

Rupture Sinus of Valsalva - Surgical Management - Single Surgeon Experience in 30 Years

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Abstract: ***Background:** The sinus of Valsalva aneurysm (SVA) is a dilatation caused by a separation between the aortic media and annulus fibrosus. Its origin may be either acquired or congenital. The right coronary sinus is most frequently affected, with the most common complication being rupture. The malformation consists of a separation or lack of fusion between the media of the aorta and the annulus fibrosus of the aortic valve. The structure becomes aneurysmal and may rupture to form a fistula. Indeed, a deficiency of normal elastic tissues and abnormal development of the bulbus cordis have been associated with the development of SVA. **Material and methods:** This is a retrospective study done during a period of 30 years from 1990 to 2020 nearly 38 cases of ruptured sinus of valsalva were encountered in various institutions by a single surgeon. The surgical results of the different approaches in each respective type were compared as follows: cardiopulmonary bypass time, clamp aorta time, mechanical ventilation time, intensive care unit time and postoperative stay time. **Results:** All the patients diagnosed as Ruptured sinus of valsalva were repaired surgically under cardiopulmonary bypass. There were 2 post operative deaths. All other patients who underwent repair were recovered well and were discharged. There were no significant differences in intensive care unit time and postoperative stay time among different approaches in each type ($P > 0.05$). **Conclusions:** The surgical repair of the rupture sinus of valsalva aneurysms exhibited good long term results. Unruptured sinus of Valsalva aneurysms without coexisting cardiac pathology, are generally followed closely without surgical intervention. Patients who have successfully undergone sinus of valsalva repair are expected to have normal life expectancy.*

Keywords: Sinus of Valsalva, Aneurysm, Repair, Rupture

1. Introduction

Rupture sinus of valsalva aneurysms may occur in the right or left or in the non coronary sinus. Aneurysms most commonly occur in the right sinus (75-90%), followed by non coronary sinus (10-25%) with the rest occurring in the left coronary sinus [1]. Edwards et al described the structural defect of the aneurysm as a lack of continuity between the aortic annulus and aortic media which forms the aneurysmal sac composed of fibrous tissue. Due to the high aortic pressures and weakened tissues, the sac appears as a finger like projection. It is more common in the eastern population compared to the western population [2, 3, 4]. The rupture sinus of valsalva aneurysm produces left to right shunting of the blood in the cardiac chamber, or pericardial cavity. When ruptured into the pericardial cavity may present with hemodynamic instability.[5]. The most common cause is congenital, followed by acquired causes caused by trauma, infection, degenerative disease. It commonly coexists with other malformations such as ventricular septal defect (VSD), anomalies of the aortic valve and coarctation of the aorta.[6,7,8,9]. Unruptured SVA are undetected lesions because they are asymptomatic, suggesting continuous monitoring and indicating surgery only if they demonstrate aneurysm expansion, rupture or infection. Risk of rupture, cardiac insufficiency, stroke and sudden death are the other indications for the asymptomatic or incidentally detected patients.

2. Materials and Methods

Clinical presentation:

Between 1990 and 2020 nearly 38 cases were operated by a single surgeon in various institutions. Thirty patients were males and the rest (n=8) were females. The mean age at

repair was 21.96 ± 10.84 (range, 2–67 years). The mean body weight was 51.58 ± 13.75 (range, 10–113 kg). Preoperative symptoms included palpitation in 20 (52.63%) cases, asymptomatic heart murmur in 28 (73.68%), dyspnoea in 25 (65.78%), congestive heart failure in 18 (47.36%), chest pain in 15 (39.47%), fever in 5 (13.15%) and syncope in 8 (21.05%). The sites of rupture in our 38 cases are right coronary sinus 78.94% (n=30), Non-coronary sinus 15.78% (n=6), Left Coronary Sinus 5.26% (n=2). The other associated cardiac lesions are ventricular septal defects in 19 cases (50%), aortic regurgitation in 10 cases (26.31%), tricuspid regurgitation in 8 cases (21.05%). In one case there were multiple openings from the left coronary sinus into the pulmonary artery repaired with double patch technique with aortic valve replacement

Operative procedure

The surgical repair was done under cardiopulmonary bypass with moderate hypothermia through median sternotomy in all the 38 patients. Antegrade or direct coronary ostial cardioplegia was infused. The mean aortic cross clamp time was 66.33 ± 39.99 (range, 13 – 128 min) and the mean cardiopulmonary bypass time was 117.55 ± 58.05 (range 33 – 313 min). The associated cardiac lesions like ventricular septal defect repair was done in 19 cases (50%), aortic valve replacement in 10 cases (26.31%) and tricuspid annuloplasty in 8 cases (21.05%). In one case there were multiple openings from the left coronary sinus into the pulmonary artery repaired with double patch technique with aortic valve replacement

Statistical analysis

Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) 20.0 (SPSS, Inc., Chicago, IL, USA). Descriptive data were expressed as mean \pm standard

Volume 9 Issue 8, August 2020

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deviation (SD). Comparisons between two groups were performed using the unpaired Student's t-test. A P-value of < 0.05 was considered statistically significant.

3. Results

There were two postoperative deaths due to low cardiac output. The time of mechanical ventilation support ranged from 0.8 to 119.7 hours, with a mean of 15.45 ± 10.91 hours. The length of time in the intensive care unit ranged from 2.4 to 475.5 hours, with a mean of 58.57 ± 38.68 hours. The length of postoperative hospital stay ranged from 4 to 78 days, with a mean of 8.76 ± 4.99 days. There were no significant differences in intensive care unit time and postoperative stay time among different approaches in each type ($P > 0.05$). Two patients developed acute renal dysfunction (5.26%) out of which one required hemodialysis on the 8th post operative day. All the 38 patients recovered well in the hospital and were discharged. The duration of follow up 36 patients (94.73%) ranged from 28 months to 190 (mean 88.62 ± 43.04 months). There were two deaths during the post operative period (5.2%) . Two patients were lost on follow up after 38 and 46 months respectively. All the post operative patients were in New York Heart association functional classes I and II.

4. Discussion

Rupture sinus of valsalva (RSOV) is a rare cardiac anomaly that occurred in 0.09% of the large autopsy series, but in 0.14–0.23% of Western surgical series [10, 11, 12] and 0.46–3.5% of Eastern surgical series [2]. Edwards et al described the structural defect of the aneurysm as a lack of continuity between the aortic annulus and aortic media which forms the aneurismal sac composed of fibrous tissue. Due to the high aortic pressures and weakened tissues, the sac appears as a finger like projection. It is more common in the eastern population compared to the western population [2, 3, 4]. Sinus of valsalva aneurysms are either congenital or acquired. Acquired causes are from syphilis, endocarditis, atherosclerosis, trauma. In our study of 38 cases the sites of rupture of sinus of valsalva are right coronary sinus 78.94% (n=30), Non-coronary sinus 15.78% (n=6), Left Coronary Sinus 5.26% (n=2). Ventricular septal defect is the most common associated cardiac lesion along with rupture sinus of valsalva aneurysm. In our study the associated lesions along with RSOV were ventricular septal defects in 19 cases (50%), aortic regurgitation in 10 cases (26.31%), tricuspid regurgitation in 8 cases (21.05%).

The classification system for Sinus of valsalva aneurysm was originally proposed by Sakakibara and Konno [13]. Because of the high complexity of the classification it is seldom used in clinical practice.

Classification of Sakakibara and Konno

I: Right sinus to the right ventricular outflow tract below the pulmonary valve

II: Right sinus to right ventricular infundibulum in the supraventricularis crest

III: **IIIa:** Right sinus to the right atrium

IIIv: Right sinus to the RV at membranous ventricular septum

IIIa + v: Right sinus to the RA and RV

IV: Non-coronary sinus to the RA

SVA: sinus of Valsalva aneurysm; **RA:** right atrium; **RV:** right ventricle; **LA:** left atrium; **LV:** left ventricle; **PA:** pulmonary artery; **Ao:** aorta.

In our study surgical repair of RSOV showed good long term results. This is a retrospective study, so there are some limitations of small sample size and non randomized nature of the comparisons made.

5. Conclusion

Sudden onset dysnoea in presence of a continuous loud murmur might be due to rupture sinus of valsalva. The surgical repair of the rupture sinus of valsalva aneurysms exhibited good long term results. Unruptured sinus of Valsalva aneurysms without coexisting cardiac pathology, are generally followed closely without surgical intervention. Patients who have successfully undergone sinus of valsalva repair are expected to have normal life expectancy.

Conflict of interest: None declared.

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