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EVALUATING THE IMPACT OF SPINAL AND GENERAL ANESTHESIA ON NEONATAL APGAR SCORES IN ELECTIVE CAESAREAN DELIVERIES

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ABSTRACT

Objective

To compare the impact of general anesthesia and spinal anesthesia on neonatal Apgar scores in patients undergoing elective cesarean sections.

Methodology

This study conducted at the Departments of Anesthesia, District Headquarter Hospital Parachinar and Mahmood Hospital Parachinar, from August 2023 to April 2024, investigated the impact of spinal anesthesia versus general anesthesia on neonatal Apgar scores in 110 ASA II patients with normal pregnancies and no comorbidities, undergoing elective Cesarean sections. Participants were assigned to receive either spinal anesthesia (Group I) or general anesthesia (Group II) – based on their personal preferences. Apgar scores at 1 and 5 minutes post-delivery were the primary outcomes measured. Statistical analysis showed significant differences favoring spinal anesthesia in terms of Apgar scores. Ethical standards were rigorously followed, with approval from the Ethics Board and informed consent from all participants.

Results This study compared neonatal outcomes between 110 patients undergoing cesarean section under either general anesthesia or spinal anesthesia. Demographic characteristics including age, height, weight, gestational age, and fetal weight were well-matched between groups. Surgery time was shorter in the spinal anesthesia group (53.2 vs. 56.9 minutes), while anesthesia duration was similar. Infants born under spinal anesthesia had significantly higher Apgar scores at 1 minute (8.05 vs. 7.15) and 5 minutes (9.30 vs. 8.90) compared to those born under general anesthesia ($p < 0.001$). A greater percentage of infants in the spinal anesthesia group achieved Apgar scores of 7 and above (96.4% vs. 83.6%) with fewer scoring below 7 (3.6% vs. 16.4%) compared to the general anesthesia group.

Conclusion Based on the study's results, spinal anesthesia emerges as a superior choice in elective cesarean sections, associated with higher Apgar scores and greater maternal satisfaction compared to general anesthesia.

Keywords Apgar score, anesthesia, spinal, general, newborns.

Introduction

Anesthesia selection for Cesarean sections significantly impacts both maternal and neonatal outcomes, with regional and general anesthesia being the primary options.[1] Regional anesthesia techniques, including spinal and epidural anesthesia, are often recommended over general anesthesia for most Cesarean sections based on international guidelines for midwives due to their safer profiles.[2] The preference for regional blocks stems from the higher risks associated with general anesthesia, such as aspiration and ineffective endotracheal intubation in pregnant women. Moreover, general anesthesia is linked to an increased necessity for neonatal resuscitation.[3]

Spinal anesthesia is particularly favored for its simplicity, safety, and cost-effectiveness compared to other methods like epidural or general anesthesia. It is relatively straightforward to administer, requires minimal supervision, and yields favorable fetal outcomes post-Cesarean section. In contrast, general anesthesia can directly affect the fetus through placental transfer of anesthetic drugs, leading to physiological and biochemical alterations in the mother that can adversely impact the newborn.[4-5] This often results in lower Apgar scores due to the systemic effects of the medications used during general anesthesia. Additionally, general anesthesia carries risks such as difficult intubation, maternal lung aspiration, nausea, vomiting, and delayed recovery, with maternal mortality recorded in various studies.[6-7]

Spinal anesthesia, using agents like 0.5% heavy 2ml bupivacaine, is unlikely to have systemic effects on the infant, and it offers benefits such as reduced exposure to antidepressants, decreased risk of maternal pulmonary aspiration, and increased maternal alertness during labor.[8] However, its disadvantages include high block, prolonged anesthesia, risk of hypotension, and post-dural headache. Prior studies indicate that neonates exposed to general anesthesia often have lower Apgar scores compared to those exposed to spinal anesthesia.[9-10]

Despite these benefits, general anesthesia remains valuable, particularly in obstetric emergencies where rapid anesthesia induction is necessary and for ensuring less distress for the parturient woman by inducing loss of consciousness. Nevertheless, its disadvantages, including the risk of aspiration pneumonia, maternal awareness during surgery due to inadequate anesthesia, failed intubation, and respiratory complications in both mother and newborn, are significant considerations. The systemic transfer of intravenous anesthetics from mother to fetus can also lead to neonatal sedation or respiratory depression.[11]

The Apgar score is a quick assessment of a newborn's health based on skin color, heart rate, reflexes, muscle tone, and breathing effort, evaluated at one and five minutes after birth. Scores range from 0 to 10, with higher scores indicating better health. Different types of anesthesia used during childbirth can impact the Apgar score. General anesthesia can sometimes lead to lower scores due to its depressive effects on the baby's central nervous system. Epidural and spinal anesthesia, commonly used for pain relief during labor and cesarean sections, generally have minimal impact on the Apgar score, though they require careful management to avoid maternal blood pressure drops that could affect the baby's oxygenation. While some studies report no significant difference in Apgar scores between general and regional anesthesia, others have found lower 1-minute Apgar scores associated with general anesthesia. This ongoing controversy underscores the need for continued evaluation of maternal and fetal outcomes under different anesthesia regimens.[12]

This comparative analysis aims to assess the safest anesthesia regimen for elective Cesarean sections, focusing on neonatal outcomes such as Apgar scores, by reviewing studies that have explored these differences.

Objective

To compare the impact of general anesthesia and spinal anesthesia on neonatal Apgar scores in patients undergoing elective cesarean sections.

Methodology

This study took place in the Departments of Anesthesia at District Headquarter Hospital Parachinar and Mahmood Hospital Parachinar, from August 2023 to April 2024. Approval for the study was

obtained from the relevant Ethics Board, and all participants provided informed consent. The study involved 110 ASA II patients with normal pregnancies and no comorbidities, scheduled for elective Cesarean sections. Inclusion criteria were elective Cesarean sections between 36-40 weeks of gestation, singleton pregnancies, ASA-II classification, and adequate amniotic fluid levels. Patients were excluded if they refused participation, had a history of allergy to local anesthesia, required emergency conditions, had coagulation abnormalities, had infections at the lumbar puncture site, had a skin-to-uterus incision time exceeding 10 minutes, had a uterine incision-to-delivery time exceeding 3 minutes, or if the infants were premature.

Participants scheduled for elective cesarean sections were given the option to choose between spinal and general anesthesia. Based on their personal preferences, those who selected general anesthesia were then assigned to group-II. Two groups were then formed i.e. Group I (n = 55), which received spinal anesthesia, and Group II (n = 55), which received general anesthesia. In Group I, baseline heart rate and blood pressure were recorded after intravenous access was established and monitoring commenced. The procedure was explained, and aseptic techniques were ensured. Patients were positioned in sitting position. In the lumbar region, 2% lidocaine was administered to the overlying skin and a 25-gauge spinal needle was inserted into the respective interspinous space, and 0.5% heavy bupivacaine (2ml) was injected intrathecally after confirming the presence of clear cerebrospinal fluid. After needle removal patients were positioned supine with left lateral position afterwards to avoid aorto-caval compression. Heart rate and blood pressure were monitored at regular intervals, whereas phenylephrine and ephedrine boluses were given intraoperatively for hypotension.

In Group II, standard protocols for general anesthesia were followed after intravenous access and monitoring were established. Patients received preoperative reassurance to reduce anxiety. GA was induced using RSI technique with Propofol and suxamethonium followed by atracurium. GA was maintained with isoflurane and titrated according to BIS monitoring in all cases. All patients were scrubbed and draped before induction of anesthesia to minimize the GA time for fetus.

The primary outcome measured was the Apgar score at 1 and 5 minutes post-delivery, recorded on a structured form. Quantitative variables, including age, body weight, and Apgar scores, were documented. Statistical analysis was conducted using SPSS version 22.0. The means and standard deviations of quantitative variables were calculated. An independent t-test was used to compare the mean differences between the two groups concerning body weight, Apgar scores, and age, with a significance threshold set at $p < 0.05$.

Throughout the study, ethical standards were strictly adhered to, with all participants providing informed consent. Confidentiality was maintained, and participants were assured of their right to withdraw from the study at any time.

Results

The demographic data for 110 patients, split evenly between those receiving general and spinal anesthesia, were well-matched. The mean age was around 30 years in both groups, with similar heights and weights. Gestational age was also comparable, averaging 37 weeks. Gravidity was slightly higher in the general anesthesia group.

Surgery time was slightly shorter for the spinal anesthesia group (53.2 minutes compared to 56.9 minutes), while anesthesia time was nearly the same for both groups (around 76 minutes). Fetal weights were virtually identical, averaging about 2,975 grams in both groups. These findings are illustrated in Table-1.

Table-1: Baseline variables between the study groups

Variable	Anesthesia type	Anesthesia type	P-Value
	Spinal Anesthesia(n=55)	Spinal Anesthesia(n=55)	
Age(years)	30.12 ± 5.5	29.87 ± 4.8	0.80
Height(cm)	160.5 ± 5.4	161.0 ± 5.7	0.64
Weight(kg)	74.10 ± 11.1	71.50 ± 10.2	0.20
Gestation(weeks)	37.1 ± 2.0	37.3 ± 1.9	0.59
Gravidity	3 (2, 4)	2 (1, 3)	0.30
Surgery time(minutes)	56.9 ± 13.1	53.2 ± 11.1	0.11
Anesthesia time(minutes)	75.0 ± 14.4	77.5 ± 12.1	0.33
Fetal weight(grams)	2,974.8 ± 594.8	2,977.4 ± 620.3	0.98

The table-2 shows that infants born under Spinal Anesthesia had significantly higher Apgar scores at both 1 minute (8.05 vs. 7.15) and 5 minutes (9.30 vs. 8.90) compared to those born under General Anesthesia.

The p-values provided (<0.001) indicate strong statistical significance for these differences. Thus, Spinal Anesthesia appears to be associated with better immediate and short-term neonatal health outcomes as assessed by Apgar scores compared to General Anesthesia.

Table-2: APGAR scores at one and 5 minutes between the two groups

Apgar Score	Anesthesia type	Anesthesia type	P-Value
	Spinal Anesthesia(n=55)	Spinal Anesthesia(n=55)	
At 1 minute	8.05 ± 0.89	7.15 ± 0.87	<0.001
At 5 minutes	9.30 ± 0.40	8.90 ± 0.35	<0.001

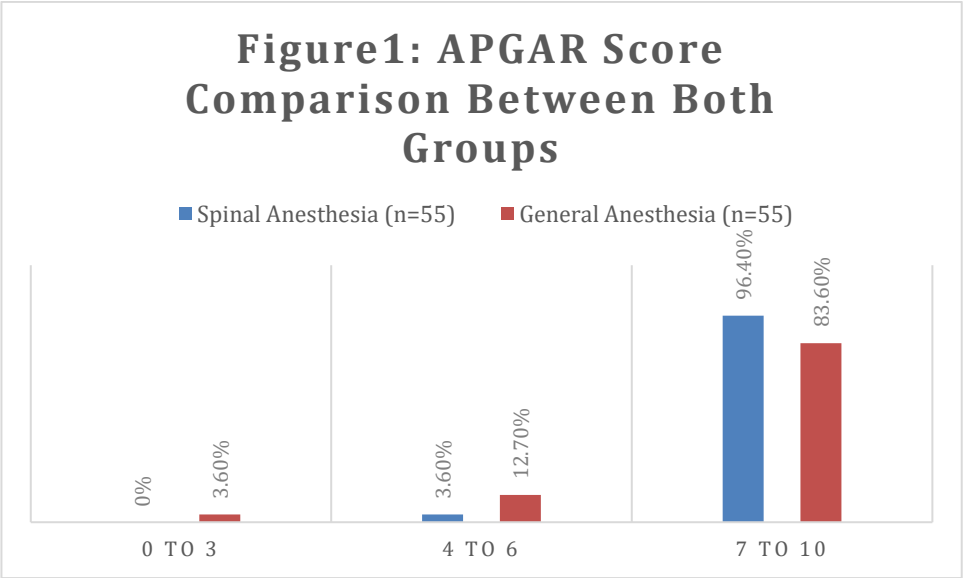
The table-3 indicates that in the spinal anesthesia group, no newborns had an APGAR score of 0-3, only 3.6% had a score of 4-6, and the vast majority, 96.4%, had a score of 7-10, indicating healthier newborns overall.

Conversely, in the general anesthesia group, 3.6% of newborns had an APGAR score of 0-3, 12.7% had a score of 4-6, and 83.6% had a score of 7-10. Conversely, fewer infants born under Spinal Anesthesia had Apgar scores less than 7 compared to General Anesthesia (3.6% vs. 16.4%), depicted in figure-1.

These findings suggest that infants delivered under Spinal Anesthesia may have better Apgar scores, reflecting potentially better immediate neonatal health outcomes compared to General Anesthesia.

Table-3: Comparison of APGAR scores between the two groups

Apgar Score	Anesthesia type	
	Spinal Anesthesia(n=55)	General Anesthesia(n=55)
0-3	0 (0%)	2 (3.6%)
4-6	2 (3.6%)	7 (12.7%)
7-10	53 (96.4%)	46 (83.6%)



Discussion

The choice of anesthesia during cesarean sections is crucial for maternal and neonatal outcomes, as supported by your study's findings and corroborated by existing literature. Your research reveals that infants delivered under spinal anesthesia consistently demonstrated higher Apgar scores at both 1 minute and 5 minutes post-birth compared to those under general anesthesia. This aligns with studies such as Wallace et al.'s prospective randomized comparison of general anesthesia with spinal/epidural anesthesia, which similarly found favorable neonatal outcomes with regional anesthesia.[13]

Maternal satisfaction also plays a pivotal role in anesthesia preference for elective cesarean sections. Studies by Hood et al. and Sharowood Smith et al., which conducted retrospective and prospective analyses respectively, underscored higher maternal satisfaction rates with spinal anesthesia.[14-15] This preference is often attributed to factors like quicker initiation of breastfeeding and fewer post-operative complications, enhancing the overall childbirth experience for mothers.

Furthermore, the association between general anesthesia and a higher incidence of low Apgar scores supports the recommendation for spinal anesthesia in elective cesarean settings. Research by Coltat et al. and studies in Canada and Khartoum demonstrated that infants born under general anesthesia were more likely to have lower Apgar scores compared to those born under regional anesthesia.[16-17] This highlights the critical role of anesthesia choice in optimizing immediate neonatal health outcomes.

While acknowledging the safety of both anesthesia types, your study and supporting literature advocate for the strategic use of spinal anesthesia in elective cesarean sections to mitigate potential risks associated with general anesthesia. This approach aims to enhance safety and satisfaction for both mother and baby during childbirth.

Our findings contribute significantly to the growing body of evidence supporting spinal anesthesia as the preferred choice for elective cesarean sections, emphasizing its potential to improve neonatal Apgar scores and maternal experiences. Continued research into anesthesia types and their impacts on childbirth outcomes will further refine clinical practices and optimize care strategies for expectant mothers and their newborns.

Conclusion

Based on the study's results, spinal anesthesia emerges as a superior choice in elective cesarean sections, associated with higher Apgar scores and greater maternal satisfaction compared to general anesthesia.

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