



## Comparison of 25G Whitacre and 25G Quincke Spinal Needles for Incidence of Post Dural Puncture Headache: A Randomised, Prospective Study from South India

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### Abstract

**Background:** Spinal anesthesia and its related complications such as post dural puncture headache (PDPH) is a common and enfeebling to patients. The present study was done to compare the incidence, onset, and severity of PDPH using 25G Whitacre's vs 25G Quincke's needles in patients undergoing abdomen and lower limb surgeries. **Material and methods:** This randomized prospective study was conducted from November 2021 to October 2022. A total of 60 patients, 30 in each of the two groups (group A - Whitacre and group B - Quincke) were included. The number of attempts required for successful insertion, the incidence of PDPH, and its severity were recorded. **Results:** The mean age of both cohorts was  $39.36 \pm 12.19$  years. The majority of the patients had a successful Sub arachnoid block on their first attempt itself (Whitacre group: 14. 47% and in Quincke group: 20.67%). In both the groups, the incidence of PDPH was reported in 19 (32%) patients, in which the majority were in the Quincke group (13, 43%) with an onset within 24-48 h (9, 30%). Our data suggests no significant association between the incidence of PDPH and gender ( $p = 0.409$ ) rather it was between the type of spinal needle and the incidence of PDPH ( $p = 0.047$ ). **Conclusion:** Overall, incidence of PDPH and its severity was recorded as low in pencil point 25G Whitacre needles compared to cutting 25G Quincke needles in patients undergoing abdomen and lower limb surgeries.

**Key words:** Subarachnoid block, post dural puncture headache, Whitacre needle, Quincke needle, South India.

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### Introduction

Subarachnoid block (SAB), popularly known as a spinal anesthesia block, was first discovered by J. Leonard Corning in 1885. It is frequently used for surgeries on lower abdomen, perineum, and

lower limb regions. SAB is advantageous in many ways like safety, rapid onset, technique reliability, shorter stay in post anaesthesia care unit, maintenance of airway patency, better post operative analgesia, excellent operating conditions, less postoperative care, reduced blood loss, little effects on blood biochemistry, and minimal requirement of equipment and monitors.[1,2] However, SABs are not devoid of complications. Among those, post dural puncture headache (PDPH) remained a well-recognized complication.

PDPH, also known as post dural puncture headache, is a potential complication caused by the leakage of the cerebrospinal fluid (CSF) through the dural rent formed by the spinal needle during attempted epidural catheter placement or interventional neuraxial procedures or for diagnostic or for spinal anaesthesia.[3–5] Depending on the patient and procedural factors, its incidence ranges widely between ~ 2% to 40%.[6] Usually, it occurs 24-48 hours post-procedure and may last from 1 day to 14 days and resolves spontaneously.[7] It was reported to be associated with disturbances in hearing, blurred vision, vertigo, nausea, and vomiting in severe cases.[8] Its pathophysiology includes loss of CSF, which leads to brain sags and intracerebral vasodilation in response to compensate for the reduction in intracranial pressure (ICP), which causes pain.[7–9] PDPH-associated risk factors include patient-related (female sex, pregnancy, prior headaches, age, low opening pressure, volume of CSF removed, and low body mass index) and procedural-related (type of needle tip whether it is cutting or pencil point, needle size, needle orientation, reinsertion of stylet, and combined spinal-epidural).[4] In many patients, PDPH subsides without any treatment. In exceptional cases, patients will be treated depending on the severity of symptoms. Such conventional strategies include lying down supine without pillow, use of abdominal binder/ or prophylactic drug therapies. In exceptional cases, aggressive invasive treatment methods are adopted such as intrathecal catheter placement, epidural saline, and the use of epidural blood patches. [4,8]

To avoid PDPH, various efforts have been made in clinical practice strike through by changing the tip design and reducing the gauge of the spinal needle and it has proven to be effective to some extent. However, our literature search observed a gap and paucity in the data in comparing the most used 25G Whitacre and 25G Quincke needles for, SAB especially in the south Indian population. Hence, we decided to conduct a study to compare the incidence, onset, and severity of PDPH using 25G Whitacre's dura splitting, pencil point tip needle and 25G Quincke's dura cutting needle in patients undergoing abdomen and lower limb surgeries.

## Materials and Methods

After approval by the Institutional Review Board (SCAHS/IRB/2021/October/173), this randomised, prospective study was conducted in the department of anaesthesiology, Saveetha Institute of Medical and Technical Sciences from November 2021 to October 2022. A total of sixty patients, aged 20-65 years, of either gender, belonging to ASA Grade I and II posted for abdomen and lower limb surgeries were included in the study. The nature of the study was briefed and written informed consent was obtained from such participants. Obstetric patients and patients with a history of headaches or migraine, psychiatric illness, contraindications for spinal anaesthesia, uncontrolled systemic disease, taking any other medications, and refusal to consent were excluded from the study.

## Randomisation

The patients were randomised into two equal groups of 30 each according to computer-generated numbers, Group A - patients received SAB with a 25G Whitacre needle and Group B - patients received SAB with a 25G Quincke needle. The patients were blinded from knowing the type of spinal needle used to perform the SAB.

Pre-operative, peri-operative, and post-operative procedures and evaluations

All the patients were fasted from midnight ( $\geq 8$ h), and premedicated with tab ranitidine (150 mg) and tab alprazolam (0.25mg) Strike through at bedtime before the day of surgery. On the day of surgery all baseline parameters and pre-anaesthetic routine checks were done as per institutional protocols. After securing a wide bore IV cannula - injection ondansetron (4 mg), injection ranitidine (150 mg), and IVF ringer lactate (500 mL) was administered before spinal anaesthesia. Routine monitors including ECG, Pulse oximetry, Non invasive BP monitor were connected to

patient. Spinal anaesthesia was given in the L2-L3 or L3-L4 intervertebral space using a 25G Whitacre needle or 25G Quincke needle based on the grouping in left lateral decubitus position. Free flow of CSF was identified as an end point of needle placement for both groups. Beyond three spinal attempts it was declared unsuccessful and such patient were excluded from the study. All the anaesthesiologists who participated in the study had a minimum of 5 years of experience and were not blinded, as blinding was not possible. However, all the patient's post-operative parameters were recorded and assessed by an investigator blinded to the needle and who was not involved in any perioperative care. After the surgical procedure, patients were shifted to the Post-anaesthesia Care Unit (PACU) and monitored for three postoperative days for any incidence of PDPH or other complications. In patients with PDPH, treatment was provided based on the pain severity. Which was graded as no pain, mild pain (no treatment required or no limitation of activity), moderate pain (limited activity and required regular analgesics), and severe pain (anorexic and confined to bed).[8]

All collected data was entered and analysed in the statistical package for social science (SPSS) version 24.0. Descriptive statistics were done for both qualitative and quantitative variables. Data was presented as mean  $\pm$  SD, median (range) values, and numbers (percent). The Chi-square test was used to find out any difference in the incidence of PDPH between the two groups. A probability value (p-value)  $\leq 0.05$  was taken as statistically significant

### Results and Discussion

In our study, a total of 60 patients were given SAB (25G Whitacre needle or 25G Quincke needle) and underwent abdomen and lower limb surgeries. All patient related demographic variables and other parameters were reported in Table 1. Where the mean age of the patients in the Whitacre group was  $40.13 \pm 12.04$  years and in the Quincke group was  $38.60 \pm 12.50$  years. A male (29, 48%) preponderance was observed in both groups over females (31, 52%). The ASA status was similar between the groups. In most of the patients, a successful SAB was given on the first attempt itself (Whitacre group: 14, 47% and in Quincke group: 20, 67%), table 1. In both the groups, the incidence of PDPH was reported in 19 (32%) patients, in which the majority were in the Quincke group (13, 43%) with an onset within the first 24-48 h (9, 30%), post-operatively. Our data suggested no significant association between the incidence of PDPH and gender (p – 0.409). However, we observed a significant association between the type of spinal needle used and the incidence of PDPH (p – 0.047).

Table 1 – The socio-demographic, surgical, and clinical characteristics associated with post dural puncture headache in patients of two groups who underwent spinal anaesthesia

Parameters	25G Whitacre needle (n=30), mean $\pm$ SD, %	25G Quincke needle (n=30), mean $\pm$ SD, %	Overall (n=60), mean $\pm$ SD, %, p-value
Age	40.13 $\pm$ 12.04	38.60 $\pm$ 12.50	39.36 $\pm$ 12.19
Gender			
Male	18 (60)	17 (57)	35 (58)
Female	12 (40)	13 (43)	25(42)
ASA status			
I	16 (53)	13 (43)	29 (48)
II	14 (47)	17 (57)	31 (52)
Number of attempts			
1.00	14 (47)	20 (67)	34 (57)
2.00	10 (33)	9 (30)	19 (31)
3.00	6 (20)	1 (3)	7 (12)
Incidence of PDPH			
Absent	24 (80)	17 (57)	41 (68)
Present	6 (20)	13 (43)	19 (32)

Onset of PDPH			
24-48 hours	5 (17)	9 (30)	--
48-72 hours	1 (3)	4 (13)	--
Not Applicable	24 (80)	17 (57)	--
24-48 hours	5 (17)	9 (30)	--
48-72 hours	1 (3)	4 (13)	--
Severity of PDPH			
0	24 (80)	17 (57)	41 (69)
1	4 (13)	4 (13)	8 (13)
2	2 (7)	7 (23)	9 (15)
3	0 (0)	2 (7)	2 (3)
Association between incidence of PDPH and Gender	Gender		
	Male	Female	Male
Absent	26 (62)	16 (38)	35 (58)
Present	9 (50)	9 (50)	
Association between type of spinal needle and incidence of PDPH			
Absent	24 (80)	17 (57)	41 (68)
Present	6 (20)	13 (43)	19 (32)

## Discussion

SAB is considered a safe and effective alternative to general anaesthesia in patients undergoing lower body wall/ or extremity surgeries. In the present study, the majority of the patients were adults with male preponderance. As iterated by Vishal et al. in their consensus practice guidelines report, among the patient factors, the level of certainty and risk of PDPH was associated to be high in younger adults and female sex.[6] On the contrary, we observed no significant association between the incidence of PDPH and gender ( $p=0.409$ ) from our study. This non-significant association can be due to the smaller number of patients per cohort.

In terms of SAB in most of the patients, it was successfully performed on the first attempt itself. Evidence from earlier studies states that repeated puncture attempts more than once were significantly associated with PDPH. A possible reason behind it can be due to a decrease in intracranial pressure of CSF due to its continuous leakage from the puncture site causing meningeal vasodilatation and positional traction on sensitive intracranial structures such as basal dura, its vessels, and tentorium cerebelli.[10] The incidence of PDPH in our cohort was reported only in 19 (32%) patients and most of them were from the Quincke group (13, 43%). We have also observed a strong association between the type of spinal needle and the incidence of PDPH ( $p=0.047$ ). These results were consistent with the multiple studies conducted earlier, where such a higher incidence of the PDPH in Quincke group was attributed to its needle gauge and cutting needle tip configuration compared to blunt or pencil-point needles (Sprotte and Whitacre needles).[6,8] Such a high level of certainty in procedural characteristics causing PDPH in the Quincke group is certainly due to its sharp cutting tip, which on insertion tears off multiple dura wall fibres causing a longitudinal dispersion making a permanent crescent-like opening for the time being. Whereas with Whitacre needles, the pencil point spinal needle separates the longitudinal dura mater fibres on insertion, and on withdrawing, the fibres return to a state of close approximation without producing serious injury or trauma Which will ultimately prevent CSF leakage and its related PDPH.[11] A systematic review and meta-analysis conducted from 110

trials by Siddharth et al. have also confirmed that atraumatic needles (Whitacre) were associated with a decrease in the risk of PDPH and other complications compared to conventional type (Quincke).[12] On the other hand, a Cochrane review conducted by Rodriguez et al. have observed very moderate-quality evidence between the atraumatic needles and their role in reducing the risk of PDPH compared to conventional traumatic needles.

In terms of the onset of PDPH, no PDPH was reported in either of the groups in the first 24h. It was reported only after 24h and its onset was observed to be more in the Quincke group than the Whitacre group. Wherein, very few patients had the PDPH onset between 48-72h. Our results were consistent with the earlier studies conducted, where the onset of PDPH was reported to be somewhere between 24h – 72h.[2,13,14] Its severity was observed to be none to moderate in a large number of patients, except for 2 (Quincke group) patients, who were timely intervened and treated using invasive aggressive protocols.[3–5]

To conclude, our study has many advantages, one among them is its geographical study origin (South India), where limited data and literature are available related to SAB and PDPH using particular 25G Whitacre and 25-G Quincke needles. Another major strength of this study is its prospective, randomised, comparative nature, where multiple factors were kept constant to study the similarities and differences between the needles.

On the other hand, the major limitation of our study is its small sample size, which could not able to provide any clinically significant concurrent evidence or outcomes to practice. However, our study has provided some interesting insights, which can be of interest to clinicians and researchers around the world to conduct a prospective study in a large population with better follow-up to confirm our outcomes. Second, the principal investigator (anaesthesiologist) was not blinded in our study, but only postoperative outcome assessors were blinded. Third, patient follow-up was done only for 3 days, post-operatively. On discharge, out-of-hospital data related to PDPH episodes was not recorded, due to the loss of follow-up of many patients.

## Conclusion

Overall, our findings conclude that the use of 25G Whitacre's non-cutting, pencil point tip needle can be associated with a lower incidence of PDPH when compared with 25G Quincke's cutting tip needle in patients undergoing abdomen and lower limb surgeries. Where Whitacre's needle was observed to be efficient in terms of ease of insertion and number of attempts for successful SAB.

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