

Implications of Subarchnoid Block in Senile Kyphosis

Pokharel K,¹ Rijal R,² Bhattarai B,¹ Subedi A,¹ Khatiwada S¹

¹Department of Anaesthesiology and Critical Care

²Department of Orthopaedics

BP Koirala Institute of Health Sciences,

Dharan, Nepal.

Corresponding Author

Krishna Pokharel

Department of Anaesthesiology and Critical Care

BP Koirala Institute of Health Sciences,

Dharan, Nepal.

E-mail: drkrishnapokharel@gmail.com

ABSTRACT

Since the literature related to safety or efficacy of placing spinal blocks in patients with kyphosis is lacking, we aim to discuss about the anaesthesia implications of spinal anaesthesia in senile kyphosis. We successfully administered spinal anaesthesia in three elderly patients with predominant kyphotic deformity with absent or mild scoliosis. The needle insertion attempts did not exceed two and a smaller dose of anesthetic was sufficient. While choosing spinal anaesthesia in patients with kyphosis, a risk benefit analysis needs to be performed based on the co-presence of scoliosis and its severity, desired level of anaesthesia, and associated or coexisting systemic illness.

KEY WORDS

Kyphosis, Spinal anaesthesia, Regional anaesthesia

Citation

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INTRODUCTION

Although spinal anaesthesia is frequently administered in patients with kyphotic deformity, there is no guideline on the use of neuraxial blocks in these patients. Interestingly, the concerns related to anaesthesia are expressed in the literature using the terms like “kyphoscoliosis”, “abnormal spinal curvature” or “spinal deformity”, but not “kyphosis” alone. Moreover, even when the word “kyphoscoliosis” is used, publications is limited to anecdotal case reports and discussion is focused on “scoliosis”.^{1,2} We want to share our experience of successful administration of spinal anaesthesia in three elderly patients with predominant kyphotic spine and also discuss the related anesthetic implications. Our report is unique because scoliosis was either mild or absent. The authors obtained patients’ consent and institutional review committee approval to report these cases.

CASE SERIES

Our first patient was a 65 years female and the second patient was an 85 years male. Both had severe senile thoracolumbar kyphosis and mild lumbar degenerative scoliosis (fig. 1 and 2). Our third patient was a 74 years female with senile round thoracolumbar kyphosis and no scoliosis (fig. 3). The lumbar lordosis was absent in all the three patients. All of our patients had fracture neck of femur. The patients did not have any respiratory problems. They had no features suggestive of cardiac, neuromuscular or coagulation abnormalities. One patient was scheduled for hemi-replacement arthroplasty and two patients for dynamic hip screw fixation. In the operating room, for the relief of pain during positioning, all the patients received IV bolus dose of 25 ug fentanyl followed by 25 ug top ups until Numeric Rating Scale Score was less than 4 but not exceeding 100 ug. After the relief of pain, all the patients



Figure 1. Photograph and radiograph of the first patient with severe kyphosis and mild scoliosis

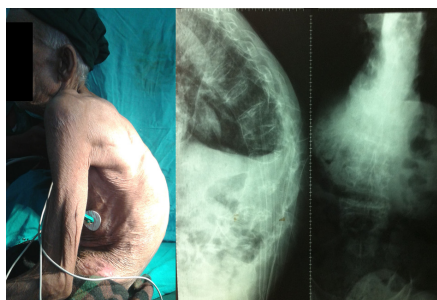


Figure 2. Photograph and radiograph of the second patient with severe kyphosis and mild scoliosis

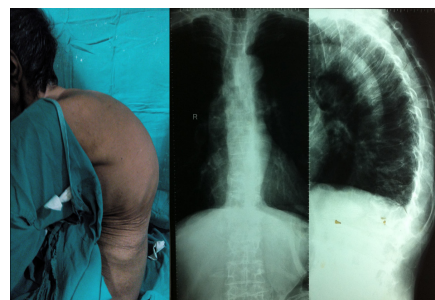


Figure 3. Photograph and radiograph showing senile round kyphosis in the third patient

Table 1. Describing the details of spinal deformity and subarachnoid block.

| Patient serial no | Kyphosis angle | Kyphosis apex level | Associated scoliosis | Needle insertion attempt (n) | Bupivacaine dose (mg) | Maximum block level | Surgery | Surgery duration (h) |
|-------------------|----------------|---------------------|----------------------|------------------------------|-----------------------|---------------------|---------|----------------------|
| 1 | 72 | L1 | Mild | 2 | 10 | T 10 | DHS | 1 |
| 2 | 110 | L1 | None | 1 | 12.5 | T 6 | HRA | 1 |
| 3 | 70 | NA | None | 1 | 12.5 | T 8 | DHS | 0.5 |

L: Lumbar Vertebrae; T: Thoracic Vertebrae; DHS: Dynamic Hip Screw Fixation; HRA: Hemi-replacement Arthroplasty. NA: Not applicable.

were placed in sitting position, and the landmarks were defined by palpation. Subarachnoid space was reached from the L3-4 interspace using the midline approach by a 25 gauze Quincke needle. Free-flowing cerebro-spinal fluid was obtained before injecting 0.5% hyperbaric bupivacaine. The number of attempts at needle insertion and the amount of drug administered is depicted in table 1. The surgery was started when the block level of T12 was achieved. The hemodynamics were stable throughout the surgery and afterwards.

There was no episodes of failure to place spinal needle or inadequate block. There was no features suggesting neurologic injury when assessed at 48 hours and two weeks after surgery.

DISCUSSION

There is a general apprehension that neuraxial block in abnormal spinal curvature may be technically difficult.³ However, kyphosis alone should not be an impediment to introduction of the spinal needle. Osseous obstruction to needle insertion may be reduced because of widening of interlaminar and interspinous spaces. The insertion site of the spinal needle was below the level of the apex of the kyphosis in all our patients resulting in a successful block with the surgical duration between 60 and 70 minutes. All our patients, having predominant kyphotic deformity, did not require more than two passes of the needle for block performance. On the other hand, in case of isolated scoliosis, the failure rate of spinal needle placement may be as high as 4%.⁴ This is the result of both rotation and angulation of the vertebrae. Hence, the co-presence of scoliosis and its severity is a predominant factor in the failure of spinal anaesthesia in patients with kyphosis.⁵

With increasing kyphosis, the posterior longitudinal ligaments and vertebral discs put pressure on the anterior spinal cord, leading to myelopathy and flattening of the spinal cord, demyelination of the anterior funiculus as well as neuronal loss and atrophy of the anterior horn.^{6,7} This has certain implications on spinal anaesthesia. The distance from the ligamentum flavum to the subarachnoid space increases, and hence, the risk of needle induced cord trauma may be reduced. However, there is also a possibility of “double crush syndrome”, which may occur when a local anaesthesia adds further insult to neuronal tissue in a spine already undergoing a pathological process.⁸ Appropriate selection of local anaesthetic agent and minimizing the dose and concentration are probably effective strategies to reduce such undesired consequences. Since the hyperbaric solution may pool in the dependent portion of the spine and result in possible neurotoxic concentrations, use of the isobaric local anaesthetic is perhaps a better choice.⁹ As the plain local anaesthetic for spinal block is not available at our center, we administered a smaller dose of hyperbaric solution instead. Our routine practice is to administer 2.8 ml of hyperbaric 0.5% bupivacaine for surgery involving lower extremity in patients without short stature. We chose to use not more than 2.5 ml in our patients and fortunately, the surgical block was adequate, requiring no anaesthetic or analgesic supplementation and no neurological sequelae.

About 80% cases of kyphoscoliosis are idiopathic in nature. Secondary kyphoscoliosis occurs as a result of various neuromuscular, vertebral or connective tissue disorders.¹⁰ Deformity of the upper spine, on the other hand, may compromise cardiorespiratory reserve.¹¹ However, pulmonary function usually remains unaffected in predominant kyphosis if the associated thoracic scoliosis is only mild.¹² If at all it gets affected, dysfunction is

restrictive type and patients with Cobbs angle more than 60° or apex above T10 are more prone.¹³ Therefore, during preanaesthetic visit, any co-morbid condition that may coexist with kyphosis should also be evaluated.

Although the concerns related to neuraxial blocks should always be borne in mind, they should not be overstated or translated to all back deformities regardless of their type or specific location. As patients with senile kyphosis are elderly with multiple co-morbidities, the risk of spinal anaesthesia may be less than dealing with the respiratory/

cardiac complications of general anaesthesia.^{14,15} Nevertheless, certain precautions should be considered: a careful pre-operative examination remains mandatory, and it is always prudent to use plain local anaesthetic avoiding high concentration and volume for spinal anaesthesia.¹⁶

Our current understanding of spinal anaesthesia in patients with kyphosis alone or predominant kyphosis with mild scoliosis is limited by paucity of publications. Single shot spinal block was safe and effective in our patients. We have discussed the potential anesthetic implications.

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