International Journal of Science and Research (IJSR)
ISSN: 2319-7064
Impact Factor 2025: 7.089

Articaine in Pediatric Dental Procedures: Clinical Evidence from a Case Series

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Abstract: ***Background. Effective pain control is essential in pediatric dentistry because inadequate anesthesia may increase anxiety, reduce cooperation, and adversely influence the child's dental experience. Although 2% lidocaine with epinephrine remains a commonly used reference anesthetic, 4% articaine has attracted interest because of its favorable infiltration characteristics and pharmacokinetic profile.[1]–[4] Case series: This clinical case series describes the use of 4% articaine with epinephrine administered by buccal infiltration in children aged 6–14 years undergoing pulpectomy, extraction, root canal treatment, and restorative procedures associated with molar-incisor hypomineralization (MIH). Articaine was administered using a 30-gauge needle and a 1.7-mL cartridge system. The reported volume ranged from 1.0 to 1.5 mL according to the procedure. Results: Clinical anesthesia was reported within approximately 2–5 minutes. The reported procedures were completed without supplemental injections, and the reported anesthetic effect lasted approximately 4–5 hours. No intraoperative pain or postoperative complications were reported in the source case series. Conclusion: Within the limitations of a small, descriptive case series, 4% articaine administered by buccal infiltration was associated with satisfactory anesthesia for selected pediatric dental procedures in children aged 6–14 years. These observations are hypothesis-generating and require confirmation in controlled prospective studies.***

Keywords: articaine; local anesthesia; buccal infiltration; pediatric dentistry; pain management; children

1. Introduction

Pain control is a fundamental component of pediatric dental care and contributes to cooperation, reduction of anxiety, and a more positive treatment experience. Local anesthesia is therefore central to the delivery of comfortable dental treatment in children. Current pediatric guidance emphasizes appropriate anesthetic selection, weight-based dosing, careful injection technique, documentation, and prevention of postoperative soft-tissue injury.[1]

Articaine is an amide local anesthetic distinguished by a thiophene ring and an additional ester group. These structural characteristics contribute to its physicochemical properties and rapid plasma metabolism.[7],[8] Articaine is widely used at a 4% concentration with epinephrine and has been investigated extensively as an alternative to lidocaine for infiltration anesthesia.

Pediatric clinical studies and systematic reviews have generally found articaine to provide anesthetic efficacy comparable with, and in some settings potentially favorable to, lidocaine, although the evidence is heterogeneous and the certainty of evidence varies.[2]–[6],[12] In particular, buccal infiltration with 4% articaine has been studied as an alternative to inferior alveolar nerve block in children undergoing treatment of mandibular primary molars.[5],[12]

The present case series describes clinical experience with buccal infiltration of 4% articaine with epinephrine in children aged 6–14 years treated for a range of pediatric dental conditions. The purpose is descriptive: to document the reported technique, clinical observations, and representative treatment outcomes without implying comparative efficacy or definitive safety.

2. Case Series

This case series describes the clinical use of 4% articaine hydrochloride with epinephrine (Septodont) as the primary local anesthetic administered by buccal infiltration in pediatric patients treated at the College of Dental Sciences, Davangere. The source manuscript reports that the patients were systemically healthy and had no history of hypersensitivity to local anesthetics. Written informed consent was obtained from parents or guardians before treatment.

The patients were 6–14 years old and underwent pulpectomy, extraction, root canal treatment, or restorative procedures associated with MIH. Representative clinical and radiographic treatment records supplied with the case series are presented in Figures 3–10.

The source manuscript reports that a 0.5-mL intradermal test dose was administered before each procedure, followed by a 30-minute observation period, with no adverse reaction observed. Because the diagnostic value and routine use of intradermal testing for amide local anesthetic allergy are not established by the information supplied, this should be regarded as a protocol-specific practice rather than a validated allergy test and should be verified against the institution's approved protocol before submission.

Local anesthesia was administered using 4% articaine with epinephrine through a 30-gauge Septoject needle and a 1.7-mL cartridge system. Buccal infiltration was used for both maxillary and mandibular procedures; no palatal or lingual injections or nerve blocks were reported. The administered volume ranged from 1.0 to 1.5 mL according to the procedure and anticipated duration. Pulpectomy, extraction, and MIH-associated restorative procedures generally

required approximately 1.0–1.2 mL, whereas root canal treatment required approximately 1.5 mL.

Onset of anesthesia was reported within 2–5 minutes. All patients reportedly developed subjective anesthesia in the corresponding maxillary or mandibular region, and the planned procedures were completed without supplemental injections. No intraoperative pain was reported. The duration of the anesthetic effect was reported as approximately 4–5 hours.

Postoperative instructions emphasized prevention of accidental biting of the anesthetized lips, cheeks, or tongue. Parents were advised to supervise the child until normal sensation returned and to avoid chewing solid food while the tissues remained numb. Follow-up in the reported cases revealed no allergic reactions, excessive paresthesia, soft-tissue trauma, or other postoperative complications.

3. Representative Clinical Cases

1) **Pulpectomy:** A representative pulpectomy case is shown in Figures 3 and 4, demonstrating the preoperative and postoperative radiographic appearance supplied with the case series.
2) **Extraction and space maintenance:** A representative extraction case and the postoperative clinical result with a space maintainer are shown in Figures 5 and 6.
3) **Root canal treatment:** A representative root canal treatment case is shown in Figures 7 and 8, with the supplied preoperative and postoperative intraoral periapical radiographs.
4) **MIH-associated restorative treatment:** A representative MIH-associated restorative case is shown in Figures 9 and 10, demonstrating the preoperative condition during indirect pulp capping with mineral trioxide aggregate (MTA) and the postoperative composite restoration. The commercial anesthetic preparation used in the reported cases is shown in Figure 11.

4. Discussion

This case series describes the clinical use of 4% articaine with epinephrine administered by buccal infiltration alone for selected dental procedures in children aged 6–14 years. The principal clinical observations were rapid onset of anesthesia, adequate anesthetic depth for completion of treatment, a reported duration of approximately 4–5 hours, and no reported postoperative complications. These observations are broadly compatible with the pediatric literature, while the descriptive nature of the present report prevents direct comparison with other anesthetic techniques.[2–6]

Articaine differs structurally from other commonly used amide local anesthetics through the presence of a thiophene ring and an ester group. It undergoes substantial plasma hydrolysis, which contributes to its pharmacokinetic profile.[7,8] Its diffusion characteristics have contributed to interest in infiltration techniques, particularly in the mandible where inferior alveolar nerve block has traditionally been used.

The reported onset of 2–5 minutes is clinically plausible and consistent with the rapid onset described in comparative studies.[2–6] A short onset may be useful in pediatric practice by reducing waiting time before treatment. However, the present case series did not use a standardized objective measure of pulpal anesthesia or a comparator group, so the reported onset should be interpreted as a clinical observation rather than a measured comparative endpoint.

The reported anesthetic duration of 4–5 hours also emphasizes the importance of postoperative counseling in children. Prolonged residual soft-tissue anesthesia can increase the risk of self-inflicted biting injuries, and pediatric guidance recommends caregiver instructions and supervision while numbness persists.[1]

Comparative evidence does not uniformly demonstrate superiority of articaine. Malamed et al. found articaine to be an effective local anesthetic in pediatric patients, while Ram and Amir reported similar anesthetic efficacy with somewhat longer soft-tissue numbness for articaine.[3,4] Arrow's randomized study found differences according to injection technique and highlighted that buccal infiltration in mandibular posterior teeth should not automatically be assumed to be equivalent to inferior alveolar nerve block.[5] More recent randomized trials have reported broadly similar efficacy between articaine infiltration and lidocaine-based techniques for selected pediatric procedures.[12,13]

The absence of adverse events in this case series is reassuring but cannot establish safety. Systematic reviews and clinical trials suggest broadly comparable adverse-event profiles between articaine and lidocaine when used appropriately, but adverse-event rates are influenced by dose, injection technique, patient characteristics, and the completeness of follow-up.[6,11–13]

The manuscript previously discussed the use of articaine in children younger than four years. The present case series included only children aged 6–14 years and therefore provides no direct evidence for younger children. Older retrospective data and subsequent randomized evidence have examined articaine in children below four years, but these studies should be considered separately from the present case series.[9,10]

The major limitation of this report is its descriptive case-series design. The number of individual patients, distribution of procedures, exact patient-level doses, standardized pain scores, objective measures of pulpal anesthesia, and duration measurements are not provided. There is no control or comparator group, and safety surveillance was not described systematically. Accordingly, the findings should be regarded

as preliminary clinical observations and should not be interpreted as proof of superiority or definitive evidence of safety.

Future prospective studies should compare articaine with commonly used local anesthetics using standardized measures of onset, pulpal anesthetic success, injection pain, intraoperative pain, need for supplemental anesthesia, duration of soft-tissue anesthesia, postoperative soft-tissue injury, and adverse events. Stratification by arch, tooth type, procedure, age, and weight-based dose would further clarify the clinical indications for buccal infiltration.

5. Conclusion

Within the limitations of this descriptive case series, 4% articaine with epinephrine administered by buccal infiltration was associated with rapid onset, satisfactory clinical anesthesia, and completion of selected dental procedures without supplemental injections in children aged 6–14 years. No postoperative complications were reported. These observations are preliminary and warrant confirmation through adequately designed prospective comparative studies.

Declarations

Ethical considerations: Written informed consent was obtained from parents or guardians according to the source manuscript. Institutional ethics committee approval or waiver was not reported in the supplied manuscript and should be added before journal submission if applicable.

Consent for publication: The supplied case-series documentation states that parental/guardian consent was obtained for treatment and discussion of postoperative precautions. The authors should confirm that consent for publication of clinical photographs and radiographs was obtained and documented according to the target journal's requirements.

Conflict of interest: Not reported in the supplied manuscript. The authors should provide the required journal-specific declaration.

Funding: Not reported in the supplied manuscript. The authors should provide the required funding statement.

Author contributions: To be completed according to the target journal's authorship and contributorship requirements.

Data availability: Individual patient-level data were not provided in the supplied manuscript.

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Figure Legends

Figure 1. Reported pre-procedural intradermal test-dose procedure. Left: marked test site; right: administration of the test dose.

Figure 2. Buccal infiltration of 4% articaine in a pediatric patient.
Figure 3. Preoperative radiograph for pulpectomy.
Figure 4. Postoperative radiograph following pulpectomy.
Figure 5. Preoperative radiograph associated with the extraction case.
Figure 6. Postoperative clinical view following extraction and placement of a space maintainer.
Figure 7. Preoperative intraoral periapical radiograph.
Figure 8. Postoperative radiograph following obturation.
Figure 9. Preoperative MIH-associated lesion during indirect pulp capping with MTA.
Figure 10. Postoperative composite restoration.
Figure 11. 4% articaine with epinephrine (Septanest; Septodont) used in the reported cases.

Figures

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Figure 3: Preoperative radiograph for pulpectomy.

Figure 4: Postoperative radiograph following pulpectomy.

Figure 5: Preoperative radiograph associated with the extraction case

Figure 6: Postoperative clinical view following extraction and placement of a space maintainer.

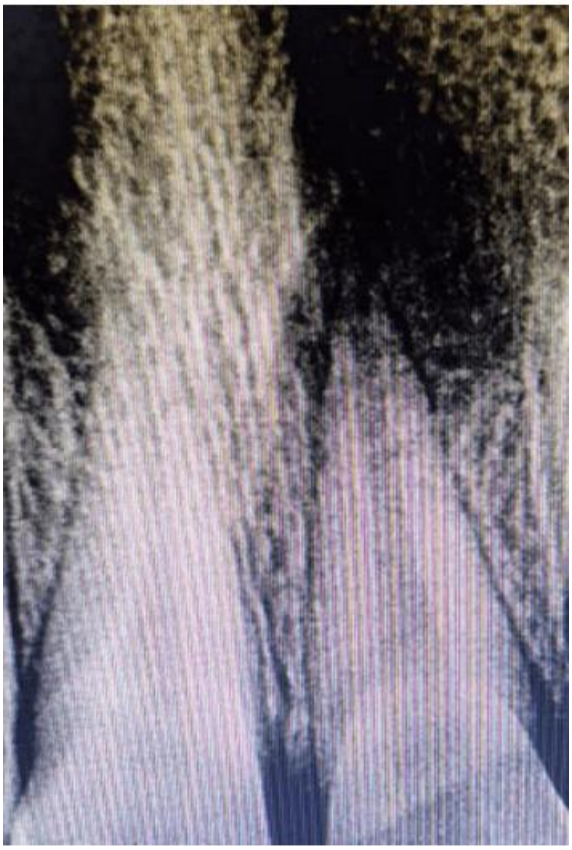

Figure 7: Preoperative intraoral periapical radiograph

Figure 8: Postoperative radiograph following obturation.

Figure 9: Preoperative MIH-associated lesion during indirect pulp capping with MTA

Figure 10: Postoperative composite restoration.

Figure 11: 4% articaine with epinephrine (Septanest; Septodont) used in the reported cases.