THE ONSET, EXTENT AND DURATION OF ACTION OF LOCAL ANAESTHESIA USING ARTICAINE IN MAXILLARY TOOTH EXTRACTION

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ABSTRACT:

AIM: To evaluate the onset, extent and duration of action of local anaesthesia using articaine in maxillary tooth extractions.

BACKGROUND: One of the major phobias associated with tooth extraction can be traced to the administration of local anaesthesia. Injection of local anaesthesia is often accompanied by pain. Due to the presence of rich nerve complement and adherence of palatal mucosa to underlying bone, administration of injection is reported to be more painful than other sites in oral cavity. Articaine has ability to penetrate dense cortical bone and has superior infiltrating property hence it can be used instead of lignocaine for infiltration anaesthesia, however as the maxillary bone becomes more sclerotic with age, the bone penetrating efficacy of articaine may decrease.

MATERIALS AND METHOD: The study group consisted of 15 patients, reporting to Saveetha dental college for extraction of permanent maxillary teeth. The materials required for this study are 2ml syringe, 4% articaine.

REASON: To eliminate the use of palatal injection and reduce the discomfort associated with it.

INTRODUCTION:

Local anaesthetics are the most commonly used injectable drugs in dentistry to reversibly block nerve conduction. Articaine is an amide local anesthetic with high lipid solubility due to the thiophene ring it contains [1] .It also contains an ester group which makes enable its hydrolization in plasma. The mechanism of action of this drug is similar to other local anaesthetics where it binds to the sodium potassium channels and prevents action potential at the nerve cell [2]. Articaine has high protein binding capacity (94%) which helps in keeping the drug for longer period and increases its duration of action. The drug has been widely used in the field of dentistry. Although articaine was related to permanent paraesthesia, it has been shown that it is safe and very effective local anesthetic [3]. It provides palatal anaesthesia without the need for a palatal injection. There are differences between the anterior and posterior regions of the maxilla in innervation and bone quality. The anterior region of the maxilla has greater innervation density than the posterior region, which can affect the diffusion and anesthetic ability of articaine when used as a buccal infiltration for tooth extraction without a palatal injection. Different regions of the maxilla have different bone compositions. Age, gender, and race are factors that contribute to variation in bone composition of the maxilla.[4]The anterior region of the maxilla has denser bone than the posterior region, which can affect the diffusion and anesthetic ability of articaine when used as a buccal infiltration for tooth extraction without a second palatal injection. Bone thickness also can have an effect, because it is thinner in the anterior region than in the molar region of the upper jaw. Pain on palatal injection is a very commonly experienced symptom in dentistry and as such is a major concern to dentist. A number of techniques may be used to reduce the discomfort of intra-oral injections,[5,6] the application of topical anesthetic being a well known and frequently used option. However, it is effective only on surface tissues (2–3 mm) and tissues deep to the area of application are poorly anesthetized. Surface anaesthesia does allow for atraumatic needle penetration, but because of the density of the palatal soft tissues and their firm adherence to the underlying bone, palatal injection is still painful.

MATERIALS AND METHODS:

The study was conducted among 15 patients attending Saveetha Dental College for maxillary extraction. Self aspirating cartridge based syringe [7] and 1.7ml articaine cartridge were used. Buccal infiltration using Cartridge syringe loaded with articaine was given. After 1 minutes & 5 minutes the area anaesthetised buccally and palatally was measured using a divider from the point of insertion to the soft tissues anaesthetised.

RESULTS:

S.NO	1st minute	5th minute	Additional LA
1	1cm – 23,24,25	2.5cm- 22,23,24,25,26	
2	3.5cm- 25,26,27,28	4cm- 24,25,26,27,28	
3	3.5cm-15,16,17	4.5cm-13,14,15,16,17	
4	3.5cm-14,15,16,17,18	4.5-12,13,14,15,16,17,18	
5	3.5cm-22,23,24,25	4.5cm-21,22,23,24,25,25	1ml of articaine bucally
6.	3cm-11,12,13,14	3.5cm-11,12,13,14,15	
7.	3.5cm-15,16,17,18	4cm – 14,15,16,17,18	
8.	4cm-25,26,27,28	4.5cm- 24,25,26.27,28	
9.	3cm-14,15,16,17	4.5cm-13,14,15,16,17,18	
10	3cm- 12,13,14,15	3cm-12,13,14,15	
11.	3cm-25,26,27,28	4.5cm- 23,2,25,26,27,28	0.5 bucally
12.	3cm-13,14,15,16	4cm- 11,12,13,14,15,16	
13.	3cm-24,25,26,27	4.5cm- 22,23,24,25,26,27	
14.	3cm- 13,14,15,16	4.5cm- 11,12,13,14,15,16	
15.	4cm-12,13,14,15,16	4.5cm-11,12,13,14,15,16,17	

Table:1

The table :1 represents the findings recorded during this study. The mean area anaesthetised in the 1st minute is 3.1cm. And the mean area anaesthetised every 5th minute is 4.1 cm .

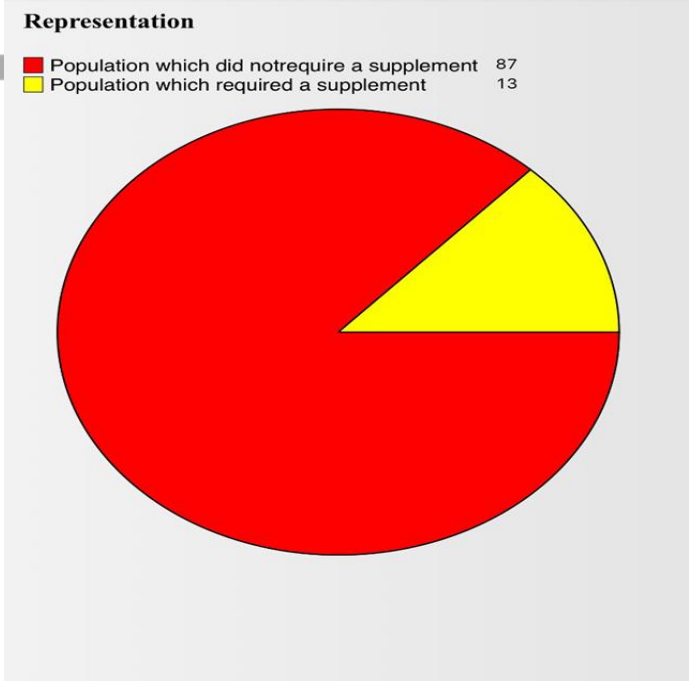

Fig:1

Fig:1 represents that in this study 87% patients did not require any additional supplement and the extraction was completed with a single dose buccal infiltration with articaine, whereas the rest required additional doses mostly due to presence of infection near the site. With a single buccal infiltration 3.1 cm got anaesthetised which approximately included 4 teeth at the first minute , and at the 5 th Minute approximately 6 tooth were anaesthetised.

DISCUSSION:

In this study the statistical analyses showed no significant difference in extraction pain for the visual analogue scale and faces pain scale scores of test and control sites. Hence it can be stated that palatal anesthesia achieved by depositing articaine to the buccal vestibule was as effective as palatal infiltration of lignocaine. This finding is in accordance with the study done by Sina et al. Oertel et al. [8], Grace et al. [9] and Song et al. [10].
Hence permanent maxillary premolars can be extracted by giving only buccal infiltration with 4 % articaine, there by eliminating the need for a palatal injection.The mechanism of reversible nerve conduction block by articaine is similar to that of other amide local anesthetics. However, articaine is unique among them, because it contains a thiophene group, which increases its lipid solubility. Lipid solubility determines to what degree the molecules penetrate nerve membranes. Therefore, articaine diffuses better through soft tissues than do other anesthetics [11], thereby achieving higher intraneural concentration, more extensive longitudinal spreading, and better conduction blockade. This better nerve penetrating property of articaine is because it contains a thiophene ring unlike the benzene ring of lignocaine.

Lima-Júnior[12] et al determined that maxillary third molar removal could be performed with only 4% articaine HCl buccal infiltrative anesthesia in the majority of cases, with no need for supplemental palatal injections.
Fan et al [10] determined that the deposition of 1.7 mL of 4% articaine HCl with 1:100,000 epinephrine into the buccal vestibule provides similar clinical efficacy to the routine type of anesthesia with palatal injection for maxillary tooth removal.
But contrarily, in a study conducted by Ozeç et al,[13] they could not find any evidence to confirm the hypothesis regarding vestibule–palatal diffusion of 4% articaine or the presence of 4% articaine at palatal tissues after buccal injection. The results of their study contradict the results of the previous studies on this topic, which advocated the presence of vestibule–palatal diffusion.
In a comparative study between articaine and lidocaine, superiority of articaine over lidocaine could not be statistically corroborated by a clinical study. Both solutions presented a similar behavior, and both were not entirely efficient in controlling pain during the treatment of irreversible pulpitis, which reveals their similar properties.[9]

Malamed et al. 14 evaluated the safety of 4 % articaine and 1:100,000 epinephrine with that of 2 % lidocaine and 1:100,000 epinephrine in 1,325 patients (882 in the articaine group, 443 in the lidocaine group) aged 4–80 years. Exclusion criteria included pregnancy, allergy or sensitivity to sulphites or amide-type local anesthetics, cardiac or neurologic disease, history of paroxysmal tachycardia, severe untreated hypertension or bronchial asthma, soft tissue infection at the site of injection, intake of analgesics within 24 h before administration of the anesthetic or maxillofacial surgery. The study concluded that Four percent articaine with 1:100,000 epinephrine provides effective anesthesia with a low risk of toxicity in both adults and children.

Potocnik et al. [15] in an in vitro study concluded that 2 and 4 % articaine is more effective than 2 % and 4 % lidocaine or 3 % mepivacaine in depressing the compound action potential of the A fibers in the isolated rat sural nerve. In addition, the thiophene derivative (carticaine) blocks ionic channels at lower concentrations than the benzene derivative (lidocaine) [16].
The higher concentration of articaine (4 %) compared to lidocaine (2 %) may also be a reason for adequate diffusional palatal anaesthesia. Oertel et al. [8] determined the concentration of 4 % articaine and 2 % lidocaine in alveolus blood using high performance liquid chromatography. Blood samples were collected from the alveolus of upper molars 2 to 14 min after sub mucous injection of 4 % articaine and 2 % lidocaine (2 ml each). They postulated that higher blood levels found for articaine in alveolus blood compared to lidocaine was because of higher concentration of the drug in the injection solution.

The area anesthetized reveals that articaine has wider spread and can be used for infiltration and extraction of multiple tooth even without the use of palatial injections.

CONCLUSION:

The sample set utilized is this study is minimal and the outcomes got in this study should be extrapolated with a bigger sample size for clinical application. Regular use of articaine for maxillary extractions can eliminate the need for palatal anesthesia and save the patient from painful palatal injection.

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