

# Cesarean section under epidural anesthesia in a documented case of ruptured aneurysm of the sinus of valsalva

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## Abstract

Ruptured aneurysm of sinus of Valsalva (RSOV) occurring in pregnancy is a rare cardiac anomaly and it may be either congenital or acquired. Congenital sinus of Valsalva aneurysms are commonly associated with other structural defects such as ventricular septal defect (50-55%), aortic regurgitation (AR) (25-35%), bicuspid aortic valve (10-15%) and Marfan's syndrome (10%). RSOV in pregnancy accentuates the hemodynamic stress on maternal cardiovascular system and pose a significant challenge from obstetric anesthesia point of view. We report a case of 35-year-old documented patient of RSOV with mild AR presenting completely asymptomatic at 37 weeks 4 days of gestation. A successful elective lower segment cesarean section was conducted under epidural anesthesia.

**Key words:** Anesthesia, caesarean section, epidural, pregnancy complications, sinus of Valsalva

## Introduction

Sinus of Valsalva aneurysm (SOVA) is a very rare cardiac anomaly that can be either congenital or acquired. The congenital variant is more common and accounts for 0.1-3.5% of all congenital cardiac defects.<sup>[1]</sup>

Congenital SOVA occurs more commonly in males with a male: Female ratio of 4:1 and higher prevalence in Asian population than western.<sup>[2]</sup>

Sinus of Valsalva aneurysm usually remains silent until rupture occurs, leading to catastrophic events.<sup>[1,3]</sup> Size, location and rapidity of rupture are the chief determinants of presentation and prognosis of ruptured aneurysm of sinus of Valsalva (RSOV).<sup>[2]</sup> High degree of clinical suspicion

followed by imaging studies helps in the confirmation of diagnosis.

There is only a little discussion in english-literature regarding RSOV occurring in pregnancy and its anesthetic management. All earlier reported cases have either not discussed the anesthetic management,<sup>[4]</sup> conducted normal vaginal delivery<sup>[5]</sup> or cesarean section under general anesthesia.<sup>[6]</sup>

Here, we present the anesthetic management in a documented patient of RSOV at term posted for elective lower segment cesarean section (LSCS) and tubal ligation under epidural anesthesia.

## Case Report

A 35-year-old multigravida from rural background presented at 9 months of amenorrhea to the obstetric department for routine check-up. Her previous history revealed two deliveries first being LSCS done under spinal anesthesia 4½ years back for non progress of labour with an uneventful intra-operative and postoperative course and second being normal vaginal delivery 2 years back at home. Postpartum period was normal except for transient retrosternal discomfort and mild breathlessness, which developed immediately after second delivery. It lasted for one week and subsided without any treatment/consultation. In the present pregnancy, she had an unremarkable antepartum period.

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On general physical examination, patient appeared pale and malnourished. She had a pulse rate of 108 beats/min, bounding in character. Her blood pressure was 116/52 mm Hg in both arms.

Cardiovascular system examination revealed a palpable thrill along the left parasternal region and a loud grade 4/6 continuous machinery murmur heard all over the precordium, best auscultated over the lower left parasternal region. Rest of her general and systemic examination was normal.

Obstetric ultrasound revealed a live fetus at 37 weeks 4 days in transverse lie with normal heart rate.

All routine blood investigations were normal except for hemoglobin 9.6 g/dl. Chest radiography and arterial blood gas analysis were normal. Electrocardiography revealed sinus tachycardia with left ventricular enlargement. Transthoracic two-dimensional echocardiography revealed a membranous outpouching from right Coronary sinus into right ventricle with a small perforation of 2.7 mm width giving a characteristic “windsock” appearance with a peak pressure gradient of 80 mm Hg across the shunt [Figure 1a]. Continuous wave Doppler and color flow imaging revealed a high velocity unidirectional flow from aorta into right ventricle through the shunt lesion [Figures 1b and 2]. Pulmonary artery systolic pressure was 24 mm Hg with no evidence of clot, emboli or vegetations. The ventricular chambers were enlarged with a good left ventricular function at rest.

During preanesthetic check-up, general and systemic examination findings were confirmed. As the patient was completely asymptomatic with no fetal distress, surgery was planned under epidural anesthesia.

On the preoperative night, oral ranitidine 150 mg and alprazolam 0.25 mg were administered. She was kept nil per

oral for 6 h. Written informed consent was obtained from both patient and her husband.

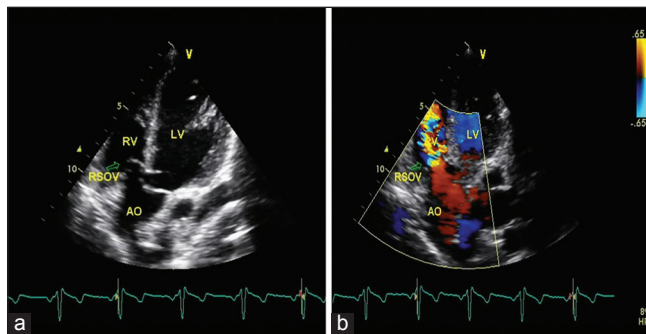
In the operating theater, patient was made to lie down supine on the operating table with a wedge of 10-15° under the right hip. Hudson mask was attached with continuous oxygen flow. Intravenous access was obtained with an 18G cannula after topical anesthesia with Eutectic mixture of local anesthetic cream (2.5% lignocaine + 2.5% prilocaine). Intravenous injection ranitidine 50 mg, injection. Metoclopramide 10 mg and antibiotic prophylaxis with 2 g ceftriaxone were given 30 min prior to induction.

Pulse rate, noninvasive blood pressure, oxygen saturation, electrocardiography, and central venous pressure (CVP) (normal 5-10 cm H<sub>2</sub>O) were monitored throughout the surgery and kept within the normal limits.

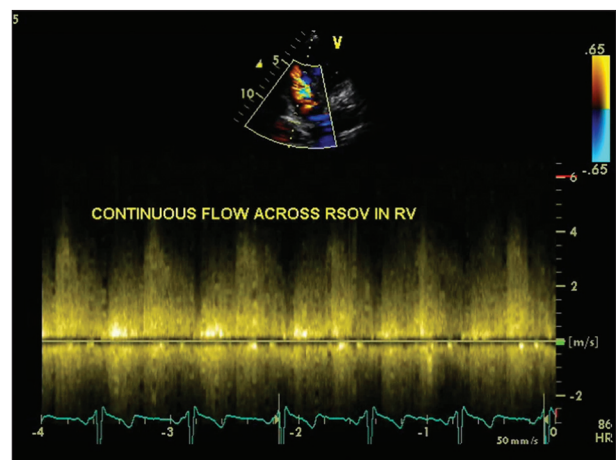
After preloading with 600 ml ringer’s solution, patient was made to sit and a local anesthesia was established at L<sub>2</sub>-L<sub>3</sub> intervertebral space using 3 ml solution of 2% lignocaine.

Epidural space was located at this level using 18G Tuohy needle with the loss of resistance to saline technique at a depth of 4 cm and 18G epidural catheter was advanced 5 cm into the epidural space. The epidural catheter was secured and a test dose of 3 ml 2% lignocaine with epinephrine 1:2,00,000 was administered with no evidence of subarachnoid block developing after 5 min. Patient was repositioned in her original position.

A local anesthetic solution was prepared using 15 ml 0.5% bupivacaine, 100 µg fentanyl, 5 ml 2% lignocaine and 0.15 ml 8.4% sodium bicarbonate.



**Figure 1:** (a) Transthoracic two-dimensional echocardiography demonstrating the typical “windsock” appearance of the aneurysm of right sinus of Valsalva with rupture into right ventricle. AO-Aorta, RV-Right ventricle, LV-Left ventricle, ruptured aneurysm of sinus of Valsalva. (b) Transthoracic two-dimensional echocardiography with color flow imaging demonstrates a unidirectional continuous mosaic jet from aorta into right ventricle through the ruptured right sinus of Valsalva aneurysm



**Figure 2:** Transthoracic two-dimensional echocardiography with continuous wave Doppler flow imaging demonstrates a continuous high velocity turbulent flow through the shunt lesion

This local anesthetic-opioid mixture was administered through the epidural catheter in 5 ml increments at 5 min interval. After 25 min, successful bilateral sensory block to pain, fine touch and temperature extending from T<sub>6</sub> to S<sub>4</sub> was established. LSCS was performed and a healthy female infant weighing 2600 g was delivered with an Apgar score of 8/10 and 9/10 at 1 and 5 min respectively. Bilateral tubal ligation was performed.

Injection oxytocin 10 units were given slow intravenous infusion to achieve sufficient uterine contraction. As there was a decreasing trend of blood pressure, total 6 mg phenylephrine was administered intravenously to maintain optimum blood pressure.

Intraoperatively, patient remained hemodynamically stable with total blood loss of approximately 550 ml, which was replaced with fluids guided by Central venous monitoring (CVP), which was later inserted intraoperatively.

Surgery lasted for 60 min. Patient was shifted to intensive care unit (ICU) for further observation. Complete recovery from epidural anesthesia occurred after 6 h. A sensory dose, 16 ml 0.125% bupivacaine and 50 µg fentanyl was injected through the epidural catheter eighth hourly for the initial 48 h and the epidural catheter was removed on the 3<sup>rd</sup> postoperative day using aseptic precautions. Patient recovered uneventfully in ICU and was further observed in the ward for next 7 days. Patient was discharged in good condition with an advice of regular postnatal check-up and cardiac consultation.

## Discussion

Congenital SOVA usually involve the right sinus accounting for 70-90% of all sinus aneurysms, while the noncoronary sinus and left coronary sinus accounts for 10-20% and <5% respectively.<sup>[7]</sup>

Most of the right coronary sinus aneurysms rupture into right ventricle and rarely into right atrium producing aorto-cadiac shunt.<sup>[2]</sup> Rupture of SOVA usually occurs during early adulthood (3-4<sup>th</sup> decade).<sup>[8]</sup>

Ruptured SOVA connects the high pressure systemic circulation to low pressure pulmonary circulation resulting in continuous shunting of blood throughout the systole and diastole. Amount of shunt volume depends upon the diameter of rupture and severity of pulmonary vascular resistance. A large shunt causes volume overload of pulmonary circulation and left sided heart chambers. Initially, there is compensatory dilation and hypertrophy of the heart chambers. When the volume of shunted blood overcomes the compensatory mechanisms, congestive cardiac failure develops.<sup>[3]</sup>

Pregnancy is a physiological state associated with changes in the total blood volume, peripheral vascular resistance and myocardial contractility, which facilitates the adaptation of maternal cardiovascular system to increased metabolic demands of mother and fetus. Normal pregnant women adapt well to these physiological changes with no adverse consequences, but women with structural heart disease may encounter adverse consequences.<sup>[9]</sup>

This case could be a typical congenital SOVA ruptured during the previous vaginal delivery precipitated by the hemodynamic strain of labor.

In this case epidural anesthesia was used because:

The onset of sympathetic blockade is very slow and thus avoids the reversal of shunt flow with maternal hypoxemia.<sup>[10]</sup>

Anesthesia level can be easily titrated by varying the volume of local anesthetics.<sup>[11]</sup>

Patient remained awake throughout the intraoperative period and did not report any adverse symptoms (breathlessness, chest pain or palpitation), which thus can be attended promptly.<sup>[12]</sup>

It offers a good postoperative analgesia avoiding opioids and their complications.<sup>[10,11,13]</sup>

It interferes with the factors increasing systemic vascular resistance (pain or the surgical stress) which may cause an acute rise in the shunt flow resulting in pulmonary congestion and eventually congestive cardiac failure.

The only disadvantage of using epidural anesthesia is that it cannot be used in emergencies like severe fetal distress because of the delay in onset of anesthesia.

Epidural anesthesia may also be used in RSOV patients undergoing normal vaginal delivery where it significantly reduces the hemodynamic strain of labor on the cardiovascular system, but no such case has been reported.<sup>[10]</sup>

Epidural anesthesia was preferred over spinal anesthesia because the latter causes rapid fall in systemic vascular resistance and reversal of shunt with sudden onset of maternal and fetal hypoxemia.<sup>[10]</sup> Epidural anesthesia was preferred over general anesthesia because general anesthesia itself accentuates the hemodynamic stress of pregnancy and labor on the cardiovascular system in such patients. Drawbacks of general anesthesia are:

During intubation, suction and extubation, acute rise in heart rate and systemic vascular resistance accentuates the shunt flow which may lead to congestive cardiac failure.<sup>[14]</sup>

Hormone induced engorgement of the respiratory mucosal vessels increases the chances of airway bleeding and aspiration following laryngoscopy and intubation.<sup>[15]</sup>

Increased chances of aspiration of gastric contents resulting in chemical pneumonitis (Mendelson's syndrome).<sup>[14]</sup>

Opioid use increases the incidence of hypoxia, hypercarbia and respiratory acidosis with reversal of shunt flow leading to maternal hypoxemia and also neonatal depression in the postoperative period.<sup>[11,13]</sup>

## Conclusion

Epidural anesthesia is beneficial in RSOV patients with term pregnancy undergoing either normal vaginal delivery or caesarean section because it reduces the additional hemodynamic stress of labour on the already compromised cardiovascular system of these patients.

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