SURGICAL REPAIR OF RUPTURED SINUS OF VALSALVA ANEURYSM: EXPERIENCE AT CARDIOVASCULAR DEPARTMENT, LADY READING HOSPITAL, PESHAWAR

Abdul Malik\textsuperscript{1}, Tariq Sohail Babar\textsuperscript{2}, Imran Khan Khalil\textsuperscript{3}, Murad Ali Shah\textsuperscript{4}, Nasreen Laiq\textsuperscript{5}

ABSTRACT

OBJECTIVES: To determine the frequency of ruptured sinus of Valsalva aneurysm (SVA) and to study its surgical outcome in terms of morbidity and mortality in our set up.

METHODOLOGY: This case series study was conducted on 23 patients of ruptured SVA’s, operated at cardiovascular department, Lady Reading Hospital, Peshawar, from January 2003 to December 2011 and followed up till December 2013. Informed consent was taken from all patients. Surgical repair was performed using cardiopulmonary bypass (CPB) via a median sternotomy. Age, sex, presentation, site and outcome of surgical repair were analyzed.

RESULTS: Ruptured SVA’s was more common in males (73.91%). Right coronary cusp was involved in 86.95% patients of the ruptured SVA’s cases. Most common ruptured site was right ventricle (91.30%). Aortic regurgitation was observed in 21.73% and ventricular septal defects in 13.04% cases. Primary closure of the defect with pledgeted stiches done in 86.95% cases while patch closure was done in 13.05% cases. Preoperatively, 34.78% & 52.17% patients were having NYHA functional status III & IV respectively, while postoperatively 45.45% & 36.36% patients were having NYHA functional status I & II respectively. Mortality was 4.35% (n=1/23) and one (4.35%) patient had residual leak and managed conservatively. Two years follow up showed no complication regarding ruptured SVA.

CONCLUSIONS: SVA are very uncommon anomalies in our setup, commonly involve right coronary cusp and rupturing mostly into right side of heart. Surgical repair of VSA is a safe procedure having good outcome in terms of morbidity and mortality.

KEY WORDS: ruptured sinus of valsalva, congenital aortic lesion, congenital cardiac lesions.

INTRODUCTION

Sinus of Valsalva Aneurysms (SVAs) are rare aortic lesions.\textsuperscript{1} It is very much common among Asians (about 1.2% to 4.94%) compared to Western populations (about 0.5% to 1.5%) and it is more common in adolescence.\textsuperscript{2} It constitutes about 0.1 to 3.5% of all congenital heart defects and 0.14 to 1.5% of all open cardiac surgeries.\textsuperscript{3,4} SVA’s lesions may be acquired or congenital. The congenital type is much common and occurs as a weakness at the junction of the aortic media. Annulus fibrosus is the most common cause of it. Acquired lesions occur secondary to syphilis and infective endocarditis.\textsuperscript{1,5}

SVAs are commonly associated with other congenital cardiac defects like ventricular septal defects (VSD), atrial septal defects (ASD) and aortic regurgitation (AR).\textsuperscript{6,7} These commonly rupture into right ventricle and right atrium but rarely into left heart chamber because of left ventricle have thick wall.\textsuperscript{6-8}

Once an aneurysm ruptures, the median survival is reduced to one to two years (if left untreated) and patients usually end up in congestive cardiac failure or infective endocarditis.\textsuperscript{3,9} For ruptured SVA prompt surgical repair is the optimal therapy and mainstay of treatment. Surgical repair has a very low perioperative risk and satisfactory long-term outcomes. Surgical repair of associated VSD, ASD and AR is required when involved.\textsuperscript{1,6}

In the light of above mentioned facts about SVA and that no such study has ever been conducted in our country we planned this study which will help to share our experience regarding management of SVAs. This study was conducted to determine the frequency of ruptured SVA and to study its surgical outcome in terms of morbidity and mortality in our set up.
METHODOLOGY

It is a case series study conducted from January 2003 to December 2011 and then follow completed till December 2013. Twenty-three patients of ruptured SVA’s were operated in cardiovascular department, Lady Reading Hospital, Peshawar. Ethical committee approval was taken. An informed consent was taken from all patients. All diagnosed cases of ruptured sinus of valsalva aneurysms (RSVA) were selected. Patients with any suspicion or evidence of infective endocarditis, non-ruptured SVA’s were excluded.

Surgery was performed in a short time once RSVA was diagnosed. Surgical repair was performed using cardio-pulmonary bypass (CPB) non-beating heart technique via a median sternotomy. CPB was instituted via standard double aortic-bicaval cannulation and moderate hypothermia 32 to 28°C. Myocardial protection was achieved by antegrade heart perfusion. Age, sex, presentation, site and outcome of surgical repair were analyzed. The patients were followed up to 2 years at our outpatient department.

Data analyzed by using Statistical Package for Social Sciences (SPSS) version 17.0.

RESULTS

The frequency of RSVA’s was more in male (n=17; 73.91%) compared to females (n=6; 26.08%). Patients were ranging in age from 17 to 49 years with median age of 27 years. All patients were Khyber Pakhtunkhwa province of Pakistanis. The base line characteristics including presentation, cusp involvement, site of rupture, associated anomalies and techniques’ used for repair are given in Table 1. Most of the patients presented with palpitation (78.26%) and shortness of breath (56.52%). Asymptomatic murmur was present in 2 patients (8.69%).

Transesophageal echo was done in all patients to investigate and diagnose SVA’s cases. CT angiography was done in 34.78% of the patients and angiography was done in only those patients aged above 40 years.

Few cases were also associated with other cardiac anomalies. In 2 cases (8.69%), with severe aortic regurgitation, aortic valve was also replaced with mechanical prosthetic valve by prolene 6/0 along with repair of ruptured SVA’s.

Preoperatively, 34.78% & 52.17% patients were having NYHA functional status III & IV respectively, while

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<td>Right coronary cusp</td>
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<td>Non coronary cusp</td>
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NEW YORK HEART ASSOCIATION (NYHA) FUNCTIONAL CLASSIFICATION
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postoperatively 45.45% & 36.36% patients were having NYHA functional status I & II respectively (Table II). Mortality was 4.35% (n=1/23) and one (4.35%) patient had residual leak and managed conservatively. Two years follow up showed no complication regarding ruptured SVA.

DISCUSSION

Aneurysm of the sinus of Valsalva is a relatively rare cardiac abnormality with congenital basis in most of the cases. Detailed illustrations of the sinuses of Valsalva were first published in 1740, in Antonio Maria Valsalva’s Opera. Congenital aneurysms are caused by weakness at the junction of the aortic media and the annulus fibrosus. Acquired lesions occur secondary to disease processes that involve the aortic root like syphilis and infective endocarditis.

In our study the frequency of RSVA’s was more in male compared to female (73.91% v 26.08%). Patient’s age was between 17 to 49 years with median age of 27 years. This supports other national and international studies reporting higher frequency of RSVA’s in young males. As this study had been conducted in Pakistan so all patients belonged to Asian race.

Most of the patient (78.76%) having RSVA presented to our unit with symptoms of exertional dyspnea, palpitations, and chest pain. Twenty percent of the cases presented with acute symptoms to their setup.

Preoperatively, 52.17% & 34.78% of patients were having NYHA functional status IV & III respectively, while postoperatively 45.45% patients were having NYHA functional status I. These results are comparable to those cited in literature. The frequency of New York Heart Association class showed that more patients belonged to higher classes in our study population and similar findings were observed in other studies.

In our study, right coronary cusp (86.95%) was involved in most of the patients of the ruptured SVA’s cases followed by non-coronary cusp (13.04%). These figures correlate well with the prevailing literature.

SVAs arising from the left coronary sinus can rupture into the left ventricle or atrium. The literature reveals that the most common site of ruptured sinus of valsalva is right ventricle (50-73%). Our study also supports this fact as 91.30% and 8.69% of our cases had ruptured their right ventricle and right atrium respectively. We did not observe any case of ruptured SVA opening into left chambers.

SVAs are commonly associated with other cardiac and aortic conditions like VSD, AR, coarctation of aorta and tricuspid insufficiency. VSD frequently occurs in these patients and is considered as a common predisposing factor for aortic valve insufficiency. In our study among the cases, AR was present in 21.73% and VSD in 13.04%. But in literature the association of VSD is very much high 27-73% compared to aortic valve insufficiency 5-35%.

Asian patients have a higher incidence of VSD compared to patients from western countries. In a study from China and Japan conducted on 654 patients revealed that VSD occurred in 343 patients (52.4%), whereas only 37.5% of Western patients had associated VSD. It was also depicted that in case of AR, if aortic valve was repaired, the operative results and postoperative long-term survival rates were both excellent. Successful aortic valve-sparing operations, such as remodeling or reimplantation procedures for sinus of Valsalva aneurysms, have recently been reported. But they are suitable for mild to moderate aortic insufficiency.

The surgical approach for closure of a ruptured aneurysm is based on its position and associated lesions. Currently Three approaches are practised to repair ruptured aneurysms, one is through the terminal chamber, another via the aortic root, and third one is combined one. Trans-aortic repair may cause postoperative aortic regurgitation because of the geometric distortion of the aortic sinus. Morrow AG, et al and Bigelow WG, et al described the first surgical repair of SVA in the mid-1950s using hypothermia and inflow occlusion techniques.

All patients presented to our unit with ruptured SVA’s underwent surgical repair of ruptured sinus along with removal of the aneurysmal sac. There are various factors which will define the surgical approach like whether the aneurysm is ruptured or not, the aortic valve replacement requirement, and the presence or absence of an aneurysmal orifice. The procedure of choice in most of the cases (21-95%) is patch closure of the orifice of the aneurysm.

In our study, the primary defect was closed with pledgeted stiches in 86.95%, while the patch closure was done in 13.04% of cases. Patch closure technique was employed in cases, which were associated with ventricular septal defects. In contrast to our experience, Liu et al stressed on patch closure for prevention of post-operative AR. He observed that direct suture closure of
RSVA may be associated with a higher risk of early worsening of postoperative AR. Ring et al favor closing the SVA with a patch when the diameter of the defect exceeds 0.8 cm; while smaller defects can be closed with pledged interrupted sutures. In SVA patients, there is a potential risk of rupture, endocarditis, stroke and sudden death. So these all risks justify surgical repair of SVA even in asymptomatic cases, considering even better results from uncomplicated SVA. 16

Once rupture has occurred, the mean survival period for untreated patients is 1–2 years. 17 In our study, one patient died within 24 hours after surgery because of low cardiac output and multi organ failure. One patient had residual leak. In literature, perioperative mortality for VSA is very low from 0 to 5% and long term survival after repair has found to be 59–100% in 10 years. 2,15,17 Two years follow up showed no complication regarding ruptured sinus of Valsalva in our study.

Among the recent advances in cases of SVA, compared to direct closure, cases with trans-catheter closure of ruptured SVA have also been done. 13,29,30 Large number of cases also repaired on On-pump beating heart surgery. 14 On-pump beating-heart surgery is characterized by avoidance of ischemia-reperfusion injury and cardioplegia.

Limitations of the study: Limited number of cases and a relatively short follow-up period are the main limitations of our study.

CONCLUSION

Our study revealed that SVA are very uncommon anomalies in our setup which commonly involve right coronary cusp in majority of the cases rupturing mostly into right side of heart. Surgical repair of VSA is a safe procedure having good outcome in terms of morbidity and mortality.

REFERENCES


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**AUTHOR’S CONTRIBUTION**

Following authors have made substantial contributions to the manuscript as under:

**AM:** Study design, acquisition of data, drafting the manuscript, final approval of the version to be published

**TSB, IKK, MAS:** acquisition and analysis of data, drafting the manuscript, final approval of the version to be published

**NL:** drafting the manuscript, critical revision, final approval of the version to be published

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

**CONFLICT OF INTEREST**

Authors declare no conflict of interest

**GRANT SUPPORT AND FINANCIAL DISCLOSURE**

NIL

KMUJ web address: www.kmuj.kmu.edu.pk
Email address: kmuj@kmu.edu.pk