Original Article

DOI: 10.7860/JCDR/2022/55248.16500

Haemodynamic Effects and Quality of Intrathecal Block in Lateral Decubitus Position using 25G Whitacre versus 25G Quincke Spinal Needles- A Cohort Study

Anaesthesia Section

BABITA RAMDEV[1], SHIVANI RATHEE[2], KUNWAR DEEPAK NEELENDRA[3]

ABSTRACT

Introduction: Various attempts have been made to manipulate the needle designs to counter the adverse effects (hypotension, postdural puncture headache) of spinal anaesthesia. This includes the modification of the tip, the location of the orifice, the length and material of the needle.

Aim: To access if a whitacre needle is a better substitute than the classical commonly used, Quincke spinal needle along with intraoperative haemodynamic changes and quality of intrathecal block.

Materials and Methods: The present study was a hospital-based cohort study which included 100 patients in the age group of 20-50 years, who belonged to American Society of Anaesthesiologists (ASA) grade of I and II, and were operated for lower abdominal and lower limb surgeries under spinal anaesthesia. They were assigned into two groups A and B, wherein group A, 25G Whitacre and in Group B, 25G Quincke needles were used respectively. The primary outcome measures were the differences in the incidence of hypotension, bradycardia, and quality of sensory and motor blockade in the two groups. The t-test and Chi-square test were used. Statistical calculations were done using Statistical Package for the Social Science (SPSS) 21.0 version.

Results: There was a noteworthy drop in the blood pressures {Systolic blood pressure (SBP), Diastolic blood pressure (DBP), and Mean Arterial Pressure (MAP)}, but the variance between the two needle groups was statistically insignificant ($p>0.05$). There was no statistically significant difference between the two needles group to the quality of intrathecal block. Sensory block onset in group A (83.08±12.26 seconds), group B (81.42±17.81 seconds) with p-value 0.410. The mean Bromage score in group A (2.90±0.30), group B (2.88±0.33).

Conclusion: Both the needles provided excellent sensory and motor blockade and haemodynamic steadiness.

Keywords: Haemodynamic, Motor and sensory blockade, Spinal anaesthesia, 25G Whitacre and quincke spinal needle

INTRODUCTION

The selection of the anaesthetic procedure depends upon surgical requirements and the patient's concerns. There are various anaesthetic techniques which includes general, regional and local anaesthesia [1]. Spinal Anaesthesia (SA) is the inoculation of a Local Anaesthetic (LA) into the subarachnoid (or intrathecal) space using a needle, thus after diluting with the Cerebrospinal Fluid (CSF) creating a conduction blockade of the spinal nerves. The resultant nerve block is required for surgical anaesthesia and the level is attained as per the site of surgery. The benefits of this technique are well aware of. It's economical, simple, and does not require any refined equipment [2].

Different designs and sizes of the needle are available based on the concept of anatomy and physiology of the CNS. This aids us in reducing the problems of spinal anaesthesia. Various efforts have been made to design the needle to counter the adverse effects of the subarachnoid blockade. This includes the alteration of the tip, location of the orifice, length and material of the needle. In various studies, compared cutting and pencil point spinal needle effect on frequency of Post Dural Puncture Headache (PDPH) and on haemodynamics [3,4]. The present study focuses on haemodynamic effect, level of sensory and motor blockade rather than postdural complications. There is less data on different needle shape effect on level of sensory, motor blockade. So, this study attempted to compare the 25G Quincke and 25G Whitacre needles for changes in the haemodynamics, level of sensory and motor blockade after giving spinal anaesthesia.

MATERIALS AND METHODS

This was a hospital-based cohort study, done in the Department of Anaesthesiology, MMIMSR, Mullana, Ambala, Haryana, India. The study period was two years, from December 2018 to December 2020. Informed consent was taken from the participants, and the Institutional Ethical Committee (IEC-1199) approval was obtained.

The patients were divided into two groups of 50 cases each- odd number selected in group A and even number in group B. Group A consisted of cases in which a 25G Whitacre needle was introduced. Group B consisted of cases in which a 25G Quincke needle was introduced.

Inclusion criteria: Patients with age group 20-50 years, of either sex, ASA grade I and II, weight 50-70 kgs. Elective surgeries like lower limb, orthopaedic and lower abdominal surgeries were included in the study.

Exclusion criteria: ASA Grade III and IV, unveiling patients, known case of any drug allergy, disease or deformity of the spine, any signs of infection at the desired site, psychiatric patients were excluded from the study.

A preanaesthetic evaluation was performed one day before the surgery and all required routine investigations were done.

Group A: Intrathecal anaesthesia was given with (0.5%) hyperbaric bupivacaine 10 mg plus inj. fentanyl 25 g using 25G Whitacre needle in left lateral position in the midline.

Group B: Intrathecal anaesthesia was given with (0.5%) hyperbaric bupivacaine 10 mg plus inj. fentanyl 25 g using 25G Quincke needle in left lateral position in the midline.

On arrival in the operating room, non invasive blood pressure, pulse oximetry, and Electrocardiography (ECG) monitoring were applied to the patient. Under all aseptic measures, lumbar puncture was performed either by 25G Quincke or 25G Whitacre spinal needle in the left lateral position in the midline between L3-L4 intervertebral space. All the patients were blinded to the type of needle utilised. An observer blinded to the spinal needle-type recorded the haemodynamic parameters and the level of sensory and motor blocks. The data were recorded at 0 mins (i.e. at the time of subarachnoid block) was considered as the baseline haemodynamic values for each patient.

Primary outcome: Heart Rate (HR), DBP, SBP, and MBP, and Oxygen saturation (SpO_2) was documented at every 1 minute for 5 minutes after the intrathecal blockade and then every 5 minutes for 30 minutes.

Secondary outcome: The level of sensory block was judged by needle prick. The time for commencement of action of block and time taken to reach the full sensory blockade level was noted. The level of motor block was assessed by the modified Bromage scale [5].

When the fall in blood pressure was >30% to the baseline reading, it was considered as hypotension and same with heart rate <55 beats/minutes or >100 beats/minute, were considered as bradycardia or tachycardia, respectively [6].

STATISTICAL ANALYSIS

Data was defined in terms of series; mean±Standard Deviation (±SD), median, frequencies (number of cases), and relative frequencies (percentages) as appropriate. Assessment of quantitative variables between the two groups was done using the Student's t-test and Mann-Whitney U test. For assessing categorical data, Chi-square (χ^2) test was performed and the Fisher's-exact test was used when the expected frequency is less than 5. A probability value (p-value) <0.05 was taken as significant. All statistical calculations were done using SPSS 21.0 version (SPSS Inc., Chicago, IL, USA).

RESULTS

The demographic data like age (20-50 years), weight (50-70 kg), and gender on comparison between two groups, values were not significant (p>0.05) [Table/Fig-1].

Variables	Group A Mean±SD	Group B Mean±SD	p-value
Weight (kg)	59.40±5.16	57.52±5.80	0.090
Age (years)	37.80±9.40	35.82±8.46	0.271
Gender	**Number (%)**	**Number (%)**	**p-value**
Male	24 (48)	22 (44)	0.688
Female	26 (52)	28 (56)	
Total	50	50	

[Table/Fig-1]: Demographic distribution in both groups.

The haemodynamic parameters taken into consideration were HR, SBP, DBP, SpO_2, MAP and there were no statistically significant (p-value >0.05). The mean baseline SBP in group A was 124.56±10.19 mmHg, and in group B was 124.80±9.19 mmHg. There was no statistically significant difference in SBP between the two groups intraoperatively at 1, 2, 3, 4, 5, 10, 15, 20, 25, 30 minutes (p-value >0.05).

There was a statistically significant (p-value <0.05) decrease in the systolic blood pressure in both the groups as compared to baseline values. The mean baseline DBP in group A was 75.62±6.87 mmHg and in group B was 75.60±7.31 mmHg. There was no statistically significant difference in the DBP between the two group intraoperatively at 1, 2, 3, 4, 5, 10, 15, 20, 25, 30 minutes (p-value >0.05).

The mean baseline MAP in group A was 91.93±7.97 mmHg and in group B was 92.35±7.93 mmHg. There was no statistically significant difference in the MAP between the two groups intraoperatively at 1, 2, 3, 4, 5, 10, 15, 20, 25, 30 minutes (p-value >0.05). The mean baseline SpO_2 in Group A was 100.00±0.00% and in Group B was 99.94±0.24% [Table/Fig-2]. There was no statistically significant difference in the SpO_2 between the two groups intraoperatively at 1, 2, 3, 4, 5, 10, 15, 20, 25, 30 minutes (p-value >0.05). [Table/Fig-3] shows comparison of intraoperative blood pressure, [Table/Fig-4] shows comparison of time required to achieve sensory and motor blockade in both groups, [Table/Fig-5] shows comparison of peak sensory block level between the two groups.

Variables	Group A Mean±SD	Group B Mean±SD	p-value
Preop HR (beats/sec)	82.14±10.44	81.86±11.36	0.898
Preop SBP (mmHg)	124.56±10.19	124.80±9.19	0.902
Preop DBP (mmHg)	75.62±6.87	75.60±7.31	0.989
Preop SpO_2 (%)	100.00±0	99.94±0.24	0.080
Preop MAP (mmHg)	91.93±7.97	92.35±7.93	0.960

[Table/Fig-2]: Preoperative haemodynamic data in both groups.

Group	Preoperative HR	Mean intraoperative HR	p-value
Group A	82.14±10.44	82.37±9.46	<0.05
Group B	81.86±11.36	82.60±10.52	0.33
p-value	0.89	0.99	
Group	**Preoperative SBP**	**Mean intraoperative SBP**	**p-value**
Group A	124.56±10.19	117.59±8.56	<0.05
Group B	124.80±9.19	117.39±9.40	0.02
p-value	0.98	0.91	
Group	**Preoperative DBP**	**Mean intraoperative DBP**	**p-value**
Group A	75.62±6.87	73.58±6.35	0.12
Group B	75.60±7.31	73.15±7.23	0.09
p-value	0.99	0.99	
Group	**Preoperative MAP**	**Mean Intraoperative MAP**	**p-value**
Group A	91.93±7.97	88.25±7.20	0.01
Group B	92.35±7.93	87.90±7.22	<0.05
p-value	0.79	0.80	
Group	**Preoperative SpO_2**	**Mean intraoperative SpO_2**	**p-value**
Group A	100.00±0.00	99.94±0.22	0.08
Group B	99.94±0.24	99.92±0.10	0.09
p-value	0.98	0.99	

[Table/Fig-3]: Comparison of intraoperative blood pressure within the groups. p-value <0.05 considered significant

Variables	Group A Mean±SD	Group B Mean±SD	p-value
Sensory block Onset	83.08±12.26	81.42±17.81	0.410
Time for max sensory block level (in sec)	382.3±26.08	381.48±22.62	0.854
Modified bromage Scale	2.90±0.30	2.88±0.33	0.750
Time for Max sensory block Level (seconds)	382.38±26.08	381.48±22.62	0.854

[Table/Fig-4]: Comparison of time required to achieve sensory and motor blockade in both groups.

Peak sensory block-level	Group A	Group B	Total	p-value
T4	27	28	55	0.841
T6	21	22	43	0.840
T8	2	0	2	0.493
Total	50	50	100	

[Table/Fig-5]: Comparison of peak sensory block level between the two groups.

DISCUSSION

This clinical trial suggests that the SBP, DBP and MAP drops after the induction of spinal anaesthesia regardless of the type of needle used as mentioned in [Table/Fig-3]. This was similar to the study conducted by Ghanei MM and Mehraban MS. They found that the SBP dropped upto 30 minutes after the induction of SA regardless of the type of needle [7]. In a similar study done by Rizwee S et al., there was no significant difference in the SBP between 27G Whitacre and 27G Quincke spinal needle [8]. Pal A et al., conducted a study using 25G Whitacre or Quincke spinal needle, and observed that the MAP did not differ between the two groups and there were no significant differences also [9]. Casati A et al., and Shutt LE et al., showed similar results [10,11].

In distinction to the present study, Campbell DC et al., did not witness hypotension and stated that it may be the result of good pre-hydration [12]. SpO_2 in both the needle groups was comparable (p-value >0.05). This is as per the study conducted by Pal A et al., using 25G Whitacre or Quincke spinal needle, observed that at all the measured time intervals, the SpO_2 did not differ between the two needle groups [9]. There was no statistically significant difference in the degree of motor blockade between the two needle groups with a p-value of 0.750 (>0.05).

Sensory block in the present study, there was no statistically significant difference in the onset of sensory blockade between the two needle groups. However, there was no statistically significant difference in the height of sensory blockade between the two needle groups. Similar findings were reported by Shutt LE et al., and Tahoor S and Rao R [11,13]. Time for attaining the highest level of sensory blockade was similar between both the groups as described in [Table/Fig-4]. Similar results were observed by others also [10,14,15]. The level of peak sensory block was either T4 (fast group) or T3 [Table/Fig-5]. McShane FJ et al., conducted a study to check the influence of 25G Whitacre spinal needle orifice direction on the level of sensory blockade. The maximum sensory block achieved in patients was either T4 (cephalad group) or T5 (caudad group) [16]. Hence, the present study findings are similar to the previous studies done by Shutt LE et al., Tahoor S and Rao R, Anderson L et al., and McShane FJ et al., [11,13,15,16].

In the present study, the degree of motor blockade (modified Bromage criteria) was either 2 or 3 in both the needle groups. There was no statistically significant difference to the degree of motor blockade between the two needle groups as shown in [Table/Fig-4]. Singla M et al., conducted a study using 25G Whitacre or 25G Quincke spinal needle. The mean Bromage group was 2.90±0.30 and in Quincke group was 2.88±0.33. Both the needles were comparable in terms of the degree of motor block [4]. Tahoor S and Rao R conducted a study using 25G Quincke and 25G Whitacre spinal needles. For grading the degree of motor blockade, they used Bromage scores of 1, 2, 3 and 4. A Bromage score of 3 was seen in 7 patients of the Quincke group and 15 patients of the Whitacre group. A score of 4 was seen in 33 patients of the Quincke group and 25 patients of the Whitacre group [14].

Limitation(s)

The main limitation of the present study was the postdural headache was not seen and anaesthesiologist comfort was not assessed.

CONCLUSION(S)

The pencil point 25G Whitacre spinal needle and cutting-beveled 25G Quincke spinal needle both are comparable in terms of sensory blockade, motor blockade, and haemodynamic changes. Hence, either of the needles can be used for the induction of spinal anaesthesia and smooth conduct of surgery.

REFERENCES

[1] Loosely A. Corning and cocaine: The advent of spinal anesthesia. Gd Rounds. 2009;9:L1-L4.
[2] Halaszynski TM, Hartmannsgruber MWB. Anatomy and physiology of spinal and epidural anesthesia. Seminars in Anesthesia, Perioperative Medicine and Pain. 1998;17(1):24-37.
[3] Xu H, Liu Y, Song W, Kan S, Liu F, Zhang D, et al. Comparison of cutting and pencil-point spinal needle in spinal anesthesia regarding post dural puncture headache. Medicine (Baltimore). 2017;96(14):e6527.
[4] Singla M, Khan MA, Singh S, Santpur M. A clinical study to compare 25G whitacre and quincke spinal needles for incidence of Post Dural Puncture Headache (PDPH) and failed spinal anaesthesia. Indian J Public Heal Res & Dev. 2020;11(5 SE-):216-20.
[5] Bromage PR. Epidural Analgesia. Philadelphia: WB Saunders, 1978:144.
[6] Sankaranand P, Krishna Prasad GV. Duration of analgesia, sensory and motor blockade, and intra operative hemodynamic changes caused by intrathecal bupivacaine, bupivacaine plus clonidine, and bupivacaine plus dexmedetomidine in spinal anesthesia: Prospective, comparative study. Int J Res Med Sci. 2018;6(2):493.
[7] Ghanei MM, Mehraban MS. Comparison of the 25,26 and 27 gauge needles for spinal anesthesia. Pakistan J Biol Sci. 2015;18(6):290-94.
[8] Rizwee S, Tiwari RL, Kotia ASS, Goyal J, Chandalia S. A comparative study of 27 G Quincke and Whitacre spinal needle for evaluation of post-dural puncture headache. Med Pulse Int J Anesth. 2019;11(2):149-53.
[9] Pal A, Pal N, Biswas J, Acharya A, Dawn S. Do pencil-point spinal needles decrease the incidence of post-dural puncture headache in reality? A comparative study between pencil-point 25G Whitacre and cutting-beveled 25G Quincke spinal needles in 320 obstetric patients. Anesth Essays Res. 2011;5(2):162-66.
[10] Casati A, Fanelli G, Cappelleri G, Aldegheri G, Leoni A, Casaletti E, et al. Effects of spinal needle type on lateral distribution of 0.5% hyperbaric bupivacaine. Anesth Analg. 1998;87(2):355-59.
[11] Shutt LE, Valentine SJ, Wee MYK, Page RJ, Prosser A, Thomas TA. Spinal anesthesia for cesarean section: Comparison of 22-gauge and 25-gauge Whitacre needles with 26-gauge quincke needles. Br J Anaesth. 1992;69(6):589-94.
[12] Campbell DC, Douglas MJ, Pavy TJG, Merrick P, Flanagan M Lou, McMorland GH. Comparison of the 27-gauge Whitacre with the 27-gauge Quincke spinal needle for elective caesarean section: Cost implications. Can J Anaesth. 1993;40(12):1131-35.
[13] Tahoor S, Rao R. Comparative study of the incidence of post-dural puncture headache with 25 gauge quincke and 25 gauge Whitacre needles in obstetric patients. J Evol Med Dent Sci. 2017;6(10):757-60.
[14] Srivastava V, Jindal P, Sharma JP. Study of post-dural puncture headache with 27g quincke & Whitacre needles in obstetrics/non-obstetrics patients. Middle East J Anesthesiol. 2010;20(5):709-18.
[15] Anderson L, Walker J, Brydon C, Serpell MG. The rate of injection through Whitacre needles affects the distribution of spinal anesthesia. Br J Anaesth. 2001;86(2):245-48.
[16] McShane FJ, Burgos N, Kapp M, Wieczorek C. Influence of Whitacre spinal needle orifice direction on the level of sensory blockade. AANA J. 2000;68(1):67-72.

PARTICULARS OF CONTRIBUTORS:
1. Professor, Department of Anaesthesia, MMIMSR, Mullana, Ambala, Haryana, India.
2. Assistant Professor, Department of Anaesthesia, SGT University, Gurugram, Haryana, India.
3. Senior Resident, Department of Anaesthesia, MMIMSR, Mullana, Ambala, Haryana, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Shivani Rathee,
Tower-C, Heritage Max, Sector-102, Gurugram, Haryana, India.
E-mail: vp.ratheeclinic@gmail.com

PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Feb 01, 2022
- Manual Googling: Apr 22, 2022
- iThenticate Software: May 07, 2022 (20%)

ETYMOLOGY: Author Origin

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Jan 29, 2022**
Date of Peer Review: **Mar 03, 2022**
Date of Acceptance: **May 09, 2022**
Date of Publishing: **Jun 01, 2022**