

Association between anesthetic type and perioperative outcomes in pediatric patients undergoing elective surgery: An observational study



Sugandhini Boda¹, Rajeshwari K²

^{1,2}Assistant Professor, Department of Anaesthesiology, Government Medical College, Nalgonda, Telangana, India

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ABSTRACT

Background: Pediatric surgeries require careful anesthetic choice. The impact of general anesthesia (GA) versus regional anesthesia (RA) on post-operative outcomes remains underexplored. **Aims and Objectives:** The aims and objectives of the study are to assess the association between anesthetic type and perioperative outcomes, including post-operative pain, nausea incidence, and recovery room stay duration in pediatric patients undergoing elective surgery. **Materials and Methods:** This observational study involved 100 pediatric patients undergoing elective surgery. Participants were grouped based on the anesthetic received: GA or RA. Outcomes measured included post-operative pain (0–10 scale), post-operative nausea incidence, and recovery room stay length. **Results:** The mean post-operative pain score for GA patients was 4.5 (standard deviation [SD]: 1.5), with most reporting scores between 3.0 and 6.0. For RA patients, the mean pain score was 3.8 (SD: 1.2), with the majority reporting scores between 2.6 and 5.0. Patients under RA had marginally reduced post-operative pain scores than those under GA. Regarding nausea, 56% of GA patients reported post-operative nausea, while only 36% of RA patients did. The mean recovery room stay for GA patients was 120 min (SD: 30 min), with most staying between 90 and 150 min. RA patients had an average stay of 100 min (SD: 25 min), with the majority staying between 75 and 125 min. **Conclusion:** Pediatric patients administered RA demonstrated slightly lower post-operative pain, decreased incidence of nausea, and a shorter recovery room stay compared to those given GA. These findings suggest potential benefits of RA in pediatric elective surgeries, although further research is warranted.

Key words: Pediatric surgery; General anesthesia; Regional anesthesia; Post-operative outcomes

INTRODUCTION

Surgical procedures in pediatric patients present unique challenges, not least of which is the selection of the most appropriate anesthesia.¹ With a focus on minimizing post-operative complications and maximizing patient comfort, the choice between general anesthesia (GA) and regional anesthesia (RA) is crucial. Both methods have their advantages and disadvantages, and understanding their respective

impacts on post-operative outcomes is paramount for making informed clinical decisions.^{2,3}

Historically, GA has been the primary choice for most pediatric surgeries. It provides a deep, unconscious state, ensuring that the patient does not experience pain or have any memory of the procedure.⁴ GA works by affecting the entire body, making it suitable for a wide range of surgeries. In addition, its predictable onset and duration make it a reliable choice for procedures of varying lengths.⁵ However,

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Address for Correspondence:

Dr. Rajeshwari K, Assistant Professor, Department of Anaesthesiology, Government Medical College, Nalgonda, Telangana, India.

Mobile: +91-9666999983. **E-mail:** rajeshwariaesthesia@gmail.com

GA's systemic nature means that it can also have a range of side effects, including nausea, respiratory complications, and a longer recovery period.⁶

On the other hand, RA has been gaining traction in pediatric surgical procedures. RA involves numbing a specific part of the body, ensuring that the patient does not feel pain in that area while remaining conscious or under light sedation. Because RA is localized, it often results in fewer systemic side effects than GA. It is particularly useful for surgeries on extremities, such as arm or leg procedures. RA's localized nature often results in a faster recovery, less post-operative pain, and a decreased risk of nausea. However, RA might not be suitable for all types of surgeries, especially those that require deep or extensive incisions.⁷

The pediatric population is especially sensitive to the potential side effects of anesthesia. Children's bodies process drugs differently than adults, and their respiratory and cardiovascular systems can react unpredictably. Furthermore, post-operative complications such as pain or nausea can be particularly distressing for children, impacting not only their immediate recovery but also their perception of medical procedures in the future.⁸

There have been several studies comparing GA and RA in adults, with many pointing to the benefits of RA in terms of reduced post-operative pain and faster recovery. However, the pediatric population has unique physiological and psychological considerations that may not make adult findings directly translatable. While some studies have explored the impacts of GA and RA in children, a comprehensive understanding remains elusive. There's a growing need for more research in this area, especially given the increasing number of pediatric surgeries and the continual advancements in anesthetic techniques.

Aim and objectives

The primary aim of our study is to discern the post-operative differences between GA and RA in pediatric patients undergoing elective surgery. Specifically, we intend to compare post-operative pain scores for patients under GA versus RA, analyze the incidence of post-operative nausea in both groups, and evaluate the duration of stay in the recovery room contingent on the anesthetic method used. Through these objectives, our aspiration is to furnish more definitive guidelines regarding anesthetic selection in pediatric surgeries, ultimately enhancing patient outcomes and comfort.

MATERIALS AND METHODS

This prospective observational study spanned 12 months and was conducted in the Department of Anesthesiology, Government Medical College, Nalgonda, Telangana, India. The study enrolled 100 pediatric patients ranging in age from 2 to 18 years, all of whom were scheduled for elective surgical procedures. This diverse participant group allowed for a comprehensive examination of anesthetic outcomes in the pediatric population undergoing elective surgery.

Inclusion criteria

- Pediatric patients aged 2–18 years
- Patients scheduled for elective surgical procedures
- Consent is given by parents or legal guardians for participation.

Exclusion criteria

- Patients with a known history of allergic reactions to anesthetics.
- Those with contraindications to either GA or RA
- Patients undergoing emergency surgeries
- Patients with pre-existing chronic pain conditions or gastrointestinal disorders.

Grouping

Given the observational design of the study, patients were not randomized. Instead, they were grouped based on the type of anesthetic administered:

- GA: 50 patients
- RA: 50 patients.

Data collection

For each participant, data were gathered on: Demographic details, including age, gender, and weight. The specific surgical procedure was conducted. Anaesthetic agents and their respective dosages. Post-operative pain scores gauged using a 0–10 standardized pain scale at intervals of 1, 6, and 24 h post-surgery. Instances of post-operative nausea within the first 24 h after surgery. Duration of stay in the recovery room recorded in minutes.

Outcome measures: The primary outcomes were post-operative pain scores, nausea incidence, and the recovery room stay length.

Statistical analysis

Continuous variables were described using means and standard deviations (SD), while categorical variables were presented as frequencies (percentages). The means between the two groups were compared using independent t-tests for continuous variables. In contrast, categorical variables

were assessed using the Chi-square test. A $P < 0.05$ was deemed statistically significant.

Ethical considerations

Approval for the study was secured from the Institutional Ethics Committee, Government Medical College, Nalgonda, Telangana. Parents or legal guardians of all the participating patients provided informed consent. The study adhered to the ethical standards set by the institution.

RESULTS

Post-operative pain

GA: The average pain score for pediatric patients under GA was 4.5 on a 0–10 scale, with a SD of 1.5. This suggests that the majority of patients under GA had pain scores between 3.0 (4.5–1.5) and 6.0 (4.5 + 1.5).

RA: The average pain score for pediatric patients under RA was 3.8, with a SD of 1.2. This implies that the majority of patients under RA had pain scores between 2.6 (3.8–1.2) and 5.0 (3.8 + 1.2) (Table 1).

Comparatively, patients under RA had slightly lower post-operative pain scores than those under GA.

Incidence of post-operative nausea

GA: Out of 50 patients, 28 experienced post-operative nausea, which is 56% of the patients. This indicates that more than half of the pediatric patients under GA experienced some degree of nausea after surgery.

RA: Out of 50 patients, 18 experienced post-operative nausea, representing 36% of the patients. This is a considerably lower proportion than the GA group (Table 2).

This suggests that pediatric patients under GA are more likely to experience post-operative nausea compared to those under RA.

Length of stay in recovery

GA: The average length of stay in the recovery room for patients under GA was 120 min, with a SD of 30 min. This means the majority of GA patients spent between 90 (120–30) and 150 (120 + 30) min in recovery.

RA: The average length of stay for patients under RA was 100 min, with a SD of 25 min. This suggests that most RA patients spent between 75 (100–25) and 125 (100 + 25) min in recovery (Table 3).

Table 1: Post-operative pain scores

| Anesthetic type | Mean pain score | Standard deviation | Pain score range (68% of patients) |
|---------------------|-----------------|--------------------|------------------------------------|
| General anesthesia | 4.5 | 1.5 | 3.0 to 6.0 |
| Regional anesthesia | 3.8 | 1.2 | 2.6 to 5.0 |

Table 2: Incidence of post-operative nausea

| Anesthetic type | Number of patients with nausea | Percentage |
|---------------------|--------------------------------|------------|
| General anesthesia | 28 | 56 |
| Regional anesthesia | 18 | 36 |

Table 3: Length of stay in recovery

| Anesthetic type | Mean length of stay (minutes) | Standard deviation | Recovery time range (68% of patients) |
|---------------------|-------------------------------|--------------------|---------------------------------------|
| General anesthesia | 120 | 30 | 90–150 |
| Regional anesthesia | 100 | 25 | 75–125 |

Patients under RA, on average, spent 20 min less in the recovery room compared to those under GA.

DISCUSSION

The comparison between GA and RA in pediatric patients undergoing elective surgery has garnered increasing attention in the medical literature, with several studies shedding light on post-operative outcomes and offering valuable insights into anesthetic choices.

Our study's findings regarding post-operative pain align with the conclusions of Mir Ghassemi et al.,⁹ which indicated that RA may provide advantages in terms of reduced post-operative pain compared to GA. Similarly, Mandee et al.,¹⁰ also reported lower pain scores associated with RA in neonates and infants undergoing non-cardiac surgery with GA.

Concerning the incidence of post-operative nausea, our study concurs with previous research. Hebre et al.,¹¹ highlighted the benefits of RA in reducing complications, including post-operative nausea. The lower percentage of pediatric patients experiencing post-operative nausea in the RA group compared to the GA group is consistent with these findings. This aligns with the idea that avoiding systemic anesthetics in RA may contribute to a lower incidence of nausea, a well-documented side effect of general anesthetics.

The shorter length of stay in the recovery room for RA patients is in line with the observations of Nasr et al.,¹² who emphasized the significance of efficient recovery in pediatric patients with congenital heart disease. The quicker recovery associated with RA has been reported in various surgical settings, as also noted in Meyer et al.,³ study,¹³ where pre-operative anemia was associated with post-operative morbidity in pediatric surgical patients.

However, it is crucial to acknowledge that the existing literature demonstrates variability in its findings, reflecting the complexity of anesthetic choices. As illustrated by Beringer et al.,^{14,15} the behavior and responses of pediatric patients during anesthesia induction can also impact the overall surgical experience. Therefore, clinical decisions must be individualized, considering patient-specific factors, the nature of the surgical procedure, and the preferences of both clinicians and patients or their guardians.

Limitations of the study

Limitations of our study include its observational nature, which may introduce selection bias. In addition, the relatively small sample size and single-center design could impact the generalizability of the findings. Further multicenter studies with larger patient populations are warranted to validate these results and provide more robust evidence for clinical decision-making.

CONCLUSION

Our study suggests that RA may offer advantages over GA in terms of post-operative pain, nausea incidence, and recovery room stay duration in pediatric elective surgery. While our findings are consistent with some prior studies, it is important to consider the individualized nature of anesthesia decisions. Anesthetic selection should always be based on a comprehensive assessment of patient-specific factors, surgical requirements, and a thorough discussion between clinicians, anesthesiologists, and patients or their guardians.

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Author's Contribution:

SB- Concept and design of the study, results interpretation, review of literature and preparing first draft of manuscript. Statistical analysis and interpretation, revision of manuscript; **RK-** Concept and design of the study, results interpretation, review of literature and preparing first draft of manuscript, revision of manuscript

Work attributed to:

Government Medical College, Nalgonda, Telangana, India

Orcid ID:

Sugandhini Boda- <https://orcid.org/0009-0008-0658-1623>

Rajeshwari K- <https://orcid.org/0009-0008-6616-264X>

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