

EFFECTIVENESS OF 25G COMPARED TO 27G QUINCKE SPINAL NEEDLE IN REGARD OF POST-DURAL PUNCTURE HEADACHE IN OBSTETRICS PATIENTS UNDERGOING SPINAL ANESTHESIA

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Abstract: *Post-Dural puncture headache (PDPH) is a distressing complication that can occur following a dural puncture during spinal anesthesia. It is believed to arise from cerebrospinal fluid leakage and subsequent reflex cerebral vasodilation. Notably, PDPH occurs more frequently in young parturient women undergoing Caesarean sections. This study aims to evaluate the frequency of PDPH in patients undergoing elective Caesarean delivery, comparing the use of 25G and 27G Quincke spinal needles during spinal anesthesia. A randomized controlled trial was conducted at Aziz Bhatti Shaheed Teaching Hospital's anesthesiology department in Gujrat from March 2022 to March 2023. A total of 140 parturient women with an American Society of Anesthesiologists (ASA) physical status classification of I to II, who underwent Caesarean sections, were included in the study. Exclusion criteria encompassed patients with infection at the injection site, severe hypervolemia, coagulopathy, increased intracranial pressure, severe aortic and mitral stenosis, severe preeclampsia, placenta previa grade-IV, placenta accreta, and twin pregnancy. The participants were divided into groups (Group I and Group II), each comprising 70 individuals. Spinal anesthesia was administered in the sitting posture using 25G Quincke spinal needles for Group I and 27G Quincke spinal needles for Group II. The puncture sites were the L3-4 or L4-5 intervertebral spaces. The incidence of PDPH was evaluated at 6, 12, 24, and 48 hours following the surgical procedure. Quantitative data, such as age, were presented as mean \pm SD, while qualitative data were reported as frequency and percentages. Statistical significance was defined as a P-value $<$ 0.05. The age range of the patients included in the study was 18 to 40 years. The mean age of patients in Group I was 26.12 ± 5.82 years, while in Group II, it was 26.34 ± 5.30 years. Eleven patients (15.71%) in Group I experienced PDPH, unlike three (4.28%) in Group II. The difference in PDPH incidence between the two groups was statistically significant ($p = 0.031$). Our findings indicate that using a 27G Quincke spinal needle for spinal anesthesia during Caesarean sections confers a distinct advantage in reducing PDPH occurrence compared to the 25G Quincke spinal needle. The results strongly support the superiority of the 27G Quincke spinal needle in minimizing the occurrence of PDPH.*

Keywords: Post-Dural Puncture Headache, Caesarean Section, Spinal Anesthesia, Quincke Needle

Introduction

Post-Dural puncture headache (PDPH) is an undesirable consequence of spinal anesthesia when the dura mater is inadvertently punctured (Pirenne et al., 2023). In obstetric patients undergoing spinal anesthesia for various procedures, including cesarean sections, the prevention and management of PDPH are of utmost importance. The choice of spinal needle gauge plays a crucial role in the incidence and severity of PDPH, as it directly influences the extent of dural perforation (Okpala et al., 2022).

PDPH is believed to result from the loss of cerebrospinal fluid and subsequent cerebral vasodilation, leading to characteristic symptoms such as a throbbing headache worsened by an upright posture (Sayre and Gaiser, 2023). Young parturient women are particularly vulnerable to PDPH due to

their age and gender. Previous research has shown a decline in PDPH rates over time, attributed to advancements in spinal needle technology (Mowafy and Ellatif, 2021). Thinner needles ranging from 25G to 31G have been developed to reduce the incidence of PDPH compared to older, thicker needles (Bhat and Ganapathi; Rao, 2021).

Spinal anesthesia has gained popularity in the obstetric setting due to its ease of administration, rapid onset, and optimal operating conditions (Plaat et al., 2022). However, the risk of PDPH remains a concern, impacting postoperative recovery and patient satisfaction. By comparing the effectiveness of 25G and 27G Quincke spinal needles, this study aims to provide valuable insights into the choice of needle gauge in obstetric patients undergoing spinal

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anesthesia, specifically minimizing PDPH occurrence.

Understanding the comparative effectiveness of different spinal needle gauges in preventing PDPH is vital for optimizing patient care. By elucidating the potential benefits of a specific needle gauge, anesthesiologists can make informed decisions when selecting the most suitable spinal needle for obstetric procedures (Nanji and Carvalho, 2020). Ultimately, this research enhances the overall experience and outcomes for obstetric patients undergoing spinal anesthesia, furthering advancements in obstetric anesthetic practice. This study aims to compare the effectiveness of 25G and 27G Quincke spinal needles in mitigating the occurrence of PDPH among obstetric patients undergoing spinal anesthesia.

Methodology

This study was conducted at the Department of Anesthesiology, Aziz Bhatti Teaching Hospital Gujrat, from March 2022 to March 2023. The research focused on pregnant women scheduled for elective cesarean sections, aged between 18 and 45, with an American Society of Anesthesiologists (ASA) physical status of I or II and gestational age over 37 weeks. The sample size of one hundred and forty was calculated using the WHO calculator. The 95% precision and 10% incidence of PDPH. One hundred forty patients provided signed consent and were enrolled after meeting the inclusion criteria. Exclusion criteria included infection at the injection site, severe hypotension, bleeding disorders, elevated intracranial pressure, significant aortic and mitral stenosis, severe preeclampsia, placenta previa grade-IV, placenta accreta, and twin pregnancy. Patients with comorbidities, a history of surgery, allergies, substance abuse, or prosthesis wearers were excluded after a thorough pre-operative examination.

Before the surgery, comprehensive preliminary tests were conducted, including a complete blood picture, urine examination, bleeding profile, and hepatitis B and C screening. The study participants, aged 18 to 45, were randomly assigned to two groups (n = 70 each) using a computerized allocation system. Both groups underwent spinal anesthesia for elective

cesarean sections using a 25G (Group I) or 27G (Group II) Quincke needle. A day before the procedure, patients were informed about the possibility of experiencing post-spinal headaches with a less than 5% chance of occurrence. An hour before surgery, intravenous administration of Ranitidine 50 mg and Metoclopramide 10 mg was performed using an 18G catheter. Patients were also preloaded with Ringer's lactate (20 ml/kg) over 20 minutes before spinal anesthesia in the L3-4 or L4-5 intervertebral space.

Spinal anesthesia was administered using a 25G 90 mm needle in Group I and a 27G 90 mm needle in Group II. The anesthetic solution included 10-12.5 mg (2.0-2.5 ml) of 0.5% Bupivacaine (Hyperbaric Bupivacaine) and 25 µg Fentanyl (total volume 2-3 ml). The needle tip was positioned longitudinally to minimize dural fiber damage. Following the surgery, post-dural puncture headache (PDPH) was evaluated at 6, 12, 24, and 48 hours. PDPH was a severe headache localized in the frontal or occipital areas, aggravated by standing and relieved by sitting or increased water intake. Headache severity was categorized as mild, moderate, or severe based on its impact on the patient's ability to sit or stand.

When present, PDPH was managed with restricted activity, intramuscular Diclofenac 75 mg, increased water intake, intravenous paracetamol infusion (1 g in 100 ml), and an epidural blood patch (EBP). The data collected were analyzed using SPSS Version 21. Quantitative variables like age were reported as mean \pm SD, while qualitative variables, including PDPH frequency, were presented as numbers and percentages. Statistical analysis included a sample t-test for numerical variables and the Chi-square test for comparisons of PDPH incidence. Statistical significance was defined as a p-value $<$ 0.05.

Results

Demographic and baseline information were analyzed for 140 patients undergoing spinal anesthesia for elective cesarean sections, with 70 patients in each Group. The age range of the patients was 18 to 40 years. A comparison of demographic characteristics between Group I (25G Quincke needle) and Group II (27G Quincke needle) revealed no significant differences, as shown in Table 1.

Table 1: Demographic and baseline information:

Variables	Group-I (n = 70)	Group-II (n = 70)	*P-value
ASA(I/II) (n/n)	63/7	61/9	0.59
Age (yr.)	26.12 \pm 5.82	26.34 \pm 5.30	0.47
BMI (kg/m ²)	25.8 \pm 5.2	26.65 \pm 4.92	0.97
MAP(mmHg)	69.6 \pm 5.87	71.1 \pm 6.23	0.09
HR (beat/min)	88 \pm 9	91 \pm 7	0.11
O ₂ Saturation (%)	98 \pm 2	99 \pm 1	0.37

**no significant differences, so these two groups can be compared*

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The incidence of post-dural puncture headache (PDPH) was assessed in both groups. In Group I, 11 patients (15.71%) experienced PDPH; in Group II, only 3 patients (4.28%) reported PDPH. Statistical analysis using the Chi-square test

revealed a statistically significant difference in PDPH incidence between the two groups ($p = 0.031$), indicating a higher incidence in Group I compared to Group II, as shown in Table 2.

Table 2: Frequency of PDPH

PDPH	Group-I (25G Quincke)	Group-II (27G Quincke)	Chi-square	P-Value
Yes	11(15.71%)	3(4.28%)	5.013	0.031

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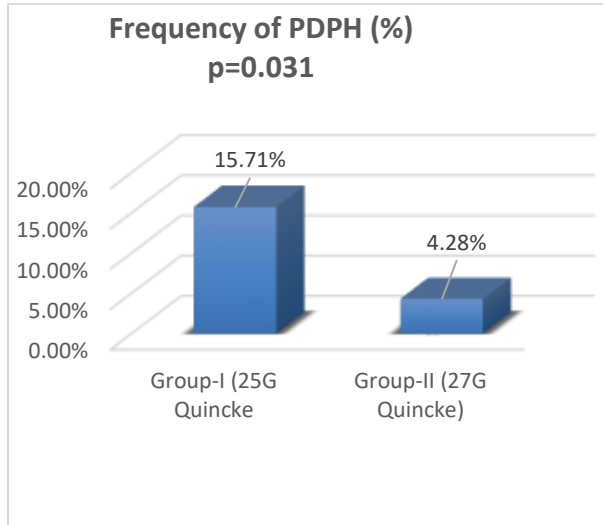


Figure 1 Distribution of PDPH between the groups

Discussion

The etiology of post-dural puncture headache (PDPH) is attributed to two main factors: inadequate cerebrospinal fluid (CSF) production by the choroid plexus and CSF leakage through the dural puncture site (Sayre and Gaiser, 2023). Additionally, negative pressure in the epidural space contributes to the absorption of CSF from the subarachnoid space, resulting in a decrease in CSF pressure (Althobaiti et al., 2023). This leads to dilation of intracranial veins and an observable increase in brain volume when the body is upright. The different volumes and pressures of the intracranial and intervertebral subarachnoid spaces contribute to the manifestation of post-spinal headaches, as venous dilatation strains pain-sensitive tissues such as the dural veins, basal dura, and tentorium cerebelli, along with the compensatory increase in brain volume. Larger dural perforations result in increased CSF leakage and a longer duration of the dural defect, often persisting for two weeks or more (Sayre and Gaiser, 2023; Turnbull and Morreale, 2021).

Studies have reported a wide range of prevalence rates for debilitating post-spinal headaches, varying from

3% to 75% (Lo Bianco et al., 2023; Pirenne et al., 2023). The gauge and type of needles used significantly affect the higher prevalence of PDPH. The incidence of PDPH increases with larger needle gauges and traumatic needle types (such as cutting needles) (Patel et al., 2020). In our study, we observed an incidence of PDPH of 15.71% in Group I (25G needle) and 4.28% in Group II (27G needle), with a statistically significant difference ($p = 0.031$). These findings align with previous research demonstrating that thinner needles result in lower rates of PDPH. For instance, Balusamy et al. reported significantly lower incidence rates of headache with 25G Whitacre, 25G Quincke, and 26G Quincke needles at 1.06%, 3.65%, and 2.08%, respectively (BALUSAMY et al., 2022). Another study by Lotfy Mohammed et al. found an incidence of 24% in the 25G Quincke group and 4% in the 29G group (Lotfy Mohammed and El Shal, 2017). Similarly, Tourtelotte et al. reported a decrease in headache incidence from 36% to 12% when using a 26G needle instead of a 22G needle in a double-blind study involving young volunteers, which is consistent with our findings (Mohamed et al.). Muhammad et al. demonstrated a PDPH frequency of

Table 3: Distribution of cases according to pain intensity

Severity of pain	Group-I n = 70	Group-II n = 70
No pain	59(84.28%)	67(95.71)
Mild pain	2(2.85%)	1(1.42%)
Moderate pain	6(8.57%)	1(1.42%)
Severe pain	3(4.28%)	1(1.42%)

3% to 75% (Lo Bianco et al., 2023; Pirenne et al., 2023). The gauge and type of needles used significantly affect the higher prevalence of PDPH. The incidence of PDPH increases with larger needle gauges and traumatic needle types (such as cutting needles) (Patel et al., 2020). In our study, we observed an incidence of PDPH of 15.71% in Group I (25G needle) and 4.28% in Group II (27G needle), with a statistically significant difference ($p = 0.031$). These findings align with previous research demonstrating that thinner needles result in lower rates of PDPH. For instance, Balusamy et al. reported significantly lower incidence rates of headache with 25G Whitacre, 25G Quincke, and 26G Quincke needles at 1.06%, 3.65%, and 2.08%, respectively (BALUSAMY et al., 2022). Another study by Lotfy Mohammed et al. found an incidence of 24% in the 25G Quincke group and 4% in the 29G group (Lotfy Mohammed and El Shal, 2017). Similarly, Tourtelotte et al. reported a decrease in headache incidence from 36% to 12% when using a 26G needle instead of a 22G needle in a double-blind study involving young volunteers, which is consistent with our findings (Mohamed et al.). Muhammad et al. demonstrated a PDPH frequency of

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0% with a 27G Quincke needle, while Jabbari et al. reported a prevalence of 17.3% with a 25G Quincke needle (Tayyeb et al., 2022). Shaikh et al. found that the frequency of PDPH was 8.3% with 25G Quincke needles and 3.7% with 27G Quincke needles, similar to our results (Shaikh et al., 2008). Furthermore, Malik et al. reported an incidence of 23.3% with a 25G Quincke needle. The size and type of spinal needles used have an impact on PDPH, with thinner Quincke needles showing a gradual decrease in both incidence and severity (Malik et al., 2012). Pencil point needles, which split dural fibers rather than cutting them, are thought to promote faster healing and result in a lower frequency of headaches following dural puncture compared to cutting needle tip patterns. In our study, the incidence of PDPH was 4.28% with a 27G Quincke needle and 15.71% with a 25G Quincke needle, demonstrating a significant decrease in PDPH frequency with the use of the 27G needle ($p = 0.031$). Our results are consistent with the findings of Shaikh et al. and Malik et al., although the limited sample size of our study should be taken into consideration. Further research and larger-scale studies are warranted to corroborate these results and explore additional factors that may impact the incidence and severity of PDPH in this patient population.

Conclusion

We come to the conclusion that when used for spinal anesthesia during caesarean sections, the 27G Quincke spinal needle has a considerable benefit over the 25G Quincke spinal needle in terms of both the severity and frequency of PDPH.

Conflict of interest

The authors declared absence of conflict of interest.

References

- Althobaiti, M., Ali, S., Hariri, N. G., Hameed, K., Alaghl, Y., Alzahrani, N., Alzahrani, S., and Al-Naib, I. (2023). Recent Advances in Smart Epidural Spinal Needles. *Sensors* **23**, 6065.
- BALUSAMY, D., KHOIROM, S., CHARAN, N., NAHAKPAM, S., DEVI, N. J., DIVYABHARATHI, S., DEVI, L. R., and ALI, M. A. (2022). Incidence and Severity of Postdural Puncture Headache following Subarachnoid Block using 25G Quincke and 25G Whitacre Spinal Needles: A Double-blinded, Randomised Control Study. *Journal of Clinical & Diagnostic Research* **16**.
- Bhat, A. G., and Ganapathi, P. Headache in post dural puncture using various sizes of spinal needles.
- Lo Bianco, G., Tinnirello, A., Papa, A., Marchesini, M., Day, M., Palumbo, G. J., Terranova, G., Di Dato, M. T., Thomson, S. J., and Schatman, M. E. (2023). Interventional pain procedures: a narrative review focusing on safety and complications. PART 2 interventional procedures for back pain. *Journal of Pain Research*, 761-772.
- Lotfy Mohammed, E., and El Shal, S. M. (2017). Efficacy of different size Quincke spinal needles in reduction of incidence of Post-Dural Puncture Headache (PDPH) in Caesarean Section (CS). Randomized controlled study. *Egyptian Journal of Anaesthesia* **33**, 53-58.
- Malik, M. A., Farooqi, W. S., Khan, B. H., and Ishaq, M. (2012). To compare the frequency and severity of post-dural puncture headache (PDPH) in parturients given spinal anaesthesia with 25 g quincke with that of 25 g whitacre needle. *Pak J Med Health Sci* **6**, 90-3.
- Mohamed, H. A., Mahmoud, M. F., Abd Elraouf, M., and Wahib, M. M. Role of epidural neostigmine in prevention and management of post-dural puncture headache in women after delivery by Caesarean section using spinal anesthesia.
- Mowafy, S. M., and Ellatif, S. E. A. (2021). Effectiveness of nebulized dexmedetomidine for treatment of post-dural puncture headache in parturients undergoing elective cesarean section under spinal anesthesia: a randomized controlled study. *Journal of anesthesia* **35**, 515-524.
- Nanji, J. A., and Carvalho, B. (2020). Pain management during labor and vaginal birth. *Best Practice & Research Clinical Obstetrics & Gynaecology* **67**, 100-112.
- Okpala, B. C., Eleje, G. U., Ikechebelu, J. I., Ofojebe, C. J., Ejikeme, T. B., Nwachukwu, C. E., and Okpala, A. N. (2022). A double-blind placebo controlled trial on effectiveness of prophylactic dexamethasone for preventing post-dural puncture headache after spinal anesthesia for cesarean section. *The Journal of Maternal-Fetal & Neonatal Medicine* **35**, 3407-3412.
- Patel, R., Urits, I., Orhurhu, V., Orhurhu, M. S., Peck, J., Ohuabunwa, E., Sikorski, A., Mehrabani, A., Manchikanti, L., and Kaye, A. D. (2020).

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A comprehensive update on the treatment and management of postdural puncture headache. *Current pain and headache reports* **24**, 1-9.

- Pirenne, V., Dewinter, G., and Van de Velde, M. (2023). Spinal Anesthesia in Obstetrics. *Best Practice & Research Clinical Anaesthesiology*.
- Plaat, F., Stanford, S., Lucas, D., Andrade, J., Careless, J., Russell, R., Bishop, D., Lo, Q., and Bogod, D. (2022). Prevention and management of intra-operative pain during caesarean section under neuraxial anaesthesia: a technical and interpersonal approach. *Anaesthesia* **77**, 588-597.
- Rao, A. N. (2021). A study of headache in post-dural puncture using various sizes of spinal needles. *IJMA* **4**, 84-86.
- Sayre, L., and Gaiser, R. (2023). POST-DURAL PUNCTURE HEADACHE. *Regional Anesthesia and Acute Pain Medicine: A Problem-Based Learning Approach*, 411.
- Shaikh, J. M., Memon, A., Memon, M. A., and Khan, M. (2008). Post dural puncture headache after spinal anaesthesia for caesarean section: a comparison of 25 g Quincke, 27 g Quincke and 27 g Whitacre spinal needles. *J Ayub Med Coll Abbottabad* **20**, 10-3.
- Tayyeb, M., Arsalan, M., Ullah, S. A., Ali, W., Maluik, S., Uddin, I., and Khuzayiah, S. (2022). FREQUENCY OF POST DURAL PUNCTURE HEADACHE WITH 25G QUINCKE NEEDLE IN PATIENTS SCHEDULED FOR ORTHOPAEDIC SURGERY UNDER SPINAL ANAESTHESIA. *Journal of Khyber College of Dentistry* **12**, 14-20.
- Turnbull, J. P., and Morreale, V. M. (2021). Spontaneous intracranial hypotension complicated by diffuse cerebral edema and episodes of severely elevated intracranial pressure: illustrative case. *Journal of Neurosurgery: Case Lessons* **2**.



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