

# A Comparative Study of Sphenopalatine Ganglion Block versus Conservative Management for the Treatment of Post-dural Puncture Headache

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## ABSTRACT

### BACKGROUND

Post-Dural Puncture Headache (PDPH) is a common complication following subarachnoid blockade or inadvertent dural puncture while locating the epidural space. Standard treatment for PDPH is epidural blood patch, but it is an invasive intervention. Sphenopalatine ganglion block (SPGB) may be a much safer and non-invasive alternative. We wanted to study the efficacy of SPGB for treatment of PDPH as assessed by reduction in pain scores to <4 via numerical pain rating scale (NRS), (0- no pain to 10- worst pain imaginable). We also wanted to assess the onset and duration of analgesia as well as development of any adverse effects associated with the block.

### METHODS

This is a quasi-experimental study conducted among 18 patients of ASA physical status 1 and 2, who were suffering from headache after spinal anesthesia within 7 days of surgery. Patients were divided into two groups. Group A, where PDPH was treated with conservative management (injection paracetamol 1g intravenous) and Group B, where PDPH was treated with SPGB. Independent t-test was used for statistical analysis.

### RESULTS

Group B patients demonstrated significant relief in headache within 30 min of block ( $p < 0.001$ ) and mean pain score was low in first 6 hrs. as compared to group A.

### CONCLUSIONS

Study demonstrated SPGB to be better with quicker pain relief in patients suffering from PDPH as compared to conventional management.

### KEYWORDS

Postdural Puncture Headache, Sphenopalatine Ganglion Block, Spinal Needle

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## BACKGROUND

Postdural puncture headache (PDPH) is a distressing complication of spinal anesthesia and inadvertent dural tap during location of epidural space with Tuohy's needle in epidural anaesthesia.<sup>1</sup> PDPH can also occur after an intentional dural puncture while performing spinal anaesthetics for lower abdominal surgeries, diagnostic or therapeutic lumbar punctures or intra-thecal anticancer drug or antibiotic administrations. The incidence and severity of PDPH is influenced by the types of needle (Whitacre spinal needle or Tuohy's epidural needle), number of attempts or in working with obstetric patients for labor epidurals.<sup>2</sup> Management of post-dural puncture headache (PDPH) has always been challenging for the anaesthesiologists. PDPH not only increases the misery of the patient, but the length of stay and overall cost of treatment in the hospital also increases. Topical trans-nasal sphenopalatine Ganglion block (SPGB), a minimally invasive intervention with minimal adverse effects and high efficacy, had been tried as a treatment modality for PDPH.<sup>1,3-5</sup> SPGB efficacy has been proved in the management of migraine and facial pain.<sup>1</sup> The SPGB practiced for PDPH is simple and therefore, can be done bedside in the wards or in the out-patient department and does not need fluoroscopy or an operating room. The patient needs to be in a supine position with the neck extended. The extension can be facilitated with a pillow or a folded sheet under both shoulders<sup>6</sup>. A long applicator with a cotton swab at the tip is soaked with local anaesthetic and passed through both the nares and the end of the applicator tips were positioned superior to the middle turbinate, for SPGB<sup>7</sup>.

### Postdural Puncture Headache (PDPH)

PDPH is classical spinal headache that appears between second or third to fourteenth post-operative day, and consists of an occipital headache of bind – like character with some nuchal rigidity. It is postural in nature, aggravated or appearing with assumption of the erect position and relieved by recumbence.<sup>8</sup>

### Justification / Need for Study

0.5% Ropivacaine 4 ml is used as local anaesthetic for sphenopalatine ganglion block for the treatment of postdural puncture headache in our study<sup>9</sup>. The studies have shown efficacy of 0.75% Ropivacaine in treating PDPH with minimal side effects. By using 0.5% Ropivacaine, a longer acting local anaesthetic, we studied the efficacy, onset of action, duration of action and adverse effects associated with Ropivacaine<sup>10</sup> for treatment of SPGB. Less literature is available on the use of 0.5% Ropivacaine for treatment of PDPH in the Indian population.

We wanted to study the efficacy of SPGB for treatment of PDPH as assessed by reduction in pain scores to <4 via numerical pain rating scale (NRS), (0- no pain to 10- worst pain imaginable). We also wanted to assess the onset and

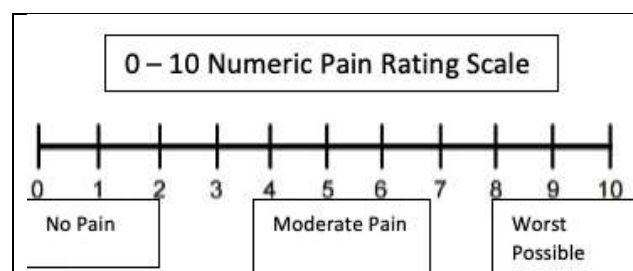
duration of analgesia as well as development of any adverse effects associated with the block.

## METHODS

This is a quasi-experimental study conducted among 18 patients diagnosed to have PDPH at our hospital, who were admitted during the period September 2019 - January 2020 after undergoing elective surgeries under spinal neuraxial blockade. After obtaining the Ethical committee clearance (YEC2/150 preparation (pre-anaesthetic checkup) of all patients were conducted including written informed consent. Then patients were divided into two groups chosen at random, using sealed envelope technique:

Group A (conservative management): n=9 Group B (SPGB): n=9. Group A patient's received Inj. Paracetamol 1g thrice daily intravenously for a day. If adequate pain relief was not achieved, intravenous Diclofenac 75 mg twice daily was added. Group B received sphenopalatine ganglion block (SPGB), which was performed in the ward. Monitors like electrocardiography (ECG), non-invasive blood pressure (NIBP) and saturation probe (SpO<sub>2</sub>) were attached to the patient. SPGB was performed by a trans-nasal approach. Then, a cotton-tipped applicator soaked in 0.5% Ropivacaine was passed through both the nares and the end of the applicator tips were positioned superior to the middle turbinate and anterior to the pterygopalatine fossa and sphenopalatine ganglion for 5 min with the patient in supine position.

After 5 min, the patient was made to sit up and presence of headache was assessed using numerical pain rating scale (NRS), (0 – no pain to 10 – worst pain imaginable). If the pain score remained >4 in group B after 2 h, intravenous Paracetamol 1 g 8 hourly was administered and Inj. Diclofenac 75 mg 12 hourly intravenously was added, if required. Patients in both the groups without adequate pain relief for 3 days were planned for epidural blood patch (EBP). Pain was assessed before procedure and at 30 min, 1, 2, 3, 4, 6, 8, 12, and 24 h after the procedure. Size of spinal needle used, heart rate (HR) and mean arterial pressure (MAP) were documented at the same time points.



### Inclusion Criteria

- Patients suffering from active PDPH within 7 days after subarachnoid block not relieved with standard treatment such as intravenous fluids, abdominal binder, bed rest and caffeine.

- Patients of either gender between the ages of 20 and 60 years.

### Exclusion Criteria

- Patients with known coagulopathy, nasal septal deviation, nasal polyp, history of nasal bleeding, allergy to local anaesthetics.
- Patients with migraine, neurological deficits, disturbance of autonomic function and ASA physical status 3 and 4.
- Patients who are not willing to participate in the study.

### Statistical Methods

Sample size (n) of 18 was calculated based on PDPH incidence in our institute and similar studies. The data obtained was tabulated and a master chart was prepared. Statistical analysis was done with the help of SPSS version 23.

Using G \*Power software, 
$$n = \frac{2(z^{1-\alpha/2} + z_{1-\beta})^2 \sigma^2}{d^2}$$

$\alpha=0.90$ , power  $(1-\beta) = 0.10$ .

Data was expressed in terms of mean  $\pm$  SD. Categorical data was expressed as count of percentage. Independent t-test will be used to compare between two groups. p value <0.05 was considered to be significant.

## RESULTS

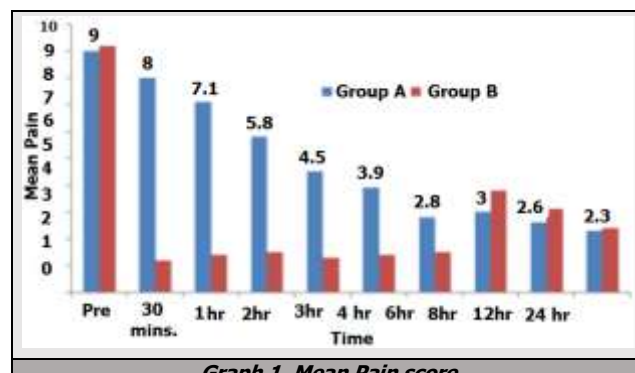
A total of 18 patients were included in our study. The patients in both the groups were comparable with respect to the distribution of age, height, weight and physical status. Pre procedural pain scores were also comparable between the groups with a p value of 0.511. In group A, no patients had adequate pain relief (NRS <4) in 30 min after initiation of the treatment, whereas in group B, seven out of nine patients (77.77%) had adequate pain relief. During the same time. In group A, the median pain score was  $\geq 4$  up to 2 hrs and from 3–24 hrs the median pain score remained <4. In group B, after the block was performed, the median pain score was <4 up to 4 h and then rose to 4 at 8 hrs and subsequently it was maintained at <4 throughout the study period. While comparing the median pain score, it was found that from 30 min to 3 hrs, group A had significantly higher pain score, whereas from 4 to 8 hrs, group a patients had significantly lower pain score than group B (p <0.05). Though the trend remained the same from 8 to 12 h, the difference was not statistically significant (p>0.05).

	Group A		Group B		p
	Mean	SD	Mean	SD	
Age (Years)	27.1	0.9	28.6	1.1	0.16
Height	154.1	0.8	153	0.2	0.09
Weight	69.1	3.1	67.6	2.1	0.91
Physical Status	75%		76.60%		0.11

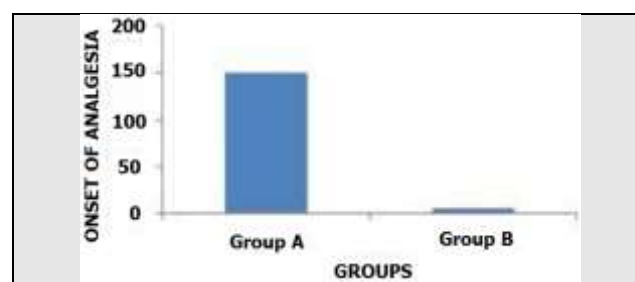
**Table 1. Patient Characteristics**

Time	Group A		Group B		p
	Mean	SD	Mean	SD	
Pre	9	0.6	9.2	0.6	0.512
30 mins	8	0.8	1.2	3.1	0.004
1 hr.	7.1	1.3	1.4	3	0.004
2 hrs.	5.8	1.5	1.5	2.9	0.006
3 hrs.	4.5	1	1.3	2.9	0.006
4 hrs.	3.9	0.9	1.4	1.4	0.009
6 hrs.	2.8	1	1.5	1.3	0.009
8 hrs.	3	1.4	3.8	0.8	0.059
12 hrs.	2.6	1.5	3.1	0.7	0.321
24 hrs.	2.3	0.8	2.4	0.6	0.562

**Table 2. Pain Score**



**Graph 1. Mean Pain score**



**Graph 2. Comparison of Onset of Analgesia between Groups**

Time	Group A		Group B		p-Value
	Mean	SD	Mean	SD	
Pre	71.42	10.51	71.3	8.09	0.854
30 mins.	72.6	9.21	71.98	9.24	0.746
1 hr.	73.86	9.68	75.89	9.03	0.623
2 hr.	71.86	9.68	70.6	8.76	0.813
3 hr.	72.09	9.9	71.6	7.89	0.755
4 hr.	72.05	9.17	72.59	7.78	0.854
6 hr.	72.15	9.89	72.73	9.13	0.788
8 hr.	71.97	9.52	71.68	8.16	0.855
12 hr.	72.08	9.91	71.46	7.86	0.785
24 hr.	74.04	9.88	73.42	7.89	0.873

**Table 3. Heart Rate**

Time	Group A		Group B		p-Value
	Mean	SD	Mean	SD	
Pre	98.6	9.6	96.9	7.5	0.68
30 mins	96.8	9.4	97	7.3	0.809
1 hr.	94.6	9.4	96	7	0.823
2 hr.	95.6	9	95.7	9.1	0.841
3 hr.	93.9	9.5	94.7	9.2	0.842
4 hr.	93.5	9.3	95	8.9	0.725
6 hr.	94.7	9.5	93	8.3	0.689
8 hr.	93.9	9.5	94.1	9.1	0.842
12 hr.	93.5	7.9	94.2	6.8	0.461
24 hr.	93.8	8.6	95.2	7.4	0.829

**Table 4. Arterial Pressures**

On comparing the two groups, the mean pain score in group A dropped gradually and reached a value <4 after 3 hrs and thereafter, was maintained at that level, whereas in group B after the block was performed, the median pain score was  $\leq 4$  throughout the study period. Onset of analgesia was significantly quicker in group B as compared to group A ( $5.2 \pm 1.3$  vs.  $150 \pm 60$  min), p <0.001.

The baseline HR and MAP did not show any significant difference between the groups. HR and mean arterial

pressure were compared between the two groups, but the difference was not found to be statistically significant at any time point with a p value of  $>0.05$ . The sizes of the spinal needle used in both groups were comparable ( $p > 0.05$ ).

## DISCUSSION

Our study demonstrated that SPGB is more effective than conservative management in the treatment of PDPH in the first 24 hrs. SPGB has faster onset of action versus conservative management ( $5.2 \pm 1.3$  vs.  $150 \pm 60$  min). With respect to duration of analgesia, there is no statistical difference between the groups, but group B patients had no need of rescue analgesia in first 8 hrs. There were no significant changes found in vitals parameters in both the group of patients. There were no adverse effects found in group B (SPGB) patients.

Nitu et al, study included 20 parturients with PDPH and used 2% Lignocaine for SPGB and Inj. Paracetamol 1 g. The results of their study suggested that SPGB could be effectively used as an initial modality in the treatment of PDPH for rapid control of severe pain. Though statistical analysis revealed lower pain scores in group A after 4 h, SPGB was found to provide adequate pain relief with NRS  $<4$  throughout the study period. Majority of patients in group B did not require rescue analgesic up to 6 h. But the intensity of pain that developed later was less and managed well by intravenous medications showing that SPGB is an effective initial modality for managing PDPH. None of the patients in their study group had any adverse effects associated with the block. Shaul Cohen et al conducted a retrospective chart review of 81 obstetrics patients who experienced PDPH from an unintentional dural puncture from a 17-gauge Tuohy needle for labour epidural from January 1997 to July 2014. Demographic characteristics, headache severity, and associated symptoms were collected prior to treatment. Forty-two patients who received SPGB and 39 patients who received epidural blood patch (EBP) were identified. Residual headache, recovery from associated symptoms, and new treatment complications were compared between the 2 groups at 30 minutes, 1 hour, 24 hours, 48 hours, and 1 week post treatment. They concluded that greater number of patients showed significant relief in their PDPH and associated symptoms at 30 and 60 minutes after treatment with SPGB than after treatment with EBP ( $P < 0.01$ ). Only the EBP patients complained of post treatment complications, which all resolved in 48 hours.

S.No.	Variables	Present Study
1.	Sample size	18
2.	Comparison with	Group A 1 g IV Inj. Paracetamol Group B SPGB with 0.5% Ropivacaine
3.	Onset of analgesia	Group A $150 \pm 60$ Mins Group B $5.2 \pm 1.3$ Mins
4.	Duration of analgesia	$>24$ hrs. in both Groups

**Table 5. Parameters**

## CONCLUSIONS

SPGB is better initial treatment modality for PDPH and has a quicker pain relief in patients as compared to conventional management. Our findings suggest that SPGB is safer, less expensive and can be tried on out-patient cases.

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