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Evaluation of 25G and 27G Quincke Spinal Needles for Post-Dural Puncture Headache Following Caesarean Section

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ABSTRACT

Introduction: Postdural Puncture Headache (PDPH) remains a well-recognized health concern following a spinal anesthesia for a caesarean section (CS). To weigh the PDPH during CS, a comparison was made between 25G and 27G Quincke spinal needles.

Methods:The prospective, single blind, cross sectional study was conducted at the different hospital MoU's with Centurion University,Vizianagaram ,Vishakhapatnam, India,170 primiparous women aged 18-36 years were selected and classified as group 1 & 2, based on the type of needle used to receive anaesthesia for elective CS. The subjects were allocated to receive spinal anaesthesia with either a 25G spinal needle (group 1, n=85) or with a 27 G needle (group 2, n=85). Data collection was done focusing on the incidence of PDPH postoperatively. Data analysis was done by STATA 17 software. This study was cleared by the institutional ethics committee (IEC) via reference No NIMSUR/IEC/2022/365

Results: A total of 170 pregnant women of CS were included in this study, who were divided in to two groups (n=85 for each group) based on the needle used during spinal anaesthesia as group 1with 25G and group 2 with 27G needle size. Age and weight distribution of pregnant women were similar in both groups, with the mean age of 27.1 years in group 1 and 26.5 years in group 2. The mean weight of the both groups were 62.0kg and 60.9kg respectively for group1 & 2. The heart rate (82.8 vs 81.6bpm) and mean BP (91.0 vs 90.1mmhg) between group 1 vs group 2 was similar between the two groups. The incidence of PDPH was higher in group 1 (25G) (16.5%) subjects than in group 2 subjects (27G) (6.1%), and the incidence rate is significantly lower ($p<0.05$) in the finer needle size. The trials required to attain CSF is higher in group 2, and a finer needle takes more attempts to collect CSF.

Conclusion: This study concludes that due to the lower frequency of PDPH with a 27G needle, it should be given preference for applying spinal anaesthesia over a 25G needle. Moreover, it

is technically more time-consuming to administer spinal anesthesia with a 27G needle than other.

Keywords: *Post dural puncture, spinal anesthesia, headache, 25G and 27G Quincke needles*

1. INTRODUCTION

Postdural puncture headache (PDPH) is a crippling headache that often appears after 2 -3 days following a dural puncture. The headache ranges from mild to severe and shows a very wide variation in its overall incidence globally [1, 2]. The defining feature of this medical condition is a bilateral front occipital headache that radiates to the neck and shoulders and worsens on certain conditions like sitting, standing, coughing etc, accompanied by dizziness, diplopia, nausea, and vomiting [3, 4]. Limited improvement has been made in avoiding the development of PDPH, despite the practice of spinal anesthesia having existed for more than 8 decades [5]. Any rupture in the dura mater leads to PDPH primarily due to the leakage of cerebrospinal fluid (CSF) [6-8], which leads to tension of the cranial contents, such as cerebral arteries, and finally to automatic cerebral vasodilation [8, 9]. It typically displays as a bilateral occipital or frontal headache immediately or 24 to 48 hours after the treatment [10-12]. A thorough literature analysis revealed that some factors contribute to the higher frequency of PDPH. A few significant characteristics among them are younger age, pregnancy, and prior history of PDPH [2, 13, 14]. To lower the incidence of PDPH, more refined and thin needles with diameters ranging from 25 to 31 G have been used during the past three and a half decades. For CS in obstetric procedures, 22G and 25G needles are frequently used. However, scientific data indicates that 27G spinocaine needles

are preferable to 22G and 25G, their use is quite rare. The size and type of spinal needle are the two most significant predictors of PDPH [10, 15]. In 1951, Hart and Whitacre found that pencil-point needles had lesser PDPH rates than cutting (Quincke) needles. Furthermore, relatively little research has been done on this subject. Given the circumstances, the study's objective was to determine if a 27G spinal needle was preferable to a 25G one during a CS in terms of reducing postpartum haemorrhage. To date, many studies have shown that using a smaller spinal needle instead of a bigger one reduces the incidence of post-spinal anesthesia PDPH.

2. MATERIALS AND METHODS

The prospective, single blind, cross sectional study was carried out at different hospital MoU's with Centurion University, Vizianagaram, and Vishakhapatnam, India. 170 primiparous women between the ages of 18 and 35 were chosen based on the inclusion criteria. To undergo spinal anesthesia for elective CS, they were divided into groups 1 and 2. Spinal anesthesia was administered to patients at random using either a 25G spinal needle (group 1, n = 85) or a 27G spinal needle (group 2, n = 85). Multiparous women, women with a history of prior CS or lumbar puncture for any reason, or women who required emergency CS were not included. Similarly, patients having coagulation issues, soft tissue infections at the needle insertion site, or anomalies of the spine were not included. Additionally, exclusion criteria also included the following: pregnancy-induced hypertension, obesity, patients receiving anticoagulants and simultaneous associated illnesses like cardiovascular, neurological disorders and respiratory tract infections. They were guaranteed not to have any type of headache issue before enrollment.

A day before surgery, all patients had a visit during which they were briefed on the study's purpose, methodology, and any advantages and disadvantages. They received assurances that the study's methodology would not increase the likelihood of postdural headaches beyond those that occur naturally. Every patient underwent a comprehensive anthropometric data collection, a detailed history of current and/or previous medical conditions, and a history of any surgical or anesthetic procedures. Each patient underwent standard preoperative tests, including a chest x-ray, serum electrolytes, random blood sugar (RBS), serum creatinine, ECG, and complete blood count (CBC). The incidence of PDPH, its onset, location, duration, and intensity of headaches following surgery were the main areas of data collection. The time needed to deliver spinal anaesthetics and the challenge of localizing the subarachnoid space were also noted.

Half an hour before the anesthesia operation, non-invasive methods were used to estimate blood pressure, heart rate, and saturation. Additionally, conventional fluid preloadings were performed before surgery. The same anaesthesiologist performed the spinal anesthetic operation in a seated position at the L3-4 or L4-5 intervertebral area while taking all necessary aseptic precautions. Using a 25Gx90 mm needle in group 1 or a 27Gx90 mm needle in group 2, the patients received a conventional spinal anesthetic that contained 10-12.5 mg (2.0-2.5 ml) of 0.5% Bupivacaine in 10% dextrose and 25µg Fentanyl (total volume 2.5-3 ml). After routine sterilizing and skin infiltration with 2 milliliters of 2% lidocaine, spinal needles were inserted with the needle tip bevel pointing laterally. This was done following the protocol of EL et al., spinal needles were inserted with the needle tip bevel pointing laterally after standard sterilizing and subcutaneous skin infiltration with 2 milliliters of 2% lidocaine [2]..

The patient was placed in a supine position with left uterine displacement after the surgical procedure. All of the patients were given life support and closely monitored before, during, and after surgery. Intravenous fluids and 5–10 mg of ephedrine were administered quickly to treat a drop in systolic blood pressure (SBP) below 80 mmHg or 20% of the baseline value. When necessary, injections of metoclopramide, atropine, and pheniramine maleate were used to treat symptoms such as vomiting, nausea, increased pulse rate, respiratory depression, and/or skin allergies. On the 1st, 2nd, and 3rd postoperative days, the women were interviewed and asked about their headaches. In addition, data on headache occurrence, onset, severity, location, and duration were evaluated in that order. According to the International Classification of Headache, PDPH is characterized by a "headache occurring within 5 days after lumbar puncture, and being aggravated when standing or sitting and relieved when lying flat." Evaluations conducted during and after surgery were collected and documented and stored in a database through a well-structured questionnaire.

Analysis of the collected data was done using STATA software version 17.

3. RESULTS

This study comprised a total of 170 CS cases. They were divided into groups 1 and 2 based on the type of needle used for spinal anesthesia. The overall mean age of the subjects was 26.8±3.4 years, mean weight was 61.5±6.9 kg, heart rate was 82.2±9.5bpm, and mean SBP was 90.6±8.1mmhg. The overall incidence of APDPH was 11.4%, requiring more than one attempt, and only 5% showed failed attempts (Table 1).

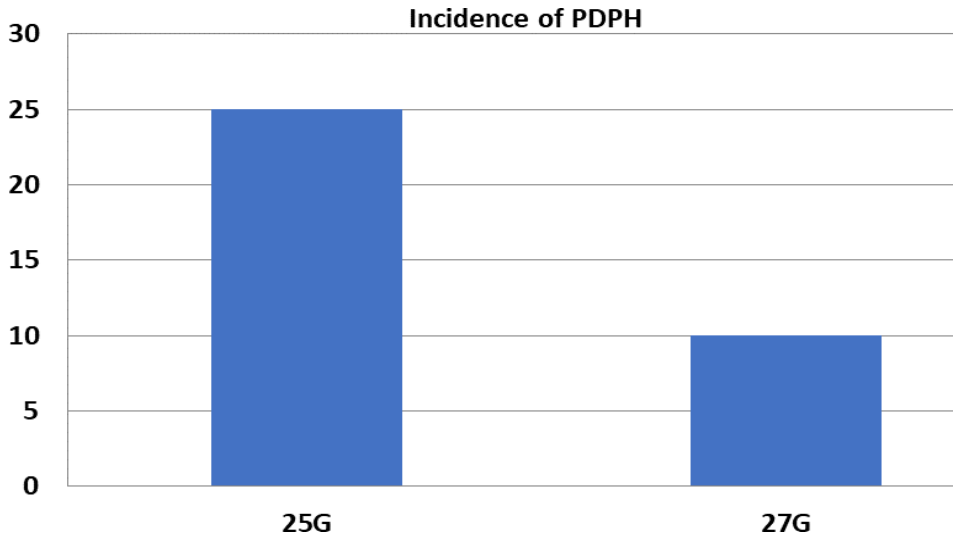

Table 1: General characteristics of patients	
Variables	**Mean±SD, Frequency (%)**
Mean age (years)*	26.8±3.4
Mean weight (kgs)*	61.5±6.9
Heart rate (bpm) *	82.2±9.5
SBP (mmhg)*	90.6±8.1
PDPH Yes No	 19 (11.4) 148 (88.6)
No. of attempts 1 2	 138 (81.2) 32 (18.8)
Failed attempts 0 1	 143 (94.7) 08 (5.3)

There was no statistically significant variation in the distribution of pregnant mothers' ages and weights between the two groups. Group 1's mean age was 27.1 ±3.6 years, while group 2's was 26.5±3.6 years. The two groups' respective mean weights were 62.0±6.8 kg and 60.9±7.0 kg. The mean heart rate of group 1 was 82.8±10.0bpm as compared to 81.6±9.1bpm in group 2. Similarly, the mean SBP was 91.0±9.1 mmHg in group 1 as compared to 90.1±7.1 group 2. All these comparative figures between the groups were statistically insignificant, *P* >0.05 (Table 2).

Table-2: Age and weight of patients (n=80)			
Variable	**Group A (25G) (n=85)**	**Group B (27G) (n=85)**	***P* value**
Age (Years) [Mean ±SD]	27.1 ±3.6	26.5±3.6	0.259
Weight (kg) [Mean± SD]	62.0±6.8	60.9±7.0	0.299
Heart rate (bpm) *	82.8±10.0	81.6±9.1	0.399
BP (mmhg)*	91.0±9.1	90.1±7.1	0.493
Table-2: Incidence and other information related to post-dural puncture headache (PDPH) (n=80)			

Variable	Group 1 (25G)	Group 2 (27G)	*p* value
APDPH			
No	71 (85.3)	77 (93.9)	0.035
Yes	14 (16.5)	05 (6.1)	
No. of attempts needed			
1	73 (85.9)	65 (76.5)	0.116
2	12 (14.1)	20 (23.5)	
Failed attempts			
0	85 (100.0)	58 (87.9)	0.001
1	0 (0.0)	8 (12.1)	

The frequency of PDPH was significantly lower in patients with finer needle sizes, and it was higher in group 1 patients (16.5%) compared to only 6.1% in Group 2 patients (p<0.05). The number of attempts was slightly higher in group 2 compared to group 1 (23.5 vs 14.1%), but the difference was statistically insignificant P>0.05. However, the failed attempts were more in group 2 (12.1%) as compared to a 100% success rate in group 1 patients; the difference was statistically significant, P<0.001 (Table 3).

In total, 14.1% of group 1 participants required multiple trials to deliver spinal regional anaesthesia. In contrast, 23.5% of patients in group 2 required many trials (p>0.05). Notably

group 2 needed more time to obtain CSF than group 1. In group 1, it took 35.08±13.43 seconds to obtain CSF, but in group 2, it took 81.12±16.71 seconds. (Table 3).

4. DISCUSSION

PDPH is the most typical clinical symptom following spinal anaesthesia, which needs to be handled properly with proper and timely management. To prevent it, anticipatory actions need to be taken, and selecting a spinal needle is one of the preventive strategies that can be implemented. This study used two different spinal needle sizes to compare PDHD. In our investigation, Quincke 25G and 27G sizes were examined. As per the reports of published reports on headaches after spinal anaesthesia, the prevalence of PDPH ranged from 0.3 to 20% during spinal anaesthesia and up to 70% following an unintentional dural puncture during epidural anaesthesia [14]. During the procedure, there is the possibility of CSF leakage, which sometimes surpasses the CSF production, resulting in PDPH [16]. The magnitude of dural leakage is closely correlated with the amount of CSF loss [17]. Consequently, it was revealed that one of the crucial parameters determining the occurrence of PDPH was the diameter of the needle that pierced the dura mater [18]. Using 25 G (group 1 in our study) and 27 G (group 2 in our study) Quincke spinal needles, the purpose of this study was to determine the variations in the incidence of post-spinal anaesthesia post-Caesarean section PDPH. Pregnant women's ages were distributed similarly among groups. In a similar study, when spinal anesthetics was administered using 22G, 25G, and 29G needles to three groups of parturient mothers, where groups A and B were found to have respective average weights of 57.90±7.13 kg and

57.26±7.26 kg [19]. Other studies revealed similar mean weights among obstetric patients. It's

worth mentioning that a lower risk of PDPH was linked to a higher weight-to-height ratio [15, 20]. When the 25G needle (25%) was used, the incidence of PDPH was substantially higher than when the 27G needle was used (p<0.05). This is in agreement with our reports. According to Wadood et al. [8], the incidence was 30.0% in the 25G needle group 1 and 14.0% in the 27G needle group. This supports the notion that both needle type and size are significant documented factors in PDPH [21, 22]. A headache following a dural puncture is a consequence of spinal anaesthesia and is thought to be caused by CSF leaking during the procedure and, more likely, by ongoing leakage after the procedure [21, 23].

It is important to address PDPH as a serious issue. There are accounts of PDPH symptoms lingering for months or years, and it carries a significant risk of morbidity [22, 24]. Studies comparing needles of varying sizes showed differences in the onset, location, intensity, and duration of headaches [25-27]. The majority of them stated that the differences between

comparison groups were small and not statistically significant. This suggests that using different needles did not significantly alter this characteristic. The 27G spinal needle groups had a higher number of trials for a successful needle prick. In this group, 23.5% of patients needed more than one trial. In contrast, 14.1% of patients in the 25G group needed more than one trial. Additionally, it was observed that Group 2's (27G) time to obtain CSF fluid was statistically

substantially longer than Group 1's (25G). These results, which are validated by additional research, show that while smaller bore needles reduce the prevalence of PDPH, have an increased failure rate, take more time to obtain CSF, and extend the time needed for anaesthetics injections. These might be explained by the small-bore needles, which increase their resistance to local anaesthetics and CSF fluid. The aforementioned discussion indicates that individuals with 27 G needles have a much-reduced incidence of PDHD, making them superior to those with 25 G needles available at the same cost.

There are several restrictions on this study. This study was not a double blind and we carried out the randomization. In addition to being operator dependent, the frequency of PDPH may also be influenced by technique, skill level, and the number of attempts, all of which were not covered in the study. Nonetheless, all spinal anaesthetics were administered by a fellow of anaesthesia with at least five years of expertise.

5. CONCLUSION

This study concludes that using a 27G needle for spinal anaesthesia should be preferred over a 25G needle because of the lower incidence of PDPH. Furthermore, using a 27G needle to provide spinal anesthesia takes longer than alternative methods. However, the usage of 27G is advised for spinal anesthesia throughout any surgical intervention and analytical technique for the patient's comfort and well-being.

Conflict of Interest: None.

Source of Fund: Nil.

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