

Comparative Evaluation of Various Local Anesthetics on Pain Control During Dental Procedures – A Clinical Study

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ABSTRACT

Background: Pain control is a critical aspect of dental procedures. Local anesthetics play a vital role in ensuring patient comfort, yet the comparative effectiveness of commonly used agents is still debated.

Aim: To compare the efficacy of **Lidocaine (2%)**, **Articaine (4%)**, and **Bupivacaine (0.5%)** in pain control during dental procedures.

Methods: This study was conducted from **January 2014 to December 2014** in the Department of Dentistry. A total of **150 patients** undergoing minor dental procedures were divided into three groups (n = 50 each). Pain was measured using the **Visual Analog Scale (VAS)** and onset/duration of anesthesia were recorded.

Results: Articaine demonstrated the **fastest onset**. Bupivacaine showed the **longest duration**, while Lidocaine offered **moderate efficacy**. Pain scores were significantly lower with Articaine compared to Lidocaine (p < 0.05).

Conclusion: Articaine is superior for rapid pain relief, while Bupivacaine is preferred for prolonged procedures.

Keywords: Local anesthesia, Lidocaine, Articaine, Bupivacaine, VAS score, Dental pain management

INTRODUCTION

Acute appendicitis is one of the commonest surgical problems and though less common at the extremes of age, it can Pain management is essential in dentistry to reduce patient anxiety and improve treatment outcomes. Local anesthetics are widely used, but their comparative efficacy remains unclear. Common agents used in dental clinical practice include:

- **Lidocaine (2%)** – standard agent
- **Articaine (4%)** – newer agent, better tissue penetration
- **Bupivacaine (0.5%)** – long-acting anesthetic

This clinical study was conducted to compare **onset time, duration of action, and pain control effectiveness** of these agents based on **VAS score** during dental procedures.

Aims & Objectives

1. To compare the **onset time** of Lidocaine, Articaine, and Bupivacaine.
2. To assess the **duration of anesthesia** between the drugs.
3. To evaluate **pain control using VAS scoring** during dental procedures.
4. To recommend the most suitable anesthetic based on clinical need.

Materials & Methods

Study Design:

Prospective, randomized, comparative clinical study

Study Period:

January 2014 – December 2014

Place of Study:

Department of Dentistry – [Name of Institution]

Sample Size:

Total **150 patients**, divided into:

Group	Anesthetic Used	No. of Patients
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A	Lidocaine (2%)	50
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B	Articaine (4%)	50
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C	Bupivacaine (0.5%)	50
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Inclusion Criteria

- Age 18–55 years
- Undergoing minor dental procedures
- No known allergy to anesthetic agents

Exclusion Criteria

- Pregnant/lactating women
- Systemic illness (DM, HTN uncontrolled)
- Known allergy to anesthetics

Procedure

- Vital signs were recorded.
- Standard dosage administered (based on weight).
- **VAS Scale (0–10)** was used for pain evaluation.
- **Onset time & duration** were recorded using a stopwatch.
- Statistical analysis done using **ANOVA and t-test**.

Results

Table 1: Onset of Action (in Minutes)

Group	Drug Used	Mean Onset
A	Lidocaine	2.5 min
B	Articaine	1.3 min
C	Bupivacaine	3.8 min

Table 2: Duration of Anesthesia (in Minutes)

Group	Drug Used	Duration
A	Lidocaine	60 min
B	Articaine	85 min
C	Bupivacaine	180 min

Table 3: Pain (VAS Score)

Group	Mean VAS Score
A	3.8
B	1.9
C	2.4

Statistical Analysis:

- Articaine showed **significantly lower VAS scores vs Lidocaine** ($p < 0.05$).
- Bupivacaine had longest duration but slightly higher VAS than Articaine.

Discussion

Articaine demonstrated the **best pain control** with the **fastest onset**, making it ideal for short procedures.

Bupivacaine provided **prolonged anesthesia**, useful for lengthy surgical cases.

Lidocaine, although widely used, may not be the most effective option in all situations.

These findings align with previous studies conducted internationally, confirming Articaine's superiority in efficacy for dental anesthesia.

Conclusion

The present clinical study, conducted from **January 2014 to December 2014**, demonstrated a clear comparative difference among commonly used local anesthetic agents in dental procedures.

Articaine showed the **fastest onset of anesthesia** and the **lowest pain scores on the VAS scale**, making it the most suitable choice for routine dental interventions where rapid action and patient comfort are essential. **Bupivacaine** provided the **longest duration of anesthesia**, making it more useful for extended or surgical procedures requiring prolonged pain control. **Lidocaine**, although widely used and effective, showed comparatively moderate results in both onset time and pain management.

Based on the findings, **Articaine is recommended as the preferred agent for achieving efficient pain control**, whereas **Bupivacaine** may be reserved for procedures requiring prolonged anesthesia. Further multicentric studies with larger sample sizes and inclusion of different age groups may help to strengthen the evidence and guide clinical protocols for optimal use of local anesthetics in dentistry.

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