

Incidence of Postdural Puncture Headache (PDPH) Using 25G Pencilpoint and 25G Quincke Spinal Needles in Patients Undergoing Cesarean Section- A Prospective Observational Study

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ABSTRACT

Introduction: Spinal anesthesia has been widely used for cesarean section than general anesthetic techniques. The first incidence of PDPH was reported as early as 1898 by August Bier and presumed it to be due to CSF loss. The incidence of PDPH varies with design and the gauge of the needle used. Thus, in the last 50 years with the development of fine gauge needles and needle tip modification there is a significant reduction in the incidence of post dural puncture headache. Study aimed to find the incidence of PDPH in patients undergoing cesarean section using 25G Quincke and 25G pencil point spinal needles.

Material and methods: After IEC approval, 120 patients undergoing Cesarean section under spinal anesthesia were enrolled in this study. They were randomly divided into two groups. One group received spinal anesthesia with 25G pencil point spinal needle and group two with 25G Quincke spinal needle. The level of blockade, heart rate, blood pressure were recorded intraoperatively. The onset of headache (if any), duration, aggravating factors were noted in postoperative period. The continuous data was assessed by means of mean and standard deviation. The discrete data by number and percentage. Chi square test and Fisher's Exact test for determining the difference between groups. P value < 0.05 was considered statistically significant.

Results: From this prospective observational study, it was concluded that the incidence of PDPH was significantly low with non cutting bevel (pencil point = 5%) spinal needles compared with cutting bevel (Quincke = 18.3%) spinal needle. The incidence of failed spinal anesthesia was significantly more in non cutting (pencil point = 16.7%) spinal needles than cutting (Quincke = 3.3%) spinal needles.

Keywords: Spinal, Dural puncture, Headache

INTRODUCTION

The history of anesthesiology is a rich mosaic of interwoven events around the world that have created and defined the specialty. From the days of the ancient Greeks and Romans, to the modern operating rooms, the care of the patients remain challenging. With the introduction of general anesthesia in 1846 to the development of regional techniques, anesthesia has been an evolving specialty.

Later in 1898, Karl August Bier was first to describe PDPH when he injected 10 – 15 mg cocaine into sub arachnoid space of himself and his assistant, and attributed this headache to excessive loss of cerebro spinal fluid.^{1,2} The incidence of PDPH is high in obstetric population because of their young age, sex and wide spread use of central neuroaxial blocks. PDPH is the third most common cause for litigation in Western countries.³ Despite obvious advantages of regional over general anesthesia for obstetrics, regional techniques was not popularized. The

period from 1930 to 1950 has often been referred to “dark ages of obstetric anaesthesia”. In 1951, after the development of pencil point spinal needles by Whitacre and Hart, and changes in needle tip design, there was a significant reduction in incidence of post dural puncture headache.⁴

The study aimed to find the incidence of PDPH in patients undergoing cesarean section using 25G Quincke and 25G pencil point spinal needles.

MATERIAL AND METHODS

This study was conducted in Department of Anesthesiology, Tagore Medical College hospital, affiliated to Tamil Nadu Dr M.G.R Medical University, Chennai from May 2015 to May 2016. Institutional Ethical Committee approval was obtained.

Patients were randomly divided into two groups by lots. Group one (G1): Patients who received spinal anesthesia with 25 G pencil point needle. Group two (G2): Patients who received spinal anesthesia with 25 G Quincke needle.

After obtaining written informed consent, the patients were included in the study. Detailed history of present and past medical illness was obtained. Routine urine and blood investigations were done. All patients received Injection ranitidine 50mg and injection metaclopramide 10 mg given slow IV one hour before surgery. They were preloaded with 500ml ringer lactate. ECG, heart rate, pulse oximetry were recorded intraoperatively.

Inclusion criteria

- Age 17-35 years,
- Singleton gestation,
- Gestational age >36 weeks,
- ASA 1 & 2 patient.

Exclusion criteria

- Pregnancy induced hypertension,
- Cardiovascular disorders,
- Hypovolemia and shock,
- Obesity (BMI>35) Infection at the back,
- Anticoagulant therapy,
- Patients requiring > one attempt,

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- Patients with history of migraine.

Spinal anesthesia was performed in sitting position, midline approach by the same anesthetist for all patients in L3- L4 space after aseptic precautions. 0.5% hyperbaric Bupivacaine 1.6 – 1.8 ml was injected intrathecally. The patient were then turned to supine position with left uterine displacement immediately.

Level of sensory blockade was noted. The heart rate and blood pressure was recorded every three minutes for ten minutes and ten minutes there after. Inadequate block was converted to general anesthesia Fall in blood pressure more than 20% below base line was treated with intravenous fluids and 6mg ephedrine IV incrementally.

Complications like nausea, vomiting were managed symptomatically. All patients were given one liter of crystalloids intraoperatively followed by postoperative fluids (ringer lactate or normal saline) 2ml/kg/hour until oral fluids were started.

Patients were followed up postoperatively by blinded operator for seven days. The onset of headache, duration, aggravating factors and relief with medication were noted. All patients were allowed to ambulate on the first postoperative day. Headache was treated symptomatically with bed rest, adequate hydration, Inj Paracetamol 1 ampule (1g) IM followed by tablet Paracetamol with Caffeine thrice daily for two days or headache resolves.

STATISTICAL ANALYSIS

		Group		
		Study	Control	Total
PDPH	Absent	57	49	106
		95.0%	81.7%	88.3%
	Present	3	11	14
		5.0%	18.3%	11.7%
	Total	60	60	120
		100.0%	100.0%	100.0%

P= 0.043, Significant.

Table-1: Incidence of PDPH

120 patients undergoing cesarean section under spinal anesthesia were selected from the population. The continuous data was assessed by means and Standard Deviation (SD). The discrete data was assessed in number and percentage. Chi-square test and Fisher’s Exact test for determining the difference between groups. P value < 0.05 was considered statistically significant.

RESULTS

In this study, totally out of 120 patients 26 patients were < 20 years (G1= 14, G2=22), 88 patients between 21-29 years of age (G1=43,G2=45) and only 6 patients above 30 years (G1=3,G2=3). Majority of the patients were between 21- 29 years in both the groups (73.3%). The mean age in both groups was similar (G1=24.3 years, G2 = 23.8 years).

The average weight between two groups the were statistically insignificant (G1=59.95kg, G2=55.68kg). The mean height was also comparable between the groups (G1=154.88cm, G2= 154.26cm). The distribution of cases among the two groups emergency 84 cases (G1=42, G2 =42) and elective 36 cases (G1 =18, G2=18).

Out of 120 patients studied, 14 patients had PDPH (G1=3, G2= 11). The over all incidence of PDPH was 5% in study group (G1= 3) and 18.3% in control group (G2= 11) (table-1). The difference in incidence of PDPH is statistically significant in between the two groups (P= 0.043). The observed onset of PDPH were 11 patients on the first postoperative day (G1=1,G2=10) and 3 patients (G1=2,G2=1) on second postoperative (table-2). No patients had onset of headache after 48 hours in both the groups. The duration of PDPH was less than 24 hours in 12 patients (G1= 3,G2=9) and less than 48 hours in 2 patients (G1=0,G2 =2). The mean duration of headache was 27.42 hours. None of the patients had headache for a duration more than 48 hours (table-3). The failure rate for spinal anesthesia was 16.7% with the study group (G1 = 10) compared to 3.3% with the control group (G2 = 2). The difference in failure rate was statistically significant (P= 0.029) (table-4).

DISCUSSION

		Group			
		Study	Control	Total	
Day of onset	No Headache	Count	57	49	106
		% within Group	95.0%	81.7%	88.3%
	First POD	Count	1	10	11
		% within Group	1.7%	16.7%	9.2%
	Second POD	Count	2	1	3
		% within Group	3.3%	1.7%	2.5%
	Total	Count	60	60	120
		% within Group	100.0%	100.0%	100.0%

Table-2: Day of onset of PDPH

		Group			
		Study	Control	Total	
Severity of PDPH	No head ache	Count	57	49	106
		% within Group	95.0%	81.7%	88.3%
	Mild	Count	3	11	14
		% within Group	5.0%	18.3%	11.7%
	Total	Count	60	60	120
		% within Group	100.0%	100.0%	100.0%

Table-3: Severity of headache

			Group		
			Study	Control	Total
Failed spinal	Failure rate	Count	10	2	12
		% within Group	16.7%	3.3%	10.0%
	Successful puncture	Count	50	58	108
		% within Group	83.3%	96.7%	90.0%
	Total	Count	60	60	120
		% within Group	100.0%	100.0%	100.0%

P= 0.029, Significant

Table-4: Failure rate of spinal anaesthesia

A German surgeon Karl August Bier and his assistant August Hildebrandt attempted the first spinal anesthetic in 1898 by injecting cocaine into their intrathecal spaces. Both suffered from severe headache and vomiting which took 9 days to resolve. This is now we recognize as PDPH⁷ which is due to CSF leak confirmed with radionuclide cisternography,⁸ radionuclide myelography, manometric studies, epiduroscopy, and direct visualization at laminectomy.⁹

Though spinal anesthesia is safer for cesarean section, it was not preferred for cesarean section in earlier days. This is mainly because of high incidence of headache attributed to CSF leak. The use of big gauge spinal needles and young age were additive factors.² The incidence of post-dural puncture headache is related not only to the size and design of the spinal needle used, but also to the experience of the personnel performing the dural puncture, and the age and sex of the patient.¹⁰

This prospective observational study was done in 120 healthy, ASA 1 and 2 young parturients undergoing elective and emergency cesarean section under spinal anesthesia.

The demographic profile of patients between two groups were comparable in distribution to age, weight and height ($P > 0.05$). Comparing between the age groups only 26 patients were < 20 years, 88 patients between 21-29 years of age and 6 patients above 30 years. The majority of cases were emergency ($n = 84$) and only 36 patients were posted for elective sections.

Various studies has mentioned the incidence of dural puncture headache and failure rate of spinal anesthesia in patients undergoing cesarean section using cutting and non cutting bevel spinal needles.¹¹⁻¹³

The incidence and severity is related directly to rate of CSF leak due to needle puncture. Studies conducted earlier shows the incidence of PDPH with quincke needles as 36% (22G), 3-25% (25G), 0.3-20% (26G), 1.5-5.6% (27G).^{11,13,14} Though the incidence is as low as 0-2% with 29G quincke needles, the incidence of failure rate is high.¹⁴ We chose 25 needle due to ease of availability in hospital and technical use.

In some studies, the authors concluded that parallel orientation spinal needles decrease the incidence of PDPH.^{2,12} However, Cruickshank and colleagues could not demonstrate any significant difference in CSF leakage by aligning the bevel of the needle either parallel or across the dural fibers, and their observation was that the CSF leakage rate was related to the needle size.¹⁵ We chose parallel technique of needle insertion in our study.

The over all incidence of PDPH was 0% to 37% as studied by various authors.^{16,17} The most important contributing factor for high incidence of PDPH was gauge and type of spinal needle used. The observed incidence in this study was in accordance

to the above finding. Out of 120 patients studied, 14 patients had PDPH. The over all incidence of PDPH was 5% in study group (pencil point needle = 3) and 18.3% in control group (Quincke needle=11). The difference in incidence of PDPH is statistically significant ($P= 0.043$).

The headache was typically distributed over frontal and occipital areas radiating towards neck, aggravated on upright posture and straining, and relieved on lying downward. It was occasionally associated with nausea, vomiting.⁶

Most headaches appear on the first or second postoperative day. In Vandam analysis approximately 75% of PDPH occurred by end of third postoperative day and 85% by the sixth postoperative day.¹⁸ In concordance with the above study, the observed onset of PDPH was 11 patients on the first postoperative day (78.5%) and 3 patients on second postoperative day (21.3%) after spinal anesthesia. No patients had headache after 48 hours.

In the study conducted by Brownridge in 1984 the severity of PDPH was graded as mild in 8%, moderate in 3% and severe in 2.3%. In concordance to the above study, all patients in this study had mild form of PDPH (11.7%) with no limitation of activity and was not associated with nausea and vomiting.²⁰ The headache was relieved by bed rest, adequate hydration and simple analgesics Tablet paracetamol with Caffeine. None of the patients developed severe headache due to fine gauge of the needle used, adequate hydration and immediate treatment.

In a study by Lynch et al (1991) the mean duration of headache was 48 hours (range 24 – 64 hours) and 57.5 hours (range 8 -80 hours) in 25 and 22 gauge groups respectively.^{23,6} In this study, the duration of PDPH was less than 24 hours in 12 patients and less than 48 hours in two patients. The mean duration of headache was 27.42 hours. None of the patients had headache more than 48 hours.¹⁹

In 2009, W.Fettes et al⁵ studied the mechanisms, management and prevention of failed spinal anesthesia and showed that pencil point spinal needles straddle the dural fibres more than the cutting needles leading to partial loss of local anesthetic solution into epidural or sub dural space even after successful aspiration of CSF.⁸ In this study, the failure rate for spinal anesthesia was 16.7% with the study group (pencil point needle = 10) compared to 3.3% with the control group (Quincke needle = 4 cases). The difference in failure rate was statistically significant ($P= 0.029$).

There was no clinical significant difference in the level of sensory blockade achieved with two spinal needles. There was no clinically significant difference in the heart rate, fall in mean arterial pressure between the groups.

Operators inexperience posed difficult in using cutting spinal needles. The cost of pencil point spinal needles was five times higher than the quincke spinal needles which may be in an

important factor that limit the widespread use of pencil point spinal needles.

CONCLUSION

From this prospective observational study, it was concluded that the incidence of PDPH was significantly low with 25 gauge non cutting bevel spinal needles compared with 25 gauge cutting bevel spinal needle. The incidence of failed spinal anaesthesia was significantly more in non cutting spinal needles than cutting spinal needles.

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