

The incidence of Post Dural Puncture Headache Following Spinal Anaesthesia:- A Comparison of Sitting Versus Lateral Decubitus Position

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ABSTRACT

Introduction: Patients are always at risk of PDPH (post dural puncture headache) when undergoing spinal anaesthesia, epidural (in case of accidental dural puncture) and lumbar puncture for diagnostic purposes. Though this form of regional anaesthesia is safe but this complication limits its use. Many attempts have been made to prevent it but till now we have succeeded in only minimising it. The incidences have decreased by gaining our knowledge from extensive review of literature regarding its pathophysiology, factors affecting it and different methods of preventing it. This study is just another step to find out that if there is any relation of incidence of PDPH with different position used for performing spinal anaesthesia.

Material and methods: Total 300 patients were randomly allocated into two groups who underwent different surgeries following spinal anaesthesia performed either in sitting position or lateral position by 25 gauge Quincke needle.

Results: Overall incidence of post dural puncture headache was 11.66%. There was no significant difference in incidence between two groups ($P=0.590$). In Group I (sitting position) the incidence was 12.66% and in Group II (Lateral position) the incidence was 10.66%.

Conclusion: The incidence of PDPH does not change whether spinal anaesthesia is performed in sitting or lateral position.

Keywords: Lumbar puncture, Postdural puncture headache, spinal anaesthesia, spinal needle.

INTRODUCTION

Spinal anaesthesia is widely practised all over the world for performance of different kind of surgery with minimal complications. It is in practice for centuries and so is the complication post dural puncture headache (PDPH). It is one of the main complication related to spinal anaesthesia which can limit its use.^{1,2} This headache is posture dependent. It occurs when patient resumes upright position and is characterised by dull pain in fronto-occipital area and relieves on lying down.³ It may be associated with nausea and vomiting, auditory and visual symptoms.⁴ Pain may radiate to the neck and neck stiffness may be present.⁵ It causes distress to patient, increases hospital stay, interferes with new born care in post-partum mother. It is an iatrogenic cause, results after either intentional or accidental dural puncture.⁶ The incidence of dural puncture in epidural anaesthesia ranges from 0.16%–1.3% in experienced hand.⁷ Post-Dural puncture headache develops in 16%–86% of cases after attempted epidural block with large bore needles.⁷ Many studies so far has been done to find out the exact cause behind it and many attempts have been done to alleviate this complication but with little success. Still, patients experience it although incidence has gone down. Different risk factors are considered

like characteristics of patient population, characteristics of needle used, puncture technique, number of punctures⁸⁻¹⁰ and many others. The use of spinal needles of smaller gauge have decreased the incidence from 30 % to 0.3%.¹¹ Of many risk factors, one of the factors assumed was related with the position of the patient while doing dural puncture, either in sitting or lateral position. Whether position of patient while performing lumbar puncture plays a role in occurrence of PDPH is not clear. Very few articles have been found in review of literature regarding patient's position in causing PDPH following spinal anaesthesia.

This study is designed to compare the incidence of PDPH following spinal anaesthesia in sitting and lateral position.

MATERIAL AND METHODS

This comparative study was conducted in anaesthesia department of Central Referral Hospital, Gangtok, Sikkim, from April 2015 to May 2016 on 300 patients. ASA GRADE I and II patients who could be operated under spinal anaesthesia aged between 18 to 65 Years were included. Patients belonging to ASA GRADE III and IV, contraindicated for spinal anaesthesia like patient's refusal, increased intracranial pressure, bleeding disorder, spinal deformity, hypotension and Patient with history of chronic headache such as migraine, cluster or tension headache were excluded.

Permission of hospital ethical committee was obtained before proceeding for the study. Pre anaesthetic check up of all the patients were done. The patients were explained the concept and procedure of this study and their consent for same were taken.

After obtaining patient's consent, patients were randomly allocated into two groups. In group I spinal anaesthesia was performed in sitting position and in group II it was performed in lateral position. Patients were followed up for post dural puncture headache for five days post operatively either in person if still admitted in hospital or by telephone if discharged. Severity and intensity of headache, onset, duration, associated symptoms like neck stiffness, vomiting were also noted. Results were compiled under each group and were analysed finally. Standardised anaesthetic technique was employed for every

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patient after recording vitals like pulse, blood pressure, SPO₂ and a good intravenous access was established. All the patients were preloaded with 500 cc of crystalloid either ringer lactate or 0.9% NaCl. The block was performed by 25G Quincke needle either in sitting or lateral position with bevel of needle directed parallel to the long axis of spine with midline approach. After successful attempt and obtaining a free clear flow of CSF local anaesthesia with or without additive was administered. Number of attempts of dural puncture, level of puncture, vital signs (heart rate, blood pressure, oxygen saturation) were noted, before the block performance and after the block till surgery was over. Patients were followed up for post dural puncture headache for five days post operatively either in person if admitted in the hospital or by telephone if discharged. PDPH was considered if headache was located in frontal / occipital area, increase with standing or sitting position and decrease on lying flat. Severity was defined as mild, moderate and severe with co-relation to *visual analog scale (VAS)* 0-10. 0= no headache, 1-3 = mild headache, 4-7 moderate headache, >7 = severe headache if admitted in hospital and *Verbal rating scale(VRS)*: 0-No pain, 1-mild pain, 2-moderate pain, 3-severe pain if at home. All patients who experienced headache were treated by advising them to lie down flat, drink plenty of fluids and coffee, decrease activity and to take 500 mg paracetamol one or two tablets every 8 hourly. None of the patient required epidural blood patch.

STATISTICAL ANALYSIS

Data were presented as number and percentages. The statistical analysis was done using SPSS version 20. Analysis of data was done by Chi- square test and ANOVA (Analysis of variance). A 'P' value of less than 0.05 was considered statistically significant.

RESULTS

Total three hundred cases were given spinal anaesthesia either

Variables	Group I (Sitting) N=150	Group II (Lateral) N=150	P Value
Age (years) Mean±SD	32.61±9.85	31.89±9.32	0.51
Sex(M/F)			
M	27	22	0.43
F	123	128	
Weight (kg) Mean±SD	67.43±11.67	67.05±9.75	0.76
ASA			
I	31	20	0.09
II	119	130	
Number of attempt			
Single	10	92	0.027
Multiple	40	58	
PDPH	19	16	0.59
Intraoperative hypotension	34	41	0.35

Table-1: Demographic Data of Patients, Number of spinal anaesthesia attempts and frequency of PDPH

in sitting position (Group I) or in lateral position (Group II) for different kind of surgeries involving lower abdomen and lower limb. Patients' characteristics were comparable in both the groups regarding Age, Sex, Weight and ASA Physical status (Table-1).

There was no significant difference in the type of surgeries in both the groups. There were 105 Caesarean sections in Group I and 111 in group II, rest were other surgeries. Regarding the ease of dural puncture there was statistical difference between two groups. Single shot dural puncture was seen in 110 cases in group I and 92 cases in group II (p=0.027). Multiple puncture was seen in 40 cases in group I and 58 cases in group II (p=0.027). The intraoperative hypotension was seen in 34 cases in group I and 41 cases in group II and was treated with intravenous Mephentermine.

The overall incidences of PDPH were seen in 35 cases (11.3%) out of 300 cases. The incidence of PDPH in group I were seen in 19 cases (12.6%) and 16 cases (10.6%) in group II and it was statistically not significant. The incidence of PDPH in single attempt of dural puncture was noticed in 15 cases in group I and 9 cases in group II. The incidence of PDPH in multiple puncture was 4 in group I and 7 in group II.

The onset of PDPH in both the group is given in the table-2 below. The severity ranged from mild to moderate in all the PDPH cases except in two cases who suffered from severe headache and one of them suffered from neck stiffness. The patients suffering from PDPH were treated conservatively with bed rest, fluid and analgesia. None of the cases required epidural blood patch.

DISCUSSION

Post dural puncture headache is defined as "a positional headache arising within 7 days of a dural puncture that becomes worse when standing and is relieved on lying down".¹² The suggested theories behind the occurrence of PDPH are leakage of CSF both at the time of dural puncture and leakage of CSF afterwards.¹³ This causes low CSF pressure causing meningeal vasodilation, in addition to mechanical traction on cranial nerves and other pain-sensitive structures when in the upright position.^{7,14,15} The various risk factors for PDPH have been cited in many literatures. Most important are age^{16,17}, Sex¹⁸, type of needles¹⁹, size of needles.²⁰ The most relevant conclusion which was made to reduce PDPH was the type and size of needle used. The atraumatic and smaller diameter needle used causes significant decrease in the incidence of PDPH.¹¹ In our study we used the Quincke needle of 25 gauge and the overall incidence of PDPH was 11.6% which is consistent with the other previous studies that have found the incidence of PDPH ranging from 4% to 40% with same gauge of Quincke needle.²¹⁻²³ The Quincke needle was introduced with bevel in parallel orientation to the long axis of spine as this has been found to decrease the incidence of PDPH.^{11,19,24} Dural fibers were once believed to run longitudinally; but recent light and electronic microscopic studies of human dura reveals that it consists of collagen fibres

Group (Number of Patient)	1 st Day	2 nd Day	3 rd Day	4 th Day	5 th Day
I (Sitting)	6	7	5	1	0
II (Lateral)	5	7	3	1	0

Table-2: Onset of PDPH

arranged in several layers parallel to surface. Each layer consists of both collagen and elastic fibres that do not demonstrate any specific orientation²⁵ Thus orienting the bevel of a cutting needle probably needs further consideration before making any statements regarding the etiology of dural puncture leaks. The factor associated with PDPH following spinal anaesthesia which has not been studied extensively is its association with different position used to perform spinal anaesthesia i.e. sitting, lateral and prone position. Very few literatures have been found in relation to it.

The retrospective study conducted by Öztürk I et al²⁶ on patient who underwent caesarean section found no significant difference between incidence of PDPH in relation to sitting and lateral position as we found in our study. Postdural puncture headache developed in Öztürk I et al study was 11 (15.2%) in the sitting position and 10 (12.9%) in the lateral position ($p>0.05$) compared to our study where 12.6% PDPH in sitting and 10.6% in lateral position ($p=0.59$).

The study done by Kyu Chang Lee et al²⁷ to evaluate the incidence of PDPH with maintenance of sitting position immediately after giving spinal anaesthesia found higher incidence of PDPH (4%) in patients those were maintained in sitting position for 3-5 minutes compared to patients those were immediately resumed lying down position(0%).The reason concluded was increase in transdural pressure in sitting position between subarachnoid space and epidural space. They presumed that due to the maintenance of the sitting position, the CSF hydrostatic pressure would be greater, resulting in elevated CSF leakage and a greater incidence of PDPH. In our study we did not find any difference in incidence of PDPH in both the groups as patients were made to lie immediately in supine position after giving spinal anaesthesia. In the lumbar region in the supine position, CSF pressure ranges between 5 and 15 cmH₂O, and this pressure can increase to over 40 cmH₂O when in the vertical position.²⁸ In the prone position, CSF pressure changes from 8 to 21 cmH₂O, but in lateral decubitus position it reduces to 7-17 cm H₂O.²⁹ The study done by Shah et al³⁰ demonstrated that epidural pressure of 6.4 cm H₂O (range 0.5–12 cm H₂O) in PDPH patients and reported a reduction in epidural pressure at dural puncture from 14.9 cmH₂O (range 11–22 cm H₂O) to 6.9 cmH₂O (range 5.0–8.5 cmH₂O). This confirms that supine position decreases the incidence of PDPH by reducing subarachnoid space pressure.

Another study done by Siamak Afshin Majd, et al³¹ where lumbar puncture was done for diagnostic purpose in sitting and lateral position by 21 gauge Quincke needle observed more PDPH in sitting position (45 %) than in lateral position 16.6%. This high incidence can be due to larger diameter of Quincke needle. The reason proposed by them for the difference in incidence of PDPH in different position was that CSF pressure in the sitting position is 40 cmH₂O and in lateral position it is 5-20 cmH₂O; this higher gradient can make a larger hole in the dura in the sitting position and makes a prolonged leak. Another reason is that in the sitting position bevel of needle is perpendicular to outer dura fibre and this makes a larger hole and more CSF leak and lastly, in the sitting position downward movement of brain that produces traction pressure upon pain sensitive structures in skull base occurs early in the procedure and this early displacement may cause more symptoms. Also,

they assume that it is easy to perform dural puncture in sitting position and which is less traumatic so healing is delayed.

The other prospective study done to find out the incidence of PDPH in migraine and in non-headache subject after lumbar puncture by W.P.J. van Oosterhout et al³² found that PDPH was more prevalent in the subgroup that underwent Lumbar puncture in sitting position vs in lateral supine position: 13 of 20 (65.0%) in sitting position vs 51 of 179 (28.5%) in lateral position; $p = 0.001$

In our study there was no significant difference in incidence of PDPH was found among the two groups. The reason could be because of use of smaller diameter needle (25G) with bevel directed parallel to sagittal plane and all the patients were immediately made to lie in supine position after giving spinal anaesthesia.

There was significant difference in number of attempts of dural puncture within the group but incidence of PDPH did not differ. The severity ranges from mild to moderate, only two patients suffered from severe headache.

Our study was limited by small sample size ($n=300$), mixed gender and it was a retrospective study.

CONCLUSION

The result of our study demonstrates that no difference in incidence of PDPH following spinal anaesthesia in sitting or lateral decubitus position. Thus we can conclude that any position can be applied in day to day practice according to the anaesthetist's choice, ease and patient's comfort. We recommend use of smaller gauge of spinal needle as far as practicable for performing spinal anaesthesia.

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