A Clinical Study to Compare 25 G Whitacre and Quincke Spinal Needles for Incidence of Post Dural Puncture Headache (PDPH) and Failed Spinal Anaesthesia

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Abstract

Post dural puncture headache (PDPH) is the most distressful complication of spinal anaesthesia. The modifiable risk factors include spinal needle type and size. Thus the present study was attempted with a primary aim to compare 25G Whitacre and 25G Quincke spinal needles with respect to the incidence, onset and severity of PDPH, incidence of failed spinal anaesthesia (FSA) and the quality of block achieved (sensory and motor). The study was conducted from December 2017 to August 2019. 120 patients posted for lower abdominal and lower limb surgeries were allocated in two groups of 60 each. Patients received sub arachnoid block (SAB) with 15 mg of 0.5% bupivacaine using 25 G Whitacre needle in Group A and using 25G Quincke's needle in Group B. All the patients were evaluated for incidence, onset and severity of PDPH at 24hr, 48hrs and 72hrs after SAB, rate of FSA and quality of block using modified bromage scale and pinprick method. Demographic data was comparable in both the groups. Incidence of PDPH was 1.6% in Whitacre group as compared to 15% in Quincke's group . However the result was statistically insignificant for rate of FSA and quality of block achieved. It is concluded that pencil point 25 G Whitacre needles are associated with a lower incidence of PDPH as compared to cutting 25G Quincke spinal needle and thus should be used in a population that is at high risk of developing PDPH.

Keywords: *Post dural puncture headache, failed spinal anaesthesia, Whitacre, Quincke.*

Introduction

Spinal anaesthesia, also known as subarachnoid block (SAB) was first discovered by J. Leonard Corning in 1885. It is one of the most routinely used technique for surgeries of lower abdomen and lower limbs. It is preferred over general anaesthesia for having advantages like rapid onset, easy technique, excellent operating conditions, better analgesia, maintenance of airway patency and requires short stay in post anaesthesia care unit (PACU) but is not devoid of complications.

Post dural puncture headache (PDPH) defined as bilateral, frontal, occipital headache which extends to the neck and shoulders and may be throbbing or constant in nature. The headache is increased by head movement, sitting or standing position and is relieved in recumbent position. Usually, headache starts 12-72 hours after dural puncture and resolves by itself within seven days or 48 hours if effective treatment is given[1]. PDPH is caused due to leakage of cerebrospinal fluid(CSF) from dural puncture leading to overall reduction of CSF volume. The pain is attributed to the traction that occurs on the pain sensitive structures in cranial cavity due to downward movement of brain. There are various predisposing factors for PDPH like young age, gender,

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pregnancy, lower body mass index, previous history of chronic headache. The most important preventable risk factor responsible for PDPH is related to the needle selection[2]. Incidence of PDPH may vary from 0.1 to 36% depending upon the type and size of spinal needle.[3]

According to Gaston Labat, there are two pre-requisite which are absolutely necessary to produce successful sub arachnoid block, they being; puncture of the dura mater and subarachnoid injection of an anaesthetic agent.[4]

Failed spinal anaesthesia (FSA) is defined as absent or partial effect of spinal block which requires conversion to general anaesthesia after waiting for 15 minutes.[5] Jeffrey H levy et al had reported 17% incidence of FSA, which they attributed to avoidable technical reasons.[6] Thus, it is necessary to identify potential pitfalls so as to decrease the failure rate by improved clinical practice.

Various mechanisms known to cause FSA include operator related causes (like incorrect positioning, inadequate dose of drug), technique related failure (like misplaced injectate, pseudopuncture), equipment related failure (like blocked needle, pencil point needle).[7]

To combat PDPH and FSA various experiments have been made to manipulate the various needle design components such as tip design, diameter, location of orifice, length and material. There are very few studies reported in the literature comparing 25-G Whitacre and 25-G Quincke needle.

Hence the present study was attempted to compare these two needles with respect to the incidence, onset and severity of PDPH, incidence of FSA and the quality of block achieved(sensory and motor).

Material and Method:

After approval from Institutional ethics committee (IEC), this study was conducted in the department of anaesthesiology, from December 2017 to August 2019 on ASA I and ASA II patients, aged 20-60 years, of either gender, who were scheduled to undergo SAB for lower abdominal and lower limb surgeries.

Pre-anaesthetic evaluation was done a day before surgery. Detailed history, physical examination, heart rate, blood pressure, routine investigations (haemoglobin, bleeding time, clotting time, liver function test, renal function test, chest Xray, electrocardiogram, fasting blood sugar and any other special investigation depending upon the disease process were recorded in all cases pre-operatively.

During the pre-anaesthetic check up, patients were explained about the procedure of SAB, drugs and needles being used. An informed written consent of patients was taken. All the patients were kept Nil per oral overnight and premedicated with tab alprazolam (0.25mg) and tab ranitidine (150 mg) at bedtime prior to the day of surgery.

Allocation of Groups: 120 healthy patients were randomly allocated into two groups of 60 each and all the patients were preloaded with 15ml/kg/hr of ringer lactate in preoperative period.

Patients received SAB with 15 mg of 0.5% bupivacaine using 25 G Whitacre needle in Group A and using 25G Quincke's needle in Group B using standard midline approach in L3-L4 space, in sitting position.

After 15 minutes of SAB, quality of block was assessed using gentle pinprick for sensory block and modified bromage scale (Table 1) for motor blockade[8]. If the block was inadequate as per surgery then it was taken as failed spinal block and general anaesthesia was administered to the patient.

In the postoperative period all the patients were advised to maintain supine position for 24 hours and received 75mg diclofenac twice daily for three days as analgesic for surgery. The patients were followed daily for three postoperative days for incidence and severity of PDPH.

Headache after SAB was regarded as PDPH if it occurred after mobilization, aggravated by erect, sitting position, coughing, sneezing or straining, relieved by lying flat and mostly located to occipital, frontal or generalised. Table 2 describes the severity of PDPH.[9]

All the cases of PDPH were managed according to intensity of headache. Mild and moderate required conservative treatment however severe required active intervention.

Statistical analysis was done for all quantitative variables of each group using statistical package for the social science 21 (SPSS 21) version statistical program for Microsoft windows. Data was arranged as range; frequencies, mean ±standard deviation (± SD), median and relative frequencies. Mann Whitney U test for non parametric data and Student t test for parametric

data was used for independent samples to compare the quantitative variables of the study groups. Chi-square (χ^2) test was done and exact test was performed (when the expected frequency was not more than 5) to compare the categorical data of the study groups. A probability value (p value) less than 0.05 was taken as statistically significant[10].

Observations and Results

Overall incidence of PDPH in our study was 8.3%. As shown in Table 3 the incidence was 1.6% in group A as compared to 15 % in group B. The p value was 0.008, which ascertains that it was significant. None of the patient complained of PDPH in first 24 hours. However when the two needles were compared for severity of PDPH, p value was 0.029 which ascertains the result was significant.

Overall incidence of FSA in our study was 7.5%. As shown in Table 4 the incidence was 11.6% in group A as compared to 3.3 % in group B. The p value was 0.083, which ascertains that it was non significant. When the two needles were compared for quality of block that is sensory and motor level achieved, p value was 0.53 and 0.35 respectively which ascertains that there is no relation between the type of needle and quality of block achieved.

Table 1. Modified Bromage scale

Score	Criteria
0	The patient is able to move hip, knee, and ankle
1	Patient is unable to move hip but able to move knee and ankle
2	Patient is unable to move hip and knee but able to move ankle
3	Patient is unable to move hip, knee, and ankle

Table 2: Severity of PDPH

Mild	No limitation of activity and no treatment required.
Moderate	limited activity and regular analgesics required.
Severe	Patient is confined to bed and anorexic.

Table 3: Variables for PDPH

Sr.No.	Variables	Opts	Groups				p value	Result
			Whitacre	%	Quincke	%		
1	Incidence of PDPH	Present	1	1.6	9	15	0.0082	Significant
		Absent	59	98.3	51	85		
2	Onset of PDPH	24-48hr	1	1.6	8	13.3	0.725	Non Significant
		48-72hr	0	0	1	1.6		
		NA	59	98.3	51	85		
3	Severity of PDPH	Mild	1	1.6	7	11.6	0.029	Significant
		Moderate	0	0	2	3.3		
		NA	59	98.3	51	85		

Table 4: Variables for FSA and quality of block

Sr.No.	Variables	Opts	Groups				p value	Result
			Whitacre	%	Quincke	%		
1	Incidence of FSA	Present	7	11.6	2	3.3	0.083	Non Significant
		Absent	53	88.33	58	96.6		
2	Sensory level	T4	22	36.6	28	46.6	0.53	Non Significant
		T6	29	48.3	25	41.6		
		T8	9	15	7	11.6		
3	Motor Block	Mean	2.85	-	2.91	-	0.359	Non Significant
		SD	0.444	-	0.334	-		

Discussion

The present study aims to compare pencil point needle and cutting type spinal needle for various complications of spinal anaesthesia. The objectives of the present study was to find out the incidence, onset and severity of PDPH, incidence of FSA and quality of block achieved in two groups where 25 Gauge Whitacre was used in group A and 25 gauge Quincke needle was used in group B.

Both the groups were comparable as regards to age, gender, weight and ASA status.

Our study shows a higher incidence of PDPH with Quincke as compared to Whitacre of same gauge. These results were consistent with the study conducted by Ripul Oberoi et al[11] in 2009, which reported 1% incidence of PDPH with 25 Gauge Whitacre needle as compared to 9 % with 25 gauge Quincke needle. A meta-analysis done by Halpern and Presto reported that pencil point needle produces a lower incidence of PDPH as compared to cutting type spinal needle.[12]

Anirban Pal et al[13] concluded that the pencil point 25G Whitacre spinal needle is responsible for lower frequency of PDPH as compared to 25G Quincke spinal needle and thus, is recommended to be used in patients at a high risk of PDPH.

Carrie suggested that the use of pencil point needle separates the longitudinal fibres of duramater without causing any serious injury and when the needle is withdrawn, fibres get back into state of close approximation thus, closing the rent and preventing any loss of CSF and PDPH.[14]

None of the patient in both the groups complained of PDPH in first 24 hrs. All the patients had PDPH between 24 to 72 hrs after surgery. Similar results were seen in study done by Shah et al in which patients were kept recumbent for 24 hrs after surgery[15]. Study done by Sumaya Syed et al also reported an onset of PDPH ranged from 24 to 72 hrs after dural puncture.[16]

In our study, nine patients had mild PDPH and were given conservative management in the form of adequate hydration and bed rest. All the patients responded well. However, one patient had moderate PDPH and was given analgesia with paracetamol, 15mg/kg, IV twice daily and tramadol 50mg twice daily in addition to conservative management. Epidural blood patch was discussed with this patient, but was not required.

Similar results were seen in study done by Veeresham Madhupathy et al, where maximum patient had mild intensity of PDPH and none of them suffered from severe PDPH on using 25G Whitacre and 25G Quincke needle.[17]

In our study, 11.6 % patients in Whitacre group and 3.33 % in Quincke group had failed spinal block. 9 patients out of 120 have experienced FSA and were given general anaesthesia for the smooth and safe conduct of surgery.

The results were consistent with the study conducted by Jawaharlal N. Irkal et al in 2016, which reported which reported 10% incidence of Failed spinal block with 25 Gauge Whitacre needle as compared to 4% with 25 gauge Quincke needle.[18]

In Whitacre group, occurance of failed spinal block even after free flow of CSF indicates that appearance of CSF at the hub of needle does not guarantee that the ejection port of needle is completely within the subarachnoid space thus, leading to some leakage of local anaesthetic drug in sub dural or epidural space resulting in inadequate analgesia[4] .

In our study, quality of block achieved with both the needle (Whitacre and quincke) was comparable and was satisfactory for the safe conduct of surgery and similar results are seen in study done by Veeresham Madhupathy et al.[17]

Limitations: Our study had relatively small sample size in proportion to the burden of PDPH in population. Also the failure rate of Whitacre needle was high in our study as acquisition of new skill takes time but still it was considered reasonable to conduct this study to evaluate this recently introduced needle for the incidence of PDPH.

Conclusion

From this present study, it is concluded that pencil point 25 G Whitacre needles are associated with a lower incidence of PDPH as compared to cutting 25G Quincke spinal needle and thus should be used in a population that is at high risk of developing PDPH. Both the needles are comparable in terms of incidence of FSA and quality of block achieved for the smooth conduct of the surgery. Thus, 25gauge Whitacre needle is better than 25gauge quincke spinal needle for spinal anaesthesia.

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