Section: Anaesthesiology

Original Research Article

INCIDENCE OF POST-DURAL PUNCTURE HEADACHE WITH MEDIAN AND PARAMEDIAN APPROACH IN CESAREAN SECTION

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Abstract

Background: Post-dural puncture headache (PDPH) is an iatrogenic complication of spinal anesthesia. Reported risk factors for PDPH include sex, age, pregnancy, needle tip shape and size, bevel orientation, approach and others. Little is known regarding the effect of different approaches on the incidence of PDPH. The least hemodynamic effects and adverse effects during caesarean delivery. In this study we aimed to compare the incidence of PDPH in the case of median and paramedian approaches in patients undergoing spinal anesthesia for lower segment caesarean section. **Materials and Methods:** Patients scheduled for lower segment caesarean section under spinal anesthesia were studied in a double-blinded randomized controlled trial. The patients were randomized to receive spinal anesthesia by either a median (n=50) or paramedian (n = 50) approach through a 23-gauge Quincke needle. Inj. Ondansetron 4 mg and inj. Ranitidine 50 mg been given 30 minutes before the procedure as premedication and all patients received 500 mL of normal saline intravenously before the procedure. All patients will receive drug volume of 2.2ml of hyperbaric bupivacaine hydrochloride (11mg) by either a median (Group A, n= 50) or paramedian (Group B, n = 50) approach through a 23-gauge quinke needle placed in the flexed lateral decubitus position. **Result:** Nine patients (18%) developed PDPH. There was no significant difference in the incidence of PDPH in both groups, with 4 (8%) patients in the median approach group versus 5(10%) in the paramedian approach group developing typical PDPH (P= 0.7268). **Conclusion:** There is no difference in PDPH incidence with median versus paramedian approaches, and therefore recommend the paramedian approach, especially for pregnant and short stature patients and those who cannot assume the proper position for the median approach; the easier positioning would result in less pain for the patient and a higher success rate for spinal anesthesia.

INTRODUCTION

Spinal anaesthesia remains one of the basic techniques in the arsenal of the modern anaesthesiologist despite the waxing and waning of its popularity over the 100 years since its introduction into clinical practice.[1-5]

Spinal anaesthesia is used extensively for lower abdominal and lower extremity surgeries because it has distinct advantages over general anaesthesia, minimum physiological disturbance resulting in minimum stress response, optimal operative conditions, minimal intraoperative blood loss and less postoperative morbidity, it is often associated with significant adverse effects like hypotension, bradycardia and post dural puncture headache (PDPH).[6-10]

Ever since its advent, the spread of popularity of spinal anaesthesia has to some extent, been checked by the complications of PDPH.[11,12]

Post-dural puncture headache was first documented by German surgeon.[13,14]

August Bier in 1899. Bier also gained first-hand experience of the disabling headache related to dural puncture. Headache and backache are the dominant symptoms that develop after post-dural puncture. Ninety per cent of headaches will occur within 2-3 days of the procedure.[15,16]

MATERIALS AND METHODS

The present study has been carried out on Patients undergoing lower segment cesarean section under spinal anaesthesia at S.V. Medical College, Tirupati.

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A total of 100 patients are randomized to two groups: groups I and II (n=50 for each group). The procedures were explained to all the patients and the informed consent was taken.

Factors like age, height and weight were considered. All these variables were comparable in the study.

Inclusion Criteria

All patients belonging to the age group 18-60 years with ASA grade I and grade II underwent lower segment cesarean section under spinal anaesthesia.

Exclusion Criteria

1. Patients belonging to ASA grades III, IV and V
2. Patient refusal
3. Liver and renal dysfunction
4. Anatomical abnormalities of the spine.
5. Patients with bleeding and clotting disorders
6. Allergy to drugs
7. History of migraine or any chronic headache preoperatively or on the morning of surgery.
8. More than two dural punctures.
9. Skin and soft tissue infection at the site of needle insertion
10. Severe hypovolemia and shock

Preoperative Assessment

During the pre-operative assessment, emphasis was placed on a history of headaches. Those who had a previous history of headaches were not considered for the study, as were those who were severely apprehensive and those with systemic disease.

Premedication

Inj. Ondansetron 4 mg and inj. Ranitidine 50 mg was given 30 min before the procedure. All patients were kept nil by mouth for a minimum period of 8 hours.

An IV line was secured at a convenient location with an 18G cannula and 500 mL of normal saline was given as pre-loading.

Technique

Lumbar puncture was performed in the flexed lateral decubitus position at L3- L4 interspace using a 23G spinal needle and approach assigned to each group. After the clear and free flow of CSF was noted, Bupivacaine Heavy 0.5% 2.2mL (Bupivacaine hydrochloride in Dextrose {Each ml containing - Bupivacaine hydrochloride [anhydrous] 5mg; Dextrose monohydrate 80mg}) was injected into the subarachnoid space.

Check for adequate block was done by pinprick method using a blunt needle.

Intra-operatively heart, blood pressure and oxygen saturation were monitored.

Side effects of spinal anaesthesia were identified and treated accordingly.

The approach and the number of attempts made to get CSF flow was noted. Patients in whom more than two attempts were made to secure CSF, were excluded from the study.

Post-operative follow-up;

Patients were followed for 3 consecutive days (excluding the day of surgery) for post-dural puncture headache (PDPH).

PDPH was diagnosed if,

The headache had a postural component (aggravated by sitting up and relieved by lying down)

1. It had occipital and/or frontal components.
2. It was relieved by abdominal compression or binder
3. External stimuli like loud noise or light irritated the patient
4. Previously the patient did not have a headache.

Headache was takeninto account even if it was complained once, or if it lasted only a few hours.

Severity of Headache1

The severity of the headache was graded into three categories as follows:

Mild: The patient continuous to be mobile. There is no significant inconvenience and treatment with hydration and small doses of caffeine and paracetamol or other analgesics is usually sufficient.

Moderately Severe: In these patients there is some degree of inconvenience.

The patient regards the headache as significant. The patient is only partially mobile and does like to recline if there has been an exacerbation of the typical type of ache.

Severe: this type of headache causes an interruption of normal activity, and the patient to prefers remain supine. This headache should be treated with an epidural injection of blood, saline or local anaesthetic solution.

We followed the above classification in our study.

Various other classifications have been proposed and employed 12 such as:

Visual analogue scale (VAS): where the headache is plotted on a scale of 0-10 by the patient; 0, being no headache and 10, being the worst possible Functional grading (FG rating):

a. **Slight:** headache not interfering with normal activity.
b. **Moderate:** troublesome that periodic bed rest is necessary to relieve the headache.
c. **Severe:** so intense that it is not possible to sit up and eat

All the patients, who complained of headache, were treated with one or more of the following.

1. Psychological support and positive reassurance of recovery.
2. Confinement to bed and head down position if necessary
3. Application of ice bag to head.
4. General body hydration – administration of large volumes of fluids orally and/or by IV route (ringer lactate, Normal saline)
5. Sedation and or analgesia. Tab.Diazepam 10mg orally, inj.Diclofenac sodium IM
6. Oxygen inhalation

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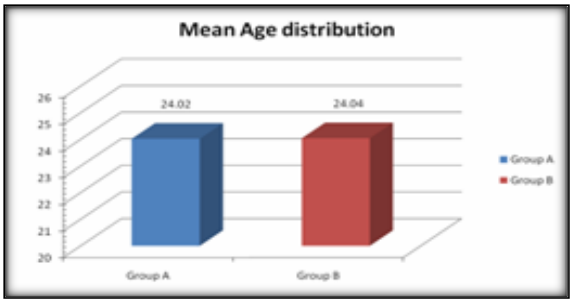
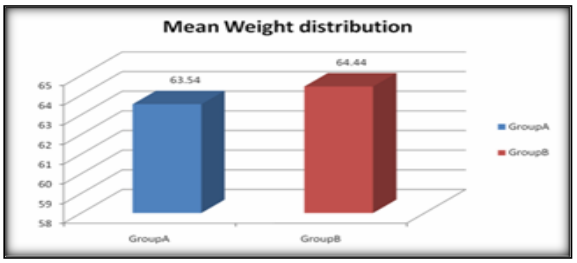
7. Abdominal compression. Use of tight abdominal binder to raise pressure in peridural venous plexus and thereby increase CSF pressure, where possible.

Though one patient complained of severe headaches, she responded to the above measures. The epidural blood patch was not employed in any patient.

The arithmetic mean and standard deviation were calculated wherever applicable. One-way ANOVA was used to analyze the data. Categorical data was analyzed using Fischer's exact test and/or Chi-square test and a P<0.05 was taken as statistically.



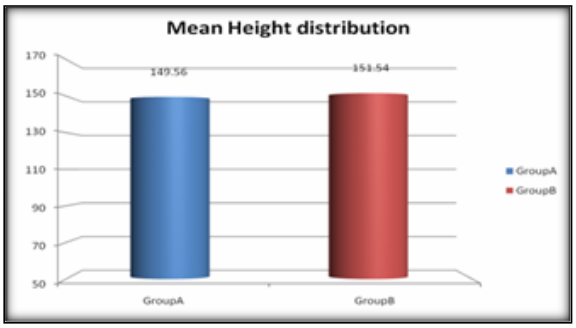


RESULTS

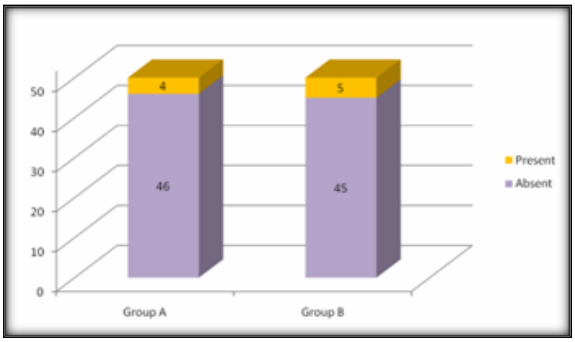
Statistical Analysis: All recorded data were entered using MS Excel software and analysed using SPSS 16 version software for determining the statistical significance.

Analysis of Variance was used to study the significance of mean of various study parameters between the two groups.

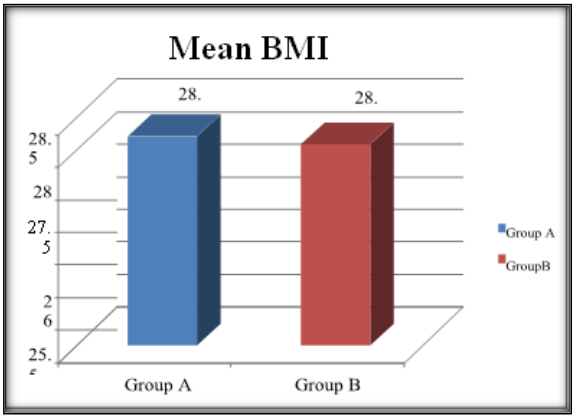
A total of 100 female patients, in the age group of 20-38 were included in the study. They were divided in to two groups of 50 patients each, depending on the approach. The groups were named A (median) and B (para-median).

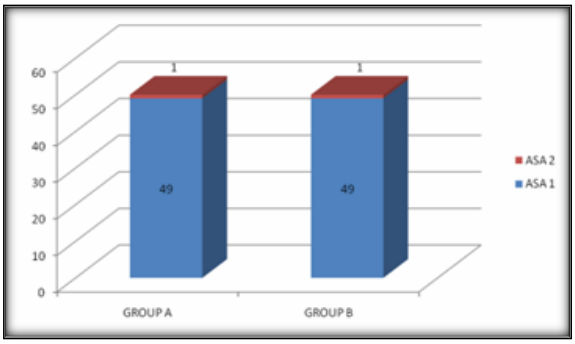


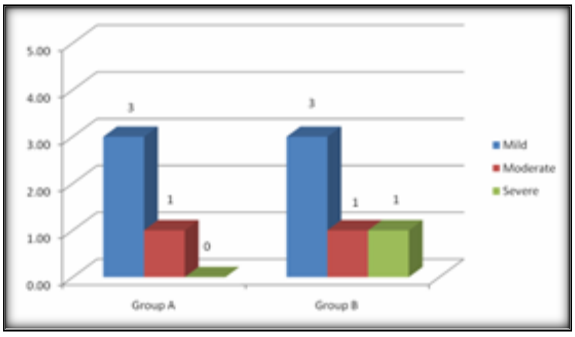
The Height of the patients ranged from 140-165 Cms. The mean height± standard deviation, in groups A and B were 149.5±4.9 and 151.5±7.6 respectively and was statically insignificant (P = 0.1279)



The BMI of the patients ranged from 24.9-30.6. The mean BMI±standard deviation, in groups A and B were 28.22±0.9 and 28.1±1.3 respectively statistically insignificant (P=0.5941).







The ASA Status of the patients ranged from 1-2. The mean ASA±standard deviation, in groups A and B

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were 1.0±0.1and 1.0±0.1 respectively which is not significant (p=1).

A total of 5(10%) out of 50 patients in the median group had PDPH, 4 (8%) out of 50 patients in the paramedian group had PDPH, which is statistically insignificant (P=0.7268).

The severity is almost same in both the groups. Only one patient in the paramedian group developed severe degree of PDPH. But statistically not significant (p=0.6376). Totally 9 patients suffered from PDPH. In the median group 3 patients had mild degree of PDPH, one had moderate degree of PDPH and one more had severe form PDPH. In the paramedian group 3 patients had mild degree of PDPH, one had moderate degree of PDPH. These are statistically insignificant (P=0.6376).

Table 1

	N	Mean Age	SD	Min.	Max.	'p' value
Group A (Median)	50	24.02	2.759	20	30	
Group B (paramedian)	50	24.04	3.487	20	38	0.9727*

		N	Mean	SD	Min.	Max.	'p' value
Weight	Group- A	50	63.54	3.908	58	74	0.2644*
	Group-B	50	64.44	4.107	58	72	

* Not-significant

		N	Mean	SD	Min.	Max.	'p'value
Height	Group A	50	149.56	4.495	140	161	0.1279*
	Group B	50	151.54	7.656	140	165	

* Not-significant

Table-5: BMI distribution

		N	Mean	SD	Min.	Max.	'p' value
BMI	Group A	50	28.22	0.933	25.4	29.8	0.5941*
	Group B	50	28.10	1.342	24.9	30.6	

* Not-significant

Table 6: ASA distribution

	ASA Grade		Total	Chi Square Value	'p' value
	Grade 1	Grade 2			
Group A	49	01	50	0.000	1.000*
	98%	02%	100.0%		
Group B	49	01	50		
	98%	02%	100.0%		
Total	98	02	100		
	98%	02%	100%		

* Not-significant

Table-7: Incidence of PDPH in both the groups

Incidence of PDPH	No of cases	PDPH	Percentage	Chi- square value	P- Value
Group A	50	4	8%	0.1221	0.7268*
Group B	50	5	10%		

*Not-significant

Table-8: Severity of PDPH in both the groups

	PDPH	Mild	Moderate	Severe	Chi- square value	P -value
Group A	4	3	1	0	0.9000	0.6376*
Group B	5	3	1	1		

* Not-significant

DISCUSSION

Spinal anaesthesia is a widely practised regional anaesthesia technique for many lower abdominal and lower limb surgeries. The advantages of spinal anaesthesia lie in its simple technique, the certainty of the block, and fewer side effects and complications. One of them is post-dural puncture headache (PDPH). Postdural puncture headache was first documented by August Bier in 1899. It remains one of the most common complications of neuraxial block, with an overall incidence that may be as high as 7%.[17]

The mechanism of PDPH is commonly thought to be persistent leakage of CSF through the dural defect at a faster rate than that of CSF production. The transdural leak leads to decreased CSF volume and pressure. When the patient is in the upright position, gravity causes intracranial contents to place traction on the exquisitely innervated meninges and pain-sensitive intracranial vessels, which refer pain to the frontal region via the trigeminal nerve, to the occiput via the glossopharyngeal and vagus nerves, and to the neck and shoulder via the upper cervical nerves.

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Compensatory distention of intracranial blood vessels may also be a mechanism.[18-22]

PDPH, although a vexing problem to both the anaesthesiologist and the patient, is ordinarily a self-limiting condition. The usual period of compliance is 4 days, and by the end of one week, 75% will have subsided.4 However those lasting longer, or those that are severe, are discomforting to the patient and require treatment.[23-25]

Factors related to increased incidence of PDPH are:

1. Age: younger more frequent
2. Gender: females>males
3. Needle size: larger>smaller
4. Needle bevel: more when dural fibres are cut transversely.[5]
5. Needle tip: more with cutting than with non-cutting needles
6. Pregnancy
7. Number of dural punctures: more with multiple punctures.[21]
8. Prior history of PDPH6
9. Approach: more with the midline approach when compared to the paramedian approach when using cutting needles.[5,23]
10. Experience: could be less in experienced hands.[19]

The present study has evaluated the incidence of PDPH with 23G Quincke needle with different approaches (Median and Paramedian).

Janik R & Dick W showed that the incidence of PDPH was higher in the paramedian approach when compared to the midline approach. However, the needle used in their study was a non-cutting needle: 25G Whitacre.[11]

Faramarz Mosaffa and Khoamorad Karimi have also demonstrated that the incidence of PDPH was higher in the paramedian approach when compared to the midline approach in orthopaedic patients,(incidence was 9.3% in the median and 10.7% in the paramedian group).[26-36]

Afsaneh Sadeghi, et al, have shown the incidence of headache was 9.8% in the paramedian group versus 9.4% in the median group (statistically not significant) in patients undergoing elective ceasarean.[37,38]

In our study, the incidence of PDPH is 8% in the median group and 10% in the paramedian group, which is statistically insignificant (p=0.7268). The results in our study are comparable to earlier studies concerning the incidence of PDPH.[39-42]

The exact mechanisms leading to PDPH are still not completely understood, PDPH is believed to be caused by dural leakage of CSF from the iatrogenic dural puncture following diagnostic lumbar puncture or spinal anesthesia.[19] The median approach involves the passage of the needle through the supraspinal and interspinal ligaments and the ligamentum flavum, but the paramedian approach avoids the supra and interspinal ligaments and approaches the ligamentum flavum directly after passing through the paraspinal muscles. The paramedian approach appears to be an easier method due to the easier positioning of patients, especially for short-statured pregnant patients who may have difficulty assuming the proper position for the median technique.[43-45]

Ready LB et al, using an in-vitro model showed that the rate of transdural fluid leak is less with the 300 approach(Paramedian) when compared to the 900 approach(Median).[5]

Kempen PM & Mocek CK using standard xerographic paper showed that when cutting needles are used, a flap is created during paramedian insertions that may fall back like a lid when the needle is removed to prevent the leak of CSF.[28] As we observe no significant difference between the two approaches regarding the rate of PDPH. The reason could be due to the identical tearing of the longitudinal dural fibres. Alternatively, despite having a different angle, due to the cylindrical shape of the dura, the orientation of the needle insertion might be the same.[46,47]

In our study 9 out of 100 patients developed PDPH. This is statistically not significant (p=0.6376). In group A (Median) a total of 4 patients developed PDPH, 3 patients of a mild degree and one patient developed a moderate degree of PDPH. Where in group B(Para-median) total of 5 patients developed PDPH, 3 patients with a mild degree, one patient with a moderate degree and one patient developed a severe degree of PDPH. All patients responded to conservative and/ or pharmacologic measures. The epidural patch was not used in any patient.[48-51]

CONCLUSION

We conclude that there is no difference in PDPH incidence with median versus paramedian approaches, and therefore recommend the paramedian approach, especially for pregnant and short-stature patients and those who cannot assume the proper position for the median approach; the easier positioning would result in less pain for the patient and a higher success rate for spinal anaesthesia.

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