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Case Report of Successful Spinal Anaesthesia in a Patient with Kyphoscoliosis for Hernioplasty

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Abstract: ***Subarachnoid block in patients with kyphoscoliosis always present a unique challenge to the anaesthesiologist owing to the deformity of spine. Spinal deformities are likely to be associated with physiologic derangements in cardiac and pulmonary function and may cause difficulties with both tracheal intubation and regional anaesthesia. Due to problems associated with respiratory system, spinal anaesthesia is used widely, though technically difficult. We present a case of thoracolumbar kyphoscoliosis with rt. sided indirect inguinal hernia posted for hernioplasty successfully managed with spinal anaesthesia with modified paramedian approach.***

Keywords: kyphoscoliosis, inguinal hernia, modified paramedian approach, subarachnoid block

1. Introduction

Kyphoscoliosis involves kyphosis, that refers to anteroposterior spinal angulation and scoliosis which is lateral spinal curvature. In addition to the lateral curvature of the spine, the vertebrae are rotated. Idiopathic kyphoscoliosis accounts for 80% of cases, commonly begins during late childhood and may progress in severity during period of rapid skeletal growth. Incidence of idiopathic kyphoscoliosis is approximately 4 per 1000 population. There may be familial predisposition to this disease, and female to male ratio is 4:1. Kyphoscoliosis may be associated with diseases of the neuromuscular system, such as poliomyelitis, cerebral palsy and muscular dystrophy and also with neurofibromatosis, Marfan's syndrome. Restrictive lung disease and pulmonary hypertension progressing to cor pulmonale are the principle causes of death in these patients.[1] Airway management and cardio-respiratory changes make general anaesthesia hazardous whereas Central neuraxial block poses an anesthetic challenge, in view of difficulties in palpating anatomical landmarks, performing dura puncture, and difficulty in predicting the extent of block.[2,3,4] Several case reports published show that spinal anesthesia is safe in these sets of patients.[5] Sensory level disparities between the two sides in these patients have been studied.

2. Case Report

A 40 year old male patient with kyphoscoliosis and right sided indirect inguinal hernia was posted for right sided hernia repair with meshplasty. Patient came with history of inguinal swelling on right side since 2 years. Patient had history of kyphoscoliosis since childhood. Patient was able to lie down on his back and was able to move with support.There was no history of any motor or sensory symptoms or any bowel disturbances. There was no complaint of any shortness of breath or symptoms suggestive of respiratory or cardiovascular instability. On examination patient was alert and cooperative.Airway examination revealed Mallampati Grade 2, adequate mouth opening and neck movements. On local examination of the lumbar spine, interspinous space was not felt . X-ray whole spine showed kyphoscoliosis of thoracolumbar spine with 45° Cobb angle, measured as the intersection between parallel lines drawn from end — Vertebrae of the curve deformity [Figures 1]. Hemogram, liver function test, renal function test, coagulation profile and blood sugar were within normal limits. PFT show mixed (obstructive plus restrictive) disorder.ECG and 2DEcho werenormal with ejection fraction of 60%.The risk of anaesthetic technique (difficult spinal anaesthesia and complications like partial block, failed spinal, high spinal, need of general anaesthesia and postoperative intensive care) was explained to patient and his attendants and the patient was accepted under ASA III grade physical status for anaesthesia after taking written informed consent.Surgery was planned under spinal anaesthesia. Patient was given tablet alprazolam 0.5mg the night before surgery.

On the day of surgery, intravenous line was secured with a wide bore 18-gauge cannula on dorsum of left hand. Half an hour before shifting to the operation theatre , inj. Ranitidine 50 mg and Metoclopramide 10 mg were given i.v as premedication. In the operation theatre monitors were attached and HR,ECG,non-invasive BP,pulse SpO_2 recording were started. Preloading with ringer lactate (15ml/kg) was done.Under strict aseptic precautions, with patient in sitting position, lumbar puncture was performed at L2-L3 intervertebral disc space using 25-G Quincke's needle via modified paramedian approach[6].The needle is inserted just lateral to dorsal spine perpendicular to skin and advanced toward and onto the lamina and needle is then "walked" cephalad over the lamina until the interlaminar space is entered. In patients with scoliosis, this technique is beneficial as the larger interlaminar space on the convex side of the scoliosis facilitates the needle placement. But on contrary, in our patient even after multiple attempts from convex side of scoliosis, needle placement into the space was unsuccessful. Further attempts were done from concave side of scoliosis and in second attempt dural puncture was achieved. After confirmation of free flow of cerebrospinal

fluid,2.2of 0.5% hyperbaric bupivacaine was injected [Figure2]. The patient was made supine and level of sensory block was tested with pin prick method after 3 min. Level of block achieved was T6 on both sides. Intra-operative period was uneventful and surgery lasted for one hr., patient was shifted to post-op. ward, patient's hemodynamics were stable in post-operative period and then pt. was shifted to ward.

3. Discussion

The scoliotic spine poses a unique challenge for the anaesthesia provider and may complicate general or regional anaesthesia. Scoliosis is broadly classified into three categories: congenital, neuromuscular, or idiopathic. Scoliosis is defined as lateral curvature of the spine of $>10^0$. The degree of lateral curvature is determined by the Cobb angle[7]. The Cobb angle is measured between the most tilted vertebral bodies in the coronal plane. A line is drawn parallel to the superior end plate of the cephalad vertebrae with the greatest angulation. A second line is drawn parallel to the inferior end plate ofthe caudal vertebrae with the greatest angulation. A perpendicular line is drawn from each of these lines, which creates the Cobb angle. In addition to the lateral curvature in idiopathic scoliosis, there is also rotation of the vertebral bodies. Anatomically, the spinous processes point towards the midline (concave-side) and the vertebral bodies rotate towards the convex-side of the curve[8]. A strong linear relationship exists between the Cobb angle and vertebral rotation in both thoracic and lumbar curves in untreated patients, and maximum rotation occurs at the apex of the scoliotic curve[9]. If this angle is 40^0 the cardio pulmonary function frequently decreases and if 100^0 it significantly decreases. In severe cases, displacement with rotation of the trachea and main stem bronchi may also be noted, which could cause problems during intubation for general anesthesia[10]. The type and severityof the scoliosis should be determined from the patient's history, physical examination and any prior radiologic studies. Patients who have neuromuscular or congenital scoliosis have to be evaluated carefully. In these cases if the anatomy is straightforward and well understood then the anaeshetist could cautiously proceed, but often these are complex scoliotic curves and consideration should be given to using a different technique for placement or pain management.

For mild scoliosis ($11\text{-}25^0$), anaesthetist should proceed with neuraxial procedure using good positioning and caution.In moderate scoliosis ($25\text{-}50^0$), if spinous process is palpable, paramedian approach can be attempted on convex side of the curve. Imaging modalities such as ultrasound or fluoroscopy should be considered. In patients who have scoliotic curves with a Cobb angle $>50^0$and unclear anatomy, imaging modalities should be used for neuraxial access or a different mode of pain management should be considered.

The main challenges for neuraxial anaesthesia in scoliosis are decreased success rate, multiple attempts, false loss of resistance, failed or inadequate block. The CSF volume is decreased in kyphotic spine, thus even lower doses of local anaesthetics may achieve higher than expected level of block resulting in higher incidence of hypotension. The volume of local anaesthetic must be accordingly adjusted but drug dose in not specified. Caution must be advised with regional anaesthesia as neurological anomalies may coexist with spinal abnormalities. Epidural anaesthesia is also difficult due to the difficulty in positioning of patient, negotiating the needle, unpredictable catheter direction and altered epidural space volume.

The abnormal spine makes intubation and ventilation difficult. Co-existing hypoxemia and pulmonary infection may lead to difficult extubation and prolonged ventilation due to difficulty in aligning the airway. The risk of malignant hyperthermia in kyphoscoliosis patient cannot be undermined with susceptible agents like succinyl choline or halothane. So general anaesthesia (GA) is not favoured as choice of anaesthesia due to difficulty in intubation and post-op. ventilation, presence of pulmonary infection, poor respiratory reserve and location of the surgery.

Anesthesia in patient with scoliosis poses a significant risk and there is no single regimen that can be recommended for anesthetic management for all cases. The location of surgery primarily determines the type of anaesthesia. GA can be associated with difficult intubation and prolonged post-operative ventilation. Epidural anaesthesia may not always give adequate level of block. Spinal anaesthesia[11] and combined spinal anaesthesia[12] are better options.Difficult airway cart must always be ready before administering anaesthesia. The success of the procedure dependon the co-operation of the patient, surgeon and a good preparation of the patient and well prepared anaesthesia team.

4. Conclusion

Spinal anesthesia is an effective and safest option for patients with kyphoscoliosis. Based on anatomical consideration in patients with scoliosis, a modified paramedian approach for needle insertion may offer several advantages.

Figure 1

Figure 2

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