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Post Dural Puncture Headache after Spinal Anesthesia for Caesarean Section: A Comparison of 27G Quincke and Whitacre Spinal Needles in Midline and Paramedian Approaches

Mahmoud Gaballeh Montasser

This study compared the frequency and severity of Post Dural Puncture Headache (PDPH) in obstetric patients using 27G Quincke and Whitacre spinal needles in midline and par median approaches. The study was comparative, randomized, double-blind and interventional carried out at Al Hamra Hospital Ministry of Health, Jeddah, KSA. Eight hundred full term pregnant women, ASA I-II, at age of 18-44 years old, scheduled for elective caesarean section, under spinal anesthesia, were randomized into four groups: Group I (27G Quincke spinal needle midline approach), Group II (27G Quincke spinal needle par median approach), Group III (Whitacre spinal needle midline approach) and Group IV (27G Whitacre spinal needle, par median approach). Spinal anesthesia was performed with 2.4-3 mL 0.5% hyperbaric bupivacaine, at L3-4 inter-vertebral space. Each patient was assessed daily for four consecutive days following caesarean section. Frequency and severity of post PDPH were recorded and treated by conventional treatment. All data were analyzed using SPSS-17. The frequency of PDPH following the use of 27G Quincke spinal needle midline approach (Group I) was 3.0% (6/200), 27G Quincke spinal needle par median approach (Group II) was 2.0% (4/200), 27G Whitacre spinal needle midline approach (Group III) was 1.5% (3/200) and 27G Whitacre spinal needle, Paramedian approach (Group IV) was 0.0% (0/200). The PDPH was mild in two patients, moderate in three patients and severe in one patient (Group I). It was mild in three and moderate in one patient in Group II, it was only mild in three patients in Group III and no any cases reported in Group IV. Also severe PDPH did not occur in Groups II, III and IV. Most of the patients with PDPH developed on 1st and 2nd postoperative day, only one case developed in the third day. When using a 27G Whitacre spinal needle in par median approach, the frequency of PDPH was significantly lower than when the same needle used in midline approach or 27G Quincke needle in bath approaches. None of the thirteen patients suffered from PDPH required an epidural blood patch. All symptoms were relieved by conventional means in all patients. Day of onset of PDPH was the same in all groups.

Key words: Post dural, puncture headache, spinal anesthesia, obstetric anesthesia, caesarean section, Quincke spinal needle, Whitacre spinal needle

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INTRODUCTION

General anesthesia for caesarean section is associated with relatively greater maternal risk than regional anesthesia. Spinal anesthesia has therefore become more widely practiced anesthetic technique in caesarean delivery. It is simple to institute, rapid in its effect and produces excellent operating conditions (Ranasinghe *et al.*, 2003).

The incidence of PDPH in obstetrics practice in UK is 0.18-3.6%. It causes considerable morbidity and is a complication that should not to be treated lightly. The PDPH is usually a self-limiting process if left untreated, 75% resolve within the first week and 88% resolve by 6 weeks (Baraz and Collis, 2005).

The PDPH is defined as "a headache occurring after dural puncture and has a significant effect on the patients postoperative wellbeing i.e., headache which is not only postural but also continues for more than 24 h at any level of intensity or so severe at any time that the patient is unable to maintain upright position (Carrie and Collins, 1991).

Two most important factors influencing the frequency and severity of PDPH are the patient's age and the size of the dural perforation (Yousefshahi *et al.*, 2012).

The parturient is at particular risk of PDPH because of her sex and young age (Cesur *et al.*, 2009).

Fine gauge spinal needles, 29G or smaller, are technically more difficult to use and are associated with a high failure rate for spinal anesthesia (Tarkkila *et al.*, 1994).

The 25G, 26G and 27G needles probably represent the optimum needle size for spinal anesthesia (Kang *et al.*, 1992).

On the other hand midline approach involves passage of needle through supraspinal, interspinal and ligamentum flavum, the par median approach avoids supra and interspinal ligaments and hits ligamentum flavum directly after passing through par spinal muscles (Campbell *et al.*, 1993).

The aim of this study was to compare the frequency and severity of PDPH in obstetric patients undergoing caesarean section under spinal anesthesia with two different spinal needles: 27G Quincke and 27G Whitacre in two different approaches.

MATERIALS AND METHODS

After approval of the ethical research committee of El Hamra Hospital; a prospective double blind interventional study was conducted on eight hundred patients; American Society of Anesthesiologists (ASA) physical status classification I-II women; aged

18-44 years, undergoing elective caesarean section. Patients were selected randomly by balloting. Patient, surgeon and the assessor in the ward did not know which spinal needle was used. Written informed consent was obtained from each patient included in the study.

Exclusion criteria: The exclusion criteria were: Patient refusal, any contraindication to spinal anesthesia, emergency caesarean section, severe pre eclampsia, patients with more than one attempt failure of the spinal anesthesia.

Uncomplicated pregnancy and normal fetal heart rate at the time of surgery were mandatory inclusion criteria. All patients fasted for 10-12 h and received ranitidine 150 mg orally on the morning of surgery. In the operation theatre, patients were positioned supine with left lateral displacement of 15-20 degree by putting a wedge under the right hip.

Continuous monitoring was done by 3-lead ECG monitor, pulse oximetry and automated non-invasive arterial blood pressure. The baseline systolic, diastolic and mean arterial pressures were noted and documented. Preload fluid (normal saline 400-500 mL) was administered via an 18 gauge intravenous cannula over a period of 15-20 min before spinal anesthesia. Spinal anesthesia was performed with the patient in sitting hamstring position after skin disinfection with pyodine. Spinal needle was inserted through the L3-4 inter space in midline approach (Group I and II) and 1.25 cm away from midline, directed 10-25° angle toward the midline in Paramedian approach (Group II and IV).

After appearance of clear cerebrospinal fluid, hyperbaric bupivacaine 0.5%, 2.4-3 mL (12-15 mg) was injected over 20-25 sec. The bevel of the Quincke spinal needles Group (I and II) was kept parallel to the saggital plane to prevent cutting of the dural fibres. Patients were then positioned supine with the wedge under the right hip and O₂ was given at a rate of 5 L min⁻¹ by facemask. Number of attempts at subarachnoid block were limited to one, ECG and oxygen saturation were monitored continuously and arterial pressure was measured every 3 min during surgery and every 15 min 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, intravenous ephedrine 10-15 mg boluses were used. Postoperatively, all patients were assessed daily for 4 days by an investigator, blinded to the type of the needle and approach used.

The PDPH was defined as a headache aggravated by assuming upright position and relieved in the supine position. Severity of PDPH was graded as mild, moderate and severe and was classified according to the criteria

listed in Table 1. In patients who developed PDPH, treatment included bed rest, enhanced fluid intake, analgesics and caffeine and avoidance of straining. In refractory cases the definitive treatment is epidural blood patch.

Statistical analysis: Statistical analysis was performed using SPSS 17. Quantitative variables were expressed as Mean±SD (standard deviation) while qualitative variables were expressed as relative frequency and percentage. The PDPH was analyzed using Treason's chi square test. A p-value <0.05 was considered significant.

RESULTS

No significant difference in demographic data of the patients as shown in Table 2 (age, weight, parity and ASA physical status) were comparable in the four groups. As shown in Table 3, 13 out of 800 patients developed PDPH giving an overall frequency of 1.6%. The frequency of PDPH was 3.0% (6/200) in Group I, 2.0% (4/200) in Group II, 1.5% (3/200) in Group III and 0.0% (0/200) in Group IV. In Group I, PDPH was mild in 2 patients, moderate in 3 patients and severe in 1 patient. In Group II, it was mild in 3 patients and moderate in 1 patient. In Group III, it was mild in 3 patients. In Group IV, it was zero. Severe PDPH was not observed with 27G Quincke spinal needle in par median approach (Group I), 27G Whitacre spinal needle in midline approach (Group III) or 27G Whitacre spinal needle in Paramedian approach (Group IV). None of the 13 patients

with PDPH required an epidural blood patch. Symptoms were relieved by conventional means in all patients as shown in Table 3.

The onset of appearance of PDPH in the most of cases were occurred in the first (6 cases) and second (6 cases) post-operative day. While only one case was occurred in the third day (Table 4).

DISCUSSION

General anesthesia for caesarean section is associated with an increased risk of maternal morbidity and mortality (Tortosa *et al.*, 2003).

So in the popular practice is doing regional anesthesia for caesarean section wherever possible (Choi *et al.*, 2003).

The PDPH is a complication of spinal anesthesia and is believed to be results from leakage of CSF both at the time of dural puncture and probably more importantly, continuing leak afterwards (Kleinman and Mikhail, 2006).

Table 1: Grading of PDPH severity (Campbell *et al.*, 1993)

Grade	Criteria
Mild	No limitation of activity No treatment required
Moderate	Limited activity Regular analgesics required Convenient treatment required
Severe	Confined to bed Anorexic Unable to feed baby Epidural blood patch required

Table 2: Characteristics of studied cases

Parameters	Groups				p-value
	I	II	III	IV	
Age (years) Means±SD	28.9±7.60	29.4±8.86	28.7±8.45	29.7±9.45	NS*
Weight (kg) Means±SD	59.8±7.37	61.9±10.37	60.9±9.37	63.9±7.37	0.007**
Parity					
Primipara	91 (45.5%)	95 (47.5%)	90 (45.0%)	93 (46.5%)	NS*
Multipara	109 (54.5%)	105 (53.5%)	110 (55.0%)	107 (53.5%)	
Physical status					
ASA I	160 (80.0%)	168 (84.0%)	154 (77.0%)	144 (72.0%)	NS*
ASA II	40 (20.0%)	32 (16.0%)	46 (23.0%)	56 (28.0%)	

*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 and severity of PDPH

Parameters	Groups								p-value
	I (Control)		II		III		IV		
	n	%	n	%	n	%	n	%	
Frequency									
Present	6	3.0	4	2.0	3	1.5	0	0.0	0.02**
Absent	194	97.0	196	98.0	197	98.5	200	100.0	
Severity									
Mild	2	1.0	3	1.5	3	1.5	0	0.0	NS*
Moderate	3	1.5	1	0.5	0	0.0	0	0.0	
Severe	1	0.5	0	0.0	0	0.0	0	0.0	

*Not significant, **p is significant

Table 4: Onset of PDPH

Onset of PDPH	Groups								p-value
	I (Control)		II		III		IV		
	n	%	n	%	n	%	n	%	
1st POD	3	2.5	2	1.0	1	0.5	0	0.0	NS*
2nd POD	2	2.5	2	1.0	2	1.0	0	0.0	
3rd POD	1	0.5	0	0.0	0	0.0	0	0.0	

*Not significant

The PDPH should not be treated lightly (Eerola *et al.*, 1981). There are reports of PDPH symptoms lasting for months or years (Gerritse and Gielen, 1999), untreated PDPH leading to subdural hematoma (Zeidan *et al.*, 2006) and even death from bilateral subdural hematomas (Grieff and Cousins, 1994).

Therefore anesthesiologists are advised to prevent PDPH by optimizing the controllable factors like spinal needle size as well as shape while conducting spinal anesthesia (Gunaydin and Karaca, 2006).

Females under forty years old are at high risk of PDPH especially home undergoing obstetric operation under spinal anesthesia (Ahsan *et al.*, 1996).

Indeed, the highest incidence of PDPH is in the parturient and may partly explain the higher incidence of PDPH in females as a whole (Hopkinson *et al.*, 1997).

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 (Garry and Davies, 2002).

Apart from other factors, PDPH is related to the size as well as type of the spinal needle used (Halpern and Preston, 1994). These are in agreement with the present study when using (G27) Quincke spinal needle the incidence of PDPH was 2.5% (10/400). Also our study agree with various authors who reports that a progressive reduction in the incidence of PDPH with the use of thinner Quincke type spinal needles (Lambert *et al.*, 1997).

In our study when using thinner Pencil point needles the incidence of PDPH was 0.75% (3/400) is agree with various authors who reports that the 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 PDPH than cutting needle tip designs (McConachie and McGeachie, 1995).

In our study when using thinner spinal needle the overall incidence of PDPH ranges from 0-1.6% while the overall incidence of PDPH ranges from 0-37% as reported by Shutt *et al.* (1992).

In our study the severity of PDPH was ranged between mild to moderate, only one case in Group I was in severe form that agrees with authors who reports that none of the patients complained of severe PDPH when using thinner (27G) either Quincke or Whitacre spinal needles (Ross *et al.*, 1992).

The study disagree with them when Quincke is used in midline approach because we registered one case of severe PDPH in Group I. In our randomized study, the incidence of PDPH was 1.6%, 1.0% was mild in, 0.5 was moderate and 0.05 was severe in all cases that disagree with the study by Viitanen *et al.* (2005) who reports that the incidence PDPH was 8.5%. It was mild in 4%, moderate in 3% and severe in 1% of patients (Viitanen *et al.*, 2005).

In the present study the onset of PDPH was started on the 1st postoperative day and gradually decreased on the subsequent days it was in the first day 46% (6/13), in the second day it was 46% (6/13) and third day was 8% (1/13) after spinal injection, none of the 13 patients required an epidural blood patch and all symptoms were relieved by conventional means in all patients within three days. The incidences of PDPH with 27 gauge Whitacre spinal needle ranges from 1.1-12.8% (Lynch *et al.*, 1994; Wiesel *et al.*, 1993).

However, in our study was 0.75% in midline approach and 0% in par median approach, that agree with recent study by Muhammad *et al.* (2007) who reports that the frequency of PDPH was 0% with 27G Whitacre spinal needle when spinal anesthesia was administered for caesarean section (Muhammad *et al.*, 2007).

In our study, we demonstrate a significant reduction in frequency of PDPH when 27G Whitacre spinal needle was used (0.75%) as compared to 27G Quincke spinal needles (2.5%). That agree with the study by Landau *et al.* (2001) who reports that incidence of PDPH with 27-gauge Whitacre needle was less than 1% (Landau *et al.*, 2001). In addition, it disagree with the study done by Shah *et al.* (2002) who reports that the incidence of PDPH was 12.5 and 4.5% in patients with, 27G Quincke and 27G Whitacre needles, respectively. Although frequency of PDPH was relatively higher in all groups in that study, it was again clearly observed that 27G Whitacre needle reduced the frequency of PDPH in patients undergoing caesarean section (Shah *et al.*, 2002).

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