# Sacral spinal anaesthesia

## INTRODUCTION

Since the introduction of intrathecal anaesthesia by Bier in 1898, traditionally subarachnoid space (SAS) is reached between the end of spinal cord at L2 (2nd lumbar) and end of dural sac at S2 (2nd sacral). It is expected that when a spinal needle is inserted through 1st or 2nd dorsal foramen of sacrum in cranial direction, it will penetrate the dural sac. During sacral neuromodulation,[1] an electrode is placed in 3rd dorsal foramen for the treatment of urge incontinence. Based on this, it was decided to administer spinal anaesthesia through 1st or 2nd dorsal foramen of sacrum to evaluate its merits and demerits, as well as to assess the feasibility of such a procedure.

## METHODS

With approval of medical ethical review board and written informed consent for procedure and study, 20 (twenty) patients, aged between 68 (sixty eight) to 85 (eighty five) years, with ASA physical status score of II and III, undergoing dynamic hip screw fixation (DHS) for trochanteric fractures were included in the study. The conditions that contraindicate surgery or spinal were considered at the time of pre-operative visit. The patients and surgeons were explained in detail about the procedure.

The femoral nerve of the fractured side was blocked with 20ml of 0.375% inj. Bupivacaine by fascia iliaca compartment block technique[2] to avoid pain from fracture site on movement to each patient.

In the operation theatre, non-invasive monitoring was initiated. 500ml of 5% dextrose in normal saline was transfused as pre-loading[3] before spinal anaesthesia through peripheral intravenous access. Identification of 3rd sacral foramina was ensured by a point located 2-3 cm lateral and 9-11cm cephalad from the tip of coccyx. 2nd sacral foramina are situated at a point 2 cm cephalad to 3rd sacral foramina. With standard aseptic preparation and with patient in sitting position, Quincke type spinal needle (Spinocan© Spinal Anesthesia Needles 27G × 3.5 inches, B Braun) was introduced obliquely towards midline through 2nd dorsal foramina of sacrum [Figure 1]. The spinal needle in most of the cases touched bone and then needle was withdrawn slightly and redirected either cephalad or caudad to enter the expected foramina and to penetrate the dural sac. After flow of clear CSF, 3ml of 0.5% bupivacaine was injected through the needle.

The onset of sensory block was defined as the time between injection of intrathecal anaesthetic and the absence of pain at the T12 dermatome, assessed by sterile pinprick every 2 min. Duration of sensory block was defined as the time interval between intrathecal injection and complete recovery of sensation. Motor block was assessed by modified Bromage scale. Complete Motor block of the lower extremities was defined as inability to move feet or knees.

Surgery was allowed when sensory block extended to the level of T12 along with motor block of lower limbs. The onset time of sensory blockade and complete motor blockade, duration of sensory block, duration of surgery, blood pressure (BP), pulse rate and oxygen saturation (SpO2) were recorded in all cases. Occurrence of postdural puncture headache, backache and haematoma was assessed through a predesigned questionnaire and careful clinical examination.

## RESULTS

In all the 20 patients (six males and fourteen females) undergoing DHS, sacral spinal anaesthesia was successfully administered. Haemodynamics were stable intraoperatively and postoperatively [Table 1].

Complete Motor block of the lower extremities was achieved rapidly (08.55 ± 1.67 minutes, range: 6-12 minutes). Onset of sensory block was slightly delayed in comparison (12.55 ± 4.14 min). Sensory block extended to T12. Sensory block lasted for 323.5 ± 91.60 minutes (Range: 210-480 minutes). Haemodynamic stability was satisfactory.

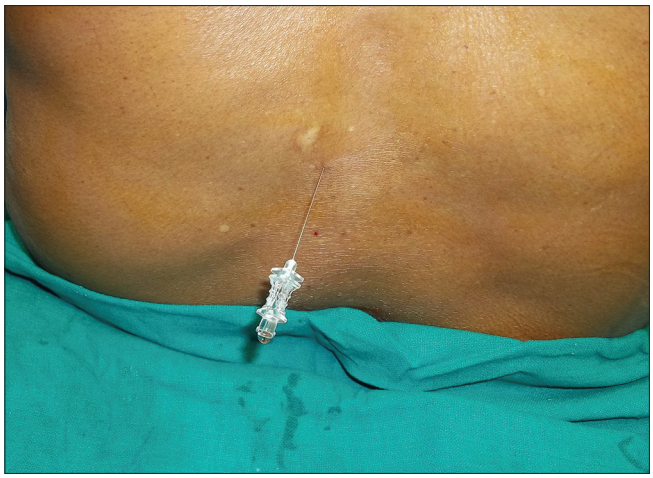

**Figure 1:** Sacral spinal anesthesia

**Table 1: Shows patient details along with operative details and haemodynamic status during the operation**

| Patient details | Mean±SD |
|---|---|
| Age (yrs) | 76.15±5.081 |
| Height (cm) | 160.25±4.411 |
| Weight (Kg) | 53.35±8.512 |
| Operative Details | |
| Duration of surgery (minutes) | 109±10.99 |
| Onset of complete motor block | |
| Time for onset of complete motor block (minutes) | 08.55±1.67 |
| Onset and duration of sensory block | |
| Time for onset of sensory block (minutes) | 12.55±4.148 |
| Duration of sensory block (minutes) | 323.5±91.60 |
| Hemodynamic parameters during O.T | |
| Heart rate (beat/min) | 78±4.519 (71-88) |
| Systolic blood pressure (mm of Hg) | 109.35±10.733 |
| $SpO_2$ (%) | 97.85±0.875 |

SD – Standard deviation; $SpO_2$ – Oxygen saturation

## DISCUSSION

The sacrum is a fused bone of 5 (five) sacral vertebrae with centrally placed sacral canal. This canal may be absent in 5 to 10% of population.[4] Bilateral 1st and 2nd dorsal foramen are selected to locate the subarachnoid space within sacral canal, but sometimes it becomes difficult due to anomalies of foramina. These foramina may be smaller or even obliterated due to deposition of calcium around the rim. The immobility of sacrum helps to introduce the spinal needle in proper direction without any help of assistant and it also helps in quick healing of puncture site without causation of backache.

Preoperative femoral nerve block on the fractured side

reduces pain on movement of patient during transport and while positioning for spinal anaesthesia. It also provides intraoperative and postoperative analgesia. It is well tolerated in old age.

The formation of lumbosacral angle by lumbar and pelvic curvatures offers obstruction to the cephalad flow of local anaesthetics when injected at the level of 2nd dorsal foramen of sacrum, thereby delaying the onset of anaesthesia. This lumbosacral angle also helps to maintain a high degree of haemodynamic stability due to less and slow involvement of sympathetic system. During our study, patients required minimum fluid infusion owing to this.

In the last century, occasional sacral subarachnoid punctures have been reported. In 1913, Danis[5] introduced 'transsacral anesthesia' by bilateral multiple injections of local anaesthetics into sacral canal through each dorsal foramen, but this difficult technique failed to gain popularity and existence. Taylor[6] in 1940 introduced 'lumbosacral subarachnoid tap' at lumbosacral foramen. Haverling[7] in 1972 punctured dural sac at the midline between 1st and 2nd sacral vertebrae, but his success was dependent on the presence of a rarely present patent interspace and penetrable 'thin bony membrane.' Overall, these attempts failed to be popular and acceptable for routine practice.

In this study, all patients were aged and had some degree of cardio-respiratory compromise with or without hepatic and renal insufficiency. These groups of patients require an anaesthetic technique that provides high degree of haemodynamic stability. Sacral spinal anaesthesia, as shown in Table 1, was suitable for lower limb surgeries in this group of patients.

## CONCLUSION

With minimal haemodynamic disturbances, sacral spinal anaesthesia technique offers a suitable alternative to traditional lumbar approach in old age for lower limb orthopaedic surgeries.

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## REFERENCES

1. Chai TC, Mamo GJ. Modified technique of S3 foramen localization and lead implantation in S3 Neuromodulation. Urology 2001;58:786-90.
2. Dalens B, Vanneuville G, Tanguy A. Comparison of the fascia iliaca compartment block with the 3-in-1 block in children. Anesth Analg 1989;69:705-13.
3. Veering BT, Immink-Speet TT, Burm AG, Stienstra R, Van Kleef JW. Spinal anesthesia with 0.5% hyperbaric bupivacaine in elderly patients: Effects of duration spent in the sitting position. Br J Anaesth 2001;87:738-42.
4. Crighton IM, Barry BP, Hobbs GJ. A study of the anatomy of the caudal space using magnetic resonance imaging. Br J Anaesth 1997;78:391-5.
5. Lundy JS, A method for producing block anaesthesia of the sacral nerves. Am J Surg 1928;43:262-70.
6. Taylor J. Lumbosacral subarachnoid tap. J Urol 1940;43:561-4.
7. Haverling M. Trans-sacral puncture of the arachnoid sac. Acta Radiol 1972;12:1-6.

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