



RESEARCH ARTICLE

MAXILLARY EXTRACTIONS WITH 4% ARTICAIN, 0.5% BUPIVACAINE, AND 2% LIGNOCAINE:  
AN EVIDENCE BASED ASSESSMENT OF EFFICACY WITH COMPARATIVE CLINICAL STUDY

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ABSTRACT

**Background:** Maxillary extractions are considered as very complicated followed with many complications. The major reasons for complication are improper dosage and choice of anesthesia. Thus, this study was conducted to find the efficacy of different percentage of anesthesia for comparing the clinical, anesthetic efficacy and post-operative complications of 4% articaine, 0.5% bupivacaine and 2% lignocaine in maxillary extractions.

**Materials and Methods:** Conduction of study was done in Department of Oral and maxillofacial surgery, on 100 systematically health subjects (18–75 years) who required multiple extractions in maxillary arch. Patients were labeled into three different groups (2% lignocaine, 4% articaine, 0.5% bupivacaine using the split mouth technique.

**Results:** The results showcased that time of onset of action were significantly faster in case of 4% articaine when comparison was made to 0.5% bupivacaine and 2% lignocaine.

**Conclusion:** Articaine usage with 4% have being proved to have better potency and efficacy in terms of onset of action with lower pain scores comparison but lignocaine still remained the gold standard local anesthetic agent in Dental practice due to its quick onset, less time of anesthesia and cost effectiveness when compared articaine and bupivacaine. Whereas bupivacaine has been proved to be more efficient in pain control and remained concentrated for major procedures.

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INTRODUCTION

The major agent in the field in any surgery field is local anesthesia and thus it is known as the backbone for a surgeon in both controlling on treatment pain and post treatment pain with complication. Therefore knowing the thorough knowledge of anesthesia is very essential. On the part of Dental surgery, local anesthesia plays a major role for controlling various important factor both in patients as well as for surgeon as the pain occurring during the dental treatment leads to aggravating stress which may further proceed towards release of catecholamines, ultimately ending to cardiovascular events.

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(Sancho-Puchades *et al.*, 2012; Shahid Hassan *et al.*, 2011) Additionally, anxiety and stress may even lead to disruption of functional activity of the neurons which changes the pain process in the central nervous system. Local anesthesia are basically the chemicals that blocks nerve conduction in a specific, temporary, and reversible manner, without affecting the patient's consciousness. (Shahid Hassan *et al.*, 2011; Gregorio *et al.*, 2008) Rapid LA is taken as a choice when inhibition of action potentials is occurring such a way that sensation cannot be diffused from the source of stimulation in condition such as a tooth or the periodontium, to the brain. Local anesthetics at a chemical and molecular level works with the mechanism which depicts blocking sodium ions entry in to the channels increasing the permeability of nerve membrane for an action potential to take place. (Malamed *et al.*, 2000;

Gregorio *et al.*, 2008) There are various studies conducted in the literature on different types of Local anesthesia. Introduction to Lidocaine as an anesthetic solution was done in 1948 by Souk. (Malamed *et al.*, 2000) Bupivacaine and articaine was introduced to the clinical practice as an anesthetic agent in terms of unique amide that consist an ester and thiopene group which in turn increases its liposolubility was done in year 1957 (Gregorio *et al.*, 2008) and 1976 (Malamed *et al.*, 2000) respectively. All three local anesthetic agent Lignocaine, articaine and bupivacaine falls under amide-type of LA agents (Gregorio *et al.*, 2008; Malamed *et al.*, 2000) with almost same potency. However, lignocaine is still considered as the gold standard anesthetic agent because of its potency, safety, and efficiency. (Gregorio *et al.*, 2008; Malamed *et al.*, 2000) Articaine is fast acting and bupivacaine is a long-lasting LA. Bupivacaine is often considered for prolonged postoperative pain control and in condition of analgesia in extended operations. There are many studies available in literature that reported the comparative studies of articaine and lignocaine and; articaine and bupivacaine. However, there has been no study till date comparing the lignocaine, articaine and bupivacaine with specific concentration for extraction in maxillary arch using split mouth technique assessing its comparison in terms of efficacy, onset, duration including post-operative complication, thus to enlighten the dark area, the study was conducted on a greater number of sample size.

## MATERIALS AND METHODS

The research was conducted taking the required permission of institution ethics committee. The research performed on the patient was conducted only after taking prior informed consent form. The entire research was conducted in department of Oral and maxillofacial surgery. Total 100 patients were included in the study keeping all inclusion and exclusion criteria's in consideration (all the criteria's are mentioned). The patients were divided using split-mouth design in which 300 sites (100 patients) were anesthetized using lignocaine 2% with adrenaline 1:200,000 (X-cain ADR), bupivacaine 0.5% with adrenaline 1:200,000 (Marcaine 0.5%), articaine 4% with adrenaline 1:200,000 (Septodont with adrenaline). The study design was of triple blinded methodology: where the subject, the surgeon and the statistician who performed the data analysis did not know which anesthetic solution had been used at respective are a stopper form the procedure. Each patient was given the same treatment for the removal of multiple maxillary teeth. All extractions were carried out at the same time. All extractions were performed and monitored by the same person. The anesthetic technique used was local infiltration, which involved supraperiosteal injection in maxillary arch.

### Inclusion criteria

ASA I or II patients, aged between 18 and 75 years including both males and females, who were indicated for multiple maxillary teeth extractions of the teeth which cannot be saved; periodontally compromised, mobile teeth (Grade I, Grade II, Grade III), root pieces, endodontically poor prognosis and advised for extraction.

### Exclusion criteria

1. Patients with Antipathy to sulphites/ amidetype of LA or any other medication,
2. Participant on anticoagulants, systemic steroids and

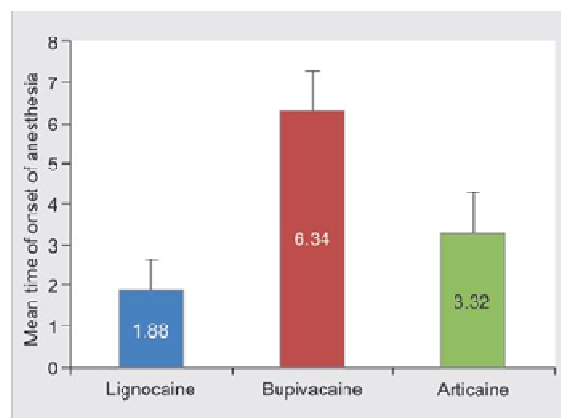
immuno suppressive drugs. Immunodeficiency or HIV patients, diabetic, hypertensive and medically compromised participants and pregnant women.

## RESULTS

The study group consisted of 100 patients who underwent multiple maxillary teeth extraction. All the participants were evaluated preoperatively before introducing an anesthesia. All of them received and 2% lignocaine with 1:100000 epinephrine, 4% articaine with 1:100000 epinephrine and 0.5% bupivacaine with 1:100000 with application of split mouth technique using tripleblinding methodology to avoid bias. The details recorded consisted of all the participants for the amount of anesthesia injected, the time of injection, quantity of anesthesia administered, onset plus duration of anesthesia and the postinjection complications. Pain experience was analyzed through a VAS scale. The values were compared and were analyzed statistically using ANOVA test, t-test paired samples statistics, Fischer's exact test, Turkey *post hoc* test for multiple comparisons. The results were tabulated and on which conclusions were made.

### Time of Onset (Graph 1)

It showcases the onset period ranging between two and four minutes in the lignocaine group; between 1 and 1.5 minutes in the articaine group and between 5 and 6 minutes in bupivacaine group. Highest time of onset of anesthesia was observed in lignocaine than that in articaine and bupivacaine groups proving it statistically significant ( $p < 0.001$ )



Graph 1. Comparison between Lignocaine, bupivacaine and articaine in relation to time of onset

### Comparison of VAS Score

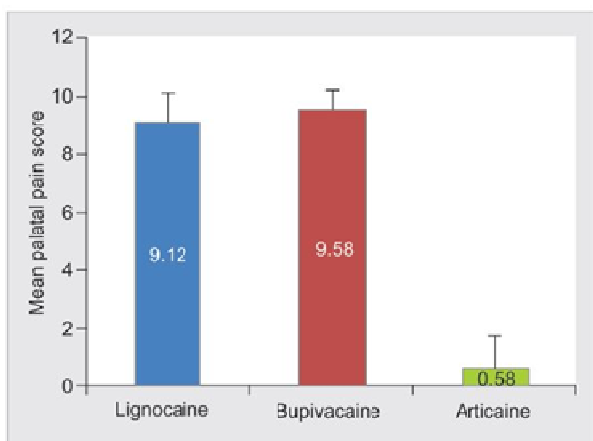
The VAS pain score assessment found the significant difference between lignocaine, Articaine and bupivacaine groups. There was significant difference noted in buccal injection and palatal injections regions ( $p < 0.001$ ) amongst all groups.

### Palatal VAS score (Graph 2)

The mean values were as follows

1. Lignocaine:  $9.12 \pm 0.961$
2. Articaine:  $0.58 \pm 1.197$
3. Bupivacaine:  $9.58 \pm 0.609$

Which showed and revealed that bupivacaine has statistically significant p value ( $p < 0.001$ )

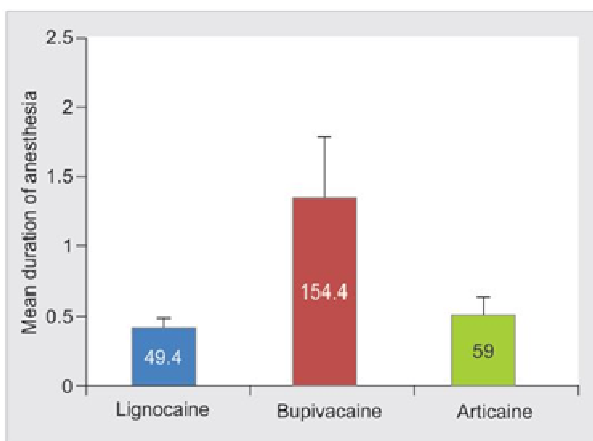


**Graph 2. Comparison between Lignocaine, bupivacaine and articaine in relation to Palatal VAS score**

**Duration of Action of Anesthesia (Graph 3)**

The mean duration in terms of action of anesthesia:

1. Lignocaine group:  $49.40 \pm 6.518$  minutes
2. Articaine group the ,  $59.00 \pm 14.846$  minutes
3. Bupivacaine group  $154.40 \pm 48.788$  minutes



**Graph 3. Comparison between Lignocaine, bupivacaine and articaine in relation to duration of action of anesthesia**

The difference is statistically significant ( $p < 0.001$ ), stating an inference that Bupivacaine has a duration longer when compared to other groups.

**Intra and Post injection Complications**

There was no record of any complications in either of the groups taken in this study; there was only a report of two patients with extra palatal injections due to their apprehensive and not cooperative nature.

**Conclusion**

Assessing its efficacy on completion of study, it can be concluded that Articaine is safer and has proved to have better potency and efficacy in terms of onset of action with lower pain scores comparison but lignocaine still remained the gold standard local anesthetic agent in Dental practice due to its quick onset, less time of anesthesia and cost effectiveness when compared articaine and bupivacaine. Whereas bupivacaine has been proved to be more efficient in pain control and remained concentrated for major procedures.

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