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Evaluation of the safety and efficacy of general anesthesia versus regional anesthesia for emergency cesarean section

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Abstract
Background and objectives: Emergency cesarean section is a crucial surgical procedure in which the selection of anesthetic profoundly affects maternal and newborn outcomes. General anesthesia (GA) and regional anesthesia (RA) are often utilized; nevertheless, their relative safety and efficacy in emergency contexts are still being assessed. This study sought to evaluate mother and newborn outcomes between general anesthesia (GA) and regional anesthesia (RA) in emergency cesarean sections.
Material and Methods: We included 60 patients who needed an emergency cesarean surgery. They were split into two groups: Group I (n=30) got general anesthesia, and Group II (n=30) got regional anesthetic (spinal/epidural). The assessed parameters encompassed intraoperative hemodynamic stability, surgical length, maternal problems, postoperative recovery, neonatal APGAR scores, and the necessity for neonatal intensive care unit (NICU) admission. We used the right tests for statistical analysis, and a p-value of less than 0.05 was judged significant.
Results: Regional anesthesia was linked to improved intraoperative hemodynamic stability in comparison to general anesthesia ($p<0.05$). Maternal problems, including nausea and shivering, were more prevalent in RA, whereas airway-related difficulties and postoperative sleepiness were more significant in GA. Patients with RA had a shorter recovery time after surgery. Neonatal outcomes were better for RA, with significantly higher 1-minute and 5-minute APGAR scores ($p<0.05$) and fewer NICU admissions than GA.
Conclusion: In emergency cesarean sections, regional anesthesia showed greater mother hemodynamic stability, faster recovery, and better outcomes for newborns than general anesthesia. However, GA was still useful in some cases where RA was not safe. In crises, choosing the right anesthetic procedure is very important for the safety of both the mother and the baby.

Keywords: Emergency cesarean section, general anesthesia, regional anesthesia, maternal outcome, neonatal outcome, APGAR score

1. Introduction
Cesarean section is one of the most common types of surgery done on pregnant women throughout the world, and the number of these surgeries is going up because of higher risks for both the mother and the baby. In emergencies, the choice of anesthesia is very important for both the safety of the mother and the health of the newborn. The anesthetic approach must guarantee swift onset, sufficient analgesia, and minimal problems while establishing optimal conditions for both mother and child [1-3].
The two main types of anesthesia used during cesarean birth are general anesthesia (GA) and regional anesthesia (RA), which includes spinal and epidural blocks. GA has the benefits of quick induction and airway control, which makes it a good choice when speedy delivery is needed or when RA is not an option. However, GA comes with concerns such trouble managing the airway, aspiration, consciousness during surgery, drowsiness after surgery, and worse results for newborns since anesthetic medicines can pass through the placenta [4-6].
RA, on the other hand, has become the most popular method for both planned and emergency cesarean sections since it gives great pain relief, lowers the amount of blood lost by the mother, lowers the risk of airway problems, and enhances the health of the baby. However, RA does have certain drawbacks, including as the possibility of low blood

pressure, nausea, shivering, and rare yet significant problems include high spinal block [7, 8].

In the setting of emergency cesarean section, the decision between GA and RA is particularly essential, as it must balance the urgency of delivery with maternal and newborn safety. Even though there have been a lot of research on this topic, the results are still different, especially in places where resources are restricted. Consequently, the current study was conducted to assess and compare the safety and efficacy of general anesthesia versus regional anesthesia in emergency cesarean sections, focusing on maternal hemodynamic stability, intra- and postoperative complications, recovery profile, and neonatal outcomes [9-11].

Material and Methods

This prospective comparative study involved 60 patients undergoing emergency cesarean section at the Department of Anesthesiology, Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry - 605 001, India, from August 2015 to July 2016. Patients were randomly assigned to two groups: Group I (n = 30) received General Anesthesia (GA), and Group II (n = 30) received Regional Anesthesia (RA - spinal/epidural).

Inclusion Criteria

- Pregnant women undergoing emergency cesarean section.
- Age between 18 and 40 years.
- Singleton pregnancies.
- Patients fit for either GA or RA based on preoperative evaluation.

Exclusion Criteria

- Patients with contraindications to regional anesthesia
- Known allergy to local anesthetic or anesthetic drugs.
- Severe systemic illness
- Patients with intrauterine fetal demise.
- Refusal to participate in the study.

Procedure

Clinical indicators and baseline demographic information were documented. The patient's heart rate, blood pressure (both systolic and diastolic), and oxygen saturation were tracked throughout the operation. Postoperative recovery time, analgesic needs, length of operation, and maternal problems (such as hypotension, nausea, vomiting, shivering, and airway-related events) were documented. A neonatal outcome measure was the need for admission to the neonatal intensive care unit (NICU), as well as 1-and 5-minute APGAR scores.

Statistical Analysis

Data were analyzed using appropriate statistical tests (Chi-square test for categorical variables, Student's t-test for continuous variables). A p-value of <0.05 was considered statistically significant.

Results

There were a total of 60 patients that participated, with 30 assigned to Group I (GA) and 30 to Group II (RA). Intraoperative hemodynamics, maternal problems, newborn outcomes, and demographic characteristics were all compared using the data that was collected.

Table 1: Demographic characteristics of patients

Variable	Group I (GA) (n=30)	Group II (RA) (n=30)	p-value
Mean age (years)	27.4 ± 4.2	26.8 ± 4.6	0.58
Mean weight (kg)	61.2 ± 7.3	60.5 ± 6.8	0.71
Mean gestational age (weeks)	37.2 ± 1.4	37.5 ± 1.3	0.42

When it came to height, weight, and gestational age, the two sets of data were very similar. When comparing the groups' demographics at the outset, no statistically significant difference was found (*p*>0.05).

Table 2: Intraoperative hemodynamic parameters

Parameter	Group I (GA) (n=30)	Group II (RA) (n=30)	p-value
Mean HR (beats/min)	92.3 ± 11.5	85.6 ± 9.8	0.03*
Mean SBP (mmHg)	117.8 ± 12.6	110.5 ± 11.4	0.04*
Mean DBP (mmHg)	76.2 ± 8.9	71.4 ± 7.6	0.05*
Mean SpO_2 (%)	97.6 ± 1.5	98.2 ± 1.2	0.12

**p*<0.05 significant.

Hemodynamic stability was better maintained by RA group patients as compared to GA group patients. There were statistically significant variations (p<0.05) in the amplitude of heart rate and blood pressure fluctuations in GA. The two groups' oxygen saturation levels were similar.

Table 3: Maternal complications and recovery profile

Complication/Outcome	Group I (GA) (n=30)	Group II (RA) (n=30)	p-value
Hypotension (%)	4 (13.3%)	7 (23.3%)	0.31
Nausea/Vomiting (%)	3 (10.0%)	6 (20.0%)	0.28
Shivering (%)	2 (6.7%)	5 (16.7%)	0.21
Airway complications (%)	4 (13.3%)	0 (0%)	0.04*
Post-op drowsiness (%)	6 (20.0%)	1 (3.3%)	0.05*
Mean recovery time (min)	45.6 ± 8.4	32.3 ± 7.5	0.001*

The GA group had significantly greater rates of airway-related problems and postoperative sleepiness (p<0.05). With a p-value of 0.001, the RA group showed significantly reduced recovery time. Although not statistically significant, RA was associated with an increased frequency of mild side effects such as nausea, vomiting, and shivering.

Table 4: Neonatal outcomes

Neonatal Parameter	Group I (GA) (n=30)	Group II (RA) (n=30)	p-value
APGAR score at 1 min	6.8 ± 1.1	7.6 ± 0.9	0.002*
APGAR score at 5 min	8.1 ± 0.8	8.7 ± 0.7	0.01*
NICU admission (%)	7 (23.3%)	2 (6.7%)	0.04*

*$p<0.05$ significant.

At both 1 and 5 minutes post-delivery, neonates who were given RA had significantly higher APGAR scores ($p<0.05$). Furthermore, the NICU admission rates were greater in the GA group (23.3% vs. 6.7% in the RA group), suggesting that RA resulted in improved newborn outcomes.

Discussion

The selection of anesthetic strategy in emergency cesarean section is essential for maximizing mother safety and neonatal welfare. In this study, we compared general anesthesia (GA) with regional anesthesia (RA) in 60 patients, assessing demographic, intraoperative, mother, and newborn outcomes [12-14]. Our results indicated that both groups had similar demographic features, thereby excluding baseline differences as potential confounding variables. The RA group had better hemodynamic stability since their heart rate and blood pressure didn't change as much. Similar findings have been documented in prior research, indicating that RA correlates with enhanced intraoperative stability by preventing sympathetic activation during laryngoscopy and intubation in GA patients [15-17].

There were different maternal problems in each group. Hypotension, nausea, and shivering were more common with RA, but these symptoms usually went away on their own and could be managed. Conversely, airway problems and postoperative somnolence were markedly elevated in GA patients. These findings corroborate previous research indicating an elevated risk of aspiration, unsuccessful intubation, and protracted recovery associated with general anesthesia. Importantly, the recovery time was much quicker in RA, which means that patients could get up and move around sooner and feel better after surgery [18-20].

RA had a big effect on neonatal outcomes. The RA group had higher APGAR scores at 1 and 5 minutes and reduced chances of NICU admission. The transplacental transfer of anesthetic drugs during general anesthesia certainly caused temporary newborn depression, which is in line with previous research. Numerous studies have recorded enhanced newborn outcomes associated with regional anesthesia (RA), establishing it as the preferred anesthetic approach for both elective and emergency cesarean deliveries. Nonetheless, GA is essential in several circumstances, including maternal rejection of RA, contraindications to neuraxial block, or critical urgency necessitating quick delivery. In these situations, careful airway management and improving the way anesthesia is given can lower the dangers [21-23].

Conclusion

Improved newborn outcomes, quicker postoperative recovery, better maternal hemodynamic stability, and fewer airway-related problems were some of the benefits of regional anesthetic over general anesthesia for emergency caesarean sections. In most emergency conditions, RA should be regarded the primary anesthetic approach, however GA is still useful when RA is contraindicated or quick induction is required. To maximize the safety of the mother and the newborn, it is crucial to carefully identify patients and to closely monitor their vital signs during the operation.

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Conflict of Interest

None

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