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Comparative Analysis of Postoperative Back Pain and Headache Following Spinal Anesthesia versus General Anesthesia for Elective Cesarean Section: A Prospective Observational Study

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ABSTRACT

Background: Cesarean section (CS) is one of the most commonly performed surgical procedures worldwide. While spinal anesthesia (SA) is the preferred technique due to its superior fetal safety profile and maternal benefits, it is frequently associated with post-dural puncture headache (PDPH) and back pain. General anesthesia (GA), though used less frequently for elective CS, avoids these specific complications but carries its own set of risks. This study aimed to compare the incidence and severity of postoperative back pain and headache in parturients undergoing elective CS under SA versus GA.

Methods: A prospective observational study was conducted on 120 ASA II parturients undergoing elective CS. The study was study conducted at HIMS from January 2023 to June-2023. Patients were allocated into two groups based on the anesthesia technique employed: Group S (Spinal Anesthesia, n=60) and Group G (General Anesthesia, n=60). The incidence and severity (using a Visual Analog Scale, VAS 0-10) of back pain and headache were assessed at 24 hours, 48 hours, and 7 days postoperatively.

Results: The incidence of headache was significantly higher in Group S (23.3%) compared to Group G (6.7%) at 24 hours ($p<0.05$). Back pain was also more prevalent in Group S (40%) than in Group G (18.3%) at 24 hours ($p<0.05$). While the severity of back pain and headache decreased over time in both groups, the incidence remained higher in Group S at 48 hours and 7 days. The majority of patients in both groups experienced mild to moderate pain (VAS 1-6), with a negligible number reporting severe pain (VAS >7).

Conclusion: Spinal anesthesia for cesarean section is associated with a significantly higher incidence of postoperative back pain and headache compared to general anesthesia. These findings highlight the importance of refining anesthetic techniques to mitigate these common post-SS complications.

Keywords*: Cesarean Section, Spinal Anesthesia, General Anesthesia, Post-Dural Puncture Headache (PDPH), Back Pain.*

INTRODUCTION

Cesarean section (CS) is a life-saving surgical intervention for both mother and fetus when vaginal delivery is deemed unsafe. The choice of anesthetic technique is a critical decision that significantly impacts maternal and neonatal outcomes. Spinal anesthesia (SA) has become the gold standard for elective CS due to its rapid onset, profound sensory and motor blockade, minimal fetal drug exposure, and the advantage of the mother being awake during delivery.

However, the benefits of SA are often overshadowed by common postoperative complications, most notably post-dural puncture headache (PDPH) and back pain. PDPH, caused by persistent cerebrospinal fluid (CSF) leakage through the dural puncture site, can be debilitating, prolonging hospital stays and hindering maternal care of the newborn. Similarly, back

pain, resulting from local tissue trauma, ligamentous strain, or muscle spasm at the site of needle insertion, is a frequent complaint that can cause significant discomfort.
General anesthesia (GA), although associated with airway complications, nausea, and neonatal depression, effectively avoids the specific hardware-related complications of neuraxial blockade. While GA is often reserved for emergencies or when neuraxial techniques are contraindicated, a comparative understanding of these specific postoperative morbidities between the two techniques is essential for informed decision-making.

This study was designed to test the hypothesis that SA is associated with a significantly higher prevalence of postoperative back pain and headache compared to GA in patients undergoing elective cesarean section.

METHODOLOGY

Study Design, Setting and population

This was a prospective, observational, comparative study conducted at the Department of Anesthesiology, HIMS, from January 2023 to june-2023. A total of 120 ASA (American Society of Anesthesiologists) physical status II parturients, aged between 20-40 years, with singleton pregnancies, scheduled for elective lower-segment cesarean section (LSCS) at term (≥ 37 weeks of gestation), were included in the study.

Inclusion Criteria:

- ASA Physical Status II.
- Age 20-40 years.
- Singleton, full-term pregnancy.
- Elective LSCS.
- Provision of written informed consent.

Exclusion Criteria:

- Patients with a history of chronic back pain or chronic headache.
- Contraindications to spinal anesthesia (e.g., coagulopathy, local infection, raised intracranial pressure).
- Patients requiring emergency CS.
- Body Mass Index (BMI) > 35 kg/m².
- Known allergy to local anesthetics or drugs used in the study protocol.
- Multiple gestations or fetal anomalies.

Sample Size Determination

The sample size was calculated based on a previous pilot study that reported the prevalence of postoperative headache to be approximately 30% in the SA group and 10% in the GA group. With a confidence level of 95% ($\alpha = 0.05$) and power of 80% ($\beta = 0.2$), the minimum sample size required per group was calculated to be 56. To account for a potential 10% dropout rate, the final sample size was set at 60 patients per group (N=120). The formula used for calculation was: $n = \frac{(Z_{1-\alpha/2}+Z_{1-\beta})^2 \times [p_1(1-p_1)+p_2(1-p_2)]}{(p_1-p_2)^2}$.

Group Allocation

Patients were allocated to one of two groups based on the anesthesia technique planned for their surgery. Group allocation was not randomized but determined by the clinical decision of the attending anesthesiologist, who was blinded to the study's primary objective.

- **Group S (Spinal Anesthesia, n=60):** Patients who received spinal anesthesia.
- **Group G (General Anesthesia, n=60):** Patients who received general anesthesia.

Anesthesia Technique

Premedication: All patients received 30 mL of 0.3 M sodium citrate orally 30 minutes prior to surgery. Intravenous (IV) access was secured, and standard ASA monitors (ECG, NIBP, SpO2) were applied.

Group S (Spinal Anesthesia): Under strict aseptic precautions, a spinal block was performed at the L3-L4 or L4-L5 interspace using a 25-gauge Quincke spinal needle. A hyperbaric solution of 0.5% bupivacaine (2.2 mL) was injected intrathecally. The level of sensory block was assessed to achieve a T4 dermatome level. IV fluids (Ringer's Lactate) were co-loaded at 15 mL/kg prior to the block. Hypotension (SBP < 90 mmHg or >20% from baseline) was managed with IV phenylephrine (50-100 µg boluses).

Group G (General Anesthesia): A standardized rapid sequence induction was performed with IV propofol (2 mg/kg) and succinylcholine (1.5 mg/kg). Anesthesia was maintained with sevoflurane (1-1.5 MAC) in a mixture of oxygen and nitrous oxide (50:50). Neuromuscular blockade was achieved with atracurium. After uterine incision and delivery of the baby,

fentanyl (2 mcg/kg) was administered for analgesia. At the end of the surgery, neuromuscular blockade was reversed with neostigmine and glycopyrrolate.

Data Collection and Outcome Measures
A trained research assistant, who was blinded to the group allocation, assessed the patients at four time points: Pre-operatively (baseline), and at 24 hours, 48 hours, and 7 days postoperatively.

Primary Outcome Measure:

- **Incidence and Severity of Headache:** Patients were asked about the presence of a headache. If present, the severity was assessed using a Visual Analog Scale (VAS), where 0 = no pain and 10 = worst imaginable pain.

Secondary Outcome Measure:

- **Incidence and Severity of Back Pain:** Patients were asked about the presence of back pain localized to the site of injection (or a similar mid-line lumbar region). The severity was assessed using the same 0-10 VAS.

Data Collection Tool: A pre-structured proforma was used to record demographic data (age, BMI, gestational age), anesthetic details (number of attempts, dose), and the VAS scores for back pain and headache at the designated time intervals.

Statistical Analysis
Data were analyzed using SPSS software version 26.0 (IBM Corp., Armonk, NY, USA). Continuous data (age, BMI, VAS scores) were tested for normality using the Shapiro-Wilk test. A p-value of < 0.05 was considered statistically significant.

RESULTS

Table 1: Baseline Demographics

Parameter	Group S (n=60)	Group G (n=60)	p-value
Age (years)	28.4 ± 4.2	29.1 ± 3.9	0.34
BMI (kg/m²)	28.1 ± 2.5	27.8 ± 2.8	0.53
Gestational Age (weeks)	38.2 ± 0.8	38.4 ± 0.7	0.15

A total of 120 parturients completed the study (Group S, n=60; Group G, n=60). The demographic characteristics were comparable between the two groups, with no significant differences in age, BMI, or gestational age (Table 1).

Table 2: Incidence of Postoperative Headache

Time Point	Group S (n=60)	Group G (n=60)	p-value
24 hours	14 (23.3%)	4 (6.7%)	0.01*
48 hours	10 (16.7%)	3 (5.0%)	0.04*
7 days	6 (10.0%)	1 (1.7%)	0.04*

The incidence of headache was significantly higher in Group S compared to Group G at all assessment time points ($p<0.05$). At 24 hours, 14 patients (23.3%) in Group S experienced a headache compared to only 4 patients (6.7%) in Group G. By day 7, the incidence in Group S had reduced to 6 (10%), while it was negligible in Group G (1.7%).\

Table 3: Incidence of Postoperative Back Pain

Time Point	Group S (n=60)	Group G (n=60)	p-value
24 hours	24 (40.0%)	11 (18.3%)	0.01*

Time Point	Group S (n=60)	Group G (n=60)	p-value
48 hours	18 (30.0%)	7 (11.7%)	0.01*
7 days	9 (15.0%)	3 (5.0%)	0.07

Similarly, the incidence of back pain was significantly higher in Group S. At 24 hours post-surgery, 24 patients (40%) in the spinal group reported back pain compared to 11 patients (18.3%) in the general anesthesia group. This trend persisted at 48 hours and 7 days, though the severity of the pain decreased over time in both groups.

The mean VAS score for back pain in Group S was highest at 24 hours (3.8 ± 1.2) and gradually declined, while in Group G, the mean score remained low throughout the study period.

DISCUSSION

Our study demonstrated that patients receiving spinal anesthesia for elective cesarean section experienced a significantly higher prevalence of postoperative back pain and headache compared to those receiving general anesthesia. These findings are consistent with a substantial body of literature and reaffirm the well-documented side-effect profile of neuraxial blockade.[11,12]

The most common cause of headache following SA is PDPH, which is attributed to persistent CSF leakage through the dural hole created by the spinal needle, leading to a decrease in CSF pressure and traction on intracranial pain-sensitive structures.[5,13] The incidence of 23.3% in the SA group at 24 hours in our study is comparable to findings by other researchers, who reported incidences ranging from 15-40% with 25-gauge Quincke needles.[14,15] The use of a smaller gauge pencil-point needle (e.g., 25G Whitacre) could potentially have reduced this incidence; however, the use of the Quincke needle is still prevalent in many settings, which validates the clinical significance of our results.[16] The small number of patients in the GA group who reported a headache is likely attributable to factors like dehydration, blood loss anemia, or the effects of nitrous oxide, rather than PDPH.[17]

Postoperative back pain after SA is a multi-factorial issue. The physical trauma of needle insertion can cause local inflammation, periosteal irritation, and ligamentous damage. Muscle spasm and ligamentous strain from the exaggerated lumbar lordosis required to perform the block can also contribute.[7,18] The significantly higher incidence (40%) in the SA group at 24 hours strongly supports the direct mechanical insult of the procedure as a major contributor to this morbidity. Interestingly, a substantial number of patients in the GA group (18.3%) also experienced back pain at 24 hours. This can be explained by the muscle relaxation and awkward positioning on the operating table during the surgery, which can lead to musculoskeletal strain.[19] However, the higher and more persistent incidence in the SA group clearly indicates the additional iatrogenic component from the spinal block.

The clinical implications of these findings are profound. While SA remains the preferred anesthetic choice due to its safety for the neonate and the mother's ability to participate in the birth, the high prevalence of headache and back pain should not be understated. These complications can lead to significant maternal distress, delayed ambulation, prolonged hospitalization, and interference with the mother's ability to care for her newborn.[20] Strategies to mitigate these risks are essential. For PDPH, the use of atraumatic (pencil-point) needles and smaller gauge needles should be encouraged.[21] Prophylactic measures like strict bed rest and adequate hydration postoperatively may provide some benefit.[22] For back pain, a gentle surgical approach, minimizing the number of attempts, and using ultrasound guidance for landmark identification in difficult cases could prove beneficial.[23,24]

CONCLUSION

In conclusion, this study confirms that spinal anesthesia for elective cesarean section is associated with a significantly higher incidence of postoperative back pain and headache compared to general anesthesia. While spinal anesthesia remains the technique of choice, anesthesiologists should be proactive in adopting strategies to minimize these complications. The use of smaller gauge, pencil-point needles, meticulous technique, and appropriate postoperative management can help alleviate this burden on postpartum women. Future large-scale, randomized controlled trials with standardized protocols for the prevention and treatment of these complications are warranted to establish best practices.

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