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CASO CLÍNICO

Thoracic Segmental Spinal Anesthesia for Cesarean Section in a Parturient with Atrial Septal Defect: A Case Report

Anestesia Raquidiana Segmentar Torácica para Cesariana em Parturiente com Defeito do Septo Atrial: Caso Clínico

Prajnananda Haloi[1], Rahul Biswas[2,*], Ananta Bora[3]

Afiliação
[1] Department of Anesthesiology and Critical Care, GNRC Medical, North Guwahati, Assam, India.

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ABSTRACT

Atrial septal defect (ASD) is a common congenital disease of the heart, and most women with ASD without coexisting PAH experience uneventful pregnancies. Anesthetic management of pregnant ASD patients presenting for lower segment cesarean section (LSCS) is challenging due to potential complications.

A 30-years-old pregnant woman with ASD presented for LSCS. She had a 24 mm ostium secundum ASD with left to right shunt, and mild pulmonary arterial hypertension (PAH). Thoracic segmental spinal anesthesia (TSSA) was administered at the T9-T10 intervertebral space. The surgery was uneventful and postoperative pain was managed with bilateral transversus abdominis plane (TAP) block administration and NSAIDS. Her hospital stay was uneventful and was discharged on the 4th post-operative day.

In conclusion, TSSA for LSCS with ASD can be a safe and effective anesthetic option, but further studies are needed to establish its clinical utility in this specific context.

RESUMO

O defeito do septo atrial (DSA) é uma doença cardíaca congênita comum, e a maioria das mulheres com DSA sem hipertensão arterial pulmonar (HAP) coexistente tem gestações sem complicações. No entanto, o manejo anestésico de gestantes com DSA submetidas a cesariana (LSCS) apresenta desafios devido às potenciais complicações.

Apresentamos o caso de uma mulher grávida de 30 anos com DSA de *ostium secundum* de 24 mm e HAP leve, submetida a LSCS. Anestesia raquidiana segmentar torácica (TSSA) foi administrada no espaço intervertebral T9-T10. O procedimento e o período pós-operatório transcorreram sem intercorrências, com a dor pós-operatória sendo controlada com bloqueio bilateral do plano do músculo transverso do abdome (TAP) e anti-inflamatórios não esteroides (AINEs). A paciente recebeu alta no quarto dia pós-operatório.

A TSSA pode ser uma opção anestésica segura e eficaz para LSCS em pacientes com DSA, embora mais estudos sejam necessários para estabelecer sua utilidade clínica.

Autor Correspondente/Corresponding Author*:
Rahul Biswas
Morada: GNRC Medical, Sila Grant, Amingaon, North Guwahati, Assam, India - 78103.
E-mail: rahulbsws098@gmail.com

INTRODUCTION

Atrial septal defect (ASD) is a common congenital acyanotic heart condition that typically presents in adulthood, characterized by interatrial communication allowing blood shunting between the right and left atria. Generally, ASD with left to right shunt is clinically silent for years to decades. When the pulmonary-to-systemic blood flow ratio is greater than 1.5:1, the patient becomes symptomatic with the development of arrhythmias, fatigue, dyspnea, and heart failure. A chronic volume overload of the right side of the heart results in pulmonary arterial hypertension (PAH), and right ventricular dysfunction.[1]

The majority of women with ASD have an uneventful pregnancy in the absence of coexisting PAH. Women with PAH has a high chance of maternal mortality during pregnancy or the early postpartum period, despite advancements in treatment modalities.[2]

The anesthetic management of LSCS in the presence of ASD is always challenging. General anesthesia increases the risk of cardiac events besides the inherited risks due to physiological changes of pregnancy.

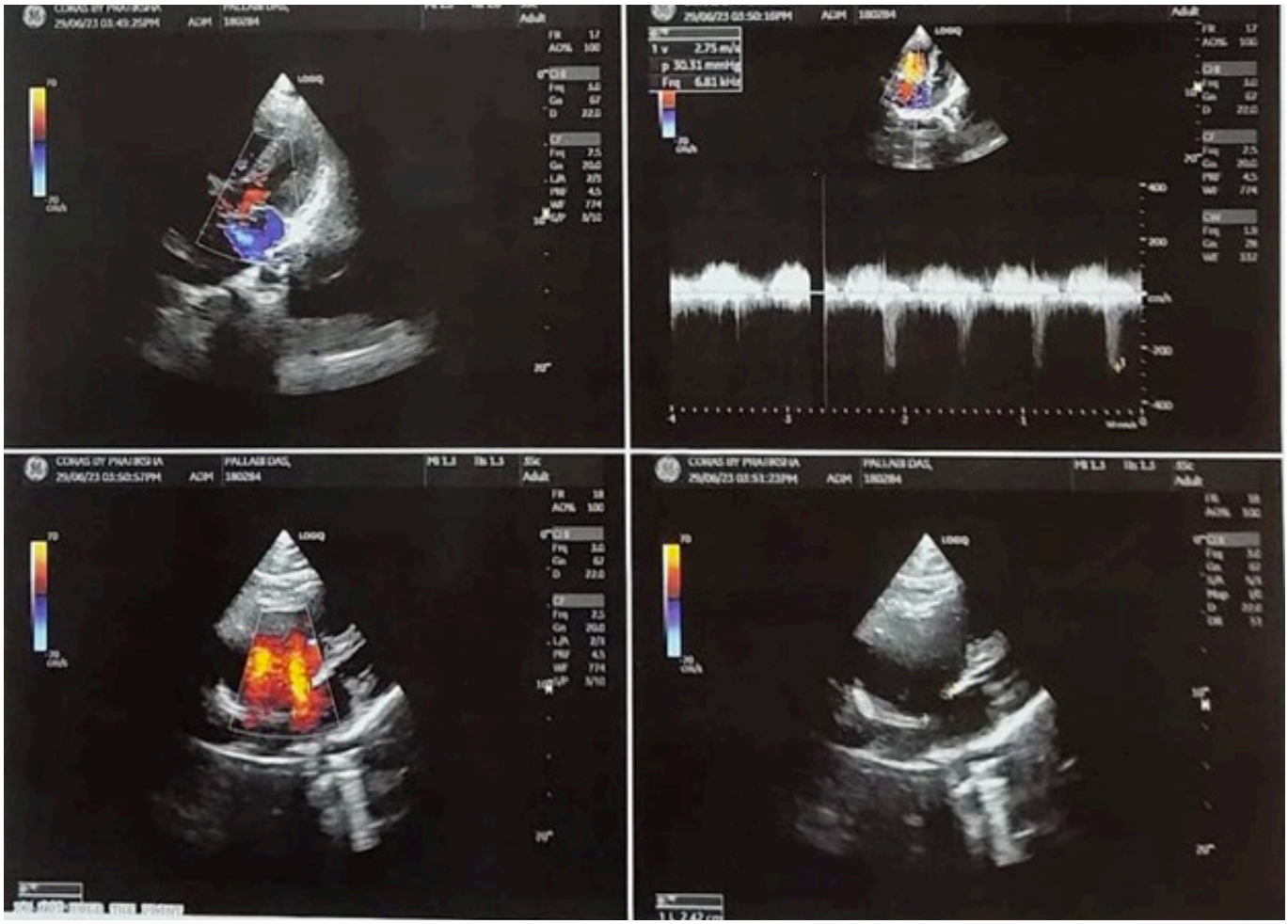

Figure 1. 2D echocardiogram image showing ASD- ostium secundum, size 24 mm with left to right shunt, mild MR, mild TR, mild PAH, RVSP-30+ RAP, RA/RV dilated.
ASD - atrial septal defect, MR- mitral regurgitation, TR- tricuspid regurgitation, PAH-pulmonary arterial hypertension, RVSP-right ventricular systolic pressure, RAP-right atrial pressure, RA- right atrium, RV- right ventricle.

Conventional lumbar spinal anesthesia at its usual dose has an increased incidence of hypotension, which is quite undesirable in ASD patients. The lower dose of local anesthetics in segmental spinal has the advantages of hemodynamics with minimal fluctuations. Here, we report a case of LSCS with ASD successfully managed under thoracic segmental spinal anesthesia (TSSA).

CASE REPORT

Written and informed consent was obtained from the patient and her family for the publication of this case report.

A parturient, aged 30 years, with weight- 64 kg and height -165 cm, at term gestation with intrauterine growth restriction (IUGR) scheduled for LSCS was diagnosed with ASD during the pre-anesthetic evaluation at another facility. Due to limited cardiac support capabilities at that facility, she was referred to our center for LSCS. Her clinical history was insignificant except for the presence of occasional palpitation and breathlessness starting at 37 weeks. On auscultation, a systolic murmur was present at the right 2nd intercostal space with a wide 2nd heart sound (S2). Her exercise tolerance was good, blood pressure (BP)-140/90, mmHg, heart rate -90/minute, and oxygen saturation -95% at room air. The chest was bilaterally clear. Mild bilateral pedal edema was present. On airway assessment, she was Mallampati grade 2, with normal neck movements. Hematological and coagulation parameters were within normal limits. Her ECG showed a right bundle branch block and a 2D echocardiogram showed the presence of ostium secundum ASD, of size 24 mm with left-to-right shunt, mild PAH, and normal biventricular function (Fig. 1). She was advised for strict perioperative monitoring for cardiac arrhythmias and heart failure by a cardiologist.

After careful evaluation of different anesthesia modalities, TSSA was opted for this patient. A multimodal analgesia strategy was planned, including bilateral TAP blocks for post-operative pain relief. The patient was shifted to the operating room and all standard monitoring were attached. An 18-gauge intravenous access was established on the left upper limb and was made sure to be free of air bubbles. The left radial artery was cannulated for real-time BP monitoring. Under aseptic conditions, thoracic spinal anesthesia was given at T9-T10 intervertebral space with a 25 g Quincke needle with 1.2 mL of 0.5% bupivacaine heavy and 60 mg of

buprenorphine in the left lateral position. The patient was then positioned supine and oxygen was supplemented with a face mask. After 2 minutes, the block was assessed using pinprick and cold sensation testing. At 4 minutes, she had a sensory block from T6 to L2 and a motor block score of 1 under Modified Bromage scale. Intraoperative hemodynamics remained stable, and no vasopressor or vagolytic medications were required. The patient did not experience any respiratory distress and maintained oxygen saturation between 98%-99%. The respiratory rate ranged between 18 to 20 breaths per minute. The baby had APGAR scores of 6 and 10 at 1 and 5 minutes after delivery, respectively. Intraoperative blood loss was 500 mL, and urine output was 400 mL. Surgery was completed within 45 minutes.

For post-operative analgesia, ultrasound-guided bilateral TAP blocks with 0.25% bupivacaine were given before shifting the patient to the ICU. Additionally, diclofenac 75 mg was administered intramuscular 8 hourly. The patient was closely monitored by a team of anesthesiologist, intensivist, obstetrician, and cardiologist.

The first rescue analgesia in the form of paracetamol infusion (1 g) was given at 19 hours of operation (Visual Analog scale score of 4). The patient had an uneventful hospital stay and was discharged home on the 4th postoperative day. Subsequent outpatient evaluation at 7 days postpartum confirmed continued well-being with no adverse events reported.

DISCUSSION

Atrial septal defect, commonly diagnosed in adulthood is the most prevalent congenital heart disease, prevalence – 1.6/1000. It is of four types – ostium secundum (75%), ostium primum (15%-20%), sinus venosus (5%-10%), and unroofed coronary sinus. ASD is characterized by a defect at the atrial level that facilitates left-to-right shunting of blood between systemic and pulmonary circulation. This results in right ventricular (RV) overload and RV hypertrophy.

The excessive pulmonary blood flow, in turn, causes morphological changes in pulmonary vasculature eventually leading to PAH, RV dysfunction, atrial arrhythmias, congestive heart failure, and reversal of shunt (Eisenmenger syndrome). Hemodynamically significant ASD is 10 mm or larger.[1]

In female with ASD, 85% complete their pregnancy uneventfully without concomitant PAH. However, they are associated with a higher risk of pre-eclampsia, small for gestational age birth weight, and increased incidence of perinatal and post-neonatal mortality.[1-4]

The physiological changes of pregnancy can accentuate the RV volume overload, with the potential of RV insufficiency, and atrial arrhythmia. The development of a hypoxic shunt leading to refractory heart failure is the worst possible outcome in pregnancy with pre-existing PAH. There are also high risks of associated paradoxical embolism during pregnancy in ASD (2%-5%).[5]

Various anesthetic modalities have been used for non-cardiac surgery with ASD patients having their own merits and demerits. Anesthesia-induced changes in SVR and PVR will determine the behavior of the shunt. The management involves reducing the magnitude of the shunt and yet also preventing the establishment of a hypoxic shunt (right-to-left shunt).[6] So, an ideal anesthetic modality will be of the best hemodynamic stability without much effect on SVR and PVR.

A difficult airway and propensity for pulmonary aspiration due to physiological changes make general anesthesia more challenging in pregnancy. Additionally, ASD patients are always at risk for developing dysrhythmia, heart block, cardiac failure, and infective endocarditis under general anesthesia.[7]

The magnitude and behavior of the shunt may be altered due to relative changes in SVR and PVR as a result of sudden sympathetic surges due to airway maneuver, intraoperative bronchospasm, hypothermia, hypercarbia, and hypovolemia under general anesthesia.[8]

The extended impact of general anesthesia post-delivery is evidenced by the elevated incidence of neonatal intubation with low APGAR scores in vulnerable neonates.[2]

Spinal anesthesia avoids the challenges associated with general anesthesia. However, the incidence of hypotension is quite high with conventional lumbar spinal anesthesia in LSCS due to physiological changes in pregnancy.[9]

In ASD patients, an acute uncontrolled hypotension may result in the development of a hypoxic shunt. Using a lower dose of spinal anesthesia (5-7 mg bupivacaine) reduces hypotension but elevates the likelihood of patchy or partial block.

Combined spinal-epidural anesthesia (CSE) has been successfully used in cases of LSCS with cardiac anomaly.

Safe initiation and efficacy of CSE requires time and expertise, compounded by increased risks of dural and vascular puncture due to pregnancy-induced anatomical changes.[10]

There is a dearth of literature of literature focusing on the utilization of thoracic segmental spinal anesthesia in LSCS. In TSSA, a small amount of local anesthetic is deposited as close as possible to the relative surgical dermatomes, thereby limiting the sympathetic blockade and providing better hemodynamic stability.[11] The risk of iatrogenic spinal cord injury is a serious concern in TSSA.

However, magnetic resonance imaging (MRI) studies indicate that the spinal cord lies anteriorly within its thecal sac in the thoracic curve and provides a safe distance before the spinal needle makes contact with neural tissue.[12]

A thinner nerve root and less dilution of local anesthetics due to less CSF volume at the thoracic level produce a dense block

with a small volume of local anesthetic.[13]

Hyperbaric local anesthetics deposit more predominantly on the posterior sensory nerve roots in relation to the anterior motor nerve root, thus producing a longer-lasting sensory block with prolonged post-operative analgesia than a motor block.[14]

A dramatic increase in SVR due to pain in the post-operative period has a detrimental effect on shunt behavior in ASD patients.[15]

The use of a TAP block as a part of a multimodal analgesia regimen provided excellent pain relief in the postoperative period.

CONCLUSION

Given our institutional expertise in TSSA and the presence of experienced anesthesiologists, we opted to use this technique for this patient with ASD.

TSSA provided a safe and comfortable anesthetic experience, enabling the active participation of the mother in childbirth. However, larger-scale investigations are necessary to establish the clinical utility of TSSA in ASD patients undergoing LSCS.

CONTRIBUTORSHIP STATEMENT / *DECLARAÇÃO DE CONTRIBUIÇÃO*

PH, RB and AB: Conception, design, data acquisition, thorough analysis, interpretation of data, composition, critical revision of the article, preparation of the final version and approval of the final version to be published.

PH, RB e AB: Conceção, desenho, aquisição de dados, análise minuciosa, interpretação dos dados, composição, revisão crítica do artigo, preparação da versão final e aprovação da versão final a ser publicada.

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