



OUT OF PLANE INTERSCALENE BLOCK – AN ANATOMICAL CHALLENGE

RUNNING TITLE: CERVICO-THORACIC KYPHOSCOLIOSIS

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ABSTRACT

The anaesthetic challenges of a patient with scoliosis are well known. The key systems involved are respiratory, cardiovascular and skeletal system. This poses a significant risk and difficulty in intubation, ventilation, positioning and administering regional anaesthesia. This case report describes the successful management of a 58-year-old female weighing 36 kg with severe cervico-thoracic scoliosis undergoing proximal humerus fixation. Given her significant anatomical and physiological challenges, an interscalene brachial plexus block was chosen as the primary anaesthetic technique. The case report highlights the benefits of regional anaesthesia in patients with comorbidities, emphasizing a multidisciplinary approach for optimal perioperative care.

KEYWORDS : Cervico-Thoracic scoliosis, interscalene brachial plexus block, regional anaesthesia, proximal humerus fixation, restrictive lung disease.

INTRODUCTION

Scoliosis is a three-dimensional,[1] complex deformity characterised by abnormal curvature of spine in thoracic and lumbar regions which may leads to the asymmetry of chest-wall and makes walking difficult, difficulty in cervical moment and may cause respiratory compromise, difficulty in intubation, also difficulty in regional anaesthesia technique like sub arachnoid block due to spine abnormality. Due to all these conditions, it presents a challenge to anaesthetists for the operative procedure. Regional anaesthesia, such as brachial plexus blocks, may provide a safer alternative to general anaesthesia in such patients for providing anaesthesia to the upper limb. But due to the anatomical distortions it may also be difficult sometimes so advanced techniques like USG guidance and PNS should be used. This report discusses the anaesthetic management and intraoperative considerations in a patient with cervico-thoracic scoliosis.

Case Report

A 58-year-old female, weighing 36 kg, with severe cervico-thoracic scoliosis presented with a displaced right proximal 1/3rd humerus fracture. She had a h/o of RTA and she was posted for proximal humerus fixation. On preoperative evaluation patient was found to have severe thoracic scoliosis since birth without any comorbidities. Patient had breathlessness on moderate exertion and 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 severe thoracic scoliosis. Hemogram, liver function test, renal function test, and coagulation profile were within the normal limits. Pulmonary function tests (PFTs) interpreted moderate obstructive with restrictive patterns. An HRCT was done to find out the cobb's angle which was measured to be 86.5 suggestive of severe scoliosis. The surgery was planned under interscalene brachial plexus block to avoid general anaesthetic complications and post operative ventilatory support. 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 her family.



On the morning of the surgery patient NPO was confirmed, vitals were noted and written informed consent was checked. Patient was taken inside the operation theatre, Standard ASA monitors were attached, Intravenous access secured with an 18G cannula on the left hand, Patient positioned semi-supine with a slight head tilt to the left side with difficulty and a wedge under the shoulder. A check scan was done with ultrasound and the bunch of grapes like appearance of the brachial plexus was visualized and traced upwards to locate the traffic signal sign confirming C5, C6 upper and lower fascicle and C7.

Under strict aseptic precautions and sterile drapes patient was prepared for block. After visualizing the traffic light sign the needle was introduced under USG vision by in-plane technique and 7mL of 0.5% Bupivacaine + 2% lignocaine with adrenaline was deposited around C6 and C7 but we were not able to negotiate the needle to reach C5 nerve root due to anatomical deformity and the plexus being very superficial, approximately 5 mm from the USG probe. An out of plane technique was attempted and 6mL 0.5% Bupivacaine + 2% lignocaine with adrenaline was deposited successfully above C5 nerve root and 4mL between C5 and C6. Adequate motor and sensory block was confirmed within 15 minutes and the procedure was uneventful which lasted for 2 hours. The patient was hemodynamically stable both intraoperatively and postoperatively.

DISCUSSION

Scoliosis is defined as an abnormal lateral curvature of the spine,[1]. It is a complex, three-dimensional problem that involves Coronal, Sagittal and the Axial plane. The severity and diagnosis is by the Cobb's angle in the coronal plane and

is often accompanied by vertebral rotation in the transverse plane and hypokyphosis in the sagittal plane.

The overall incidence,[2] of scoliosis is 0.47-5.2% and the incidence of scoliosis with cobb's angle $> 40^\circ$ is 0.04-0.3%. Thoracic scoliosis is most common with incidence of 48% followed by thoracolumbar scoliosis with an incidence of 40%. Cervical scoliosis,[3] is a rare condition whose incidence has not been defined and is always associated with conditions like Klippel-Feil syndrome, Neurofibromatosis type 1 and congenital scoliosis. Our patient had Cervi-thoracic scoliosis with no other deformities which is an extremely rare condition. The rotation component starts when the scoliosis becomes more pronounced. This is called a torsion-scoliosis which causes a gibbus. There is a significant reduction in lung volumes with cobb's angle $> 70^\circ$. In our patient, the cobb's angle was 86.5° with moderate obstructive and restrictive pattern on PFT.

The costal-vertebral joints, and the rib cage abnormalities produce a 'convex' and 'concave' hemithorax which leads to the altered pulmonary physiology causing decrease in total lung capacity and forced vital capacity with normal FEV1/FVC ratio, [4].

The restriction of the lung parenchyma and poor development of the tissues cause V/Q mismatch, hypercarbia, hypoxemia and infection.

The respiratory dysfunction with chronic hypercarbia and hypoxemia will lead to severe pulmonary hypertension which will in turn lead to right ventricular hypertrophy and failure, [4]. Scoliosis associated with Duchenne muscular dystrophy can present with dilated cardiomyopathy with significant dysfunction. So, any evidence of cardiac failure on clinical examination should prompt for a thorough cardiac evaluation. Our patient did not present with any cardiac complaints and 2D echo was within normal limits.

Kaur M et al, [5] in 2020 faced difficulty in administering subarachnoid block for IT fracture in a patient with thoracolumbar scoliosis due to inadequate spread of local anaesthetic drug which was later found to have canal stenosis and sclerosis at L4-S1 level using fluoroscopy and X ray. We used USG in a patient with severe thoracic scoliosis with difficult manoeuvrability for humerus surgery.

Mutha S et al, [6] in 2023 had a similar case with proximal humerus fracture done under interscalene and infraclavicular brachial plexus block. Their patient had cardiovascular dysfunction and there was no comment on the technique of administering the block. Our patient had features of pulmonary dysfunction and we faced difficulty while performing in-plane technique due to the cervical component of scoliosis. We managed to administer the interscalene block using out-of-plane technique under USG guidance. The presence of ultrasound played a very important role in our patient.

CONCLUSION

An interscalene brachial plexus block is a viable and effective option for upper limb surgeries mostly humerus surgery in high-risk patients with cervico-thoracic scoliosis as they may be associated with respiratory compromise and cardiovascular complications. This case emphasizes the importance of individualized anaesthetic planning and the role of regional anaesthesia in minimizing perioperative risk.

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