

# Administration of Spinal Anaesthesia with Modified Paramedian Technique in a Patient with Kyphoscoliosis: A Case Report

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## ABSTRACT

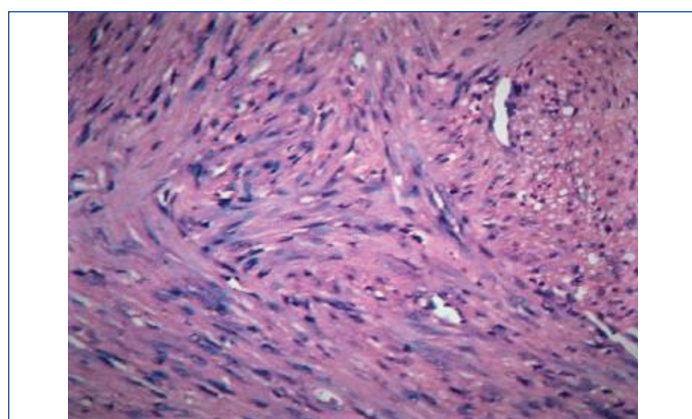
Kyphoscoliosis is a condition that affects the spine, with adolescents accounting for 75-90% of cases of idiopathic scoliosis. Scoliosis patients may experience difficulties when receiving anaesthesia during surgical procedures. There is often multisystem involvement, including the cardiovascular, nervous, and respiratory systems. Patients who have scoliosis often have difficulties with their airways (affected airway morphology, difficult intubation with laryngoscopy), respiratory systems (hypoxia, alveolar vascular constriction, pulmonary hypertension), and cardiac systems (cardiomyopathy, right ventricular enlargement, but also cor pulmonale). Scoliosis can bring on a restrictive pulmonary disease, which can lead to a decrease in both total lung volume and functional residual capacity, as well as an increase in breathing rate. Owing to the deformities of the vertebra, subarachnoid blocks in patients with kyphoscoliosis generally constitute a special hurdle for the anaesthesiologist. Midline and paramedian approach for spinal anaesthesia has been practiced since long but a novel approach as modified paramedian technique allows the entry of the needle from far away from midline hence reducing the number of punctures taken and lesser complications. Respiratory and airway concerns are customarily addressed in kyphoscoliotic patients. Authors present a unique case of 35-year-old male with severe kyphoscoliosis with neurofibromatosis posted for right above knee amputation by spinal anaesthesia using modified paramedian technique. Authors planned for subarachnoid block for this patient with modified paramedian approach which resulted in right-sided dense block with patchy sensory and motor block on left-side. For a successful operation, scoliosis patients require a thorough preoperative evaluation, a well-equipped set-up, and a teamwork.

**Keywords:** Axonal blocks, Idiopathic, Lumbar lordosis, Pulsatile pain, Spinal abnormalities

## CASE REPORT

A 35-year-old male complained of increased swelling and gradually worsening pain in the right posterior leg region for the past two months. His only complaint upon admission was discomfort in his right lower leg, which was rapidly becoming swollen for which he was admitted to our rural tertiary healthcare centre.

A haemangiopericytoma of the right knee joint was found through a biopsy and he was scheduled for a right-above-knee amputation [Table/Fig-1].

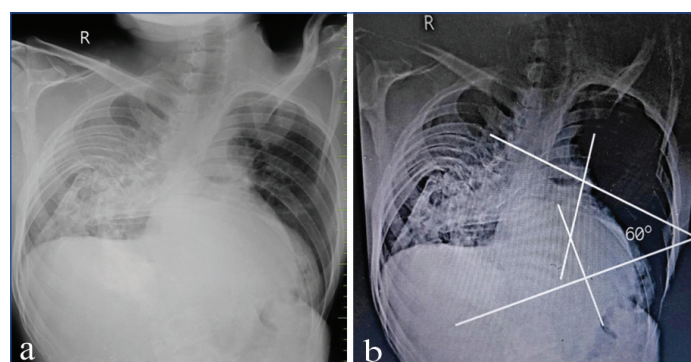


**[Table/Fig-1]:** Photomicrograph showing thick wall blood vessels surrounded by tissue sheath, H&E stain with 40x magnification.

The patient, who had been diagnosed with Neurofibromatosis type 1 since childhood and had not undertaken treatment for the same, had severe scoliosis and had never been hospitalised before and was not on any medication for the same. No similar complaints were reported by his family members.

The physical examination of the patient showed ASA grade 3, 35 kg, and 145 cm tall. On additional examination Mallampati Grade 1

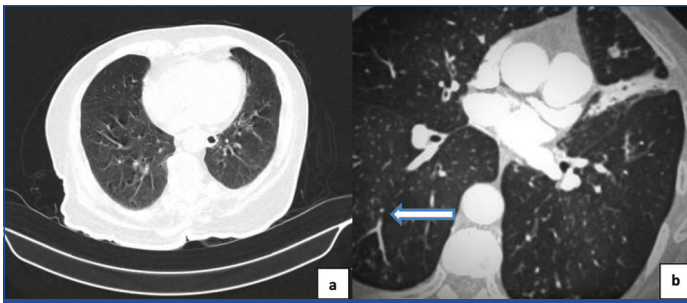
[1] was discovered during the preanaesthetic airway examination, showing acceptable mouth opening and neck mobility. Severe scoliosis was observed on inspection at the levels of the thoracic and lumbar spines. When the lumbar spine was palpated, the interspinous space was not felt. A right-sided scoliosis with a 60° Cobb angle [2], as determined by the intersection point of two parallel lines, was observed on the X-ray of the whole spine, specifically the thoracolumbar region [Table/Fig-2a,b].



**[Table/Fig-2]:** (a) Showing the scoliotic spine in AP view; (b) Depiction of Cobb's angle in AP view, as shown here when two parallel lines are drawn from the first scoliotic vertebrae and the last scoliotic vertebrae and the angle of their intersection using Picture Archiving and Communication System (PACS).

Emphysematous alterations were present in the patient's lower lobes on both sides as seen in the computed tomography image which was obtained pre surgery. These findings were also present in adolescent years and provide a better understanding of the associated co-morbidities [Table/Fig-3a,b].

The haemogram, liver function test, coagulation profile, liver function test, and renal function tests were all within the normal range of values. During the pulmonary function test, the Forced Expiratory Volume of the first second (FEV1), Forced Vital Capacity



**[Table/Fig-3]:** a) Full Computed Tomography (CT) view showing emphysematous lung field; b) CT image zoomed showing a tree in bud appearance in the bilateral lung field.

(FVC), and the ratio of FEV1/FVC were measured which were 70%, 50%, and 80%, respectively. No other abnormalities were seen during echocardiography, which revealed a left ventricular ejection fraction of 60%.

The patient was informed that spinal anaesthesia would be administered prior to the procedure. To alleviate anxiety the night before the procedure, the patient was given a 0.5 mg dose of alprazolam. On the morning of the surgery, an 18-gauge cannula was inserted into the dorsum of the left hand for an intravenous line, and the patient was preloaded with 15 mL/kg of ringer lactate.

The L2-L3 intervertebral space was punctured with a 23-gauge Quincke spinal needle using a modified paramedian approach [3] while the patient was sitting and under stringent aseptic circumstances. Just a brief penetration perpendicular to the skin, lateral to the dorsal spine, is intended for the needle [Table/Fig-4].



**[Table/Fig-4]:** Intraoperative figure showing severe scoliosis on the right-side (arrow indicating point of insertion of the quincke spinal needle for subarachnoid block).

The needle was positioned within the lamina and then pushed in its direction of lamina, gradually “walking” cephalad along the lamina until it approaches the interlaminar area. Due to the greater angle of the curve on the convex side, the needle could be inserted more accurately between the transverse and spinous processes. The lamina served as a useful marker to aid in needle insertion.

The spinal puncture was successfully carried out on the third try. After confirming that the Cerebrospinal Fluid (CSF) was flowing without any obstruction, 12.5 mg of 0.5% hyperbaric bupivacaine (2.4 mL) along with 25 µg of fentanyl (0.5 mL) as an adjuvant were administered. The patient was positioned in a 15° right lateral tilt on their back to prepare for the right-side surgery. Three minutes later, the degree of sensory block was assessed using the pinprick technique at the midaxillary line.

Although the T8 density was good, the left-side had a patchy sensory and motor obstruction. Throughout the procedure's intraoperative phase, which lasted an hour and a half, there were no issues. Once the patient was moved to a postoperative Intensive Care Unit (ICU),

no similar complaints were discovered. The haemodynamics were constant and the patient was discharged two days after from the hospital postoperative surgery ward.

## DISCUSSION

Scoliosis and thoracolumbar kyphosis, sometimes associated with previous spinal surgery, are also common in individuals with marfans syndrome, making the insertion of spinal and epidural blocks technically problematic [4]. Technical difficulties in neuroaxial blocks are brought on by the elimination of interspinous gaps and difficulties in positioning the patient due to anatomical factors like scoliosis and kyphosis that affect the natural curves of the spine [5]. This can make it difficult to distribute local anaesthetics, this verifies the patchy effect of the subarachnoid block in these patients as found in this case report. Intrathecal diffusion of local anaesthetics is made possible by interacting with the solution's physical characteristics, gravity, and the spinal canal's structure. Scoliosis is characterised by lateral spinal curvature and a progressive spinal deformity. The population frequently suffers from an idiopathic illness [5]. Secondary scoliosis may result from various neuromuscular, vertebral, or connective tissue disorders. Traumatic, congenital (hypotonia), mesenchymal (Neurofibromatosis), metabolic (Hunter syndrome), and neuromuscular (cerebral palsy, polio) all contribute to the development of scoliosis (postvertebral fracture, thoracoplasty, postradiation). Idiopathic scoliosis can be either structural or non structural. If scoliosis may be corrected by positioning or if the anatomy is properly characterised, the provider must start with the regional anaesthetic technique while utilising superb maneuverability and caution [3,6]. With posture modifications, the rigid curvature of structural scoliosis cannot be significantly changed. Scoliosis patients are recommended to lie on their side because they run the danger of unintentionally twisting their spine, which is frequently encountered in the lateral decubitus posture [7]. The larger convexity side of the curve may be approached using the paramedian technique if the spinous process can be detected or traced with a needle [8]. Possible side-effects of neuraxial anaesthesia include neural injury, spinal cord infections, haematoma around the spinal cord, postdural puncture headache, and difficulties in delivering the anaesthesia [9].

It would be feasible to have a spine X-ray to determine the angle and plane of admission in situations of people with significant spinal angulation or scoliosis as was done in this case. Authors used the same approach on their patients as was did throughout the aforementioned operation.

Therefore, after close considerations of the anatomical features, a modified paramedian technique wherein the needle insertion close to the convexity could offer a number of advantages for treating kyphoscoliosis patients [10,11].

## CONCLUSION(S)

Spinal anaesthesia is the most dependable and secure therapy for kyphoscoliosis patients. It is very necessary to understand the importance of type of anaesthesia in such patients with compromised pulmonary and cardiac reserve hence right technique is very vital in providing a safe and best mode that will reduce the morbidity. Depending on anatomical factors, a modified paramedian procedure that entails bringing a needle upto the convex side of the larger curvature may be beneficial for scoliosis patients.

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