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Original Article

Can single Buccal Infiltration with 4% Articaine induce sufficient analgesia for the Extraction of Mandibular Molars in Adults? A Prospective Study and Literature Review

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Abstract

Objectives: This study aims to compare the efficacy of 4% articaine buccal supraperiosteal/infiltration in providing pulpal anesthesia for mandibular molars in adults.
Methods: Complete cartridge solution of 1.8 mL of 4% articaine with 1:100,000 epinephrine was injected into the mucobuccal fold of the respective tooth. Five minutes after the injection, the buccal and lingual areas around each tooth were probed with a sharp end of periosteal elevator. If patients showed objective sign of pain, rescue injection that is lingual infiltration or IANB would be given using articaine. Patients who felt no pain during probing was subjected to gingival reflection by a fine periosteal elevator to dissect gingival from teeth and place the forceps, extraction is carried out. Visual Analog Scale was used to record the pain during extraction. Patient was assessed for duration of soft tissue by probing the buccal gingiva every 5 min and after 45 min of infiltration, till pain reappears.This prospective study evaluated the clinical anesthetic efficacy of 4% articaine in single labial infiltration for extraction of mandibular posterior teeth. Data were collated and processed using Excel and analysed by R commander software. The statistical tests used for the analysis of the result was Chi square test.
Results: A total of 75 samples have been taken for the study with age group between 18 to 75 years and 36 (48%) males and 39 (52%) females were participated in the study and subjects were randomly given single labial infiltration of anaesthetic solution for extraction of mandibular posterior teeth. A mean age value of 39.17 in male and 32.21 in female and a standard deviation of 16.34 in male and 15.48 in female were found. 73.33% patients had pain on lingual instrumentation at 5 minutes and 25.67% patients had pain on lingual instrumentation at 10 minutes after the labial infiltration. Among 75 patients, 16 had reported discomfort during surgery and required additional anaesthesia whereas 34 patients reported with pain and 25 patients were asymptomatic. Duration of anaesthesia showed a mean value of 64 minutes and a standard deviation of 5.58.

Conclusion: Hard tissue is anesthesia is not satisfactory with single buccal infiltration of mandibular molar teeth using 1.7 ml 4% articaine. But shows satisfactory results with single supplementary lingual infiltration using 4% articaine. When combined with inferior alveolar nerve block and lingual nerve block, buccal infiltration of mandibular teeth using 4% articaine provide adequate anesthesia during extraction of mandibular teeth.

Keywords: *Articaine, Buccal Infiltration, Pain, Extraction, Anesthesia, Mandibular Molars*.

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INTRODUCTION

Extraction is a minor oral surgical procedure performed for the therapeutic removal of teeth from the oral cavity. Ideal tooth extraction is the painless removal of the whole tooth, or root, with minimal trauma to the investing tissues, so that the wound heals uneventfully & no postoperative prosthetic problem is created. Performance of painless teeth extraction is still considered a topic of interest for patients and dental surgeons [1].

Articaine hydrochloride was first introduced as carticaine in 1976, and marketed in Germany. It is an amide anaesthetic agent and has a thiophene ring instead of a benzene ring, which is the reason that it differs from other anaesthetic agents. It penetrates the tissues to a greater depth, which is thought to be the result of its thiophene ring. The molecular structure of articaine allows it to be metabolized by both the cholinesterase in the tissue and hepatic microsomal enzymes. Its clinical advantages include the fact that its effect is long lasting than bupivacaine, etidocaine, or ropivacaine, and its superior penetration into bone [2].

Articaine blocks nerve conduction by reversibly binding to the α-subunit of the voltage-gated sodium channels within the inner cavity of the nerve, similar to other local anesthetics. Articaine is lipid soluble, highly protein-bound (94%), and has a dissociation constant (pKa) of 7.8. Articaine is an intermediate-potency, short-acting local anesthetic with a fast onset of action.

Articaine is one of the safer local anaesthetics due to its rapid metabolism into an inactive metabolite, decreasing the risk of systemic toxicity and overdose, even after repeated injection. Early studies on articaine reported no toxic reactions from 100 injections, in 211 paediatric patients and a recent study showed a low number of adverse events comparable to that of lignocaine. Other adverse reactions to articaine have been reported, including hypersensitivity, ophthalmologic complications, ischaemic skin necrosis and fever, chills and arthralgia [3].

The inferior alveolar nerve block (IANB) is common practice for anaesthetising mandibular molars and/or premolars on one side of the jaw. Achieved by depositing local anaesthetic solution at the entrance to the mandibular canal, it inhibits the transmission of action potentials along the inferior alveolar nerve towards the central nervous system. This is technique sensitive. Unfortunately, IANB proves to be the most frustrating, with highest percentage of clinical failures (approximately 15% to 20%) even when properly administered. Complications related to IANB include transient facial paralysis, trismus, local anaesthetic injected into blood vessel, self-inflicted trauma, damage to sphenomandibular ligament and pterygomandibular space infection. It unnecessarily anesthetizes all branch of inferior alveolar nerve in cases in which only a small area is required to be anaesthetized [4].

The mandible is made of thick cortical bone. Due to the increased thickness of the alveolar buccal bone compared to the maxillary bone which is thin, porous, and cancellous, local infiltration of 2% lignocaine with 1: 80,000 adrenaline cannot penetrate the mandibular buccal bone efficiently to produce pulpal anesthesia when local infiltration injection is given. Studies have shown that 4% articaine with 1: 100,000 epinephrine has excellent buccal bone penetration and provides adequate anaesthesia [5,6]. Our study on efficacy 4% articaine in buccal infiltration of mandibular posterior teeth has rarely been carried out in India. Hence the study may help clinicians to use this method for the benefit of the patient.

AIMS AND OBJECTIVES

The aim of the study was to evaluate the anaesthetic efficacy of 4% articaine in buccal infiltration of mandibular molar teeth.

The objectives of the study were

1. To assess the presence or absence of pain while probing on the buccal, lingual, mesial and distal areas around the tooth five min after buccal infiltration with 4% articaine.

2. To assess the pain experienced by patient during extraction of teeth using visual analogue scale.

3. To determine whether rescue injections (lingual infiltration or inferior alveolar nerve block) are required or not after buccal infiltration with 4% articaine.

4. To evaluate the quality of the anaesthesia using standard parameters

5. To determine the duration of anesthesia.

MATERIALS AND METHODS

A prospective study was conducted on 75 patients between age group of 18 to 70 years who reported to the Department of Oral and Maxillofacial Surgery, KVG Dental College& Hospital, Sullia for undergoing extraction of mandibular molar tooth were included in this study after obtaining informed consent.

Inclusion criteria:

1. Completely erupted mandibular first or second molar tooth indicated for extraction

2. Patients between 18 and 70 years

Exclusion criteria:

1. Periapical abscess in relation to the tooth to be extracted.

2. Patients with space infection

3. Patients with hypertension

4. Patients with liver disease.

5. Patients with renal diseases.

6. Patients with bleeding and clotting disorders.

7. Patients under antidepressant medication.

8. Patients with bone diseases and disorders.

9. Patients with altered physiological responses which affects pain perception mechanisms.

10. Patient found to be allergic to articaine after test dose.

Armamentarium:

4% articaine cartridges with 1:100,000 epinephrine injection solution (Septodont company), cartridge syringe and routine extraction instruments including periosteal elevator and extraction forceps.

Surgical Procedure:

The injection site was cleaned with sterile gauze. The needle was inserted into the tissue to the depth of the mucobuccal fold between the mesial and distal roots of mandibular molar tooth. It was observed that syringe is parallel to the longitudinal axis tooth with tip of needle inserted into the depth of mucobuccal fold and bevel of the needle facing towards the bone. Complete cartridge solution of 1.8 mL of 4% articaine with 1:100,000 epinephrine was injected into the mucobuccal fold of the respective tooth. Five minutes after the injection, the buccal and lingual areas around each tooth were probed with a sharp end of periosteal elevator. If patients showed objective sign of pain, rescue injection that is lingual infiltration or IANB would be given using articaine. Patients who felt no pain during probing was subjected to gingival reflection by a fine periosteal elevator to dissect gingival from teeth and place the forceps, extraction is carried out. Visual Analog Scale was used to record the pain during extraction. Patient was assessed for duration of soft tissue by probing the buccal gingiva every 5 min and after 45 min of infiltration, till pain reappears.

Clinical Parameters:

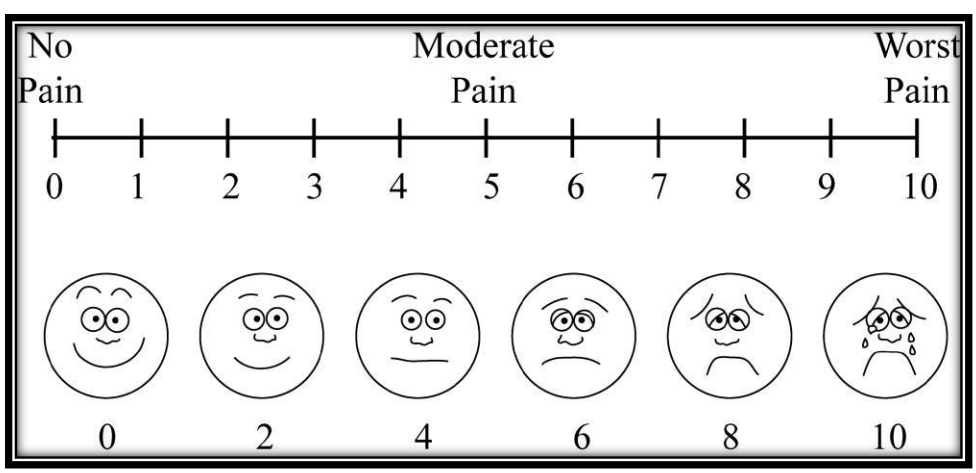
1. **Objective pain evaluation on buccal gingiva:** Instrumentation was done using sharp end of periosteal elevator on the buccal gingiva of mandibular molars as to assess the absence or presence of pain. The results was recorded 5 minutes and 10 minutes respectively after buccal infiltration.

2. **Objective pain evaluation on the lingual gingiva:** Instrumentation was done using sharp end of periosteal elevator on the lingual gingiva of mandibular molars as to assess the absence or presence of pain. The results was recorded 5 min and 10 min respectively after buccal infiltration.

3. **Number and type of rescue injections** (lingual infiltration or IANB) was recorded.

4. **Subjective pain evaluation using VAS** after the extraction will be done.

- The VAS presented as 100 mm horizontal line on which the patient pain intensity is represented by a point between the extremes of “no pain at all” and “worst pain imaginable”.



5. **The quality of anaesthesia** during the surgery as evaluated by the surgeon. This was basedon 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.

6. **Duration of post-operative anaesthesia** is measured by objective symptoms of pain checked every 5 minutes after 45 minutes from infiltration, checked on the buccal gingiva.

RESULTS

This prospective study evaluates the clinical anesthetic efficacy of 4% articaine in single labial infiltration for extraction of mandibular posterior teeth. Data were collated and processed using Excel and analyzed by R commander software. The statistical tests used for the analysis of the result was Chi square test. A total of 75 samples have been taken for the study with age group between 18 to 75 years and 36(48%) males and 39 (52%) females were participated in the study and subjects were randomly given single labial infiltration of anaesthetic solution for extraction of mandibular posterior teeth. A mean age value of 39.17 in male and 32.21 in female and a standard deviation of 16.34 in male and 15.48 in female were found. 73.33% patients had pain on lingual instrumentation at 5 minutes and 25.67% patients had pain on lingual instrumentation at 10 minutes after the labial infiltration. Among 75 patients 16 had reported discomfort during surgery required additional anaesthesia whereas 34 patients reported with pain and 25 patients were asymptomatic. Duration of anaesthesia showed a mean value of 64 minutes and a standard deviation of 5.58.

DISCUSSION

Extraction of tooth is the most common minor oral surgical procedure performed in dentistry. For performing painless tooth extraction, it is necessary to achieve anesthesia of tooth to be extracted. Local anesthetics is the best choice for effective control of pain during extraction.

Articaine was first synthesised as carticaine in 1969 by Rusching et al and entered clinical practice in Germany in 1976. It is the only amide local anesthetic that contains a thiophene ring and an additional ester ring. Substitution of the benzene ring by the thiophene ring increased the lipid solubility of the drug along with its potency. Lipid solubility affects the anesthetic potency. Increased lipid solubility permits the anesthetic to penetrate the nerve membrane. The advantages of articaine over other local anesthetics are its quick onset, long duration of action superior penetration into bone. Its greater field of action and a wide range of penetration makes this local anesthesia work only by a single administration and by providing just a single nerve block instead of several blocks that need to be given in case of the standard drug lignocaine [7].

The most common approach used for anesthesia of the inferior alveolar nerve is the traditional Halstead method. In conventional IANB anesthetise mandibular teeth to the midline, body of the mandible, inferior portion of the ramus, buccal mucoperiosteum, mucous membrane anterior to the mental foramen (mental nerve), anterior two thirds of the tongue and floor of the oral cavity (lingual nerve), lingual soft tissues and periosteum (lingual nerve). IANB is technique sensitive and associated with a failure rate of 15-20% a figure which represents the highest percentage of all clinical failures achieved using local anesthesia. Disadvantages of IANB are wide area of anesthesia (not indicated for localized procedures), rate of inadequate anesthesia in 31% to 81% cases, intraoral landmarks not consistently reliable positive aspiration (10% to 15%, highest of all intraoral injection

techniques), lingual and lower lip anesthesia, discomfiting to many patients and possibly dangerous (self-inflicted soft tissue trauma) for certain individuals. Complication related to the inferior alveolar nerve block are pain, trismus needle breakage at that point of injection, hematoma facial paralysis caused by deposition of the anesthetic solution in the parotid region, a problem which mainly occurs when the needle is directed more posterior toward the posterior border of the mandible [8].

Infiltration anesthesia, which means that local anesthetic is injected around the tooth to be anesthetized, is most commonly used in dental practices. Advantages of infiltration anesthesia compared to regional block technically simple, more comfortable for patients, provides hemostasis where it is needed, counters collateral supply in many cases, avoids damage to nerve trunks, less chance of intravascular injection, safer in patients with bleeding diatheses, reduced chances of needle stick injury. It is the technique of choice in the upper jaw. The most common sites for infiltration anesthesia to obtain a reasonable anesthetic effect are the mucobuccal fold because of its proximity to the apex of the root of each tooth It provides pulpal anesthesia by diffusion into the cancellous bone via the thin cortical plate of the maxillary alveolus. But in mandible, infiltration techniques may not be the first choice because the thick cortical plate of mandible prevents diffusion of solution into the cancellous bone and, therefore, to the nerves supplying the pulps of the teeth. Dennis F Flanagan conducted a study to evaluate the effectiveness of articaine in mandibular facial infiltrations. He conclude 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 and when there is facial cortical bone thicker than ~2.0 mm, as measured on a CBCT, adequate anesthesia may not occur [9]. We decide to do a study to evaluate the anaesthetic efficacy of 4% articaine in buccal infiltration of mandibular molar teeth on 75 patients.

In our study, 75 patients participated between the age group of 18 and 70 years. Out of 75 patients, 36(48%) males and 39 (52%) females were participated in the study. The mean age value was 39.17 and 32.21 for male and female patient respectively. Mandibular posterior teeth are mostly indicated for extraction due to localised periodontitis and chronic irreversible pulpitis. In our study 18 patients underwent extraction of mandibular molar due to localised periodontitis and 57 patients underwent extraction of mandibular molar due to chronic irreversible pulpitis. In 44 patients who were below 40 years, 43 patients (97.73%) underwent extraction due to chronic irreversible pulpitis and 1 patient (2.27%) underwent extraction due to localized periodontitis. The statistical analysis shows significant association between age group and diagnosis.

In our study, the objective signs were measured 5 minutes after injection because time is required for diffusion of anesthetic solution to reach lingual side. This was accordance with the study of Corbett et al in which they determined that the mean onset of first molar pulpal anesthesia was 6.5 minutes after buccal and 7.5 minutes after buccal plus lingual infiltrations (Pulpal anesthesia was determined by using an electronic pulp tester) [10]. The difference was not significant. The onset of pulpal anesthesia in buccal infiltration of maxillary posterior teeth using 4% articaine with 1:100,000 epinephrine is 1.4 -1.8 minutes. The onset of pulpal anesthesia in inferior alveolar nerve block using 4% articaine with 1:100,000 epinephrine is 7.4 minutes.

In our study, 88% of the patient did not perceive pain and 12% of the subject perceived pain on buccal instrumentation at 5 minutes. In the age group below 40 years, 88.64% did not perceive pain and 11.36% of patient perceived pain on buccal instrumentation at 5 minutes. Similarly, even in the age group above 40 years, 87.9% patient did not perceive pain and 12.9% patient perceived pain on buccal instrumentation at 5 minutes. Only 2.67% patients perceived pain on buccal instrumentation at 10 min. In the age group below 40 years, 95.45% patient did not perceive pain and 4.55 % patient perceived pain on buccal instrumentation at 10 minutes. In the age group above 40 years, 100 % did not perceive pain on buccal instrumentation at 10 minutes. There is no statistical significance between age group and pain on buccal instrumentation at 5 minutes and 10 minutes.

So according to our study the onset of anesthesia of 4% articaine in mandibular infiltration is in between 5 minutes and 10 minutes. This is similar to previous study done by Corbett et al, Lindasy Pabst et al and Jung et al [11-13]. Lindasy Pabst et al [12] determined that the time of onset of pulpal anesthesia for the buccal infiltrations of mandibular molar using 4% articaine ranged from 5.4 to 6.2 minutes. Jung et al and Robertson et al, using single cartridge of 4% articaine with 1 ∶ 100,000 epinephrine, reported onset times for the mandibular first molar of 6.6 minutes and 4.2 minutes, respectively [13,14].

In our study, 73.33% patient had pain on lingual instrumentation at 5 minutes and 74.67% of patients did not had pain on lingual instrumentation at 10 minutes after buccal infiltration. In the patients below age 40 years, 63.64 patients noted pain and 36.36% did not note pain on lingual instrumentation at 5 minutes after buccal infiltration. In patients above 40 years, 87.1% noted pain and 12.9% did not note pain on lingual instrumentation at 5 minutes after buccal infiltration. Similarly, in the patients below age 40 years, 29.55 % patients noted pain and 70.45% did not note pain on lingual instrumentation at 10 minutes after buccal infiltration. In patients above 40 years, 19.35% noted pain and 80.65% did not note pain on lingual instrumentation at 10 minutes after buccal infiltration. There was statistically significant association between pain and lingual instrumentation at 5 min, but not at 10 min, which suggest that above 40 years of age group experienced more pain on lingual instrumentation than below 40 years of age at 5 minutes after buccal infiltration. This finding is accordance with Sunith Maruthingal et al [15], they reported that lingual mucosa numbness was reported by 75% of patients after 4% articaine buccal infiltration mucobuccal fold adjacent to the mandibular first molar and the mean onset of time was 9.29 min for 4% articaine. Dennis F Flanagan [9] reported that I t may take at least 5–10 minutes for mandibular facial infiltrations with articaine to be effective in most sites of mandibular bone. Thicker cortices are associated with longer onset and no onset of anesthesia. He also reported that cortices thicker than ~2.00 mm may take longer to attain anesthesia or may never become anesthetized. A 3.2cc dose may be required to attain anesthesia if the cortex is thicker than 2.0 mm. For a local anesthetic to act, it must be in physical contact with the neurons to be anesthetized. In buccal infiltrations of mandible, articaine must penetrate the cortical and trabecular bone to access these nerves. According to Wen D et al [6] cortical bone is permeable to nutrients, waste products, and signal molecules. Articaine would most likely permeate cortex as well. However, increased cortical thickness may attenuate the passage of molecules. The reason for failure in achieving lingual anesthesia can be due to increased bone density in patient.

In our study, subjective pain evaluation after buccal infiltration is done using visual analog scale (VAS). It was noted before giving any rescue injection. Out of 75 patients, 5.33% of patient note no pain (VAS- 0), 26.67% of patients noted slight pain (VAS- 2), 49.33% of patient experienced mild pain (VAS-4) and 18.67% experienced moderate pain. In patients below 40 years age, 4.55% patient experienced no pain, 13.64% of patients noted slight pain, 59.09% of patients noted mild pain and 22.73% patient experienced moderate pain. Similarly, in patients above 40 years age, 6.55% patient experienced no pain, 45.16% of patients noted slight pain, 35.48% of patients noted mild pain and 12.9% patient experienced moderate pain. There is statistically significant association present between age group and subjective pain evaluation. This is accordance with Rayati et al in which 54 patients out of 72 patients experienced pain while during extraction of molar after single 4% articaine infiltration in muccobuccal fold of mandibular molar. Our study is also accordance with Batiaineh et al [2] study, in which the 1.8 ml of 4% articaine buccal infiltration technique of mandibular molar, the VAS scores for the pain experienced reported 15 to 71 mm with a mean of 38.58 ± 15.18mm. During extraction, 65.4 % of patients reported mild pain and 3.8 % reported severe pain, with the remaining patients reported no pain. This is also in accordance with Prakash Lokhande et al [5], where 83.3% of patient experienced no pain to mild pain during endodontic access after a buccal infiltration combined with intra-ligamentary injection in mandibular molars having irreversible pulpitis. Khalid et al [2] done a study on infiltration anesthesia for extraction of the mandibular molars using 1.8ml 4% articaine and 3.6ml 4% articaine, in which 56% of patient only experienced pain free extraction after infiltrating with 1.8 ml articaine.

In our study, 64% of patient required rescue injection and 36% of patient did not required rescue injection. In patient below 40 years age, 75% of patient required rescue injection and 25% didn't required rescue injection. In patient above 40 years age, 48.39 % of patient required rescue injection and 51.61 didn't required rescue injection. The statistically significant association present between age group and rescue injection, which means patient below 40 years of age group required a great number of rescue injection. Out of 48 patient who required rescue injection 18 patient (24%) was required lingual infiltration and 30 patients (40%) required both lingual infiltration and inferior alveolar nerve block.

In patients below 40 years 25% did not require any rescue injection. 20.45 % required lingual infiltration and 54.55% required both lingual infiltration and IANB. Similarly, in patients above 40 years, 51.16% did not require any rescue injection, 29.03 % required lingual infiltration and 19.35% required both lingual infiltration and IANB. The statistically significant association is present between age group and number of rescue injection. Thus, in our study 60% of patient had experienced adequate anesthesia after buccal infiltration of 4 % articaine in mandibular molar with or without lingual infiltration. This is accordance with Khalid E et al [2] study in which 56% of cases achieved successful anesthesia after 1.8 ml of 4% buccal infiltration in mandibular first molar region and 0.3 ml of 4 % articaine deposition in under the lingual mucosa opposite the third molar area near the superior margin of the ridge. He reported that the success rate obtained with 1.8 mL of articaine infiltration in mandibular first molar was not high enough to support its use as a primary injection technique in mandibular third molar surgery. This is also accordance with Nydegger et al [3] study, they report that 55% success rate when the efficacy of articaine, lidocaine, and prilocaine compared for anaesthesia of mandibular first molars. However, they used an electric pulp tester to assess the depth of anaesthesia, which differed from that of the lingual anaesthesia that is required for extraction of teeth. Our study is accordance with Bataineh et al [1], they reported that 68 % of patients reported mild pain and 32 % reported moderate pain during extraction of mandibular molar after 1.8 ml of articaine infiltration in buccal and 0.9ml of articaine lingual of mandibular first molar. They came to conclusion that the extraction of permanent mandibular first molar teeth is possible without the administration of an IANB with the use of 4 % articaine with 1:100,000 epinephrine. In contrary to our study Danyal H Awal et al [5] reported that the total success of achieving adequate anaesthesia for extraction using 4% articaine via the 2.2 ml 4% articaine only buccal infiltration technique (AOBT), with or without repeat/supplemental injections was 84%. The remaining 16% of extractions required a 2% lidocaine rescue inferior alveolar nerve block to enable completion. They came to conclusion that the AOBT could be a suitable alternative to 2% lidocaine IDBs for routine adult mandibular molar extractions.

In our study, only 36% patient underwent extraction without any rescue injection. This is accordance with Rayati et al [7] study, they reported only 25% patient underwent with single 4% articaine injection deep into the mucobuccal fold at the site of the mandibular molar. They conclude that articaine is more successful in providing adequate depth of anaesthesia, but its efficacy was not sufficient to replace an inferior alveolar nerve block for extraction of mandibular molars. According Corbett et al anesthetic efficacy of infiltration anesthesia efficacy in the mandibular molar region with 4% articaine and epinephrine (1;100,000) in adults of approximately 65%. However, they used electric pulp test to determine pulpal anesthesia, which differed from our study. Haas et al also had similar result like Corbett et al [7]. But Robert et al [9] reported 75-92 % success rate after 4% articaine infiltration in mandibular first molar. They also used electric pulp test to determine pulpal anesthesia, which differed from our study. Zain et al [6] compared buccal infiltration of articaine and inferior alveolar nerve block with lidocaine for extraction of mandibular molars, and showed that articaine was capable of penetrating into the periapical tissue and successful pulpal anesthesia ranged from 75 to 92 percent. Their results cannot be compared with our study because they did not evaluate anaesthesia of lingual tissue. The studies of Meechan and Ledvinka and Jaber and colleagues [7,8] suggested that the splitting of a dose between buccal and lingual infiltrations was more effective than either buccal or lingual alone. Kanaa et al [15] compared

the infiltration of 1.8 mL of 2% lidocaine or 4% articaine (both with 1:100,000 epinephrine) for pulpal anesthesia of mandibular first molar teeth and reported that efficacy for the articaine (64% success) significantly greater compared with the lidocaine (39% success) solution. Jung et al [13] compared the e compared the anesthetic efficacy of inferior alveolar nerve blocks (IANBs) with that of buccal infiltrations I of 1.7 mL of 4% articaine with 1:100,000 adrenaline in mandibular first molars. They concluded that, buccal infiltration with 4% articaine for mandibular first molars can be a useful alternative for clinicians because compared with IANB it has a faster onset and a similar success rate. They used pulp tester for evaluation of anesthetic efficacy. In Barlette et al [4] review literature on comparing the effectiveness of articaine buccal infiltrations (BIs) and lidocaine inferior alveolar nerve blocks (IANBs) for inducing pulpal anaesthesia in mandibular molars. They found that 55.6– 69.2% and 65.4–70.4% of lidocaine IANBs and articaine buccal infiltration were successful, respectively. So, they concluded that Articaine BIs are no more effective than lidocaine IANBs and the decision of which method to practice should be based on patient selection, cost and time efficiency.

In our study, 12 patients (66.67%) out of 18 patients who diagnosed with localised periodontitis didn't required any rescue injection and 6 patients (33.33%) was required one lingual infiltration as rescue injection. In patients who diagnosed with chronic irreversible pulpitis, 15 patients (26.32%) didn't required any rescue injection, 12 patients (21.05%) was required one lingual infiltration as rescue injection and 30 patients required both lingual infiltration and IANB.

In our study, quality of anesthesia was evaluated based on three-point category rating scale. Among 75 patients, 27 patients (36%) experienced no discomfort or mild discomfort and 48 patient (64%) experienced moderate discomfort during the surgery requiring additional anesthesia. In our study, minimum duration of anesthesia noted was 64 minute and maximum anesthesia noted was 89 minutes with mean duration of anesthesia of 70.6 minute.

CONCLUSION

Our study concluded that

- Adequate buccal soft tissue anesthesia can be achieved with 4% articaine in buccal infiltration of mandibular molar teeth
- Satisfactory lingual soft tissue anesthesia can be achieved 10 minutes after buccal infiltration of mandibular molar teeth using 4% articaine.
- Hard tissue is anesthesia is not satisfactory with single buccal infiltration of mandibular molar teeth using 1.7 ml 4% articaine. But shows satisfactory results with single supplementary lingual infiltration using 4% articaine.
- When combined with inferior alveolar nerve block and lingual nerve block, buccal infiltration of mandibular teeth using 4% articaine provide adequate anesthesia during extraction of mandibular teeth.

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