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KEY WORDS: Caesarean section, postdural puncture headache, Quincke spinal needle, subarachnoid block, Whitacre spinal needle.

INCIDENCE OF POST DURAL PUNCTURE HEADACHE IN CAESAREAN SECTION : A COMPARISON OF 25 G QUINCKE AND 25 G WHITACRE NEEDLE

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ABSTRACT

Background: Post dural puncture headache (PDPH) is a distressing complication of the subarachnoid block. Most of the previous studies showed that there were more incidence of PDPH in Quincke needle than Whitacre needle. But none of the studies mentioned about direction of needle during withdrawl. Hence, this study was designed to compare the onset, incidence, duration, severity of PDPH between 25G Quincke, 25G Whitacre needle, in patients at risk of PDPH.

Materials and Methods: 18-35 years of three hundred twenty four, ASA I and II obstetrics patient posted for Cesarean section under subarachnoid block, were randomly assigned into two groups W and Q, where 25G Whitacre and 25G Quincke spinal needles were used, respectively. The primary objective of the study was to find out the difference in incidence of PDPH, if any, between the two groups, by using the Fisher's exact test 2-tailed.

Results: The incidence of PDPH was 8.02% with group Q and 3.09% which was not statistically significant (P=0.087) difference between two groups.

Conclusion: Both 25G Quincke and Whitacre needle can be used for spinal anaesthesia in obstetric patient as there is no significant difference in onset, duration, severity, location and incidence of PDPH. However 25G Quincke needle is technically easier for insertion and significantly low price. Therefore, 25G Quincke needle can be used for spinal anaesthesia in obstetrics patients with bevel of the needle parallel to the dural fibers both during insertions and withdrawl.

INTRODUCTION

Caesarean section is one of the most common operative procedures performed in our hospital. Choice of anaesthesia for caesarean section depends on the indications of the surgery, the degree of urgency, maternal status and the desires of the patient[1]. First described by August Bier[2] in 1898, the subarachnoid block is one of the most versatile regional anaesthesia techniques available today.

It is simple to institute, rapid in its effect and produces excellent operating conditions[4]. It also avoids foetal as well as maternal risks of general anaesthesia, requires minimum postoperative anaesthesia care and provides adequate postoperative analgesia[5] but has also got its share of side effects and complications which include hypotension[6], unilateral block, transient neurological symptom[7], backache and most distressing one PDPH.

Subarachnoid block has many advantages over epidural anaesthesia for caesarean section[8] because it is simper to perform, presence of cerebrospinal fluid provides a more certain end point to inject, a higher degree of success than epidural anaesthesia, onset of anaesthesia is rapid, better motor blockade and dose requirement of local anaesthetic is less.

PDPH is defined as an occipital or frontal headache brought on by the erect or sitting posture and relieved or decreased when the supine position was assumed[11]. Onset may occur within minutes or hours but is usual after one or two days. It is usually self-limiting but may last for a few weeks to few months.

The parturient is at particular risk of PDPH because of their gender and young age[13,14]. 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 the meninges, a pain-sensitive structure. In addition as a consequence of the decreased CSF volume, there is compensatory vasodilatation and increased intracranial blood volume, according to Monro Kellie hypothesis, leading to a headache[15].

Generally we use 25G Quincke needle for spinal anaesthesia. Most of the study results showed that there were more incidence of PDPH in Quincke needle than Whitacre needle[16,17]. But none of the studies mentioned about direction of needle during withdrawl. Here we reposition the spinal needle parallel to the longitudinal dural fibers during withdrawl of the needle as it was done during introduction. Hence, this prospective, double blind, parallel group, randomized study was designed to compare the onset, incidence, duration, severity of PDPH between 25G Quincke, 25G Whitacre needle.

MATERIALS AND METHODS

This study was carried out on 324 obstetric patients(162 in each group) between 18 to 35 yrs of age belonging to ASA physical status I and II posted for caesarean section under subarachnoid block after taking Institutional ethical committee approval and written informed consent from each patient. Patients refusal, Patients with history of frequent headache or migraine, coagulation profile deranged, infection on the back, anticoagulant therapy, Spinal cord deformity/ previous spinal surgery, neuromuscular diseases (eg. myopathies and neuropathy), Hypovolaemia, acid base disturbances and electrolyte imbalance, acute obstetrics emergency e.g. Fetal distress, eclampsia, Patients requiring more than one attempt of lumbar puncture and we forgot to repositioned the Quincke needle during withdrawl, all the cases of failure, dural puncture was achieved but inadequate or patchy subarachnoid block were excluded from the study.
Pre-anaesthetic check up was conducted and a detailed history and complete physical examination recorded. Haemoglobin, fasting and post-prandial blood sugar, and urine routine examination findings were reviewed.

The study population were randomly divided into two groups as follows:
Group-Q patients received spinal anaesthesia with 25G Quincke needle.
Group-W patients received spinal anaesthesia with 25G Whitacre needle.

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 was noted. All patients were volume preloaded with crystalloids 400–500 ml via an 18gauge intravenous cannula over a period of 10–15 minutes before proceeding for spinal anaesthesia. Subarachnoid blocks were performed at L2-3, L3-4 or L4-5 intervertebral space, with the patient in the sitting position using standard midline approach under strict aseptic preparation and local infiltration.While using Quincke needle the bevel was maintained parallel to presumed disposition of dural fibers. Upon entering the subarachnoid space, as evidenced by clear, free flowing CSF, the needle was rotated so that the ejection orifice was directed cephalad. After return of clear cerebrospinal fluid, hyperbaric bupivacaine 0.5%, 7.5–10 mg (1.5–2.0ml) + fentanyl 25mcg was injected over 20–30 seconds. After giving drug the needle was rotated again so that the ejection orifice or the bevel end was repositioned parallel to the dural fibers while withdrawing from the lumbar space to prevent cutting of the dural fibers.

Patients was then positioned supine with the wedge under the right hip, and O2 was given at a rate of 3liters/min via a binasal prong. Number of attempts at subarachnoid block was limited to one. Patients with more than one attempt and where we forgot to reposition the needle during withdrawl were excluded from the study. ECG and oxygen saturation were monitored continuously, and non invasive blood pressure was measured every 5-minutes for 20 minutes and then 15 minutes interval during surgery and every 1hr during immediate postoperative period for 6hrs. If patient developed hypotension, it was managed by intravenous crystalloids and/or colloids, inj. mephentermine & inj. Phenylephrine. Hypotension associated with bradycardia was managed with intravenous atropine and crystalloids or colloids. In case of refractory hypotension, injection adrenaline was given 10–20 g boluses. Ephedrine not used due to its non-availability.

In case of failure of dura puncture or inadequate subarachnoid block, the following patients were excluded from the study and administered general anaesthesia with endotracheal intubation (rapid sequence intubation) and controlled ventilation.

Post operatively all patients in the study group was interviewed daily for four consecutive days by an anesthesiologist unaware of the type of needle used and was questioned for the presence of headache, onset, characteristics, duration, location and any accompanying symptoms such as nausea, vomiting, blurred vision and tinnitus. PDPH was characterized by, (1) postural, aggravated by sitting or standing, relieved by lying supine (2) frontal or occipital (3) may be accompanied by nausea, vomiting, neck stiffness, diplopia, tinnitus. The PDPH was treated conservatively initially with bed rest, hydration, and paracetamol 15mg/kg orally four times daily.

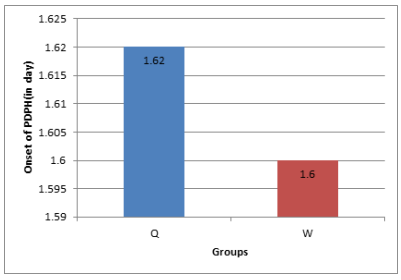
Results were summarized by descriptive statistics such as mean and standard deviation for numerical variables and counts and percentages of categorical variables. Numerical variables were compared between 2 study groups by "students independence sample **t** test". Analysis were two tailed (other than the primary outcome measured) and p value of less than 0.05 was considered statistically significant.

RESULTS

The patients in the two groups were comparable with age, parity, weight and the difference between the two groups was not statistically significant (p>0.05).

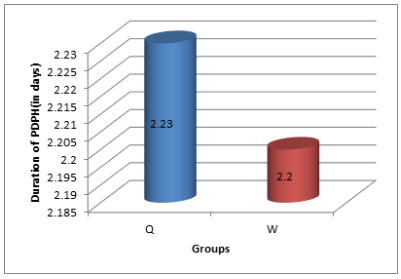
In the present study mean time of onset of PDPH was 1.62±0.650 days for group Q and 1.60±0.548 days for group W. There was no statistically significant change found (p<0.05) in onset of postdural puncture headeche between two groups (Q and W) using Student's t test(p=0.963).

Figure 4: Comparison of onset of postdural puncture headeche(in day) between the groups



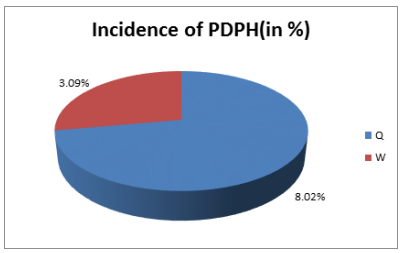
It was observed that mean time for duration of PDPH in group Q and W were 2.23±0.439days and 2.20±0.447days respectively. There was no statistically significant change found (p<0.05) in the duration of PDPH between two groups (Q and W) using Mann-Whitney U test (p=0.921).

Figure 5: Comparison of duration of postdural puncture headeche between the groups



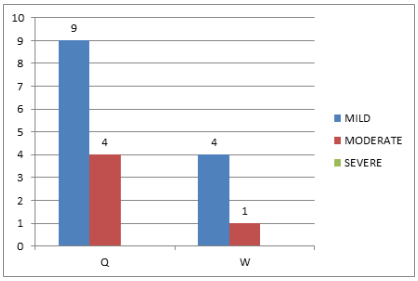
In the present study, the incidence of PDPH was 8.02%(13 out of 162 patients) with group Q and 3.09% (5 out of 162 patients).Though group Q had higher incidence of PDPH than group W, there was no statistically significant change found in the incidence of postdural puncture headeche using Fisher's exact test 2-tailed(p value 0.087)between two groups(Q and W).

Figure 6: Comparison of incidence of postdural puncture headeche between the groups



In the present study 9 patients(69.23%) experienced mild headache, 4 patient had moderate headache in group Q. In group W there were 4 patients who experienced mild headache and 1 patient had moderate headache. There was no statistically significant change found (p<0.05) in the severity of PDPH between two groups(Q and W) using Fisher's exact test 2-tailed(p value 1.000).

Figure 7: Comparison of severity of postdural puncture headache between the groups



DISCUSSION

There are several factors seem to predispose a patient to develop PDPH after spinal anesthesia including age, gender, number of attempts, and needle type (design) and size, history of previous PDPH or chronic headache and technical expertise. Moreover delivery of fetus causes reduction of epidural pressure thus increasing the rate of CSF leakage through the dural opening leading to loss of buoyant support of the brain, thereby causing traction on the meninges, a pain-sensitive structure. Therefore the obstetrics patient were chosen for this study[20].

This is a universal consensus about the fact that the thicker the lumbar puncture needles, the higher could be the incidence of PDPH. Even as the incidence of PDPH is 0–2% with a 29G Quincke needle, but they are associated with a high incidence of failed anaesthesia[20,21,26,28] or multiple attempts [21,32].

If there are multiple holes in the dura, no matter how small, they will increase the incidence of Headache[21,34] and defeat the purpose of using the smaller-gauge needle. Therefore, 25G, 26G, and 27G Quincke needles are in widespread use. The incidence of PDPH is 3–25%,[21] 0.3–20%,[20] and 1.5–5.6%[25] with 25G, 26G, and 27G needles, respectively. Therefore in this study the lumber puncture attempts were limited to one and chose the 25G spinal needle because of the technical ease of insertion over the finer spinal needles.

With pencil-point needles, which push the tissue apart bluntly, a large opening on the inside was found, with some tearing of the dura, however on electron microscopic examination a persistent perforation channel was not found[32,36]. When Quincke needle is inserted with bevel end perpendicular to the dural fibres, it causes a typical cresent like puncture site and a sharply delineated, persistent perforation channel, when viewed under an electron microscope, which may explain the high CSF loss. But when cutting needle is inserted parallel to the long axis of the spine it produces a narrow slit like opening which has a greater tendency to contraction and plugging of the hole[31], thus decreasing the leakage of CSF and lesser frequency of PDPH.

Most of the textbook has described dural fibres as longitudinal in direction[1] , but Fink and Walker noted that the dura consists of multidirectional interlacing collagen fibers and both transverse and longitudinal elastic fibres[19].

Lybecker et al[22] found that the incidence of PDPH was 0.56 times higher among patients in whom the bevel was inserted parallel to the longitudinal dural fibres than the incidence among patients in whom the bevel was inserted perpendicular to the longitudinal dural fibres.

In the present study, the bevel of the Quincke needle was inserted as well as withdrawn parallel to the longitudinal dural fibres. It was observed that out of 162 patients only 13 suffered PDPH in Quincke group and 5 in Whitacre group. The incidence of PDPH was 8.02 % vs 3.09 % in group Q and W respectively. It was statistically insignificant (p=0.087, Fisher's exact t test 2-tailed). Severity of the PDPH was also comparable in both groups (p=1.000, Fisher exact test 2 tailed). Severity ranges from mild to moderate. None patients in both groups suffered severe headache and did not require any aggressive treatment. The results were consistent with some previous works[7,16,27,29,30]. However, a few authors[23,24,31,32,33] found a higher incidence, and more severe PDPH in the cutting needle and few authors[7,17] found a lower incidence, and more severe PDPH in the cutting needle.

In the present study only single lumber puncture attempt was included, whereas in the other studies, they included upto 3rd attempts. In our study we introduced and withdraw the bevel of the Quincke needle parallel to the direction of the dural fibers, producing a narrow slit like single opening, whereas in the previous studies they did not mention the direction of the bevel end during withdrawl. They introduced the needle with the bevel parallel to the dural fibres and rotated with bevel up to inject the medication, but during withdrawl, they probably did not reposition the needle and the bevel end was at perpendicular to the dural fibres producing a slit with cresent like opening in the dura, thus causing larger hole and higher incidence and more severe PDPH.

The mean time of onset and duration of the PDPH were comparable in both groups (p=0.963, Student's unpaired t test). Our results were consistent with some previous work[28,30,33]. However few authors[7,17] reported early onset of PDPH.

Associated with PDPH, out of 162, only 4 patients (2.71 %) experienced nausea and 1 patient experienced vomiting in group Q whereas in group W, only 1 patient i.e., 0.62 % patient had nausea. There was no case of blurred vision and tinnitus.

CONCLUSION

Both 25G Quincke and Whitacre needle can be used for spinal anaesthesia in obstetric patient as there is no significant difference in onset, duration, severity, location and incidence of PDPH. However 25G Quincke needle is technically easier for insertion and significantly low price. Therefore, 25G Quincke needle can be used for spinal anaesthesia in obstetrics patients with bevel of the needle parallel to the dural fibers both during insertions and withdrawl.

REFERENCES

1. Brown DL. Spinal, Epidural, and Caudal Anesthesia. In: Miller RD, editor. Miller s Anesthesia. 7th ed. Philadelphia (PA): Churchill Livingstone Elsevier;2010. p. 1625.
2. Ranasinghe JS, Steadmann J, Toyama T, Lai M. Combined spinal epidural anaesthesia is better than spinal or epidural alone for caesarean delivery. Br J Anaesth. 2003; 91(2): 299-300.
3. Fauzia B, Saleem S, Safia Z, Nabeela R, Mirza NI, Saeeda H. Intrathecal fentanyl as adjunct to hyperbaric bupivacaine in spinal anesthesia for Caesarean Section. JCPSP. 2006; 16(2): 87–90.
4. Norris M C. Hypotension during spinal anaesthesia for cesarean section : Does it affect neonatal outcome ? Reg Anesth. 1987; 12: 191.
5. Viitanen H, Porthan L, Viitanen M. Postpartum neurologic symptoms following single shot spinal block for labour analgesia. Acta Anaesthesiol Scand. 2005; 49: 1015-22.
6. Riley E T, Cohen S E, Macario A. Spinal versus epidural anesthesia for cesarean section : A comparison of time, efficiency, costs, charges and complications. Anesth Analg. 1995; 80: 709-12.
7. Green HM. Lumber puncture and the prevention of postdural puncture headache. JAMA. 1926; 86: 391-2.
8. D. K. Turnbull and D. B. Shepherd. Postdural puncture headache: pathogenesis, Prevention and treatment. Br J Anaesth. 2003; 91(5): 718-29.
9. Carrie L E S, Collins P D. 29 G spinal needles. Br J Anaesth. 1991; 66: 145-6.
10. Tohmo H. Prolonged impairment in activities of daily living due to PDPHA after diagnostic lumbar puncture. Anesthesia. 1998; 53: 296-307.
11. Flaatten H, Rodt S, Rosland J, Vamnes J. Postoperative headache in young patients after spinal anaesthesia. Anaesthesia. 1987; 42: 202-5.
12. Morewood G H. A rational approach to the cause, prevention and treatment of postdural puncture headache. Can Med Assoc J. 1993; 149: 1087-93.
13. Grant R, Condon B, Hart I, Teasdale GM. Changes in intracranial CSF volume after lumbar puncture and their relationship to post L P headache. J Neurol Neurosurg Psychiatry. 1991; 54: 440–2.
14. Hwang J J, Ho S T, Wang J J, Liu H S. Postdural puncture headache in caesarean section : comparision of 25 and 26 gauge Quincke needles. Acta Anaesthesiol Sin 1997; 35: 33-7.
15. Shaikh JM, Memon A, Memon MA, Khan M. Post dural puncture headache after spinal anesthesia for Cesarean section: A comparison of 25g Quincke, 27g Quincke and 27g Whitacre spinal needles. J Ayub Med Coll Abbottabad. 2008; 20: 10–3.
16. Crawford J S. Experiances with epidural blood patch. Anaesthesia. 1980; 35: 513-15.
17. Fink B R, Walker S. Orientation of fibers in human dorsal lumbar dura mater in relation to lumbar puncture. Anesth Analg. 1989; 69: 768-72.
18. Flaatten H, Rodt SA, Vamnes J, Rosland J, Wisborg T, Koller ME. Postdural puncture headache. A comparison between 26 and 29 gauge needles in young patients. Anesthesia. 1989; 44: 147–9.
19. Geurts J W, Haanschoten M C, Van Wijk R M, Kraak H, Besse T C . Postdural puncture headache in young patients. Acomparative study between the use of 25G and 29G spinal needles. Acta Anaesthesiol Scand. 1990; 34: 350-3.
20. Lybecker H, Moller JT, May O, Nielsen HK. Incidence and prediction of postdural puncture headache: a prospective study of 1021 spinal anesthesias. Anesth Analg. 1990; 70: 389 –94.
21. Ross BK, Chadwick HS, Mancuso JJ, Benedetti C. Sprotte needle for obstetric anesthesia: decreased incidence of post dural puncture headache. Reg Anesth. 1992; 17: 29 –33.
22. Tarkkila PJ, Heine H, Tervo RR. Comparison of Sprotte and Quincke needles with respect to post dural puncture headache and backache. Reg Anesth. 1992; 17: 283–7.
23. Corbey M P et al. Grading severity of postdural puncture headache after 27

gauge Quincke and Whitacre needles. Acta Anaesthesiol Scand. 1997; 41: 779-784.
24. Jack T M. Post partum intracranial subdural haematoma : a possible complication of epidural analgesia. Anaesthesia. 1979; 34: 176-80.
25. Devic A, Sprung J, Patel S, Kettler R, Maitra- D'Cruze A. PDPH in obstetric anesthesia : comparison of 24 gauge Sprotte and 25G Quincke needles and effect of subarachnoid administration of fentanyl. Reg Anesth. 1994; 19: 222.
26. Lynch J, Krings-Ernst I, Strick K,Topalidis K, Schaaf H, Fiebig M. Use of a 25G Whitacre needle to reduce the incidence of postdural puncture headache. Br J Anaesth. 1991; 676: 690.
27. Buettner J, Wresch K P, Klose R. Postdural puncture headache : comparison of 25 gauge Whitacre and Quincke needles. Reg Anesth. 1993; 18: 166-9.
28. Vallejo M C, Mandell G L, Sabo D P, Ramanathan S. Post-dural puncture headache : randomized comparison of five spinal needles in obstetric patients. Anesth Analg 2000 ; 91: 916-20.
29. Shah A, Bhatia, Tulsiani. Postdural puncture headache in Caesarean Section - A Comparative Study Using 25G Quincke, 27G Quincke And 27G Whitacre Needle Indian J. Anaesth. 2002; 46(5): 373-77.
30. Shah VR, Bhosale GP. Spinal anaesthesia in young patients: evaluation of needle gauge and design on technical problems and postdural puncture headache. S Afr J Anaesthesiol Analg 2010; 16(3) : 24-28.
31. Tanveer Baig. Comparison of 25G Cutting with Noncutting Needles for Postdural Puncture Headache in Obstetric Patients. J Anesth Clin Res. 2014; 10(5): 1-3.
32. Lesser P, Bembridge M, Lyons G, MacDonald R. An evaluation of 30gauge needle for spinal anesthesia for Cesarean section. Anesthesia. 1990;45:767–8.
33. Cappe, B.E. and Park, N.M.; "Prevention of post spinal headache with a 22 gauge pencil point needle and adequate hydration". Anaesthesia and analgesia current Researches, 39: 463-65, 1960.
34. Holst D, Möllmann M, Ebel C, et al. In vitro investigation of cerebrospinal fluid leakage after dural puncture with various spinal needles.Anesth Analg 1998;87:1331–5.