POST DURAL PUNCTURE HEADACHE AFTER SPINAL ANAESTHESIA FOR CAESAREAN SECTION: A COMPARISON OF 25G QUINCKE, 27G QUINCKE AND 27G WHITACRE SPINAL NEEDLES

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Objective: To compare the frequency and severity of post dural puncture headache in obstetric patients using 25G Quincke, 27G Quincke and 27G Whitacre spinal needles. **Design:** Comparative, randomized, double-blind, interventional study. **Place and Duration of Study:** Liaquat University Hospital Hyderabad from October 2005 to December 2006. **Patients and Methods:** 480 ASA I-II full term pregnant women, 18 to 45 years of age, scheduled for elective Caesarean section, under spinal anaesthesia, were randomized into three groups: Group I (25G Quincke spinal needle: n=168), Group II (27G Quincke spinal needle: n=160) and Group III (27G Whitacre spinal needle: n=152). Spinal anaesthesia was performed with 1.5–2.0 ml 0.75% hyperbaric bupivacaine using 25G Quincke spinal needle (Group I), 27G Quincke spinal needle (Group II) and 27G Whitacre spinal needle (Group III) at L3-4 inter-vertebral space. Each patient was assessed daily for four consecutive days following Caesarean section. Frequency and severity and of postdural puncture headache (PDPH) were recorded. Data were analyzed using SPSS-11. **Results:** Frequency of PDPH following the use of 25G Quincke (Group I), 27G Quincke (Group II) and 27G Whitacre (Group III) spinal needles was 8.3% (14/168), 3.8% (6/160) and 2.0% (3/152) respectively. In Group I, PDPH was mild in 5 patients, moderate in 7 patients and severe in 2 patients. In Group II, it was mild in 2, moderate in 3 and severe in 1 patient. In group III, it was mild in 2 and moderate in 1 patient. Severe PDPH did not occur in Group III. Most of the patients with PDPH developed it on 1st and 2nd postoperative day. **Conclusion:** When using a 27G Whitacre spinal needle, the frequency and severity of PDPH was significantly lower than when a 25G Quincke or 27G Quincke needle was used.

Keywords: Obstetric Anaesthesia, Caesarean Section, Spinal Anaesthesia, Postdural, Puncture Headache, Quincke spinal needle, Whitacre spinal needle.

INTRODUCTION

General anaesthesia for Caesarean section is associated with relatively greater maternal risk than regional anaesthesia. Spinal anaesthesia has therefore become more widely practiced anaesthetic technique in Caesarean delivery. It is simple to institute, rapid in its effect and produces excellent operating conditions.[1] It also avoids foetal as well as maternal risks of general anaesthesia, requires minimum postoperative anaesthesia care and provides adequate postoperative analgesia.[2]

Post dural puncture headache (PDPH) is an iatrogenic complication of spinal anaesthesia and results from puncture of the dura mater. The signs and symptoms of PDPH result from loss of cerebrospinal fluid, traction on the cranial contents, and reflex cerebral vasodilation.[3] Two most important factors influencing the frequency and severity of PDPH are the patient's age and the size of the dural perforation.[4] The parturient is at particular risk of PDPH because of her sex and young age.[5] Fine gauge spinal needles, 29G or smaller, are technically more difficult to use, and are associated with a high failure rate for spinal anaesthesia.[6] 25G, 26G and 27G needles probably represent the optimum needle size for spinal anaesthesia.[7]

The aim of this study was to compare the frequency of PDPH in obstetric patients undergoing Caesarean section under spinal anaesthesia with three different spinal needles: 25G Quincke, 27G Quincke and 27G Whitacre.

PATIENTS AND METHODS

This prospective, randomized study was undertaken in three obstetric units of Liaquat University Hospital, Hyderabad. The patients were selected randomly by balloting. The randomization was double blind except for the anaesthetist performing spinal block. Patient, surgeon and the assessor in the ward did not know which spinal needle was used. Study was approved by institutional ethics committee. Written informed consent was obtained from each patient. 480: American Society of Anaesthesiologists physical status classification (ASA) I-II women, aged 18-45 years, undergoing elective Caesarean section, were included in the study. Uncomplicated pregnancy and normal foetal heart rate at the time of surgery were mandatory inclusion criteria. The exclusion criteria were: patient refusal, contra-indication to spinal anaesthesia for infectious,

haemodynamic, haemostatic or neurological reasons, emergency Caesarean section, severe pre-eclampsia or failure of the spinal anaesthesia.

All patients fasted for 10–12 hours and received ranitidine 150 mg orally on the morning of surgery. On arrival in the operation theatre, patients were positioned supine with left lateral displacement of 20° by putting a wedge under the right hip. A 3-lead ECG monitor, pulse oximeter and an automated non-invasive arterial blood pressure monitor were applied. Baseline systolic, diastolic and mean arterial pressures were noted. A fluid preload of colloid 400–500 ml was administered via an 18gauge intravenous cannula over a period of 10–15 minutes before proceeding for spinal anaesthesia. Spinal anaesthesia was performed with the patient in sitting position after skin disinfection with pyodine. Spinal needle was inserted through the L_{3-4} interspace.

After return of clear cerebrospinal fluid, hyperbaric bupivacaine 0.75%, 11–15 mg (1.5–2.0 ml) was injected over 20–30 seconds, through either a 25G Quincke (Group I), 27G Quincke (Group II) or a 27G Whitacre (Group III) spinal needle. The bevel of the Quincke spinal needles (group I and II) was kept parallel to the sagittal plane to prevent cutting of the dural fibres. Patients were then positioned supine with the wedge under the right hip, and O_2 was given at a rate of 5 litres/min via a facemask. Number of attempts at subarachnoid block were limited to one. Patients with more than one attempt were excluded from the study.

ECG and oxygen saturation were monitored continuously, and arterial pressure was measured every 3-minutes during surgery and every 15-minutes during immediate postoperative period. If patient developed hypotension, it was managed by intravenous crystalloids and/or colloids. Hypotension associated with bradycardia was managed with intravenous atropine and crystalloids or colloids. In case of refractory hypotension, injection adrenaline was used in 10–20 µg boluses. Ephedrine could be not used due to its non-availability.

Postoperatively, all patients were assessed daily for 4-days by an investigator, blinded to the type and size of the needle used. PDPH was defined as a headache aggravated by assuming upright position and relieved in the supine position. Other types of headache were considered as non-specific and were not included in PDPH category. Severity of PDPH was graded as mild, moderate and severe and was classified according to the criteria listed in Table-1.

Statistical analysis was performed using SPSS-11. Quantitative variables were expressed as Mean±SD (standard deviation) while qualitative variables were expressed as percentage. PDPH was analyzed using Tearson's chi square test. A *p*-value <0.05 was considered significant.

In patients who developed PDPH, treatment included bed rest, enhanced fluid intake, analgesics and caffeine, and avoidance of straining. None of the patients needed epidural blood patch, which is the definitive treatment in refractory cases.

Table-1: Grading of PDPH Severity[8]

Mild	No limitation of activity No treatment required
Moderate	Limited activity Regular analgesics required
Severe	Confined to bed Anorexic Unable to feed baby

RESULTS

We studied 480-women, ASA physical status I-II, aged 18–45 years undergoing elective Caesarean section under spinal anaesthesia using 25G Quincke (n=168), 27G Quincke (n=160) and 27G Whitacre (n=152) spinal needles.

Demographic data of the patients are shown in Table-2. Age, weight, parity and ASA physical status were comparable in the three groups.

Twenty three (23) out of 480 patients developed PDPH giving an overall frequency of 4.8% (Table-3). Frequency of PDPH was 8.3% (14/168) in Group I, 3.7% (6/160) in Group II and 2.0% (3/152) in Group III. In Group I, PDPH was mild in 5 patients, moderate in 7 patients and severe in 2 patients. In Group II, it was mild in 2, moderate in 3 and severe in 1 patient. In group III, it was mild in 2 and moderate in 1 patient. Severe PDPH was not observed with 27G Whitacre spinal needle (Group III). None of the 23 patients with PDPH required an epidural blood patch. Symptoms were relieved by conventional means in all patients. Day of onset of PDPH in the three groups is given in Table-4.

Table-2: Demographic Data

	Group-1	**Group-II**	**Group-III**	***p*-value**
	25G Quincke	**27G Quincke**	**27G Whitacre**	
Age (yrs) Means±SD	25.8±5.60	26.4±5.86	26.7±4.45	NS*
Weight (Kg) Means±SD	59.9±8.37	61.7±8.45	63.0±9.10	0.006**
Parity				
Primipara	91 (54.2%)	83 (51.9%)	76 (50.0%)	
Multipara	77 (45.8%)	77 (48.1%)	76 (50.0%)	NS
Physical Status				
ASA I	136 (81.0%)	128 (80.0%)	109 (71.0%)	
ASA II	32 (19.0%)	32 (20.0%)	43 (28.3%)	NS

*Not Significant, ***p* is significant

ASA I= A normal healthy patient

ASA II= A patient with mild systemic disease with no functional imitation

Table-3: Frequency of PDPH

PDPH	**Group I (n=168) 25G Quincke n(%)**	**Group II (n=160) 27G Quincke n(%)**	**GroupIII (n=152) 27G Whitacre n(%)**	***p*-value**
Present	14 (8.3%)	6 (3.7%)	3 (2.0%)	0.02**
Absent	154 (91.7%)	154 (96.3%)	149 (98.0%)	

***p* is significant

Table-3: Severity of PDPH

PDPH	Group I (n=168) 25G Quincke n(%)	Group II (n=160) 27G Quincke n(%)	Group III (n=152) 27G Whitacre n(%)	*p*- value
Mild	5 (3.0%)	2 (1.2%)	2 (1.3%)	NS
Moderate	7 (4.1%)	3 (1.9%)	1 (0.7%)	
Severe	2 (1.2%)	1 (0.6%)	0	

Table-4: Onset of PDPH

Onset (POD)*	25G Quincke n(%) (n=168)	27G Quincke n(%) (n=160)	27G Whitacre n(%) (n=152)	*p*-value
1st POD	6 (3.5%)	1 (0.6%)	0	
2nd POD	5 (3.0%)	4 (2.5%)	3 (2.0%)	NS
3rd POD	2 (1.2%)	1 (0.6%)	0	
4th POD	1 (0.6%)	0	0	

*Postoperative Day

DISCUSSION

General anaesthesia for Caesarean Section is associated with an increased risk of maternal mortality[9]. It is therefore a popular practice to use regional anaesthesia wherever possible.[10]

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 importantly, continuing leak afterwards.[11] Post dural puncture headache is a complication that should not be treated lightly. There is the potential for considerable morbidity due to postdural puncture headache[12] and there are reports of PDPH symptoms lasting for months or years[13], untreated PDPH leading to subdural haematoma[14], and even death from bilateral subdural haematomas.[15] Therefore anaesthesiologists are advised to prevent PDPH by optimizing the controllable factors like spinal needle size as well as shape while conducting spinal anaesthesia.[16] Obstetric patients are at high risk of PDPH, being female and under 40 years of age.[17] Indeed, the highest incidence of PDPH is in the parturient and may partly explain the higher incidence of PDPH in females as a whole.[18]

Diagnosis of dural puncture headache depends upon its association with body position; the pain is aggravated by sitting or standing and relieved or decreased by lying down flat.[19]

Apart from other factors, post dural puncture headache is related to the size as well as type of the spinal needle used[20]. It is progressively reduced with the use of thinner Quincke type spinal needles.[6,20,21] Pencil point needles are considered to produce less damage to the dural fibers and allow the hole to close more readily. Thus they have a lower incidence of post dural puncture headache than cutting needle tip designs.[22]

The overall incidence of postdural puncture headache ranges from 0% to 37% as reported by various authors.[23]

Reported frequency of PDPH ranges from 4%[24] to 40%[25] when 25G Quincke spinal needle is used in young females. Ross *et al*[27] reported PDPH in 9% of patients. In the study by Roheena and colleagues[27], severity of PDPH was from mild to moderate. None of the patients complained of severe PDPH. It was more on the 1st postoperative day and gradually decreased on the subsequent days.

Incidence of PDPH with 27 gauge Quincke needle ranges from 1.1%[27] to 12.8%.[28] However, in a recent study by Muhammad *et al*[29], frequency of PDPH was 0% with 27G Quincke spinal needle when spinal anaethesia was administered for Caesarean section.

In a study by Viitanen *et al*[30], PDPH incidence was 8.5%. It was mild in 4%, moderate in 3% and severe in 1% of patients. Symptoms started on first or second day after spinal injection and lasted for 3 days.

In our randomised study, the frequency of PDPH was 8.3% with 25G Quincke needle, 3.7% with 27G Quincke needle and 2.0% with 27G Whitacre needle. PDPH was severe in 2 patients in Group I and 1 patient in Group II. Severe PDPH was not observed with 27G Whitacre spinal needle (Group III). Our study, therefore, clearly demonstrated a significant reduction in frequency of PDPH when 27G Whitacre spinal needle was used as compared to 25G Quincke and 27G Quincke spinal needles. In a study by Landau *et al*[31], incidence of PDPH with 27-gauge Whitacre needle was less than 1%, even lower than our study. However, a study by Shah and collegues[32], which closely resembles our study, demonstrated PDPH incidence of 20%, 12.5% and 4.5% in patients with 25G Quincke, 27G Quincke and 27G Whitacre needles respectively. Although frequency of PDPH was relatively higher in all the three groups in that study, it was again clearly observed that 27G Whitacre needle reduced the frequency of PDPH in patients undergoing Caesarean section.

CONCLUSION

Overall, we concluded that when performing spinal anaesthesia for Caesarean section, 27G Whitacre spinal needle has definite advantage over 25G Quincke and 27G Quincke spinal needles as far as frequency and severity of PDPH is concerned. Therefore we recommend routine use of the 27G Whitacre spinal needle when performing spinal anaesthesia for Caesarean section.

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