

## Comparison of Median and Paramedian Approach in Spinal Anaesthesia Using Whitacre Spinal Needle in Cesarean Surgery

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### Abstract

**Background:** Spinal anaesthesia is the most common anaesthesia techniques used for Caesarean surgeries, median and paramedian approaches are two common techniques used for spinal anaesthesia. The present study was conducted to compare both median and paramedian approach in spinal anaesthesia in pregnant patients undergoing caesarean surgery in terms of incidence of PDPH, ease of each approach and skin to subarachnoid distance in both the approaches.

**Materials and Methods:** A total of 100 obstetric patients, undergoing cesarean surgery were included in the study. Patients were randomly allocated into two groups. Group M (n=50)-median approach and Group PM (n=50)- Paramedian approach.

**Results:** Mean number of attempts for successful spinal anesthesia were higher in Group PM (paramedian 1.90+0.65) as compared to Group M (median 1.54+0.68). Mean skin to subarachnoid distance was higher in Group PM (5.97 ± 0.13cms) as compared to Group M (5.05 ± 0.19cms). Nine patients presented with Post dural puncture headache out of total 100 patients. In Group M, six patients (12%) developed PDPH out of 50 patients while in group PM, three patients (6%) developed PDPH, however, the difference was not statistically significant.

**Conclusion:** Paramedian approach is better than median approach in terms of reduction in the frequency of PDPH, though the results were statistically insignificant. Skin to subarachnoid distance (SSD) is significantly higher in paramedian approach as compared to median group.

**Keywords:** Median approach; Paramedian approach; Post dural puncture headache; Cesarean surgery.

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### Introduction

The first spinal anaesthesia was performed in 1898, by a German surgeon named Karl August Bier, by injecting 10-15 mg cocaine into his assistant's

(Hildebrandt Bier) and his subarachnoid space and in seven other patients as well five of the subjects had the symptoms of post dural puncture headache. He suggested that the headache seen in these patients is due to loss of CSF.

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Regional anaesthesia, especially spinal anaesthesia, is most commonly used for caesarean delivery. Spinal anaesthesia can be achieved either through the median or paramedian approach. Headache or PDPH is the commonest complication seen following spinal anaesthesia due to continuous leak of CSF from the puncture site that results in meningeal stretch. Commonly observed in young Females, pregnant females<sup>1</sup>, age group (20-40 years) & patients with history of previous Headache. Factors that may lower the incidence of postdural puncture headache are design as well as gauge of needle, parallel positioning of bevel to longitudinal dural fibres and approach.

Pencil point needles include Whitacre, Gertie Marx, and Sprotte, they are different in terms of gauge and design.<sup>2-5</sup> Because of favourable evidence, these needles are increasingly used in clinical practice for both spinal anaesthesia and diagnostic lumbar punctures. Nevertheless, some studies have failed to confirm benefits of these new needles.<sup>6,7</sup> In 2000, Vallejo et al.,<sup>8</sup> concluded that frequency of PDPH was high with Quincke needles compared to the pencil-point needles. In 2000, Reina MA et al.,<sup>9</sup> hypothesized that Whitacre needles had lower incidence of PDPH, In 2018, Singh B et al., concluded that the paramedian approach reduced the incidence of postdural puncture headache and low backache as compared to median approach.

## Materials and Methods

After approval from institutional ethical committee, randomized prospective comparative study was conducted in attached teaching hospital between years 2017-2019.

Our study included 100 patients and were divided into two groups of 50 each. Group M included 50 patients who received spinal anaesthesia with 25G Whitacre needle in median approach and patients in Group PM received in paramedian approach.

The patients under American Society of Anaesthesiology (ASA) Grade I/II and the patients with elective caesarean surgery under spinal anaesthesia were included in the study. Patients unable to give informed consent, with known comorbidities like hypertension, diabetes, preeclampsia, history of PDPH, chronic headache, coagulation abnormalities, bleeding diathesis and taken up on emergency basis were excluded from the study.

Patients were randomly allocated into two groups using chit system.

- Group M (n = 50) – Median approach.
- Group PM (n = 50) – Paramedian approach.

**Median approach:** The patient is placed in the sitting position. A stool was provided as a footrest and a pillow placed on the lap. The patient is maintained in a vertical plane while the patient's neck was flexed and the patient's lower back pushed out. The needle was inserted below the lower edge of the spinous process of the selected upper vertebrae. Inj. Bupivacaine heavy 0.5% was used to achieve spinal anaesthesia.

**Paramedian approach:** A skin wheal is raised 1 cm lateral and 1 cm caudal to the L4 spinous process. The spinal needle inserted 10 to 15 degrees off the sagittal plane in a cephalomedial plane. Once the cerebrospinal fluid (CSF) was obtained after ligamentum flavum punctured, standard dose of Inj. Bupivacaine heavy 0.5% injected. The level of analgesia and time to achieve were noted. After the block was administered, supine position was given and a wedge was placed to tilt the patient towards left side. In both the approaches, maximum of three attempts at L3-L4 space done. If not successful, the L4-L5 space was selected.

Skin to subarachnoid distance was assessed in each approach by marking over the needle at skin tip after injecting the drug using sterile marker. Patients were followed upto 72 hours postoperatively to find out the Occurrence of post dural puncture headache and any other associated symptoms. The degree of post dural puncture headache was assessed with the help of the Visual Linear Analogue Scale.

## Statistical Data Analysis

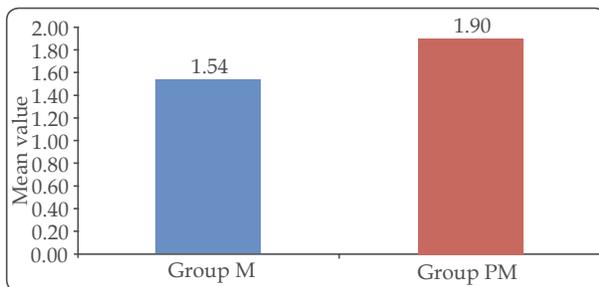
The entire data is statistically analyzed using Statistical Package for Social Sciences (SPSS ver 21.0, IBM Corporation, USA) for MS Windows. The data on categorical variables is shown as n (% of cases) and the data on continuous variables is presented as mean and standard deviation (SD) across two study groups. The inter-group statistical comparison of distribution of categorical variables is done using Chi-Square test or Fisher's exact probability test. The inter-group statistical comparison of means of continuous variables is done using independent sample t test. Intra-group comparison of means of continuous variables is done using paired t test. The underlying normality assumption was tested before subjecting the study variables to t test. All results are shown in tabular as well as graphical format to visualize the statistically significant difference more clearly.

In the entire study, the p-values less than 0.05 are considered to be statistically significant. All the hypotheses were formulated using two tailed alternatives against each null hypothesis (hypothesis of no difference).

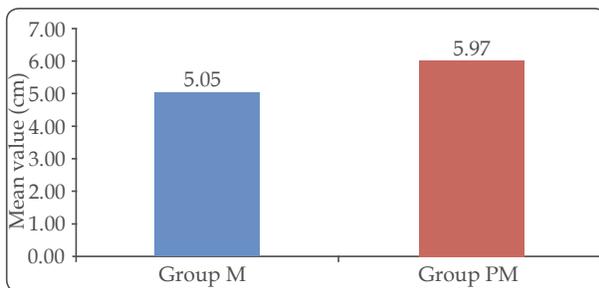
**Result**

Out of 100 patients, group M and PM were consists of 50 patients each. The mean  $\pm$  SD of age of cases studied in GROUP M and GROUP PM was  $26.88 \pm 3.083$  years and  $25.98 + 2.53$  years respectively. The minimum - maximum age range in GROUP PM and GROUP M was 20 - 33 years and 21 - 31 years respectively.

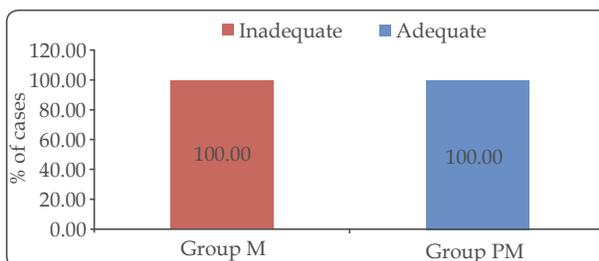
The mean  $\pm$  SD of no. of attempts among the cases studied in GROUP M and GROUP PM was  $1.54 \pm 0.68$  and  $1.90 \pm 0.65$  respectively. Distribution of mean no. of attempts among the cases studied is significantly higher in GROUP PM compared to GROUP M (P-value<0.01). (Graph 1)



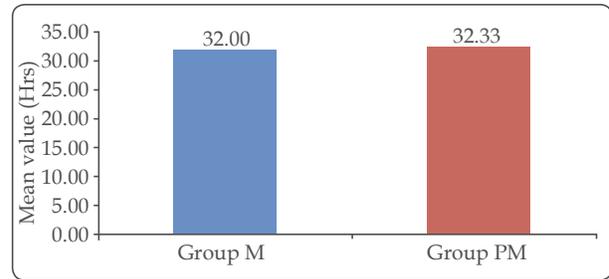
**Graph 1:** Inter-group comparison of mean number of attempts.



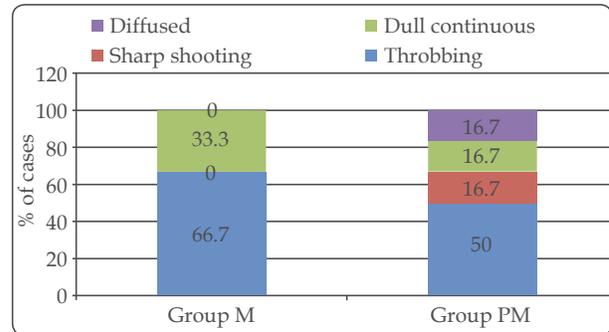
**Graph 2:** Inter-group comparison of mean skin to subarachnoid distance (SSD).



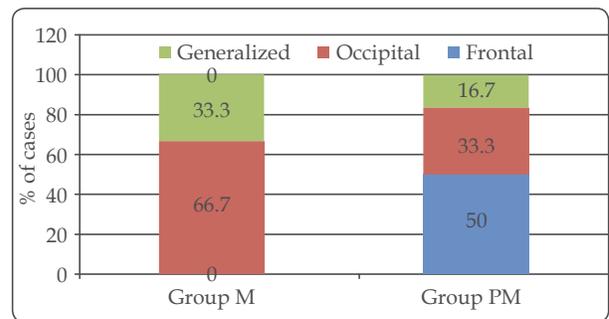
**Graph 3:** Inter-Group Distribution of adequacy of action intraoperatively.



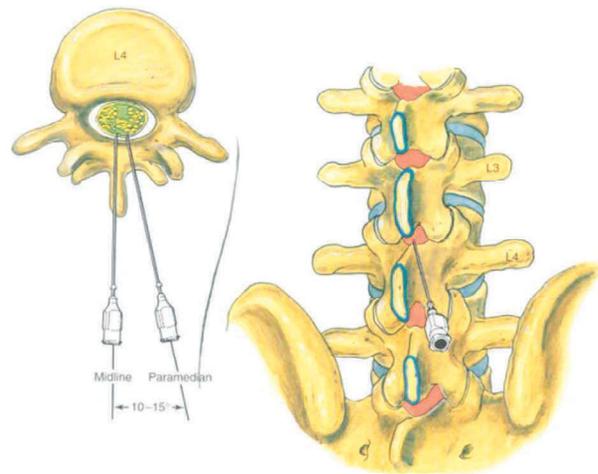
**Graph 4:** Inter-Group Distribution of Mean Time of Onset of PDPH.



**Graph 5:** Inter-Group Distribution of Nature of PDPH.



**Graph 6:** Inter-Group Distribution of Location of PDPH.



The mean  $\pm$  SD of skin to subarachnoid distance among the cases studied in GROUP M and GROUP PM was  $5.05 \pm 0.19$  cms and  $5.97 \pm 0.13$  cms respectively. Distribution of mean skin to subarachnoid distance among the cases studied is

significantly higher in GROUP PM compared to GROUP M ( $P$ -value $<0.001$ ). (Graph 2)

Of 50 cases studied in GROUP M, none had inadequate action. Of 50 cases studied in GROUP PM, none had inadequate action (Graph 3). Of 50 cases studied in GROUP M, 44 (88.0%) had no pain, 6 (12.0%) had mild pain requiring no treatment. 50 cases studied in GROUP PM, 47 (94.0%) had no pain, 3 (6.0%) had mild pain requiring no treatment.

The mean  $\pm$  SD of onset of PDPH among the cases studied in GROUP M and GROUP PM was  $32.33 \pm 2.94$  Hrs and  $32.00 \pm 3.46$  Hrs respectively. The minimum - maximum range of onset of PDPH in GROUP M and GROUP PM was 30 - 36 Hrs and 30 - 36 Hrs respectively (Graph 4).

Of 6 cases who had PDPH in GROUP M, 3 (50.0%) had throbbing, 1 (16.7%) had sharp shooting, 1 (16.7%) had dull continuous and 1 (16.7%) had diffused type of PDPH. Of 3 cases who had PDPH in GROUP PM, 2 (66.7%) had throbbing, 1 (33.3%) had dull continuous type of PDPH (Graph 5). Of 6 cases who had PDPH in GROUP M, 3 (50.0%) had it at frontal location, 2 (33.3%) had it at occipital and 1 (16.7%) had generalized PDPH. Of 3 cases who had PDPH in GROUP PM, none had it at frontal location, 2 (66.7%) had it at occipital and 1 (33.3%) had generalized PDPH. The mean  $\pm$  SD of pain score (VAS) among the cases studied in GROUP M and GROUP PM was  $3.83 \pm 0.75$  and  $3.33 \pm 0.58$  respectively. The minimum - maximum range of pain score in GROUP M and GROUP PM was 3 - 5 and 3 - 4 respectively (Graph 6).

Distribution of adequacy of action, incidence, time of onset, nature, location, and mean pain score (VAS) of PDPH among the cases studied did not differ significantly between two study groups ( $P$ -value $>0.05$ ).

## Discussion

The median approach may be technically difficult due to the exaggerated lumbar lordosis in pregnant patients. The paramedian approach is a useful technique in difficult or challenging situations like elderly and pregnant patients. The exact mechanisms leading to PDPH are still not completely understood. The signs and symptoms of PDPH result from loss of cerebrospinal fluid, traction on the cranial contents, and reflex cerebral vasodilation. Two most important factors influencing the frequency and severity of PDPH are the patient's age and the size of the dural perforation. The parturient is at particular risk

of PDPH because of her sex and young age. Fine gauge spinal needles, 29G or smaller, are technically more difficult to use, and are associated with a high failure rate for spinal anaesthesia. 25G, 26G and 27G needles probably represent the optimum needle size for spinal anaesthesia.

Hence, we conducted a study by comparing median and paramedian approach using 25G Whitacre needle in patients who underwent elective caesarean surgery.

In our study 100 patients were included with 50 each in M and PM groups with mean age of group M patients was  $26.88 \pm 3.083$  and group PM patients was  $25.98 \pm 2.53$ , similarly Manisha Kanagarajan et al.,<sup>11</sup> in 2017, and Afshan Nisar et al.,<sup>12</sup> in 2016, included similar ratio patients in median and paramedian approach, and with nearly similar mean age.

In our study the mean  $\pm$  SD of no. of attempts among the cases studied in Group M and Group PM was  $1.54 \pm 0.68$  and  $1.90 \pm 0.65$  respectively. According to a study by Manisha Kanagarajan et al.,<sup>11</sup> in 2017, The mean  $\pm$  SD of no. of attempts among the cases studied in Group M and Group PM was  $2.6 \pm 0.8$  and  $2 \pm 0$  respectively. In the study by Teena Bansal et al.,<sup>13</sup> in 2018, Single attempt was successful in 75 patients (75%) in group I and 80 patients (80%) in group II.

In our study mean  $\pm$  SD of skin to subarachnoid distance among the cases studied in Group M and Group PM was  $5.05 \pm 0.19$  cm and  $5.97 \pm 0.13$  cm respectively. The minimum - maximum range of skin to subarachnoid distance in Group 1 and Group 2 was 4.7 - 5.4 cm and 5.7 - 6.2 cm respectively. Our results are comparable with the study by Behzad sohil et al<sup>14</sup> in 2011 they compared the median and paramedian approaches in one hundred patients and demonstrated that the distance from skin to subarachnoid space was more in the paramedian group.

According to a study by Teena Bansal et al<sup>13</sup>, in 2018, Six patients presented with PDPH out of total 200 patients. In group I, five patients (5%) developed PDPH out of 100 patients while in group II, only one patient (1%) developed PDPH out of 100 patients; however, the difference was not significant statistically. This study was comparable with our study, as in our study also the difference of incidences of PDPH was not significant statistically.

Distribution of mean onset of PDPH among the cases studied did not differ significantly between two study groups ( $P$ -value $>0.05$ ). According to a study by Manisha Kanagarajan<sup>11</sup> in 2017, The

mean duration of onset of PDPH was similar in both groups i.e.  $2.8 \pm 0.8$  vs.  $2.7 \pm 1.2$  days. Similar to the study by Teena Bansal et al.,<sup>13</sup> in 2018, nature of PDPH in our study also was not statistically significant.

In our study the mean  $\pm$  SD of pain score (VAS) among the cases studied in GROUP M and GROUP PM was  $3.83 \pm 0.75$  and  $3.33 \pm 0.58$  respectively, while in the study by Teena Bansal et al.,<sup>13</sup> in 2018 Mean VAS of total patients was  $2.34 \pm 1.23$  with minimum score of 2 and maximum score of 14.

## Conclusion

The mean number of attempts taken for successful spinal anaesthesia were more in paramedian approach compared to median approach. Skin to subarachnoid distance is significantly high in paramedian approach as compared to median approach. Incidence of post dural puncture headache is less in paramedian approach as compared to median approach.

## References

1. Cesur M, Alici HA, Erdem AF, Silbir F and Celik M. Decreased incidence of headache after unintentional dural puncture in patients with caesarean delivery administered with postoperative epidural analgesia. *J Anaesthesia* 2009;23:31-35.
2. Dittmann M, Schaefer HG, Renkl F, Greve I. Spinal anaesthesia with 29 gauge Quincke point needles and post dural puncture headache in 2,378 patients. *Acta Anaesthesiol Scand*. 1994;38:691-693.
3. Lybecker H, Moller JT, May O, Nielsen HK. Incidence and prediction of postdural puncture headache. A prospective study of 1021 spinal anesthetics. *Anesth Analg*. 1990;70:389-394.
4. Puolakka R, Jokinen M, Pitkanen MT, Rosenberg PH. Comparison of postanesthetic sequelae after clinical use of 27-gauge cutting and noncutting spinal needles. *Reg Anesth*. 1997;22:521-526.
5. Riley ET, Hamilton CL, Ratner EF, Cohen SE. A comparison of the 24-gauge Sprotte and Gertie Marx spinal needles for combined spinal-epidural analgesia during labor. *Anesthesiology*. 2002;97:574-577.
6. Lambert DH, Hurley RJ, Hertwig L, Datta S. Role of needle gauge and tip configuration in the production of lumbar puncture headache. *Reg Anesth*. 1997;22:66-72.
7. Reid JA, Thorburn J. Headache after spinal anaesthesia. *Br J Anaesth*. 1991;67:674-677.
8. Vallejo MC, Mandell GL, Sabo DP, Ramanathan S. Postdural puncture headache: A randomized comparison of five spinal needles in obstetric patients. *Anesth Analg*. 2000;91:916-920.
9. Reina MA, de Leon-Casasola OA, Lopez A, De Andres J, Martin S, Mora M, et al. An in vitro study of dural lesions produced by 25-gauge Quincke and Whitacre needles evaluated by scanning electron microscopy. *Reg Anesth Pain Med* 2000;25:393-402
10. Singh B, Sohal AS, Singh I, Goyal S, Kaur P, Attri JP. Incidence of postspinal headache and low backache following the median and paramedian approaches in spinal anesthesia. *Anesth Essays Res* 2018;12:186-9
11. Manisha Kanagarajan, Vanishree C, Gomathy Jeeva. Median and paramedian approach for spinal anaesthesia for caesarean delivery: A comparative analysis of safety and effectiveness. *Indian Journal of Clinical Anaesthesia*, 2017;4(4): 518-522
12. Nisar A, Saleem J, Hussain S, Bashir K. Comparison of postdural puncture headache in median and paramedian approach under spinal anesthesia in cesarean section. *Pak J Med Health Sci* 2016;10:298-301.
13. Bansal T, Vashisht G, Sharma R. A study to compare median versus paramedian approach regarding incidence of postdural puncture headache under spinal anesthesia in cesarean section. *Indian Anaesth Forum* 2018;19
14. Behzad Sohail, Imran - ul - Haq, Khalid Ameer, Rashid Iqbal, Ahmed Adnan. Comparison of median and paramedian techniques of spinal anaesthesia. *Pakistan Armed Forces Medical Journal* 2011;(2).

