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A CLINIC ETIOLOGICAL STUDY TO DETERMINE THE INCIDENCE AND RISK FACTORS RESPONSIBLE FOR POST DURAL PUNCTURE HEADACHE (PDPH) AFTER SPINAL ANAESTHESIA IN OBSTETRIC AND NON-OBSTETRIC PATIENTS

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Abstract:

Background and Aims: Post-dural puncture headache (PDPH) is a common complication after dural puncture and its presence can be debilitating for a patient and can significantly interfere with functional capacity and quality of life.

This prospective observational study examined the incidence of PDPH in 1238 patients undergoing spinal anaesthesia for obstetric and non-obstetric surgeries. The primary aim of our study was to determine the incidence of PDPH. We also evaluated the risk factors responsible for the development of PDPH.

Material and Methods: A total of 1238 patients of either sex; of age group 20-60 years and ASA grade I and II were included. Data was collected by interviewing patients using structured questionnaire. Patients were observed for seven days in postoperative ward for PDPH. Data was analyzed using SAS V9.1.3.

Results and conclusion: Overall incidence of PDPH was 4.84%. Incidence was higher in obstetric (5.16%) than in non-obstetric patients (4.29%). Incidence of PDPH was higher with the use of Quincke needle in both the groups. 61.6% patients developed PDPH within 48 hours. Mean duration of PDPH was 3 days. PDPH was mild in 50% patients, moderate in 35% patients and severe in 15% patients. In obstetric patients, incidence of PDPH was highest (56.10%) when ambulation was on 3rd day.

On the basis of this study, we concluded that incidence of PDPH can be reduced by using smaller gauge pencil point needle and early ambulation.

Key words: Post-dural puncture headache, spinal anaesthesia, incidence, caesarean

Introduction:

Postdural puncture headache (PDPH) has been a recurring problem since the inception of spinal anaesthesia and was first reported by August Bier in 1898.[1] PDPH is a distressing complication both for the patient and anesthesiologist and requires prevention and prompt management.

Postdural puncture headache is defined as: a bilateral headache that develops within 7 days after dural puncture and disappears within 14 days. Headache worsens within 15 minutes of the upright position and improves within 30 minutes of resuming the recumbence position.[2] Visual changes, photophobia, and auditory changes including tinnitus may be associated symptoms. With conservative management

50% of headaches resolve within 4 days, 75% within seven days, and 95% within six weeks.[2,3]

The incidence and severity of PDPH varies greatly in reported literature. It has been reported from <1% to 70%.[4] Risk factors for the development of PDPH include female gender, pregnancy, younger age and history of headache prior to lumber puncture, needle size and type, time of ambulation.[5,6]

Although the problem has been widely reported, its magnitude and associated factors has never been studied in our institute. Thus the aim of our study was to determine the incidence of PDPH. We also evaluated the risk factors responsible for the development of PDPH.

Material and Method:

An institution based prospective study was conducted after approval from Hospital Ethics and Performa committee. The study involved 1238 patients of either sex; of age group 20-60 years and ASA grade I and II, admitted in for elective or emergency caesarian section and other surgical procedures.

Enrollment occurred seven days per week. Patients were excluded if they declined to participate or if they were unable to communicate. The patients who gave consent were followed from the day of operation to the day of discharge from the hospital. The patients were observed daily for postdural puncture headache.

Diagnosis of PDPH was made using an algorithm based on the diagnostic criteria of the International Headache Society as below-

1. Location in the occipital/frontal areas of head
2. Associated with complete or partial relief when assuming the supine position
3. Minimum of 4 hours duration

The following data: patient's age, sex, height, weight, ASA classification, type of surgery, type and size of spinal needle, number of attempts, the timing of ambulation after spinal anaesthesia and experience of person performing procedure were recorded. Patients were observed in postoperative ward for post dural puncture headache .Onset, site, severity duration and medication used for headache was recorded.

The severity of the post dural puncture headache was graded as follows-

Mild- No interference with daily activities and no treatment required (In Obstetric patients- able to take care of self and baby)

Moderate- Limited activity and regular analgesic required (In Obstetric patients- able to take care of self, but not baby)

Severe- confined to bed and required analgesic or blood patch

Statistical analysis:

Sample size calculation was based upon the headache incidence in previous literature. We used a rule of thumb to estimate the number of cases required to evaluate the association between potential risk factor and outcome in multivariate analysis. Approximately ten cases and ten controls per binomial predictive risk factors were included, so we expected to have sufficient power to evaluate a maximum of six potential risk factors within a multivariate logistic regression mode. Data was analyzed using SAS V9.1.3.

The primary outcome, incidence of headache, was calculated as the proportion of patients who developed at least one headache with 95% confidence interval (CI) calculated using exact binomial methods. Secondary continuous outcomes (onset, duration and severity of headache) were summarized as medians, while binomial and categorical outcomes were summarized as proportions.

A nested case control analysis was done to evaluate possible risk factors for headache. Obstetric patient who developed PDPH were compared to non obstetric patients. Initial uni-variate comparisons were conducted for 6 potential risk factors: Type of surgery (obstetric and non obstetric), Type of needle (cutting and non cutting), size of needle (23G and 25G), number of attempts, the time of ambulation and anaesthesia operator experience. The distribution of risk factors between the two groups was described by comparison between means. Continuous variables were compared using the two -tailed student t test, using $p<0.05$ as the designated level of statistical significance. Binary variables were compared using the Fischer's exact test for proportions, and categorical variables with more than

two factors were compared using logistic regression with the same level of statistical significance. 95% confidence interval (CI) was estimated for all analysis. Risk factors for the development of PDPH were estimated using logistic regression and multivariate analysis. Modeling was conducted using a backward stepwise progression method. The full model consisted of a priori defined variable with a significant difference (P<0.1) found on uni-variate analysis. Removal of insignificant variables occurred following statistical evaluation of two successive models using the likelihood ratio statistics (P<0.05). The final model was assessed for the goodness of fit using the Pearson Chi-square test, and predictive test possibilities.

Results:

The present study involved 1238 patients of either sex between the age group of 20-75 yrs. 795 patients underwent cesarean section while 443 patients underwent non obstetrical surgeries. (Table1 and 2)

In our study, the overall incidence of PDPH was 4.85%. It was slightly higher (5.16%) in obstetric population (95% confidence interval (CI) =3.73%-6.93%) than non-obstetrical population (4.29%) (95% confidence interval (CI) =2.60%-6.62%), though difference was not statistically significant (P=0.518).

26.6% patients complained of headache within 24 hours, 61.6% patients within 48 hours, and 11.8% patients within 72 hours. Median duration of PDPH was 3 days (range 1-7 Days). Out of 60 patients, the headache was mild in 30 patients (50%), moderate in 21 patients (35%), and severe in 9 patients (15%). Out of 41 obstetrical patients headache was frontal in 25 (60.90%) and occipital in 16 (39.02%) patients. In non-obstetrical group headache was frontal in 8 patients (42.10%) and occipital in 11 patients (57.89%).

In obstetric patients, incidence of PDPH was 5.62% with 23 G quincke needle, 5.18% with 25G Quincke needle (p>0.05). In non-obstetrical patients, incidence with 23 G Quincke needle was 4.29% and nil with 25 G Whitacre needle (p<0.023) (Table 3). No patient in both the groups developed PDPH with Whitacre spinal needle.

Out of 41 obstetrical patients with PDPH, 23 (56.09%) received spinal anaesthesia in first attempt, 11 (26.82%) in second attempt and 7 (17.07%) in third attempts. In non-obstetrical patients with PDPH, 11(57.09%) received spinal anaesthesia in first attempt, 8 (42.10%) in second attempt. Thus in majority of patients, spinal anaesthesia was given in first attempt. Among all the patients with PDPH, 51.22% obstetric and57.89% non-obstetric patients received spinal anaesthesia by postgraduate student.

Incidence of PDPH was higher (56.10%) among obstetric patients when ambulation was on third day of surgery.

The multivariate association and regression analysis between incidence and risk factors (Age, sex, type and size of needle, time of ambulation after surgery, number of attempts, operator' experience of performing spinal anaesthesia) identified that among all these factors only time of ambulation in obstetric patients was a statistically significant factor for the development of PDPH (p<0.0001) (Table 4).

Discussion:

Post dural puncture headache is a common complication after spinal anaesthesia since it was first described by August Bier in 1898.[1] It occurs most commonly in young female patients particularly parturient and correlates with the configuration of spinal needle used.[7] In our study, the overall incidence of PDPH was 4.85%, with the incidence of 5.16% in obstetric population and 4.29% in non-obstetric population. In contrast to our study, some authors have reported higher incidence ranging between 8-20%.[8,9] Whereas, some authors reported lower incidence ranging between <1-2.2%.[10,11,12] Hwang et al (1997) reported significantly higher incidence of PDPH in Obstetric population (3.08%) than non-obstetric group (0.37%) as in our study.[13] Incidence in parturients is high because of increase intra-abdominal pressure, which tend to increase in CSF pressure and in return leakage from the dural rent is high leading to headache.[11]

Although not found statistically significant, In our study, female patients had higher incidence (9.09%) of PDPH than males (2.48%) in non-obstetric patients similar to the studies reported by Kuntz et al (1992) and Despond et al (1998).[14] The higher incidence of PDPH in females is because of difference in the processing of nociceptive information, greater degree of sensitization compared with male, greater activation of contra lateral prefrontal cortex and psychological factors involved.[15]

Incidence of PDPH in obstetric population was 5.61% with 25 G Quincke needle and 5.16% with the use of 26 G Quincke needle. None of the patients had PDPH with Whitacre needle. Incidence similar to our study has been reported by Singh et al (2009) and Shutt et al (1992). The incidence reported by Singh et al (2009) was 33.3% with 26 G Quincke needles and 0% with 25 G Whitacre needles.[16,17]

Hwang et al (1997) observed much lower incidence than our study in 94 cesarean sections using Quincke needles (25 G and 26 G) and Whitacre needles (25G). The incidence of PDPH was 3.65% with 25G Quincke and 2.06% with 26 G Quincke needles and only one case suffered from PDPH in Whitacre group. Lambert et al (1997) reported much higher incidence than our study in the 366 consecutive obstetric patients receiving spinal anaesthesia using 26 G Quincke, 27 G Quincke and 25 G Whitacre needles. The incidence was 5.2% with 26 G Quincke, 2.7% with 27 G Quincke and 1.2% with 27 G Whitacre needles.[18]

The thicker the lumber puncture needle, the higher could be the incidence of PDPH. A cutting type of needle inserted through the dural wall tears off a number of fibers in the wall and a permanent opening in it ensured. This leads to grater loss of CSF leading to headache. Increased needle size is associated with greater PDPH rate, presumed to be due to increased size of dural hole.[19]

Although PDPH may occur shortly after puncture,[20] but the typical onset is within 48 hrs[21] or may be delayed up to 5-14 days.[22] In our study; onset was within 48 hours similar to the studies reported by Reynold (1993), Shah et al (2002). Usually the headache subsides within 7 days but there are reports which described duration of 1-8 years.[22,23] Median duration of PDPH was 3 days in our study.

In our study, 50% patients had mild headache, 35% had moderate headache and 15% developed severe headache. Our results were quite similar to as reported by Pederson et al (1996) who reported 40.90% mild headache, 27.27% moderate headache and 13% severe headache.[24]

Maximum number of patients (56%) who developed PDPH received spinal anaesthesia in first attempt in contrast to Singh et al (2009) who reported that in maximum number of patients with PDPH; more than 3 attempts were made for dura puncture.

In this study, in maximum number of cases with PDPH (57%) spinal anaesthesia was given by post graduate students, which was similar to the study done by Singh et al (2009) who reported that in 70% of the patients with PDPH, spinal anaesthesia was given by inexperienced person (trainee).

By multivariate logistic regression analysis we identified that, only time of ambulation after surgery in obstetric patients and type and size of spinal needle in non-obstetric patients were found to be statistically significant ($p<0.0001$ and $p<0.023$ respectively).

In our study, incidence of PDPH was higher amongst obstetric patients (56.10%), when ambulation was delayed for 3 days. Role of bed rest is controversial now days. Evidence against prophylactic bed rest comes from Thornberry et al (1988) who, in a prospective randomized trial of 80 obstetric patients found that early ambulation actually decreases the incidence of PDPH.[25] In contrast to our study, Hafer et al (1992) reported that duration of bed rest did not influence the development of PDPH.

Conventionally, bed rest for 24 hours was recommended after spinal anaesthesia in our hospital to prevent occurrence of PDPH. This old belief was denied in our study. The patients who remained recumbent for 3-4 days developed PDPH on second postoperative day, well before ambulation.

Conclusion:

On the basis of this study, we concluded that incidence of PDPH can be reduced by using smaller gauge pencil tip needles and early ambulation.

Table 1:
Demographic Data

Age (yrs)	No of patients (%)	Male	Female	PDPH
20-40	901(73.25)	241	660	44 (4.88%)
40-60	274(22.27)	59	215	14 (5.10%)
>60	55(4.47)	39	16	2 (3.63%)

Incidence of PDPH was higher in young patients (<40 year)

Table 2:
Distribution of patients according to type of surgery (Data presented as n (%)

Type of surgery	No. of Patients	PDPH
Obstetrics	795 (100)	41(5.16)
Non-obstetrics	443 (100)	19 (4.29)
General Surgery	165 (37.25)	4 (2.42)
Urological	72 (16.25)	3 (4.16)
Ortho	106 (23.93)	12 (11.32)
Gynecology	100 (22.56)	0

The incidence of PDPH was slightly higher in obstetrical patients, though the difference was not statistically significant (p=0.518)

Table 3:
Distribution of patients according to the type and size of needle used

Size of spinal needle		Obstetric patients with PDPH N (%)		Fisher's Exact test		Non-obstetric patients with PDPH N (%)		Fisher's Exact test	
				Cell (1,1) Frequency (F)	29.00			Cell (1,1) Frequency (F)	
Quincke	25G	535	67.29	Lt sided Pr <=F	0.671	324	76.90	Lt sided Pr <=F	
	26G	212	26.66	Rt sided Pr >= F	0.465	97	23.04	Rt sided Pr >= F	0.003
Whitacre	25G	48	6.03	Probability (P)	0.137	22	4.97	Probability (P)	0.023
				Two sided Pr <= P	0.860			Two sided Pr <= P	

This table shows that incidence of PDPH was higher with 25 and 26 gauge Quincke spinal needle than 25 gauge Whitacre needle in both the groups and the difference was statistically significant in non-obstetric patients. (P==0.023)

Table 4:
Logistic regression Analysis for Obstetrical patients

Type 3 Analysis of Effects			
Effect	**DF**	**Wald Chi-Square**	**Pr>ChiSq**
Size of Needle	2	3.2159	0.2003
Age	1	0.0004	0.9846
Attempts	1	2.5777	0.1084
Ambulation time	1	23.0810	<0.0001

This table shows that time of ambulation after surgery was a significant risk factor for PDPH in Obstetric patients (P<0.0001)

References:

1. Bier A. Versuche uber Cocainisirung des Ruckenmarkes. Dtsch Chir 1899: 51: 361-369.
2. Olsen J, Bousser MG, Diener HC et al. The international classification of headache disorders. Cepalalgia. 2004; 24: 9-160.
3. Lybecker H, Moller JT, May O, Neilson HK. Incidence and prediction of postdural puncture headache: a prospective study of 1021 spinal anesthesia. Anesth analg. 1990; 70: 389-94.
4. Kokki H, Heikkinen M, Turunen M, Vanamo K, Hendolin H. Needle design does not affect the success rate of spinal anaesthesia or the incidence of post puncture complications. Acta Anaesthesiol

Scand. 2000; 44: 210-13.

5. Choi PT, Galinski SE, Takeuchi, Lucas S, Tamayo C, Jabad AR. PDPH is a common complication of neuraxial blockade in parturients: a meta-analysis of obstetric studies. CJA. 2003; 50: 460-9.

6. Wu CL, Rowlingson AJ, Cochen SR et al. Gender and post dural puncture headache. Anesthesiology. 2006; 105: 613-8.

7. Brown LD: Atlas of regional Anaesthesia 2nd edition New York: WB Saunders company, 1992, p.305-9.

8. Despond o, Pascal M, hemming G. Postdural puncture headache after spinal anaesthesia in young orthopedic patients using 27 gauge needles. CJA. 1998; 45 (11): 1106-9.

9. Shah A, Bhatia PK and Tulsiani KL. Post dural puncture headache in cesarean section: A comparative study using 25 G Quincke, 27 G Quincke and 27 G Whitacre needle. IJA. 2002; 46: 373-77.

10. Hafer J, Rupp D, Wollbruck M, Engel J, Hempelmann G. The effect of needle type and immobilization on post spinal headache. Anaesthesia. 1997; 46 (10): 860-6.

11. Malik TM, Iqbal A, Khan MA. Post spinal headache; comparing needles of 25 G and 27 g for incidence of post spinal headache. Professional Medical Journal. 2007; 14: 441-7.

12. Goldszmidt E, Kern R, Chaput A, Mac Aurthur A. The incidence and etiology of post partum headache: A prospective cohort study. CJA. 2005; 52: 971-77.

13. Hwang JJ, Ho ST, Wang JJ and Lier HS. "PDPH in cesarean section. Comparison of 25 G Whitacre with 25 and 26 G Quincke needle". Acta. Anaesthesiol. Sin. 1997; 35 (1):33-37.

14. Kuntz KM, Kokmen E, Stevens JC et al. Post lumber puncture headache experience in 501 consecutive procedures. Neurology. 1992; 42: 1884.

15. Wieser EA, Price DD, Myers CD, Heft MW, Robinson ME. Gender role expectation of pain: relationship to experimental pain perception. Pain. 2002; 96: 335-42.

16. Singh S, Chaudry SY, Phelps AL, Vallejo MC. A five year audit of accidental dural puncture, post dural puncture headache and failed anesthesia at a tertiary-care medical center. Scientific World Journal. 2009; 9: 715-22.

17. Shutt LE, Valentine SJ, Wee MY, Page RJ, Prosser A, Thomas TA. Spinal anaesthesia for cesarean section: comparison of 22 gauge and 25 gauge Whitacre needles with 26 gauge Quincke needles. BJA. 1992; 69 (6): 589-94.

18. Lambert DH, Hurly RJ, Hertwing L, Datta S. Role of needle gauge and tip configuration in the production of lumber puncture headache. Reg. Anesth. 1997; 22 (1): 66-72.

19. Turnbull DK, Shepherd DB. Post dural puncture headache: Pathogenesis, prevention and treatment. BJA. 2003; 91: 718-29.

20. Zeiden A, Farhat O, Maaliki H, Baraka A. Does postdural puncture left untreated lead to subdural hematoma? Case report and review of literature. Int. J. Obstet. Anesth. 2006; 15: 50-8.

21. Jankowski. Raj PA text book of regional anaesthesia. 2002; 831-834.

22. Weir EC. The sharp end of dural puncture. BMJ. 2000; 320:127-8.

23. Reynolds F. Dural puncture and headache. BMJ. 1993; 306: 874-6.

24. Pederson ON. Use of a 22 gauge Whitacre needle to reduce the incidence and side effects after lumber myelography: a prospective randomized study comparing Whitacre and Quincke spinal needles. Eur Radiol. 1996; 6 (2): 184-7.

25. Thornberry EA, Thomas TA. Posture and post spinal headache: A controlled trial in 80 obstetric patients. BJA. 1988; 60 (2): 195-97.