivery sheath. This was passed into the right ventricle through the ruptured side of the SoV and the JR catheter pulled back. The floppy segment of guide wire was delivered into the right ventricle. The delivery sheath was passed through the defect region into the right ventricle over the guide wire. The guide wire was pulled back and the sheath crossed the defect. An ADO II device with its delivery system was introduced through the sheath. The disc on the right ventricle side was initially released, and after confirming its correct position on both the TEE and fluoroscopy, the aortic end was released by withdrawing the sheath further (Figure 2a).



Prior to final release of the device, the position and residual shunt were reevaluated by TEE and no shunt was seen (Figure 2b). The device was deployed successfully, and following its deployment, aortography and left ventriculography were done. No shunt was seen on angiograms. The procedure time was 26 minutes and fluoroscopic time was 12 minutes. The patient was discharged uneventfully one day later on oral treatment of 100 mg of aspirin daily. At a 2-year follow-up, no residual shunt, embolization, infective endocarditis, or aortic regurgitation were noted.

## DISCUSSION

SoV rupture most commonly occurs when aneurysm formation develops. However, it may exist without aneurysm formation in case of infections such as endocarditis. In this paper, we presented an unusual ruptured SoV without aneurysm formation which was repaired using the retrograde approach with single-side femoral access.

The traditional treatment of SoVAs has been surgical repair. The operative mortality is less than 2%, with long-term survival from reoperation at 88% at 14 years.<sup>[6]</sup> Indications of surgical repair depend on the location of the SoVA, and whether there has been rupture. Percutaneous closure of ruptured SoVAs was first described by Cullen et al.<sup>[7]</sup> in a patient with recurrent rupture after prior surgical repair using a Rushkind umbrella device (RUD). Fedson et al.<sup>[8]</sup> first described using an ADO in a patient with type IV SoVA.

Arora et al.<sup>[9]</sup> reported eight patients with ruptured SoVA repaired by transcatheter closure, using RUD in two patients and various Amplatzer devices in six. They closed the SoVA in all with the antegrade approach by obtaining arteriovenous ring and the procedure was performed successfully in all eight patients. They reported no device embolization, residual shunt, infective endocarditis, or aortic regurgitation in seven patients with 2-96 months follow-up.

In current literature, the antegrade approach is most commonly described. There is only one report describing the retrograde approach in percutaneous closure of a ruptured SoVA.<sup>[10]</sup> In that report, Jarananganath et al. firstly tried to close a ruptured right SoVA using the antegrade approach with an ADO device. However, the procedure was unsuccessful and the device embolized into the descending aorta soon

after deployment and was retrieved using a Goose Neck Snare. A few days later, they closed the ruptured SoVA using the retrograde approach successfully with a muscular ventricular septal defect patch occluder. In that report, they punctured both two femoral arteries: one for the delivery sheath and one for aortography to evaluate residual shunt before releasing the aortic end of the device. They concluded that the retrograde approach was both safer and quicker than the conventional antegrade approach.

The ADO II device has symmetric discs on both sides. Thus, it is suitable only for defects not greater than 6 mm. When the defect is larger, non-symmetric devices like the ADO device must be used.

In the case reported here, we repaired a ruptured right SoV using the retrograde approach with an ADO II device. The procedure time was 26 minutes. We used single-side femoral access just for the delivery sheath. Location of the device was evaluated by TEE and fluoroscopy and residual shunt was evaluated by color Doppler imaging.

## Conclusion

In our opinion, the retrograde approach for percutaneous closure of a ruptured SoV may be both safer and quicker than the antegrade approach. However, because of a lack of long-term follow-up results such as rate of embolization or residual shunt, we do not have enough data to evaluate its inferiority or superiority over the antegrade approach. As is well known, residual shunt carries a risk of hemolysis and infective endocarditis, and therefore, technically, one must try to achieve complete occlusion to eliminate those risks.

**Conflict-of-interest issues regarding the authorship or article: None declared.**

## REFERENCES

1. Davis JA, Cecchin F, Jones TK, Portman MA. Major coronary artery anomalies in a pediatric population: incidence and clinical importance. *J Am Coll Cardiol* 2001;37:593-7. [CrossRef](#)
2. Yildirim A, Batur MK, Kabakci G. Ruptured aneurysm of the sinus of Valsalva in association with persistent left superior vena cava-a case report. *Angiology* 2000;51:167-71. [CrossRef](#)
3. Goldberg N, Krasnow N. Sinus of Valsalva aneurysms. *Clin Cardiol* 1990;13:831-6. [CrossRef](#)
4. Azakie A, David TE, Peniston CM, Rao V, Williams WG. Ruptured sinus of Valsalva aneurysm: early recurrence and fate of the aortic valve. *Ann Thorac Surg* 2000;70:1466-71.

5. Kerkar PG. Ruptured sinus of Valsalva aneurysm: Yet another hole to plug! *Ann Pediatr Cardiol* 2009;2:83-4. [CrossRef](#)
6. Au WK, Chiu SW, Mok CK, Lee WT, Cheung D, He GW. Repair of ruptured sinus of valsalva aneurysm: determinants of long-term survival. *Ann Thorac Surg* 1998;66:1604-10.
7. Cullen S, Somerville J, Redington A. Transcatheter closure of a ruptured aneurysm of the sinus of Valsalva. *Br Heart J* 1994;71:479-80. [CrossRef](#)
8. Fedson S, Jolly N, Lang RM, Hijazi ZM. Percutaneous closure of a ruptured sinus of Valsalva aneurysm using the Amplatzer Duct Occluder. *Catheter Cardiovasc Interv* 2003;58:406-11.
9. Arora R, Trehan V, Rangasetty UM, Mukhopadhyay S, Thakur AK, Kalra GS. Transcatheter closure of ruptured sinus of valsalva aneurysm. *J Interv Cardiol* 2004;17:53-8. [CrossRef](#)
10. Jayaranganath M, Subramanian A, Manjunath CN. Retrograde approach for closure of ruptured sinus of Valsalva. *J Invasive Cardiol* 2010;22:343-5.

---

**Key words:** Aortic aneurysm; angioplasty, balloon, coronary; echocardiography, transesophageal; sinus of Valsalva; ventricular/therapy.

**Anahtar sözcükler:** Aort anevrizması; anjiyoplasti, balon, koroner; ekokardiyografi, transözofajiyal; Valsalva sinüsü; ventriküler/tedavi.