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Post Dural Puncture Headache Following Subarachnoid Block for Caesarean Section: A Comparison Between 25G And 27G Quincke Spinal Needle

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Abstract

Introduction: Spinal anesthesia is a standard anesthetic procedure for cesarean section due to rapid onset of dense block, avoidance of intubation or aspiration of gastric contents, avoidance of depressant agents, reduced blood loss, and moreover less procedural failure. Postdural puncture headache (PDPH) remains a well-recognized complication with incidence varying from 0.1% to 36%.

Objective: To assess the Post dural puncture headache following subarachnoid block for caesarean section: A comparison between 25G and 27G Quincke spinal needle.

Methods: The prospective, single blind, randomized study was conducted at Department of Anesthesia, 250 Beded General Hospital, Kurigram, Bangladesh from January to December 2022. Total eighty full term primi-parous women aged within 18-36 years were selected according to the inclusion criteria. They were divided into two group: group A & Group B, and scheduled to receive spinal anesthesia for elective CS. Patients were randomly assigned to receive spinal anesthesia with either 25G spinal needle (group A, n=40) or with 27 G needle (group B, n=40). Women who had history of previous CS or lumbar puncture due to any cause, multiparous, and need emergency CS were excluded. Data collection were done focusing incidence of PDPH, onset, site, duration and severity of the headache post operatively. Intraoperatively, difficulty in localizing the subarachnoid space and required time taken to administer spinal anesthesia were also recorded. Data analysis was done by SPSS 23.

Results: Total 80 cases of Caesarian section were included in this study. Based on the needle used during spinal anesthesia they were divided into group A and group B. 25 G and 27 G needle was used for group A and group B respectively. Age and weight distribution of pregnant mothers were almost similar in both groups and there was no statistical difference. Mean age of group A was 25.92±3.94 years and of group B was 26.56±3.83 years. Mean weight of the both groups were respectively 57.90±7.13 kg and 57.26±7.26 kg. Incidence of post-dural puncture headache (PDPH) was higher in Group A (25G) (25%) patients than Group B patients (27G) (10%) and incidence rate is significantly lower ($p<0.05$) in finer needle size. Irrespective of spinal needle, the overall incidence of PDPH of 80 CS patients was 14% and significantly higher incidence is noticed in-group A than group B (25% vs 10%, $p<0.05$). Attempt required to attain CSF is higher in group B and finer needle takes significantly more time to collect CSF ($p<.001$). Mean duration for CSF collection was 35.08±13.43 seconds (group A) and 81.12±16.71 seconds (group B). Use of 27G spinal needle will be a good choice for reduction of PDPH.

Conclusion: This study concludes that due to less frequency of PDPH with 27G needle, it should be given preference for applying spinal anesthesia over 25G needle. Moreover, it is technically more time consuming to administer spinal anesthesia with a 27G needle than other.

Keywords: Post dural puncture headache, complication of spinal anesthesia, complications of lumbar puncture

Introduction

Spinal anesthesia is a standard anesthetic procedure for cesarean section due to rapid onset of dense block, avoidance of intubation or aspiration of gastric contents, avoidance of depressant agents, reduced blood loss, and moreover less procedural failure [1]. Postdural puncture headache (PDPH) remains a well-recognized complication with incidence varying from 0.1% to 36% [2]. PDPH is a mild to severe debilitating headache that occurs usually 2-3 days after dural puncture.

It is characterized by a bilateral front occipital headache, which radiates to neck and shoulders, exacerbated with sitting, standing, coughing, or straining but relieved on assuming a lying down or prone position [3]. It may be associated with nausea (up to 60%), vomiting, tinnitus, hearing loss, dizziness and paresthesia of scalp, photophobia, or diplopia [4]. Besides this, reported PDPH incidence is ranged from 16%-86% of cases after attempted epidural block [5-7]. Even after a history of practicing spinal anesthesia over 80 years limited advancement has been achieved in completely preventing the occurrence of PDPH [8]. Irrespective of methods either iatrogenic or spontaneous, any breach in the dura matter may result in PDPH. The signs and symptoms of PDPH mostly resulted from the loss of CSF [9-10], which causes the tension of the cranial content eg. cerebral vessels and therefore reflex cerebral vasodilation [11, 12]. Young age, female sex, pregnancy, and prior history of headache believed to be the demographic risk factors, while large bore cutting spinal needle and number of attempts are well known iatrogenic causes of PDPH. After tip design, needle gauge is considered to be next important factor, which may predispose to PDPH [5]. However, it usually presents as a bilateral frontal or occipital headache immediately or within 24-48 h after the procedure [5, 13]. Extensive review of the literatures suggested that few factors influence the increased incidence of PDPH. Among them age (Younger age) [2, 3, 14], sex (7.4% for females vs. 3.4% for males) [2, 15], pregnancy and previous history of PDPH are few important factors [12, 16]. Over last three decades more refined and thinner needles of 25-31G sizes have been used to reduce the incidence of PDPH. In Bangladesh, 22G, and 25G needle are commonly used for obstetrics procedure particularly CS. But use of 27G is very much infrequent though scientific information suggests superior benefits over 22G and 25G spinocaine needle. Moreover, there is very limited studies underwent regarding this topic. Considering the facts, the study was designed to evaluate comparative superiority of 27G spinal needle over 25G in Caesarean Section for reduction of PDPH. Two most important predictors of (PDPH) are type of spinal needle and its size.[5,16] In 1951 Hart and Whitacre reported lower PDPH rates with pencil point needle (Whitacre) than cutting (Quincke) type of needle. Till date, numerous studies demonstrated lower incidence of PDPH following spinal anaesthesia with the use of smaller size spinal needle in comparison to larger one.

Materials and Methods

The prospective, single blind, randomized study was conducted at Department of Anesthesia, 250 Beded General Hospital, Kurigram, Bangladesh from January to December 2022. Total eighty full term primi-parous women aged within 18-36 years were selected according to the inclusion criteria. They were divided into two group: group A & Group B, and scheduled to receive spinal anesthesia for elective CS. Patients were randomly assigned to receive spinal anesthesia with either 25G spinal needle (group A, n=40) or with 27 G needle (Group B, n=40). Women who had history of previous CS or lumbar puncture due to any cause, multiparous, and need emergency CS were excluded. Data collection were done focusing incidence of PDPH, onset, site, duration and severity of the headache post operatively. Intraoperatively, difficulty in localizing the subarachnoid space and required time taken to administer

spinal anesthesia were also recorded. Patients with abnormalities of spine, soft tissue infection at the site of needle insertion, and/or coagulation disorders were excluded. Moreover, patient's factors like history of previous CS or lumbar puncture due to any cause, multiparous, pregnancy induced hypertension, required emergency CS (Due to fetal distress or others), obesity (BMI>30), patients on anticoagulation therapy and concomitant respiratory tract infection or suffering from cardiovascular and neurological disorder were considered as exclusion criteria. Before inclusion, it was assured that they did not suffer from any kind of headache disorder.

All the patients were visited a day before surgery and were described about the study, study procedure and potential benefits and risks. They were assured that procedure of this study will not enhance the chance of postdural headache other than usual headache. All patients were subjected to a thorough and detailed history of present & past medical illness, past history of any surgical as well as anesthetic procedure along with detailed physical examination. Preoperatively, routine investigations like Complete Blood Count (CBC), ECG, serum creatinine, random blood sugar (RBS), serum electrolytes, and chest x-ray were done in each patient.

Blood pressure, heart rate and saturation estimation were done non-invasively half an hour before anesthetic procedure. Moreover, preloadings by standard fluid were also done before surgery. With maintaining all aseptic precautions, spinal anesthesia procedure was performed in sitting position by the same anesthesiologist at L3-4or L4-5 intervertebral space. The patients were given a standard spinal anesthetic consisting of 10-12.5 mg (2.0-2.5 ml) of 0.5% Bupivacaine in 10% dextrose (Hyperbaric Bupivacaine) and 25µg Fentanyl (total volume 2.5-3 ml) by either a 25Gx90 mm needle in group A, and 27Gx90 mm needle in group B. Spinal needles were introduced with the needle tip bevel directed laterally following standard sterilization and subcutaneous infiltration of skin by 2ml of 2% lidocaine, which was followed according to the methodology of the study by Mohammed EL *et al.* [2]

Following operative procedure, the patients was turned to the supine position with left uterine displacement. All patients were resuscitated and followed up cautiously during pre-operative, per operative and post-operative period. Fall in systolic blood pressure below 80 mmHg or 20% of the baseline value was treated with rapid administration of i.v. fluids and 5-10 mg of Ephedrine given intravenously. Complications like nausea, vomiting, bradycardia, respiratory depression &/or skin reaction (i.e.; itching, erythema or pruritus) were managed symptomatically and injection metoclopramide, atropine, and pheniramine maleate was used respectively whenever required. The women were interviewed on days 1, 2, and 3 days postoperatively and were questioned about headache. Besides the information regarding incidence, onset of headache, severity, location, and duration, were assessed respectively. PDPH was defined as by the 'headache occurring within 5 days after lumbar puncture, and being aggravated when standing or sitting and relived when lying flat' according to the definition of the International Classification of Headache Disorder, 3rd edition. Intraoperative and post-operative evaluation were collected and kept recorded in separate case record form. Following, collection of all the required data, these were analyzed by

the SPSS/PC software 23. The study conducted with 95% confidence level at 5% acceptable error level and p value <.05 was considered as statistically significant. Unpaired t test and Chi-square test was used for analysis of continuous variables and categorical variables, respectively.

Results

Total 80 cases of Caesarian section were included in this study. Based on the needle used during spinal anesthesia they were divided into group A and group B. 25 G and 27 G needle was used for group A and group B respectively. Age and weight distribution of pregnant mothers were almost similar in both groups and there was no statistical difference. Mean age of group A was 25.92±3.94 years and of group B was 26.56±3.83 years. Mean weight of the both groups were respectively 57.90±7.13 kg and 57.26±7.26 kg (Table 1). Incidence of post-dural puncture headache (PDPH) was higher in Group A (25G) (25%) patients than Group B patients (27G) (10%) and incidence rate is significantly lower (p<0.05) in finer needle size. (Figure-1 & Table-1).

Onset, site, severity and duration of headache were comparable across groups. In group A headache took mean 23.75±10.00 SD hours to develop and in group B it was 15.60±11.23 SD hours. The most commonly identified site of headache was occipitofrontal (50%) in group A and occipital (50%) in group B. Fifty percent subjects of group A had moderate headache in comparison of group B (50%) (More illustrated in table-2). Mean headache duration in both groups was varied and, majority subjects (40%) of Group A had headache duration between 49 to 72 hours. In addition, majority in-group B (50%) had headache duration

between 49 to 72 hours (Table-2).

Of all, 22.5% subjects of group A, needed more than one trial to administer spinal regional anesthesia. Whereas, in-group B, 40% subjects needed more than one trial (p 0.05). Significantly, more time was required to get CSF in group B than in group A. Time to get CSF in group A was 35.08±13.43 seconds and in group B 81.12±16.71 seconds. (Table-3).

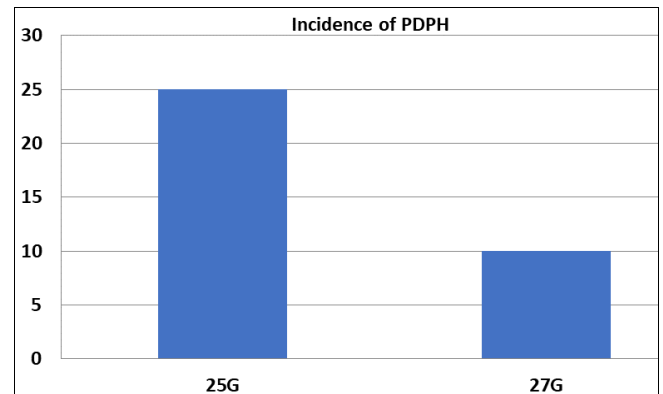


Fig-1: Incidence of post-dural puncture headache among the caesarean women (n=80)

Table-1: Age and weight of patients (n=80)

Variable	Group A (25G) (n=40)	Group B (27G) (n=40)	P value
Age (Years) [Mean ±SD]	25.92 ±3.94	26.56±3.83	.41
Weight (kg) [Mean± SD]	57.90±7.13	57.26±7.26	.66

Table-2: Incidence and other information related to post-dural puncture headache (PDPH) (n=80)

Variable	Group A (25G)	Group B (27G)	p value
Incidence, n (%)	10 (25)	4 (10)	0.04
Onset: (h), mean (SD) range	23.75 (10.00) 10 - 43	15.60 (11.23) 7 - 34	0.16
Site of headache, n (%)			
Occipital	3 (30.0)	2 (50.0)	0.49
Occipitofrontal	5 (50.0)	1 (25.0)	
Frontal	2 (20.0)	1 (25.0)	
Severity of headache, n (%)			
Mild	3 (30.0)	1 (25.0)	0.81
Moderate	5 (50.0)	2 (50.0)	
Intense	1 (10.0)	1 (25.0)	
Headache while lying in bed	1 (10.0%)	(0)	
Duration (hours): n (%)			
≤ 24 hours	2 (20.0)	0	0.64
25 - 48 hours	3 (30.0)	1 (25.0)	
49 - 72 hours	4 (40.0)	2 (50.0)	
>72 hours	1 (10.0)	1 (25.0)	

Table 3: Number of trials and time to get CSF during spinal anesthesia (n=80)

Variable	Group A (25G) (n=40)	Group B (27G) (n=40)	p value
Number trials needed n (%)			
One	31(77.5)	24(60)	.05
More than one (>1)	9 (22.5)	16(40)	
Time to get CSF (sec): mean (SD)	35.08 (13.43)	81.12 (16.71)	<0.001

Discussion

PDPH is a frequent problem seen after spinal anesthesia. This must be dealt adequately and prompt management should be done. Prophylactic measures may be taken to avoid it. One of the prophylactic measure is the choice of

size of spinal needle. This study was a comparison of PDHD by using two different sizes of the spinal needles. The sizes compared in our study were of Quincke 25G and 27G. Post-dural puncture headache (PDPH) is a common complication associated with spinal anaesthesia. A review article on

headache following spinal anaesthesia documented an incidence of PDPH ranging from 0.3 to 20% in spinal anaesthesia and upto 70% after accidental dural puncture during epidural anaesthesia^[17]. PDPH occurs due to CSF leakage which exceeds CSF production^[18]. The amount of CSF leakage is directly proportional to the size of dural leakage^[19]. Therefore, among other factors needle diameter that pierces the dura mater was found to be an important factors influencing incidence of PDPH^[5]. Also, parturient women are considered at increased risk for PDPH^[20]. This study was designed to find out the differences in incidence of PDPH after spinal anesthesia during Caesarian Section using 25 G (Group A) and 27 G (Group B) Quincke spinal needles. Age distribution of pregnant mothers was similar across groups. The mean age of subjects in group A and group B was 25.92±3.94 years and 26.56±3.83 years respectively. Mohammed E L and El Shal S M in a comparable study used 22G, 25G and 29G needles in three groups of parturient mothers. They reported a mean age of 27.8±5.7 years, 27.3±4.9 years and 27.6±5.0 years respectively in the former mentioned needle groups^[2]. The average weight in group A and B was found 57.90±7.13 kg and 57.26±7.26 kg respectively^[21, 22]. Comparable means weight in obstetric patients was reported by other studies. Interestingly higher weight in relation to height was found to be associated with low risk of PDPH^[19]. Incidence of PDPH was significantly high in cases where the 25G needle (25%) was used compared to cases where 27G needle (10%) was used ($p<0.05$). This is consistent with findings of other similar studies. Wadood *et al.*^[12] reported an incidence of 30.0% in 25G needle group compared to 14.0% in 27G needle group. Shah *et al.*^[23] reported an incidence of 20% in 25G needle group and 12.5% in 27G needle group. This conforms to the fact that needle size along with type are important documented factors in PDPH^[21-23]. Lower abdominal surgeries performed under spinal anaesthesia are less hazardous than general anaesthesia. Nowadays it is a common and acceptable anaesthetic practice throughout the world. Headache after dural puncture is a complication of spinal anaesthesia and is believed to result from leakage of CSF both at the time of dural puncture and probably more important due to continuous leak afterwards^[23]. Post dural puncture headache is a complication that should not be treated lightly. There is potential considerable morbidity due to post dural puncture headache and there are reports of PDPH symptoms lasting for months or years^[24]. Onset, site, severity and duration of headache varied across studies involving comparison of different size needles^[2, 12, 23, 24]. Most of them reported minor and statistically non-significant differences across comparisons groups. This implies that this variable did not differ much with use of different needles. Number of trials for a successful needle prick was found high in 27G spinal needle groups. Forty percent patients in this group required more than one trial. Whereas, patients in 25G group required multiple trials in 22.5% cases. Time to get CSF fluid was also found to be statistically significantly higher in group B (27G) compared to group A (25G). These findings, supported by other studies^[2], indicate that small bore needles, although lowers the incidence of PDPH, have high failure rate, takes longer time to get CSF and prolongs anaesthetic injection times. These could be attributed to decreased internal diameter of the more fine needles which provide increased resistance to CSF fluid as well as local anesthetic agents. So, the above

discussion reflects that frequency of PDHD is significantly lower in patients with 27 G needle, so it should be preferred over 25 G needle as both of them are available at the same cost. This study has some limitations. This was not a double blind study carried out in a single centre. This was not possible due to the difference in size of the needle. However, we did the randomization. The frequency of PDPH is also operator dependant and may also depend upon the technique, skills and number of attempts, which were not addressed in the study. However, a fellow of anesthesia who has at least 5 years' experience of conducting spinal anesthesia gave all the spinal anesthesia.

Conclusion

This study concludes that due to less frequency of PDPH with 27G needle, it should be given preference for applying spinal anesthesia over 25G needle. Moreover, it is technically more time consuming to administer spinal anesthesia with a 27G needle than other. However, as patient's well-being and comfort is the first priority, therefore, use of 27G is recommend for spinal anesthesia during any surgical procedure and diagnostic technique.

Conflict of Interest: None.

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