

# Evaluation of Post Dural Puncture Headache Using Various Sizes of Spinal Needles

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## Abstract

**Introduction:** Post-dural puncture headache (PDPH) is one of the most common complications encountered by physicians following spinal anesthesia or lumbar puncture.

**Aims and Objectives:** This study was done for evaluating the incidence of PDPH following spinal anesthesia in the south Indian population using various gauges of Quinckes spinal needle.

**Materials and Methods:** A total of 75 American Society of Anesthesiologists I-II patients undergoing lower limb or lower abdomen surgery under spinal anesthesia were randomized into three groups each consisting of 25 patients. Patients belonging to Group I, Group II, and Group III received spinal anesthesia using 23 gauge, 25 gauge, and 26 gauge Quinckes spinal needle, respectively. Moreover, all the patients were followed up post-operatively for 5 days and evaluated for PDPH.

**Results:** The incidence of PDPH in the present study was 20% in Group I, 12.5% in Group II, and 4.5% in Group III, which was statistically insignificant.

**Conclusion:** In the present study for PDPH using three different gauge Quincke spinal needles, the incidence was found to be minimum with 26 G Quincke needle.

**Key words:** Post-dural puncture headache, Quincke needle, Spinal anesthesia

## INTRODUCTION

Post-dural puncture headache (PDPH) is one of the most common complications encountered by physicians following spinal anesthesia or lumbar puncture. The first recorded incidence of PDPH was by Augustus Bier on his first ever demonstration of spinal anesthesia using cocaine.<sup>1,2</sup> Even after a century of practicing spinal anesthesia there has been a less advance in methods for completely preventing the occurrence of PDPH.

There are multiple factors that may lead to a headache following spinal anesthesia, hence before diagnosing PDPH

it is mandatory to rule out other causes of the headache.<sup>3,4</sup> This study was done for evaluating the incidence of PDPH following spinal anesthesia in the south Indian population using various gauges of Quinckes spinal needle.

## MATERIALS AND METHODS

After getting approval from Institutional Ethics Committee, the study was conducted in Department of Anesthesiology, Rajah Muthiah Medical College and Hospital, Chidambaram, Tamil Nadu, India from a period of August 2006 to December 2008.

A total of 75 patients who were planned to undergo lower limb or lower abdomen surgery under spinal anesthesia, and satisfying the inclusion criteria were enrolled into the study. A written informed consent was taken from all the patients. The inclusion criteria was defined as American Society of Anesthesiologists Physical Status I and II, age between 25 and 75 years

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who are planned to undergo below umbilical surgeries under spinal anesthesia. Patients with previous history of PDPH, migraine, history of a chronic headache, with contraindications for spinal anesthesia, multiple punctures for spinal anesthesia, failed spinal anesthesia, poor follow-up, and patient refusal to give consent were excluded from the study.

The study subjects were randomly divided into three groups, Group I, II, and III each consisting 25 patients. All patients were uniformly preloaded with intravenous ringer lactate 10 ml/kg and positioned in sitting position for lumbar puncture. Under all aseptic precautions, a lumbar puncture was made in the L3-L4 interspace using Quinckes spinal needle of size 23 gauge, 25 gauge, and 26 gauge, respectively, in patients belonging to Group I, Group II, and Group III. In all the study, subjects uniformly 0.5 ml of cerebrospinal fluid (CSF) was allowed to spill out before injecting the local anesthetic.

The intraoperative period was managed as per protocols used for managing routine spinal anesthesia. Moreover, the patients were shifted to the post-operative wards after completion of surgery and were followed up daily for the next 1 week to evaluate the incidence of PDPH. Patients complaining of the headache and satisfying the criteria for PDPH as laid out by International Society of Headache (Table 1) were diagnosed to have PDPH and treated accordingly. Moreover, the severity of headache was assessed using Cocker's scale (Table 2).

Once the patients were diagnosed with PDPH, the severity of the headache was assessed using Cocker's scale.

## RESULTS

The data were analyzed using Statistical Package for Social Sciences 12 software and Chi-square and paired *t*-test were

used to compare the incidence and validity of the study. The results are summarized in the form of Tables 1-9 and Graphs 1-5.

**Table 2: Severity of headache by Cockers (1976)**

Mild headache which permitted long periods of sitting/erect position and no other symptoms
Moderate headache, which made it difficult for the patient to stay upright for more than ½ h, occasionally accompanied by nausea, vomiting, auditory and ocular symptoms
Intense headache immediately upon getting up from bed, alleviated while lying horizontal in bed, often accompanied by nausea, vomiting, ocular and auditory symptoms
Headache that occurred even while lying horizontal in bed and greatly aggravated immediately upon standing up, eating is impossible because of nausea and vomiting

**Table 3: Demographic distribution**

Characteristics	Mean (SD)		
	Group I	Group II	Group III
Age (years)	23.6 (2.9)	23.1 (2.7)	23.7 (2.1)
Weight (kg)	56.8 (8.9)	56.9 (8.9)	52.6 (6.1)

SD: Standard deviation

**Table 4: Incidence of PDPH**

Groups	Number of cases (%)	P value	Significance
Group I	5 (20)	0.5041	NS
Group II	3 (12.5)	0.914	NS
Group III	1 (4.5)	2.509	NS

PDPH: Post-dural puncture headache, NS: Not significant

**Table 5: Onset of PDPH**

Post-Operative Day	Group I (%)	Group II (%)	Group III (%)
1 <sup>st</sup> day	0	0	0
2 <sup>nd</sup> day	3 (33.33)	1 (11.11)	1 (11.11)
3 <sup>rd</sup> day	1 (11.11)	2 (22.22)	0
4 <sup>th</sup> day	1 (11.11)	0	0

PDPH: Post-dural puncture headache

**Table 1: Diagnostic criteria for defining PDPH defined by International society of headache**

A. Headache that worsens within 15 min after sitting or standing, and improves within 15 minutes after lying, with at least one of the following (1 to 5) and fulfilling criteria C and D

1. Neck stiffness
2. Tinnitus
3. Hypoacusia
4. Photophobia
5. Nausea

B. Dural puncture has been performed

C. Headache develops within 5 days after dural puncture

D. Headache resolves either

1. Spontaneously within 1 week
2. Within 48 h after effective treatment of the spinal fluid leak (usually by epidural blood patch)

PDPH: Post-dural puncture headache

**Table 6: Location of PDPH**

Site/ Localization of Headache	Group I (%)	Group II (%)	Group III (%)
Frontal	4 (44.44)	2 (22.22)	1 (11.11)
Generalized	1 (11.11)	1 (11.11)	0
Occipital	0	0	0

PDPH: Post-dural puncture headache

**Table 7: Severity of PDPH**

Severity of PdpH	Group I	Group II	Group III
Mild	5	3	1
Moderate	0	0	0
Severe	0	0	0

PDPH: Post-dural puncture headache

**Table 8: Duration of PDPH**

	Group I	Group II	Group III
<24 h	4	3	1
24-48 h	1	0	0
>48 h	0	0	0

PDPH: Post-dural puncture headache

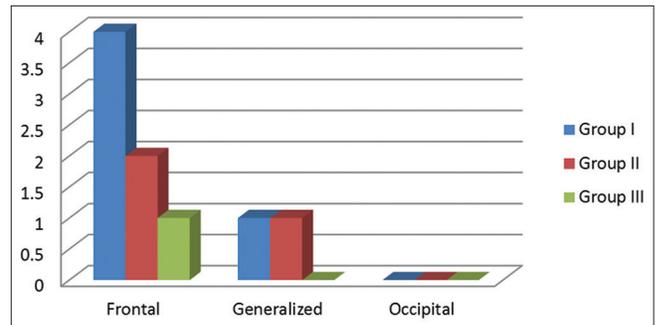
**Table 9: Post spinal headache**

	N (%)		
	Group I	Group II	Group III
Incidence	5 (20)	3 (12.5)	1 (4.5)
Chi-square significance	Group I versus II 0.5041 NS	Group II versus III 0.9147 NS	Group III versus I 2.509 NS
Onset			
1 <sup>st</sup> day	-	-	-
2 <sup>nd</sup> day	3 (33.33)	1 (11.11)	1 (11.11)
3 <sup>rd</sup> day	1 (11.11)	2 (22.22)	-
4 <sup>th</sup> day	1 (11.11)	-	-
Location			
Frontal	4 (44.44)	2 (22.22)	1 (11.11)
Generalized	1 (11.11)	1 (11.11)	-
Occipital	-	-	-
Severity			
Mild	05	03	01
Moderate	-	-	-
Severe	-	-	-
Duration			
<24 h	04	03	01
24-48 h	01	-	-
>48 h	-	-	-

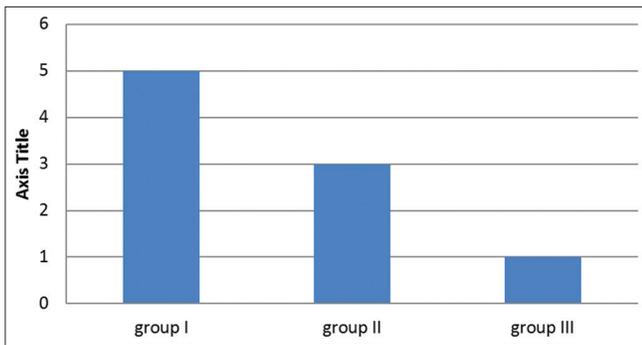
**DISCUSSION**

PDPH is due to a low CSF pressure consequent upon seepage of CSF through the dural puncture hole and choroid plexus is unable to secrete sufficient fluid to maintain the CSF pressure. CSF leakage from the dural hole produces CSF hypotension, which in turn leads to intracranial venous dilation resulting in an increase in the brain volume in the upright position. Venous dilation and a compensatory increase in brain volume will result in brain sag and stimulate pain sensitive anchoring structures such as dural vessels, basal dura, and tentorium cerebelli causing a post-spinal headache. Larger the hole in the dura mater more will be the leakage of CSF and longer will be the time required for repair. It takes about 2 weeks or more for the holes to seal.<sup>3-5</sup>

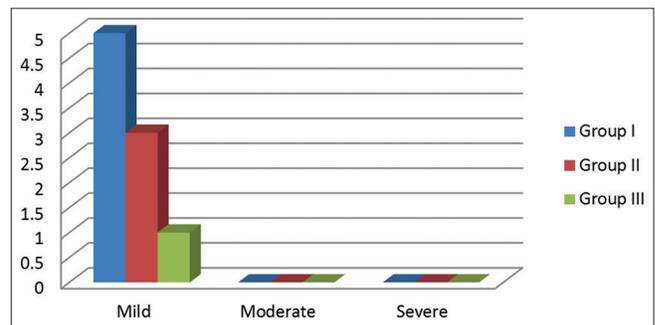
The overall incidence of distressing post-spinal headache has varied from 0% to 37.2% as reported by Flaatten and



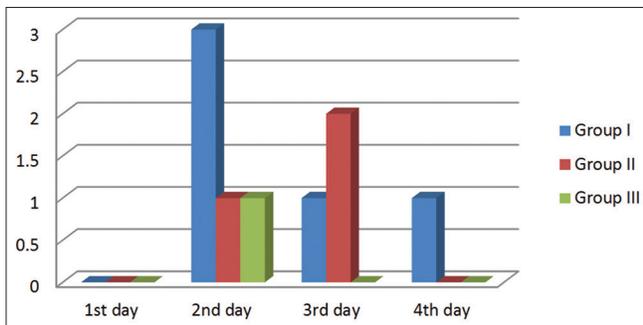
**Graph 3: Location of post-dural puncture headache**



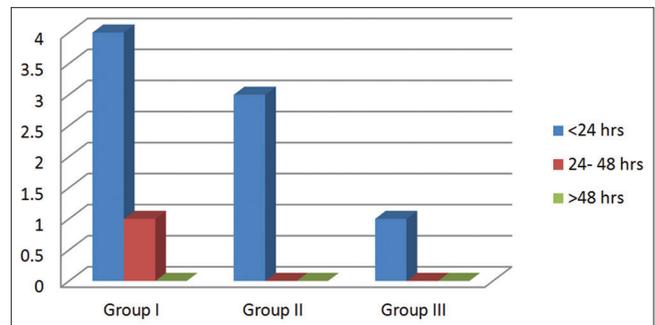
**Graph 1: Incidence of post-dural puncture headache**



**Graph 4: Severity of post-dural puncture headache**



**Graph 2: Onset post-dural puncture headache**



**Graph 5: Duration of post-dural puncture headache**

Raeder.<sup>6</sup> The most important factor contributing to the higher incidence of PDPH was the gauge and type of needles used. Use of wide bore and cutting type of needles led to more incidence of post-spinal headache.<sup>7,8</sup>

The incidence of PDPH in our study was 20% in Group I, 12.5% in Group II, and 4.5% in Group III. This difference is statistically insignificant. In the study by Shah, the incidence of the headache was 20%, 12.5%, and 4.5% with 25 G Quincke, 27 Quincke, and 27 G Whitacre needle, respectively.

Duration of the headache was found to be 27.77 h (range 24-48 h). In 8 out of 9 patients, headache lasted <24 h. In one patient, headache was lasted up to 48 h. In the study by Lynch<sup>9</sup> (1991), duration of headache was 48 h and 57.5 h in the 25 and 22 G groups, respectively. In the 7 out of 9 patients who had PDPH, the location of the headache was frontal region. Only one patient had generalized headache.

All patients who developed PDPH had the mild headache; none of the patients developed a severe headache or neurological sequelae because of the use of fine gauge needle, proper hydration, bed rest, and analgesics. In a study of Flaatten *et al.*,<sup>10</sup> a much decreased severity of the headache was observed in the 29 G Quincke needle and the moderate headache was observed in 26 G needle. Onset of headache was from 2<sup>nd</sup> to 3<sup>rd</sup> day, respectively. 3 out of 5 patients (75%) had headache on the 2<sup>nd</sup> day in Group I and 1 patients (25%) had headache on the 3<sup>rd</sup> day, whereas in Group II 1 had headache on the 3<sup>rd</sup> day and 1 had headache on the 2<sup>nd</sup> day, in Group III in our study.

Once the patient had the headache, the patient was instructed to take complete bed rest, good hydration therapy with 5% 500 ml of dextrose transfused as an additional fluid and injection diclofenac sodium 75 mg intramuscularly was given. All patients responded to this treatment and none required epidural blood patch.

There is a universal consensus about the fact that the thicker the lumbar puncture needle, the higher could be the incidence of PDPH. A cutting type of needle inserted through the dural wall tears off a number of fibers in the wall and a permanent opening in it is ensured. The puncture site has typical crescent like appearance produced by cutting type of needle. The anatomical feature of dura is such that longitudinal dispersion of its fiber plus a copious interspersions of elastic fibers keeps the hole open once the dural fibers are cut. Cappe<sup>11</sup> suggested the use of a pencil point needle separates the longitudinal dural fibers without producing the serious injury. When the needle is withdrawn the fibers return to a state of close approximation.

In the present study, the bevel of the needle was inserted parallel to the longitudinal dural fibers, so that these fibers are separated and are not damaged and a narrow slit-like opening is obtained, with a greater tendency to contraction and a plugging of the hole, decreasing the leakage of CSF. In a study by Lybecker *et al.*,<sup>12</sup> the incidence of PDPH among patients in whom the bevel was inserted parallel to the longitudinal dural fibers was 0.56 times the incidence among patients in whom the bevel was inserted perpendicular to the longitudinal dural fibers.

PDPH is due to loss of CSF through the dural hole. Increase in blood volume by means of hydration facilitates choroid plexus to produce more CSF. Therefore, increasing the production of CSF will neutralize the loss due to leakage and when the balance is maintained, there should be no post-spinal headache. All the patients were hydrated in a similar manner.

Almost all the recent studies have expressed the opinion that early ambulation does not enhance the incidence of PDPH nor does it increase the severity of the syndrome. However, in the present study, all the patients were instructed to remain in supine position for 24 h in the post-operative period.

Age of the patient did not play any significant role in our study. All the patients in varying groups were of the similar age groups. However, the incidence is found to be lower in older patients. In an older patient, an altered pain sensitivity of vascular pain receptors and narrowed route of escape of CSF from epidural space are assumed to be the explanation for lower incidence. In a study by Rasmussen *et al.*,<sup>13</sup> the incidence of PDPH in the young patient was 27.6% (with 20G) and 12.6% (with 25G). In the elderly patients, incidence of the headache with 20 and 25 G needles was 10.8% and 7.8%, respectively. The incidence PDPH is more common among women than men; particularly prone are the parturients because of the reduction of both the intra-abdominal and epidural pressure after delivery, thereby promoting extra leakage of CSF than usual. Sex bound difference is caused by emotional and hormonal factors. Spielman mentioned the factors responsible for an increase incidence of PDPH in obstetric patients as stress of labor, changing hormonal level, and dehydration.

## CONCLUSION

In the present study for PDPH using three different gauge Quincke spinal needles, the incidence was found to be minimum with 26 G Quincke needle (although statistically insignificant).

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