

Incidence of postdural puncture headache following the median and para median approaches in spinal anesthesia - a randomized control study

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ABSTRACT

Objectives: This study was conducted to compare the incidence of post dural puncture headache between two methods of insertion of spinal needle i.e., median approach versus para median approach, and also to compare the incidence of other complications such as hypotension, bradycardia, nausea and vomiting, and rare adverse effects like photophobia. **Methods:** This was a hospital based prospective, randomized, control trial study conducted among 142 pregnant women who presented with uncomplicated pregnancy. The women were divided in two groups. Group A Spinal anaesthesia by median approach and group B – Spinal anaesthesia by paramedian approach. **Results:** PDPH (postdural puncture headache) was seen in 5/71 (7.04%) patients in group A versus patients in group B 2/71 (2.82%); with p value 0.245. In group A 15/71 (21.1%) complained of backache when compared with 9/71 (12.7%) in group B; p-value is statistically insignificant ($p = 0.179$). Vomiting was more with group A (1.41%) when compared to group B (0%) with p-value of 0.316. No patients complained of photophobia. The mean value of patients who had hypotension was 0.93 in group A and 0.79 in group B with a p-value of 0.697, statistically insignificant. **Conclusion:** The incidence of PDPH was higher in median approach of spinal anesthesia as compared to that in the paramedian approach. Hence, the paramedian approach of spinal anesthesia is preferred in pregnant women undergoing caesarean section.

Keywords: Incidence, post-dural, puncture headache, median, para median, spinal anesthesia.

Spinal anesthesia was developed in the late 1800s. In 1891, Wynter and Quincke aspirated cerebrospinal fluid (CSF) from the subarachnoid space for the treatment of raised intracranial hypertension associated with tubercular meningitis.¹ The catheters and trocars used were probably about 1mm in diameter and would have certainly led to a postdural puncture headache. However, all of Quincke and Wynter's subjects died soon after. In 1898, Karl August Bier,² a German surgeon, injected 10-15mg of cocaine into the subarachnoid space of seven patients, himself and his assistant, Hildebrandt. Bier, Hildebrandt and four of the subjects all described the symptoms associated with postural puncture headache. Bier surmised that the headache was attributed to a loss of CSF.

By the early 1900s, there were numerous reports in the medical literature of the application of spinal anesthesia using large bore needles. Headaches were reported to be a complication in 50% of subjects.³ The symptoms of post spinal headache typically begin within 2 days but regress spontaneously in a few days. This is thought to be caused by excessive loss of CSF through the dural hole leading to low intracranial pressure, resulting in traction on the pain sensitive parietal dura mater and compensatory venodilation. A method to decrease the incidence of post-spinal headache in a study on pregnant patients posted for caesarean section under spinal anesthesia found that post-spinal headache is less if subarachnoid block is administered by paramedian approach as compared to the median approach. This is based

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on the fact that, in the paramedian approach, perforation of the dura and arachnoid occurs at different angles, which produces a valvular mechanism that prevents a loss of CSF flow to the epidural space.⁴ Very few studies have compared the incidence of PDPH between the two approaches in patients undergoing LSCS. Sothe study aimed to compare the incidence of post-spinal headache with para median and median approaches of the subarachnoid block. The null hypothesis of this study is that there is no difference in the incidence of PDPH between two methods of insertion of spinal needles, i.e. median versus paramedian approach.

Aims and objectives

- To compare the incidence of post dural puncture headache between two methods of insertion of spinal needle i.e. median approach versus paramedian approach.
- To compare the incidence of other complications such as: hypotension, bradycardia, nausea, and vomiting, and rare adverse effects like photophobia.

Methods

This was a hospital-based prospective, randomized, control trial study conducted among 142 pregnant women's who presented with uncomplicated pregnancy to the department of Anesthesiology and Critical Care in association with the department of Obstetrics and Gynecology, Guwahati Medical College and Hospital, Guwahati, over a period of one year from 1st April 2021 to 31st March 2022 after obtaining clearance from the institutional ethics committee and written informed consent from the study participants.

One hundred and forty two patients meeting the inclusion criteria were divided in two groups using block randomisation using a computer generated random sequence. Group A – Spinal anaesthesia by median approach and group B – Spinal anaesthesia by paramedian approach.

Inclusion criteria -

142 adults were enrolled in the study who met the following criteria:

- Age between 18 and 45 years.
- American Society of Anesthesiologist's physical status II.
- Scheduled for an elective caesarean section under spinal anesthesia.
- Informed and written consent.

Exclusion criteria -

The following patients were excluded from the study:

- Refusal by the patient.

- Any hypersensitivity to local anesthetics.
- Emergency surgeries.
- Bleeding diathesis.
- Infections at the injection site.
- Known congenital abnormalities of lower spine or vertebral column.
- Pre-existing neurological disease.
- History of developmental delay, mental retardation.
- Additional plexus or nerve block.
- Conversion to general anesthesia.
- Patients with more than one attempt at dural puncture.
- Chronic headache, previous PDPH, PIH, pre-eclampsia, gestational diabetes.
- Fetal factors such as IUGR, macrosomia infants, and small for gestational age.

Surgery was initiated when the sensory block level reached at T4. Patient's demographic data (age, weight, height, BMI), duration of surgery, number of hypotensive episodes, total vasopressor requirements and intraoperative nausea and vomiting was also be noted. Hypotension is defined as a decrease in SBP of >30% below baseline or to <90mmHg and will be treated by increasing the rate of crystalloid infusion and use of vasopressors.

Postoperative analgesia protocol is as follows: Tramadol 2mg/kg iv 12hrs apart; paracetamol 10mg/kg iv was applied when analgesia was inadequate despite tramadol.

The patients were questioned for the possibility for the possible occurrence of PDPH on the 1st, 3rd and 7th postoperative days. All the patients were advised emotional support, reassurance, bed rest and oral rehydration. A telephone follow up call was used if the hospital stay was shorter than 7 days. Postdural puncture headache was evaluated according to the International Classification of Headache Disorders (ICHD-II) diagnostic criteria. The intensity of headache and puncture pain was assessed on a scale of 0 to 10, where 0 means no pain and 10 the worst possible pain (0 no, 1-3 mild, 4-6 moderate, 7-10 severe) using the NRS (Numerical Rating Scale).

Statistical methods: The data was entered into MS Excel spread sheets and analysis was done. The procedures involved were transcriptions, preliminary data inspection, content analysis and interpretation. For analysis, descriptive and inferential statistics were used.

Results

The demographic data variables of the patients were comparable in both groups. In our study, the mean age of the patients in group A was 27.10 versus 26 in group B with a p-value of 0.123 which is statistically insignificant. The descriptive data suggests that the two groups were comparable in terms of age of the patients.

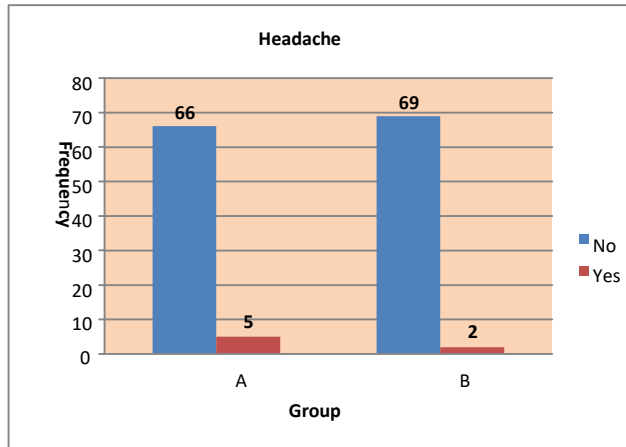


Figure 1: Multiple bar diagram showing postdural puncture headache among group A and group B

In our study, the mean weight in group A was 62.07 while in group B it was 62.55 with a p-value of 0.488 which is statistically insignificant. The descriptive data suggests that the two groups were comparable in terms of the gestational age of the patients. The mean height in group A was 154.65 versus 155.20 in group B with a p-value of 0.109 which is statistically insignificant. The descriptive data suggests that the two groups were comparable in terms of the height of the patients. The mean gestational age of patients in group A was 37.75 versus 37.65 in group B with a p-value of 0.309 which is statistically insignificant.

Table 1: Distribution according to backache among the study group subjects

Variables	Group			P value
	Group A	Group B	Total	
No	56(78.9%)	62(87.3%)	118(83.1%)	0.179
Yes	15(21.1%)	9(12.7%)	24(16.9%)	
Total	71(100%)	71(100%)	142(100%)	

In this study, PDPH was seen in 5/71 (7.04%) patients in group A versus 2/71 (2.82%) patients in group B; p-value was 0.245 which was statistically insignificant (figure 1).

In our study, in group A 15/71 (21.1%) complained of backache when compared with 9/71 (12.7%) in group B; the p-value was statistically insignificant (p = 0.179) (table 1). Vomiting was more common in group A (1.41%) when compared to group B (0%) with a p-value of 0.316. The mean value of patients who had hypotension was 0.93 in

group A and 0.79 in group B, with a p-value of 0.697 which was statistically insignificant.

Discussion

PDPH is the most common complication following spinal anaesthesia and presents within 48-72 hours after dural puncture and lasts for several days.⁵ The loss of CSF from the intrathecal space is the main causative factor. The CSF leakage results in a fall in intracranial CSF volume and CSF pressure, causing gravitational traction on the pain-sensitive structures and headache.⁶ The loss of CSF may result in compensatory adenosine receptor mediated intracranial vasodilatation, leading to PDPH.^{7,8}

Spinal anaesthesia is performed using either the median or paramedian approach. The median approach is the most commonly used.⁹ Midline approach involves passage of needle through supraspinous, interspinous and ligamentum flavum. Technically, it may be difficult to perform the midline approach, especially in elderly patients (calcified ligaments), obese individuals and in parturients (difficult positioning).¹⁰

Alternatively, paramedian approach which is technically easier can be used which avoids the midline ligamentous structures and hits the ligamentum flavum directly after passing through the paraspinal muscles. The paramedian approach may result in a decreased incidence of PDPH as there is leakage of CSF because of the valvular mechanism created due to perforation of dura mater at different angles.¹¹

In our study, we attempted to compare the incidence of PDPH via median versus paramedian approaches on days 1,3 and 7, taking into consideration only patients in whom spinal has been given in a single attempt while using the NRS scale to measure the intensity of the headache that the patients experienced. Secondly; backache, hypotension, bradycardia, vomiting and photophobia were observed in these patients.

Mosaffa F et al¹² studied the incidence of PDPH in the case of median and paramedian approaches in patients undergoing spinal anaesthesia for orthopaedic operations. It was a double-blinded randomized controlled trial. The patients were randomized to receive spinal anaesthesia by either a median (n = 75) or paramedian (n = 75) approach through a 25-gauge Crawford needle. Fifteen patients (10%) developed PDPH. There was no significant difference in the incidence of PDPH in both groups, with 7(9.3%) patients in the median approach group versus 8(10.7%) in the paramedian approach group developing typical PDPH (P = 0.875). However, a significant difference in PDPH incidence

($p = 0.041$) was observed between females (9; 16.7%) and males (6; 6.3%). In our study, only female patients were taken as sample size, blinding was not done; however, patients were allocated randomly and 23G Quincke's needle was used.

Gurulingaswamy S¹³ et al conducted a randomized, prospective, double blind study on 100 patients scheduled to undergo elective caesarean section. 100 patients with American Physical Status 1 and 2 were randomly allocated into two groups of 50 patients each. Group M received the subarachnoid block with a median approach using 25G Quincke spinal needle and 10mg Inj.Bupivacaine heavy 0.5% at L3-L4 intervertebral space while group P underwent spinal anaesthesia with paramedian approach. Postoperatively, patients were monitored for PDPH, low backache, nausea, vomiting, first attempt success rate and the need for rescue analgesia. The incidence of PDPH was 18% in group M and 4% in group P, with a p-value of 0.025 which was statistically significant. The incidence of low backache was 14% in group M as compared to 0 in group P, with a p-value of 0.006 which was also statistically significant. In contrast, blinding was not done in our study, and those patients in whom a single attempt of spinal anaesthesia was made were taken into consideration. Also 23G Quincke needle was used in this study. Shehzad F et al¹⁴ conducted a randomized clinical study on 50 patients posted for elective below umbilical surgery and compared the incidence of PDPH in median and paramedian approaches. Only 4% in group P had PDPH as compared to 28% in group M. Thus, they concluded that the paramedian approach has a lesser incidence of PDPH as compared to the median approach. Even in our study, the incidence of PDPH was lower in group A (4.93%) as compared to group B(2.82%).

Sheybani S et al¹⁵ also studied two approaches of subarachnoid block for the incidence of post dural puncture headache and low backache. Results of the study showed that the incidence of PDPH was less in paramedian approach (12%) as compared to the median approach (15%). Our study results also showed a lesser incidence of PDPH and low backache in group B(2.82% and 12.7%) as compared to group A(4.93% and 21.1%) respectively.

Guglielminotti J et al¹⁶ compared the incidence of PDPH between median and paramedian approaches of spinal anaesthesia on 700 women posted for caesarean section under spinal anaesthesia, which revealed a lower incidence of PDPH in the paramedian approach (0.9%) as compared to

the median approach (4.3%). Our study also revealed similar results.

Mohammed ZE et al¹⁷ had done a randomized clinical trial on 120 elective caesarean section patients for the incidence of PDPH and low backache. Results of the study showed that the incidence of PDPH was lower in the paramedian approach (5.2%) as compared to the median approach (19.6%). Similarly, the incidence of low backache was lower in group P (1.7%) as compared to group M (7.1%). Our study also revealed similar results.

Sadeghi SE¹⁸ et al conducted a double-blind clinical trial involving 125 patients scheduled for elective caesarean section using the median versus paramedian approach, the incidence of a headache was 9.8% in the paramedian group as compared to 9.4% in the median group ($p > 0.05$). The authors concluded that the use of the paramedian approach in pregnant women who have difficulty in positioning is acceptable without increasing the risk of headache or hemodynamic changes.

Bansal T¹⁹ et al compared the frequency of PDPH in patients scheduled for caesarean section, using the midline versus paramedian approach. The authors observed that PDPH was more frequent with the paramedian approach compared to the median approach. Out of a total of 100 patients, only 6% of patients presented with PDPH. Two of these (4%) belonged to median group, and four of them (8%) belonged to the paramedian, which was statistically not significant ($p = 0.068$).

Conclusion

We can conclude that the incidence of PDPH was higher in the median approach of spinal anesthesia as compared to the paramedian approach. Hence, the paramedian approach of spinal anesthesia is preferred in pregnant women undergoing caesarean section.

Conflict of interest: None. **Disclaimer:** Nil.

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