



CODEN [USA]: IAJ PBB

ISSN: 2349-7750

**INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES**<http://doi.org/10.5281/zenodo.1283797>Available online at: <http://www.iajps.com>

Research Article

**RUPTURED SINUS OF VALSALVA: SURGICAL TECHNIQUE
TO REPAIR THROUGH TRANS-AORTIC APPROACH:
EXPERIENCE AT N.I.C.V.D**

Saad Bader Zakai, Iqbal Hussain Pathan, Aftab Ahmed Khatri
National Institute of Cardiovascular Diseases (NICVD)
Karachi, Pakistan

Abstract:

Objectives: Ruptured sinus of valsalva is considered a rare cardiac surgical condition that be result of congenital weakness of the aortic media . We like to present our experience of surgical management and post operative outcome of that condition .

Methods: After reviewing our surgical record we identified 29 patients operated for Ruptured Sinus of Valsalva repair between January 2010 to December 2016. Nevertheless we had selected 11 patients as final cohort as we have complete record of hospital course with six month follow upn.The mean age was 27 ± 7.2 years. The pattern of involvement of coronary sinus of Valsalva was right coronary sinus of valsalva was found to be involved in 9 patients while left coronary sinus of valsalva was involved in 2 patient and non coronary sinus of valsalva i 1 patients respectively . All the RSV were closed with patch within the aorta while double chamber exposure were required in two patients .

Results: One patient developed post-op bacterial endocarditis required surgical re-intervention. While one patient required permanent pacemaker The hospital survival rate was 91% with a single mortality.

Conclusions: Trans-aortic approach with single patch technique for repair of RSV has low operative mortality and morbidity with good long-term results.

Keywords: Ruptured Sinus Of Valsalva , Aortic Root Complex

Corresponding author:

Saad Bader Zakai,
National Institute of Cardiovascular Diseases (NICVD),
Karachi, Pakistan

QR code



Please cite this article in press Saad Bader Zakai et al., **Ruptured Sinus of Valsalva: Surgical Technique to Repair through Trans-Aortic Approach: Experience at N.I.C.V.D**, Indo Am. J. P. Sci, 2018; 05(05).

INTRODUCTION:

Aortic root is a complex and dynamic structure that begins at the left ventricular outflow tract. Aortic valve cusps are directly attached to the outer wall all though no definite annulus is there i.e Circular orifice. Distal to the annulus, the aortic root consists aortic valve leaflets, aortic wall , the sinuses of valsalva and the coronary ostia.

The sinus of valsalva is a dilated and out-pouching of the left ventricular outflow tract distally that limits aortic valve proximally and the sino-tubular junctions above the aortic valve. The name (sinus of valsalva) is given accordingly to the corresponding origin of the coronary arteries i.e Left , Right and non-coronary sinus [1].

Pathologic involvement of the aortic root is an interesting and dramatic pathology that results in its enlargement, narrowing and abnormal connections to nearby heart chambers. Rupture of sinus of valsalva is a rare phenomena that may occur due to congenital aortic wall weakening or maybe iatrogenic in aortic valve surgery. It commonly ruptures in left or right side chamber that results left to right shunting of the blood which creates severe hemodynamic instability. The natural history of rupture of sinus of valsalva proceeds hemodynamic deterioration i.e heart function and the mean survival of mentioned patients is 1-2 [2] years or 3-9 [3] years. So early surgical correction is the treatment of choice [4].

Different surgical methods have been described to close the defects that is Single vs Double chamber

repair⁴, Primary or patch repair technique on extra-corporeal circulation.

MATERIALS AND METHODS:

A retrospective review of the surgical records of The National Institute Of Cardiovascular Diseases Karachi from January 2010 to December 2016 was carried out to identify the patient operated for ruptured sinus of Valsalva . Total 29 cases were detected as operated for ruptured sinus of valsalva. Out of these 11 patients were selected as final cohort as we had desired record was available with followed up of six months.

There were total of 8(73%) males and 3(27%) females with mean age of 27 ± 7.2 years. Congenital predisposition were identified in 10(82%) patients due to absence of any other predisposition while 1(18%) had bacterial endocarditis. One of the patients from congenital predisposition group had iatrogenic injury during the course of coronary cath involving left coronary sinus and presented with cardiogenic shock. Ten patients presented with shortness of breath with or without chest discomfort in outpatient department. Two of these patients presented in emergency with cardiogenic shock. The first of these had perforation of sinus valsalva while the other had frank pulmonary oedema with fever due to bacterial endocarditis. Associated heart defects included small ventricular septal defect in three patients , moderate to severe aortic stenosis in one patient . Demographic and echocardiographic data is shown in tab 1 .

Table 1: Demographic Data

	sex	age	Sinus	Chamber
1	M	16	RCS	RV
2	F	19	LCS	LA
3	M	23	LCS	RV
4	F	32	RCS	RV
5	M	11	RCS	RV
6	M	26	RCS	RV
7	M	31	RCS	RV
8	M	45	RCS	PERICARDIUM
9	M	29	NCS	RV
10	F	34	RCS	RV
11	M	31	RCS	RV

M (MALE), F (FEMALE),RCS (RIGHT CORONAR SINUS), LCS (LEFT CORONAR SINUS), NCS (NONE CORONARY SINUS), RV (RIGHT VENTRICLE), LA (LEFT ATRIUM),

Surgical Technique

Median sternotomy was used in all patient for surgical access . All the patients were anticoagulated with heprin to achieve ACT of > 400 seconda heprinization, Standard cardiopulmonary bypass with moderate hypothermic was achieved with aortic and bicaval cannulation in all patients. Cold blood cardioplegia infused directly in conronary ostia by specialized ostial canula to achieve cardiac arrest .An oblique / transverse aortotomy was carried out to achieve access to Sinus of Valsalva . To get a tension free closure of defect we always use patch to close the defect. VSDs closure was carried out by different approaches; via aortic valve , closed via aortic valve through same aortotomy ,w hile in patient with endocarditis, two chamber technique was used to close the defect and aortic valve replacement after debridement of the infected tissue . In one patient membranous VSD was not adequately visible via aortotomy so trans-atail approach was used to close as it .

Statistical analysis

Data were presented as mean \pm standard deviation.

RESULTS:***Early mortality and postoperative complications***

Early mortality was 9% (1 patients). Patient had acute bacterial endocarditis was presented in emergeny with decompensated heart failure and operated in emergeny. Patient failed to wean off cardiopulmonary bypass and declared as on table expired . One patient required permanent pacemaker, who was operated with associated closure of membranous VSD.

Postoperative follow-up

Post operative hospital course of all 10(91%) patients were unremarkable. Nevertheless one presented at 3 rd month with fever and diagnosed with bacterial endocarditis with VSD patch dehiscence, patient required surgical re-intervention. In the redo procedure, we approached VSD through right ventriculotomy. His postoperative course was unremarkable.

DISCUSSION:

Rupture of sinus of valsalva is a condition in which a communication forms between the aortic sinus and with other chambers of the heart that can occur in a pathological breach of sinus media, weakening and dilatation that ruptures the sinus of valsalva (Marfan syndrome) or a congenital anomaly in which failed fusion of the aortic media with the fibrous annulus of

the aortic valve, resulting in weakening of that area leading to aneurysm formation [5,6].

While the syphilitic or other types of endocarditis of the aortic root may result in rupture of sinus of Valsalva as well trauma has been reported [7-9]. On the other hand iatrogenic type of RSV is a rare clinical anomaly.

The incidence of RSV in right sinus of valsalva is 76.8%, 3% in left. On the other hand the non-coronary sinus of valsalva is 20.2% due to their Bulbar septal origin [10].

In our series the incidence of RSV is 73% in the right, 18% in non-coronary and 9% in left.

A clinical manifestation depends on the involvement of the communicating chambers. In 10 % of the patients there is right atrial involvement, 60-90% it directly communicates with right ventricle and when it ruptures into the peri-cardial cavity it can cause cardiac tamponade [11].The associated anomalies may occur in which the ventricular septal defect is more common i.e Sub-aortic type (25-55%), with aortic incompetence , Patent Ductus arteriosus and Atrial septal defect [12,13] also been reported.

The incidence of RSV is about 5 times higher in Oriental population reported by Chu [14].

The repair of RSV requires many surgical modalities like Primary repair [15], Patch repair of the ruptured set and the correction of the associated anomalies like VSD [16-20]. All the sutures lines should be tension free on associated aortic wall.

Considering of the very rarity of this cardiac condition, the consensus had not been developed to regarding the approach, single vs double chamber repair. Different surgeons approach through different routes with either primary or patch repair (synthetic, peri-cardial patch), dual chamber or single shamber approach . Apart from surgical repair, the device closure in cath suite had been reported²¹.

The concern in primary closure is tension on the suture line, deforming the aortic sinus and the recurrence of RSV. The Trans-aortic approaches ha many advantages like direct visualisation, proper placement of sutures, avoiding the distortion of close by structure like coronary ostia and aortic valve cusps. There are opposite opinion suggestive of aortic valve distoration when RSV approached via trans aortic root [22]. Frurther more approach to the sub-aortic VSD is good. In all patients we approached through trans-aortic root, except in one patient whom VSD was closed through the right atrium because it was located distal to the aortic valve.

Jung et al [22] showed concern of post operative aortic incompetence with trans-aortic approach and attempt was made to address the lesion via the respective chamber involved [23]. Further more it will avoid any foreign material in aortic root and risk of impair functioning of aortic valve. Therefore it is better to reserve this approach for those who have mild to moderate aortic incompetence as it will avoid the suture line tension on the aortic valve minimizing the chance of distortion.

However we believe this approach result in persistent communication between the aorta and the aneurysmal sac and may lead to bacterial colonization, and thrombus formation within the aneurysmal sac. In our series none of the patients developed aortic valve dysfunction (Trans-aortic approach). The trans-aortic approach has the advantage that it is less time consuming vs Dual chamber approach . Nevertheless dual chamber approach has advantages of both technique [24,25].

CONCLUSION:

The repair of ruptured sinus of valsalva through trans-aortic approach with single patch technique is less time consuming and has low peri-operative morbidity and mortality with good long term results in expert surgical hands.

REFERENCES:

- 1 M J Underwood, G El Khoury, D Deronck, D Glineur, R Dion The aortic root: structure, function, and surgical reconstruction ..Heart 2000;83:4 376-380
- 2 van Son JA, Danielson GK, Schaff HV, Orszulak TA, Edwards WD, Seward JB. Long-term outcome of surgical repair of ruptured sinus of Valsalva aneurysm. Circulation 1994;90:II20-9.
- 3 Sawyers JL, Adams JE, Scott HW. Surgical treatment for aneurysms of the aortic sinuses with aorticoatrial fistula: experimental and clinical study. Surgery 1957;41:46-8.
- 4 Sabit Sarıkaya, Taylan Adademir, Ahmet Elibol, Fuat Büyükbayrak, Alper Onk and Kaan Kirali. Surgery for ruptured sinus of Valsalva aneurysm: 25-year experience with 55 patients. European Journal of Cardio-Thoracic Surgery 43 (2013) 591-596
- 5 John A. Lakoumentas¹, Maria S. Bonou¹, Stella Brili², Constantinos S. Theocharis¹, Alexandros D. Benroubis¹, Anastasia S. Perpinia¹, Panagiotis K. Harbis. Ruptured Aneurysm Of The Right Sinus Of Valsalva Into The Right Ventricle Hellenic J Cardiol 43: 242-245, 2002

- 6 Knight JL, Jacka M, Charrette JP: Repair of isolated, symptomatic, sinus of Valsalva aneurysm in a patient with Marfan's syndrome. Can J Cardiol 1988; 4: 214-216.
- 7 Murray EG, Minami K, Kortke H, Seggewiss H, Korfer R: Traumatic sinus of Valsalva fistula and aortic valve rupture. Ann Thorac Surg 1993; 55: 760-761.
8. Shumacker Jr HB: Aneurysms of the aortic sinuses of Valsalva due to bacterial endocarditis, with special reference to their operative management. J Thorac Cardiovasc Surg 1972; 63: 896-902.
9. Smith WA: Aneurysm of the sinus of Valsalva, with report of 2 cases. J Am Med Assoc 1914; 62: 1878.
- 10 Chue SH, Hung CR, How SS, et al: Ruptured aneurysm of the sinus of Valsalva in oriental patients. J Thorac Cardiovasc Surg 1990; 99: 288-298.
- 11 Ring WS. Congenital Heart Surgery Nomenclature and Database Project: Aortic Aneurysm, Sinus of Valsalva Aneurysm, and Aortic Dissection. Ann Thorac Surg. 2000. 69:S147-S163
- 12 Moustafa S, Mookadam F, Cooper L, Adam G, Zehr K, Stulak J, et al. Sinus of Valsalva aneurysms--47 years of a single center experience and systematic overview of published reports. Am J Cardiol. Apr 2007. 99:1159-64
- 13 Liu YL, Liu AJ, Ling F, Wang D, Zhu YB, Wang Q et al. Risk factors for preoperative and postoperative progression of aortic regurgitation in congenital ruptured sinus of Valsalva aneurysm. Ann Thorac Surg 2011;91: 542-8.
- 14 Chu SH, Hung CR, How SS, Chang H, Wang SS, Tsai CH et al. Ruptured aneurysms of the sinus of Valsalva in oriental patients. J Thorac Cardiovasc Surg 1990;99:288-98.
- 15 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
- 16 Kirali K, Guler M, Daglar B, Yakut N, Mansuroglu D, Balkanay M et al. Surgical repair in ruptured congenital sinus of Valsalva aneurysms: a 13-year experience. J Heart Valve Dis 1999;8:424-9.
- 17 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;70:1466-70.
- 18 Li F, Chen S, Wang J, Zhou Y. Treatment and outcome of sinus of valsalva aneurysm. Heart Lung Circ 2002;11:107-11.

- 19 Harkness JR, Fitton TP, Barreiro CJ, Alejo D, Gott VL, Baumgartner WA et al. A 32-year experience with surgical repair of valsalva aneurysms. *J Card Surg* 2005;20:198–204.
 - 20 Liu YL, Liu AJ, Ling F, Wang D, Zhu YB, Wang Q et al. Risk factors for preoperative and postoperative progression of aortic regurgitation in congenital ruptured sinus of Valsalva aneurysm. *Ann Thorac Surg* 2011;91:542–8.
 - 21 Lihua Guan, Mbs, Daxin Zhou, Mbs, Feng Zhang, Md, Wenzhi Pan, Md, Lili Dong, Md, Haiyan Chen, Mbs, Junbo Ge, Md. Percutaneous Device Closure Of Ruptured Sinus Of Valsalva Aneurysm: A Preliminary Experience. *J Invasive Cardiol* 2013;25(10):492-496.
 - 22 Jung SH, Yun TJ, Im YM, Park JJ, Song H, Lee JW et al. Ruptured sinus of Valsalva aneurysm: transaortic repair may cause sinus of Valsalva distortion and aortic regurgitation. *J Thorac Cardiovasc Surg* 2008;135:1153–8.
 - 23 Murashita T, Kubota T, Kamikubo Y, Shiiya N, Yasuda K. Long-term results of aortic valve regurgitation after repair of ruptured sinus of valsalva aneurysm. *Ann Thorac Surg* 2002;73:1466–71.
 - 24 Lin CY, Hong GJ, Lee KC, Tsai YT, Tsai CS. Ruptured congenital sinus of valsalva aneurysms. *J Card Surg* 2004;19:99–102.
 - 25 Wang ZJ, Zou CW, Li DC, Li HX, Wang AB, Yuan GD et al. Surgical repair of sinus of Valsalva aneurysm in Asian patients. *Ann Thorac Surg* 2007; 84:156–60.
-