

## Anesthetic management in cleft lip and palate repair in children: a retrospective analysis

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### Keypoints

Evaluate specific anesthetic approaches in pediatric patients undergoing surgical correction of congenital cleft lip and/or palate, focusing on airway management, induction technique

### Abstract

#### Introduction

To evaluate specific anesthetic approaches in pediatric patients undergoing surgical correction of congenital cleft lip and/or palate, focusing on airway management, induction technique, complication rates, and analgesic efficacy.

#### Materials and Methods

A retrospective review of 84 pediatric patients aged 3 to 36 months who underwent cleft lip or palate repair between 2014 and 2024 in a pediatric maxillofacial surgery department. Parameters included method of induction, airway approach, use of anesthetic and analgesic agents, and intra-/postoperative complications. Statistical analysis was performed using SPSS v22.0;  $p < 0.05$  was considered significant.

#### Results

Inhalational induction with preserved spontaneous breathing was used in 85.7% of patients. Difficult intubation (Cormack–Lehane grade  $\geq 3$ ) occurred in 19% of cases. Postoperative respiratory events were recorded in 11.9%, predominantly in patients with syndromic features. Multimodal analgesia was used in 92.9%, and local infiltration was performed in 76.2% of patients. Pain scores (FLACC scale) remained below 3 in 83.3% of children at 2 hours postoperatively.

### Conclusion

Cleft lip and palate patients present a high risk of airway difficulty, necessitating careful preoperative planning and access to advanced airway tools. Inhalational induction with spontaneous ventilation remains safe and effective. Multimodal pain management, including non-opioid systemic agents and local infiltration, provides excellent analgesia and minimizes opioid-related complications.

### Keywords

cleft lip, cleft palate, pediatric anesthesia, airway management, multimodal analgesia, postoperative pain.

### Introduction

Cleft lip and palate are among the most common congenital craniofacial anomalies requiring surgical correction in infancy. Anesthetic management in these cases is particularly challenging due to airway malformations, limited mouth opening, glossoptosis, and the risk of aspiration. Furthermore, the high sensitivity of infants to anesthetic agents and the narrow margin of safety underline the need for tailored anesthetic strategies. This study aims to provide a structured assessment of anesthetic practice in this vulnerable group.

**Material and Methods**

A retrospective single-center study was conducted at the Pediatric Maxillofacial Surgery Unit between January 2014 and December 2024. Medical records of 84 children (36 males, 48 females) aged 3 to 36 months who underwent cleft lip or palate repair under general anesthesia were analyzed.

Inclusion criteria:

- Age between 3 and 36 months
- Surgical correction of cleft lip and/or palate
- General anesthesia

Exclusion criteria:

- Reoperations
- Severe congenital anomalies requiring preoperative mechanical ventilation

Evaluated parameters:

- Type of anesthesia induction (inhalational vs. intravenous)
- Method of airway management (direct laryngoscopy, video-laryngoscopy, LMA)
- Anesthetic and analgesic drugs used
- Use of local/regional anesthesia
- Intra- and postoperative complications

**Results**

Demographics:

- Cleft lip repair: 34 patients (41%)
- Palate repair: 50 patients (59%)
- Syndromic features (Pierre Robin, Van der Woude): 15 patients (17.9%)

Induction and airway:

- Inhalation (sevoflurane) induction: 72 patients (85.7%)
- IV induction (propofol ± fentanyl): 12 patients (14.3%)
- Difficult intubation: 16 patients (19%)
  - Video-laryngoscopy: 9
  - Intubation via LMA: 4
  - Fiberoptic intubation: 3

Mean intubation time:

- Cormack I–II: 35 ± 12 seconds
- Cormack III–IV: 92 ± 28 seconds (p < 0.001)

Anesthetic maintenance:

- Sevoflurane 1.8–2.5 vol%
- Fentanyl (2.1 ± 0.6 µg/kg)
- Rocuronium (0.4–0.6 mg/kg)
- Dexmedetomidine (0.5 µg/kg) in 21.4% of cases

Analgesia:

- Multimodal approach (paracetamol + NSAIDs): 92.9%
- Local infiltration with 0.25% articaine with epinephrine: 76.2%
- FLACC score <3 at 2 hours: 83.3%

Complications:

- Respiratory events (apnea, retraction): 11.9%
- Reintubation in PACU: 1.2%
- Nausea/vomiting: 3.6%
- Delayed emergence: 4.8%
- No cases of LAST, laryngospasm, or allergic reactions

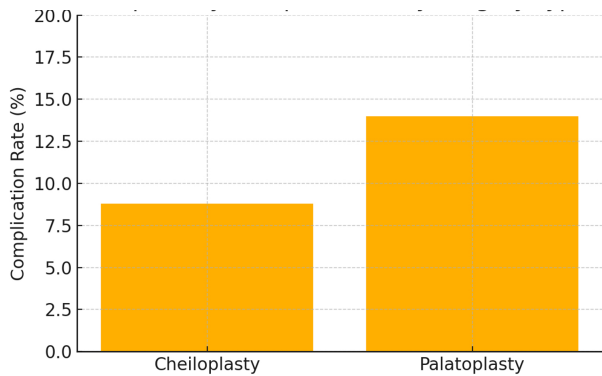
See Table 1.

Complication	n (%)
Respiratory events (retraction, apnea)	10 (11.9%)
Reintubation in the recovery room	1 (1.2%)
Nausea and vomiting	3 (3.6%)
Prolonged emergence (>30 min)	4 (4.8%)
Allergic reactions	0
LAST, bronchospasm, laryngospasm	0

**Table 1.** Postoperative complications

All children with complications were monitored in the Pediatric Intensive Care Unit (PICU) for 24 hours. No cases of mortality, anaphylaxis, or severe cardiopulmonary events were reported. Bar chart showing the percentage of respiratory complications in patients undergoing cheiloplasty versus palatoplasty. Complications (retractions, apnea, desaturation) were more frequently

observed after palatoplasty (14.0%) compared to cheiloplasty (8.8%). (Figure 1 and Table 2.



**Figure 1.** Incidence of Respiratory Complications by Type of Surgery

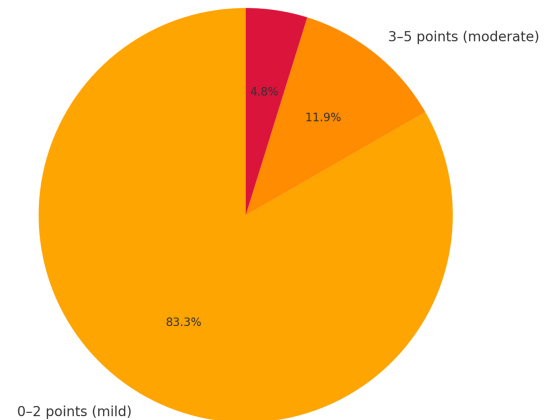
The figure demonstrates that the incidence of respiratory complications was higher in palatoplasty (14.0%) than in cheiloplasty (8.8%). This difference is attributed to the more invasive nature of surgery in the soft and hard palate area, possible postoperative oropharyngeal edema, and longer surgical duration. Additionally, patients undergoing palatoplasty more often presented with associated syndromes (e.g., Pierre Robin), further affecting airway patency in the postoperative period. These findings emphasize the need for enhanced respiratory monitoring in children after palatoplasty.

Type of Surgery	Total Number of Patients	Respiratory Complications (n)	Complication Rate (%)
Cheiloplasty	34	3	8.8%
Palatoplasty	50	7	14.0%

**Table 2.** Incidence of Respiratory Complications by Type of Surgical Intervention

Pain assessment using the FLACC scale 2 hours postoperatively showed that 83.3% of patients experienced mild pain (0–2 points), 11.9% had moderate pain (3–5 points), and only 4.8% reported severe pain (6–10 points). Figure

2. These findings indicate the high effectiveness of the Pain Intensity 2 Hours After Surgery (FLACC Scale Assessment)



**Figure 2.** Pain Intensity 2 Hours After Surgery (FLACC Scale).

implemented multimodal analgesia strategy, which combined systemic non-opioid analgesics and local infiltration anesthesia.

The use of dexmedetomidine and the restriction of opioids further contributed to smoother emergence from anesthesia and reduced postoperative pain levels.

### Discussion

The data obtained confirm that cleft lip and palate surgeries in children require a specialized anesthetic approach, primarily due to anatomical challenges in airway management. Nearly one in five patients (19%) in the study group exhibited signs of difficult intubation, which is consistent with previously published data (Engelhardt et al., 2012 — up to 20%). This underscores the need for mandatory preparation of alternative airway strategies (video laryngoscopy, LMA, fiberoptic intubation).

Inhalational induction remains the method of choice for most children under one year of age, due to its controllability and safety in cases of difficult mask ventilation. Intravenous induction was used less frequently and only in patients without signs of micrognathia or retrognathia, reflecting an individualized approach in clinical practice.

The high efficacy of multimodal analgesia combined with local infiltration made it possible to minimize opioid

dosage, avoid episodes of hypoventilation, and achieve smooth emergence. The use of dexmedetomidine at a dose of 0.5 µg/kg as premedication had a positive effect on hemodynamic stability and reduced opioid requirements, in line with the findings of Tsui & Suresh (2019). The incidence of postoperative respiratory complications was 11.9%, primarily observed in children with syndromic conditions (Pierre Robin, Van der Woude), highlighting the need for their screening and prolonged observation after extubation.

It is worth noting that nausea and prolonged emergence were observed only in isolated cases, mostly among children who received opioids in combination with high concentrations of inhalational anesthetics.

### Conclusion

- Inhalational induction is safe and effective for infants.
- Difficult intubation occurs in ~19%, requiring pre-operative planning.
- Multimodal analgesia and surgical site infiltration reduce opioid needs.
- Monitoring in syndromic patients should be extended post-op.
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