

Ultrasound-Guided Suprazygomatic Maxillary Nerve Blocks for Pediatric Cleft Palate Repair: A Retrospective Analysis

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BACKGROUND

Cleft palate is one of the most common congenital abnormalities, with an incidence of approximately 1 per 1623 live births in the United States.¹ To optimize speech outcomes in patients with cleft palate, experimental and large-cohort data support palatal repair before or very early in speech onset.² Effective perioperative pain control in cleft palate repair is essential to support recovery, minimize complications, and reduce reliance on opioid analgesics, which carry heightened risk in infants and young children.³⁻⁵ Suprazygomatic maxillary nerve (SZMN) blocks have been shown to provide safe, effective regional anesthesia for cleft palate repair and decreased postoperative opioid consumption⁶⁻⁸. However, many previous studies did not use the ultrasound-guided technique or did not show reduced intraoperative opioid consumption.⁶⁻⁸

AIM

To evaluate whether ultrasound-guided SZMN blocks reduce opioid consumption and affect recovery outcomes in pediatric patients undergoing cleft palate repair.

METHODS

We conducted a retrospective chart review of pediatric patients undergoing cleft palate repair at a single tertiary center from January 2020 to February 2023.

Exclusion criteria: Postoperative ICU admission or additional invasive surgical procedures during cleft palate repair

Primary outcome: Total opioid consumption during hospitalization in morphine milligram equivalents per kilogram (MME/kg)

Secondary outcomes: Intraoperative opioid use; postoperative opioid use (within 72hrs of surgery); opioid use in the PACU; hospital length of stay (LOS); time to first feeding

Medical Data: ASA status; cleft palate type with Veau classification; timing of surgery

Statistical Analysis: Performed using SAS v.9.2. Differences in patient characteristics between groups were assessed using 2-sample t-tests or Wilcoxon rank-sum tests for continuous and ordinal variables and chi-square tests or Fisher's exact tests for categorical variables. Variables significant in the univariate analysis at $p < 0.2$ were included as potential confounders in the multivariable regression model, with statistical significance set at $p < 0.05$.

ULTRASOUND-GUIDED NERVE BLOCK TECHNIQUE

All patients received general endotracheal anesthesia. Ropivacaine or bupivacaine and a 15-6MHz linear ultrasound probe were used for the block.

Figure 1. Placement of linear ultrasound probe. Placement was inferior to the zygomatic arch, with a 45-degree angle to obtain optimal view of the pterygopalatine fossa. Needle (27g, 30mm) placement was lateral to the corner of the eye, diving under the zygomatic arch, with a trajectory toward midline.

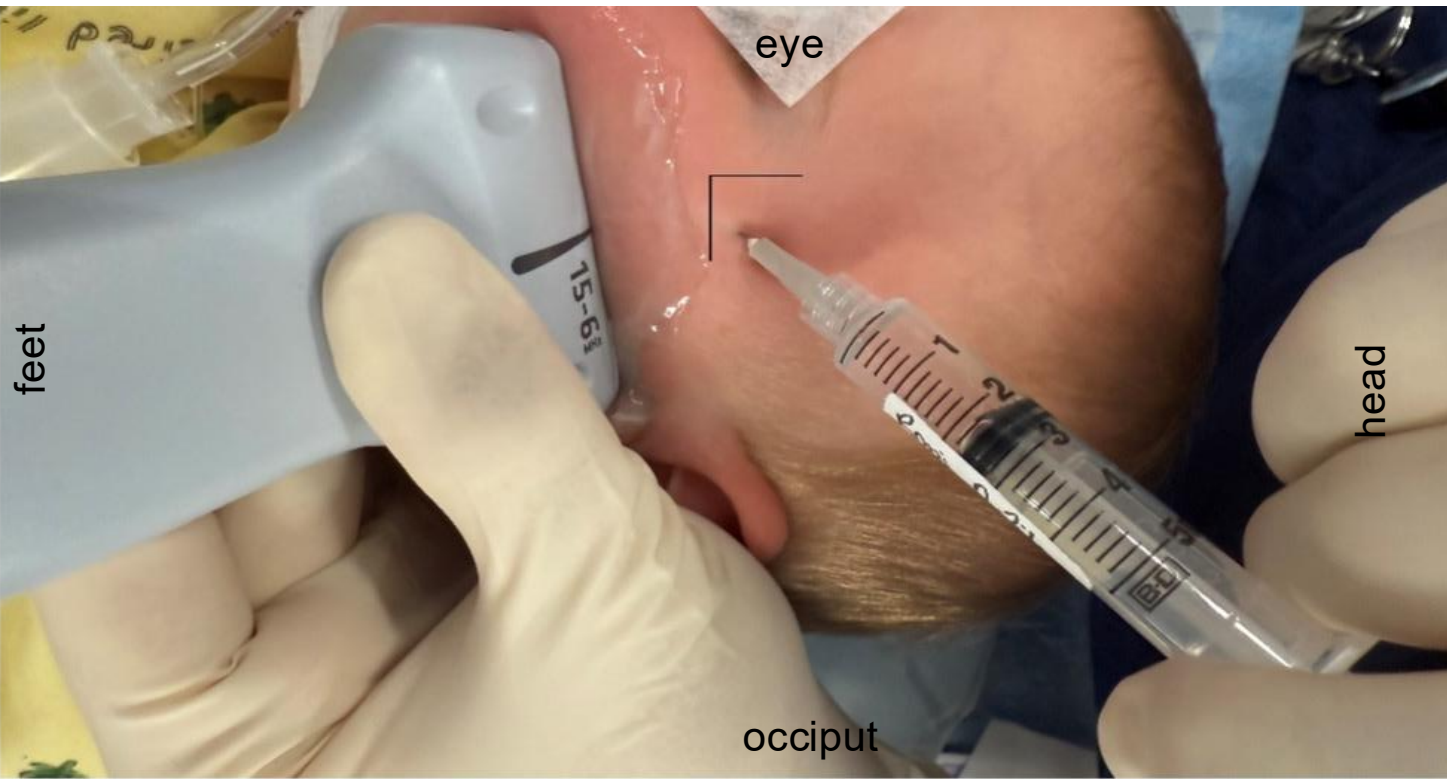
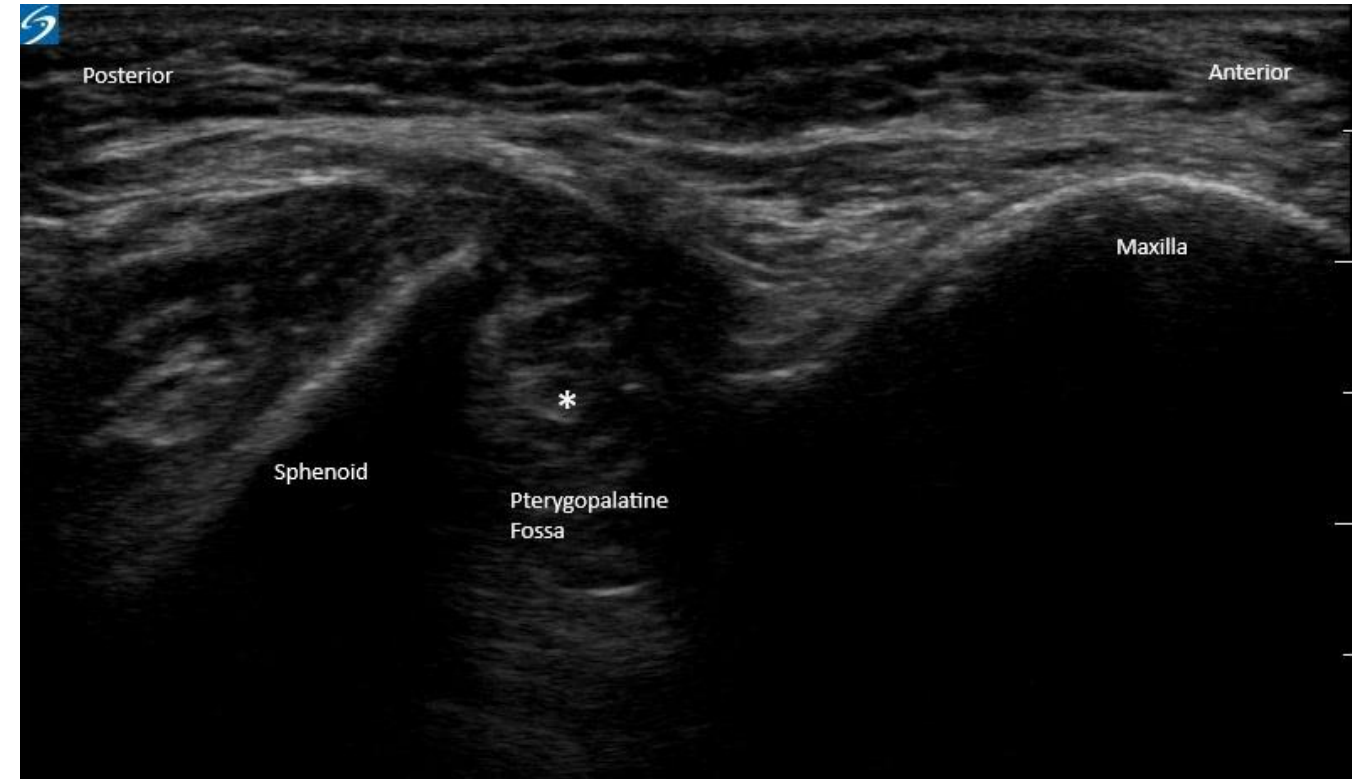


Figure 2. Ultrasound image showing the maxilla anteriorly, the pterygopalatine fossa, and the sphenoid posteriorly. Asterisk represents the needle target for local deposition, where spread of the local anesthetic may be visualized.



RESULTS

The total study population included 74 pediatric patients, of whom 46 did not receive an ultrasound-guided SZMN block and 28 received an ultrasound-guided SZMN block.

SZMN blocks were placed in a median of 4.5 minutes (3.0-8.0).

Primary outcome:

Patients who did not receive an ultrasound-guided SZMN block had a 49% higher opioid consumption than that of patients who received an SZMN block when controlling for complete cleft palate status, use of non-narcotic medications intraoperatively, and time from induction to anesthesia-ready (mean percent increase [95% CI]: 48.9[4.41,112.4]; $p=0.031$).

Secondary outcomes:

Patients in the SZMN block group had a significantly longer time from induction to anesthesia-ready ($p=0.002$). However, there was no significant difference in total anesthesia time ($p=0.086$) or intraoperative time ($p=0.075$) between the two groups.

Patients who did not receive an ultrasound-guided SZMN block had a longer PACU LOS (median, 60 minutes) than patients who received an ultrasound-guided SZMN block (median, 47 minutes), though the difference was not statistically significant ($p=0.053$).

There were no differences in postoperative opioid use ($p=0.568$), time to first successful feeding ($p=0.881$), or hospital LOS ($p=0.863$).

Table 1. Procedural, Analgesia, and Postoperative Outcomes by Block Group (N = 74)

Outcome	No SZMN block (n = 46)	SZMN block (n = 28)	P value
Time from induction to anesthesia-ready, min, median (IQR)	14.5 (10.0-19.0)	21.5 (14.5-29.0)	0.002
Total anesthesia time, min, median (IQR)	288 (237.0-339.0)	307 (286.0-344.0)	0.086
PACU LOS, min, median (IQR)	60 (44.0-91.0)	47 (36.0-67.5)	0.053
Intraoperative opioids, MME/kg, median (IQR)	0.35 (0.15-0.52)	0.21 (0.13-0.33)	0.016
Other PACU medications, No. (%)			0.028
Acetaminophen	14 (30.4)	2 (7.1)	
Ibuprofen	1 (2.2)	1 (3.6)	
None	31 (67.4)	25 (89.3)	
Total opioids, MME/kg, median (IQR)	0.44 (0.23-0.58)	0.24 (0.16-0.38)	0.017

Abbreviations: LOS, length of stay; MME, morphine milligram equivalents; PACU, post-anesthesia care unit; SZMN, suprazygomatic maxillary nerve.

Associations between opioid consumption and patient or procedural factors:

Patients who received adjuvant pain medications intraoperatively also consumed 36% less opioids than those who did not ($p=0.029$).

A 5-minute increase in induction time was associated with a 10% reduction in overall opioids consumed ($p=0.034$)

Patients who had complete cleft palate (Veau III-IV) repair consumed significantly more opioids than other repairs ($p=0.003$).

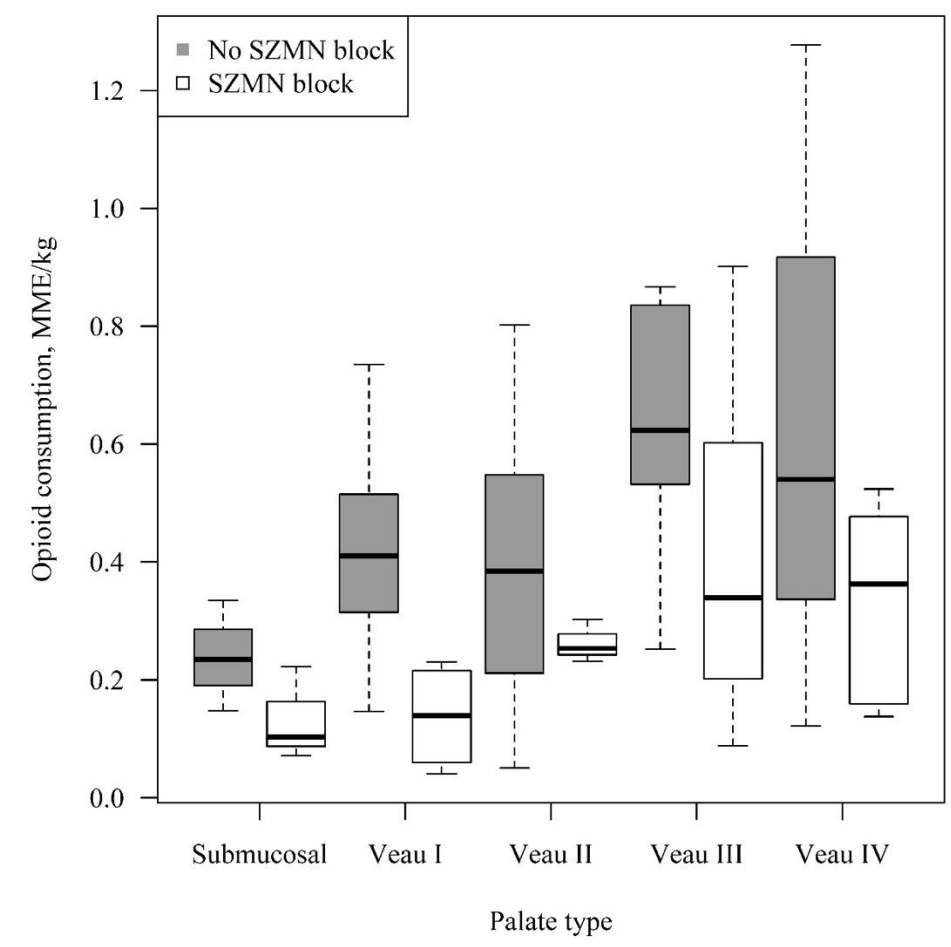


Figure 3. Boxplots of the distribution of opioid consumption by block group and palate type. Boxes show the 25th, 50th, and 75th percentiles of the data, whiskers extend 1.5 x IQR from the median

CONCLUSIONS

We found that ultrasound-guided SZMN blocks were associated with significantly reduced opioid consumption by nearly 50% and improved recovery profiles in pediatric patients undergoing cleft palate repair. We completed multivariate analysis to account for key potential confounders, including cleft type, intraoperative non-narcotic medication use, and time from induction to anesthesia-ready, and found that the association between SZMN block use and reduced opioid consumption persisted after adjustment. SZMN blocks were placed rapidly and safely, demonstrating the feasibility of using this approach in this population without significantly prolonging anesthesia time.

Limitations include sample size, which was restricted to available cases of cleft palate repair during the study period. The possibility of selection bias given the unequal distribution of cleft types between groups was adjusted for, but there could be residual confounding. Although prospective randomized trials are needed to confirm our findings and evaluate broader recovery outcomes, our findings support the incorporation of SZMN blocks into standard analgesic protocols for pediatric cleft palate repair.

SUMMARY

By substantially reducing opioid requirements while maintaining effective pain control, SZMN blocks offer a safe, efficient, and reproducible option for perioperative analgesia in a population particularly vulnerable to opioid-related adverse effects. This approach also aligns with current priorities in pediatric anesthesia for opioid-sparing, multimodal pain management.

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