Original Research Paper Anaesthesiology

Comparison of Incidence of Post Dural Puncture Headache With the Use of 25 & 27 Gauge Quincke Spinal Needles

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ABSTRACT

Aim & Objective: To evaluate the role of needle diameter in causing PDPH in patients undergoing elective caesarean section.

Place and Duration of Study: This study was conducted in Department of Anaesthesia, MGM hospital over one year.

Patients and Methods: Cross sectional study of 60 patients, divided into two separate groups. Group I and Group II were given spinal anaesthesia with 25 and 27 gauge Quincke needles respectively. Randomly selected patients were blind to size of the needle used.

Results: Data was analysed using Chi-square test. p value of <0.05 was considered statistically significant. 3 of 30 patients in Group I and 1 of 30 patients in Group II suffered from post spinal headache.

Conclusion: Proportion of patients with post spinal headache using 25 G Quincke spinal needle is significantly more than those with 27 G Quincke spinal needle.

KEYWORDS: Post spinal headache, lumbar puncture, needle size, cerebrospinal fluid.

INTRODUCTION

Spinal anaesthesia is a widely practiced popular anaesthetic technique for patients undergoing caesarean section. 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]

Headache following spinal anaesthesia ,that is ,PDPH may be incapacitating many a times .The aggravating factors for PDPH are sitting, standing, coughing and straining following spinal anaesthesia and subsides completely when the patient lies down .It is often accompanied by nausea, anorexia, photophobia, diplopia, vertigo and neck stiffness and on rare occasion ,cranial nerve palsies can occur. Rarely, serious complications may occur including subdural haematoma and death from medullary and tentorial coning has also been reported. PDPH usually occurs within the first 3 days of dural puncture and may persist for several weeks or even months causing mental depression in the patients and anxiety in the anaesthetist.

The most important factors influencing the frequency and severity of PDPH are the patient's age and the size of the dural puncture and the number of attempts required for achieving the dural puncture.[4] The parturient is at particular risk of PDPH because of her young age and early ambulation required for feeding and nursing care of the newborn.[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.

AIM & OBJECTIVE

The aim of this study is to compare the frequency, onset, location, duration and severity of PDPH following spinal anaesthesia with 25G Quincke & 27G Quincke spinal needle in obstetric patients posted for caesarean section. Regional anaesthesia has become more popular in caesarean deliveries because most of the parturients prefer being awake during child birth. In addition it is a safer method than general anaesthesia.[1]Subarachnoid block (SAB) is the anaesthesia technique of choice and is the gold standard for caesarean section because of the ease, effectiveness as well as the rapidity in establishing adequate levels of analgesia. In addition, the small amounts of local anaesthetics (LA) administered make placental transfer and foetal uptake of drug negligible compared to other regional techniques.[2]

PATIENTS AND METHODS

After approval by hospital research ethics committee, informed written consent for anaesthesia was taken. 60 patients posted for elective lower segment caesarean sections with ASA grade I and II in age group (20yr-35yr) were enrolled for the study, with 30 patients in each group. The study was carried out as a double blind study from March 2014 to March 2015 in Mahatma Gandhi Mission Hospital, Kamothe, Navi Mumbai. For the study, patients were divided in two groups:

Patient receiving spinal anaesthesia with 25 G Quincke spinal needle	Group I
Patient receiving spinal anaesthesia with 27 G Quincke spinal needle	Group II

INCLUSION CRITERIA

- Age between 20 to 35 years
- ASA physical status class I or II.
- Patients requiring spinal anaesthesia for uncomplicated pregnancy and normal foetal heart rate at the time of surgery.

EXCLUSION CRITERIA

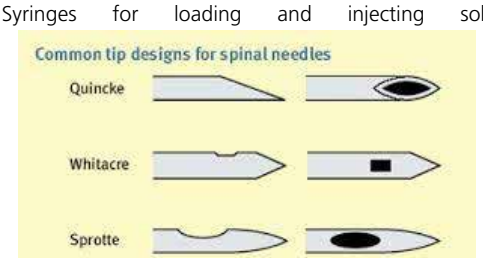
- Patient's refusal
- ASA physical status III and IV
- Co-morbid diseases - cardiac, pulmonary, diabetes, raised intracranial pressure, severe hypovolemia, bleeding coagulopathy, PIH and emergency LSCS for foetal distress.
- Allergy to the drug to be used.
- More than one attempt for lumbar puncture.
- Contra indications of spinal anaesthesia
- Patients with history of migraine or other causes of headache.

Pre-anaesthetic assessment

1. Appropriate patients were selected after preoperative assessment by eliciting proper history and physical examination.
2. Thorough investigations included haemoglobin, complete blood count, bleeding time, clotting time, fasting blood sugar level, chest x-ray, urine routine and microscopic examination, serum creatinine, liver function test (if required).
3. Patients were randomly divided into two groups as described above.

Equipments

1. Intravenous cannula 20G.
2. Syringes for loading and injecting solution.



3. Spirit swabs
4. Tourniquet for IV canula insertion.
5. Anaesthesia machine with vaporizer.
6. Intubation and resuscitation equipments.
7. Local anaesthetic drugs - inj. Bupivacaine 0.5% heavy
8. 25G & 27G Quincke spinal needles
9. Monitors: ECG monitor, Pulse oximeter, NIBP monitor, Manual BP apparatus.

Methodology

- The patients were randomly divided into two groups as designated above and demographic data noted.
- Baseline vital parameters were noted.

PROCEDURE

After obtaining written informed consent, the subjects were divided into two groups by random method. Each group consists of 30 patients: Group I: Patients who will receive spinal anaesthesia with 25G Quincke spinal needle. Group II: Patients who will receive spinal anaesthesia with 27 G Quincke spinal needle. Thorough pre-anaesthetic assessment of patients was done. Patients were premedicated with Inj. Ranitidine 50 mg and Inj. Metoclopramide 10 mg intravenously slowly 1 hour before surgery. In the operating room, ECG and heart rate was monitored by a cardioscope. Blood pressure was monitored non-invasively. Oxygen saturation was monitored by pulse oximeter. All the patients were preloaded with 500 ml Ringer lactate solution prior to spinal anaesthesia. Spinal anaesthesia was administered with a 25 G or 27 G needle after explaining the procedure to the patient. Patient was given sitting position. The back of the patient was cleaned with Povidone Iodine and spirit and draped with sterile towels. Spinal anaesthesia was performed, with the patient being in sitting position, using a midline approach at the L3-L4 or L4-L5 interspaces in the sagittal plane with bevel facing laterally. 2.0 ml of 0.5% hyperbaric bupivacaine was injected in subarachnoid space after obtaining free flow of CSF. After withdrawal of the needle, the patient was made to lie down in supine position with left uterine displacement .Level of sensory blockade and changes in parameters like heart rate, BP was recorded at regular intervals .Solution of Ringer lactate, colloid and blood was transfused as maintenance fluid and also according to the blood loss. Hypotension was treated with Inj. Ephedrine given intravenously. Complications like nausea, vomiting, bradycardia, respiratory depression skin reaction were managed accordingly .After surgery, patient was shifted to post-operative care unit till recovery from spinal anaesthesia.

Anaesthesiologist blinded to the size of needle used, monitored the patients postoperatively. All the patients were interviewed on day 1,2,3,4,5 postoperatively and were questioned as regard to onset of headache, its severity, location, character and duration and associated symptoms like nausea ,vomiting, auditory and ocular symptoms. Post dural puncture headache was defined as:

1. Headache occuring after mobilization.
2. Aggravated by erect or sitting position and coughing, sneezing and snoring.
3. Relieved by lying flat
4. Mostly localized in occipital, frontal region or may be generalized.

Following parameters were monitored:

- Frequency of PDPH: was defined as number of cases of PDPH occurring in each group.
- Time of onset of PDPH: was assessed from 1st post operative day to 4th post operative day in each group.
- Severity of headache: was assessed on 1-4 scale (Crocker 1976).

1. Mild headache: Which would permit long periods of sitting/ erect position and no other symptoms.
2. Moderate headache: which makes it difficult for the patient to sit upright for more than half an hour. Occasionally headache may be accompanied by nausea, vomiting, auditory and ocular symptoms.
3. Severe headache: immediately upon getting up from bed, alleviated while lying horizontal in bed. Often accompanied by nausea, vomiting, ocular and auditory symptoms.
4. Intense headache: which can occur even while lying horizontal in bed and greatly aggravated immediately upon standing up, eating could be impossible because of nausea and vomiting.

The severity of headache will also be graded on a 0-10 verbal numerical analogue scale (0-no pain and 10-worst pain imaginable).

Location of Headache: was defined according to the area or region where the headache is present in the patient, that is, Frontal, Generalized or Occipital.

V. Duration of PDPH: was assessed according to the number of hours for which PDPH persists postoperatively.

VI. Other Complications of Spinal Anaesthesia If Any. If headache was reported, patients were managed with bedrest, enhanced fluid intake, analgesics and avoidance of straining and the follow up was continued till headache gets resolved or up to 7 the post operative day. The observations were noted and results were statistically analysed and interpreted.

OBSERVATION AND RESULT

Table 1: Frequency of PDPH

Total	Group		27 Gauge Spinal Needles 25 Gauge Spinal Needles		
56	27	29	Count	Absent	Frequency of PDPH
93.3%	90.0%	96.7%	%		
4	3	1	Count	Present	
6.7%	10.0%	3.3%	%		
60	30	30	Count	Total	
	100.0%	100.0%	100.0%	%	
Z = 2.471, p < .05, Significant					

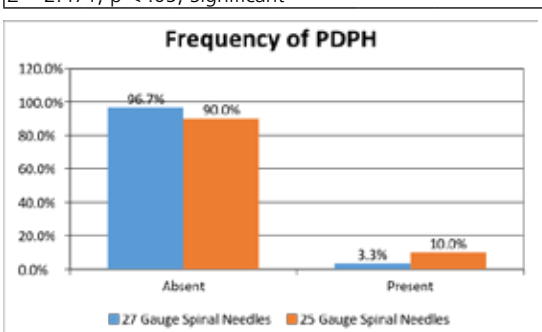


Fig 1: The proportion of PDPH in 27 Gauge spinal needles group was 3.3% whereas the proportion of PDPH in 25 Gauge Spinal Needles was 10%. The Z test for proportion indicates a significant higher proportion in the 25 Gauge Spinal Needles group (p <0 .05).

DISCUSSION

Post dural puncture headache (PDPH) is a complication of puncture of the dura mater (one of the membranes that surround the brain and spinal cord). Leakage of cerebrospinal fluid through the dura mater puncture causes reduced fluid levels in the brain and spinal cord, and may lead to the development of PDPH hours or days later. It occurs so rarely immediately after puncture that other possible causes should be investigated when it does. The headache is severe and involving the back and front of the head, and spreading to the neck and shoulders, sometimes involving neck stiffness. It is exacerbated by movement, and sitting or standing, and relieved to some degree by lying down. Nausea, vomiting, pain in arms and legs, hearing loss, tinnitus, vertigo, dizziness and paraesthesia of the scalp are common. PDPH typically occurs hours to days after puncture and presents with symptoms such as headache (which is mostly bi-frontal or generalized or occipital) and nausea that typically worsen when the patient assumes an upright posture. The rate of PDPH is higher with younger patients, complicated or repeated puncture, and use of large diameter needles, in females, in pregnancy, and with darker skin. Modern, atraumatic needles such as the Sprotte or Whitacre spinal needle leave a smaller perforation and reduce the risk for PDPH.[3-5,7,8]

Cerebro spinal fluid (CSF) leakage from the dural hole produces CSF hypotension, which in turn leads to intracranial venous dilatation resulting in an increase in brain volume in the upright position. There occurs a difference in CSF volume and also pressure differential between the intracranial and intravertebral part of the subarachnoid space. Venous dilation and compensatory increase in brain volume will result in brain sag which in turn will exert traction and stimulate pain sensitive anchoring structures like dural vessels, basal dura and tentorium cerebelli, causing post spinal headache. Larger the hole in dura mater, more will be the leakage of CSF and longer the time required for repair. Size and number of holes in the dura make a difference in the loss of CSF. It takes about 2 weeks or more for the holes to seal. The most important factor contributing to the higher incidence of PDPH was the gauge, type of needles used and entrance angle of the needle to the longitudinal axis of the spinal cord.[3]

Comparison of frequency of PDPH: While analysing the frequency of PDPH in our study, it is seen that the proportion of PDPH in Group I was 10% whereas the proportion of PDPH in Group II was 3.3%.Thus, it shows that the proportion of PDPH was significantly higher in Group I as compared to Group II ($p<0.05$). (Table 1) Similarly, Muzcuri S et al in their study of PDPH following spinal anaesthesia for caesarean section reported that the use of smaller gauge needles resulted in less incidence of post spinal headache. The incidence of PDPH was 6% with the use of 25 G and 2% with 27 G spinal needle.

Muhammad SK etal[8] in their study compared the frequency of Post dural puncture headache in obstetrics using 25G Whitacre & 27G Quincke needles in which the incidence was higher in 25G Whitacre group; Shutt LE etal[7] in their study compared the frequency of PDPH 22 gauge and 25 gauge Whitacre needle with 26 gauge Quincke needles, the incidence of frequency of headache being higher in 22G than in 25G and higher in 25G than in 26G; Shah et al in their comparative study using 25G, 27G Quincke and 27G Whitacre needles demonstrated incidence of PDPH to be 20% ,12.5% and 4.5% respectively and concluded that the frequency of PDPH was less with 27G Whitacre needle. When onset of PDPH was compared in both groups, in Group I (25 G), 2 out of 3 patients who developed PDPH had its onset on POD 2 (66.7%) and 1 out of 3 patients who developed PDPH had its onset on POD 3(33.3%).

In Group II (27G), 1 out of 1 patient who developed PDPH had its onset on POD 2 (100%). Thus, there was no significant difference in the onset of PDPH between the two groups ($p>0.05$). When severity of PDPH was compared in both groups, in Group I (25 G),2 out of 3 patients who developed PDPH had mild severity of headache(66.7 %) and 1 out of 3 patients who developed PDPH had moderate severity of headache(33.3%) (Figure 1).

In Group II(27 G),1 out of 1 patient who developed PDPH had mild severity of headache (100 %). Thus, there was no significant difference in the severity of PDPH between the two groups($p>0.05$). When location of PDPH was compared in both groups, in Group I (25 G), 2 out of 3 patients who developed PDPH had frontally located headache (66.7%) and 1 out of 3 patients had generalized location of headache (33.3%).

In Group II (27G), 1 out of 1 patient who developed PDPH had frontally located headache (100%). Thus, there was no significant difference in the location of PDPH between the two groups ($p>0.05$). When duration of PDPH was compared in both of groups, in Group I (25G), 2 out of 3 patients who developed PDPH had it for less than 24 hours (66.7%) and 1 out of 3 patients who had PDPH had it for 25-48 hours (33.3%). In group II(27G) ,1 out of 1 patient who developed PDPH had it for less than 24 hours (100%)Thus, there was no significant difference in location of PDPH between the two groups ($p>0.05$).

CONCLUSION

The frequency of post dural puncture headache is significantly reduced by using a smaller gauge Quincke needle, i.e. 27 Gauge as compared to a larger sized Quincke needle ,i.e. 25 Gauge. The use of smaller diameter needle will cause less CSF leakage through human dura and this CSF leakage is the contributing cause of the PDPH associated with spinal anaesthesia. Thus, the role of needle diameter is significant in causing PDPH in patients undergoing elective LSCS. There was no significant difference in time of onset of PDPH, severity of PDPH, location of PDPH and duration of PDPH by using smaller gauge 27 G Quincke needle and larger sized 25 G Quincke needle.

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