



LOW DOSE THORACIC SEGMENTAL SPINAL ANAESTHESIA WITH ISOBARIC LEVOBUPIVACAINE: IS IT AN OPTION FOR PATIENT WITH SEVERE HEART DISEASE UNDERGOING EMERGENCY CESAREAN SECTION? A CASE STUDY.

Anaesthesiology

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ABSTRACT

Background: Heart disease is the third most common cause of maternal death. In the anaesthesia protocol for cesarean sections in pregnant individuals with heart disease, especially those facing severe mitral stenosis, general anaesthesia and/or epidural anaesthesia are generally preferred choices, but there is one article which emphasises potential benefits of low dose subarachnoid block in certain cases. The primary aim of an anaesthesiologist is to prevent intraoperative hemodynamic instability. Thoracic segmental spinal anaesthesia stands out as an additional method offering remarkable hemodynamic stability and fostering elevated patient satisfaction levels. LSCS can be effectively and safely conducted through the proficient application of segmental thoracic spinal anaesthesia. This case study aims to observe the outcome of my patient with heart disease undergoing emergency LSCS under low dose thoracic segmental spinal anaesthesia with isobaric levobupivacaine. **Case Study:** 24-year-old, G2P1L1, previous 1 cesarean scar, DCDA twins, with rheumatic origin severe mitral stenosis complicated with severe pulmonary artery hypertension and severe tricuspid regurgitation with severe pre-eclampsia, posted for an emergency LSCS under ASA IV(E). Thoracic segmental spinal anaesthesia was administered at T10-T11 space using a 25G Quincke's needle. This procedure utilized a 1.3 ml injection of 0.25% isobaric levobupivacaine, with the addition of 30 micrograms of buprenorphine. Post-operative pain relief was achieved through a transverse abdominis plane block using a 0.25% bupivacaine injection 40ml and 8mg dexamethasone injection provided bilaterally. The patient's intraoperative occurrences, hemodynamic stability, post-operative ICU care, and pain management were all carefully observed and noted. **Result:** The procedure went smoothly without any complications, exhibiting notable hemodynamic stability and effective post-operative pain relief for a duration of 18 hours. **Conclusion:** In resource-limited peripheral centers lacking dedicated postoperative cardiac intensive care, low- dose thoracic segmental spinal anaesthesia emerges as a viable alternative for emergency cesarean sections in patients with severe heart disease experiencing fetal distress.

KEYWORDS

Thoracic segmental spinal anaesthesia, mitral stenosis, isobaric levobupivacaine.

INTRODUCTION

While only around 1% of pregnancies involve maternal heart disease, rheumatic heart disease (RHD) significantly impacts morbidity and mortality rates among pregnant individuals with acquired heart conditions⁽¹⁾. The typical area of the mitral valve ranges from 4 to 6 cm². Symptoms usually manifest when the area decreases to 2 cm².⁽²⁾ We describe a case where a patient with severe mitral stenosis, grade 2 mitral regurgitation, severe tricuspid regurgitation, and severe pulmonary artery hypertension, all rheumatic in origin, underwent emergency cesarean section successfully managed using low-dose thoracic segmental spinal anaesthesia.

CASE REPORT

A 24-year-old woman, whose obstetric score is Gravida 2 Para 1 Living 1 presented at 37 weeks gestational age with previous scar, with severe pre-eclampsia, with moderate anaemia, with severe heart disease in latent labour, posted for emergency lscs due to fetal bradycardia.

Patient presents with chief complaints of breathlessness during exertion, notably when climbing stairs or engaging in strenuous activities, with an effort tolerance limited to less than one flight of stairs and a metabolic equivalent score below 4. There are no other comorbidities, except for hypertension managed with antihypertensive medication due to pre-eclampsia, and the patient has received a loading dose of magnesium sulphate according to the Pritchard regime. While there are no impending signs or symptoms, the patient appears tired, dehydrated, with significant pallor, and mild icterus. Pedal edema with pitting is present. Airway examination reveals a mouth opening of three fingers and a Mallampatti grade 2. Systemic examination shows a mid diastolic murmur grade 5 over the mitral area and an early diastolic murmur grade 5 over the aortic area. Respiratory examination indicates bilateral air entry with no added sounds, and the respiratory rate is 24. Abdominal examination reveals no organomegaly.

2D echo report confirms severe rheumatic mitral stenosis (0.9 mm²) with Grade 2 Mitral Regurgitation, moderate rheumatic Aortic Regurgitation without stenosis, and organic Tricuspid Valve

Dysfunction. Mitral stenosis is complicated by severe pulmonary artery hypertension and severe tricuspid regurgitation, with dilation observed in both the inferior vena cava and left atrium.

Time	HR	BP	SP02	RR	Fluids
02:30	86	120 / 90	100	23	100 ml NS 1pint
02:35	92	130 / 90	100	26	1 pint
02:40	84	120 / 90	100	28	1 pint
02:45	98	110 / 70	100	28	1 pint
02:50	85	130 / 80	100	27	PCV started - slowly over 6 hours
02:55	78	140 / 80	100	24	2nd Pint 100 ml NS started
03:00	80	140 / 80	100	22	2nd
03:10	78	130 / 80	100	21	2nd

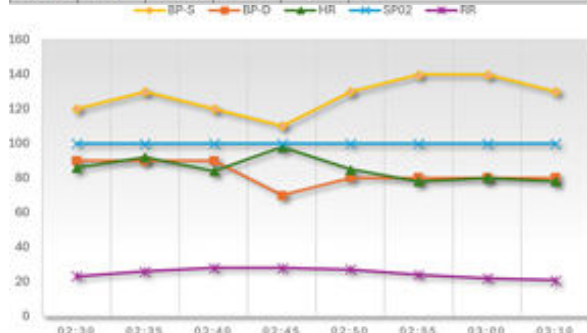
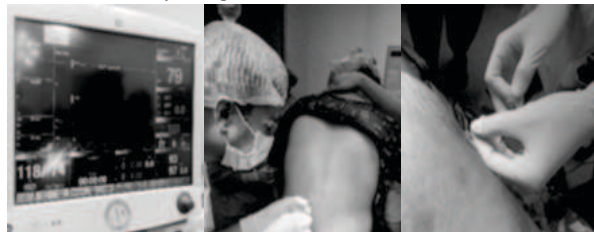


Figure 1 & 1.1: Intra Operative Monitoring Chart

Investigations reveal a haemoglobin level of 8.2, necessitating blood transfusion, with other parameters within normal limits. High-risk consent has been obtained from the patient, who expresses a reluctance towards general anaesthesia. Due to fetal bradycardia and distress, plain epidural anaesthesia is avoided, and referral is deemed impractical. Therefore, low-dose thoracic segmental spinal anaesthesia is planned as an alternative. In the operating theatre, the patient was positioned and prepared aseptically, with monitors

including pulse oximeter, blood pressure, and electrocardiogram attached. A central line and difficult airway trolley were made readily available. With the patient in a sitting position, the targeted T10-T11 space was painted and draped before administering segmental spinal anaesthesia using a 25G Quincke's needle. A mixture of 1.3 cc of 0.25% levobupivacaine, along with 30 µg of buprenorphine, was injected after confirming adequate flow of cerebrospinal fluid, resulting in motor onset within 2 minutes and achieving a dense level of anaesthesia from T6 to L1. The cesarean section proceeded smoothly, and the baby was delivered with an APGAR score of 10 at 1 and 5 minutes after birth. Following delivery, 100 µg of fentanyl was administered intravenously over 10 minutes, along with uterotonic carbocin 100 µg IV over the same duration. Throughout the surgery, the patient maintained stable hemodynamics, and the procedure concluded without any complications. Postoperatively, a transverse abdominis plane block was performed for analgesia, utilizing 20 cc of 0.5% bupivacaine diluted to 40 cc, with the addition of 8 mg of dexamethasone on each side. Vital signs upon shifting were BP 130/90 mmHg, PR 86 bpm, and SpO2 100%.

In the post-operative period, the patient received continuous oxygen support at a rate of 2L/min through a Hudson mask for over 24 hours. Remarkably, the patient remained free of discomfort or pain for 16 hours following the transverse abdominis plane block. Oral intake resumed after a 4-hour period of nil per oral (NPO), starting with sips of water. After 3 days, the patient was transferred to the ward.



DISCUSSION

Physiological Changes and Their Impact

Managing pregnancy in patients with rheumatic heart disease, particularly when involving the mitral valve, presents unique and significant challenges. The physiological changes occurring in pregnancy, such as increased blood volume and cardiac output, can exacerbate pre-existing cardiac conditions, leading to severe complications.⁽¹⁾ During pregnancy, the body experiences a substantial increase in blood volume to support the developing fetus and maternal needs. This heightened volume can intensify the symptoms in women with RHD, especially when there is compromised cardiac function due to mitral valve involvement. Similarly, the increased cardiac output required to meet the metabolic demands of pregnancy places additional strain on the heart.⁽²⁾

This scenario is particularly perilous in patients with severe mitral stenosis, as their already narrowed valve cannot accommodate the increased blood flow efficiently, leading to hemodynamic instability. These hemodynamic changes can be poorly tolerated in patients with severe mitral stenosis. The compromised valve function results in significant obstruction to blood flow, causing increased pressure in the left atrium, pulmonary circulation, and ultimately the right side of the heart. This can precipitate symptoms such as breathlessness, fatigue, and pulmonary edema, making careful management of these patients crucial during pregnancy and delivery.⁽²⁾

Strategic Anaesthetic Choice

Given these challenges, the choice of anaesthesia in such high-risk obstetric patients is critical. One article highlights that although general anaesthesia and epidural anaesthesia are typically favoured, there's recognition of the potential preference for low-dose thoracic spinal anaesthesia (TSA) in specific cases as well.⁽³⁾ TSA offers multiple advantages that addresses the specific needs of patients with severe cardiac conditions.

1. Hemodynamic Stability: TSA provides stable hemodynamics by selectively blocking minimal spinal segments. This targeted approach minimises the risk of significant hypotension and other adverse hemodynamic effects that can be particularly dangerous in patients with severe mitral stenosis. The stability afforded by TSA is crucial for maintaining adequate cardiac function and ensuring the safety of both the mother and the fetus during the procedure.⁽³⁾



2. Effective Analgesia: TSA is effective in providing adequate pain relief while keeping the patient conscious. This is beneficial as it avoids the complications associated with airway manipulation that are necessary in general anaesthesia. By maintaining patient consciousness, TSA reduces the risk of aspiration and other respiratory complications, further enhancing the safety profile of the procedure.⁽⁵⁾

3. Economical And Efficient: The use of TSA is cost-effective, reducing the overall length of hospital stay. Patients receiving TSA typically experience quicker recovery times, allowing for early resumption of oral intake and faster discharge from the hospital. This efficiency is particularly advantageous in settings with limited resources, ensuring that high-risk procedures can be conducted safely and effectively without undue financial burden.⁽⁵⁾

Anaesthetic Drug Choice

Levobupivacaine has gained prominence in clinical practice owing to its favourable safety profile, particularly its reduced propensity for cardiac and central nervous system toxicity compared to bupivacaine. Research comparing the use of levobupivacaine and bupivacaine in intrathecal administration indicates that levobupivacaine offers superior hemodynamic stability. Moreover, it typically exhibits a quicker onset of motor block, highlighting its potential advantages in various clinical scenarios.⁽⁶⁾

Administering anaesthesia to certain high-risk patients can be incredibly challenging, often presenting complex considerations. However, there are innovative approaches being explored to broaden the scope of regional anaesthesia, such as the implementation of segmental spinal anaesthesia in the thoracic region. This method represents a novel option that may offer advantages for specific patients, pushing the boundaries of traditional techniques to cater to individual needs more effectively.⁽⁴⁾

CONCLUSION

This case exemplifies the successful management of a high-risk obstetric patient with severe cardiac and pre-eclamptic complications using thoracic segmental spinal anaesthesia. The strategic choice of TSA ensured hemodynamic stability and provided effective pain management, leading to a favourable outcome for both the mother and the baby.

This case report suggests that in areas with limited resources, where referring high-risk cases like heart disease during pregnancy isn't possible, using thoracic segmental spinal anaesthesia can lead to better outcomes. This reframes the approach to managing such cases, potentially offering a more effective and accessible solution in resource-constrained settings.

Abbreviations

TSSA - Thoracic segmental spinal anaesthesia
LSCS - Lower segment cesarean section
RHD - Rheumatic heart disease

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