Ruptured Sinus of Valsalva aneurysm: 115'Hospital Experience and the Concise Review of the Literature

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ABSTRACT

OBJECTIVES: Sinus of Valsalva aneurysms are rare cardiac anomalies and more common in Eastern than in Western populations, surgery is the most common option of treatment for ruptured sinus of Valsalva aneurysm (RSVA) To examine demographic information, clinical presentation, results, and long-term effects of surgically repairing sinus of Valsalva aneurysm (SVA), a retrospective study was conducted.

METHODS: We looked back at the data of 26 individuals who had their ruptured sinus of Valsalva aneurysm treated between May 2007 and December 2018 and overview of the literature on RSVA instances that have been reported in PubMed.

RESULTS: Following the original repair, there was no mortality. At five years, the actuarial survival rate was 92.3%.

Key word:

INTRODUCTION

The sinuses of Valsalva were first described in detail in a 1740 posthumous work by Antonio Maria Valsalva. (1) The sinuses of Valsalva are the three distinct aortic wall outpouchings that correspond to the three aortic valve cusps. The regular operation of the heart depends on these three dilations, which are situated just above the aortic valve. The clinical manifestations of ruptured sinuses of Valsalva aneurysm (RSVA) may differ, which can pose a diagnostic difficulty. (2)

MATERIALS AND METHODS

From May 2007 to December 2018, a total of 26 patients underwent repair of RSVA (ruptured sinus of Valsalva aneurysm) surgery at the 115 People's Hospital in Ho Chi Minh City, Vietnam. The patient population included adults from both Vietnam and Cambodia, consisting of 19 males and 7 females. Their ages ranged from 21 to 56 years, with a median age of 35,2 ±11 years (Table 1).

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Table 1. Age at operation of 26 patients with RSVA	
Age range	No. of Patients
Less than 20	0
21-30 years	14 (53,8%)
31-40 years	4 (15,4%)
41-50 years	2 (7,6%)
51-60 years	6 (23,2%)
Total	26

Table 2: Preoperative characteristics of the patients	
Variable	Value
Age, year	35 (median age)
Male: female, n (ratio)	17: 9 (1.9:1)
Symptoms, n (%)	
Murmur	15(57,7%)
Asymptomatic heart murmur	1(3,8%)
Dyspnea	24(92%)
Palpitation (fatigue)	25(96%)
Fever	1(3,8%)

We looked for English-language articles in the PubMed databases. Previous large study on RSVA was included in the literature review. "Rupture sinus of Valsalva aneurysm" and "surgical repair" were the keywords. Twenty-six patients underwent surgical repair of RSVA. The presenting symptoms are summarized in Table 2

PREOPERATION

A heart murmur was heard in 15 patients (57,7%) and was usually described as a continuous machinery-like murmur along the left sternal border. Symptoms at presentation were palpitation (fatigue) in 25 patients (96%), dyspnea in 24 patients (92 %). Only one patient (3,8%) was free of symptoms, with the diagnosis made incidentally during routine examinations.

RESULT

The most common associated cardiac lesions included ventricular septal defect (VSD) in 17 patients (16 of which were sub-arterial) and severe AR in 8 patients (30,7%). A patch was used to close the VSD in 17 (65%) patients with that defect. The windsock of aneurysm was excised and patch closure of RSVA was done in all patients.

The postoperative hospital stay ranged an average of 8.2 ± 4.2 days, with a range of 7–28 days. At the time of hospital discharge, all 26 survivors were NYHA classes I (Table 3). There was no death in-hospital mortality, neurological

complications were not seen in any of the patients. The operating finding and procedures are summarized in table 4 and 5. There have been 2 late deaths, after 3 months follow-up, one had reoperation by infection and one by sudden death after 6 months. Our comprehensive analysis encompasses 26 distinct studies, with a predominant focus on the Asian continent, which features 18 studies (11 conducted in China, 3 in Japan, 2 in Korea and 2 in India). In contrast, the research includes 6 studies in America and 2 in Europe. Theses findings suggest a higher prevalence of this disease in Asia compared to other regions, indicating a significant geographic disparity in its manifestation. (Table 6)

Table 3. Pre-postoperative NYHA

Preoperative	At discharge
0	26 (100%)
2 (7,7%)	
18 (69,2%)	
6 (23,1%)	

NYHA: New York Heart Association

Table 4. Origin and cardiac chamber exit of the RSVA

	Cardiac chamber exit		
Origin	RA	RV	No. of Patients
Right coronary sinus	2	23	25
Noncoronary sinus	1		1
Total	3	23	26

RA= right atrium; RV= right ventricle

TABLE 5 Associated lesions with RSVA and procedures

Isolated RSVA	8 (30,8%)	Coexisting lesion	Procedures	Total (%)
RSVA with VSD	7 (27%)	VSD	Patch closure	17 (65%)
RSVA with VSD and AR	7 (27%)	AR	AVR	8 (30,7%
RSVA with VSD, AR and endocarditis	1 (3,8%)	MR	MVR	1 (3,8%)
RSVA with VSD and AR, MR	1 (3,8%)		MP	1 (3,8%)
RSVA with VSD and MR	1 (3,8%)	TR	TP	1 (3,8%)
RSVA with VSD and TR	1 (3,8%)		TP + ring	2 (7,6%)
Total	26			

RSVA= Ruptured sinus of Valsalva aneurysm, VSD=ventricular septal defect, AVR=aortic valve replacement, MVR=mitral valve replacement, MP=mitral plasty, TP=tricuspid plasty

DISCUSSION

ETIOLOGY- EPIDEMIOLOGY

SVA can be either congenital or acquired. According to Edwards and Burchell, the structural defect of an SVA is a lack of continuity between the aortic media and the aortic annulus, Multiple lesions, most commonly a ventricular septal defect, have been associated to SVA. Rarely, infections or degenerative processes can impact the aortic wall. (3–6) Congenital weakening of the aortic annulus can occur in people with Ebstein's anomaly, Marfan's syndrome, Ehlers Danlos syndrome, (7,8) and other connective tissue disorders. Aneurysm formation may be caused by Behcet's disease (9) or Takayasu's arteritis. (10) The literature has documented cases of SVA presenting with thromboembolic cerebrovascular accidents or other systemic emboli, suggesting that a large SVA may be a possible location of thrombus formation. (11)

A hematoma, which is a pseudoaneurysm, may occur after these aneurysms are acquired iatrogenically, during aortic valve replacement (AVR) (12) or following the excision of severe aortic valve calcifications. (13) These pseudoaneurysms have the potential to dissect the interventricular septum and bulge into the left and right ventricles (12,14).

SVA is a rare congenital heart disease accounting for approximately 0.14% to 1.5% of congenital heart repairs (15,16) and accounting for only 0.14% (17) to 0,43% (18) of all open heart surgery. SVA occurs more frequently in men than in women, with a male-to-female ratio of approximately 4:1. (19) Sinus of Valsalva aneurysm (SVA), is noted to be five times more common in Asians. (20) The mean age at presentation was 35.4 years, with the age range being 4 days to 96 years. (21) But there are two cases in a newborn infant (22) and one patient aged 10 months. (23)

In our series, age between 6 weeks to 80 years old, men predominate over women from 56 percent to 85 percent of SVA patients. (Table 6) An unruptured congenital sinus of Valsalva aneurysm was discovered during an 82-year-old man's incidental necropsy**.**(24) Greiss I described a case of ruptured aneurysm of the left sinus of Valsalva discovered 41 years after a decelerational injury.(25) In the present study, the mean age of presentation was 35,2± 11 years, with a range of 21 to 56 years and 73% were male. **DAMAGED CHAMBER-INVOLVED CORONARY SINUS**

An aneurysm may burst into a heart chamber with low pressure. (6) Right coronary sinus aneurysms, which are normally located next to the right ventricular outflow tract, typically rupture into the right ventricle (60%). They also occasionally rupture into the right atrium (29%), left ventricle (4%), or the pericardium (1%) and the majority of ruptures into the right atrium came from noncoronary sinus ASVs. (6,19)

Bricker et al. discovered that aneurysms originating from the right coronary sinus (72%), the noncoronary sinus (22%), and the left coronary sinus (6%), in a study of 1121 patients examined in vivo. 34% did not rupture upon presentation, while 66% did. rupture into the RV (64,1%), the RA (30,3%), the LV (2,1%), the LA (1,1%), the interventricular septal (1,6%), the pericardium (0,6%) and the PA (0,2%). (21) In Asian patients, RSVA more commonly ruptures into the right ventricle rather than the right atrium, which differs from the pattern observed in Western patients. (20) Ruptures into the pulmonary artery, which can cause an aortopulmonary tunnel, or into the pericardium, which can cause cardiac tamponade, have been documented.

TABLE 6 Previous large study on RSVA

Author, year	Country	No. of RSVA/SVA	Age (year)	Sex Male (%)	Most common SVA rupture site (%)	Most common SVA origin (%)	Associated VSD repair (%)	Associated AVR / AV repair	Patch	Perioperative mortality	Long-term survival after surgery
Luo X[(26), 2018	China	286/286	2 to 64 y	67%	RV in 58%	RCS in 80%	132 (46%)	**56 (19.6%)/10 (3.5%)**	260 (91%)	4 (0,013%)	>90% at 10 years
Li F(27), 2002	China	187/216	8 to 65 y	67%	RV in 69%	RCS in 92%	143 (66%)	12 (6%)/6 (3%)	151 (70%)	8 (3,7%)	93% at 10 years
Cheng T(28), 2014	USA	152/212	2 to 60 y	67%	RV in 68%	RCS in 78%	113 (53%)				
Liu YL(29), 2011	China	210/210	23 to 67 y	68%	RV in 61%	RCS in 81%	108 (51%)	43 (20%)/9 (4%)	149 (71%)	1 (0.5%)	98% at 5 years
Nowicki ER(30), 1977	USA	175/175	6 weeks to 79 y	66%	RV in 71%	RCS in 67%	43 (33%)			16 (13%)	
Yan F(31), 2014	China	160/160	Mean: 30 ±12 y	70%	RV in 55,6%	RCS in 67,5%	59 (37%)	23 (14%)/9 (5,7%)	104 (65%)	3 (1,9%)	88% at 20 years
Xin-jin L(32), 2013	China	159/159	2 to 71 y	66%	RV in 56%	RCS in 77%	77 (48%)	33 (21%)/-	149 (94%)	0	92,5% at 5 years
Choudhary SK(33), 1997	India	12/104	5 to 62 y	78%	RV in 59%	RCS in 77%	46 (44%)	21 (20%)/	32 (31%)	2 (2%)	97% at 20 years
Moustafa S(34), 2007	Canada	57/86	5 to 80 y	63%	RV in 20%	RCS in 70%	27 (31%)	18 (21%)/14 (16%)	29 (34%)	6 (7%)	63% at 10 years
Wang Z(20), 2007	China	83/83	3 to 69 y	66%	RV in 63%	RCS in 89%	38 (46%) 38 (46%)	6 (7%)/4 (5%)	37 (45%)	0	98,7% at 10 years
Lee JH(35), 2021	Korea	71/71	11 to 62 y	56%	RV in 59%	RCS in 83%	38 (53%)	11 (15%)/28 (39%)	71 (100%)	0	89% at 15 years
Dong C(15), 2002	China	67/67	2 to 57 y	66%	RV in 58%	RCS in 78%	32 (48%)	12 (18%)/-	63 (94%)	1 (2%)	99% at 5 years
Jung SH(36), 2008	Korea	56/56	14 to 64 y	61%	RV in 73%	RCS in 82%	41 (73%)	3 (5,4%)/6 (11%)	49 (88%)	0	86% at 8 years

Sarıkaya S(37), 2013	Turkey	55/55	10 to 65 y	85%	RV in 69%	RCS in 78%	20 (36.4%)	6 (11%)/3 (5,5%)	43 (78%)	2 (3,6%)	87% at 15 years
Vural (38), 2001	Turkey	34/53	4 to 60 y	58%	RV in 59%	RCS in 66%	18 (34%)	5 (9%)/4 (8%)	21 (40%)	1 (2%)	88% at 14 years
Au WK(39), 1998	China	53/53	13 to 65 y	66%	RV in 72%	RCS in 77%	26 (49%)	13 (24%)/-	17 (32%)	0	84% at 15 years
Taguchi K(40), 1969	Japan	45/45	-	58%	RV in 82%	RCS in 89%	20 (44%)	8 (18%)	29 (64%)	6 (13%)	-
Zhao G(3), 2003	China	37/37	12 to 57 y	76%	RV in 51%	RCS in 70%	21 (57%)	2 (5%)/6 (16%)	30 (81%)	0	100% at 10 years
Murashita T(41), 2002	Japan	35/35	6 to 64 y	66%	RV in 69%	RCS in 86%	19 (54%)	0/0	16 (46%)	0	87% at 20 years
Liu S(42), 2014	China	35/35	16 to 74 y	66%	RV in 63%	RCS in 77%	15 (43%)		16 (80%)	1 (2,8%)	
Azakie A(43), 2000	Canada	34/34	7 to 57 y	56%	RV in 68%	RCS in 79%	18 (53%)	5 (15%)/6 (18%)	24 (71%)	0	90% at 10 years
Van Son(44), 1994	USA	31/31	3 to 54 y	-	RV in 68%	RCS in 77%	16 (52%)	4 (13%)/9 (29%)		0	95% at 20 years, 90% at 37 years
Mo A(45), 2010	China	31/31	Mean:26,06 ±6,71y	74%	RV in 58%	RCS in 87%	9 (29%)	6 (19%)/1 (3%)	17 (55%)	0	-
Naka Y(46), 2000	Japan	15/27	17 to 62 y	81%	RV in 33%	RCS in 63%	21 (78%)	3 (11%)/13 (48%)	5 (19%)	3 (11%)	78% at 15 years
Jaswal V(47), 2020	India	26/26	9 to 65 y	62%	RV in 54%	RCS in 62%	9 (35%)	7 (27%)/1 (4%)	26 (100%	1 (4%)	96% at 10 years
Harkness JR(48), 2005	USA	19/22	Mean:33.8 ±4.1y	73%	RV in 36%, (RA in 41%)	RCS in 32% (NCS in 50%)	6 (27%)	4 (18%)/2 (9%)	21 (95%)	1 (5%)	85,11% at 5 y, 59% at 10 years

RSVA: ruptured sinus of Valsalva aneurysm; SVA: sinus of Valsalva aneurysm; VSD: ventricular septal defect; AVR: aortic valve replacement; AV: aortic valve; RCS: right coronary sinus; NCS: non-coronary sinus; RV: right ventricle; RA: right atrium. y= year

A congenital aneurysm of the left sinus of Valsalva with an aortopulmonary tunnel was reported by Scagliotti D. (49,50) Due to the anatomical proximity of the base of the heart with the aortic root, the SVA rupture into the pulmonary artery is very rare. (51) Compared to right or noncoronary sinus aneurysms, there is a higher risk of myocardial ischemia with left SVA because a left coronary sinus aneurysm may intrude between the left atrium and pulmonary trunk and compress the trunk or branches of the left coronary artery. The aneurysm expanded quickly, resulting in compression of the left coronary artery and a major myocardial infarction that eventually led to death. (52,53)

VENTRICULAR SEPTAL DEFECT-AORTIC PROBLEMS

The most prevalent related abnormality, affecting 12% to 54% of individuals, was a ventricle septal defect. While other studies have found no link, aneurysms of the right coronary sinus were more likely to have ventricular septal abnormalities than noncoronary sinus aneurysms. (39,41,43) In our series the most frequent cardiac abnormality that coexist with RSVA is VSD, which affects 27% to 78% of individuals who are reported while in the present study, 17 patients (65%) had VSDs.

Additional congenital abnormalities associated with ruptured SVA, especially aneurysms that rupture into the right ventricle, include sub-valvular aneurysms, VSD (30–60%), bicuspid aortic valve (10%), pulmonary stenosis, aortic insufficiency, atrial septal defect, and sub-valvular aneurysms and coarctation of the aorta. (6,15,39,54–56) While supra-cristal VSD (type I) is the most prevalent kind in Asian countries, peri-membranous VSD (type II) is commonly seen in Western countries. (47,(57)

In the comparison betwween 654 Asian and 395 Western patients, the data from Wang Z's study showed a higher incidence of VSD in Asian patients with RSVA compared to Western patients. VSD occurred in 52,4% significantly higher than the 37.5% incidence of VSD in Western patients with RSVA. The difference between these two groups is statistically significant. (20) VSD is a risk factor for aortic insufficiency and often coexists with it in these patients. (56) AR is the second most common related lesion among SVA patients.

Takach described that aortic valve replacement (AVR) is necessary for 58% of people with AR.(54) In our series 0 to 27% AVR is done with AR.(Table 6) Worsening AR postoperatively can lead to persistent or worsening LV dysfunction. If AR is not adequately addressed during surgery, the heart may continue to suffer from chronic volume overload, which compromises long-term cardiac function.(20) Murashita found that their Japanese group did not have any progression of moderate AR over a period of 10 to 20 years. (41)

In the present study, 8 patients (30,7%) with mild or severe AR we proactively replaced the aortic valves, worsening of aortic incompetence was seen in only one patient died in the second surgery after 3 months by endocarditis of aortic prothesis. In patients with RSVA, the incidence of AR is 32.7% in the Western group and 33.6% in the Asian group, with the incidence of aortic regurgitation being approximately equal in the two groups.(20) Ring (58) reported a 10% incidence of bicuspid

aortic valve (BAV) in patients with RSVA, which is higher than the general population, where BAV occurs in about 1-2% of people. Azakie et al (43) found an even higher incidence, reporting a 20.59% rate of BAV in their study of RSVA patients. This suggests that BAV might be more prevalent in certain patient populations or studies of RSVA.

There is a notable difference in the incidence of BAV between Western and Asian patients with ruptured sinus of Valsalva aneurysm (RSVA). The data revealed that 7.8% of Western patients had a BAV. In contrast, only 0,6% Asian patients had BAV, a much lower incidence that is statistically significant. (20) The incidence of association with aortic regurgitation is similar in both Asian and Western series. (20)

30% to 50% of patients with SVA have valve prolapse, which results in aortic regurgitation. (15,33,39,44,46,48,54) while rates between 50 and 80% of patients have AVR. (44,48) Moderate AR that gets worse over time is uncommon in Asian patients. (41) Instead than replacing aortic valves, some centers would rather repair them. (43)

CLINICAL PRESENTATION- DIAGNOSIS

A continuous murmur is a significant clinical finding, the most frequent presenting symptom was dyspnea, and 76% (59)**,** 96.3% of the individuals had a continuous murmur upon examination. Bricker' literature search 795 cases of SVA, only 22,2% had signs or symptoms at presentation in which14% were asymptomatic. The most common clinical sign was cardiac murmur, which was observed in 57%, and the most common symptom was dyspnea, which was present in 56%. (21)

In present study, 24 of 26 patients presented acutely with heart failure (HF).(Table 3) Only one male, 24 year-old (3,8%) was free of symptoms, the diagnosis found incidentally during routine medical check with murmur. (Table 2) SVA is frequently confused with coronary or pulmonary arteriovenous malformation, tricuspid regurgitation, VSD associated with aortic regurgitation, and coarctation of the aorta. (6) Cardiomegaly (cardiothoracic ratio > 0.5) and pulmonary plethora in varied degrees were found in 72.2% of cases on chest roentgenograms. (39)

With echocardiography, the distinctive 'windsock' appearance can be used to diagnose a ruptured SVA. About two-thirds of patients with ruptured SVA have the "windsock deformity," which is a recess in the sinus of Valsalva's apex. (60–64) Typically, the ECG displays ST-T wave abnormalities and voltage criteria for left ventricular hypertrophy. (52) An excessive anterior-superior bulge may be seen on a chest X-ray in the left anterior oblique view, while a bulge to the right of the caval shadow may be seen on the postero-anterior view. (65)

The location and identification of the ruptured aneurysm can be determined with high accuracy using transesophageal echocardiography (TEE). Additionally, TEE can offer more details to distinguish SVA from the more prevalent coronary arteriovenous fistula or VSD aneurysm. (20,49,60) Magnetic resonance imaging (MRI) is a valuable diagnostic tool when the diagnosis of a ruptured SVA is unclear. (66,67)

SURGERY

Surgical repair is recommended, even in children, when problems including infection,

arrhythmias, obstruction of the right ventricular outflow tract or coronary ostium are present. (6,49,54) The goals of RSVA repair techniques are to remove the aneurysmal sac, close the RSVA firmly, and tackle any associated defects without causing heart block or aortic valve dysfunction. The indications for repairing asymptomatic unruptured SVA remain debatable.

A 53-year-old male patient with no symptoms was identified with a massive aneurysm of the right coronary sinus of Valsalva, measuring 61 mm in diameter, necessitating emergency surgery, according to Schullerer D. (68) Although there are currently no established criteria for surgical intervention in asymptomatic unruptured aneurysms, progressive aneurysm expansion on serial examinations needs to be taken into consideration as an indication for surgery. (49) The mean survival period following diagnosis for patients with untreated SVA has been estimated to be 3.8 years. (69) According to one case report, a patient with an unruptured aneurysm was monitored for 13 years without undergoing surgery. (70)

The trans-aortic surgical technique makes it simple to reveal the aortic root, the degree of AR, the location of the RSVA, and the coronary ostia. It enables precise suture insertion without worrying about harming the aortic cusps or coronaries. (37) Although Liu YL et al. (29) found no correlation between the surgical technique and aortic regurgitation, Jung et al. pointed out that trans-aortic repair may result in postoperative aortic regurgitation due to progressive distortion of the sinus geometry. (36) In addition to evaluating for any VSDs, the surgeon should examine the coronary ostia for correct location and patency. (6)

AVR is usually necessary in cases with BAV leaflets, retracted, thickened, or moderate to severe aortic regurgitation. (43,46,49) Aortic valve prolapse can be treated by attaching the free edge of the prolapsing leaflet to the commissural aortic wall (the Trusler technique) (71) Complex operations such as the Ross procedure or aortic root replacement may be necessary in cases of severe infection. The diagnosis should be examined before surgery. (49,72)

Some clinicians believe that small, unruptured SVA can be repaired with just simple closure. (39,73) For the repair of minor, ruptured and unruptured instances, primary closure of SVA can be adequate and frequently employed. (37) Potential disadvantages include aortic sinus deformation, disruption of aortic competence and suture line stress, which may lead to recurrent rupture. Aortic regurgitation and recurrent rupture have been associated in some studies with primary closure. (39,43,48)

For closing the SVA, 19% to 100% of the patients in our series were patched. Patch repair has become more and more popular in recent years. Since 2001, patch repair from the aortic end has been standard procedure. (37) Because it prevents the aortic valve from deforming and reduces the strain on the suture line, pericardial patching is recommended by several authors in all situations. This may improve long-term patency in comparison to direct closure. (43,44,48)

To prevent recurrence, sutures should be placed into healthy tissue, and the patch should be big enough to keep the annulus from stretching. (49,72) Routine use of patch closure of the RSVA is recommended. Four out of ten patients who underwent direct suture closure had an early recurrence, according to Azakie et al. In contrast, the remaining 24 patients who had patch closure showed no signs of recurrence. (43)

Surgical repair is the most effective treatment for ruptured sinus of Valsalva aneurysm (RSVA). For patients without associated ventricular septal defects (VSD), transcatheter closure is both feasible and effective. (74)

TRANSCATHETER

Several case reports demonstrating the feasibility and efficacy of the various percutaneous closure devices, has come to be as an alternative to open surgical treatment due to advancements in cardiac imaging, especially the Amplatzer device have been published since 1994. (49,75,76) Percutaneous closure (PC) intervention offers the benefits of noninvasiveness, a faster recovery than surgery, and long-term follow-up data appear positive. (77–79) and it may be an excellent alternative treatment for SVA. However, it can also result in issues including tricuspid regurgitation (TR), AR, and residual shunt. (80)

PC using modified double-disk occluders is a promising alternative for surgery in certain isolated RSVA or RSVA combined with peri-membranous VSD, according to Liu X's comparison of the immediate outcomes and mid-term follow-up of surgical and PC of ruptured sinus of Valsalva aneurysm. For RSVA sub-arterial VSD or other cardiac anomalies requiring for a surgical approach, surgical closure is more appropriate. (42)

FOLLOW-UP

Following surgical therapy for RSVA, long-term survival is very good. In 2003, Zhao G reported the survival of his study was 100% at 10 years. The total survival rate for Van Son was 95% at 20 years, and the follow-up period for the 28 (90%) remaining survivors extending to 37 years. (Table 6) Patients who successfully repair a ruptured aneurysm have life expectancies that are comparable to those of the healthy population (10-year survival rates of 90–95%). (39,44) even though patient populations that were previously dominated by Westerners may have worse survival rates. (48)

In the present study, the mean follow-up time for patients is 105.5 months, the actual survival rate was 92 at 5 years, which was similar to earlier reports. (Figure 1).

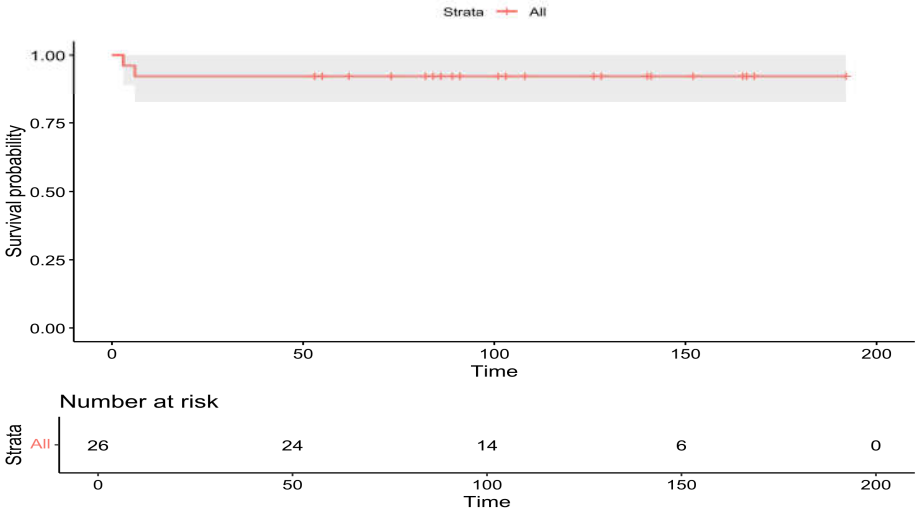

Figure 1. Kaplan-Meier Survival chart for RSVA, patients with mortality events

The survival rates are 90% ± 7% at 10 years, 93% at 20 years (41) Residual or progressive aortic regurgitation at hospital discharge is important factor impacting the long-term prognosis. (39,41) Aortic prosthesis dehiscence was the sole significant predictor affecting late survival, aortic cross-clamp time (<70 minutes), bacterial endocarditis, aortic prosthetic dehiscence, reoperation, and aneurysm draining into the left ventricle were all significant predictors in long-term survival. (39)

Moustafa's study has been conducted for about 50 years; improvements in surgical skill throughout the years have allowed for a 0% mortality rate after 1990, compared to 12% prior to 1990.(34) In contrast, there is no evidence that patients with aortic regurgitation have a poor prognosis, those who have an SVA, a VSD, and concomitant aortic regurgitation seem to have a worse prognosis. (46,49) It frequently worsens following repair if the native aortic valve is insufficient, and the patient may eventually need to have the valve replaced. (6)

CONCLUSION

SVAs are rare cardiac anomalies that can be congenital or developed as a result of trauma, infection, or degenerative diseases. Congenital aneurysms are more common and usually result from a lack of normal elastic tissue, which weakens the region where the aortic media and annulus fibrosus connect. Along with a persistent, mechanical-sounding cardiac murmur, ruptured ASVs frequently lead to peripheral edema, tachycardia, coughing, easy fatigability, chest pain and dyspnea.

Sinus of Valsalva aneurysms are rare cardiac anomalies and more common in Eastern than in Western populations,(20) with the age range being 4 days to 96 years (21), with a male-to-female ratio of approximately 4:1.(19) TEE is usually sufficient to detect SVA because it can determine the size of the aneurysm, the chamber into which it ruptures, the degree of aortic valve regurgitation, the sinus of origin, and associated congenital anomalies.

SVA should be operated on immediately because it could rupture at any time. (68) Surgical repair of an RSVA is an acceptably low operative risk. They most frequently affect the right or noncoronary sinuses and often associated with other cardiac problems, such as aortic valve dysfunction and VSDs. The main aims of surgical repair are to remove or obliterate the aneurysmal sac, close the ASV firmly, and repair any associated abnormalities.

Aortotomy, either alone or in combination with cardiotomy, is the recommended method for patch repair when an SVA ruptures. Concomitant bacterial endocarditis and other factors (aortic prosthesis dehiscence, aortic cross-clamp time (<70 minutes), reoperation, and aneurysm draining into the left ventricle) have been associated to an increased risk, despite the generally low operating mortality.(39)

PC is a promising alternative for surgery in certain isolated RSVA or RSVA combined with peri-membranous VSD.(42)

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