

## Brachial Plexus Block in Lateral Position for Fracture Shaft Humerus in Severe Thoracic Kyphoscoliosis- A Case Report

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### Abstract

Patients with spine deformities, present unique challenges to the anaesthesiologists. These patients have abnormalities such as cardiovascular, pulmonary, musculo-skeletal, etc. Spinal deformities may cause difficulties with ventilation, tracheal intubation, regional anaesthesia and positioning. Due to problems associated with respiratory system, regional anaesthesia is widely preferred, though it is technically and logistically difficult. We present a case report of the anaesthetic management of an elderly female with severe thoracic kyphoscoliosis who could not lie supine on bed. She had a fracture of left upper 1/3<sup>rd</sup> shaft humerus. She was posted for open reduction and internal fixation of fractured shaft of left humerus under brachial plexus nerve block in right lateral position with a pillow under the head. The patient was given left interscalene and costoclavicular (infraclavicular) brachial plexus block under ultrasonography and peripheral nerve stimulator guidance. Major problems for brachial plexus block were positioning, approach, dosage of medications and respiratory compromise. Another difficulty was the position of the patient during the surgical procedure. The surgery was successful and the patient was pain free both intra and postoperatively. Intraoperatively no sedation or anxiolysis were required

**Keywords:** Kyphoscoliosis, Brachial plexus block, Fracture humerus, Patient position

### Introduction

Kyphoscoliosis is forward and lateral bending of the spine commonly affecting the dorsal and lumbar spine [1]. Because of kyphoscoliosis, there is a reduction in functional residual volume, inspiratory volume, vital capacity, and total lung volume. This leads to restrictive pattern. There is reduction in thoracic wall compliance because of abnormal rib cage geometry. There is a marked ventilation-perfusion mismatch, leading to arterial hypoxemia [2]. In the circulatory system, there is a rise in lung vascular resistance which leads to high pulmonary blood pressure. Because of pulmonary hypertension, right ventricular hypertrophy and right ventricular failure may occur. Restrictive lung disease, airway management, and cardiorespiratory

embarrassment make general anaesthesia hazardous, whereas regional anaesthesia is met with technical problems due to an abnormal curvature of the spine [3-4].

The heart and lung functions may be deranged because of spinal deformities. It may cause difficulties with both tracheal intubation and regional anaesthesia. Due to problems associated with respiratory system, regional anaesthesia is widely preferred, though it is technically and logistically difficult. We report an interesting and challenging case of an 86-year-old female with kyphoscoliosis presenting with a fracture of upper 1/3<sup>rd</sup> of left humerus planned for open reduction and internal fixation (ORIF) under brachial plexus nerve block.

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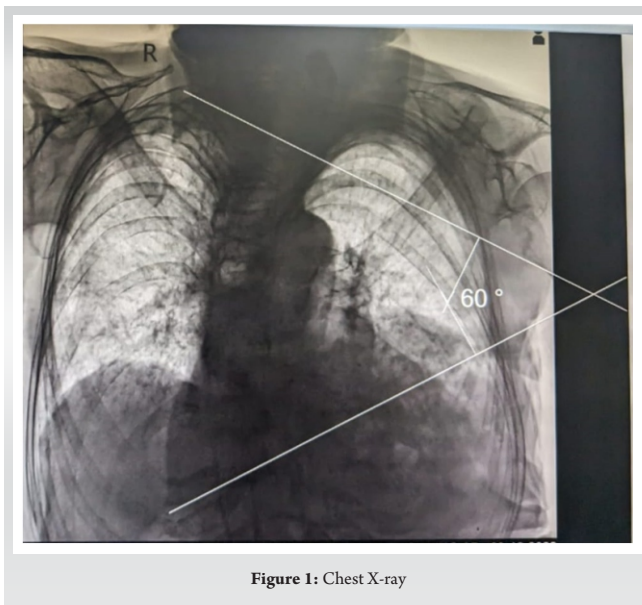


Figure 1: Chest X-ray

### Case report

An 86-year-old female with severe kyphoscoliosis had a history of fall causing fracture of upper 1/3<sup>rd</sup> of left humerus. She was admitted for ORIF of fractured shaft of left humerus. The patient had no comorbidities like hypertension, diabetes mellitus, bronchial asthma, ischemic heart disease, etc. Patient could not lie supine since many years due to kyphoscoliosis. She normally lied on lateral position. Her effort tolerance was restricted to household activities before fall. On examination, all the vitals were stable. In systemic examination, there was a pansystolic murmur all over the precordium and bilateral posterobasal crepitations. All the blood investigations were in normal range, electrocardiogram (ECG) was suggestive of left axis deviation, 2D electrocardiography showed left ventricular ejection fraction 55.0%, mild aortic regurgitation, mild mitral regurgitation, mild tricuspid regurgitation and mild pulmonary hypertension. The chest X-ray revealed thoracic scoliosis towards right side, crowding of ribs on left side and a left lower lobe patch. Cobb's angle was 60° (Fig. 1).

The patient was nil by mouth for 6 hours before the surgery and was preloaded with 500 mL of 360ringer lactate solution. In the operation theatre, ECG, heartrate, non-invasive blood pressure, respiratory rate, oxygen saturation and temperature were monitored. Rapid ultrasonography (USG) assessment of diaphragm thickness and movement was done as a reference for post-plexus block phrenic nerve palsy. Large bore intravenous cannulas were secured, and ringer lactate infusion was continued. Patient could not lie supine for more than 2-3 minutes. So, it was decided to perform brachial plexus block in right lateral position with a pillow under the head. In the right lateral position, the nerve block area was cleaned and draped. Under USG [FUJIFILM SONOSITE, Inc (USA) with a linear probe of 6-13 MHz] and peripheral

nerve stimulator [PNS- Stimuplex R HNS 12 (B Braun, Germany) with 22G short PNS needle Stimuplex R Ultra 360 (B Braun, Japan)] guidance left interscalene and costoclavicular(infraclavicular) brachial plexus block was given. For inter-scalene C5-C6 root block, 3 mL of 0.75% ropivacaine and 1 mL of adrenalized 2% lignocaine was given. Costo-clavicular block was given with 4 mL of 0.75% ropivacaine. Sensory and motor blockade was achieved in 5 mins and 10 mins respectively. As the surgical approach was from antero-medial part of arm, left lateral position was not comfortable. So, surgery was performed in right lateral position with operating hand in dependent position.

All the vitals were stable, and the patient was pain free both intra and postoperatively. Intraoperatively no sedation or anxiolytics were required. USG examination of diaphragm showed good movement and not significant palsy. Surgery lasted approximately for an hour. Oxygen supplementation was given by PranNiti, an inspiratory assist device using nasal cannula. It measures respiratory rate and gives alarm if patient stops breathing for more than 8 sec. Intraoperative vitals were stable and oxygen saturation remained 100%. ORIF was successful.

### Discussion

In 70% of the population the cause of kyphoscoliosis is not known. Some other causes of kyphoscoliosis are neuromuscular, congenital, and traumatic [1]. Secondary kyphoscoliosis occurs because of various neuromuscular, vertebral, or connective tissue disorders [5]. It's occurrence in the general population varies from 0.3% to 15.3% with a females/males ratio 3:1. Patients with scoliosis suffer from restrictive lung disease which decrease vital capacity, decrease functional residual capacity (FRC), decrease tidal volume, and increase respiratory rate [6, 7]. The cardiopulmonary problems are usually reduced and slight progress may be observed after surgical correction. The deformity of the rib cage makes the respiratory system much less adaptable, and increases the effort of breathing even though the lungs are healthy. There could be difficulty during intubation for general anaesthesia because of displacement with rotation of the trachea and main stem bronchi in severe cases [6].

The type, duration of scoliosis, and Cobb's angle of curvature determines the severity of scoliosis [6-8]. The Cobb's angle is a radiological measurement made on an X-ray anteroposterior view of the spine to evaluate the severity of scoliosis. The lung function tests can be associated with the Cobb's angle. An angle more than 60° results in a restrictive type of pulmonary impairment with a decrease in forced expiratory volume in 1 sec (FEV1), forced vital capacity

(FVC), and chest wall compliance [6, 7]. In the present case, the Cobb's angle was 60°. If the Cobb's angle is > 50° in the thoracic spine and >40° in the lumbar spine, the surgical correction of scoliosis is required.

The growth and development of the lungs takes place from birth to 8 years of age. At birth there are approximately 20 million alveoli and by 4 years of age they are doubled to 40 million. There is a substantial reduction in the number of alveoli due to thoracic scoliosis, hence in these patients there is an impairment of gas exchange and high pulmonary blood pressure [6]. If the cause of scoliosis is neuromuscular, laryngeal ineffectiveness and impaired swallowing may be present. Hence, the chances of intra and postoperative pulmonary aspiration of stomach contents are increased. Scoliosis patients with severe obstructive pulmonary disease could present problems during extubating. These patients may need postoperative ventilation, and difficulty in weaning off the ventilator. Our case report is unique as an 86-year-old

female with severe kyphoscoliosis with fractured shaft of left humerus underwent ORIF under brachial plexus block in right lateral decubitus position using USG and PNS.

### Conclusion

For anaesthesiologists' severe kyphoscoliosis poses multiple problems, like physiological changes, optimisation, positioning, ergonomic, approach for invasive procedures, and conduct of anaesthesia. During regional anaesthesia in these patients, anaesthesiologist must modify the approach to give successful USG and PNS guided nerve block. As in our patient, brachial plexus was approached in right lateral decubitus position using both USG and PNS. It is essential to limit the volume of local anaesthetic used, to prevent phrenic nerve block and respiratory compromise.

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**Declaration of patient consent:** The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his/her consent for his/her images and other clinical information to be reported in the Journal. The patient understands that his/her name and initials will not be published, and due efforts will be made to conceal his/her identity, but anonymity cannot be guaranteed.

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