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ANAESTHETIC MANAGEMENT OF A PARTURIENT WITH ACHONDROPLASIA UNDERGOING ELECTIVE LOWER SEGMENT CAESAREAN SECTION (LSCS) - A CASE REPORT

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Abstract
Background: Achondroplasia presents unique anesthetic challenges in parturients due to difficult airway management, spinal deformities, and respiratory complications, necessitating careful planning for elective LSCS.[1][3].
Case Presentation: A 27-year-old primigravida with achondroplasia underwent elective LSCS at 38 weeks. Preoperative assessment identified a difficult airway and challenging neuraxial access.[4] Ultrasound-guided spinal marking was used to optimize needle placement, resulting in successful spinal anesthesia with 0.5% hyperbaric bupivacaine and fentanyl.[5]Intraoperative hypotension was managed with IV phenylephrine, and the recovery was uneventful with multimodal pain management.[2]
Discussion: Ultrasound-guided spinal anesthesia improves success rates in achondroplastic parturients by reducing the risk of failed blocks.[17] Proactive management of airway, hemodynamics, and respiratory function ensures safe outcomes.[14]
Conclusion: This case highlights the effectiveness of ultrasound-guided spinal anesthesia and the importance of individualized planning and multidisciplinary collaboration to achieve favorable maternal and fetal outcomes.[18][15]
Keywords: Achondroplasia, spinal anesthesia, ultrasound guidance, cesarean section, difficult airway.

INTRODUCTION

Achondroplasia is the most prevalent type of skeletal dysplasia, occurring in approximately 1 in 25,000 live births[10]. It is caused by a gain-of-function mutation in the fibroblast growth factor receptor 3 (FGFR3) gene, which disrupts endochondral ossification and leads to abnormal bone development[9]. Characteristic features of the condition include short stature, macrocephaly, midface hypoplasia, and spinal deformities such as kyphosis, lumbar hyperlordosis, and spinal stenosis.[8]

Pregnant women with achondroplasia pose significant anesthetic and obstetric challenges due to a combination of airway anomalies, difficult neuraxial access, restrictive lung disease, and cephalopelvic disproportion[13]. As a result, most parturients with achondroplasia require an elective lower segment caesarean section (LSCS) rather than vaginal delivery[19]. Careful preoperative planning, meticulous anesthetic technique, and vigilant postoperative monitoring are essential to ensure maternal and fetal safety.[6]

This case report describes the successful anesthetic management of a parturient with achondroplasia undergoing elective LSCS, focusing on preoperative evaluation, neuraxial anesthesia techniques, intraoperative monitoring, and postoperative care.

Case Presentation

A 37 year old primigravida, a known case of achondroplasia, presented at 38 weeks of gestation for an elective lower segment cesarean section (LSCS) due to cephalopelvic disproportion (CPD). She had no history of previous surgeries, no known drug allergies, and had been under regular antenatal care.

PREOPERATIVE EVALUATION

The general examination revealed a height of 125 cm, weight of 37 kg, and BMI of 23.7 kg/m².

Airway Assessment: The patient had a Mallampati Grade III airway, a short neck with limited extension, macroglossia, and midface hypoplasia, indicating a potentially difficult intubation[7]. Although there was no evidence of atlantoaxial instability, minimal neck manipulation was advised.

Spinal Examination: The patient exhibited exaggerated lumbar lordosis and narrow interspinous spaces, predicting challenging neuraxial access. However, there were no neurological deficits or signs of spinal stenosis.

Respiratory System: The patient had mild restrictive lung disease due to a short thoracic cage and lumbar hyperlordosis, with normal oxygen saturation (SpO_2 98% on room air). There was no history of sleep apnea, but postoperative respiratory monitoring was recommended.

Cardiovascular System: Echocardiography findings were normal, with no structural abnormalities, signs of pulmonary hypertension, or congenital heart defects.

Laboratory Investigations: Hemoglobin was 13.3 g/dL, platelet count was 203,000/µL, renal and liver function tests were within normal limits, and the coagulation profile was normal.

Preoperative Ultrasound-Guided Spinal Marking

Given the anticipated difficulty in spinal anesthesia placement, a pre-procedure ultrasound scan of the lumbar spine was performed to identify the midline, locate the optimal intervertebral space, measure the depth to the dura mater, and confirm the absence of spinal stenosis or abnormal anatomy.

Ultrasound Findings: The L3-L4 space was identified as the widest and most accessible, with an epidural space depth of 3-3.5 cm, ensuring the feasibility of spinal anesthesia. The planned puncture site was marked for precise and efficient needle placement[17].

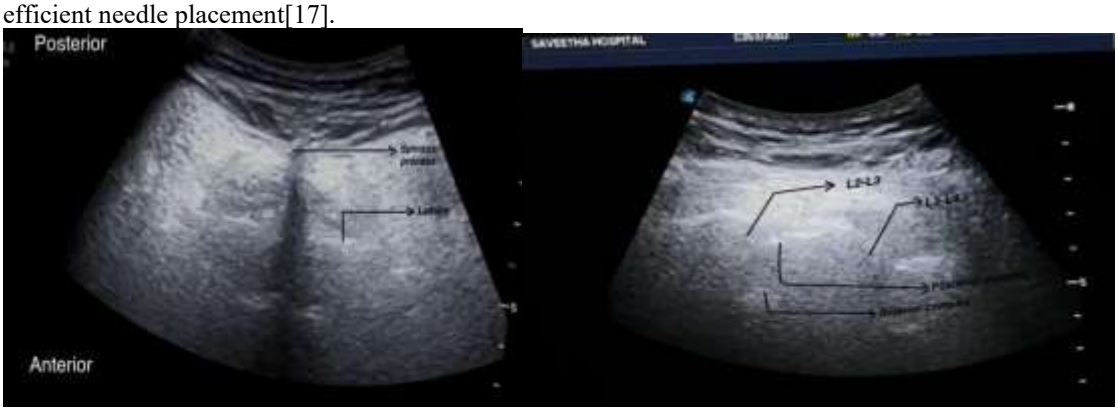

Image 1 shows Transverse view of lumbar spine ; Image 2 shows Paramedian Sagittal laminar view of lumbar spine.

Anesthetic Management

Choice of Anesthesia: Due to the difficult airway anatomy and anticipated challenges with general anesthesia, spinal anesthesia (SA) was preferred. Ultrasound-guided spinal anesthesia was planned for accuracy and success[5].

Spinal Anesthesia Procedure: The patient was positioned in a sitting posture to optimize lumbar spine access. Sterile precautions were maintained, and the skin was infiltrated with 2% lignocaine. A single-shot spinal block was administered at the L3-L4 interspace using a 25G Quincke needle at the marked site, with free CSF flow confirmed before drug administration. The intrathecal injection included 0.5% hyperbaric bupivacaine (1.2 mL) and fentanyl (10 mcg) as an adjuvant for prolonged analgesia. The patient was immediately positioned supine with left uterine displacement to prevent aortocaval compression.

Intraoperative Course: The surgery commenced uneventfully, achieving a T4 sensory level block. A healthy female baby was delivered with Apgar scores of 8 at 1 minute and 10 at 5 minutes. Mild intraoperative hypotension (90/60 mmHg) was managed with a crystalloid fluid bolus, and oxygen supplementation (4 L/min via nasal cannula) was provided. There were no signs of high spinal block, respiratory compromise, or neurological complications.

Postoperative Management

Immediate Recovery Phase: The patient was monitored in the recovery room for two hours, during which no respiratory depression, prolonged motor block, or hemodynamic instability was observed.

Postoperative Pain Management: Scheduled IV paracetamol (1 g every 8 hours) was administered for pain control, with IV tramadol (50 mg) available as rescue analgesia if needed.

Respiratory Care: The patient was encouraged to perform deep breathing exercises and incentive spirometry to prevent atelectasis. Early mobilization was encouraged to reduce thromboembolic risks.

Follow-up and Outcome

The patient had an uneventful recovery, with early ambulation on postoperative day 1. No complications such as post-dural puncture headache (PDPH), prolonged motor block, or respiratory issues were observed. She was discharged on postoperative day 3 with advice for regular follow-up and postpartum physiotherapy.

Discussion

The anesthetic management of achondroplastic parturients undergoing LSCS is complex due to airway abnormalities, spinal deformities, restrictive lung disease, and cardiovascular instability. [9][10]Airway challenges, including midface hypoplasia, macroglossia, and limited neck extension, increase the risk of difficult intubation.[18] If general anesthesia (GA) is necessary, awake fiberoptic intubation is the preferred approach, with alternative airway devices and a difficult airway cart readily available.[13][1]

Neuraxial access can be challenging in patients with kyphoscoliosis and a narrow epidural space. Achondroplasia presents additional anatomical complexities, including hypertrophied superior and inferior articular facets, short and thickened pedicles due to premature fusion, scalloping of the posterior vertebral body, prominent intervertebral disc bulging, and a spinal canal that tapers caudally due to a decreasing interpedicular distance in the lumbar region—contrary to the typical widening seen in normal anatomy. Additionally, the dura is thin, contributing to spinal stenosis and potential nerve root compromise.

For patients with a history of lumbar decompression surgery, scar tissue and altered anatomy further complicate neuraxial techniques. Given these anticipated challenges, we utilized ultrasound to assist in accessing the intrathecal space.

Determining the appropriate dose and volume of local anesthetic is further complicated by factors such as pronounced lumbar lordosis, spinal stenosis, engorged epidural veins, and reduced epidural and intrathecal spaces. These factors can lead to unpredictable anesthetic spread, increased risk of dural puncture, difficulty with catheter placement, potential air embolism, or excessive cephalad spread resulting in a high spinal or epidural block.

Respiratory considerations include restrictive lung disease and potential obstructive sleep apnea, increasing the risk of postoperative hypoventilation and atelectasis[20][8]. Oxygen supplementation, incentive spirometry, and early ambulation play a crucial role in preventing complications[11][16]. Postoperative pain management should emphasize multimodal analgesia, using IV paracetamol with rescue tramadol to minimize opioid-induced respiratory depression[6][3]. Additionally, deep vein thrombosis (DVT) prophylaxis and physiotherapy are essential to prevent thromboembolic complications.[15][18]

CONCLUSION

This case demonstrates the successful anesthetic management of a pregnant woman with achondroplasia undergoing elective LSCS. The use of preoperative ultrasound-guided neuraxial anesthesia significantly improved block success and minimized complications. A multidisciplinary approach, including anesthetic, obstetric, and neonatal teams, ensured optimal maternal and fetal outcomes.[2]

Key takeaways include preoperative airway assessment and difficult airway preparedness, ultrasound-guided neuraxial techniques for enhanced accuracy, judicious use of local anesthetic to prevent high spinal block, proactive hemodynamic management, and early postoperative mobilization to minimize respiratory and thromboembolic risks[4]. By implementing these strategies, anesthesia in achondroplastic parturients can be conducted safely, ensuring favorable perioperative outcomes.

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Conflict of Interest:

The authors declare that there are no conflicts of interest related to this study.

Consent Declaration:

Written informed consent was obtained from the patient for the publication of this case report and any accompanying images.

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