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Extraction of Permanent Mandibular Premolars Using single Buccal Infiltration of Articaine

Mandeep Sharma[1], Praveen Akhtar Lone[2], Pooja Sharma[3], Sandeep Sharma[4], Priyanka MV[5]
[1]PG student oral surgery KVG dental College and Hospital Kurunjibhag, Sullia, Karnataka 574327, India
[2]Professor and HOD (OMFS) Indira Gandhi Govt. Dental College Jammu, India
[3]Registrar gynaecology S.M.G.S Hospital Jammu, India
[4]Registrar medicine government medical College Jammu, India
[5]Final year student KVG dental College and Hospital, India

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***Corresponding author**
Mandeep Sharma

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Abstract: Effective control of pain during dental procedures has been one of the most important pre-requisite of painless dentistry. There are various methods used to control pain. Use of local anesthetic is one such method. Lignocaine is most commonly used local anesthetic solution for extracting tooth in oral surgery. Articaine contains a thiophene group, which increases its liposolubility. It has high diffusion properties so it can be used as a single buccal infiltration to extract mandibular premolars. Objectives of the study were to evaluate the efficacy of single buccal infiltration of 4% articaine in mandibular pre-molar extraction. A randomized study was carried on 50 patients of age group 15-55 years who required mandibular premolar extraction, visiting the Department of Oral and Maxillofacial surgery. They were included in the study after obtaining informed consent. Buccal infiltration of 1.8ml of anesthetic solution was given randomly to 50 patients. Objective signs were checked after 10 minutes. If any additional injection was given, it was noted. Postoperatively VAS score and surgeon's quality of anesthesia was noted. Duration of anesthesia was measured every 5 minutes after 45 minutes from infiltration. Out of 50 patients, 39 patients extraction was done without the need of additional injection, 11 patients require additional infiltration at the lingual side. The VAS score values were also significantly less. The mean duration of anesthesia being (68.20 ± 19.22 min) in 39 patients which received buccal infiltration only. The single buccal injection of articaine can be used for extracting mandibular premolars.
Key words: Extraction, Articaine, infiltration.

INTRODUCTION

Intra operative pain management is of great importance in extraction procedure. One may define pain as "an unpleasant emotional experience usually initiated by a noxious stimulus and transmitted over a specialized neural network to the central nervous system where it is interpreted as such"[2]. Cocaine was isolated by Niemann in 1859. In 1884, regional anesthesia in the oral cavity was first performed by the surgeon Halsted, when he removed a wisdom tooth without pain. In 1905, Einhorn reported the synthesis of procaine, which was the first ester-type local anesthetic agent. In 1943, Lofgren synthesized lidocaine[2].

Articaine hydrochloride was synthesized by Rusching *et al*. in 1969 and first marketed in Germany in 1976 [3]. Articaine contains a thiophene group, which increases its liposolubility, and it also contains an ester group. The ester group enables articaine to undergo biotransformation in the plasma as well as in the liver[4]. The mechanism by which articaine blocks nerve conduction is similar to that of lidocaine, mepivacaine and prilocaine[3]. Clinical trials comparing the time of onset of clinical anesthesia, the duration and the depth of anesthesia with 1%, 2%, 3%, and 4% articaine, with and without a vasopressor, to at least one other local anesthetic have shown that 4% articaine with epinephrine provides a significantly shorter time of onset of anesthesia as well as a greater consistency in both the onset and duration of anesthesia than 2% articaine with the same epinephrine concentration. Importantly, no differences in toxicity were noted between 4% articaine and lower concentrations [5-9]. In pharmacokinetic & pharmacodynamics studies, the duration of soft tissue anesthesia produced by 4% articaine with a dose of 1.8 ml was reported as 2.6 to 4.5 hours for maxillary infiltration and 4.3 to 5.3 hours for nerve block[10,11].

The purpose of this study is to evaluate the efficacy of single buccal infiltration of 4% articaine in mandibular premolar extraction.

Aim

To compare the efficacy of single buccal infiltration of 4% articaine in mandibular premolar extraction

Objectives

To assess the presence or absence of pain in buccal gingiva after single buccal infiltration using objective method. To assess the presence or absence of pain in lingual gingiva. To record number and type of rescue injections. To record the subjective pain during procedure using VAS scale. To record the quality of anesthesia as evaluated by the surgeon using standard parameters. To measure the duration of the anesthesia.

METHODOLOGY

A randomized study was carried on 50 patients of age group 15-55 years who required mandibular premolar extraction, visiting the Department of Oral and Maxillofacial surgery. They were included in the study after obtaining informed consent. Buccal infiltration of 1.8ml of anesthetic solution was given randomly to 50 patients. Objective signs were checked after 10 minutes.

Inclusion criteria

Patients who require mandibular premolar extraction due to appropriate causes. Patients not having any acute periapical infection in relation to mandibular premolar. Patients in the age group of 15-55 years.

Exclusion criteria

Subjects with any previous history of complications associated with local anaesthetic administration. Presence of acute infection or swelling. Those with teeth showing mobility. Patients having sickle cell anemia diseases. Pregnant women and lactating mother. Patients unable to give informed consent.

MATERIALS

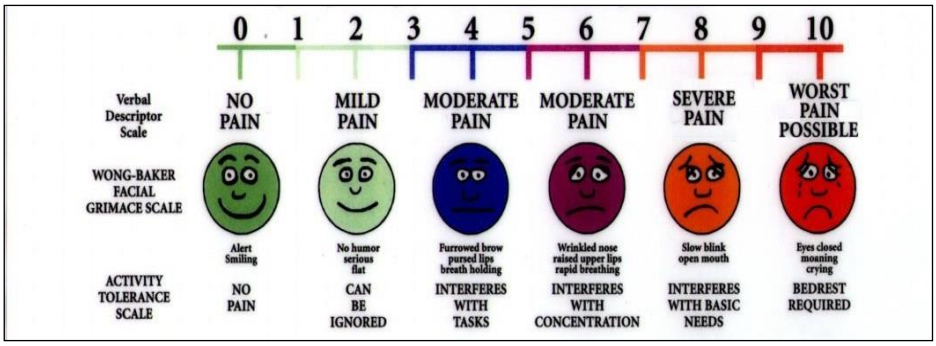
- SEPTANEST® (Articaine HCl. 4% with Epinephrine 1:100,000 Injection) manufactured by Septodont, France (Marketed by Septodont Healthcare India Pvt. Ltd., Maharsahtra)
- Septoject sterile 27 gauge disposable needles manufactured by Septodont, France (Marketed by Septodont Healthcare India Pvt. Ltd., Delhi)
- Rescue injections- Lignox 2% Lignocaine HCl. 2% and Epinephrine 1:80,000) manufactured by INDOCO Remedies Gujrat India.
- Method of collection of data-

After obtaining the informed consent and taking intra oral periapical radiograph (to rule out any periapical pathology) patient was randomly allocated to the study. Buccal infiltration along the long axis of premolars was given. All injections were accomplished by one person, with slow injection technique (approximately 1ml/min) and full cartridge (1.8ml of solution) was deposited. Objective signs were checked and if the patient complains of pain, then appropriate rescue injections (lingual infiltration and inferior alveolar nerve block) were given and was mentioned in the case history proforma. VAS scores (scale given by wong-baker) were obtained after the extraction procedure. Following the surgery, the standard postoperative instructions were given to the patients along with the antibiotics and analgesics as and when required. Patients were monitored till the anesthetic effect wears off.

Clinical parameters

- Instrumentation (objective assessment with the help of sharp end of periosteal elevator) was done on buccal gingiva as to assess the presence or absence of pain and the results were recorded.
- Instrumentation (objective assessment with the help of sharp end of periosteal elevator) was done on lingual gingiva as to assess the presence or absence of pain and the results were recorded.
- The type and number of rescue injections were recorded.
- Subjective pain was evaluated using VAS after extraction.

The pain evaluation was done by the patient using Visual Analog Scale (VAS). The VAS was composed of an unmarked, continuous, horizontal, 100-mm line, anchored by the end points of “no pain” on the right and “worst pain” on the left.



- The quality of anaesthesia during the surgery as evaluated by the surgeon.

This is based on three point category rating scale–

1= no discomfort reported by the patient during surgery,

2= any discomfort reported by the patient during surgery,

3= any discomfort reported by the patient during surgery requiring additional anaesthesia.

- Duration of postoperative anaesthesia.

Measured by objective symptoms of pain checked every 5 minutes after 45 minutes from infiltration

RESULTS

26 males and 24 females participated in the study (graph 1). Mean age of the patient were 24.3 years of age (graph 2).

Pain on buccal instrumentation: The pain on buccal instrumentation was measured as present or absent. All patients did not experience pain on buccal side. There was effective reduction in the pain (graph 3).

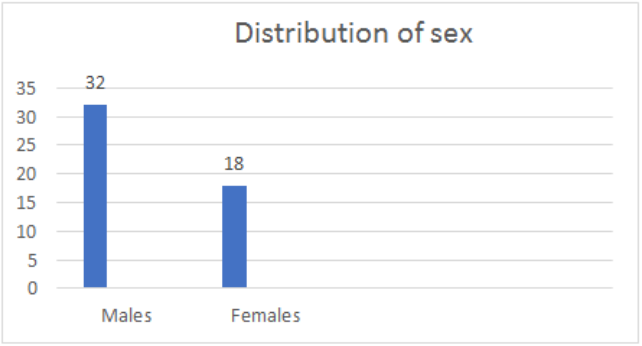
Pain on lingual instrumentation: 39 patients experienced no pain on lingual instrumentation after waiting for 10 minutes (graph 4). Chi square test was done for comparing both sexes which was not statistically significant (p value > 0.05).

Number of rescue injections: The number of rescue injections used was 11 which were lingual infiltration of 0.8ml of Lignocaine HCl. 2% with Epinephrine 1:80,000.

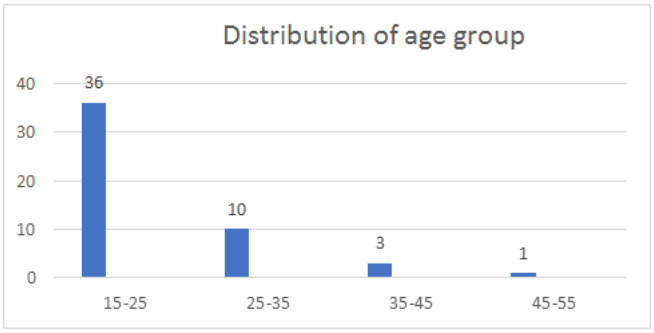
VAS score after extraction: VAS scores after extraction were: none for 0 patients (0%), mild for 39 patients (78%), moderate for 10 patients (20%) and severe for 1 patient (2%) (Graph 5). Chi square test was done for comparing both sexes which was not statistically significant (p value > 0.05).

Quality of the anesthesia: Scores after evaluating quality of anesthesia were 28 (56%) patients for grade 1 and 11 (22%) patients for grade 2. Rest 11 (22%) patients required additional anesthesia which were included in grade 3 (graph 6). Chi square test was done for comparing both sexes which was not statistically significant (p value > 0.05).

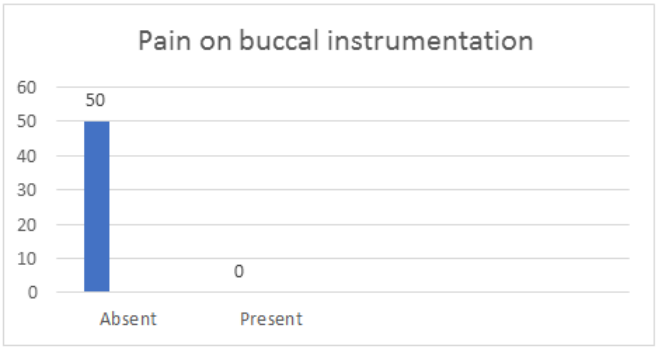
Duration of postoperative anesthesia: The mean duration of postoperative anesthesia was (68.20 ± 19.22 min) in 39 patients who only received buccal infiltration.



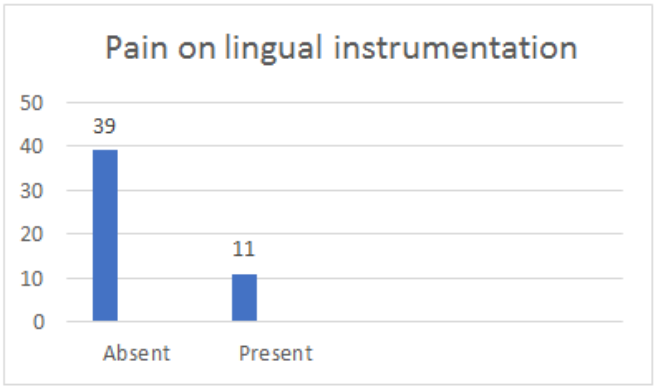
Graph-1: Distribution of sex



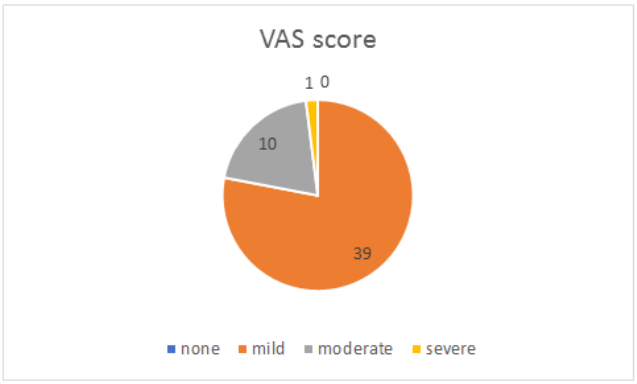
Graph-2: Distribution of age group



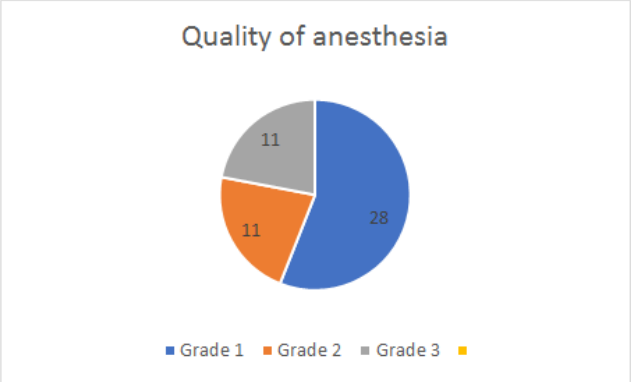
Graph-3: Pain on buccal instrumentation



Graph-4: Pain on lingual instrumentation



Graph-5: VAS score during extraction



Graph-6: Quality of anesthesia

DISCUSSION

Extractions are the most frequently performed oral surgical procedures and it mandates complete pain control in order to gain patient's cooperation and to manage patient's anxiety. Pain perception depends upon the patient's pain threshold[4]. Pain control during any operative or surgical procedure is one of the most important factors for successful treatment. There are various methods used to control pain among which use of local anaesthetic agents is the most commonly employed technique in dental practice[3].

Articaine has been first reported in German literature in the year 1969 and referred to as carticaine[3]. Being an amide-type local anesthetics, it contains a carboxylic ester group, thus is inactivated in the liver as well as by hydrolyzation in the tissue and the blood. Articaine is therefore cleared more quickly from the body. Since the hydrolyzation is very fast and starts immediately after injection, about 85 to 90 % of administered articaine is inactivated in this way. Main metabolic product is articainic acid (or more accurately: articainic carboxylic acid), which is non-toxic and inactive as local anesthetic. Articaine has a reputation of providing a good local anesthetic effect. The available literature indicates that articaine is equally effective when statistically compared to other local anesthetics[12].

The onset of anesthesia with 4% articaine with epinephrine 1:200,000 is 1.5 to 1.8 minutes for maxillary infiltration and 1.4 to 3.6 minutes for inferior alveolar nerve block[13]. Corbett *et al.* [14] determined the onset of anaesthesia after buccal infiltration in mandibular molar and found out that the mean onset of first molar pulpal anesthesia was 6.5 minutes (SD, 5.5 minutes) after buccal and 7.5 minutes (SD, 6.0 minutes) after buccal plus lingual infiltrations. The difference was not significant. But the delay in onset can be attributed to thick cortical bone in mandible. In our study, all the subjects were anaesthetized on the buccal side using 4% articaine, after 10 minutes on the lingual side 39 (78%) were anaesthetized.

Pain on buccal instrumentation in our study was present in none of the patient whereas the pain on lingual instrumentation was present in 11 patients. VAS scores were significantly less in patients which make articaine a good substitute as a local anesthetic. Our study results were same as compared to the study done by Corbett *et al*. [14] which found no difference in buccal and buccal plus lingual infiltrations of articaine with epinephrine in obtaining pulpal anesthesia for mandibular permanent first molar. Flanagan *et al*. [15] did a CBCT evaluation of the mandibles which were infiltrated with 4% articaine solution and found out that a total of 4% articaine infiltration at the facial aspect of the mandible may produce effective local anesthesia in patients with thinner cortices where the anesthetic is delivered. When there is facial cortical bone thicker than ~2.0 mm, as measured on a CBCT, adequate anesthesia may not occur. Cortical density expressed in HU or tooth apex distance from the facial cortical aspect of the site did not appear to dramatically affect anesthetic effect. A waiting time of 5–10 minutes may be required for effective anesthesia. An additional 1.8 cc of dose may be required to attain anesthesia if an initial 1.8 cc of dose fails. The additional anesthetic solution may allow better penetration.

One of the most controversial aspects of articaine administration is its potential to cause paresthesia after inferior alveolar nerve block [16, 17]. This adverse effect is attributed to the higher concentration of articaine (4%) in comparison with other local anesthetics (e.g., 2% lidocaine in association with epinephrine). It may be possible to decrease the risk of paresthesia by using a lower concentration of articaine to block the inferior alveolar nerve. In Germany, a 2% formulation in association with 1:200,000 epinephrines has recently become available for dental use, which proved to be as effective as 4% concentration in teeth extractions with infiltration anesthesia[18]. Those who argue that articaine does not produce a greater incidence of paresthesia claim that, as it is chiefly the lingual nerve that suffers, this might be due to direct trauma from the needle and that over-

reporting of problems is natural when a new drug is introduced to practice[19].

Our study concluded that the pain experienced during the single buccal injection of 1.8 ml of 4% articaine is significantly less during extraction of mandibular premolar extraction procedure. Mandibular premolars can be extracted by giving only buccal infiltration of articaine thereby there is no need of using inferior alveolar nerve block. The tooth which still show pain can be extracted giving additional lingual infiltration

Lidocaine is considered as the gold standard local anesthetic for most dental procedures but articaine is a good substitute. Further studies with larger sample size are warranted to substantiate our results.

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