

## Introduction

Dental pain in children is an important clinical concern, as it contributes to the development of dental anxiety and avoidance behaviors. Adequate pain control during operative procedures is therefore essential for pediatric dentists. Young children present unique challenges when evaluating pain perception due to limited communication abilities, as well as ethical restrictions on research involving invasive procedures.

The inferior alveolar nerve block (IANB) has been a common technique for achieving anesthesia in mandibular primary molars. While effective, it has well-documented drawbacks, including postoperative soft tissue trauma, higher reported levels of pain on injection, and more difficult delivery due to anatomical variation.

To address these concerns, infiltration techniques with 4% articaine have been investigated. Because children have thinner cortical bone and more porous mandibular anatomy, articaine infiltration has been shown to be effective for procedures on primary molars. Several studies suggest that articaine infiltration can reduce discomfort compared to IANB while achieving comparable levels of anesthesia.

In recent years, computer-controlled local anesthetic delivery (CCLAD) systems have been introduced. These systems deliver anesthetic solution at a fixed pressure and rate, reducing pain perception during injection. Studies show that CCLAD systems are associated with greater child cooperation, reduced injection-related fear, and fewer postoperative complications compared to IANB.

Despite these advancements, no single anesthetic technique has been shown to be universally effective for all pediatric patients. Clinical outcomes vary based on age, proximity to tooth exfoliation, treatment needs, and patient behavior. Surveys of pediatric dental specialists highlight variability in practice patterns, with many clinicians continuing to rely on IANB and expressing uncertainty regarding the effectiveness of alternative techniques.

As tooth extractions are among the most stressful dental procedures for children, optimizing anesthesia delivery remains a high priority. Painful or traumatic injections can create lasting negative impressions, increase dental fear, and reduce cooperation in future visits.

## Aims and Objectives

- To determine provider preference for local anesthesia technique in non-abscessed mandibular primary molar extractions
- To identify factors influencing provider decision-making
- To assess whether provider characteristics (years in practice, practice setting) are associated with anesthetic preference
- To assess how training and prior experience with CCLAD devices may influence provider choice of anesthetic technique and delivery

## Subjects

- The study population consisted of pediatric dentists and pediatric dental residents who are American Academy of Pediatric Dentistry (AAPD)
- There were no exclusions based on age, gender, or geographic region. Participation was voluntary and responses were collected anonymously.

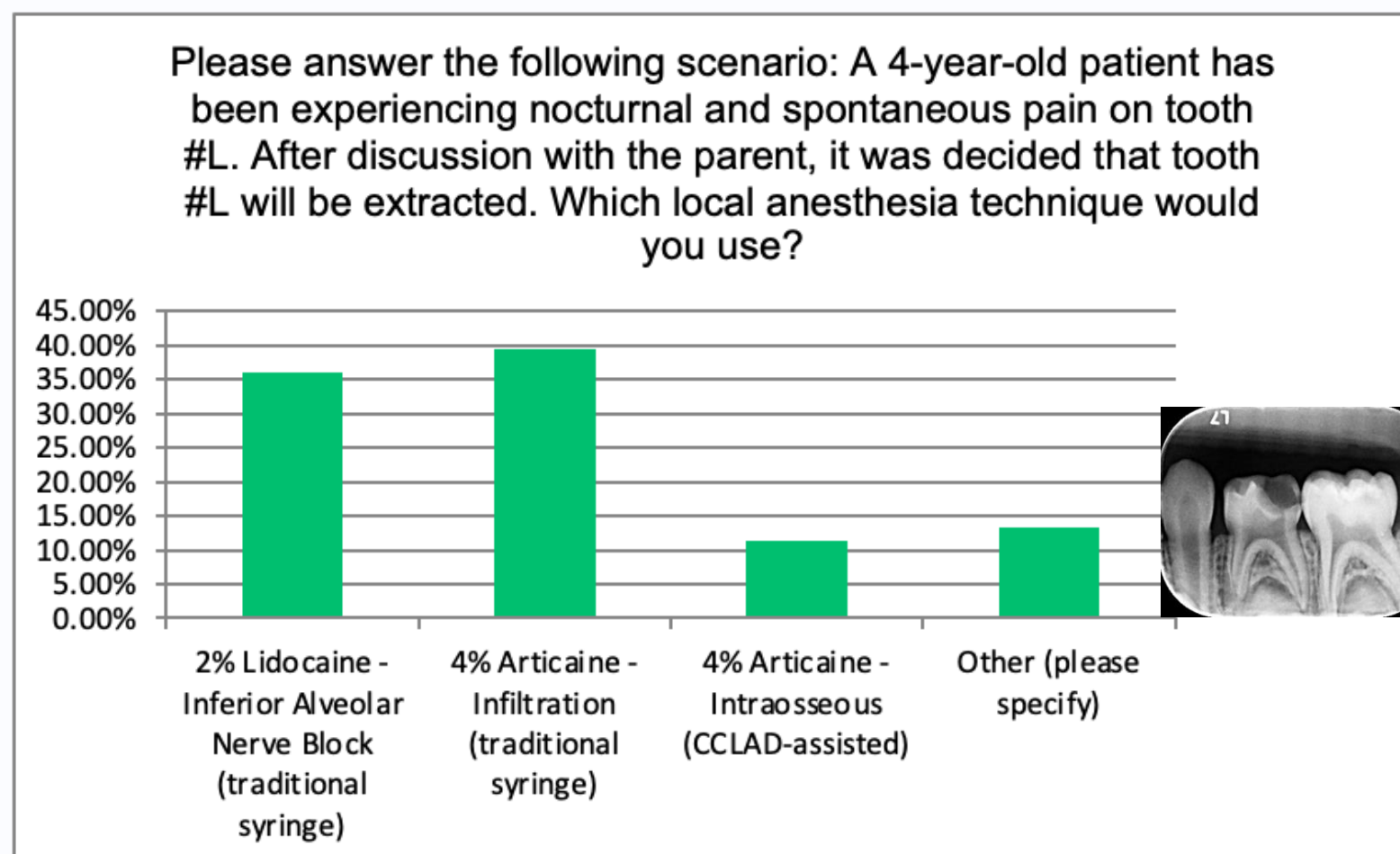
## Study Design

A cross-sectional survey study was conducted using a 12-question anonymous questionnaire distributed electronically to American Academy of Pediatric Dentistry members via SurveyMonkey. The survey assessed:

- Preferred local anesthesia technique
- Factors influencing clinical decision-making
- Experience and training with CCLAD systems
- Provider demographics (years in practice, practice setting)

Data were collected from January to March 2026. Descriptive statistics, including frequencies and percentages, were calculated. Associations between provider characteristics and anesthetic preference were evaluated using Monte Carlo simulation, with statistical significance set at  $p \leq 0.05$ .

## Results



## Results

### Participant Characteristics and Associations with Anesthetic Preference

Variable	Category	n (%)	n = 211
Years	0-5	68 (32%)	
	6-10	26 (12%)	
	11-15	22 (10%)	
	16-20	21 (10%)	
	>20	74 (35%)	
Practice Setting	Private Practice	136 (65%)	
	Hospital-Based	32 (15%)	
	Academic	22 (10%)	
	Public Health	13 (6.2%)	
LA Preference	Other	7 (3.3%)	
	IANB	76 (36%)	
	Articaine Infiltration	83 (39%)	
	CCLAD	24 (11%)	
	Other	28 (13%)	

### Years in Practice vs Technique ( $p = 0.10$ , not significant)

Years	Other	IANB	Articaine Inf	CCLAD
0-5	14%	28%	45%	25%
6-10	7%	12%	13%	17%
11-15	11%	9%	11%	13%
16-20	11%	12%	6%	17%
>20	57%	39%	25%	29%

### Practice Setting vs Technique ( $p = 0.30$ , not significant)

Setting	Other	IANB	Articaine Inf	CCLAD
Private	78%	58%	61%	83%
Hospital	7%	16%	20%	4%
Academic	7%	12%	11%	8%
Public Health	4%	12%	4%	0%

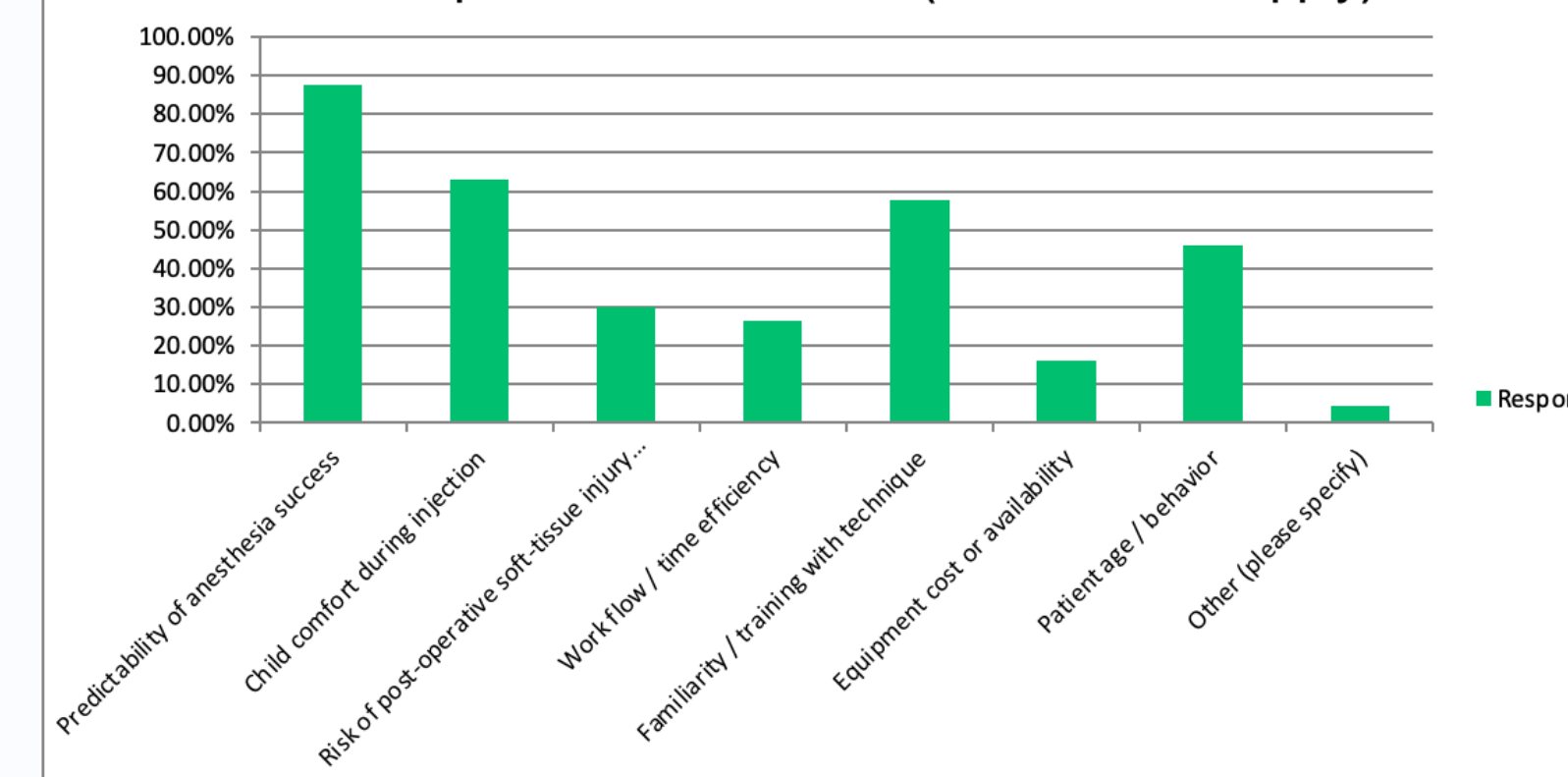
### CCLAD Training vs Technique ( $p < 0.001$ , statistically significant)

CCLAD Training	Other	IANB	Articaine Inf	CCLAD
Yes	29%	30%	29%	74%
No	71%	70%	71%	26%

### Level of Concern vs Technique ( $p = 0.004$ , statistically significant)

Concern Level	Other	IANB	Articaine Inf	CCLAD
Extremely concerned	11%	1%	6%	8%
Very concerned	21%	22%	28%	12%
Neutral	36%	43%	37%	25%
Not very concerned	21%	25%	27%	21%
Not concerned	11%	8%	2%	33%

### What factors most influence your choice of anesthetic technique for this scenario? (Select all that apply)



## Discussion and Conclusion

This study explores trends in local anesthesia selection for pediatric mandibular primary molar extractions. Articaine infiltration was the most commonly selected technique, though IANB remains widely used, suggesting that no single approach has fully replaced others and that clinical familiarity and perceived predictability may continue to influence provider decision-making.

The study population demonstrated a bimodal distribution of experience (0-5 years and >20 years) and was primarily composed of private practice providers. A descriptive summary of participant characteristics was generated, with key variables presented as percentages alongside 95% confidence intervals (CI). Within this sample, no significant associations were identified between anesthetic preference and years in practice or practice setting, suggesting that technique selection may be relatively consistent across these provider characteristics despite differences in clinical experience and practice environment.

In contrast, differences in anesthetic preference were observed across clinically relevant factors. Anesthetic choice varied with provider concern for soft tissue injury ( $p = 0.004$ ), suggesting a possible influence of perceived risk on clinical decision-making. Training and prior experience with CCLAD systems were associated with anesthetic preference ( $p < 0.001$ ), primarily driven by increased use of CCLAD among trained providers, with less pronounced differences observed for other techniques. Associations were evaluated using Monte Carlo simulation ( $N \approx 10,000$ ), with statistical significance defined as  $p \leq 0.05$ .

Despite literature supporting improved patient comfort with CCLAD systems, their reported use in this sample remained limited. This may reflect practical barriers such as cost, availability of training, time efficiency, and integration into clinical workflow, all of which may impact adoption in routine practice.

Given the cross-sectional design, relatively small sample size, and exploratory nature of these analyses, these findings should be interpreted with caution. The observed associations do not imply causation and may be influenced by unmeasured factors. Overall, these results suggest that while anesthetic preference may not vary by provider demographics, clinical perception and prior training exposure may contribute to technique selection, highlighting areas for future investigation.

## References

- American Academy of Pediatric Dentistry. Use of local anesthesia for pediatric dental patients. *Pediatr Dent*. 2023;45(6):343-350.
- Malamed SF. *Handbook of Local Anesthesia*. 7th ed. St. Louis: Elsevier; 2020.
- Meehan JG. Infiltration anesthesia in the mandible. *Dent Clin North Am*. 2010;54(4):621-629.
- Oulis CJ, Vadiakas GP. Clinical evaluation of articaine vs lidocaine for primary molar extractions. *Pediatr Dent*. 1996;18(3):239-242.
- Ram D, Peretz B. The assessment of pain sensation during local anesthesia using different injection techniques. *Int J Paediatr Dent*. 2003;13(3):161-164.
- Ashkenazi M, Blumer S, Eli I. Effectiveness of computerized delivery of intrasulcular anesthetic in primary molars. *J Am Dent Assoc*. 2005;136(10):1418-1425.
- Kammerer PW, et al. Comparison of computer-controlled local anesthesia delivery vs conventional syringe. *Clin Oral Investig*. 2015;19(3):567-574.
- Wright GZ, Kupietzky A. *Behavior Management in Dentistry for Children*. 3rd ed. Wiley-Blackwell; 2014.
- Allen KD, Kotli D, Larzelere RE, Hutfless S, Beiraghi S. Comparison of a computerized anesthesia device with a traditional syringe in pediatric patients. *Pediatr Dent*. 2002;24(4):315-320.
- Versloot J, Veerkamp JS, Hoogstraten J. Children's self-reported pain at the dentist. *Pain*. 2008;137(2):389-394.