

Comparative study of postdural puncture headache in midline and paramedian approach of spinal anaesthesia at a tertiary hospital

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Abstract

Background: Postdural puncture headache (PDPH) is a known complication of spinal anaesthesia. It is an iatrogenic cause, results after either intentional or accidental dural puncture. It begins typically within 2 days but regresses spontaneously in a few days. Present comparative study was conducted in patients who underwent elective lower abdominal surgery under spinal anaesthesia by midline or paramedian approach to evaluate incidence of postdural puncture headache at our tertiary hospital. **Material and Methods:** This prospective and comparative study was conducted 120 patients undergoing elective lower abdominal surgery under spinal anaesthesia were considered for present study. Patients were randomly divided in double-blind fashion (patient and observer were blind to procedure) into two groups of 60 each. Numeric visual analog pain score was used to assess the postdural puncture headache in both the groups. Any case of persistent postdural puncture headache after discharge was followed up to 7 days through telephonic communication with the patient. The data collected was analysed statistically. Quantitative variables were expressed as Mean \pm SD (standard deviation) while qualitative variables were expressed as relative frequency and percentage. The PDPH was analysed using Chi square test. P-value <0.05 was considered as statistically significant. **Results:** 120 patients undergoing elective lower abdominal surgery under spinal anaesthesia were randomly divided in double-blind fashion (patient and observer were blind to procedure) into two groups as Group M (median approach) and Group P (paramedian approach) of 60 patients each. General characteristics such as age, weight, gender and ASA status were comparable in both groups. Intra-operative hypotension was noted in 10% patients of group M and 8% patients of group P, difference was not statistically significant. 3% patients of group M and group P required medications (tramadol / paracetamol) to treat PDPH. In present study postdural puncture headache was mild in 8% and moderate in 3% patients in group M. While 7% patients had mild and 3% patients had moderate postdural puncture headache in group P. Incidence of postdural puncture headache was 10% in group M and 8% in group P, difference was not statistically significant. **Conclusion:** There was no difference regarding the incidence of PDPH in median and paramedian approach for spinal anaesthesia.

Keywords: Spinal anaesthesia, Median approach, Paramedian approach, PDPH.

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INTRODUCTION

Spinal anaesthesia widely practiced anesthetic technique and preferred due to simplicity, ease of performance, requirement of minimal apparatus, minimal effect on blood biochemistry, conscious patient maintaining airway, good immediate postoperative pain relief, blunts stress response to surgery and decreased thromboembolic events. Postdural puncture headache (PDPH) is a known complication of spinal anaesthesia. It is an iatrogenic cause, results after either intentional or accidental dural puncture.¹ According to International Headache Society, PDPH is defined as “bilateral frontal/occipital headache

that develops within 7 days after a lumbar puncture and disappears within 14 days. The headache worsens within 15 min of resuming the upright position, disappears or improves within 30 min of resuming the recumbent position".² It causes distress to patient, increases hospital stay, interferes with new born care in post-partum mother and delays early resumption of daily activities of patient. The signs and symptoms of PDPH mostly resulted from the loss of CSF, which causes the tension of the cranial content e.g. cerebral vessels and therefore reflex cerebral vasodilation. However, it usually presents as a bilateral frontal or occipital headache immediately or within 24-48 h after the procedure.³ It begins typically within 2 days but regresses spontaneously in a few days. Sometimes, it becomes very severe causing symptoms such as photophobia, nausea, vomiting, neck stiffness, tinnitus, diplopia, dizziness, and severe headache of throbbing nature in the bifrontal and occipital region exacerbated in sitting or standing posture.⁴ Various causes reported to influence the incidence of Post-dural puncture headache (PDPH) are sex, age, pregnancy, previous history of PDPH, needle tip shape, needle size, bevel orientation, number of lumbar puncture (LP) attempts, median versus paramedian approach, type of local anesthetic solution, and clinical experience of the person operating the procedure.¹ The midline approach is most commonly used for administration of spinal anaesthesia.⁵ 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.⁶ Present comparative study was conducted in patients who underwent elective lower abdominal surgery under spinal anaesthesia by midline or paramedian approach to evaluate incidence of postdural puncture headache at our tertiary hospital.

MATERIAL AND METHODS

This prospective and comparative study was conducted in Department of Anaesthesiology, Dr Ulhas Patil Medical College, Jalgaon. Study period was of 6 months (January 2020 to July 2020). Institutional ethical committee approval was obtained for present study. 120 patients undergoing elective lower abdominal surgery under spinal anaesthesia were considered for present study.

Inclusion criteria: Patients 18-60 years, with ASA status I/II, undergoing elective lower abdominal surgery under spinal anaesthesia and willing to participate and follow up.

Exclusion criteria: Any chronic preoperative headache, migraine, patients with history of PDPH in previous surgery, patients required additional general anaesthesia, patients with spinal deformities, neurological deficits, psychological ailment, bleeding disorders, grossly obese,

extreme height (<140cm, >180cm), patients with medical disorders such as hypertension, diabetes mellitus, ischemic heart disease, any cardiac, renal or other end organ diseases, required more than one prick, general contraindications for spinal anaesthesia such as infection at lumbar puncture site, allergic to local anaesthetics. Preoperative assessment of patient including routine blood investigations, electrocardiogram (ECG), and X-ray chest were done before surgery. Procedure was explained to patients in local language, one day before surgery and a written informed consent was taken for participation and follow up. In operation theatre multipara monitor to record pulse rate, blood pressure, ECG, and oxygen saturation was attached. Records were reviewed and clinical examination done. Before the start of procedure, 500 ml of ringer lactate infusion was given over 30 min as preloading. Patients were randomly divided in double-blind fashion (patient and observer were blind to procedure) into two groups of 60 each. In Group M (median approach), subarachnoid block was given with spinal needle no. 25 introduced at intervertebral space between L3 and L4 below the spinous process of upper vertebra, whereas in Group P (paramedian approach), the spinal needle no. 25 was introduced at 1 cm below and lateral to the caudal edge of the spinous process of superior vertebra in the lumbar region. All the spinal punctures were performed in sitting position. In both the groups, 10 mg of Injection Bupivacaine heavy 0.5% was used to achieve subarachnoid block. Standard intra-operative monitoring was done. Standard post-operative care was provided to all patients. All the patients were observed for 1 week for postdural puncture headache and low backache by an independent observer. The observer was blinded to the approach used for subarachnoid block.

Criteria for post dural puncture headache were:

1. Occurred after mobilization.
2. Aggravated by erect or sitting position and coughing, sneezing or straining.
3. Relieved by lying flat.
4. Mostly localized in occipital, frontal or generalized.

Numeric visual analog pain score was used to assess the postdural puncture headache in both the groups. Any case of persistent postdural puncture backache after discharge was followed up to 7 days through telephonic communication with the patient. The data collected was analysed statistically. Statistical analysis was performed using SPSS 24. Quantitative variables were expressed as Mean \pm SD (standard deviation) while qualitative variables were expressed as relative frequency and percentage. The PDPH was analysed using Chi square test. P-value <0.05 was considered as statistically significant.

RESULTS

120 patients undergoing elective lower abdominal surgery under spinal anaesthesia were randomly divided in double-blind fashion (patient and observer were blind to procedure) into two groups as Group M (median approach) and Group P (paramedian approach) of 60 patients each.

General characteristics such as age, weight, gender and ASA status were comparable in both groups. Intra-operative hypotension was noted in 10% patients of group M and 8% patients of group P, difference was not statistically significant. 3 % patients of group M and group P required medications (tramadol / paracetamol) to treat PDPH.

Table 1: General characteristics

Variables	Group M (n=60)	Group P (n=60)	p value	Significance
Age (in years, mean \pm SD)	37.8 \pm 9.1	39.8 \pm 11.3	0.57	Not significant
Weight (kg, mean \pm SD)	56 \pm 7.4	57 \pm 4.9	0.51	Not significant
Gender (Male/ Female)	34/26	31/29	0.61	Not significant
ASA status			0.56	Not significant
I	39 (65%)	43 (72%)		
II	21 (35%)	17 (28%)		
Intra-operative hypotension	6 (10%)	5 (8%)	0.34	Not significant
Medications required to treat PDPH (Tramadol / Paracetamol)	2 (3%)	2 (3%)	0	Not significant

In present study postdural puncture headache was mild in 8 % and moderate in 3% patients in group M. While 7% patients had mild and 3% patients had moderate postdural puncture headache in group P. Incidence of postdural puncture headache was 10% in group M and 8% in group P, difference was not statistically significant.

Table 2: Incidence of postdural puncture headache

Incidence of postdural puncture headache	VAS score	Group M	Group P	p value	Significance
Nil	0-2	53 (88%)	54 (90%)	0.45	Not significant
Mild (No limitation of activity, no treatment required)	3-4	5 (8%)	4 (7%)	0.34	Not significant
Moderate (Limited activity, Regular analgesics required, Convenient treatment required)	5-7	2 (3%)	2 (3%)	0	Not significant
Severe (Confined to bed, Anorexic, postpartum patients unable to feed baby, epidural blood patch may require)	8-10	0	0	--	--

(VAS - Visual analog scale)

DISCUSSION

Spinal anaesthesia is preferred for infra-umbilical surgeries as an alternative to general anaesthesia as it reduces post-operative morbidity and other complications. The median approach involves passage of needle through the supraspinal and interspinal ligaments and the ligamentum flavum, but the paramedian approach avoids the supra- and interspinal ligaments and approaches the ligamentum flavum directly after passing through the paraspinal muscles. Several factors have been implicated to determine the difficulty of the intended puncture which leads to multiple punctures, followed by PDPH. Both patient-related factors – e.g., age⁷, body mass index⁷, deformities of the spine^{8,9}, the ability of the patient to flex his back⁹, palpability of bony landmarks^{8,9} and nonpatient-related factors – e.g., equipment used, experience of the person performing the procedure¹⁰, patient position chosen by the clinician⁷ have been described in the literature. Dural perforation is less likely in thick areas than thin areas of the dura results in more CSF leak leading to traction on pain-sensitive dura and counter venodilation of the brain vessels (low CSF pressure and vasodilation headache) on adopting erect posture and typically relieved on lying

down position. Accurate identification of the subarachnoid space is paramount, as multiple attempts at needle insertion may cause patient discomfort, higher incidence of spinal hematoma, trauma to the neural structures and PDPH.¹¹ Though the incidence of headache after spinal anaesthesia is similar in obstetric and non-obstetric patients, pregnancy has always been implicated as a risk factor for PDPH.¹² A number of factors, including dehydration, hormonal imbalance, and high serum oestrogen influencing the tone of the cerebral vessels, have been implicated for high incidence of PDPH in obstetric population.¹³ Incidence of postdural puncture headache was 11% in present study. Groupwise incidence was 10% in group M and 8% in group P, difference was not statistically significant. Similar findings were noted in other studies.^{1,14} In study by Manisha Kanagarajan *et al.*,¹⁵ overall incidence of PDPH was 15%. The incidence was higher in the median group (18%) than the paramedian group (8%) but it was not statistically significant. In study by Singh *et al.*,⁴ the incidence of postdural puncture headache in paramedian group was 4% and in median group was 20%, and on intergroup comparison, data were statistically significant. The paramedian approach has been found to be better than

midline approach in a study conducted by Firdous *et al.*,¹⁶ although the results were statistically insignificant. Sheybani *et al.*¹⁷ also studied two approaches of subarachnoid block and found that incidence of postdural puncture headache is less in paramedian approach (12%) as compared to median approach (15%). Behary and Mohammed¹⁸ studied postdural puncture headache in pregnant patients posted for cesarean section under spinal anesthesia, and found that postdural puncture headache is less if subarachnoid block was administered by paramedian approach (5.2%) as compared to median approach (19.6%), difference was statistically significant. This is based on the fact that, in the paramedian approach, perforation of the dura and arachnoid occurs at different angles which produce a valvular mechanism that prevented a loss of CSF flow to the epidural space. Some modifiable risk factors like needle size, needle tip shape, bevel orientation and inserting angle to the dural fibers, stylet replacement, number of lumbar puncture (LP) attempts, midline versus lateral LP approach, type of local anesthetic solution, and clinical experience of the operator are suggested to have an important role in development of PDPH. Advantage of the paramedian approach is a large target area. By placing the needle laterally, the anatomical limitation of the spinous process is avoided. This is of advantage in elderly patients where interspinous spaces may not open up due to inadequate flexion. Present study was of small sample, single center study with elective surgeries. More and larger studies are needed to answer the question ‘which approach under what conditions should be preferred’ to reduce incidence of PDPH in practice.

CONCLUSION

There was no difference regarding the incidence of PDPH in median and paramedian approach for spinal anaesthesia. However, further long-term trials enrolling a greater number of patients are required to confirm these findings.

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