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A comparive study of post dural puncture headache [PDPH] with quincke and whitacre spinal needle in early abulation with lower limb surgeries in young patients

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Abstract
Background: Only few studies has been documented the incidence of PDPH with 25 or 27 G (Quincke or Whitacre) needles in patients who had an early ambulation. The present study was designed to evaluate the effect of gauge of needle (25 or 27), shape or type of needle (Quincke or Whitacre) and ambulatory time.
Materials & Methods: In this randomised prospective study 100 ASA physical status I & II adult patients of both sex undergoing lower limb surgery under subarachnoid block were assigned in to four groups of 25 patients each; they received spinal anaesthesia either with Quincke`s (I & II) AND Whitacre (III & IV) spinal needles. The incidence of PDPH, no. of attempts required for successful insertion were recorded. The primary objective of study was to find out the difference in the incidence of PDPH, if any, between the two groups, by using the t-test and Chi square test.
Results: All the 100 patients completed the study. Significantly high rate of PDPH was recorded in Quincke 25G (20%), & IN 27G (12%) as compared to Whitacre (25 or 27) G (4%). This was statistically significant (P. value <.05).
Conclusion: Overall to reduce the number of attempts and the incidence of PDPH, Whitacre 25G spinal needle has better option than Quincke 25G or 27G spinal needle for subarachnoid block.

Keywords: PDPH; post dural puncture headache, quincke spinal needle, whitacre spinal needle, subarachnoid block

Introduction

The technique of subarachnoid analgesia or commonly known as Spinal Anaesthesia, is the most commonly and widely practiced technique across the globe amonst all central neuroaxial blocks, particularly surgery below umblicus. The credit of introducing the technique the technique goes to August Bier 1848 [1], through he himself suffered from one of the dreadful complication that is Post Dural Puncture Headache PDPH. Since the introduction of spinal analgesia, PDPH had remained a well recognised complication. The expected cause of PDPH is a loss of CSF through the dural hole made by the needle. The magnitude and rapidity with which CSF is lost, and the rate by which it reforms, governs the incidence, rapidity of onset and severity of headache. The overall incidence of PDPH has varied form 1-70% from one study to another study [2, 3, 4]. Among the various factors studied include age; lower in older [4, 5, 6, 7, 8], sex; more in woman [9, 10], physical state; greater in patients with small body mass index BMI [6], psycosomatic factors; number of attempts; more in patients received multiple puncture at dura. Incidence of PDPH decreases 50% if the insertion of spinal needle is parallel with the longitudinal dural fibres [11, 14, 15, 12, 16, 17, 18, 13, 19]. As the size of needle decreases or the gauge of needle increases, the incidence of the PDPH decreases. Smaller needle size is associated with lesser risk of headache according to a small tear in the dura and less potential for leakage of CSF [16]. The shape of needle ia also major risk factor [13, 22, 20]. When the beveled needle is inserted through the dural wall, it tears a number of fibres composing the wall and a permanant opening crescent like appearance, in it is ensured. But when point Whitacre needle inserted, its tip pencil separates the longitudinal dural fibres and arachnoid without producing serious injury [23]. Hence pencil point Whitacre needle causes decreased incidence of PDPH [24, 25, 26, 20, 28, 29, 30, 31]. It is generally believed that those patients become ambulated earlier in post-operative period, having incidence of PDPH. However studies focusing on the aspect have found varible result; Early ambulation decreases the incidence of PDPH [32], recumbance decreases the incidence of PDPH [33], no role of recumbance in decreasing the incidence of PDPH [34], and early ambulation neither decreases nor increases the severity of syndrome [35, 36].

Material and Methods

The present randomised prospective study was carried out in MDM and MGH hospitals, Department of Anaesthesiology, Dr S.N.Medical College, Jodhpur. After approval by institutional ethics committee a total 100 consenting patient age 15-35 years were considered in the study which were furthur divided into 4 groups and each group consist of 25 patients. Group-A; Patients had SA with 25G Quincke spinal needle. Group -B; Patient had SA with 27Quincke spinal needle. Group C; Patient had SA with 25G Pencil point (Whitacre) needle. Group D; Patient had SA with 27G Pencil point (Whitacre) spinal needle. Inclusion criteria: Male patients between 15-35 yrs age group undergoing lower limb surgery and ASA gr I and II. Surgical procedure 90 min. Exclusion criteria: Age group less than 14 years, more than 35 years, ASA grade III, IV, V and VI patients, patients with CNS and psychiatric problem and vertebral anomaly, hypovolemic patients, infection at site and patient on anticoagulation therapy. All the patients were uniformly managed with regards to PAC, investigations, and premedications. Inj. midazolam was given as premedication to relieve anxiety and preloaded with 15ml/kg of crstalloid Ringer lactate solution prior to spinal anaesthesia. All patients were given SA in L2-L3 or L3-L4 intervertebral space. In the present study single attempt at lumbar puncture

were included and the needle was inserted parellel with longitudinal fibres. Pulse oximetry, NIBP, ECG monitoring was instituted in all patients. A specially designed performa was used to collect the data, which include patient's paricular, indication of surgery, the anaesthetic details, intraop monitoring for hemodynamics, observation for side effect. Onset and peak sensory lockade level was measured using pin prick sensitivity at level of L_1. Onset and duration of motor blockade was assesed using "Modified Bromage Scale". Mean B.P. was recorded just before giving spinal anaesthesia and intraoperatively till end of surgery. Regression of SA was noted according to recovery of sensory block (normal perianal sensation) and motor block (ability to move hip, knee & foot). In the postoperative period all patients were allowed to ambulate when they meet the CHUNG, S Criteria [37]. In the postoperative period spinal headache (Drissen *et al*. 1980) [38] was classified into 3 groups as suggested by "CRAFT"

Observations and Results

The study was conducted in 100 patients who underwent lower limb surgery. All patients were randomly divided into four groups with 25 patients each. All statistical analysis of continous data was done by Standard Deviation (SD), Paired't' test, Chi-Square Test and the discrete data was assessed in number and percent. P value <.05 represented stastistically significant. All groups were comparable in all demographic characteristics and did not show any statistical significant difference with p-value >0.5. All patients were given spinal anaesthesia with the study needle. Time of onset of sensory was taken as interval between the end of injection of drug and the complete loss of cutaneous sensation. Onset of sensory was significantly faster in group gp III 4.32+_0.7744 min. followed by gp I 4.4+_0.8544min. Then followed by gp II 5.28+_0.9797min. And in gp IV 5.36+_0.9521 min. It was signicant. The height of of sensory blockade was mostly T10 in 64%, 68%, 80% and 80% in gp I, gp II, gp III and in gp IV rspectively. Some pt had sensory blockade upto T8 level in 64%, 68%, 80% and 80% in level in gp I, gp II, gp III and in gp IV respectively. The motor level was grade I in 96%, 92%, 92% and 92% patients of gp I, II, III, and IV respectively. The mean duration(min.) of regression of sensory block was 83+_14.30 min, 85.8+_16.70min, 86.2+_14.66min and 82.8+_15.25min in gp I, II, III, and IV respectively no significant different statistically. The mean duration (hrs) of motor blockade was 4.42+_1.15, 4.08+_0.9025, 3.96+_2.526 and 4.2+_1.05 in group I, II, III and IV respectively. Statistically there is no significant difference. The change in mean arterial B.P. and pulse rate intraoperatively were not significant. Hypotension occured in 8%, 4%, 4% and 8% of patients in gp II, II, III and IV respectively. While nausea occured in 4% patients of gp IV only which was managed by ondansetron. Statistically these value were non-significant. The mean ambulatory time (hrs) was 5.52+_1.66, 5.96+_1.63, 5.84+_1.616 and 5.6+_1.78 in gp I, II, III and IV respectively which were statistically non-significant. THE incidence of post spinal headache was 20% in gp I, 12% in gp II, 4% in both gp III and gp IV. Statistically this is non-significant between I vs III and III vs IV while significant among other groups. The onset of headache was on 2nd day in 3, 1, 1 and 1 patient of group I, II, III and IV respectively. One patient of gp I & 2 patients from gp II had onset on 3rd day. While only 1 patient of gp had onset on 4th day. It was of mild grade of severity who developed headache. Total percentage of frontal headache was 80% and generalised headache in 20%. All patients had duration of headache 24hrs, while one patient had 48hrs.

Table 1: Demographic table and variables

Variables		Group I	Group II	Group III	Group IV	p value	Interpretation
Age (yrs)		28.36±5.14	27.68±5.44	26.68±4.92	25.8±4.58	>0.05	NS
Weight (kg)		61.72±6.47	61.6±6.65	63.64±6.2	60.72±6.85	>0.05	NS
Height (cm)		163.8±5.45	164.08±4.96	164.24±16.01	164.36±5.43	>0.05	NS
ASA Grade	I	23	23	22	23	-	-
	II	3	2	3	2	-	-

Table 2: Charts in vitals in Intra op

	Group I	Group II	Group III	Group IV	p value	Interpretation
Change in Mean Arterial Pressure (mmHg)	84.63±9.66	86.63±6.87	85.70±8.02	85.70±7.22	>0.05	NS
Intra operative Mean Pulse Rate (bpm)	89.72±4.57	85.76±5.32	87.48±5.49	88.5±4.5	>0.05	NS

Table 3: Charts in vitals in Intra op

	Group I	Group II	Group III	Group IV	Com. between group	Interpretation
Onset of blockage (min)	4.4±0.97	5.28±0.97	4.32±0.77	5.36±0.95	I vs II	S
					I vs IV	S
					II vs III	S
					III vs IV	S
Regression of sensory blockade	83±14.30	8.58±16.7	86.2±14.66	82.8±15.25	-	NS
Regression of Motor blockade	4.42±1.15	4.08±0.92	3.96±2.52	4.2±1.05	-	NS

Table 4: Ambulatory time after spinal anaesthesia

	Group I	Group II	Group III	Group IV	p value	Interpretation
Time (hrs)	5.52±1.66	5.96±1.63	5.84±1.61	5.6±1.76	>0.05	NS

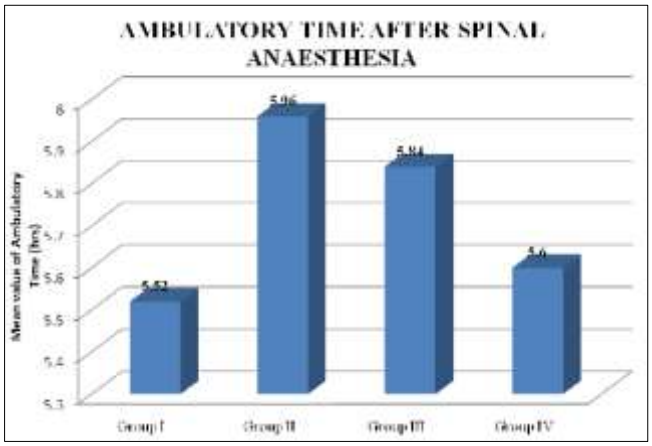

Fig 1

Table 5: Incidence of post spinal headache

	Group I	Group II	Group III	Group IV	Com. Between group	Interpretation
No. of patients	5 (20%)	3(12%)	1(4%)	1(4%)	I vs III	S
					I vs IV	S
					II vs III	S
					III vs IV	S

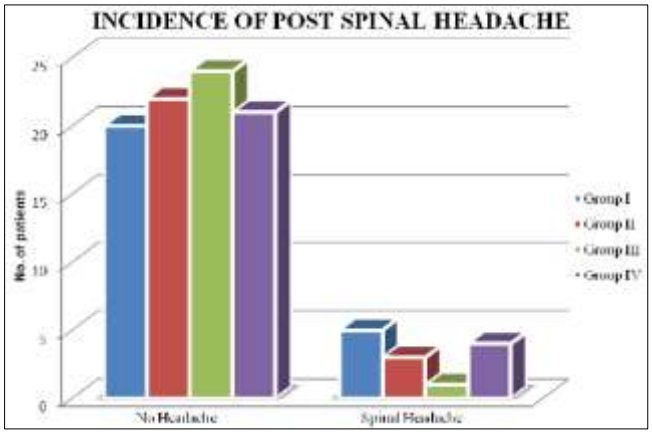

Fig 2

Table 6: Characteristic of Headache

Parameters		Group I	Group II	Group III	Group IV	Interpretation
Onset (days)		2.1±1.13	1.83±0.48	1.6	1.6	-
Severity (Mild) (No. of patients)		5 (100%)	3 (100%)	1 (100%)	1 (100%)	-
Location	Frontal	4 (80%)	2 (66.66%)	1 (100%)	1 (100%)	NS
	Generalised	1 (20%)	1 (33.33%)	-	-	
Duration (hrs)		21.4±4	19.3±1.22	21	18	-

Discussion

PDPH is a common sequale to lumbar puncture. The pathophysiology of the headache is related with ongoing leakage of CSF through the dural rent made by the lumbar puncture that exceeds the rate of CSF production and simultaneously stretches the pain sensitive structure of brain. Majority of previous studies focussed on the issue of PDPH have indicated that the size & shape or type of needle plays an important role in the occurence of PDPH [4, 13, 20, 22]. The present study furthur strengthens the fact that non cutting type smaller or larger (Whitacre) of spinal needle leads to less incidence of PDPH than cutting type (Quincke) spinal needle even in those patients who were made ambulatory within 6 hrs of early post-operative period. The results are in accordaance with the previous documented less incidence of PDPH with non-cutting type than cutting type (Halpern S *et al*. 1994 [20], Richman JM *et al*. 2006 [19], de diego Fernandez [30], Bano F *et al*. 2004 [39], Irkal JN *et al*. 2016 [41]. Another fact which emerged out from the results of the present study is that the gauge of the needle also plays an important role in increasing the incidence of PDPH, particularly, with the cutting type of different gauge (25 and 27 Whitacre). In this aspect, our findings are in colloboration of the findings of Dittman *et al*. (1996) [21], Pal A *et al*. 2011 [40]. Moreover, the incidence of PDPH in early ambulatory patients in the present study are in accordance with the authors (Tejavanija S [36] *et al*. 2006, who focussed that early ambulation neither increased the incidence of PDPH nor its severity. The overall incidence of PDPH in the present study was 20%, 4%, 12% and 4% with Quincke, 25G Whitacre, 27G Quincke and 27 G Whitacre accordingly. The pencil point spinal needle and the tip of pencil point separates the longitudinal fibres of the dura and arachnoid without producing serious injury (1960) [23]. In the present study, with Whitacre needle either 25G or 27 G needle only in 2 patients (one with 25G and 1 with 27 G Whitacre) incidence of PDPH occured on 2nd day, while with 25 Quincke, 3 patients had PDPH on 2nd day, one patient each had occurence on 3rd day nd 4th day with 27G Quincke (mean duration of onset 2.1+_ 1.13day).One patient developed PDPH on 2nd post-operative day and 2 patients developed Pdph on 3rd day with mean duration of 1.83+_0,4884 days. In study by Tejavanija S *et al*. (2006) [36] the onset of PDPH was at 6hrs through to the 4th day after LP (mean 1.6 days+_1.5 days. Thus our results are in accordance to this study. In study by Bano F *et al*. 2004 [39] most of the PDPH resolves within 48hrs of their onset, while 25G Quincke & Whitacre. Thus our results are similar to this as in our study PDPH resolved within 24 hrs. The severity of headache in the present study was mild in nature and the results are similar to study by Greene [27] in which reduced incidence was noted with 27G needle. The overall incidence of PDPH in the present study with 25 G & 27G Quincke & Whitacre needle did not differ much with the already reported incidence of PDPH in those patients who were advised to take rest upto 24 hrs or more in supine or recombinant posture in postoperative period. Several previous studies confirmed that duration and posture of recumbance after LP did not influence PDPH [34] (Hafer J. *et al*. 1997) [34].

Conclusion

So far it is inferred that Whitacre needle pencil point reduces the incidence of PDPH in comparison to Quincke needle (cutting). The higher the gauge, the lower is the incidence of PDPH. Overall incidence of PDPH was documented in our study was 20% and 12% in 25G &27G Quincke spinal needle while 4% in each 25G & 27 G Whitacre spinal needle.
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None. Conflict of Interest:
None.

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