

Removal of maxillary permanent teeth by only single buccal infiltration of 4% articaine: A prospective, randomized, single blinded study

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Abstract

Background and Aim: In dentistry tooth extraction is routine minor oral surgical procedure. But patients have fear of painful injection for local anaesthesia. For maxillary tooth need to apply buccal and palatal prick for local anaesthesia. Out of this palatal injection is very painful. The aim of this prospective, randomized study is to demonstrate whether 4% articaine hydrochloride administered alone as a single buccal infiltration in maxillary premolar tooth removal, can provide favourable palatal anesthesia as compared to buccal and palatal injection of 2% lidocaine.

Material and Method: Single blinded study was conducted on 50 patients, who required bilateral maxillary premolar tooth extraction for their orthodontic treatment. Extractions were done on single sitting only. Subject received 2% lidocaine with 1:100000 adrenaline on control side (left side) and 4% articaine with 1:100000 adrenaline on experiment side (Right side). Noting the duration for onset of action of the local anesthetic Following extraction all the patients were asked to score the pain experienced during extraction on Faces Pain Scale (FPS) and a 100mm Visual Analogue Scale (VAS).

Result: According to the VAS and FPS scores, the pain on extraction between buccal infiltration of articaine and the routine buccal and palatal infiltration of lignocaine was statistically significant.

Conclusions: The removal of permanent maxillary teeth without palatal injection is possible by depositing 4% articaine hydrochloride to the buccal vestibule of the tooth. Although the technique described here by us can make clinical practice simpler and more comfortable for patients.

Keywords: Maxillary, buccal infiltration, articaine, randomized

Introduction

Background and Aim: In dentistry tooth extraction is routine minor oral surgical procedure. But patients have fear of painful injection for local anaesthesia. For maxillary tooth need to apply buccal and palatal prick for local anaesthesia. Out of this palatal injection is very painful due to the displacement of the mucoperiosteum rather than the needle pricking to the palatal mucosa. But oral surgery should be pain free with limited needle pricks.

Different techniques may be used to reduce the discomfort of intraoral injections, including topical anesthetic application, topical cooling of the palate, computerized injection systems, pressure administration and transcutaneous electronic nerve stimulation. Because of the high diffusion properties of articaine, use of articaine as a local anaesthetic agent with only single buccal infiltration for extraction of maxillary tooth, provide palatal soft tissue anesthesia also. Articaine diffuses better through soft tissue and bone than other local anaesthetics and that the concentration of articaine in the alveolus of a tooth in the upper jaw after extraction was about 100 times higher than that in systemic circulation ^[1].

The aim of this prospective, randomized study is to demonstrate whether 4% articaine

hydrochloride administered alone as a single buccal infiltration in maxillary premolar tooth removal, can provide favourable palatal anesthesia as compared to buccal and palatal injection of 2% lidocaine. It is also important to record the efficacy of single buccal infiltration of 4% articaine with that of 2% lignocaine in maxillary tooth extraction, it means of use of articaine hydrochloride without palatal injection, compare the onset of action of articaine and lidocaine on palatal mucosa.

Materials and Methods

Single blinded study was conducted on 50 patients, who required bilateral maxillary premolar tooth extraction for their orthodontic treatment. Extractions were done on single sitting only. Subject received 2% lidocaine with 1:100000 adrenaline on control side (left side) and 4% articaine with 1:100000 adrenaline on experiment side (Right side).

After infiltration of the local anesthetic, measuring the duration for the onset of action of the local anesthetic by applying pressure over the soft tissue by using a sharp instrument. The duration for the onset of the soft tissue anesthesia was noted when the patient had no pain on pricking the soft tissue with a sharp instrument.

After noting the duration for onset of action of the local anesthetic, the premolars were extracted by using the forceps technique. Following the surgery, the standard postoperative instructions were given to the patients along with the antibiotics and analgesics as and when required. Following extraction all the patients were asked to score the pain experienced during extraction on Faces Pain Scale (FPS) and a 100mm Visual Analogue Scale (VAS). Patient scored the pain by comparing the two sides.

Results

In this study, a total of 50 patients, aged from 10 to 30 years participated. The mean age of the subjects who participated in this study was 16.76 ± 5.25 years.

The onset of action of articaine on the buccal side ranged from 40-90 sec and the mean for the onset of action of articaine on the buccal side is 57.78 ± 12.15 sec. On the palatal side the time for the onset of action ranged from 150 - 240 sec and the mean for the onset of action on the palatal side is 175.13 ± 21.35 . The onset of action of lignocaine on the buccal side ranged from 60-100 sec and the mean for the onset of action on the buccal side is 76.58 ± 8.38 sec. On the palatal side the time for the onset of action also ranged from 60-100 sec and the mean for the onset of action on the palatal side is 84.28 ± 8.48 sec (table 3, graph 3).

The pain on buccal instrumentation was measured as present or absent. On articaine side and on lidocaine side showed no statistically significant difference.

Pain on palatal instrumentation was measured as present or absent, which shows highly statistical significant difference between them ($p=0.001$) which indicates palatal pain was less experienced by articaine side as compared with lidocaine side.

According to Visual Analogue Scale and Facies Pain Scale scores of 50 patients with bilateral extractions, when permanent maxillary premolar tooth removal with buccal and palatal infiltrations of lignocaine and only buccal infiltration of articaine were compared, two patients in the articaine group had mild pain and six patient in the lignocaine group had mild pain (table 4, graph 4). When these pain scores were compared statistically by doing a paired student t test gives a statistically significant result.

Table 1: Onset of action of the local anesthesia

Onset of Action of the local Anesthesia n=50		
Parameters	Articaine Side	Lidocaine Side
Range of onset on buccal side	40-90 sec	60-100 sec
Range of onset on palatal side	150-240 sec	60-100 sec
No. of subjects	50	50
Mean onset on buccal side	57.78 ± 12.15 sec	76.58 ± 8.38 sec
Mean onset on the palatal side	175.13 ± 21.35 sec (without palatal infiltration)	84.28 ± 8.48 sec (with palatal infiltration)

Table 2: Pain on Buccal instrumentation

Pain on Buccal Instrumentation n=50			
n=50	Buccal Pain		Chi square Value p
	Present	Absent	
Articaine Side	0	50	Nil
Lidocaine Side	0	50	Nil

Table 3: Pain on Palatal instrumentation

Pain on Palatal Instrumentation n=50			
n=50	Palatal Pain		p
	Present	Absent	
Articaine Side	4	46	0.001
Lidocaine Side	13	37	

Table 4: Pain during extraction based on Visual Analogue Scale and Facies Pain Scale scores

Number of Subject with and without pain during extraction n=50		
No. of subject	Articaine Side	Lignocaine Side
No. of subjects with pain during extraction	2	6
No. of subjects without pain during extraction	48	44

Discussion

Even the development of modern injection techniques, palatal injection is still a painful experience for patients. A number of techniques may be used to reduce the discomfort of intra-oral injections, the application of topical anesthetic is 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 anesthesia does allow for atraumatic needle penetration, but because the density of the palatal soft tissues and their firm adherence to the underlying bone, palatal injection is still painful [2]. In the present study local anesthetic deposition to the buccal vestibule only provided palatal anesthesia also, due to this method eliminating the need for palatal injection.

U *et al.* [2] reported successful removal of permanent maxillary teeth in 53 patients, by depositing 2ml articaine hydrochloride into the buccal vestibule of the tooth, without additional palatal injection. So permanent maxillary premolars can be extracted by giving only buccal infiltration with 4% articaine, thereby eliminating the need for a palatal injection [3]. That's why we conducted study to extraction of maxillary premolar tooth by single buccal infiltration of 4% articaine and we found very well anesthetic effect on palatal soft tissue and patients does not have any major discomfort or pain during extraction on articaine side.

Tom VB, Gielen MJM [1] (2005) stated that articaine diffuses better through soft tissue and bone than other local anaesthetics and that the concentration of articaine in the alveolus of a tooth in the upper jaw after extraction was about 100 times higher than that in systemic circulation.

Costa CG *et al.* [4] conducted a study on 20 patients comparing the onset of actions of articaine and lignocaine with respect to maxillary infiltrations and observed that articaine has faster onset of action than lignocaine. In the present study it has been observed that articaine has a faster onset of action than lignocaine. The mean onset of action of articaine on the buccal mucosa is 57.78 ± 12.15 sec and for lignocaine it is 76.58 ± 8.38 sec. These findings are similar to that of Costa CG *et al.* and Tom VB *et al.*

The test (articaine) and control (lignocaine) sites of the present study were randomized. In this study Statistical analyses showed statistically significant result difference in extraction pain, two patients in the articaine group had mild pain and six patient in the lignocaine group had mild pain for the visual analogue scale and facies 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. The better bone

penetrating property of articaine is because it contains a thiophene ring unlike the benzene ring of lignocaine. Thiophene ring has better bone penetration than benzene ring.

A study conducted by Somuri *et al.* [5] demonstrated that articaine administered alone as single buccal infiltration provides favorable anesthesia as compared to buccal and palatal injection of lidocaine for extraction of maxillary premolars. In our study we also found single buccal infiltration provides favorable anesthesia as compared to buccal and palatal injection of lidocaine for extraction of maxillary premolars.

The use of articaine as a single buccal infiltration, regarding the possibility of permanent maxillary tooth removal without palatal injection, the first issue is that the relatively porous thin bone of the buccal maxilla facilitates the diffusion of any local anesthetic. Second, that sufficient palatal tissue anesthesia can be provided using articaine as a maxillary buccal infiltration, since articaine diffuses more readily through soft and hard tissues than other local anesthetics. They concluded that permanent maxillary teeth can be successfully extracted by giving only buccal infiltration of articaine [6].

We concluded that the removal of permanent maxillary teeth without palatal injection is possible by depositing 4% articaine hydrochloride to the buccal vestibule of the tooth. Articaine has a faster onset of action than lignocaine. The discomfort associated with palatal injections is of concern to most dentists, many of whom avoid using palatal injections unless they are absolutely necessary. Although the technique described here by us can make clinical practice simpler and more comfortable for patients.

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