



Assessment of Post Dural Puncture Headache in Patients Undergoing Caesarean Section: A Comparison between 25 G Quinke V/S Whitacre Needles

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Authors' contributions

This work was carried out in collaboration between all authors. Author SG designed the study, wrote the protocol, collected the data and wrote the first draft of the manuscript. Authors SKN and SR managed the analyses of the study and statistical analysis. Author SR managed the data collection and literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Background: PDPH (post dural puncture headache) is a common complication of subarachnoid block and results from iatrogenic puncture of the duramater. Size of the dural puncture [1,2], age of the patient, needle tip designs [2,3], and number of lumbar puncture attempts [4,5,6] are also responsible for post dural puncture headache. Incidence of PDPH has been reported to be higher in obstetric patients [7].

Aims and Objectives: This study aims at finding the difference in the incidence of PDPH in two different groups of patients undergoing Caesarian section, who have undergone subarachnoid block either with Quinke or Whitacre needles (25 G). Other associated complications were also to be evaluated.

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Methodology: In this randomised prospective single blind study, 200 patients undergoing Elective Caesarian Section were divided into two groups Q & W (n=100), each to receive subarachnoid block with Quinke needle (25G) and Whitcre Needle (25G) respectively. Assessment of the incidence of postdural puncture headache was done on the 1st, 2nd & 3rd and 5th postoperative days using a standard questionnaire. The presence, severity duration and nature and onset of headache was assessed.

Results: The demographic profile was similar in both groups Q & W. The incidence of post dural puncture headache (PDPH) was greater with 25 G Quinke's needle. The intensity and duration of PDPH was higher in group Q ie in whom Quinkes needle was used. Nausea and vomiting was also greater in group Q.

Conclusion: There was a statistically significant decrease in the incidence of postdural puncture headache using conical tipped pencil point 25G Whitacre spinal needle. There was no statistical difference in the onset of PDPH and the accompanying symptoms with the use of Quinke or Whitacre needles.

Keywords: Subarachnoid block; caesarean section; Quinke needle; Whitacre needle.

1. INTRODUCTION

Spinal anaesthesia was developed in late 1800s with the work of Wynter, Quinke and Corning [1]. German surgeon, Karl August Bier in 1898 [2,4], who probably gave the first spinal anaesthetic. Bier also gained firsthand experience of PDPH. Bier injected cocaine 10-15 mg into the subarachnoid space of seven patients, including himself and his assistant [3,4,5]. He also described the most important sign of PDPH, that all symptoms disappeared immediately when laid horizontal, but came back when got upright [6,7]. He correctly summarized that the headache was related to excessive loss of CSF [8,9]. Whitacre and Hart [7,8,9] developed the pencil point needle, based on the observation of Greene [8,9] in 1926. Buettner J et al. [10] during 1993 focused on comparison between 25G Whitacre and 25 G Quinke needle, and also between 25G and 26G Quinke needle. The incidence of PDPH was significantly less with the use of 25G Whitacre needle. The present trend of anaesthetic technique in caesarean section worldwide is subarachnoid block, because it is safe and comfortable for the parturient, least depressant to the newborn and provides optimal working conditions for the obstetrician with little chance of maternal toxicity and minimal placental transfer of drugs [11,12,13,14].

Subarachnoid block has also got its side effects and complications which include hypotension, [10] unilateral block, transient neurological symptom, [11,12,15] backache and not to forget about the most distressing one postdural puncture headache (PDPH) [16,17,18]. PDPH is defined as an occipital or frontal headache brought on by the erect or sitting posture and

relieved or decreased when the supine position was assumed [12]. Onset may occur within minutes or hours but is usual after one or two days [7,8,9], It is usually self-limiting but may last for a few weeks to few months. It leads to patient dissatisfaction, prolonged hospitalization [13] and increased cost [19].

There are research works going on worldwide to identify the risk factors of PDPH and the possible preventive methods. Reducing the size of the spinal needle has made a significant impact on the incidence of post-spinal headache [7,8,17,18]. A lot of interest has been shown by research workers to prevent the PDPH by using different varieties of needles [19]. In our study, conducted in a teaching hospital in Kolkata, on obstetric patients undergoing caesarean section under subarachnoid block. Two different varieties of needles - Quinke (bevelled point dura cutting) and Whitacre (pencil point needle, dura splitting) of same gauge (25G) were used and the difference in the incidence of PDPH, if any, was studied.

1.1 Aims and Objectives

The aims of the study is: To assess whether the tip design of the needle creates any differences in the incidence, grade and duration of PDPH in patients undergoing caesarean section under subarachnoid block, independant of the needle diameter and technique of insertion of needle. (25G Quinke or 25G Whitacre spinal needles with median approach).

2. MATERIALS AND METHODS

This prospective randomized single blind study was undertaken in the Gynaecology & Obstetrics

Department in a teaching hospital in Kolkata. 200 patients over a period of 12 months were randomly divided into 2 groups through systematic random sampling by tossing a coin.

ASA I patients between the age of 18-35 years were included in the study. ASA III & IV patients, patients with bleeding diathesis and coagulopathy, obese patients with history of headache, haemodynamic instability, raised ICP, patients with contraindication to spinal anaesthesia, and patients requiring more than 2 attempts were excluded from the study.

Incidence, onset, grade and duration of postdural puncture headache were noted in each of the patients. Evaluation was done through a pretested validated questionnaire taken twice a day to avoid diurnal variation of pain.

Ethics Committee Clearance and patient's informed consent was taken before starting the study.

After preanaesthetic check the spinal needle (25G Quincke or 25G Whitacre) for each patient was chosen by systematic random sampling by tossing the coin and the patients were allocated to be given subarachnoid block with either Quincke's dura cutting needle (25G) or Whitacre's dura splitting needle (25G).

Standard institutional protocol for spinal anaesthesia and monitoring was undertaken for all patients. Volume preloading with 10 ml/kg of Ringers lactate was done. Subarachnoid blocks were performed at L3-4 intervertebral space, with the patient in the sitting position using standard midline approach under strict aseptic preparation and local infiltration. While using Quincke needle the bevel was maintained parallel to presumed disposition of dural fibers. All patients received a standard spinal anaesthetic of 0.5% hyperbaric bupivacaine 12.5 mg. T4-6 dermatome level of sensory block was ensured. Patients who had Quincke needle for the subarachnoid block were allocated to group "Q" and patients who had Whitacre needle for the subarachnoid block were allocated to group "W". A wedge of 15 cm was applied for left uterine displacement. Oxygen 4 lts / min was administered.

Post operatively all patients were interviewed daily for 5 (five) consecutive days by an

anesthesiologist who was unaware of the needle type and questioned the patients for the presence of headache and any accompanying symptoms such as nausea, vomiting, blurred vision and tinnitus. The criteria for post dural puncture headache were:

- a. Occurred after mobilization.
- b. Mostly frontal and occipital in distribution.
- c. Exaggerated within 15 minutes of standing, sitting and straining and relieved within 15 minutes of lying flat.
- d. Associated with nausea or vomiting other symptoms.

The severity of the headache was analyzed by Crocker scale (1976); and given a score of 1-4.

Grade /score	Symptoms
1	Mild headache which allowed long periods of sitting : no associated nausea or vomiting
2	Moderate headache which made sitting difficult for more than half an hour: occasionally associated with nausea and vomiting
3	Severe headache which made sitting difficult frequently and associated with nausea and vomiting
4	Intense headache even an lying down; nausea and vomiting make feeding impossible

Characteristics of headache was described in terms of:

1. Onset
2. Location
3. Quality
4. Aggravating factor
5. Relieving factor
6. Duration
7. Any associated symptoms like vertigo, nausea, vomiting, blurring of vision and neck rigidity.

This was asked to all patients twice daily (7 am and 7 pm).

The PDPH was treated conservatively with bed rest, hydration, and paracetamol 15 mg/kg orally four times daily and drinking coffee. Injection Diclofenac Sodium 50 mg was used as a rescue analgesic.

2.1 Data Analysis

Symptoms like nausea, vomiting, blurred vision and tinnitus in each group were expressed as percentage. Demographic data like age, height, weight were expressed as mean \pm two standard deviation. Comparison of demographic data between the two groups was done using Student's unpaired two-tailed t-test. The incidence of PDPH, the onset, grade and duration of PDPH between the two groups was also compared by using Pearson Chi Square Test. A P value of less than 0.05 was considered statistically significant.

2.2 Statistical Evaluation

The sample size was determined by the "PS – Power and Sample Size Calculations" software (version – 2.1.30 February 2003) and was calculated to be 100 in each group. The sample size required for correctly rejecting the Null hypothesis with a probability of 85 % (i.e. power = 0.85) & alpha error of 5%, was calculated to be 160 in each group based on the data available from a previous study by Vallejo MC, Mandell GL, Sabo DP et al. [11]. For feasibility 100 patients in each arm was taken as the sample size. Unpaired Student's t test was used to compare the normally distributed variables such as age, height, body weight etc. The incidence, onset, grade and duration of PDPH was found out in the two groups and both chi-square and t test were applied to find out if the difference in the incidence of PDPH is statistically significant.

3. RESULTS AND ANALYSIS

Two groups (n=100) of obstetric patients posted for elective caesarean section, in a teaching hospital in Kolkata, were given subarachnoid block, Group Q with 25G Quincke and Group W with 25G Whitacre spinal needles, respectively. In the 5 postoperative days, they were studied for the occurrence of PDPH. The analyzed demographic data and results were as follows- The following results were obtained:

3.1 Demographic Characteristics

Tables 1, 2 and 3 shows that there were no statistically significant differences in the groups with respect to age, body weight and height. So Group Q and Group W are comparable in terms of these demographic characteristics.

The Table 6 shows that 15 out of total 27 patients i.e. 55.6% of the patients complained of PDPH on the 1st post-operative day. 11 patients i.e. 40.7% patients developed headache on 2nd post-operative day. Only 1 patient complained of onset of pdph on the 3rd post-operative day (i.e. 3.7%). None of the patients complained of headache on the 4th or 5th post-operative day. The day of onset of pdph was also compared between the two groups. In both groups the maximum percentage of patients (54.5% in group Q and 60% in group W) complained of headache on the first day. On statistical analysis there was no significant difference in the onset of headache between the two groups.

Table 1. Age (in years) profile in study groups

Group	n	Mean	Std. Dev	Std. Err. Mean	Sig (2-tailed) p value
Q	100	27.73	2.954	0.295	0.420
W	100	28.02	2.040	0.204	

There was no statistically significant difference in age distribution between the two groups (2 tailed unpaired t test) [p>0.05]

Table 2. Body weight (in kilograms) distribution in study groups

Group	n	Mean	Std. Dev.	Std. Err. Mean	Sig (2-tailed) p value
Q	100	70.56	5.229	0.523	0.498
W	100	71.05	4.969	0.497	

There was no statistically significant difference in body weight distribution between the two groups (2 tailed unpaired t test) [p>0.05]

Table 3. Height (in feet) distribution of the study groups

Group	n	Mean	Std. Dev	Std. Err. Mean	Sig (2-tailed) p value
Q	100	5.62	0.897	0.490	0.906
W	100	5.54	0.703	0.470	

There was no statistically significant difference in height distribution between the two groups (2 tailed unpaired t test) [p>0.05]

Table 4. Postdural puncture headache

Groups	Number		Percentage	
	Q	W	Q	W
PDPH	22	5	22%	5%

Both Chi square test and t test has been applied to find any statistically significant difference in the incidence of postdural puncture headache between the two study groups. The results show that the difference in the incidence of PDPH to be statistically significant as p value is 0.000435 ($P < 0.05$)

4. DISCUSSION

Caesarean section is one of the most common operative procedures performed in our hospital. Choice of anaesthesia for caesarean section depends on the indications of surgery, the degree of urgency, maternal status and desires of the patient. postdural puncture headache, the a distressing complication of subarachnoid block, the most common technique adopted for caesarean section all over the world. PDPH results in increased morbidity and the patient is unable to carry out her daily activities as well as nursing her baby resulting in prolongation of hospital stay and cost. The simple measures used to treat PDPH are of doubtful efficacy [9,10]. The only effective treatment, use of an epidural blood patch [7,8,9]. It is an invasive procedure and has its own complications. So PDPH is still a little big problem for the anaesthesiologist.

Tables 1–3, show the demographic profile of the obstetric patients assigned to the two groups and there was no statistically significant difference between the groups in terms of age, body weight and height distribution. Hence, the groups were comparable with respect to the demographic characteristics.

Table 4 shows the number and percentage of patients who experienced postdural puncture

headache and the percentage of the patients of the two groups Q and W who had PDPH. The main objective of this present work was to study the difference, if any, in the incidences of PDPH between the two groups Q and W. In group Q 22 out of 100 patients i.e., 22% patients had PDPH. In group W 5 out of 100 patients i.e., 5% patients had PDPH. Statistical tests, both Chi square test and t test were applied to find out whether this difference in incidence of PDPH between the two groups is statistically significant and it was found out to be statistically significant.

Vallejo M. C., Mandell G. L. et al. in their study of one thousand and two obstetric patients undergoing elective caesarean delivery studied difference in incidence of PDPH, using five different types of spinal needles. They also found that the 25G Quincke needle, introduced with bevel parallel to dural fibers, had a higher frequency of PDPH compared with the pencil point needles (which included 25G Whitacre) [10].

Dittman et al. [20] studied two thousand three hundred and seventy-eight spinal anaesthetics using a 29 G Quincke point needle. The overall post dural puncture headache rate (PDPH) was 1.2% with a maximum of 2.5% in patients between age 30 and 39. PDPH was related to the experience of using 29 G needles (0.5% in consultants versus 2.0% in trainees, $P < 0.05$).

Kuhnert et al. [21] in their study with 93 caesarean section patients, using 25G Whitacre and 25G and 26G Quincke needles, found that though not statistically significant, the 25G Whitacre caused a lower incidence and less severity of PDPH compared to 25G, 26G Quincke needles.

Table 5. Accompanying symptoms

	Number		Percentage		Significance p -value
	Q	W	Q	W	
Nausea	3	1	13.63	20	0.312
Vomiting	3	1	13.63	20	0.312
Blurred vision	0	0	0	0	0
Tinnitus	0	0	0	0	0

In group Q, 3 patients i.e. 13.63% patients experienced nausea and vomiting, in group W, only 1 patient i.e. 20% patient had these symptoms. There was no case of blurred vision and tinnitus. There was no statistically significant difference in accompanying symptoms between the two groups (Chi-Square test) 0.312 [$p > 0.05$]

Table 6. Showing onset of PDPH in different post-operative days

Group	Post op day 1	Post op day 2	Post op day 3	Post op day 4	Post op day 5
Q	12	9	1	0	0
W	3	2	0	0	0
p-value	0.907	0.982	0.635	0	0

Table 7. Showing grades of PDPH

	Grade 1	Grade 2	Grade 3	Grade 4
Group Q	18	4	0	0
Group W	4	1	0	0

The grading of PDPH on a scale of 1-4, we can see that most of the patients who complained of PDPH had only a mild grade 1 headache. 22 out of 27 patients had grade 1 headache ie 81.5%. The rest suffered from grade 2 headache

Buettner J et al. [10] in their study of 400 nonobstetric patients undergoing lower extremity surgery, by using 25G Quincke and 25G Whitacre needles, found that the use of a Whitacre needle results in significantly less PDPH compared to a standard Quincke spinal needle of the same size [22]. The lower incidence of PDPH in the study of Buettner et al. [10] was probably due to difference in the patient population in the two studies [14].

Multiple attempts of lumbar puncture are an independent predisposing factor for PDPH [23,22]. So cases requiring more than two attempts were not included in the study and have been mentioned as exclusion criteria. Table 4 shows the number and percentage of attempts of lumbar puncture.

Lumbar puncture was achieved in the first attempt in 74% cases in group Q and in 69% cases in group W. 26% patients in group Q and 31% patients in group W required second attempt. There is no statistically significant difference regarding the number of attempts of lumbar puncture in the two study groups ($p > 0.05$) [23,22,24].

The day of onset of PDPH was also compared between the two groups. In both groups the maximum percentage of patients (12% in group Q and 3% in group W) complained of headache on the first day. On statistical analysis there was no significant difference in the onset of headache between the two groups [25,26,27].

On comparing the severity of PDPH between the two groups, we can see that most of the patients developed only grade 1 headache in both groups (GrQ=18% and Gr W= 4%) It was observed that the incidence of PDPH was higher when using 25G Quincke needle (dura cutting) when compared with 25G Whitacre needle (Dura separating). The earlier notion that the use of finer gauge spinal needles prevented PDPH completely was not justified. The fact that PDPH occurred with finer gauge needle is an indication that PDPH is governed by many factors of which

the bore of the needle and the type of the needle used also play a part [28,29].

5. CONCLUSION

PDPH is a significant morbidity of obstetric patients after caesarean section under subarachnoid block. The present study showed that in these patients, the use of 25G Whitacre spinal needle is associated with lower incidence of postdural puncture headache, compared to 25G Quincke spinal needles. So 25G Whitacre needle may be preferred to 25G Quincke needle in obstetric patients undergoing caesarean section under subarachnoid block. There is no significant difference in the onset and incidence of associated symptoms like nausea and vomiting among the two groups.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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