

CASE REPORT

Spinal anesthesia in a scoliosis patient: a case report

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ABSTRACT

Background: Scoliosis is a spinal deformity that exceeds a curve of 10 degrees identified at an early age (10 to 16 years old). Neuromuscular scoliosis is associated with a heterogeneous spectrum of muscular or neurological symptoms. Thus it is challenging to give a patient neuraxial/spinal anesthesia treatment before the surgery as it can alter the respiratory mechanism by changing the muscle orientation in the respiratory system.

Objectives: This paper reported a challenging case of thoracolumbar scoliosis presenting with osteomyelitis requiring sequestrectomy after the patient had a motorbike accident. **Case:** The patient had a previous history of difficult spinal anesthesia. Fortunately, it only took one attempt to do the spinal anesthesia for the recent surgery. **Conclusion:** This report emphasizes the need for anesthesiologists to evaluate the cardiopulmonary functions and radiology features of the spine and anesthesia techniques to provide safe and efficient treatment in such a patient.



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Highlights

1. Spinal anesthesia should be considered for patients with severe scoliosis undergoing lower limb surgery.
2. It was challenging to give spinal anesthesia to patients with a history of difficult spinal anesthesia.

BACKGROUND

Scoliosis is defined as a deviation of curvature or vertical line of the spine with the vertebrae rotating within the curve by at least 10 degrees, measured by the Cobb angle. The causes can be either



congenital, neuromuscular, or idiopathic. The incidence of scoliosis accounts for 1-3% of all scoliosis cases (Kuznia et al., 2020). Patients with such abnormal spinal anatomy will have difficulties in receiving the anesthesia required for surgery, making it hard for the anaesthetic team to determine a specific type of anaesthesia (Hudec et al., 2023). When the situation happens, it usually requires aid from imaging modalities such as fluoroscopy, computed tomography (CT), or ultrasound to ensure the placement of the dural catheter is safe and correct (Kuznia et al., 2020; Park et al., 2020). Scoliosis can alter the respiratory mechanism by changing the muscle's orientation in the respiratory system. In severe situations, scoliosis patients have a great risk of having severe respiratory morbidity or respiratory failure (Mayer, 2015). Neuromuscular scoliosis is associated with a heterogeneous spectrum of muscular or neurological symptoms (Halawi et al., 2015; Sharma et al., 2013).

Anesthesia and surgery for neuromuscular scoliosis provide a higher risk of perioperative complications than idiopathic scoliosis. Therefore, a patient needs a formulated treatment plan, not only considering the degree of curvature, but also the patient's need and quality of life, the risk of perioperative risk, and the natural history of the underlying neuromuscular disorders (Sharma et al., 2013). However, patients and their relatives report there was an improvement the quality of life after the surgery. It is challenging for the anesthetic team to choose specific anesthesia or identify factors associated with neuromuscular disorder (Mayer, 2015). Physiologically, thoracic spine deformity, especially severe scoliosis, might pose the risk of respiratory failure and/or restrictive lung disease by impeding lung compliance (Özkan et al., 2020). In the cardiovascular system, scoliosis poses the risk of perioperative complications through pulmonary hypertension, including right ventricle failure and hypotension (Li et al., 2022). This makes general anesthesia more risky compared to spinal anesthesia which is not preferred either due to the unpredictability in the level and pattern of blockade, not to mention the multiple attempts required (Kishimoto et al., 2020). Hence, it is imperative to dive into details of pre-anesthetic evaluation, intraoperative management, and postoperative care in the intensive care unit, despite requiring interdisciplinary cooperation for neuromuscular scoliosis cases. This paper described a challenging case of a 19-year-old female with thoracolumbar scoliosis and osteomyelitis in her left leg and was planned for sequestrectomy due to a motorbike accident.

OBJECTIVE

This case report intended to comprehend the importance of reviewing preoperative radiography and cardiopulmonary functions before the patient was given the safest anesthesia.

CASE REPORT

A 19-year-old female with a normal body mass index (BMI) of 23.44 kg/m², body weight of 60 kg, and body height of 160 cm, was admitted to the Emergency Department with osteomyelitis after having a motorbike accident. She was then planned for sequestrectomy under spinal anesthesia. She stated that she had scoliosis since birth with a previous history of surgery in her lower limbs. Vital signs were within normal values.



Figure 1. Preoperative lumbosacral x-ray



Figure 2. Preoperative thorax x-ray

Before the surgery started, she was positioned sitting on the operation table (**Figures 3 and 4**). The subarachnoid spinal block was successfully applied on the first attempt. Using the paramedian insertion technique on L4-L5 level, the spinal anesthesia was given with 7 mg of 0.5% Bupivacaine spinal heavy with 25 µg of fentanyl and 0.1 mg of morphine using spinal needle number 26G. During the surgery, vital signs were relatively normal. After the surgery ended, she was moved to a postoperative care unit where regular monitoring of blood pressure, heart rate, respiratory rate, temperature, and urine output was done.

The effect of spinal anesthesia lasted for about 1.5 hours. After that, the patient was returned to the ward where she continued to be hospitalized until she was discharged. No abnormal complications were found. For pain management, she was given 30mg of ketorolac every eight hours.

DISCUSSION

Using Cobb's angle, scoliosis is usually considered moderate if it is greater than 25 degrees, and especially severe if it exceeds 45 degrees (Kuznia et al., 2020). According to the thorax x-ray, this patient had scoliosis with a moderate degree as it did not exceed 45 degrees. In spinal anesthesia, deformity of the spine is one of the challenging procedures because of the difficulty of doing the procedure. In our patient, there is no appreciable cardiovascular instability when evaluating the preoperative condition. The anesthesiologist chose to use spinal anesthesia due to the complications that may arise from tracheal deformity or difficulty of neck extension. Patients with severe scoliosis may be at risk of cardiovascular complications such as right-heart failure and pulmonary issues like restrictive lung disease with reduced functional residual capacity and reduced chest wall compliance (Kempen et al., 2022; Ko and Leffert, 2009). Besides conducting restrictive pulmonary function tests, the anesthesiologist decided to use spinal anesthesia to prevent ventilator-associated lung injury. Combined femoral and sciatic nerve block can be an alternative because it provides more stable hemodynamic and prolonged postoperative analgesia (Bansal et al., 2016). However, due to unavailability and high cost, it was not used.



Figure 3. Clinical appearance of the patient

Ko and Leffert in their literature review described that spinal anesthesia for severe scoliosis poses a risk of block inadequacy with the most common causes being asymmetric (8%), patchy (8%), or unilateral (8%) analgesia. There were 4% of cases in which spinal anesthetic was placed with multiple attempts. Fortunately, the success rates of epidural and intrathecal anesthetics (i.e., single-shot spinal and continuous spinal anesthesia) in uncorrected scoliosis patients were relatively high (80% and 73%, respectively) (Ko and Leffert, 2009).



Figure 4. Insertion of spinal anesthesia

In scoliosis patients, palpating the spinous process can be difficult or unidentifiable. This could cause post-dural puncture headache, spinal hematoma, infection, or other neural injuries (Goel et al., 2021). In our case, the spinous process was palpable, and the anesthesiologist managed to anesthetize the patient once using the paramedian insertion technique. Another factor contributing to this success is the

location of insertion being the L4-L5 where the intralaminar space in the spine is wider, and the convexity of the scoliosis is not as severe as in the thoracic section (Ko and Leffert, 2009).

STRENGTHS AND LIMITATIONS

Further studies in larger populations might provide additional valuable information and possibilities regarding the choice of anesthesia for patients with scoliosis.

CONCLUSION

When an anesthesiologist faces patients with scoliosis or severe scoliosis, it is important to assess preoperative radiography and cardiopulmonary functions to determine the safest and most efficient method of anesthesia.

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CONFLICT OF INTEREST

None declared.

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AUTHOR CONTRIBUTION

The authors contributed to all processes in this study, including preparation, data gathering and analysis, drafting, and approval for the manuscript's publication.

PATIENT CONSENT FOR PUBLICATION

Written and verbal informed consent to present this case report was obtained from the responsible parties, which in this case, was the patient herself and his/her guardian.

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