Original Article

Incidence of Postdural Puncture Headache after Caesarean Section Comparison Between 25G and 27G Quincke Variety of Spinal Needle

Rahman MA[1], Alam ABMM[2], Mandal MA[3], Kamruzzaman M[4], Kabir MA[5], Begum SA[6], Karmakar CS[7]

Abstract

Background: *Post dural puncture headache is related to the size as well as type of the spinal needle used[90]. It is progressively reduced with the use of thinner Quincke type spinal needles.*

Objective: *This was a Quasi-experimental study to compare the incidence of post dural puncture headache after caesarian section with spinal anaesthesia by two typys of needles named 25G and 27G Quincke varities.*

Methods: *This study was conducted in the Department of Anaesthesiology of Shaheed Shurawardy Medical College Hospital, Dhaka. A total number of 60 adult patients with ASA physical status I & II scheduled for elective surgical caesarian section under spinal anaesthesia were enrolled in this study. Patients were randomly allocated equally, 30 in each group into two groups I and II. Patients of Group I, II received 25G and 27G quincke variety of spinal needle respectively. The randomization was double blind except for the anaesthetist performing spinal block. Patient, surgeon and the assessor in the ward was aware of the study. Spinal anaesthesia was performed with 2.0-2.5 ml 0.5% hyperbaric bupivacaine using 25G Quincke spinal needle (Group I),and 27G Quincke spinal needle (Group II) at L3-4 inter-vertebral space. Each patient was assessed daily for four consecutive days following Caesarean section. Incidence and severity of postdural puncture headache (PDPH) was recorded.*

Result: *Seven (7) out of 60 patients developed PDPH giving an overall frequency of 11.6% (Table-2). Frequency of PDPH was 16.7% (5/30) in Group I, 6.7% (2/30) in Group II. In Group I, PDPH was mild in 3 patients (60%), moderate in 1 patient (20%) and severe in 1 patient (20%). In Group II, it was mild in 2 (100%), moderate in 0 and severe in 0 patient. Moderate and Severe PDPH was not observed with 27G Quincke spinal needle (Group II). None of the 60 patients with PDPH required an epidural blood patch. Symptoms were relieved by conventional means in all patients.*

Conclusion: *In current practice epidural blood patch has the highest cure rate for management of PDPH and is usually very well tolerated by majority of patients. Overall, we concluded that when performing spinal anaesthesia for Caesarean section, 27G Quincke spinal needle has definite advantage over 25G Quincke spinal needles as far as frequency and severity of PDPH is concerned. Therefore we recommend routine use of the 27G Quincke spinal needle when performing spinal anaesthesia for Caesarean section.*

Key Words: *PDPH, Caesarean Section, 25G and 27G spinal needle.*

1. Dr. Md. Afzalur Rahman, Junior Consultant, Dept. of Anesthesiology, Kaliakor Healthcomplex, Gazipur.
2. Dr. ABM Muksudul Alam, Professor & Head, Dept. of Anesthesiology, ShSMCH, Dhaka.
3. Dr. Muhammad Alamgir Mandal, Assistant Professor, Dept. of Physical Medicine & Rehabilitation, KYAMCH, Sirajgonj.
4. Dr. Mostofa Kamruzzaman, Assistant Professor, Dept. of Neurology, ShTAMCH, Gazipur.
5. Dr. Md. Asraful Kabir, Junior Consultant, Dept. of Anesthesiology, ShSMCH, Dhaka.
6. Dr. Sharmin Ara Begum, MO, Dept. of Anesthesiology, ShSMCH, Dhaka.
7. Dr. Chandra Shekhor Karmakar, MO, Dept. of Anesthesiology, ShSMCH, Dhaka.

Correspondence: Dr. Muhammad Alamgir Mandal, Assistant Professor, Dept. of Physical Medicine & Rehabilitation, KYAMCH, Sirajgonj.

Introduction

Dural puncture is a commonly performed invasive procedure for various indications like diagnostic lumbar puncture, spinal anaesthesia, myelography and intrathecal chemotherapy. However, in anaesthesia practice apart from intentional dural puncture as in spinal anaesthesia, unintentional dural puncture can also occur while performing epidural anaesthesia or analgesia for various indications, including postoperative and labour pain relief. Carrie and Collins define post dural puncture headache (PDPH) as "a headache occurring after dural puncture and has a significant effect on the patient post operative well being i.e. headache which is not only postural but also continues for more than 24 hours at any level of intensity or so severe at any time that the patient is unable to maintain upright position[1]. When headache appears in the postoperative or postpartum period after regional anaesthesia it can be due to many reasons, rather as a complication of dural puncture during regional anaesthesia. However the most common cause of an anaesthesia induced headache is PDPH. Dr. Biers suggested that CSF loss caused the symptoms he experienced and his advise is to prevent the loss of CSF as much as possible, as he lost excessive CSF while receiving the experimental spinal block by his assistant who was unable to fit the syringe to the needle during the procedure. Dural response to trauma: It is now claimed that the repair of a dural perforation is facilitated by the fibroblastic proliferation from surrounding tissues and promoted more by the damage to pia, arachnoid, the underlying neural structures and presence of blood clot[2]. So, a careful placement of spinal needle does not promote dural healing, as trauma to adjacent tissue is minimal in this instance. Indeed, it is now observed that bloody taps are less likely to lead to PDPH[3]. Consequences after cutting tip puncture compared to spreading bevel: Insertion of needle with cutting bevel parallel to the long axis of the spine decreases the likelihood of PDPH as fewer fibers are cut compared with perpendicular orientation. Tearing of the dura may

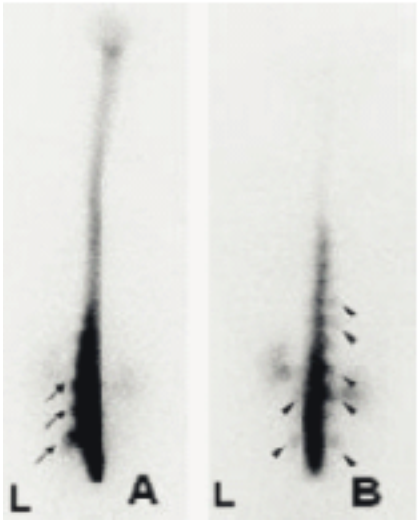


Fig.-1: Radioisotope cisternography images in two patients of PDPH. A. Parathecal activity at lumbar level (arrows). B. Parathecal activity at both lumbar and thoracic levels (arrowheads). L: left side. (Reproduced from Takahashi K, Mima T. Cerebrospinal fluid leakage after radioisotope cisternography is not influenced by needle size at lumbar puncture in patients with intracranial hypotension. CSF Research 2009; 6:5)

occur upon removal of the needle if it is rotated to a perpendicular orientation after insertion. Bevel orientation is not an issue with a traumatic needle as they separate the dural fibers rather than cutting them allowing them to return to their original position with decreased CSF leakage[4]. Theories and mechanisms of PDPH: Puncture of dura has the potential to allow the excessive leakage of CSF which leads to intracranial hypotension due to reduction in CSF volume. After development of PDPH, a CSF leak has been confirmed with radionuclide cisternography (Figure-I), radionuclide myelography, manometric studies, epiduroscopy and direct visualization at laminectomy. There are two possible mechanisms of headache. First, the lowering of CSF pressure causes traction on the intracranial structures in upright position.

These structures are pain sensitive, leading to the characteristic headache. Secondly, the loss of CSF produces a compensatory venodilatation as per the Monro-Kellie doctrine[8]. The consequence of a decrease in CSF volume is a compensatory increase in blood volume. The venodilatation is then responsible for headache.

Table 1: Relationship between needle size and incidence of PDPH.

Needle tip design	Needle gauge	Incidence of PDPH (%)
Quincke	22	36
Quincke	25	3–25
Quincke	26	0.3–20
Quincke	27	1.5–5.6
Quincke	29	0–2
Quincke	32	0.4
Sprotte	24	0–9.6
Whitacre	20	2–5
Whitacre	22	0.63–4
Whitacre	25	0–14.5
Whitacre	27	0
Atraucan	26	2.5–4
Tuohy	16	70

Reducing the size of spinal needle narrower to 31G has made a significant impact on incidence (Table-I)[6]. However, technical difficulties leading to failure of the spinal anaesthetic are common with needles of 29G or narrower. Today the use of fine gauge pencil-point needles has largely reduced the incidence of PDPH (Figure - II). During applying epidurals, the incidence of accidental dural puncture (ADP) is in between 0.7 and 2.6%. The incidence of ADP with a Tuohy needle, unrecognized by CSF visualization, but subsequently diagnosed by onset of PDPH, is 1.8%. PDPH may also be even due to a scratch by the tip of a Tuohy needle on the dorsal dura[7].

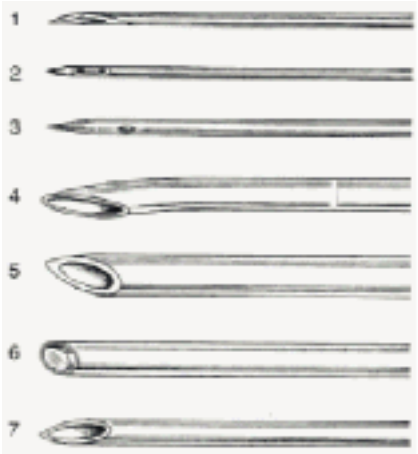


Fig.-2: Graphical representations of needle used for central neuraxial blocks 1. 26G Quincke® medium cutting bevel; 2. 26G Sprotte® pencil point; 3. 22G Whitacre pencil point; 4. 16G Tuohy needle; 5. 17G Barkers needle; 6. Large gauge spinal needle; 7. 18G Crawford needle. Needles 5, 6 and 7 are from the Sheffield Anaesthetic Museum and are an indication of the style of spinal needles used in the past. (Reproduced from Geurts JW, Haanschoten MC. Post-dural puncture headache in young patients. Acta Anaesthesiol Scand 1990; 34: 350-3).

Table2: Estimated rate of spontaneous recovery from postdural puncture headache

Duration (days)	Percentage recovery
1 – 2	24
3 – 4	29
5 – 7	19
8 – 14	8
3 – 6 weeks	5
3 – 6 months	2
7 – 12 months	4

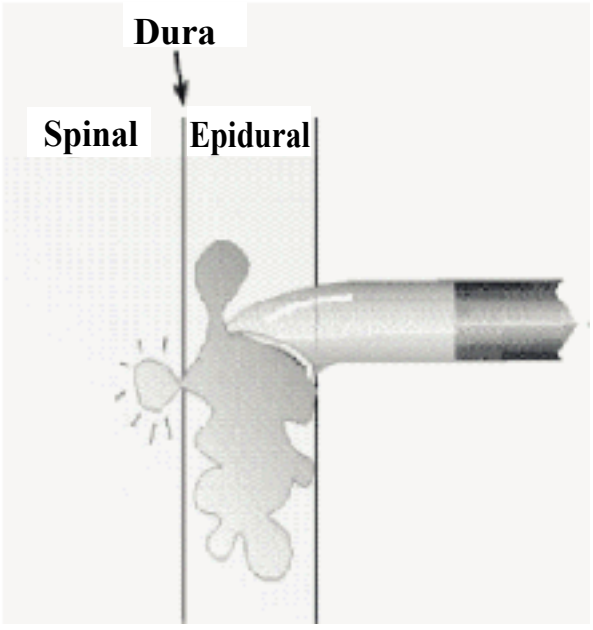


Fig.-3: Unrecogniseddural puncture by Tuohy needle. (Reproduced from Joseph Eldor, MD. Combined Spinal-Epidural Anesthesia. www.csen.com) Diagnosis of PDPH should only be made when other causes of headache are ruled out.

When a headache occurs after spinal or epidural anaesthesia it must be considered potentially serious and should be differentiated from other causes of headache. Awareness must be cultivated thatdural puncture headache is only one of the many causes of headache in postoperative and postpartum period. Careful questioning and physical examination needs to be done for other causes of headache[8]. There are enough evidences that both needle size, and tip design impact the incidence of PDPH. The results of a meta analysis of 450 articles showed reduction of PDPH when: (a) small spinal needle was used compared with a large needle of the same type and (b) non-cutting spinal needles rather than cutting needles were used, unless the discrepancy in needle size is very large[9]. With quincke needle the incidence of PDPH is directly related to the size of the needle used[10]. In general the relative risk of PDPH decreases with each successive reduction in needle diameter. Many clinical trials investigated the relation between size and design of spinal needle and incidence of PDPH. The literature regarding size and shapes of needle has already been reviewed.

Method & Materials

This was a Quasi-experimental study to compare the incidence of post dural puncture headache after caesarian section with spinal anaesthesia by two typys of needles named 25G and 27G Quincke varities. This study was conducted in the Department of Anaesthesiology of Shaheed Shurawardy Medical College Hospital, Dhaka. Patients admitted for elective Caesarean section, in-patients department of Gynaecology & Obstetrics in Shaheed Suhrawardy Medical College Hospital, Dhaka. Sixty (60) patients admitted in-patient department of Gynaecology & Obstetrics in Shaheed Suhrawardy Medical College Hospital, Dhaka who fulfill the inclusion criteria are included in the study.

Inclusion Criteria

1. Uncomplicated pregnancy with normal fetal heart rate
2. Age 18-45 years undergoing elective caesarean section
3. ASA grading I, II.

Exclusion Criteria

1. Patients refusal
2. Contraindication to spinal anesthesia for infection, haemodynamic, haemostatic or neurological reasons.
3. Emergency caesarean section
4. Severe pre-eclampsia or failure of the spinal anesthesia
5. Not willing to participate in this study.

PDPH is defined by the International Headache Society are a headache that develops within 7 days of dural puncture and disappears within 14 days. Mild PDPH-No limitation of activity, No treatment required. Moderate - Limited activity, Regular analgesics required Severe-Confined to bed, Anorexic, Unable to feed baby, Blood patch will be required. The procedure was explained to the patients during pre anaesthetic check up at least twenty-four hours prior to surgery, written informed consent was obtained and a careful physical examination was done to exclude patients with other problems. Patients was randomly assigned to two groups by odd and even number basis. In Group-1 (n1 = 30), SAB was given by 25G quinke type of spinal needle; in Group-2 (n2 = 30), the SAB was given by 27G quinke type of spinal needle. Spinal anaesthesia was performed with 2.0-2.5 ml 0.5% hyperbaric bupivacaine using 25G Quincke spinal needle (Group I), and 27G Quincke spinal needle (Group II) at L3-4 inter-vertebral space. Each patient was assessed daily for four consecutive days following Caesarean section. Incidence and severity of postdural puncture headache (PDPH) was recorded. All patients were fasting for 10-12 hours and received ranitidine 150 mg orally on the morning of surgery. On arrival in the operation theatre, patients was positioned supine with left lateral displacement by putting a wedge under the right hip. A pulse oximeter and an automated non-invasive arterial blood pressure monitor was applied. Baseline systolic, diastolic and mean arterial pressures were noted. A fluid preload of crystalloid 500-1000 ml was administered via an 18 gauge intravenous cannula over a period of 10-15 minutes before proceeding for

Main Outcome Variables

- PDPH - Yes
- PDPH - No
- PDPH - Mild
- PDPH - Moderate
- PDPH - Severe
- 2.12.0 Study plan (work flow chart)

Ethical clearance was taken from the Institutional ethical body. The purpose and effects of the study was clearly explained to each of the subjects and the confidentiality was ensured. The study was done after taking proper informed written consent. At the end of the day of data collection, individual questionnaire was edited through checking and rechecking to see whether it was filled completely and consistently.

Then the data were entered into the computer, with the help of software SPSS program version 14 by the researcher himself. An analysis plan was developed keeping in view with the objective of the study. Frequency distributions of all continuous variables were checked. For analysis of the study results mean, percentage and standard deviation was used. Cross tabulation was prepared. Chi-square, independent t-test, analysis of variance (ANOVA) and correlation were done to see the association. A value of $P<0.05$ has been taken as statistically significant. The graph was made using software Sigma plot 8.0.

Result

Age, weight, parity and ASA physical status were comparable in the two groups. Seven (7) out of 60 patients developed PDPH giving an overall frequency of 11.6% (Table-2). Frequency of PDPH was 16.7% (5/30) in Group I, 6.7% (2/30) in Group II. In Group I, PDPH was mild in 3 patients (60%), moderate in 1 patient (20%) and severe in 1 patient (20%). In Group II, it was mild in 2 (100%), moderate in 0 and severe in 0 patient. Moderate and Severe PDPH was not observed with 27G Quincke spinal needle (Group II). None of the 60 patients with PDPH required an epidural blood patch. Symptoms were relieved by conventional means in all patients. Day of onset of PDPH in the two groups is given in Table-5. Ages of the patients were divided into three groups. 12 patients were <20 years of age (20%), 35 patients were <21-30 years of age (58.3%), 13 patients were >30 years of age (21.7%). No relationship was found between age of the patients and PDPH. Weights of the patients were divided into three groups. 34 patients were <65 kg weight(56.7%), 22 patients were <65-74 kg weight (36.7%), 4 patients were >75 kg weight (6.7%). No relationship was found between weight of the patients and PDPH.

Table 3: Comparison of basic characteristics of participants in relation to two experimental groups

	Group-1	**Group-2**	***p*-value**
	25G Quincke	27G Quincke	
Age (yrs) Means±SD	25.6±5.61	26.5±4.52	0.074 (NS)
Weight (Kg) Means±SD	66.0±6.28	64.4±5.85	0.489 (NS)
Parity			
Primipara	13 (43.3%)	12 (40%)	
Multipara	17 (56.7%)	18 (60%)	0.793 (NS)
Physical Status			
ASA 1	20 (66.7%)	16 (53.3%)	
ASA 2	10 (33.3%)	14 (46.7%)	0.292 (NS)

Table 4: Total incidence of PDPH

PDPH	Frequency	Percentage (%)
Present	7	11.6
Absent	53	88.4

Table 5: Comparison of outcomes (PDPH) in relation to two experimental groups

PDPH	Group -1 (n=30)	Group -2 (n=30)	p - value
	25G Quincke	27G Quincke	
Present	5 (16.7%)	2 (6.7%)	
Absent	25 (83.3%)	28 (93.3%)	0.228 (NS)

Table 6: Comparison of different types of PDPH in relation to two experimental groups

PDPH	Group -1 (n=30)	Group -2 (n=30)	p - value
	25G Quincke	27G Quincke	
Mild	3 (60%)	2 (100%)	
Moderate	1 (20%)	0	
Severe	1 (20%)	0	0.571 (NS)

Table 7: Onset of PDPH

Onset (POD)	Group -1 (n=30) 25G Quincke n%	Group -2 (n=30) 27G Quincken %	p - value
1st POD	2	1	0.438 (NS)
2nd POD	2	1	
3rd POD	1	0	
4th POD	0	0	

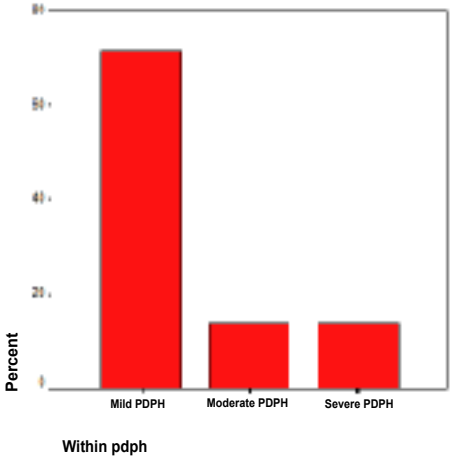
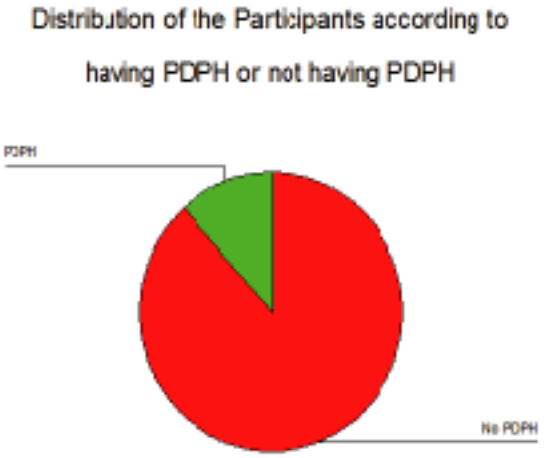


Figure 4: Distribution of the participants according to different types of PDPH

Among all having PDPH about 71% are represent as Mild, 14.5% as Moderate and another 14.5% as Severe.



PDPH = 11.7%
No PDPH = 88.4%

Figure 5: Distribution of the participants according to having PDPH or not having PDPH

Among all participants 11.7% was suffered from PDPH and 88.3% had not complain any type of PDPH

Table 8: Distribution of the participants according to age groups

Age Groups	Frequency	Percent
<20 years	12	20.0
21 –30 years	35	58.3
>30 years	13	21.7
Total	60	100.0

Mean Age: 26.06±5.07
Minimum Age: 18
Maximum Age: 38

Table 9: Distribution of the participants according to weight groups

Weight Groups	Frequency	Percent
55 – 64 Kg	34	56.7
65 – 74 Kg	22	36.7
75 – 84 Kg	4	6.7
Total	60	100.0

Mean Weight: 65.23±6.07
Minimum Age: 55
Maximum Age: 84

Table 10: Comparison of outcomes (PDPH) in relation to age groups

PDPH	<20 years	21 – 30 years	>30 years	*p* value
Absent	11 (20.8%)	29 (54.7%)	13 (24.5%)	0.239 (NS)
Present	1 (14.3%)	6 (85.7%)	0 (0%)	

Table 11: Comparison of outcomes (PDPH) in relation to weight groups

PDPH	55 – 64 Kg	65 – 74 Kg	75 – 84 Kg	*p* value
Absent	28 (52.8%)	21 (39.6%)	4 (7.5%)	0.248 (NS)
Present	6 (85.7%)	1 (14.3%)	0 (0%)	

Discussion

General anaesthesia for Caesarean Section is associated with an increased risk of maternal mortality11. It is therefore a popular practice to use regional anaesthesia wherever possible12. Headache after dural puncture is a complication of spinal anaesthesia and is believed to result from leakage of CSF both at the time of dural puncture and, probably more importantly, continuing leak afterwards13. Post dural puncture headache is a complication that should not be treated lightly. There is the potential for considerable morbidity due to postdural puncture headache14 and there are reports of PDPH symptoms lasting for months or years15, untreated PDPH leading to subdural haematoma16, and even death from bilateral subdural haematomas17. Therefore anaesthesiologists are advised to prevent PDPH by optimizing the controllable factors like spinal needle size as well as shape while conducting spinal anaesthesia18. Obstetric patients are at high risk of PDPH, being female and under 40 years of age19. Indeed, the highest incidence of PDPH is in the parturient and may partly explain the higher incidence of PDPH in females as a whole20. 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[21]. Apart from other factors, post dural puncture headache is related to the size as well as type of the spinal needle used[22].

It is progressively reduced with the use of thinner Quincke type spinal needles[23]. 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 post dural puncture headache than cutting needle tip designs[24]. The overall incidence of postdural puncture headache ranges from 0% to 37% as reported by various authors[25]. Reported frequency of PDPH ranges from 4% 24 to 40% 25 when 25G Quincke spinal needle is used in young females. Ross et al 27 reported PDPH in 9% of patients. In the study by Roheena and colleagues[26], severity of PDPH was from mild to moderate. None of the patients complained of severe PDPH. It was more on the 1st postoperative day and gradually decreased on the subsequent days. Incidence of PDPH with 27 gauge Quincke needle ranges from 1.1%27 to 12.8%[27].

However, in a recent study by Muhammad, et al.[28], frequency of PDPH was 0% with 27G Quincke spinal needle when spinalanaethesia was administered for Caesarean section. In a study by Viitanenet, al.[29], PDPH incidence was 8.5%. It was mild in 4%, moderate in 3% and severe in 1% of patients. Symptoms started on first or second day after spinal injection and lasted for 3 days. In our randomised study, the frequency of PDPH was 16.7% with 25G Quincke needle, 6.7% with 27G Quincke needle. PDPH was severe in 1 patients in Group I and Severe PDPH was not observed with 27G Quincke spinal needle (Group II). Our study, therefore, clearly demonstrated a significant reduction in frequency of PDPH when 27G Quincke spinal needle was used as compared to 25G Quincke spinal needles. However, a study by Shah and collegues[30], which closely resembles our study, demonstrated PDPH incidence of 20%, and 12.5% patients with 25G Quincke, and 27G Quincke needles respectively. Although frequency of PDPH was relatively higher in all the three groups in that study, it was again clearly observed that 27G Whitacre needle reduced the frequency of PDPH in patients undergoing Caesarean section. There also not taken into account whether the patient had any other medical problem causing headache. An important limitation of our study is that we only studied elective patients. So we could not able to test the situation in emergency cases.

Conclusion

Although PDPH is a self limiting and nonfatal condition, its postural nature prevents the patient from performing routine activity and many make them anxious and depressed. Therefore these patients require psychological support and a lot of reassurance in addition to therapeutic measures. Preventive measures like smaller needle size, shape of needles and direction of needle bevel in relation to dural fibers, should always be considered with the hope to decrease the incidence of PDPH. Overall, we concluded that when performing spinal anaesthesia for Caesarean section, 27G Quincke spinal needle has definite advantage over 25G Quincke spinal needles as far as frequency and severity of PDPH is concerned. Therefore we recommend routine use of the 27G Quincke spinal needle when performing spinal anaesthesia for Caesarean section.

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