RESEARCH PAPER

Post Dural Puncture Headache After Spinal Anesthesia: A Comparison Of 25G And 27G Quincke Needles In Cesarean Section

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Abstract-

Introduction- Post-dural puncture headache (PDPH) is a common complication of spinal anesthesia in cesarean section, influenced by needle design and gauge. Smaller Quincke needles may reduce PDPH but could increase technical difficulty. This study compares the incidence and characteristics of PDPH using 25G and 27G Quincke needles in obstetric patients.

Materials and Methods- This prospective randomized study at Government Medical College, Jammu (April 2024–May 2025) included 200 ASA I–II parturients undergoing elective cesarean section. Patients were allocated to 25G or 27G Quincke needles (n=100 each). Spinal anesthesia was standardized. PDPH was assessed for five days using International Headache Society criteria. Data were statistically analyzed ($p<0.05$ was considered significant).

Result- Two hundred parturients were randomized and equally allocated into Group A (25G Quincke needle) and Group B (27G Quincke needle). Baseline and procedural variables were comparable. PDPH incidence was significantly lower with 27G (6%) than 25G (14%) ($p=0.048$). Multiple attempts increased PDPH risk ($p=0.003$). Mean VAS score and duration were significantly higher in the 25G group ($p<0.05$). Most headaches occurred within 24–48 hours and were managed conservatively.

Conclusion- Use of a 27G Quincke needle significantly reduced the incidence, severity, and duration of post-dural puncture headache compared to 25G in cesarean section patients. Multiple attempts increased PDPH risk. The 27G needle offers a safer, effective option for obstetric spinal anesthesia.

Keywords- Cesarean section, Anesthesia, PDPH, 25G, 27G, Quincke needle etc.

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Introduction-

Post-dural puncture headache (PDPH) is one of the most common and distressing complications following spinal anesthesia, particularly in obstetric patients. It is defined as a headache occurring within five days of dural puncture, typically aggravated by upright posture and relieved on recumbency, and may be associated with nausea, neck stiffness, tinnitus, or visual disturbances [1,2]. The pathophysiology is primarily attributed to cerebrospinal fluid (CSF) leakage through the dural defect, resulting in intracranial hypotension and traction on pain-sensitive intracranial structures [3]. The reported incidence of PDPH varies widely, ranging from less than 2% to over 30%, depending on patient characteristics, needle type, gauge, and technical factors [3,4]. Pregnant women undergoing cesarean section are particularly susceptible to PDPH due to young age, female gender, and pregnancy-related physiological changes such as increased intra-abdominal pressure and vascular engorgement [5,6]. Spinal anesthesia remains the preferred anesthetic technique for cesarean delivery because of its rapid onset, dense sensory blockade, minimal neonatal drug exposure, and lower maternal morbidity compared to general anesthesia [7]. However, the occurrence of PDPH can significantly impair maternal recovery, delay ambulation, interfere with breastfeeding, prolong hospital stay, and reduce patient satisfaction [4,8]. In rare instances, untreated severe PDPH may lead to serious neurological complications such as subdural hematoma or cerebral venous thrombosis [2].

Among the modifiable procedural factors influencing PDPH, needle design and gauge play a pivotal role. Cutting needles such as the Quincke type create a linear dural tear that may predispose to persistent CSF leakage compared to atraumatic (pencil-point) needles [3,6].

Additionally, smaller gauge needles theoretically produce smaller dural defects and are associated with a reduced incidence of PDPH. Several studies conducted between 2015 and 2026 have compared 25-gauge (25G) and 27-gauge (27G) Quincke needles in cesarean section patients, reporting a lower incidence and severity of PDPH with the finer 27G needle [8–10]. Nevertheless, the use of smaller needles may increase technical difficulty and the number of puncture attempts, which itself is an independent risk factor for PDPH [6,9]. Therefore, the optimal balance between needle size, technical feasibility, and complication rate remains clinically relevant. In many healthcare settings, especially in resource-constrained regions, Quincke needles are still widely used due to availability and cost considerations. Despite previous research, inconsistencies in findings and variations in methodology warrant further focused evaluation in obstetric populations. Hence, the present study aims to compare the incidence and characteristics of PDPH following spinal anesthesia using 25G and 27G Quincke needles in patients undergoing cesarean section. The results of this study may contribute to evidence-based needle selection, enhance maternal comfort, and reduce postoperative morbidity.

Material and Method-

This prospective, randomized comparative study was conducted in the Department of Anesthesiology at Government Medical College (GMC), Super Speciality Hospital (SSH), Jammu, over a period of 14 months from April 2024 to May 2025. The study was initiated after obtaining approval from the Institutional Ethics Committee, and written informed consent was obtained from all participants prior to enrollment. The study population comprised parturients aged 18–40 years, belonging to the American Society of Anesthesiologists (ASA) physical status I or II, scheduled for elective cesarean section under spinal anesthesia. Patients with contraindications to spinal anesthesia (coagulopathy, infection at puncture site, raised intracranial pressure), history of chronic headache or migraine, spinal deformity, multiple puncture attempts (>3), or those requiring conversion to general anesthesia were excluded from the study. The sample size was calculated based on previous studies reporting an incidence of post-dural puncture headache (PDPH) of approximately 12% with 25G Quincke needles and 5% with 27G Quincke needles. Assuming a power of 80% and a confidence level of 95%, with a minimum detectable difference of 7%, the calculated sample size was 90 patients per group.

Considering possible dropouts, a total of 200 patients were enrolled and randomly allocated into two equal groups (n = 100 each) using a computer-generated randomization sequence and sealed envelope technique. Group A received spinal anesthesia using a 25-gauge (25G) Quincke spinal needle, while Group B received spinal anesthesia using a 27-gauge (27G) Quincke spinal needle. All procedures were performed in the sitting position under strict aseptic precautions at the L3–L4 or L4–L5 interspace using a midline approach by experienced anesthesiologists. After confirmation of free flow of cerebrospinal fluid, 0.5% hyperbaric bupivacaine (10–12 mg) was administered intrathecally. Patients were monitored intraoperatively for hemodynamic parameters and managed as per institutional protocol. Postoperatively, patients were observed for 5 days for development of PDPH. Diagnosis of PDPH was made according to International Headache Society criteria. Demographic, clinical and procedural characteristics of all the participants were noted. The associated symptoms, incidence, onset, severity (assessed using Visual Analog Scale), duration, and need for therapeutic intervention in PDPH patients were recorded. Data were compiled and analyzed using appropriate statistical tests, with $p < 0.05$ considered statistically significant.

Result-

A total of 200 parturients were included in the study and equally allocated into Group A (25G Quincke needle) and Group B (27G Quincke needle), with 100 patients in each group. Table 1 shows that the mean age of patients in Group A was 27.8 ± 3.6 years, while in Group B it was 28.1 ± 3.9 years, and the difference was statistically not significant ($p = 0.62$). The mean body weight was 68.4 ± 7.2 kg in Group A and 69.1 ± 6.8 kg in Group B ($p = 0.48$). Similarly, the mean height was comparable between the two groups (158.6 ± 5.4 cm vs 159.2 ± 5.1 cm; $p = 0.39$). The mean Body Mass Index (BMI) was 27.2 ± 2.8 kg/m² in Group A and 27.5 ± 2.6 kg/m² in Group B, with no statistically significant difference ($p = 0.44$). Regarding obstetric characteristics, 58% of patients in Group A and 61% in Group B were primigravida, which was not statistically significant ($p = 0.68$). Distribution according to American Society of Anesthesiologists (ASA) physical status was also comparable between the two groups. In Group A, 72% of patients belonged to ASA I and 28%

to ASA II, whereas in Group B, 75% were ASA I and 25% were ASA II (p = 0.64). Overall, there were no statistically significant differences in demographic or baseline clinical characteristics between the two groups (p > 0.05), indicating that the groups were comparable at baseline and suitable for outcome comparison.

Table 1- Distribution of participants based on demographic and clinical characteristics

Variable		Group A (25G) (n=100)	Group B (27G) (n=100)	p-value
Age in years (Mean ± SD)		27.8 ± 3.6	28.1 ± 3.9	0.62
Weight in kg (Mean ± SD)		68.4 ± 7.2	69.1 ± 6.8	0.48
Height in cm (Mean ± SD)		158.6 ± 5.4	159.2 ± 5.1	0.39
BMI in kg/m² (Mean ± SD)		27.2 ± 2.8	27.5 ± 2.6	0.44
Primigravida n(%)		58 (58%)	61 (61%)	0.68
ASA n(%)	I	72 (72%)	75 (75%)	0.64
	II	28 (28%)	25 (25%)	

The procedural characteristics of spinal anesthesia were comparable between the two groups as seen in Table 2. Successful dural puncture on the first attempt was achieved in 84% of patients in Group A (25G) and 78% in Group B (27G), with no statistically significant difference between the groups (p = 0.27). Similarly, the requirement of two or more attempts was observed in 16% of patients in Group A and 22% in Group B, which was also not statistically significant (p = 0.27). The mean number of attempts required for successful spinal anesthesia was 1.18 ± 0.42 in Group A and 1.26 ± 0.51 in Group B. This difference was not statistically significant (p = 0.21), indicating that the use of a finer 27G needle did not significantly increase the number of attempts compared to the 25G needle. With respect to the level of puncture, the majority of procedures in both groups were performed at the L3–L4 interspace (65% in Group A vs 68% in Group B), while the remaining were performed at the L4–L5 level (35% vs 32%, respectively). There was no statistically significant difference in the distribution of puncture levels between the groups (p = 0.65). Overall, procedural variables including success rate on first attempt, number of attempts, and level of puncture were comparable between the two groups (p > 0.05), suggesting that needle gauge did not significantly influence technical aspects of the procedure.

Table 2- Distribution of participants based on procedural characteristics

Variable		Group A (25G)	Group B (27G)	p-value
Successful First Attempt n(%)		84 (84%)	78 (78%)	0.27
≥2 Attempts Required n(%)		16 (16%)	22 (22%)	0.27
Number of Attempts (Mean ± SD)		1.18 ± 0.42	1.26 ± 0.51	0.21
Level of Puncture n(%)	L3–L4	65 (65%)	68 (68%)	0.65
	L4–L5	35 (35%)	32 (32%)	

Table 3 depicts that the overall incidence of post-dural puncture headache (PDPH) was higher in Group A (25G Quincke needle) compared to Group B (27G Quincke needle). PDPH occurred in 14 out of 100 patients (14%) in Group A, whereas only 6 out of 100 patients (6%) in Group B developed PDPH. The difference in incidence between the two groups was statistically significant (p = 0.048), indicating that the use of the 27G Quincke needle was associated with a significantly lower incidence of PDPH compared to the 25G needle. The majority of patients in both groups did not develop PDPH, accounting for 86% in Group A and 94% in Group B. However, the statistically significant reduction observed in Group B suggests a clinical advantage of using a finer gauge Quincke needle in reducing the occurrence of PDPH following spinal anesthesia for cesarean section.

Table 3- Incidence of post-dural puncture headache (PDPH)

Outcome	Group A (25G)	Group B (27G)	p-value
PDPH Present n(%)	14 (14%)	6 (6%)	**0.048**
PDPH Absent n(%)	86 (86%)	94 (94%)	

A significant association was observed between the number of attempts required for spinal anesthesia and

the occurrence of post-dural puncture headache (PDPH) as clear in Table 4. Among the 20 patients who developed PDPH, 10 patients (50%) had successful dural puncture on the first attempt, while the remaining 10 patients (50%) required two or more attempts. In contrast, among the 180 patients who did not develop PDPH, a majority of 152 patients (84.4%) had a successful first attempt, and only 28 patients (15.6%) required two or more attempts. The association between multiple attempts (≥2) and the development of PDPH was found to be statistically highly significant (p = 0.003). These findings suggest that an increased number of dural puncture attempts is an important risk factor for PDPH following spinal anesthesia in cesarean section patients.

Table 4: Association between number of attempts and PDPH

Attempts	PDPH Present (n=20)	PDPH Absent (n=180)	p-value
Single Attempt n(%)	10 (50%)	152 (84.4%)	**0.003**
≥2 Attempts n(%)	10 (50%)	28 (15.6%)	

Figure 1 illustrates the time of onset of post-dural puncture headache (PDPH) among affected patients in both groups. In Group A (25G Quincke needle), out of the 14 patients who developed PDPH, 4 patients (28.6%) experienced onset within the first 24 hours, 7 patients (50%) developed symptoms between 24–48 hours, and 3 patients (21.4%) reported onset after 48 hours. Similarly, in Group B (27G Quincke needle), among the 6 patients who developed PDPH, 2 patients (33.3%) developed symptoms within 24 hours, 3 patients (50%) between 24–48 hours, and 1 patient (16.7%) after 48 hours.

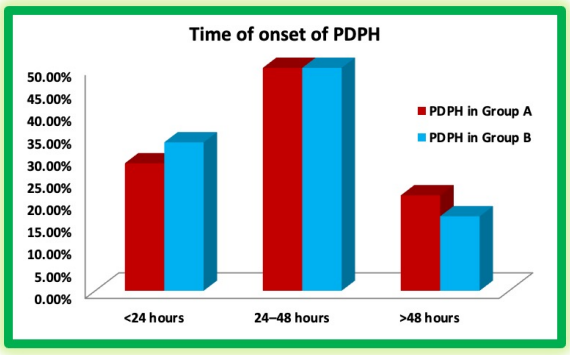

Figure 1-Time of onset of PDPH

Table 5 compares the severity, duration, and management of post-dural puncture headache (PDPH) between Group A (25G Quincke needle) and Group B (27G Quincke needle). Regarding severity, in Group A (n = 14), 5 patients (35.7%) experienced mild headache (VAS 1–3), 7 patients (50%) had moderate headache (VAS 4–6), and 2 patients (14.3%) developed severe headache (VAS 7–10). In contrast, in Group B (n = 6), the majority of patients had mild headache (4 patients, 66.7%), while 2 patients (33.3%) had moderate headache. None of the patients in Group B developed severe PDPH. Although the categorical distribution of severity did not reach statistical significance (p = 0.19), the mean VAS score was significantly higher in Group A (4.8 ± 1.2) compared to Group B (3.5 ± 0.9), indicating greater headache intensity with the 25G needle (p = 0.03). The mean duration of PDPH was also significantly longer in Group A (3.2 ± 1.1 days) compared to Group B (2.1 ± 0.8 days), with statistical significance (p = 0.02). Resolution within 3 days occurred in 8 patients (57.1%) in Group A and 5 patients (83.3%) in Group B; however, this difference was not statistically significant (p = 0.21).

Table 5- Severity, duration, and management of PDPH in 25G and 27G groups.

Severity		PDPH in Group A (n=14)	PDPH in Group B (n=6)	p-value
Severity of PDPH n(%)	Mild (VAS 1–3)	5 (35.7%)	4 (66.7%)	0.19
	Moderate (VAS 4–6)	7 (50%)	2 (33.3%)	

	Severe (VAS 7–10)	2 (14.3%)	0 (0%)	
	Mean ± SD of VAS Score	4.8 ± 1.2	3.5 ± 0.9	**0.03**
Duration in days n(%)	Mean ± SD	3.2 ± 1.1	2.1 ± 0.8	**0.02**
	Resolved within 3 days	8 (57.1%)	5 (83.3%)	0.21
Management n(%)	Conservative only	12 (85.7%)	6 (100%)	0.24
	Epidural blood patch	2 (14.3%)	0 (0%)	

Figure 2 depicts the associated symptoms observed among patients who developed post-dural puncture headache (PDPH) in both groups. In Group A (25G Quincke needle, n = 14), nausea and vomiting were the most common associated symptoms, reported in 6 patients (42.9%). Neck stiffness was observed in 4 patients (28.6%), photophobia in 3 patients (21.4%), and tinnitus in 2 patients (14.3%). In Group B (27G Quincke needle, n = 6), nausea and vomiting were reported in 2 patients (33.3%), while neck stiffness and photophobia were each observed in 1 patient (16.7%). None of the patients in Group B experienced tinnitus. Overall, associated symptoms were more frequently reported in the 25G group compared to the 27G group. Nausea and vomiting were the most common accompanying features in both groups. Although the incidence of associated symptoms appeared higher in Group A, the small number of PDPH cases in Group B limits definitive comparison.

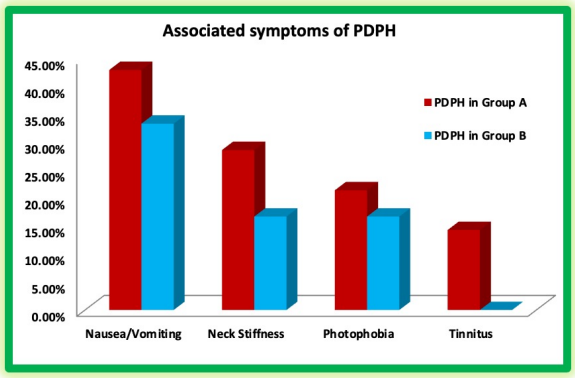

Figure 2- Associated symptoms of PDPH in 25G and 27G groups.

Discussion-

In this randomized comparative study of 200 parturients undergoing cesarean section under spinal anesthesia, post-dural puncture headache (PDPH) remains a significant complication following spinal anesthesia in obstetric patients, particularly after cesarean section. The present study demonstrated a significantly lower incidence of PDPH with the 27G Quincke needle (6%) compared to the 25G Quincke needle (14%) (p = 0.048). These findings reinforce the concept that smaller gauge needles reduce cerebrospinal fluid (CSF) leakage and consequently decrease PDPH incidence. Our results are supported by the study of Vallejo MC et al., who reported a reduced incidence of PDPH with finer spinal needles in obstetric populations [11]. Similarly, Arzola C et al. demonstrated that smaller gauge needles are associated with a lower risk of PDPH without compromising block efficacy [12]. In contrast, a study by Shaikh JM et al. found no statistically significant difference in PDPH incidence between 25G and 27G Quincke needles, suggesting that factors other than gauge may also contribute [13]. Importantly, demographic and baseline characteristics in our study were comparable between groups, minimizing confounding variables. Procedural characteristics such as number of attempts and level of puncture were also similar, indicating that the reduced PDPH incidence in the 27G group was likely attributable to needle gauge rather than technical variation. Concerns that finer needles may increase technical difficulty were not substantiated in our findings, as the mean number of attempts did not differ significantly between groups. This observation aligns with findings by Peralta F et al., who reported comparable success rates with 25G and 27G needles in cesarean section patients [14].

A significant association was observed between multiple dural puncture attempts and the occurrence of PDPH ($p = 0.003$). Half of the patients who developed PDPH required two or more attempts, highlighting the role of repeated dural trauma in CSF leakage. Our findings are consistent with the observations of Bezov D et al., who emphasized multiple punctures as an independent risk factor for PDPH [15]. Similar conclusions were drawn by Heesen M et al., who noted that minimizing attempts is critical in reducing PDPH incidence [16]. Regarding onset, the majority of PDPH cases in both groups occurred within 24–48 hours, which is in agreement with the classical temporal profile described in recent obstetric anesthesia literature [17]. Although categorical severity distribution was not statistically significant, the mean VAS score was significantly higher in the 25G group ($p = 0.03$), and headache duration was longer ($p = 0.02$). These findings suggest that not only incidence but also intensity and persistence of PDPH may be influenced by needle size. Comparable results were reported by Ahmed SV et al., who noted increased severity with larger cutting needles [18]. In contrast, Kwak KH et al. observed no difference in severity between adjacent gauge Quincke needles, possibly due to smaller sample sizes [2]. Associated symptoms such as nausea, neck stiffness, and photophobia were more frequent in the 25G group, consistent with the pathophysiology of intracranial hypotension. Most cases were managed conservatively, with only two patients in the 25G group requiring an epidural blood patch. This low intervention rate is comparable to recent obstetric studies reporting predominantly self-limiting PDPH [19]. Overall, our study demonstrates that the 27G Quincke needle offers a clinically significant reduction in PDPH incidence, severity, and duration without increasing technical difficulty. These findings support the routine use of finer gauge Quincke needles in cesarean section to enhance maternal comfort and postoperative recovery.

Conclusion-

The present study demonstrates that the use of a 27G Quincke needle for spinal anesthesia in cesarean section is associated with a significantly lower incidence of post-dural puncture headache (PDPH) compared to the 25G Quincke needle. In addition to reduced occurrence, the 27G needle was associated with lower mean pain scores and shorter duration of headache, indicating not only quantitative but also qualitative benefit. Importantly, the finer needle did not significantly increase the number of attempts or compromise procedural success, suggesting that it is technically feasible in routine obstetric practice. Furthermore, multiple dural puncture attempts were found to be a significant risk factor for PDPH, underscoring the importance of careful technique and operator expertise. These findings support the preferential use of 27G Quincke needles in cesarean section to improve maternal comfort and reduce postoperative morbidity. Adoption of finer gauge needles may enhance patient satisfaction, facilitate early mobilization, and potentially decrease the need for additional interventions such as epidural blood patch. Additionally, minimizing repeated attempts through proper training and adherence to optimal technique may further reduce PDPH incidence. Future multicentric studies with larger samples may strengthen these recommendations and contribute to standardized guidelines in obstetric anesthesia practice.

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