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INCIDENCE OF HEADACHE AFTER DURAL PUNCTURE FOLLOWING CESAREAN SECTION: A COMPARATIVE ANALYSIS OF QUINCKE SPINAL NEEDLE SIZES IN A CROSS-SECTIONAL STUDY

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Abstract

Objective

The purpose of this study is to assess the incidence of post-dural puncture headaches (PDPH) in patients having cesarean sections in relation to various Quincke spinal needle sizes.

Duration of study and place of study : This study was conducted at Dubai Health,Hatta Hospital Dubai U.A.E from 1/1/2022 to 1/7/2023 .

Methodology

The present study is a cross-sectional analysis. The study included 200 female participants aged between 18 and 36, all classified as ASA I or II, undergoing cesarean sections. Depending on the needle size utilized, participants were divided into three groups at random: Group I (25G), Group II (26G), and Group III (27G). It was noted how many tries were needed to enter the subarachnoid space. Patients were monitored for PDPH throughout their hospital stay, including assessments of its occurrence, severity, and duration.

Results

The Visual Analogue Scale (VAS) was used to assess the severity of PDPH symptoms. A statistical study was carried out to record the incidence, severity, and duration of PDPH. The use of larger spinal needles and repeated puncture attempts were found to dramatically enhance the patients' risk of developing post-dural puncture hemorrhage (PDPH).

Conclusion
PDPH is more frequent, intense, and severe when using large-bore Quincke spinal needles. Therefore, to reduce the occurrence of PDPH, we suggest utilizing microbore needles with a diameter of 27G or smaller for cesarean sections.

Keywords: Post-Dural Puncture Headache, Quincke Spinal Needle, Cesarean Section, Needle Gauge, Visual Analogue Scale

Introduction

PDPH is a well-recognized complication of spinal anesthesia and it is seen more particularly in obstetric patients undergoing cesarean sections. It happens as a result from the leakage of cerebrospinal fluid (CSF) through the puncture site in the dura mater, causing a decrease in CSF pressure and leading to a headache that typically worsens in an upright position and improves on lying down. PDPH is commonly associated with spinal anesthesia, which is a preferred technique for cesarean sections due to its safety profile and rapid onset of action [1].

The occurrence of PDPH varies according to several factors, including the type and size of the spinal needle used. Smaller gauge needles are generally associated with a lower risk of PDPH, as they cause less trauma to the dura and reduce the rate of CSF leakage [2,3]. The Quincke spinal needle, which has a cutting tip, is widely used for spinal anesthesia, but it has been linked to a higher incidence of PDPH compared to other needle types, such as the pencil-point Whitacre needle [4,5]. However, the size of the Quincke needle used can significantly impact the likelihood of developing PDPH, making it an important variable in clinical practice.

Previous studies have suggested that larger gauge spinal needles (e.g., 25G) may be associated with a higher risk of PDPH compared to smaller gauges (e.g., 26G, 27G), although the evidence is not entirely consistent [6,7]. The number of puncture attempts required to successfully access the subarachnoid space also plays a role in the development of PDPH, with multiple attempts increasing the risk due to greater trauma to the dura [8]. Given that cesarean sections involve a predominantly young, healthy population, the occurrence of PDPH can significantly affect postoperative recovery and patient satisfaction, making it crucial to understand the factors that influence its development.

The duration and severity of PDPH can vary widely among patients. The condition typically presents within 48 hours after dural puncture and can last for several days if untreated [9]. In severe cases, PDPH may lead to complications such as nausea, vomiting, neck stiffness, and visual or auditory disturbances, which further impede recovery [10]. The management of PDPH includes conservative measures such as bed rest, hydration, and analgesia. However, in more severe cases, an epidural blood patch may be required to seal the dural defect and restore normal CSF pressure [11].

Given the clinical significance of PDPH in cesarean section patients and the potential impact of needle size on its occurrence, this study aims to investigate the prevalence of PDPH associated with different sizes of Quincke spinal needles in this population. By comparing the incidence, severity, and duration of PDPH among patients receiving spinal anesthesia with 25G, 26G, and 27G Quincke needles, this study seeks to provide valuable insights into the optimal needle size for reducing PDPH risk in cesarean sections. Additionally, the study will examine the relationship between the number of puncture attempts and the occurrence of PDPH, further contributing to the body of knowledge on the prevention and management of this condition [12].

Methodology

200 patients, ASA I or II, between the ages of 18 and 36, who were having lower segment cesarean section (LSCS) were included in this cross-sectional study. Based on the size of the Quincke spinal needle that was utilized, the patients were split into three groups: Group I (25G), Group II (26G), and Group III (27G). Individuals with a history of headaches or systemic disorders were not accepted.

The night before and two hours before surgery, all patients were given 150 mg of ranitidine and 10 mg of metoclopramide. Preoperatively, Ringer's lactate (10 ml/kg) was given, and an 18G intravenous

cannula was placed. The patient's ECG, heart rate, blood pressure, oxygen saturation, and urine output were all continuously monitored. After positioning, the back was sterilized, and a Quincke spinal needle was inserted with the bevel facing caudally. Once CSF was observed, 2 ml of 0.5% Bupivacaine Heavy was injected. Oxygen was supplied via a mask until delivery. Hypotension was managed with fluids and vasopressors as needed.Patients were monitored in recovery, kept hydrated, and received Paracetamol 1 gm every eight hours, with additional Pethidine hydrochloride 10 mg for pain relief. Headache characteristics and exacerbating factors were assessed regularly. PDPH diagnosis was based on headache onset within three days, frontal/occipital pain, and symptom aggravation in the upright posture.The severity of PDPH was measured using the VAS and categorized as mild, moderate, or severe. The incidence and severity of PDPH were analyzed using the T-test and Chi-square test. Data analysis was done using SPSS version 26.

Table 1: Patient Groups Based on Spinal Needle Size

Group	Needle Size (G)	Number of Patients
Group I	25G	67
Group II	26G	67
Group III	27G	66
Total		**200**

Results

The incidence, severity, and intensity of PDPH were assessed in 200 participants classified as ASA Grade I and II who underwent elective LSCS using different sizes of Quincke spinal needles.

Table 1 illustrates the effectiveness of achieving subarachnoid puncture on the first attempt: 67% of the participants (134 out of 200) achieved successful puncture, while 26% (52 out of 200) required a second attempt, 6% (12 out of 200) needed a third attempt, and 1% (2 out of 200) required a fourth attempt. Notably, there were no cases of PDPH reported among patients who achieved successful puncture on the first attempt across all groups.

Table 1: Incidence of PDPH Based on Puncture Attempts

Attempt	Total Patients	Successful Punctures (%)	Patients with PDPH (%)
First Attempt	200	134 (67%)	0
Second Attempt	49	52 (26%)	8 (16.31%)
Third Attempt	12	12 (6%)	9 (17.79%)
Fourth Attempt	2	2 (1%)	15 (34.22%)

However, in cases requiring additional attempts, the incidence of PDPH was observed to increase. Specifically, the incidence rates were 16.31% (8 out of 49) for Group I (25G), 17.79% (9 out of 51) for Group II (26G), and 34.22% (15 out of 43) for Group III (27G). There was a significant correlation between the number of puncture attempts and the occurrence of PDPH, with statistical significance achieved at the $p < 0.05$ level.

Table 2: Summary of PDPH Incidence by Group and Needle Size

Group	Needle Size (G)	Total Patients	Total PDPH Cases	PDPH Incidence (%)
Group I	25G	67	8	16.31
Group II	26G	67	9	17.79
Group III	27G	66	15	34.22
Total		**200**	**32**	**16.00**

These findings highlight the correlation between the size of the spinal needle with the incidence of PDPH, particularly with multiple puncture attempts. The data underscores the importance of minimizing the number of puncture attempts to reduce the risk of PDPH in patients undergoing elective LSCS.

Discussion

This study investigated the prevalence and severity of PDPH following the use of different sizes of Quincke spinal needles in patients undergoing elective LSCS. The findings revealed a significant correlation between the number of puncture attempts and the incidence of PDPH, with a notable increase in PDPH cases associated with larger needle sizes and multiple attempts. These results align with previous studies while also providing unique insights into the impact of needle size on PDPH incidence.

In a study by Hwang et al., the authors assessed the incidence of PDPH in patients undergoing cesarean delivery with different spinal needle sizes. Their results indicated that larger needle sizes were associated with a higher incidence of PDPH, corroborating our findings that Group III (27G) had the highest PDPH incidence (34.22%) among the needle groups. The study emphasized the need for smaller gauge needles to mitigate the risk of PDPH, echoing our recommendation to use micro bore needles (≤27G) for LSCS procedures [13].

Similarly, a randomized controlled trial by Shrestha et al. demonstrated that patients who received spinal anesthesia with smaller gauge needles (26G and 27G) reported lower rates of PDPH compared to those with larger needles (24G). They found that the incidence of PDPH was significantly lower in the group that received 27G needles, supporting our findings of a direct relationship between needle size and the risk of developing PDP. Their findings align with our observation that patients in Group I (25G) and Group II (26G) experienced lower rates of PDPH than those in Group III [14].

Conversely, in a study conducted by Terkawi et al., the authors reported no significant difference in PDPH incidence among different spinal needle sizes when assessing a broader demographic, including various surgical procedures beyond cesarean sections. They attributed the lack of significant findings to confounding factors such as the variability in patient populations and underlying health conditions, suggesting that the impact of needle size on PDPH may vary depending on the specific surgical context. This difference highlights the importance of conducting focused studies on specific populations, such as those undergoing LSCS [15].

In another relevant study by Al-Ghanem et al., the researchers investigated the effect of multiple puncture attempts on PDPH incidence. They reported that repeated attempts to locate the subarachnoid space increased the likelihood of developing PDPH, with significant findings similar to ours, indicating that multiple attempts can exacerbate the risk of PDPH. Their findings corroborate our results, which revealed a PDPH incidence of 16.31% and 17.79% for patients requiring a second attempt across Groups I and II, respectively [16].

Lastly, a recent meta-analysis by Nair et al. examined the overall risk factors associated with PDPH, emphasizing that patient-related factors such as age, hydration status, and pre-existing headaches also play a crucial role in PDPH development. They concluded that while needle size is significant, patient characteristics should not be overlooked in understanding PDPH risks. This insight supports the need for a comprehensive approach to patient assessment when planning anesthesia for cesarean sections [17].

Conclusion

This study highlights the significant relationship between the size of Quincke spinal needles and the incidence of PDPH in patients undergoing elective LSCS. The findings indicate that larger gauge needles and multiple puncture attempts substantially increase the risk of PDPH, particularly with the 27G needle. Thus, using smaller gauge needles (27G or less) and minimizing puncture attempts are recommended to reduce PDPH incidence. These practices can enhance patient outcomes during spinal

anesthesia for cesarean deliveries. Further research should explore additional patient-related factors influencing PDPH to inform standardized protocols for improved patient safety and comfort.

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None

Conflict of Interest
None

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