Original Article

OUTCOME OF DEVICE CLOSURE OF RUPTURED SINUS OF VALSALVA (RSOV); AN EXPERIENCE AT TERTIARY CARE HOSPITAL

Masood Sadiq[a*], Asif ur Rehman[b], Samra Haq[b]

[a]Punjab Institute of Cardiology, Lahore-Pakistan.
* Corresponding author: drasifrn@gmail.com

Submission Date: 01-11-2019
Acceptance Date: 08-11-2019
Publication Date: 02-11-2020

Author's Contribution

MS:Conducted the study and wrote the article. AUR:Helped in review the article. SH:Re-arranged data and corrected article.

All authors declare no conflict of interest.

This article may be cited as: Sadiq M, Rehman AU, Haq S. Outcome of device closure of Ruptured Sinus of Valsalva (RSOV); An experience at tertiary care hospital . J Cardiovasc Dis 2020;16(4):144 - 148

ABSTRACT

BACKGROUND: Isolated rupture of the sinus of valsalva is a rare condition. Traditionally isolated rupture of the sinus has been treated surgically. Device closure by duct occluder has been described by many case series and can be used as a therapeutic option.

OBJECTIVES: To study the efficacy of different types of occluding devices for treatment of isolated rupture of the sinus of valsalva.

STUDY DESIGN: This is a retrospective, observational study, case series.

MATERIAL AND METHODS: Eight patients with isolated rupture of the sinus of valsalva underwent device closure under general anesthesia. Five were closed with classic duct occluder, 2 with reverse shank occluder and 1 with muscular occluder.

RESULTS: Eight patients with isolated rupture of the sinus of Valsalva (RSOV) underwent transcatheter device closure from 2009-2019. The mean age of presentation was 29.62 ± 7.13 years. New York Heart Association (NYHA) class at the time of presentation was II (n=6) and IV (n=2). The RSOVs were all closed using Amplatzer duct occluder I (ADO I), reverse shank duct occluder (DO-RS) and Amplatzer ventricular septal device (A-VSD). The mean procedural time was 42.3 ± 5.4 minutes, while the fluoroscopic time was 15.5 ± 5 minutes. Seven has complete successful closure, one case was unsuccessful. There was no complication. All were discharged next day. They were followed up for a mean of 6.7±4.03 years. At the time of the last follow up all the patients were in NYHA class I.

CONCLUSION: Transcatheter closure, using different occluders, of isolated RSOV is safe and can be an alternative to surgical repair and has good long term results.

KEYWORDS: Device closure, ruptured sinus of Valsalva.

(J Cardiovasc Dis 2020;16(4):144 - 148)

INTRODUCTION:

Rupture of aneurysm of the sinus of Valsalva (RSOV) is rare condition. Its presentation, ranges from an asymptomatic murmur to cardiac failure or even sudden cardiac death[1]. Lillehei et al in 1957 reported the first successful surgical repair, that has low mortality <2% [2]. Since then surgical repair has become the treatment of choice. However, lately isolated RSOVs have been successfully closed percutaneously using occluder devices [3].

Device closure is preferred treatment for isolated RSOV. There are a few case series that highlight the significant role of percutaneous closure of RSOV with duct occluders[4].

In almost all studies Amplatzer duct occluder I (ADO I) has been used to occlude the RSOV. Currently, there are different devices available. These devices are different in shape as compared to classical ADO1. These devices can be used with same results and has high safety profiles. Devices exert radial force that varies from device to device. A device with lesser radial force will have lesser chance to damage aortic valve.We share our experience of RSOV occlusion using different devices. They are Amplatzer duct occluder I (ADOI), Amplatzer septal occluder, (VSD),(St. Jude Medical Inc., St. Paul, Minnesota, USA) and reverse shank duct occluder (DO-RS), (Occlutech, Helsingborg, Sweden).

MATERIAL & METHOD:

Eight patients, with isolated RSOV were enrolled for device closure from 2009-2019. All patients were examined clinically for functional status and baseline cardiac examination.

Transthoracic echocardiographic (TTE) assessment was done, to confirm the diagnosis and exclude associated lesions, like ventricular septal defect (VSD), aortic regurgitation (AR). Other important structures such as tricuspid valve, right ventricular out flow tract (RVOT) and ventricular contractility were evaluated. Transesophageal echocardiographic (TEE) was done to see detailed anatomy, size of perforation and surrounding anatomy. All patients with RSOV regardless of age and gender were included. Patients with associated cardiac abnormalities like IHD and congenital lesions were excluded.

Patients were counseled and written consent was taken.Procedure was done under general anesthesia. After securing femoral vascular access (artery and vein), IV heparin 100IU/Kg followed by TEE evaluation noting the minimum and maximum diameter of aortic end of the RSOV, presence of the windsock, proximity of coronary ostium was done. An aortic root angiogram was done to delineate the perforation in anterior-posterior (AP) or right anterior oblique (RAO) 30^0.[Figure 1]. The RSOV was crossed by a 0.035" $\times$ 260 cm J tipped Terumo wire (Terumo Corp, Japan) from the aortic side with a 6F Judkin Right catheter (Cordis Corporation) that helped to guide the wire from aorta through RV, RA to inferior vena cava (IVC) and snared through the right femoral vein with a 15 mm Goose Neck Snare (Microvena, MN, USA) to establish the arteriovenous loop.

Considering the expected size of occluding device, delivery sheath was passed from the venous end over the wire across the RSOV and parked in ascending aorta. An angiogram with sheath in situ was done to counter check the size of the hole. An appropriate device was pushed to ascending aorta. Retention disc of the device was opened well high in the ascending aorta to make an onion shaped disc. Holding the device, entire assembly was pulled back till the onion of the disk reach the aortic sinus, released the disc bit more to opt the shape of the disc. Device pulled back against the wall of the aortic sinus. Now holding the delivery cable, sheath was pulled back to deliver the device completely.

A check angiogram was done to check the position of the device, any residual leak and neo valvular insufficiency. Findings were confirmed by TOE. Once it looks satisfactory, device was released, followed by another root angiogram [Figure 2]. All the patients were put on dual anti platelets for six months following the procedure.

Patients were discharged after 24 hours. An electrocardiogram (ECG) was done for any ischemic change. To ensure device position, residual leak or development of aortic regurgitation TTE was done.

Patients were advised follow up after 1 week, 1 month and then 6 month to 1 year.

RESULTS:

There were a total of 8 patients. The mean age was 29.62 $\pm$ 7.13 years. New York Heart Association (NYHA) class at the time of presentation was II (6 patients), class IV (2 patient), these 2 patients presented with cardiac failure and pulmonary edema. Mean duration between presentation and occlusion was 1 month- 6 month. Transthoracic Echo confirmed diagnosis, size, anatomical location, draining chamber and proximity to the com-

Table 1:Clinical Findings with TTE & TOE Findings

S #	Age (Y)	Sex	Presentation	Symptoms durations (Mn)	Commu-nication	Defect size mm
1	30	M	No cardiomegaly & only Cardiac Murmur	24	NC ⇒ RA	6 mm
2	25	F	No cardiomegaly & only Cardiac Murmur	30	RC ⇒ RV	6 mm
3	38	M	No cardiomegaly & only Cardiac Murmur	40	RC ⇒ RV	8 mm
4	23	F	No cardiomegaly & only Cardiac Murmur	18	RC ⇒ RV	5 mm
5	27	F	Tachy cardia, cardiomegaly with continuous murmur & tender heptomegaly	4	RC ⇒ Rv	11 mm
6	26	M	No cardiomegaly & only Cardiac Murmur	26	RC ⇒ RV	7 mm
7	25	M	No cardiomegaly & only Cardiac Murmur	39	RC ⇒ RA	7 mm
8	43	M	Tachy cardia, cardiomegaly, continuous murmur & tender hepatomegaly	24	RC ⇒ RV	10 mm

Table 2: Hemodynamic &Interventional characteristics

S #	Age (Y)/ Sex	Defect size & Echo appearance	Qp/Qs	Device Type	Size of Device	Follow up (Ys)
1	30 / M	8 mm, windsock	1.4/1	ADO1	10/8 mm	10 Ys
2	25 / F	6 mm windsock	1.5/1	ADO1	8/6 mm	10 Ys
3	38 / M	8 mm windsock	1.8/1	ADO1	12/10 mm	9Ys
4	23 / F	5 mm windsock	1.3/1	ADO1	8/6 mm	9 Ys
5	27 / F	11 mm, No windsock	2.8/1	ADO1	16 mm	Referred for surgery
6	26 / F	7 mm windsock	2/1	ADO1	14/12 mm	5 Ys
7	25 / F	7 mm windsock	1.9/1	RS-DO	10/12 mm	2 Ys
8	43 / M	10 mm windsock	2.2/1	RS-DO	12/15 mm	1 Ys

missures. (Table 1)

The RSOVs were all closed using ADO1 in 5 patients; duct occluder revers shank RS-DO in 2 patients and muscular VSD device in 1 patient. The mean procedural time was 42.3 ± 5.4 minutes, while the fluoroscopic time was 15 ± 5 minutes. One patient had failure of procedure as the device did not hold and slipped through the defect. This was referred for surgical closure. There was no major complication. The average hospital stay was 2 ± 1.1 days. After intervention functional class improved, from IV to II (Table 2)

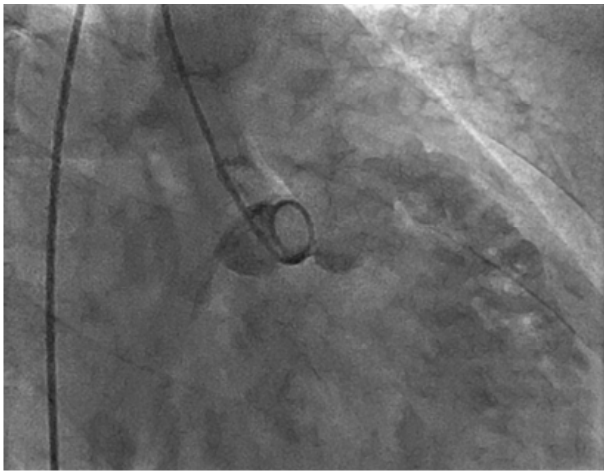

Fig 1: Aortic root angiogram in 30 RAO Ao (Aortic root)*, RSV arrow, RVOT***

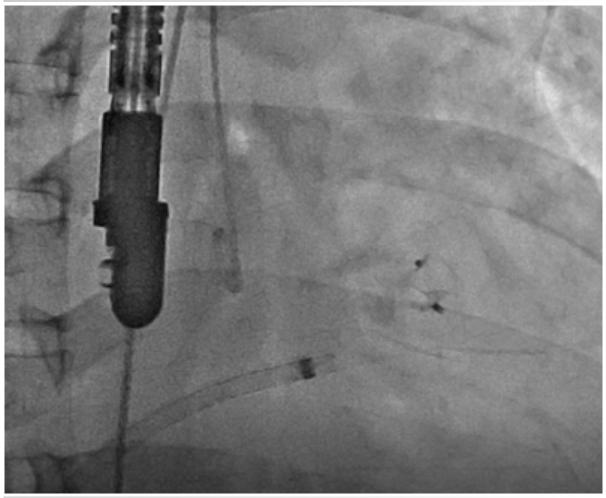

Fig 2: Angiogram showing ADO1 insitu

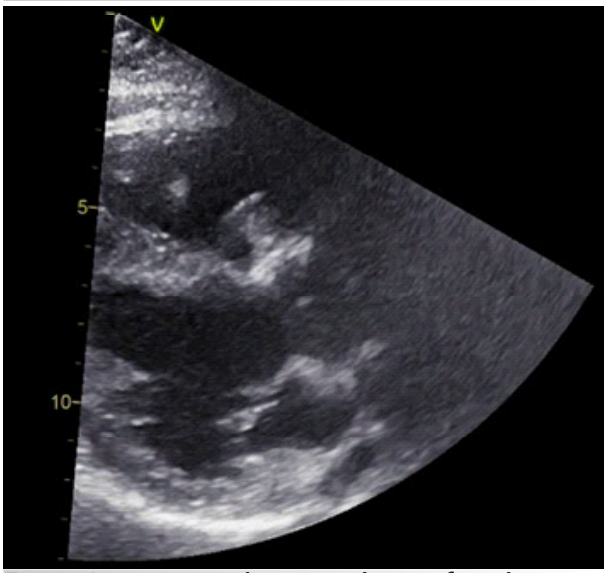

Fig 3: Long axis, showing device fitted in aortic sinus (Arrow)

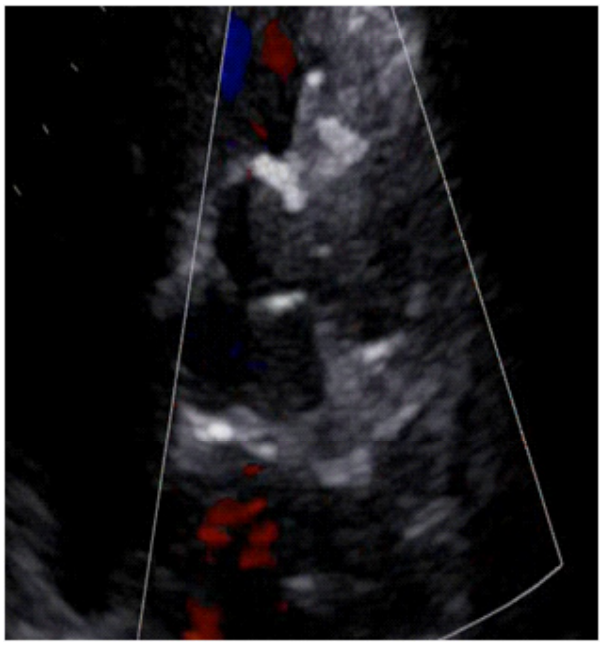

Fig 4: Short axis Device in RCC

Mean duration of follow up was 6.7±4.03 years. All had complete closure of the shunt shown in last TTE follow up. There was no increase in distortion indices like aortic annulus, aortic root or neo-aortic insufficiency. All the patients were in NYHA class I. (Fig 3 -4)

DISCUSSION:

Rupture sinus valsalva usually involve right aortic sinus followed by non-coronary sinus. In our study 7 out of 8 involved right coronary sinus (RCC) that drained to right ventricle (RV), which is the most common cusp involved. Symptoms appear after rupture of aneurysm into a heart chamber. Aneurysm rupture happens usually in adulthood. It may follow strenuous effort, infection or trauma.

The severity of symptoms depends on magnitude of the left to right shunt. They can be asymptomatic to cardiac failure due to volume over load[5]. As two patients who had Qp/Qs more > 2, were in cardiac failure that was controlled medically. This is rare to have cardiac failure. Diagnosis is established during echocardiographic examination with color-Doppler, which shows affected sinus and communication between draining chamber.

During the procedure TEE was a very helpful diagnostic tool that could confirm proper device placement and assess the function of the aortic valve and the presence of eventual residual shunt[6]. Special attention must be given to new changes in ECG monitor tracing before unscrewing of the device, as this might be an early clue to device related coronary obstruction. If there are ECG changes, device can be retrieved and patient need surgical closure[7].

Initially closure of RSOV was done with Rash kind umbrella[8]. Later, effectiveness and safety by ADO1 for trans catheter closure of RSOV has been reported by many series[4, 9].

In case with large RSVA, as our case [5], surgical correction is the treatment. This case was attempted by a large 16mm VSD device considering due to its bigger retention discs. This case did not have a windsock appearance that might me an indication of healed and fibrous tissue. Theoretically the device has chance to give way. Therefore increase the size of rupture and increasing the amount of left to right shunt. So surgical back up is essential. This index case had the shortest presentation to intervention time and had cardiac failure. So we prefer that intervention must be done after few weeks' time to have cicatrization of the tissue.

CONCLUSIONS:

Transcatheter closure of isolated RSOV is an appropriate alternative to surgical repair with good outcome. This can be further augmented by judiciously selecting the device type to ensure no long term aortic valve malfunctioning.

REFERENCES

1. Shah RP, Ding ZP, Ng AS, Quek SS. A Ten-Year review of ruptured sinus of Valsalva: Clinico-pathological and echo-Doppler features. Singapore Med J. 2001; 42:473–6
2. Lillehei Cw, Stanley P, Varco RI. Surgical treatment of ruptured aneurysms of the sinus of Valsalva. Ann Surg. 1957; 146:459–72.
3. Hamid IA, Jothi M, Rajan S. Transaortic repair of ruptured aneurysm of sinus of Valsalva. Fifteen-year experience.J Thorac Cardiovasc Surg. 1994; 107:1464-8.
4. Zhong L, Tong SF, Zhang Q, et al. Clinical effcacy and safety of transcatheter closure of ruptured sinus of Valsalva aneurysm. Catheter Cardiovasc Interv 2014; 84:1184–9.
5.Ott DA. Aneurysm of the sinus of Valsalva.Semin Thorac Cardiovasc Surg Pediatr Card Surg Ann. 2006; 9:165-76.
6.Priti K and Tapan K Matia. "Rupture Sinus of Valsalva into Right Ventricle with Classical Windsock Deformity on Transthoracic Echocardiography: A Case Report". EC Cardiology 6.1 (2018): 47-51.
7.Szkutnik M et al. Transcatheter Closure of Ruptured Sinus Valsalva Aneurysms. Rev Esp Cardiol.
2009; 62(11):1317-21
8.Cullen S, Somerville J, Redington A. Transcatheter closure of a ruptured aneurysm of the sinus of Valsalva. Br Heart J. 1994; 71:479-80.
9.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.