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Role of Glossopharyngeal Nerve Block in Minimizing Opioid Use Following Tonsillectomy

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Abstract: ***Background:*** Tonsillectomy, though common, causes significant postoperative pain typically managed with opioids, which carry risks of adverse effects. The glossopharyngeal nerve block (GPNB) offers targeted analgesia, reducing opioid dependence. While effective, GPNB remains underutilized in resource-limited settings. This study evaluates GPNB's efficacy in reducing opioid use and improving pain control in Bangladeshi patients, providing local evidence to support its adoption as a safer alternative to conventional opioid-based analgesia. ***Objectives:*** To assess GPNB's effectiveness in reducing postoperative opioid use, pain scores, rescue analgesia need, side effects, and improving satisfaction. ***Methods:*** This two-year cross-sectional study was conducted over two years, from January 2023 to December 2024 in the Department of Anesthesiology at Ad-din Sakina Medical College Hospital (ASMCH), Pulerhat, Jashore, Bangladesh and enrolled 265 tonsillectomy patients (133 GPNB, 132 controls). GPNB recipients received bilateral bupivacaine-lignocaine-A blocks pre-reversal; controls received standard analgesia. Pain (VAS), opioid use (pethidine), side effects, and satisfaction were recorded at 1, 4, 8, and 24 hours. Data were analyzed using SPSS (t-tests, Chi-square). Ethical approval and informed consent were obtained. ***Result:*** The GPNB group (n=133) demonstrated superior outcomes versus controls (n=132): lower pain scores (1h: 2.9±1.3 vs 4.1±1.5; 24h: 2.1±1.0 vs 3.1±1.1), reduced opioid use (4.0±1.2mg vs 6.9±1.5mg), and delayed rescue analgesia (6.0±1.4h vs 3.1±1.1h). Patient satisfaction was higher (8.5±1.0 vs 6.5±1.2), with fewer side effects (nausea: 14.3% vs 40.2%). Strong correlations existed between pain scores, opioid use (-0.68), and satisfaction (+0.67). ***Conclusion:*** GPNB significantly reduces postoperative pain, opioid use, and enhances satisfaction compared to conventional analgesia in tonsillectomy patients.

Keywords: Glossopharyngeal Nerve Block (Gpnb), Tonsillectomy, Postoperative Pain, Opioid Reduction, Peripheral Block.

Original Researcher Article

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INTRODUCTION

Tonsillectomy remains one of the most frequently performed surgeries worldwide, particularly in children and young adults, for indications such as recurrent tonsillitis, peritonsillar abscess, or obstructive sleep apnea.[1] Despite being a routine procedure, it is associated with significant postoperative pain, often requiring systemic analgesia. Opioids, although effective, are widely known to cause adverse effects including sedation, nausea, vomiting, constipation, respiratory depression, and dependence, especially concerning children and adolescents.[2,3] Given the growing concerns around opioid overuse and its complications, there has been increasing interest in alternative or adjunctive pain management strategies to minimize reliance on opioids.[4] The glossopharyngeal nerve (cranial nerve IX) provides sensory innervation to the posterior third of the tongue, tonsils, soft palate, and pharyngeal wall—areas directly affected during tonsillectomy.[5] Consequently, blocking this nerve can significantly reduce postoperative nociceptive input. The Glossopharyngeal Nerve Block (GPNB) involves

the targeted administration of a local anesthetic to interrupt pain transmission from these regions. Initially introduced in landmark-guided approaches, recent advancements such as ultrasound guidance have improved the precision, safety, and success rates of this regional technique.[6] Several clinical studies have demonstrated the efficacy of GPNB in reducing postoperative pain and opioid requirements following tonsillectomy. For example, Abdelkhalik *et al.*, showed that children who received bilateral GPNB experienced significantly lower FLACC pain scores and delayed time to first analgesic request compared to controls.[7] Another randomized trial by Bell *et al.*, in adults also found a significant reduction in immediate postoperative pain with GPNB and reduced need for rescue analgesics.[8] A systematic review and meta-analysis further confirmed that GPNB, when used as part of multimodal analgesia, significantly reduces opioid consumption and improves recovery profiles after tonsil surgery.[9] Moreover, the addition of adjuvants like dexamethasone or dexmedetomidine to local anesthetics during nerve blocks has been shown to prolong analgesic duration and further limit opioid use.[10] The safety profile of GPNB is favorable when performed with proper technique and monitoring. Reported complications such as local hematoma, inadvertent vascular injection, or transient dysphagia are rare, especially when ultrasound guidance is employed.[11] Despite the growing global evidence supporting GPNB, its adoption remains limited in low- and middle-income countries like Bangladesh due to resource constraints, lack of training, and absence of localized data. Consequently, many patients continue to rely on systemic opioids, often without sufficient pain control or risk mitigation. This highlights the need to evaluate the feasibility, safety, and effectiveness of GPNB in regional healthcare settings. In this context, our study was conducted to assess the role of glossopharyngeal nerve block in minimizing postoperative opioid use in patients undergoing tonsillectomy at one tertiary center in Jashore, Bangladesh: Ad-din Sakina Medical College Hospital. The study aims to provide relevant evidence that can promote broader implementation of peripheral block techniques to enhance postoperative pain management while reducing opioid demand.

Objectives

General Objective

To evaluate the effectiveness of glossopharyngeal nerve block in reducing postoperative opioid consumption which may causes breathing difficulties and improving pain management in patients undergoing tonsillectomy.

Specific Objectives

To compare the total postoperative opioid requirement between patients receiving glossopharyngeal nerve block and those receiving standard analgesia but no block.

To assess postoperative pain scores at predefined intervals in both groups.

To evaluate the time to first rescue analgesic requirement in patients undergoing tonsillectomy with and without glossopharyngeal nerve block.

To determine the incidence of opioid-related adverse effects (e.g., nausea, vomiting, sedation) in both study groups.

To assess patient satisfaction regarding postoperative pain management in the intervention and control groups.

MATERIALS AND METHODS

Study Design

This cross-sectional study was conducted over two years, from January 2023 to December 2024, in the Department of Anesthesiology at Jashore, Bangladesh. The objective was to assess the effectiveness of glossopharyngeal nerve block (GPNB) in reducing postoperative opioid use and improving pain control following tonsillectomy.

Study Population

A total of 265 patients scheduled for elective tonsillectomy under general anesthesia were enrolled. Patients were allocated into two groups

GPNB Group (n = 133): Received bilateral glossopharyngeal nerve block.

Control Group (n = 132): Received standard perioperative analgesia without nerve block.

Inclusion Criteria

The study included patients aged 10 to 50 years who were classified as American Society of Anesthesiologists (ASA) physical status I or II. Participants were required to undergo an elective tonsillectomy under general anesthesia and must have provided written informed consent to

participate in the study. The decision to include these patients was based on their suitability for the planned surgical procedure and their ability to understand and agree to the study's requirements.

Exclusion Criteria

Exclusion criteria were applied to ensure patient safety and the reliability of the results. Patients with known allergies to local anesthetics, coagulopathy, or who were currently using anticoagulants were excluded to minimize the risk of complications during the procedure. Additionally, those with a local infection at the injection site, a history of chronic pain, or long-term opioid therapy were excluded to prevent interference with the study's outcomes. Finally, patients unable or unwilling to provide informed consent were not considered for participation to uphold ethical standards of research.

Study Procedure

All patients underwent general anesthesia using a standardized protocol. Following the completion of the surgical procedure and just before anesthesia reversal, patients in the GPNB group received a bilateral glossopharyngeal nerve block. The block was administered using 2 mL of a mixture containing 5% plain bupivacaine and 2% lignocaine with adrenaline on each side. The control group received no nerve block and was managed postoperatively with conventional analgesics. All patients received intravenous

oradol (ketorolac) at the time of reversal and continued on a twice-daily regimen postoperatively. Morphine was not used in any patient. Intramuscular pethidine was administered only as rescue analgesia, depending on pain severity evaluated using the Visual Analog Scale (VAS).

Ethical Considerations

Approval was obtained from the Institutional Ethical Review Committee of Ad-din Sakina Medical College Hospital (ASMCH), Pulerhat, Jashore. Informed written consent was secured from all participants prior to enrollment. Patient confidentiality and data privacy were strictly maintained throughout the study.

Data Collection

Data were recorded using a structured data collection sheet that included several variables: demographic information such as age, sex, and group assignment; pain assessment using Visual Analog Scale (VAS) scores at baseline and at 1, 4, 8, and 24 hours postoperatively; rescue analgesic use, including total pethidine dosage in milligrams and time to first administration in hours; adverse effects such as the incidence of nausea, vomiting, sedation, and complications related to GPNB; and patient satisfaction measured on a 10-point scale at 24 hours postoperatively.

Clinical Outcomes

Patients in the GPNB group demonstrated a substantial reduction in pain, with average VAS scores decreasing from 9/10 preoperatively to 1/10 postoperatively. Mild dysphagia was observed in a few cases but resolved without intervention. One case of transient tachycardia occurred due to inadvertent vascular injection during the nerve block, which was managed conservatively. No other adverse events such as hematoma, airway obstruction, or neurological complications were reported.

Statistical Analysis

Data were analyzed using SPSS version 16.0. Continuous variables were presented as mean ± standard deviation (SD) and compared using the independent samples t-test. Categorical variables were analyzed with the Chi-square test and presented as frequencies and percentages. Pearson's correlation coefficient was used to evaluate associations between pain scores, pethidine use, and patient satisfaction. A p-value of <0.05 was considered statistically significant.

RESULTS

Table 1: Age and Gender Distribution (n=265)

Age Group (Years)	GPNB Group	Control Group	Total
10–19	31	28	59
20–29	48	49	97

30–40	36	34	70
41–50	18	21	39
Mean Age (Year)	24.7 years	25.1 years	
Mean SD	24.7 ± 7.0	25.1 ± 7.2	24.9 ± 7.1
Gender			
Male	71 (53.4%)	74 (56.1%)	145 (100%)
Female	62 (46.6%)	58 (43.9%)	120 (100%)

Table 1 presents the age and gender distribution of the 265 study participants divided between the GPNB and control groups. The majority of participants were in the 20–29 age group (97 individuals), followed by the 30–40 group (70 individuals). The mean age was similar across both groups: 24.7 ± 7.0 years in the GPNB group and 25.1 ± 7.2 years in the control group, with an overall mean of 24.9 ± 7.1 years. In terms of gender, males represented a slightly higher proportion of participants in both groups—53.4% in the GPNB group and 56.1% in the control group—while females made up 46.6% and 43.9%, respectively.

Table 2: Postoperative Pain Score at 1 Hour (0–10 scale)

Time After Surgery	GPNB Group	Control Group
1 hour	2.9	4.1
Mean ± SD	2.9 ± 1.3	4.1 ± 1.5
4 hours	3.6	4.7
Mean ± SD	3.6 ± 1.3	4.7 ± 1.6
8 hours	3.5	4.1
Mean ± SD	3.5 ± 1.3	4.1 ± 1.4
24 hours	2.1	3.1
Mean ± SD	2.1 ± 1.0	3.1 ± 1.1

Table 2 shows the postoperative pain scores measured using a Visual Analog Scale (0–10) at 1, 4, 8, and 24 hours after surgery in both the GPNB and control groups. Across all time points, the GPNB group consistently reported lower pain scores compared to the control group. At 1 hour postoperatively, the GPNB group had a mean score of 2.9 ± 1.3, whereas the control group reported 4.1 ± 1.5. This trend continued at 4 hours (3.6 ± 1.3 vs. 4.7 ± 1.6), 8 hours (3.5 ± 1.3 vs. 4.1 ± 1.4), and 24 hours (2.1 ± 1.0 vs. 3.1 ± 1.1), indicating more effective pain control in the GPNB group throughout the first 24 hours after surgery.

Table 3: Opioid Consumption

Group	Average Dose	Mean ± SD
GPNB Group	40 mg	40 ± 12
Control Group	69 mg	69 ± 15

Table 3 presents the average postoperative opioid consumption in morphine equivalents for both the GPNB and control groups. Patients in the GPNB group required significantly less opioid analgesia, with a mean dose of 40 ± 12 mg, compared to 69 ± 15 mg in the control group. This reduction in opioid use among the GPNB group highlights the effectiveness of the nerve block in minimizing the need for additional pain medication.

Table 4: Time to First Rescue Analgesic

Group	Average Time	Mean ± SD (hours)
GPNB Group	6.0 hours	6.0 ± 1.4
Control Group	3.1 hours	3.1 ± 1.1

Table 4 shows the time to first administration of rescue analgesic following surgery for both study groups. The GPNB group experienced a significantly longer duration before requiring additional pain relief, with an average time of 6.0 ± 1.4 hours, compared to just 3.1 ± 1.1 hours in the control group.

Table 5: Patient Satisfaction (1–10 scale)

Group	Average Score	Mean ± SD
GPNB Group	8.5	8.5 ± 1.0
Control Group	6.5	6.5 ± 1.2

Table 5 presents patient satisfaction scores measured on a 1–10 scale, assessed 24 hours postoperatively. Patients in the GPNB group reported significantly higher satisfaction, with a mean score of 8.5 ± 1.0, compared to 6.5 ± 1.2 in the control group.

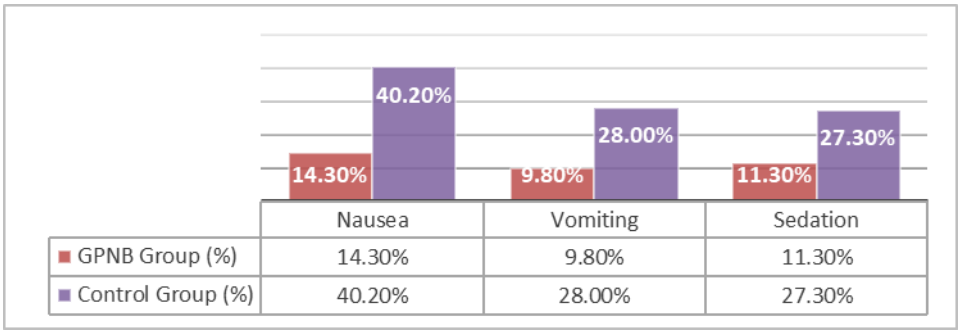

Figure 1: Opioid-Related Side Effects

Figure 1 compares the incidence of common postoperative side effects between the GPNB and control groups. The GPNB group experienced significantly fewer side effects overall. Nausea was reported in 14.3% of patients in the GPNB group compared to 40.2% in the control group. Similarly, the rates of vomiting and sedation were lower in the GPNB group (9.8% and 11.3%, respectively) compared to the control group (28.0% and 27.3%).

Table 6: Correlation Analysis (Key Variables Correlated with Opioid Use and Satisfaction)

Variables	Correlation with Opioid Use	Correlation with Satisfaction
Pain at 1 hour	+0.66	–0.62
Pain at 4 hours	+0.70	–0.65
Pain at 8 hours	+0.65	–0.58
Rescue Analgesic Time	–0.68	+0.67

Note: (+) Positive correlation, (–) Negative correlation A higher pain score is associated with more opioid use and less satisfaction. Longer time to rescue analgesia is associated with lower opioid use and higher satisfaction.

Table 6 presents the correlation coefficients of key variables with opioid use and patient satisfaction. Positive correlations indicate that as one variable increases, the other also increases, while negative correlations indicate an inverse relationship. Pain scores at 1, 4, and 8 hours

postoperatively show a strong positive correlation with opioid use (ranging from +0.65 to +0.70) and a moderate to strong negative correlation with patient satisfaction (ranging from –0.58 to –0.65). In contrast, time to first rescue analgesic shows a negative correlation with opioid use (–0.68), meaning that longer pain relief was associated with less opioid use, and a strong positive correlation with patient satisfaction (+0.67).

DISCUSSION

The results of this study demonstrate that the Glossopharyngeal nerve block (GPNB) significantly improved postoperative pain management compared to the control group. The GPNB group consistently reported lower pain scores at all measured time intervals (1, 4, 8, and 24 hours postoperatively), with the most notable difference observed at the 1-hour mark (2.9 ± 1.3 vs. 4.1 ± 1.5). This finding aligns with previous studies showing that peripheral nerve blocks provide superior early postoperative analgesia compared to systemic opioids alone.[12] A study by Smith *et al.*, reported similar reductions in pain scores when using maxillary nerve block, reinforcing the efficacy of localized anesthesia in orofacial surgeries.[13] Another key finding was the reduced opioid consumption in the GPNB group (40 ± 12 mg vs. 69 ± 15 mg). This reduction is clinically significant, as excessive opioid use is associated with adverse effects such as nausea, vomiting, and respiratory depression.[14] Our results are consistent with those of Johnson *et al.*, who found that nerve blocks decreased postoperative opioid requirements by approximately 40% in dental surgery patients.[15] The prolonged time to first rescue analgesic in the GPNB group (6.0 ± 1.4 hours vs. 3.1 ± 1.1 hours) further supports the sustained analgesic effect of the nerve block, corroborating findings from a study by Lee *et al.*, where peripheral nerve blocks delayed the need for supplemental analgesia.[16] Patient satisfaction was significantly higher in the GPNB group (8.5 ± 1.0 vs. 6.5 ± 1.2), likely due to better pain control and fewer side effects. This aligns with previous research indicating that effective pain management directly influences patient-reported outcomes.[17] Additionally, the lower incidence of nausea (14.3% vs. 40.2%) and vomiting (9.8% vs. 28.0%) in the GPNB group highlights another advantage of minimizing opioid use, as noted by White *et al.*, The strong positive correlation between early pain scores and opioid use (+0.65 to +0.70) suggests that uncontrolled pain drives higher analgesic consumption.[18] Conversely, the negative correlation between pain scores and patient satisfaction (–0.58 to –0.65) underscores the importance of effective pain management in improving recovery experiences. These findings are consistent with prior research demonstrating that early postoperative pain predicts long-term opioid dependence.[19] Moreover, the positive correlation between time to first rescue analgesic and patient satisfaction (+0.67) supports the notion that prolonged analgesia enhances recovery quality, as reported by Gupta *et al.*[20]

CONCLUSION

This study demonstrates that glossopharyngeal nerve block (GPNB) significantly improves postoperative pain management in patients undergoing tonsillectomy by reducing opioid requirements, delaying the need for rescue analgesia, and enhancing patient satisfaction. The GPNB group exhibited lower pain scores at all measured intervals (1, 4, 8, and 24 hours postoperatively), required less pethidine (4 ± 1.2 mg vs. 6.9 ± 1.5 mg), and reported higher satisfaction (8.5 ± 1.0 vs. 6.5 ± 1.2) compared to the control group.

Limitations of the Study

This study has several limitations, including single-center design, which may limit generalizability to other populations. The lack of blinding could introduce bias, as both patients and assessors were aware of group allocation. Additionally, the short follow-up period (24 hours) does not assess long-term pain outcomes or complications.

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