**How to Cite:**
Tichkule, S., & Jain, S. K. (2022). An evaluation of median and paramedian approach for spinal anaesthesia in caesarean delivery. *International Journal of Health Sciences*, *6*(7), 312–320. https://doi.org/10.53730/ijhs.v6n7.10953

# An evaluation of median and paramedian approach for spinal anaesthesia in caesarean delivery

**Sudhir Tichkule**
Associate Professor , Department of Anaesthesiology , Raipur Institute of Medical Sciences , CG, India.

**Sunil Kumar Jain**
Associate Professor , Department of Anaesthesiology , Raipur Institute of Medical Sciences , CG, India.
Corresponding author email: sudhir.tichkule@gmail.com

***Abstract*---**Introduction : Spinal anesthesia can be achieved either through the median or paramedian approach. hence we evaluated the median and Paramedian Approach by following variables - Number of attempts, success of the block, presence of paraesthesia, the level of sensory level, and the incidence of head ache and lower back ache. Methods: The present Retrospective analytical comparative study is carried out on the records of 100 subjects . Records of the Patients were divided into two groups: Group ME (n=50) received spinal anaesthesia with median approach and Group PM (n=50) received through paramedian approach. Results: In Group ME, 12 (24%) patients developed PDPH vs. 6 (12%) in Group PM, which was not statistically significant . There was no significant difference in the incidence of paraesthesia in both groups. The mean duration of onset of PDPH was similar in both groups Conclusions : Our study shows that paramedian approach is equally effective and may be helpful in reducing the incidence of PDPH and paraesthesia, and it can be easily performed in pregnant patients.

***Keywords*---**Median , Paramedian , LSCS , Spinal Anaesthesia

## Introduction

Spinal anaesthesia, is most commonly used for caesarean delivery (CD). . It is simpler, cheaper and offers better physiological benefits with lesser complications than general anaesthesia.[1] Spinal anesthesia can be achieved either through the median or paramedian approach. Headache or PDPH is one of the widespread complications following spinal anaesthesia. Reducing the number of attempts to

get the spinal puncture is very important as multiple attempts increase the incidence of complications such as spinal hematoma, injury to the neuronal structures, PDPH etc.[1]

The midline approach is most commonly used for administration of spinal anaesthesia.[2] The midline approach for spinal needle insertion requires accurate identification of a lumbar interspinous process. In the midline approach, the needle is inserted into the substance of the interspinous ligament and it passes through the ligamentum flavum and epidural space and then pierces the dura arachnoid before entering into subarachnoid space. For most patients, the midline approach is faster, easy to administer and less painful.

The paramedian approach is a useful technique that allows for successful identification of the subarachnoid or epidural space, especially in difficult cases, in obese patients, in pregnant patients and in geriatric patients.[3] Even though it is not regularly or frequently used, the paramedian approach is a very easy method and can be used routinely. The paramedian approach directly punctures ligamentum flavum. The advantage of paramedian approach is that it does not require the parturient to fully reduce the lumbar lordosis.

Post dural puncture Headache (PDPH) or post spinal headache is more common in younger age groups, in female patients and in pregnant females[4,5,6,7,8] and also in patients with the previous history of headache (migraine, tension or cluster headache). The incidence of PDPH is reported to be high in parturients.[9] PDPH usually occurs 72 hours after the spinal anaesthesia, but most often it occurs within the first 48 hours, and it can last up to seven days.

Vilming and Kloster reported a median duration of six days.[10] The influence of median or paramedian approach towards the incidence of PDPH remains unclear. Haider et al[11] had shown that the incidence of PDPH was less in paramedian than median approach (4% vs. 28%), which was statistically significant. However, other studies show that incidence were similar in both approaches.[11,12,13]

We conducted an Retrospective comparative study of patients who underwent caesarean delivery using spinal anaesthesia by both midline as well as paramedian approach to evaluate the safety and efficacy of paramedian approach.

**Method**

The present Retrospective analytical comparative study is carried out on 100 subjects was carried . The patients were divided using simple random sampling technique into two groups of 50 patients each.

This Retrospective Analytical study involved Prior Consent from Hospital Authorities / Medical Superintendents of the Local Randomly selected Secondary & Tertiary care Radio-diagnostic Centres / hospitals including ours to see the records of the patients from their Medical Records Departments ( MRD). The study was conducted within ethical standards and only those were selected who were posted for elective surgery under general anesthesia in hospitals in past 3 years . Randomization was done using computer tables in

selecting data. Only those Patients records were selected who underwent standard clinical examinations, routine biochemical and hematological investigations & Radiological Investigations. Medical record numbers were used to generate the data for analysis.

For the purpose of the present study, data of 100 of the randomly selected patients ( candidates / study subjects ) who seek care for care were retrospectively identified with age ranging from 18 to 65 years.

Only those records were selected which had the following Inclusion criteria -

Inclusion criteria: All pregnant females between the age 21 – 40 and with ASA Grade I & II. Patients who were not willing to receive spinal anaesthesia, with history of allergy to local anaesthetic agent, pre-existing neurological disease, coagulopathies and infection at the site of puncture were excluded from the study.

Records in which Patients with any anatomical deformity involving vertebrae, spinal pathologies, previous history of head ache and morbidly obese patients were also excluded from the study.

Records of the Patients were divided into two groups: Group M (n=50) received spinal anaesthesia with median approach and Group PM (n=50) received through paramedian approach.

It was observed in records that Standard monitors were attached to the patients. The spinal anaesthesia was given in sitting position, using 25 G Quinke needle at the L3 – L4 space. After achieving a complete sterile condition, the spinal anaesthesia was given in the following technique:

**a.** Median approach: The patient is placed in the sitting position. 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. 10 mg of Inj. Bupivacaine heavy 0.5% with Inj. Fentanyl 25 microgram was used to achieve spinal anaesthesia.

**b.** 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, 10 mg of Inj. Bupivacaine heavy 0.5% with Inj. Fentanyl 25 microgram was injected to achieve spinal anaesthesia. 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 the records it was observed that in both the approaches, maximum of three attempts at L3-L4 space done. If not successful, the L4-L5 space was selected.
After the surgical procedure (caesarean delivery) was over, the patient was shifted to post-anaesthesia care unit (PACU). The following variables were observed and recorded:

Number of attempts, success of the block, presence of paraesthesia, the level of sensory level, and the incidence of head ache and lower back ache. The patients were observed for a period of 7 days postoperatively. The Visual Analogue Scale (VAS) was used to assess the severity of the pain. Post dural puncture head was defined as headache developed within 7 days of spinal anaesthesia, relieved or reduced in intensity by lying down.

Patients were asked to give a score from 1 to 10; higher the score, more severe the pain. Inj. Tramadol 50mg i.v or Inj. Paracetamol 1g i.v was used to treat the PDPH wherever deemed necessary.

**Statistical Analysis**

The data obtained were analyzed in detail using the statistical software SPSS 21 for Windows. Data are reported as mean ± SD or proportions and 95% confidence intervals. Statistical analysis was performed by tests of significance. Analysis was done by Chi-square test, paired t test and Student's t-test. The difference was considered as statistically significant for a p- value of less than 0.05.

**Results**

100 parturients were included in the study, received the spinal anaesthesia with a median (n=50) or paramedian (n=50) approach. The demographic data of (Table 1) the patients were comparable in both groups. The mean age of patients in Group ME was 25 ± 3.87 vs. 25 ± 3.12 in Group PM. Weight in kgs in ME was 63 ± 10.73 kgs Vs 67 ± 8.9 in PM group. BSA was 1.8 ± 0.43 in ME & 1.7 ± 0.92 in PM.

In Group ME, four (8%) patients required more than one attempt, while in Group PM two (4%) patients required more than one attempt (Table 2). The success rate was 100% in both the groups.

The incidence of PDPH, paraesthesia and analgesic requirement for the headache are shown in Table 3. In Group ME, 12 (24%) patients developed PDPH vs. 6 (12%) in Group PM, which was not statistically significant (P= 0.21). There was no significant difference in the incidence of paraesthesia in both groups. PDPH was treated with conventional analgesics in all patients. The mean duration of onset of PDPH was similar in both groups (2.52 ± 0.7 vs. 2.69 ± 1.08 days).

Table -1
Demographic variables

| Sl. No. | Variables | Median (ME) (n=50) | Paramedian (PM) (n=50) | P value |
|---|---|---|---|---|
| 1. | Age | 25 ± 3.87 | 25 ± 3.12 | 0.59 |
| 2. | Weight | 63 ± 10.73 | 67 ± 8.9 | 0.63 |
| 3. | BSA | 1.8 ± 0.43 | 1.7 ± 0.92 | 0.51 |

Table 2
Success rate & attempts

| Sl. No. | Variables | Median | Paramedian | P value |
|---|---|---|---|---|
| 1. | Mean additional attempts | 2.5 ± 0.82 | 2.0 ± 0.06 | 0.64 |
| 2. | No. of patients required additional attempts | 4 (8%) | 2 (4%) | 0.32 |
| 3. | Success rate | 50 (100%) | 50 (100%) | NS |

Table 3
Adverse effects / complications

| Sl. No. | Variables | Median | Paramedian | P value |
|---|---|---|---|---|
| 1. | Headache (no. of pts) | 12 (20%) | 6 (10%) | 0.21 |
| 2. | Headache pod | 2.52 ± 0.7 | 2.69 ± 1.08 | 0.48 |
| 3. | Paraesthesia | 8 (16%) | 5 (10%) | 0.76 |
| 4. | Medications required (no. of patients) to treat PDPH (Tramadol / Paracetamol) | 10 (20%) | 5 (10%) | 0.13 |

**Discussion**

Pain during the first stage of labour results primarily from changes in the lower uterine segment and cervix. Pain is transmitted by visceral afferent nerve fibres that accompany the sympathetic nerves and enter the spinal cord at the T10 to L1 segments. During the late first stage and second stage of labour, pain results from distension of the pelvic floor, vagina, and perineum. Pelvic pain is transmitted by somatic nerve fibres, which enter the spinal cord at the S2 – S4 segments . Hormonal changes, anatomic changes, decrease in CSF specific gravity are likely responsible for the lower local anaesthetic dose requirements during spinal anaesthesia in pregnant women.[14,15]

Pregnant women have an exaggerated lumbar lordosis, and it is more difficult for them to flex the lumbar spine. However, most pregnant women are young, and in younger patients there is sufficient flexibility to facilitate the insertion of needle into the epidural or subarachnoid space. Most obstetric patients may assume the lateral decubitus position comfortably.

Headache or PDPH is the most common complication following spinal anaesthesia or analgesia and presents hours to days after the dural puncture. The loss of CSF from the intrathecal space is the main causative factor. The CSF leakage results in fall in intracranial CSF volume & CSF pressure.[16] It causes gravitational

traction on the pain sensitive structures causing head ache.[17] The loss of CSF may result in compensatory intracranial vasodilatation. Relative CSF hypovolemia[18] results in painful possibly adenosine receptors mediated [19] cerebral vasodilatation. It is characterised by dull or throbbing headache and the severity is increased in an upright posture and lesser in supine position. The incidence of headache following CD was ranging from 0 – 4%.[20] The technique, type of needle and number of puncture may influence the incidence of complications like PDPH.[21,22] The incidence varies with size of needle. Greater the size of the needle, higher the incidence of PDPH. Turnbull DK et al reported a decrease in the incidence of PDPH from 40% with a 20GA needle to less than 2% with a 29GA needle.[23] The other causes for PDPH should be evaluated or excluded before confirming the diagnosis of PDPH: migraine, tension or cluster headache, neuralgia, subdural hematoma, lactation headache, postpartum cerebral angiopathy, preeclampsia and caffeine withdrawal.[21,24-29]

Spinal anaesthesia is performed using either median or paramedian approach. The median approach is the most commonly used one. Technically it may be difficult to perform the midline approach in elderly patients (calcified interspinous ligaments), in obese individuals, and in parturients (difficulty in positioning). In these kinds of situations, the paramedian approach may be useful.

The incidence PDPH was higher in the median group than the paramedian group but it was not statistically significant. Few studies show that incidence were similar in both approaches.[11,12]

The target area is large in paramedian approach. Because the needle is introduced laterally, any limitation of the spinous process is avoided. It does not require the parturient to reduce the lumbar lordosis fully. The paramedian approach may result in decreased incidence of PDPH. Studies show that there is less CSF leak in the paramedian approach than the median approach. It may be because of a valvular mechanism produced which prevents the excess amount of leakage of CSF.[10,30-31] The valvular mechanism is created because the dura matter and arachnoid are perforated at different angles. Our study also found that the incidence of PDPH was lower in paramedian approach. The success rate was equal on both approaches.

There were no differences in the incidence of backache between the two groups. Up to 46.5% of pregnant patients can have backache following spinal anaesthesia.[22] We could not find any difference in the incidence of backache. We found that there was a high incidence of paraesthesia in the median group but it was not statistically significant. This was in contrast with other studies which showed higher incidence of paraesthesia in paramedian group. May be a bigger sample size would have shown better association between the incidence of paraesthesia and technique of spinal blockade (median vs. paramedian). Blomberg et al showed a statistically significant difference between the median and paramedian approaches with regard to number of attempts and paraesthesia.[26]

We have a few limitations in our study. Firstly, it is a retrospective study. The number of patients may be small to draw any firm conclusion about the safety and effectiveness of the paramedian approach for spinal anaesthesia in parturient

**Conclusion**

Our study shows that paramedian approach is equally effective and may be helpful in reducing the incidence of PDPH and paraesthesia, and it can be easily performed in pregnant patients.

**Acknowledgments**

We would like to thank all the participants of this study for their Support along with our HoD and Dean Sir.
Funding: No funding sources.
Conflict of interest: None declared ,
Consent – Yes

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