Anesthetic Challenges in a Patient with Severe Thoracolumbar Kyphoscoliosis

Manbir Kaur¹, Kuljit Singh Aujla¹, Jaskaran Singh Gosalg²
¹Department of Anaesthesia, Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar, Punjab, India, ²Department of Neurosurgery, All India Institute of Medical Sciences (AIIMS), Jodhpur, Rajasthan, India

Abstract

Patients with thoracolumbar kyphoscoliosis present unique challenges to anesthesia. We report an interesting and challenging case of kyphoscoliosis presenting with a displaced right intertrochanteric femur fracture who was planned for spinal anesthesia. However, spinal anesthesia was not successful even with the use of intraoperative fluoroscopy. The patient was again planned for spinal anesthesia the next day after reviewing his preoperative lumbar X-rays, which were suggestive of severe canal stenosis and sclerosis of the spine at L₁–L₂ and L₂-S₁ level thus causing the failure of contrast to spread up. Using appropriate space (L₃–L₄) after viewing X-ray, successful spinal anesthesia could be given. This report underscores the importance of reviewing the preoperative radiology of the diseased spine by the anesthesiologist to administer an effective and safe spinal anesthesia in such patients.

Keywords: Failed spinal anesthesia, fluoroscopy, sclerosis, thoracolumbar kyphoscoliosis

INTRODUCTION

Kyphoscoliosis is a forward and lateral bending of the spine affecting thoracolumbar spine.¹ The most common cause of kyphoscoliosis is idiopathic, which occurs in 70% of the population. The secondary causes include neuromuscular, congenital, or traumatic.¹ Patients with thoracolumbar kyphoscoliosis present unique challenges to anesthesia. Kyphoscoliosis causes a decrease in functional residual capacity, inspiratory capacity, vital capacity, and total lung capacity leading to restrictive pattern. The abnormal thoracic cage geometry leads to a decrease in chest wall compliance. There is a marked decrease in ventilation-perfusion mismatch, leading to arterial hypoxemia. In the cardiovascular system, there is an increase in pulmonary vascular resistance causing pulmonary hypertension. This may lead to right ventricular hypertrophy and right ventricular failure. Restrictive lung disease, airway management, and cardiorespiratory embarrassment make general anesthesia hazardous, whereas regional anesthesia is met with technical problems due to an abnormal curvature of the spine.²³ We report an interesting and challenging case of a 65-year-old male with kyphoscoliosis presenting with a displaced right intertrochanteric femur fracture planned for open reduction and internal fixation (ORIF) under regional anesthesia. We also discuss the importance of preoperative radiology in helping the anesthesiologists in planning regional anesthesia.

CASE REPORT

A 65-year-old male, weighing 70 kg, with kyphoscoliosis presented with a displaced right intertrochanteric femur fracture. He was posted for ORIF. On preoperative evaluation, the patient had a history of kyphoscoliosis since birth. No other positive history was present. On examination, vitals were stable. Airway assessment shows Mallampati Grade 2, adequate mouth opening, and full range of neck movements. An examination of the spine revealed a lateral curvature along with thoracolumbar kyphosis. Hemogram, liver function test, and other routine investigations were within normal limits. Preoperative X-rays revealed severe canal stenosis at L₁–L₂ and L₂-S₁ level. On reviewing the X-ray, patient was planned for spinal anesthesia. Fluoroscopy was used intraoperatively, which was not successful. Spinal anesthesia was again planned the next day after reviewing the preoperative lumbar X-rays, which were suggestive of severe canal stenosis and sclerosis of the spine at L₁–L₂ and L₂-S₁ level. Using appropriate space (L₃–L₄) after viewing the X-ray, successful spinal anesthesia could be given. This report underscores the importance of reviewing the preoperative radiology of the diseased spine by the anesthesiologist to administer an effective and safe spinal anesthesia in such patients.
renal function test, and coagulation profile were within the normal limits. Pulmonary function tests (PFTs) interpreted severe restrictive patterns. The surgery was planned under regional anesthesia. The patient was kept nil per oral for 2 h for water and 8 h for solid food. Written, informed, and explained consent was obtained from the patient and his family.

**Intraoperative management**

On the day of surgery, the patient was shifted to the operation theater. Monitors attached and vitals were recorded. Peripheral venous access was secured by using 18G intravenous (i.v.) cannula on the left forearm. Under all aseptic conditions, the spinal block was tried. Four to five unsuccessful attempts were taken for spinal anesthesia. Then, the C-arm-guided spinal block under fluoroscopy was tried, but it failed. The contrast spread was localized at the L5-S1 area under fluoroscopy. There was only a unilateral segmental block of L5-S1 nerve roots. Procedure was abandoned, and the patient’s radiology, including X-rays dorso-lumbar spine antero-posterior (AP) and lateral views, were reviewed. X-ray lumbar spine showed sclerosis and severe canal stenosis at L5-L1 and L5-S1 level in both AP and lateral views, which was probably missed under fluoroscopy. Sclerosis at L5-L1 and L5-S1 might have been the reason for contrast not spreading up, thus leading to a failed spinal block. Using appropriate space (L5-L3) after viewing X-ray, spinal anesthesia was given with 3 mL of 0.5% bupivacaine heavy with 25 µg fentanyl, and surgery could be completed successfully.

The patient was shifted and monitored in the PostAnesthesia Care Unit during the postoperative period. Regular monitoring of heart rate, blood pressure, urine output, and temperature was done.

In the postoperative period, the effect of spinal anesthesia lasted for 2 h. For pain management, the patient was given injection paracetamol 15 mg.kg\(^{-1}\) i.v. every six hourly, injection tramadol 2 mg.kg\(^{-1}\) i.v. 8 hourly, and injection diclofenac 1.5 mg.kg\(^{-1}\) as and when required to cover multimodal analgesia.

**Discussion**

Kyphoscoliosis is a deformity of the spine, characterized by abnormal curvature of the vertebral column in two planes (coronal and sagittal). It is a combination of kyphosis and scoliosis.\(^1\) Spinal deformities present with functional and physical problems to the patient and anesthesiologists in terms of planning the anesthesia technique. Due to problems associated with the respiratory system, spinal anesthesia is used widely, though technically difficult.\(^2\) In our case, the patient had severe restrictive pattern on PFT’s. Thus, in the view of the requirement of postoperative ventilatory support under general anesthesia and being a lower limb surgery, we also opted for regional anesthesia as our first choice.

There are only a few case reports where fluoroscopy has been used to perform spinal anesthesia in such patients.\(^3\) Fluoroscopy may aid in identifying the small accessibility window, thereby facilitating subarachnoid block in those inaccessible by the landmark technique. Gupta and Gupta conducted a case series of 10 patients where they used fluoroscopic-guided paramedian approach to subarachnoid block in patients with ankylosing spondylitis.\(^4\) However, fluoroscopy is not a foolproof method to ensure that the spinal block would always be successful in such patients as the intraoperative fluoroscopy may sometimes not show the spinal canal stenosis or sclerosis. We, therefore, recommend that every patient of kyphoscoliosis’s preoperative X-ray/magnetic resonance imaging of the diseased spine must be studied by the anesthesiologist to adequately plan the exact level of the spinal block.

The causes of failed or patchy spinal block in kyphoscoliotic patients can be due to anatomical defect itself, lack of proper placement of the local anesthetic, drug incompatibility, drug density, and drug defects.\(^3\) However, in our case, it failed due to the inability to detect sclerosis that prevented the spread of local anesthetic solution in the subarachnoid space. It was detected later on X-ray lumbar spine AP and lateral view [Figure 1]. This led to the easy detection of space and the performance of the block.

Another important, though rare, cause of difficulty in performing spinal anesthesia is the presence of Baatrup’s disease wherein the presence of thick and fibrous granulation tissue in the spinal canal may cause difficulty in doing it.\(^5\) This case intends to show that with the proper review of preoperative X-rays of the lumbar spine in lumbar kyphoscoliotic patients, the successful performance and safety of neuraxial anesthesia can be ensured. Our report is unique in that there is no report of failed spinal anesthesia in kyphoscoliosis with the use of fluoroscopy in the literature, and we present the possible etiopathogenesis of the difficulty encountered in our case. We also suggest ways of preventing this difficulty.

![Figure 1: X-ray lumbar spine anteroposterior and lateral view showing lumbar kyphoscoliosis and sclerosis at L4–L5 and L5-S1 level (red arrows)](image-url)
CONCLUSION

The anesthetic options are limited and technically difficult when both the airway and spine are involved in the disease process. Subarachnoid block with proper preoperative radiological planning and meticulous approach can be a useful technique of providing safe and effective anesthesia in patients with severe thoracolumbar kyphoscoliosis.

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Conflicts of interest
There are no conflicts of interest.

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