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Successful Percutaneous Closure of Unusually Large RSOV: Two Cases

Aditya Gupta*, Rahul Singla, Vishal Patil, Akshat Jain and Narendra Omprakash Bansal

Department of Cardiology, Grant Medical College and Sir JJ group of Hospitals, Mumbai, India

*Corresponding author: Aditya Gupta, Department of Cardiology, Grant Government Medical College and Sir JJ group of Hospitals, Mumbai, India
Email Id: aadimeets@gmail.com

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Abstract

Ruptured Sinus of Valsalva (RSOV) a rare but well recognized entity commonly presents in young male with signs of heart failure. In this article, we report two patients of large RSOVs, who were treated through a percutaneous route with the duct occluder device (16/14) despite of being unusually large. Earlier such patients were treated surgically but with recent advancement of interventional cardiology more number of the patients can be treated percutaneously but only after suitable case selection, assessment of anatomy using transthoracic, transesophageal echocardiography and catheterization and addressing complications including aortic regurgitation, device embolization and obstruction of flow.

Keywords: Ruptured sinus of Valsalva; Percutaneous closure; Duct occluder device

Introduction

Ruptured sinus of Valsalva aneurysm though rare but a well-recognized clinical entity described in the literature. It commonly results in the left to right shunt, due to rupture into the right atrium or right ventricle at various levels. It uncommonly ruptures into the left atrium and pulmonary artery resulting in profound hemodynamic changes. Traditionally, RSOVs were closed surgically but with recent advances in the interventional cardiology more and more of ruptured sinuses are closed percutaneously with devices used for PDA closures. In this article, we report two unusually large RSOVs which were successfully closed with PDA devices.

Case Study

Case 1

A 31-year-old male patient admitted in our hospital with complaints of breathlessness on exertion NYHA class III rapidly progressing to class IV over last one week. On examination, Pulse rate was 98 per minute, Blood pressure was 130/40 mmHg

with signs of peripheral runoff. Cardiac examination showed continuous murmur grade IV/VI heard all over precordium with superficial thrill having to and fro character. Electrocardiogram showed Left ventricle hypertrophy. Echocardiography, transthoracic and transesophageal showed a large ruptured sinus of Valsalva through RCC into right ventricle i.e. Type I according to modified Sakakibara classification measuring about 9 mm with flimsy rims as shown in Figure 1.

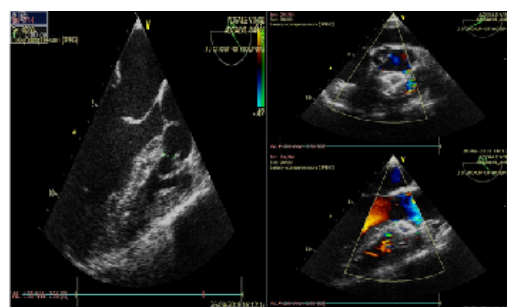


Figure 1: Case 1 Transesophageal echocardiography Long axis view at 135 degrees showing 11 mm RSOV on left and PDA device successfully deployed closing the RSOV with no residual shunt and no Aortic regurgitation.

Patient was planned for device closure. Right femoral arterial and venous access obtained. Aortogram in lateral view showed ruptured aneurysm into right ventricular measuring 9 mm. It was crossed with JR 6F catheter via right femoral arterial route and Terumo wire was placed into pulmonary artery through the right ventricle and it was subsequently snared through right femoral venous route, creating an arteriovenous loop. Multipurpose A catheter was passed to over the Terumo wire to cross the RSOV from the venous side and subsequently parking the Amplatz super stiff wire with 6 mm floppy end. Delivery sheath (8F) was used to cross RSOV and ultimately COCOON device 14/12 mm (14 mm at aortic end and 12 mm at ventricular end) was successfully deployed after slippage of 12/10 mm device. Repeat Aortogram and transesophageal echocardiography showed no flow across the ruptured sinus of Valsalva aneurysm, no aortic regurgitation. Patient was

monitored in ICCU and daily 2D echo was done which showed device in situ. Patient was discharged after 4 days on dual antiplatelet (Tab. Ecosprin 75 OD and Tab. Clopidogrel 75 OD) which were continued for 6 months. Patient is asymptomatic on subsequent follow-ups.

Case 2

Twenty eight year old male patient admitted with breathlessness NYHA class II from last four months that was sudden in onset which patient tends to remember as he fell down due to sudden onset of severe chest pain while carrying sac on his back but gradually recovered and now has developed more of breathlessness which has made his daily activity difficult. On examination, pulse rate was 88 per minute, blood pressure was 120/50 mmHg with the hyperkinetic with signs of peripheral runoff. Echocardiography showed ruptured Sinus of Valsalva into right ventricular outflow tract measuring up to 9 mm at the ruptured end and sinus being 13 mm with trivial AR. Cardiac CT showed rupture RSOV into right ventricular outflow tract, just below the pulmonary valve. Patient was planned for device closure. Right femoral arterial and venous access obtained. Aortogram in RAO view showed ruptured aneurysm into RVOT measuring 13 mm. It was crossed with JR 6F catheter *via* right femoral arterial route and Terumo wire was placed into pulmonary artery through the right ventricle and it was subsequently snared through right femoral venous route, creating an arteriovenous loop. Multipurpose A catheter was passed to over the Terumo wire to cross the RSOV from the venous side and subsequently parking the Amplatz super stiff wire with 6 mm floppy end. Delivery sheath (9F) was used to cross RSOV and ultimately COCOON device 16/14 mm (16 mm at aortic end and 14 mm at ventricular end) was successfully deployed. Repeat Aortogram and transesophageal echocardiography showed no flow across the ruptured sinus of Valsalva aneurysm with no aortic regurgitation. Patient was monitored in ICCU and daily 2decho was done which showed device in situ. Patient was discharged after 5 days on dual antiplatelet (Tab. Ecosprin 75 OD and Tab. Clopidogrel 75 OD) which were continued for 6 months. Patient is asymptomatic on subsequent follow-ups (Figures 2-4).

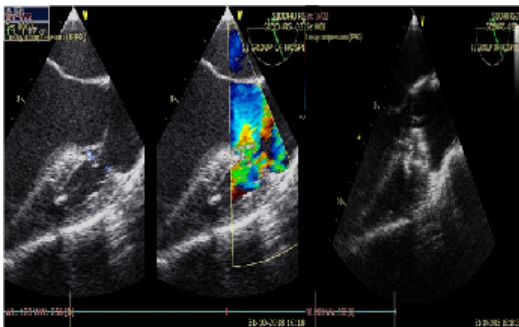


Figure 2: Long axis view of transesophageal echocardiography in the second patient showing RSOV defect of 13 mm with the left to right shunt in middle and successfully deployed 16/14 COCOON PDA device on the right side.

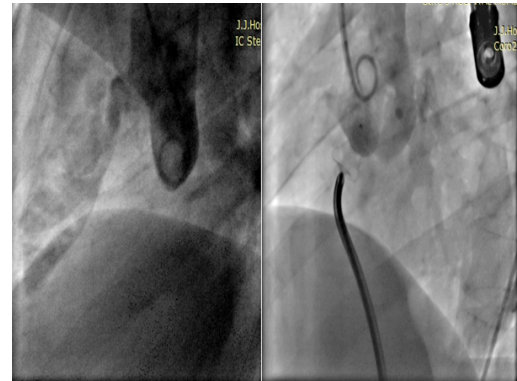


Figure 3: Showing catheterization images of RSOV in LAO cranial view and flow from the aortic sinus into right ventricle on left and successfully closed RSOV on the right side with no flow across RSOV.

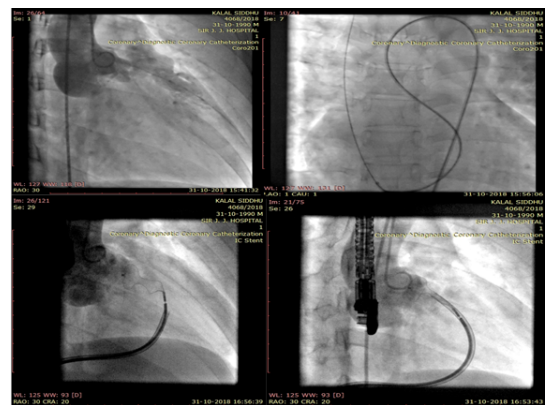


Figure 4: Top left the image in RAO cranial highlight RSOV with opacification of right ventricle on aortic root-shoot, the creation of arterial loop on the top left the image and successful device closure of RSOV with 16/14 device as there is no leak and AR on aortic root-shoot

Discussion

A sinus of Valsalva aneurysm (SVA) being a rare cardiac anomaly that may be acquired or congenital. It results from the separation between aortic media and annulus fibrosus which subsequently results in aneurysm formation [1]. The congenital variant may be associated with Marfan syndrome, syphilis, and infective endocarditis of aortic valve and acquired variant with aortic interventions [2]. RSOV is more common in males with mean age of rupture being 34 years. Both the patients were male and were around the same age. Ventricular septal defects, as well as aortic valve regurgitation and bicuspid aortic valve, are frequently associated with ruptured sinus of Valsalva aneurysms—particularly with aneurysms that rupture into the right ventricle [3]. The second patient was having small subaortic VSD and bicuspid aortic valve. Most commonly originating from the right coronary sinus (70%–90%), followed by noncoronary sinus (10%–20%) and rarely from a left sinus (<5%). An aneurysm

from right coronary sinus usually ruptures into RV. Rupture of the left coronary sinus is rare and may rupture into the pericardial cavity. Modified Sakakibara classification system for RSOV is based on the chamber into which rupture occurs, and divides patients into 5 types [4]. Transthoracic two-dimensional echo shows the typical windsock deformity but the better delineation of the lesion is done with transesophageal echocardiography. Definitive diagnosis can be made with thoracic aortography with cardiac catheterization and ascending aortic angiography. Although open-heart surgery with or without aortic valve replacement remains the treatment of choice, transcatheter device closure of a ruptured SVA has been successfully performed.

RSOV was first closed percutaneously closed by Cullen et al. [5]. In 1994 using Rash kind umbrella, since then Catheter closure of RSOV has now become the accepted treatment of choice when there are no associated lesions that require surgery. Multiple case series [6-8] have been published in RSOV patients in which the used Amplatzer duct occluder (ADO), a nitinol-based plug, but other devices such as Amplatzer septal occluder and muscular VSD closure device have also been used successfully. We in the present case have however used cocoon duct occluder device which is somewhat similar to the Amplatzer device. The size of the device selected was 2–4 mm larger than the landing zone. AV loop was created after taking femoral access and selected was delivered after checking for migration of device, aortic regurgitation due to large size, coronary compromise and AV conduction defects. Other complications include infection, thromboembolic events, and internal bleeding was looked post op in ICCU. Our case highlighted that even large RSOVs that were earlier considered for surgery are amenable to trans catheter closure but with being watchful for aortic regurgitation and device remobilization which are the common complication with large defects and large devices.

Conclusion

Ruptured sinus of valsalva aneurysms are managed surgically, but in selected patients this can be closed percutaneously with

devices used for closing PDA. Percutaneous closure of ruptured sinus of valsalva is safe and feasible and can avoid complications that occur after surgical procedure. It also helps in early stabilization of patient. Device closure in ruptured sinus of Valsalva is technically challenging.

Informed Consent

Written informed consent was obtained from the patient for publication of this report and any accompanying images

Conflict of Interest

None

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