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Comparison of Post Dural Puncture Headache with 23G, 25G and 27G quincke needle in Caesarean section

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Abstract

Background: Post dural puncture headache (PDPH) is a common and incapacitating complication of spinal anesthesia, with higher incidence in obstetric patients, affects postoperative wellbeing of mother as well as child. The study was undertaken to compare incidence and severity of post dural puncture headache in caesarean section after spinal anesthesia using 23G, 25G and 27G quincke needle. *Methodology:* 150 patients of ASA grade I or II undergoing emergency or elective caesarean section were selected and randomly divided in to 3 equal (50 in each) groups; A, B and C and received spinal anesthesia with 23G, 25G and 27G spinal needle respectively. No. of trials, time to get successful puncture and time to achieve T6 block recorded. Incidence, onset, severity and duration of PDPH recorded postoperatively. *Results:* Incidence of PDPH was 20%, 6% and 0% in group A, B and C respectively. Onset and duration of PDPH were 34.60 (+ 4.427) hrs and 5.90 (+ 0.876) days in group A and 39.33 (+ 3.055) hrs and 4.67 (+0.577) days in group B respectively. 2 patients in group A had moderate and rest had mild PDPH. 6 patients in group A, 10 patients in group B and 14 patients in group C required >1 trial. Time taken for successful puncture was 21.8 (+9.833), 44.08 (+14.251) and 92.72 (+12.420) sec in groups A, B and C respectively. Time to achieve T6 level was 4.08 (+1.226), 6.22 (+1.112) and 7.14 (+1.16) min in group A, B and C respectively. *Conclusion:* Incidence of PDPH was significantly lower with 27G and 25G than in 23G spinal needles.

Keywords: Post dural puncture headache (PDPH); spinal anesthesia; caesarean section; spinal needles.

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Introduction

Spinal anaesthesia also known as subarachnoid block is first demonstrated by German surgeon Karl August Bier in 1898 [1,2,3,4], by injecting cocaine in intrathecal space, himself and his assistant and both felt severe headache [4]. Thereafter, it became popular technique of anaesthesia, especially in infraumbilical surgeries [2] as it is simple to perform, has rapid onset of action and reliable effect and avoids complications of general anaesthesia like aspiration pnuemonitis, failed intubation, respiratory depression etc.

Spinal anaesthesia is the first choice of anaesthesia in obstetric patients undergoing caesarean section, if not contraindicated, as it is easy to perform, has

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rapid onset and dense neuraxial block, reliable effect, safe to mother as well as fetus, no interference with airway, conscious mother, associated with less blood loss, excellent operative condition [2,5,6]. But, post-dural puncture headache (PDPH) is the most common and incapacitating complication of spinal anaesthesia [1,6], which increases post-operative morbidity, increases hospital stay and cost, increases workload of physician and affects mother and child care. PDPH occurs due to cerebro spinal fluid (CSF) leakage from dural puncture [4,7,8]. Patients undergoing lower segment caesarean section are at high risk for development of PDPH due to female gender, young age, high estrogen level, high peri-dural pressure [1,4,9,10-13].

The size of the needle is the principle factor which can be considered for the development of PDPH [1,14]. So, reduction in needle size may lead to decrease in the incidence of PDPH. But we should balance between risk of PDPH and technical difficulties with thinner needles. This prospective doble blinded study was undertaken to compare incidence and severity of PDPH in caesarean section after spinal anaesthesia with 23G, 25G, 27G quincke spinal needle. Secondary goal was to compare technical difficulties like no. of trials, time to achieve surgical anaesthesia, time to get successful lumbar puncture with these needles.

Methodology

A prospective observational double blinded study was conducted in the anaesthesia department of GMERS medical college and hospital Junagadh after getting approval from Institutional Ethics Committee on the patients undergoing elective or emergency lower segment caesarean section. We have taken patients with full term pregnancy with single fetus and ASA grade I or II patients from age group 20-30 yrs. Selected patients were divided randomly in to three groups i.e. group A (23G), group B (25G) and group C (27G), 50 patients in each group. Exclusion criteria were patients with deformities of spine, coagulopathies, infection at local site of injection, cardiac or neurological disorders, compromised fetus, pregnancy induced hypertension (PIH).

After taking verbal and written informed consent, all patients were evaluated thoroughly preoperatively. Monitoring gadgets applied and preoperative electrocardiogram, heart rate (HR), systolic and diastolic blood pressure, mean arterial pressure (MAP), oxygen saturation (SpO_2) was recorded. Intravenous line secured and ringer lactate started foe preloading. Premedication given with glycopyrrolate 0.2 mg, ranitidine 50 mg, ondansetron 4 mg and metoclopramide 10 mg slow intravenously. Adequate preloading done with 500-1000 ml of ringer lactate in all patients.

Spinal anaesthesia given with inj. Bupivacaine 0.5% 2-2.5 ml, at L3-L4 space, in left lateral position by 23G (group A), 25G (group B) or 27G (group C) after taking all the aseptic precautions. Spinal anaesthesia performed by same anaesthesiologist in all patients in all three groups. Patients were not aware of the size of the spinal needle used. Time to get successful puncture was recorded from insertion of needle to getting cerebro spinal fluid (CSF). Oxygen was given via nasal prongs at the rate of 5 l/min till baby delivery. Level of block is checked every minute by pin prick method up to 10 minutes. Surgery started after achieving sensory block up to level of T6. Time to get T6 block is noticed. Hypotension and bradycardia treated with mephentermine 5 mg and atropine 0.6 mg intravenously.

Postoperatively patients were visited 6 hourly for first 24 hours and then 12 hourly for up to 72 hours for the presence or absence of PDPH. PDPH is differentiated from other headaches by frontal, occipital or generalized headache exacerbated in sitting or standing position, coughing or sneezing and relieved in supine position. Patients having PDPH asked further for the time of onset of symptoms and severity of headache. Severity of headache was categorized mild, moderate or severe according to Lybecker classification [15] (Table 1).

Patients who developed PDPH were treated by strict bed rest, additional intra venous fluids, NSAIDs like diclofenac or paracetamol. Opioids added if headache is not relieved by these measures. Severe PDPH requires epidural blood patch but that is not required in any patients in our study. These patients were discharged after headache subsided completely. Duration of headache also recorded. Anaesthesiologist collecting data was blinded to the group of the patient.

Demographic profile, onset, duration, time to get successful puncture and time achieve T6 sensory block were expressed as mean and standard deviation (SD) and compared using ANOVA test. The discrete data like ASA status, incidence and no of trials were assessed by numbers and percentage and differences between groups have been determined by Chi-square test.

Results

A total 150 patients undergoing emergency or elective caesarean section were studied. Demographic profile and baseline vitals are comparable in three groups with no significant difference statistically (Table 2).

As per shown in Table 3, out of 150 patients, total 13 patients (8.6%) had PDPH, 10 patients (20%) in group A and 3 patients (6%) in group B. No patient felt PDPH in group C with 27 G spinal needle. Incidence of PDPH was significantly higher in group A then group B and C. Among these 13 patients, 2 from group A had moderate PDPH and rest 11 patients had mild PDPH. Onset of headache was on first or second postoperative day in both groups. Range of duration of PDPH was 4-7 days. Differences in onset, duration and severity of PDPH were statistically not significant.

Table 4 shows the technical difficulties faced in the three groups. Time to get successful puncture and time to achieve T6 sensory blockade were significantly longer in group C then in group A and B and in group B then in group A. Differences between no of patients requiring >1 trial were not significant statistically in three groups.

Table 1: Lybecker classification

Category	Signs and symptoms
Mild	Postural headache with slight restriction of daily activity Not bedridden No associated symptoms Responds well to non-opiate analgesics
Moderate	Postural headache with significant restriction of activity Bedridden part of the day With or without associated symptoms Requires addition of opiate derivatives
Severe	Postural headache with complete restriction of activity Bedridden all day Associated symptoms present Not responsive to conservative management

Table 2: Demographic profile and baseline parameters

Parameter	Group A (23G) (n = 50)	Group B (25G) (n = 50)	Group C (27G) (n = 50)	P value
Age (yrs) Mean + SD	25.32+ 2.614	25.80 + 2.914	25.30 + 2.985	0.99
MAP (mmHg) Mean + SD	82.30 + 5.108	82.58 + 5.873	81.62 + 6.356	0.69
HR (beats / min) Mean + SD	84.80 + 8.310	84.76+ 7.708	84.24 + 8.248	0.92
SpO2 (%) Mean + SD	98.62 + 0.602	98.64+ 0.563	98.60 + 0.606	0.94
ASA gr I/II	16/34	14/36	15/35	0.90

SD=Standard deviation, ASA=American Society of anaesthesiologists; p value <0.05 significant

Table 3: Incidence, severity and onset and duration of PDPH

	Group A (23G) (n = 50)	Group B (25G) (n = 50)	Group C (27G) (n = 50)	P value
Incidence n (%)	10 (20%)	3 (6%)	0	0.03
Onset (hrs) Mean + SD	34.60 + 4.427	39.33+ 3.055		0.4
Severity (n) Mild Moderate	8 2	3 0		0.4
Duration (days) Mean + SD	5.90+ 0.876	4.67 + 0.577		0.32

SD=Standard deviation, p value <0.05 significant

Table 4: Technical difficulties

	Group A (23G) (n = 50)	Group B (25G) (n = 50)	Group C (27G) (n = 50)	P value
No. of trials (n) >1/1	6/44	10/40	14/36	0.13
Time to get successful puncture (sec) Mean + SD	21.08 + 9.833	44.08 + 14.251	92.72 + 12.420	0.001
Time to achieve T6 block (min) Mean + SD	4.08 + 1.226	6.22 + 1.112	7.14 + 1.161	0.001

SD=Standard deviation, p value <0.05 significant

Discussion

Post dural puncture headache (PDPH) was first noticed by Karl August Bier and his assistant, Hilderbrand, when he attempted spinal anaesthesia himself and his assistant. Both felt severe head ache and vomiting for 9 days [1,2,3,4]. Since that time PDPH is still important matter of concern for anaesthesiologists as it affects post operative recovery significantly.

Post-dural puncture headache occurs due to low CSF pressure because of CSF leakage through dural puncture hole by spinal needle, inadequate secretion of cerebro spinal fluid by choroid plexus and withdrawal of CSF due to negative pressure in epidural space leads to further reduction in CSF pressure [2,4]. Mechanisms behind PDPH are due to reflex vasodilatation of meningeal vessels and due to traction on pain sensitive intracranial structures in sitting or standing position [2,16,17,18]. Larger hole in dura causes more CSF leakage and more time to repair of dural hole. Minimum two weeks are required for repair of dural hole [3,19]. CSF leakage is confirmed by various methods like radionucleotide cisternography [19], radionucleotide myelography, manometric studies, epiduroscopy and direct visualization at laminectomy [18].

Post-dural puncture head ache is characterized by dull pain in fronto-occipital region, radiated to neck and shoulders, exacerbated in sitting or standing position and by activities such as sneezing and coughing which increases intra-cranial pressure [1,6]. It is relieved in supine position. It is mostly mild to moderate in severity, treated by rest, additional fluids, oral analgesics like NSAIDs, opioids and caffeine. Rarely it is very severe, affects general health, and requires epidural blood patch (EBP). Usually symptoms start within 1-3 days and resolves within 5-7 days. Sometimes it lasts for more than 2 weeks.

Predisposing factors for occurrence of PDPH in are female gender, young age, pregnancy, previous history of PDPH, needle size, tip design, bevel direction, no. of attempts of lumbar puncture, approach for lumbar puncture, experience of anesthesiologist etc [1,9-11,13,20-22]. Obstetric patients are particularly at high risk due to many factors like young age, female gender, hormonal imbalance (high estrogen level), increase in intra-abdominal pressure and high peri-dural pressure [1,4,9,10-13]. There is one more theory that after baby delivery there is sudden reduction in intra abdominal and peridural pressure which leads to CSF leakage more than in non obstetric patients [2,23,24].

Overall incidence of PDPH ranges from 0.1-36% [1,6]. It is higher (40%) in obstetric patients. Two Important principle factors responsible for development of PDPH are needle thickness and tip design [2]. Thickness of needle is directly proportional to the incidence of PDPH. It is demonstrated by various authors that pencil point whitacare needle is associated with lower incidence of PDPH than quincke needle [1,4,25]. Still whitacare needle is not popular due to technical difficulties and cost effectiveness [4]. So, quincke needle used in the present study.

In this prospective observational double blinded study, incidence of PDPH was 20% in group A, 6% in group B and 0% in group C. Emad et al. found in their study that incidence of PDPH was 31.7% with 22G, 11.7% with 25G and 0% with 29G quincke spinal needles, in caesarean patients [2]. These are suggestive of lower incidence of PDPH with finer gauge spinal needles. These results are in concordance with our results.

Onset of PDPH in this was either on first or second postoperative day. Mean onset time 34.6 (±4.427) hrs in group A and 39.33 (±3.055) hrs in group B. Malarvizhi et al. observed in their study that no patient felt PDPH after 48 hrs [4]. We have observed all patients till 72 hrs. Patients not having headache were discharged thereafter. Duration of PDPH in the present study was 4-7 days with mean duration of 5.90 (±0.876) days in group A and 4.67 (±0.577) days in group B. Duration was slightly

longer in group A because larger dural hole requires more time to close. Emad et al. also observed similar results in their study. They found mean duration of PDPH 4.3 (1.55) days with no significant difference between 22G and 25G needles [2]. Lynch et al. found shorter duration of PDPH (48h) with 25G than with 22G (57.5h) [26].

Severity of PDPH was found lower in group B. Only 2 out of 10 patients from group A felt moderate PDPH, who required opioids. While in group B, all 3 patients had mild PDPH, which can be controlled with bed rest, additional fluids and NSAIDs. No patients from any group felt severe headache who required epidural blood patch. This result attributed to the theory that small dural hole causes less leakage of CSF.

Our secondary goal was to compare technical difficulties with finer gauge needles. No. of patients required >1 trial are 6 in group A, 10 in group B and 14 in group C. This is suggestive of more technical difficulty with finer gauge needles. Total 8 patients among 13 patients who felt PDPH had >1 trials. So, more no. of trials also associated with increase in the incidence of PDPH. Time taken to get successful puncture and time to achieve T6 level of sensory block were also higher in group B (44.08 sec and 6.22 min) and C (92.72 sec and 7.14 min) than in group A (21.08 sec and 4.08 min). It suggests that finer gauge spinal needles consumes more time in compare to thicker gauge needles. This factor should be considered especially in emergency situations.

Conclusion

In conclusion, spinal anaesthesia using finer gauge spinal needles like 25G and 27G instead of 23G definitely reduces the incidence of post-dural puncture headache in the patients undergoing caesarean section. But use of finer gauge needles is little more time consuming especially 27G spinal needle. So, use of 27G is preferred but time factor should be considered in life saving emergency situations.

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