

A comparative study on incidence of post dural puncture headache using 25-gauge quincke with 25 gauge Whitacre spinal needle in elective caesarean section

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Abstract

Background: Spinal anaesthesia is one of the most-commonest anaesthetic technique used in caesarean section nowadays. Post Dural Puncture Headache (PDPH) is a drawback to the use of spinal anaesthesia. The incidence of PDPH is assumed to be less since pencil point needles separates dural fibres, rather than cutting it during dural puncture. Taking into account the above mentioned facts, present study was conducted to evaluate and compare the incidence of PDPH using 25G Quincke spinal needle and 25G Whitacre spinal needle in obstetric patients undergoing caesarean section delivery under spinal anaesthesia. **Methods:** This comparative double blind study was conducted in 120, ASA I-II obstetric patients scheduled to undergo caesarean section delivery under spinal anaesthesia. Patients were randomly allocated to one of the two groups, where in Group Q(n=60) we used 25G Quincke needle and in Group W(n=60) we used 25 G Whitacre needle. Patients demographic datas, incidence of PDPH, onset, duration, location, severity, treatment modality required in post-operative period and hemodynamic changes during intra-operative period between the two groups were recorded and compared. **Results:** The PDPH was observed in 20% of Group Q and 5% of Group W. The difference was statistically significant (p=0.01). On 1st post operative day 16.67% patients in Group Q and 5% patients in Group W developed PDPH. On 2nd post operative day 3.33% of patients in Group Q and none of the patients in group W developed PDPH. The difference was statistically significant (p=0.04). None of the patients developed PDPH after 2nd postoperative day. **Conclusion:** The incidence of PDPH was significantly low with 25G Whitacre spinal needle compared with 25G Quincke spinal needle.

Key Words: Caesarean section, Post dural puncture headache, Quincke needle, Spinal anaesthesia, Whitacre needle.

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INTRODUCTION

Spinal anaesthesia is one of the commonest anaesthetic techniques used in caesarean section nowadays. Spinal anaesthesia provides simple, safe and rapid anaesthesia for caesarean section. Though this technique is popular, it is not without any unwanted side effects. One of the common complications, PDPH is a drawback to the use of spinal anaesthesia for caesarean section. PDPH has been a complication of neuroaxial block anaesthesia since 1898 when Bier and Hildebrandt *et al* observed a 100% incidence of this complication while performing spinal

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anaesthesia¹. Tip design needle is the second most important factor determining the rate of PDPH. To minimize such problem, pencil point conical tipped spinal needles like Whitacre, Sprotte and Green have become popular which are basically designed to spread dural fibres rather than cutting like Quincke. The incidence of PDPH is assumed to be less since pencil point needles separates dural fibres, rather than cutting it during dural puncture. PDPH with Non-cutting needles were as high as cutting needles in both obstetrics and non obstetrics patients^{2,3}. These two types of needles with smaller gauge has given rise to the newer problems like lateral bending of the needle tip, side hole being obstructed by the tissues, and delayed appearance of CSF while performing the procedure. Only few studies were done specifically on caesarean patients. They couldn't find the increased incidence of PDPH in caesarean patients with the Non-cutting needles. And in majority of the studies the needle bevel orientation was parallel to the dural fibres, but with usage of non cutting needle there was no correlation with the needle tip orientation to the dural fibres. As pregnant patients appear to be at the risk of PDPH than non-pregnant and would benefit greatly from reduction in the rate of PDPH. Considering the above mentioned facts, this study was planned with the objective of comparing the incidence of PDPH in patients undergoing caesarean section under spinal anaesthesia using 25 Gauge Quincke and 25 Gauge Whitacre Spinal Needles^{4,5}.

MATERIALS AND METHODS

This Comparative double blind study was conducted after getting written informed consent in 120 patients scheduled to undergo Caesarean section under spinal anaesthesia in the Department of Anaesthesia, Southern Railway Headquarters Hospital, Perambur, Chennai over 2 years period from October 2014 to October 2016. Pregnant women planned for elective caesarean section were randomly allocated to one of the two groups in a double blinded fashion based on computer generated code: Q and W with 60 patients in each group. Randomization was done following a computer generated random number table. In order to avoid bias only trained anaesthesiologist performed the procedure who was not blinded as two needles have different appearance and the Anaesthesiologist monitoring post-operatively were blinded to the type of the needle used to administer.

Group Q (n = 60): 25 Gauge Quincke spinal needle group

We included Term patients in the age group 18 yrs to 45 yrs, ASA PS –I and II and admitted in the hospital for elective caesarean section. We excluded patients with infection at the site of injection, Coagulopathy, posted for Emergency caesarean section, ASA PS –III and IV, allergic to local anaesthetic agents, grossly obese patient, gestational hypertensive patients, heart disease complicating pregnancy, severe hypovolemia, patient with previous history of head ache, elevated ICP, neurological deficits, Spinal deformity, Psychological disorders, Patients sustaining more than two spinal needle prick. All baseline parameters were observed and recorded. Patients were then put in left lateral position and under strict aseptic precaution, lumbar puncture was done with either 25 Gauge Quincke spinal needle or 25 Gauge Whitacre spinal needle according to the patient's allocated group at L2-L4 or L3-L4 inter vertebral space by midline approach. Needle bevel was inserted perpendicular to the direction of dural fibres. Any backward movement of needle followed by redirection will be taken as a second attempt. Entering the subarachnoid space was evidenced by clear, free flowing CSF and aspiration test. After ensuring free flow of CSF, local anaesthetic drug was injected over 10 seconds. Every patient received INJ. (0.5%) HYPERBARIC BUPIVACAINE (1.8ML TO 2.0ML) intrathecally. After withdrawal of needle, patient was turned to supine position with left uterine displacement. Level of sensory blockade, heart rate, and blood pressure were recorded every five minutes for ten minutes and ten minutes thereafter. A T4-T6 sensory dermatomal level was attained before surgical incision. The level of sensory block was defined as the loss of sharp sensation by using a pinprick test with a 20 Gauge hypodermic needle and was recorded bilaterally at the midclavicular line. Postoperative follow up was done by an anaesthesiologist, blinded to the type of the needle used. Patients were questioned and proforma was filled by anaesthetist who assesses the patient post operatively. Patients were followed up for five days. The character of headache, location, severity, duration, aggravating and pain relieving factors were noted. Transient headaches limited to the day of surgery will not be considered as Post Dural Puncture Headache. Severity of PDPH was graded as mild, moderate, severe and classified according to the following criteria.

SEVERITY	LIMITATION OF ACTIVITY	DURATION
MILD	No limitation of activity	(A)=Lasting <24 hours, or >24 hours, <48 hours without limitation of activity
MODERATE	Limited activity	(B)=Lasting >24 hours, <48 hours
SEVERE	Confined to bed associated with nausea, vomiting, anorexia, ocular and auditory symptoms.	(C)=Lasting >48 hours

All patients who had headache were treated symptomatically with bed rest, adequate hydration, Inj. Paracetamol 1gm (Intravenous infusion), followed by Tab Paracetamol. Statistical analysis was performed using SPSS-16. Basic variables were expressed as percentages, Mean+/- SD (Standard Deviation). Association between multiple parameters in both groups were compared using T test and Pearson’s chi square test. A p-value <0.05 was considered significant.

RESULTS

Table 1 shows demographic profile between the groups were comparable in age, weight and height distribution. There is a statistically significant difference in incidence of PDPH between both groups (20% vs 5%)(table 2). When we compare onset of PDPH there is also a statistically significant difference on day 1 (16.67% vs 1.67%) and on day 2 (3.33% vs 3.33%) (table 3). Most of the patients who had PDPH developed headache in frontal region when compared with occipital region in both groups (table 4). Both the group had only mild headache on comparing the severity of PDPH (table 5). Around 83% of group W and 17% of group Q patients with PDPH lasted for >24 hours. None of them in both groups lasted PDPH more than 48 hours (table 6).

Table 1: Age(yrs),Weight(kg), Height (cm) distribution between the two groups

PARAMETERS	QUINCKE(Q)(N=60)		WHITACRE(W)(N=60)		p-VALUE
	MEAN	SD	MEAN	SD	
AGE(YRS)	26.37	2.79	26.40	3.46	0.95
HEIGHT(CM)	73.88	9.55	75.63	9.08	0.31
WEIGHT(Kg)	156.53	6.77	157.22	5.09	0.53

Table 2: Comparison of the incidence of PDPH between the two groups

PDPH	QUINCKE		WHITACRE	
	No of Patients(N)	Percentage(%)	No of Patients(N)	Percentage(%)
YES	12	20	3	5.00
NO	48	80...	57	95.00
TOTAL	60	100	60	100
CHI SQUARE VALUE	6.17		p-VALUE 0.01	

Table 3: Comparison of onset of PDPH between the two groups

PDPH ONSET	QUINCKE		WHITACRE	
	No of Patients(N)	Percentage(%)	No of Patients(N)	Percentage(%)
DAY ONE	10	16.67	1	1.67
DAY TWO	2	3.33	2	3.33
NIL	48	80.00	57	95.00
TOTAL	60	100	60	100
CHI SQUARE VALUE	8.14		p-VALUE 0.02	

Table 4: Comparison of location of PDPH between the two groups

LOCATION OF PDPH	QUINCKE		WHITACRE	
	No of Patients(N)	Percentage(%)	No of Patients(N)	Percentage(%)
FRONTAL	10	16.67	3	5.00
OCCIPITAL	2	3.33	0	0
GENERALISED	0	0	0	0
NIL	48	80.00	57	95.00
TOTAL	60	100	60	100
CHI SQUARE VALUE	6.54		p-VALUE 0.04	

Table 5: Comparison of severity of PDPH between the two groups

SEVERITY	QUINCKE		WHITACRE	
	No of Patients(N)	Percentage(%)	No of Patients(N)	Percentage(%)
MILD	12	20.00	3	5.00
MODERATE	0	0	0	0
SEVERE	0	0	0	0
NIL	48	80.00	57	95.00
TOTAL	60	100	60	100
CHI SQUARE VALUE	6.54		P-VALUE	
				0.04

Table 6: Comparison of duration of PDPH between the two groups

DURATION OF PDPH	QUINCKE		WHITACRE	
	No of Patients(N)	Percentage(%)	No of Patients(N)	Percentage(%)
< 24 HOURS	10	83.33	3	100
24 – 48 HOURS	2	16.67	0	0

DISCUSSION

The present trend of anaesthetic technique in caesarean section worldwide is spinal anaesthesia, because it is safe to the mother and newborn, easier to perform, and has a high degree of success rate. However, among the side effects of spinal anaesthesia, PDPH is the most distressing one and results in increased morbidity, prolonged hospital stay, increased cost, and patient dissatisfaction. Therefore, PDPH remains a “big problem” for the anaesthesiologist. Obstetric patients are at high risk for PDPH because of their female sex and young age. After delivery of the fetus, the reduced epidural pressure increases the rate of CSF leakage through the dural opening leading to loss of buoyant support of the brain, thereby causing traction on meninges, a pain sensitive structure. In addition as a consequence of decreased CSF volume, there is compensatory vasodilatation and increased intracranial blood volume leads to headache. The incidence and severity of PDPH is directly proportional to the rate of CSF leakage through the dural hole made by the spinal needle. This is directly related to the size of spinal needle and type of the spinal needle. So in high-risk patients for PDPH like obstetric patients, the use of finer gauge spinal needle is justified. Because of this fact 25G, 26G, 27G Quincke and Whitacre size spinal needles are in widespread use. Several studies were carried out worldwide with different types of needle tip designs, to find out any difference in incidence of PDPH. As a smaller diameter needles produce a smaller tear in the dura, potential for leakage is less and incidence of PDPH is lower with finer gauge needles⁶⁻⁸. The Quincke type is the standard needle with a medium cutting bevel and the orifice at the needle tip. The problem of low CSF flow and paraesthesia seen with the pencil-point needles has promoted the search for novel needle designs. The pencil point needles straddles the dura mater due to longer orifice (1mm) than the Quincke needle so that the local anaesthetic solution is misplaced into the epidural or

subdural space resulting in high incidence of failed blocks. The dura or arachnoid mater may act as a ‘flap’ valve across the opening of a pencil point needle. During aspiration the dura / arachnoid are pulled back allowing CSF to enter the needle. During injection the dura / arachnoid is pushed forward and the local anaesthetic enters the epidural or subdural space leading to failed spinal anaesthesia⁹⁻¹¹. Perpendicular orientation of the bevel of a spinal or epidural needle leads to a reduction in the incidence of post-dural puncture headache¹². 90% cent of headaches occur within 3 days of the procedure, and 66% start within the first 48 hrs. Rarely, the headache develops between 5 and 14 days after the dural puncture. The common distribution of headache is over the frontal and occipital areas radiating to the neck and shoulders¹³⁻¹⁵. In our study 16.67% in Quincke group and all 5% patients in Whitacre group had PDPH in frontal region. 3.33% patients with PDPH in Quincke group alone had occipital headache. The overall incidence of PDPH in our study was 12.5% and among them 20% of patients in Group Q and only 5% of patients in Group W developed PDPH. These results were similar to the study done by Anirban Pal *et al*, Gisore E *et al* and Sadqa aftab *et al*.^{16,17,18} In our study, Onset of PDPH was found to be on 1st post operative day was 73.3%. Around 17 % in Group Q and 2% in group W developed headache on first postoperative day. 2 out of 60 cases respectively in both Groups developed headache on 2nd post operative day, none of the patient developed headache after 2nd post operative day. Around 83% of group W and 17% of group Q patients with PDPH lasted for >24 hours. None of them in both groups lasted PDPH more than 48 hours. The largest follow-up study done by Vandam *et al* reported that 72% of headaches resolved within 7 days, and 87% had resolved in 6 months. The duration of headache is less in our study when compared to above study may be because of using smaller gauge needles¹⁹. Bano F *et al* conducted a study in 100 womens

undergoing elective or emergency caesarean section under spinal anaesthesia by using 25G Quincke or 25G Whitacre needles found out PDPH was significantly higher in Quincke group ($p=0.015$).²⁰ Similar results were observed from study done by Jost U *et al.*²¹ In our study all patients who developed PDPH were treated with bed rest, hydration, oral/parenteral analgesic. None of our patients in either group required Epidural Blood Patch and other modalities due to use of finer gauge and pencil point spinal needle. In our study intra-operatively monitored variable like Heart rate and Mean arterial Blood Pressure did not differ between these two groups, at all measured time intervals. Based on our study we recommend to use 25G Whitacre spinal needle (pencil-point tip) for administration of spinal anaesthesia in the obstetric patients for caesarean section who are at high risk for PDPH. The cost of the Whitacre spinal needle has to be balanced against the risk of PDPH, the associated cost of a longer hospital stay, and the hazardous therapy (Epidural Blood Patch). Thus there is no doubt, that prevention is better option than definitive therapy.

CONCLUSION

We conclude that the incidence of PDPH was significantly low with 25G Whitacre spinal needle compared with 25G Quincke spinal needle.

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