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ORIGINAL RESEARCH

Clinical efficacy of 4% articaine with 1:100,000 epinephrine with 2% lidocaine with 1:80,000 epinephrine in patients undergoing dental extractions- A Comparative Study

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***ABSTRACT*:**
Background: Articaine is an amide local anesthetic that differs from other agents of its group due to the presence of a thiophene ring instead of a benzene ring, and it is one of the commonly used local anesthetic agents for day care surgeries. Some researches claim that articaine is superior to lidocaine in its biologic profile. **Material and method:** 90 patients were included in this study who were supposed to undergo orthodontic extraction of maxillary premolar teeth. 0.5 ml of 4% articaine HCl with 1:100,000 adrenaline solution was used for buccal infiltration for anesthetizing maxillary teeth. Similarly, 0.6 ml and 0.3mi of 2% lignocaine HCl with 1:80000 adrenaline solution was used for buccal and palatal infiltration respectively for anesthetizing maxillary teeth on the other side. VAS (visual analog scale) was used to evaluate pain during extraction. SPSS software was used for statistical analysis. **Results:** 41 out of 90 patients were males comprising of 45.55% of the study sample. 74.44% of the sample size was below 16 years of age. Volume of solution of lignocaine group was higher than that of articaine group. Only 0.5 ml of articaine was used for buccal infiltration. The mean time of onset of anesthesia came out to be 37.38 ± 26.41seconds and 81.56 ± 28.94 s in articaine group and lignocaine group respectively. **Conclusion:** Atricaine showed a faster onset and longer duration of action of anesthesia as compared with lignocaine HCL. Moreover a lesser volume of articaine was sufficient to induce profound anesthesia and thus, articaine can be used as an alternative to lignocaine as a local anesthetic agent in dental procedures.
Key words: Local anaesthesia, Extraction, Articaine.

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INTRODUCTION

The era of local anesthetics started with discovery of Cocaine in 1860 [1]. Later, the developments of Novocain 1904 and then Lignocaine by Lofgren and Lundquist in 1942 revolutionized dental practice. This soon became a gold standard drug against which all other new local anesthetics were compared and later several newer drugs such as Bupivacaine, Etidocaine, Articaine, Mepivacaine etc. were discovered.[2-3] Achieving profound local anesthesia is essential for successful patient management in clinical dental practice. The selection of a particular anesthetic technique and agent depends on the arch, number of teeth requiring anesthesia, the area of soft tissue anesthesia required, and duration of the effect.[4]

Lidocaine is the most widely used local anesthetic agent for pain control because of its pharmacokinetic characteristics and low toxicity compared with other anesthetics and hence make it safe for use in dental practice [5]. In 1969, articaine hydrochloride was synthesized by Rusching *et al.* with the name of carticaine and was first marketed in Germany in 1976. By 1983, the drug was available practically in all of

Europe and Canada, though it was not approved in the United States until March 2000 [6].

Malamed *et al*. reported articaine to be a safe local anesthetic after comparing the drug with 2% lidocaine and epinephrine 1:100,000 and can be used in both adults and children. Articaine is outstanding as the local anesthetic indicated for dental procedures and control of postoperative pain. The purpose of the present study was to compare the clinical efficacy of 4% articaine with 1:100,000 epinephrine with 2% lidocaine with 1:80,000 epinephrine in patients undergoing dental extractions.

MATERIAL AND METHODS

The purpose of the present study was to compare the clinical efficacy of 4% articaine with 1:100,000 epinephrine with 2% lidocaine with 1:80,000 epinephrine in patients undergoing dental extractions. A total of 90 patients were included in this study who were supposed to undergo orthodontic extraction of maxillary premolar teeth. Demographic details of the patients were recorded and informed consent was taken. The patients were made comfortable in the dental chair and were kept unaware of the anesthetic solution used on either side. 0.5 ml of 4% articaine HCl with 1:100,000 adrenaline solution was used for buccal infiltration for anesthetizing maxillary teeth. Similarly, 0.6 ml and 0.3mi of 2% lignocaine HCl with 1:80000 adrenaline solution was used for buccal and palatal infiltration respectively for anesthetizing maxillary teeth on the other side. Approximately 5 minutes after the delivery of local anesthesia subjective symptoms of anesthesia were evaluated and the VAS (visual analog scale) was explained to the patients in detail before carrying out the extraction procedure. Different parameters including time of injection, commencement of anaesthesia, and quantity of aesthetic agent injected were noted. All patients were reviewed for any postoperative complications.

Entire data was recorded in the Microsoft excel sheets. SPSS software was used for statistical analysis. Chi square test and student T test were use to compare the variables. P-value of less than0.05was considered significant.

RESULTS

In the current study 41 out of 90 patients were males comprising of 45.55% of the study sample. Females accounted for 54.4%of the sample size (table 1). Majority of patients scheduled to undergo maxillary premolar extraction in this study were below 16 years of age accounting for 74.44% of the sample size. Only 23 out of 90 patients were above 16 years of age (table 2).

Table 1: Gender-wise distribution of patients

Gender	Number of patients	Percentage of patients
Male	41	45.55
Female	49	54.44
Total	90	100

Table 2: Distribution of patients according to age

Age group (years)	Number of patients	Percentage of patients
< 16 years	67	74.44
≥16 years	23	25.55
Total	90	100

In the current study 0.6 ml and 0.2 ml of lignocaine was used for buccal and palatal infiltration of local anesthesia. Volume of solution of lignocaine group was higher than that of articaine group. Only 0.5 ml of articaine was used for buccal infiltration (table 3)

Table 3: Volume of solution of anesthesia used

Volume (ml)	Lignocaine group	Articaine group
Quaintity	Buccal 0.6ml, Palatal 0.2ml	Buccal 0.5ml

The current study observed that the mean duration of onset of anesthesia was greater in the lignocaine group as compared to the articaine group. The mean time of onset of anesthesia came out to be 37.38 ± 26.41seconds and 81.56 ± 28.94 s in articaine group and lignocaine group respectively. This difference was statistically significant (P= .02) with the time of onset being faster in articaine group (table 4).

Table 4: Mean duration of onset

Duration of onset (min)	Lignocaine group	Articaine group	p- value
Mean ±SD	81.56 ± 28.94 s	37.38 ± 26.41	0.02

Discussion

Local anesthetics form the mainstay of pain control techniques in dentistry. They are chemicals that block the nerve conduction in a specific, temporary, and reversible manner without affecting the patient's consciousness[7]. The advantage of articaine over other local anesthetic is its potency due to its high liposolubility attributed to the thiopene ring in its molecule[8].

Articaine differs from the previous amide local anesthetics in that it has a thiophene ring in its molecule instead of the usual benzene ring. It was first named *C articaine*, but its generic name was changed to *Articaine* in 1984. Articaine is the most widely used local anesthetic in a number of countries, including Canada, Norway, Italy, France and the Netherlands. In Germany, more than 90% of the local anesthesia used by dentists is articaine [9-10] .Patients treated with articaine will be "drug free" more quickly than those who receive other local anesthetics. Articaine is claimed to be superior to lidocaine, owing to its better diffusion through soft tissue and bone, the rapid onset, the excellent quality of the anesthesia and the lower degree of toxicity [11].

In the current study 41 out of 90 patients were males comprising of 45.55% of the study sample. Females accounted for 54.4%of the sample size (table 1). Majority of patients scheduled to undergo maxillary premolar extraction in this study were below 16 years of age accounting for 74.44% of the sample size. Only 23 out of 90 patients were above 16 years of age (table 2). Balachandran Ashwath et al carried out a randomized split-mouth double-blind study was to evaluate whether 4% articaine hydrochloride with 1:100,000 epinephrine administered as a single buccal infiltration in the maxillary posterior sextant can provide palatal anesthesia when compared with 2% lignocaine with 1:100,000 epinephrine during scaling and root planing and access flap surgery (AFS). A total of 40 patients with chronic generalized periodontitis requiring periodontal therapy in the maxillary posterior sextants were recruited in this study. About 4% articaine and 2% lignocaine were administered as buccal infiltration in a split-mouth design randomly. The pain scores in the palatal aspect were recorded during scaling and root planing and open flap debridement using Heft-Parker visual analog scale. The onset of anesthesia was also recorded and compared. The success rate for maxillary buccal infiltration to induce palatal anesthesia using articaine was 90% during scaling and root planing and 82.5% during AFS and for lignocaine solution was 20% and 15%, respectively. The difference between the two agents was statistically significant ($P < 0.05$). The onset of anesthesia between articaine and lignocaine was also found to be statistically significant ($P < 0.05$). In this study, we observed that the efficacy of 4% articaine was superior to 2% lignocaine to induce palatal anesthesia following maxillary buccal infiltration in maxillary posterior sextants.[12]

In the current study 0.6 ml and 0.2 ml of lignocaine was used for buccal and palatal infiltration of local anesthesia. Volume of solution of lignocaine group was higher than that of articaine group. Only 0.5 ml of articaine was used for buccal infiltration (table 3). Shahid Hassan et al evaluated the efficacy, time of onset of anesthesia, duration of action and intra- or post-administration complications of articaine in comparison with lignocaine for bilateral extraction of maxillary premolars for orthodontic reasons. The study was carried out in 20 patients visiting the Department of Oral and Maxillofacial Surgery, Yenepoya Dental College and Hospital, Mangalore, needing bilateral extraction of maxillary premolars for orthodontic purposes. A volume of 0.6-1 ml of 4% articaine hydrochloride (HCl) was injected in the buccal vestibule on one side and 1-2 ml of 2% lignocaine HCl was injected on the other side. After attaining adequate anesthesia, the extraction procedure was carried out under aseptic conditions. An onset period 0.975 ± 0.1118 and 2.950 ± 0.5104 min and duration of anesthesia of 72 ± 17.275 and 49 ± 5.026 min was found for articaine and lignocaine, respectively. Statistically significant differences were noted in the perception of pain using the visual analogue scale. Articaine can be used as an alternative to lignocaine, especially in the extraction of maxillary premolars for orthodontic reasons. The clinical advantages including rapid onset, longer duration of action and greater diffusing property over lignocaine and the elimination of the need for a painful palatal injection were demonstrated [13].

The current study observed that the mean duration of onset of anesthesia was greater in the lignocaine group as compared to the articaine group. The mean time of onset of anesthesia came out to be 37.38 ± 26.41seconds and 81.56 ± 28.94 s in articaine group and lignocaine group respectively. This difference was statistically significant (P= .02) with the time of onset being faster in articaine group (table 4). Fatma Alzahrani et al compared the anaesthetic efficacy for pain and behaviour during treatment with mandibular infiltration using 4% articaine (BI) with inferior dental nerve clock (IDNB) using 2% lidocaine for extraction or pulp therapy in mandibular primary molars. This was equivalence parallel prospective RCT. A total of 98 children aged 5-9 years old were randomly assigned into two groups: BI supplemented by buccal intrapapillary infiltration with 4% articaine; IDNB with 2% lidocaine supplemented with long buccal infiltration. Behaviour during the injection and treatment procedures was assessed using Wong-Baker

Facial Rating Scale (W-BFRS), Visual Analogue Scale (VAS), and Frankl Behaviour Rating Scale (FBRS). During the injection phase, the absolute differences in success rates between the two techniques were 0.06 (95% CI: -0.11 to 0.23) for VAS and -0.08 (95% CI: -0.19 to 0.03) for the behaviour of the child (FBRS). FBRS results showed the equivalence of the two, whereas the VAS results showed nonequivalence with the 95% confidence intervals slightly exceeding the equivalence margin (±0.20). W-BFRS success rates were 63.3% for both. During the treatment, VAS results showed similar success rates, demonstrating equivalence between the two as did the results for FBRS. The results suggested equivalence in success rates for both anaesthetic techniques during treatment.[14]

CONCLUSION

From the above study the author concluded that atricaine showed a faster onset and longer action of anesthesia as compared with lignocaine HCL. Moreover a lesser volume of articaine was sufficient to induce profound anesthesia and thus, articaine can be used as an alternative to lignocaine as a local anesthetic agent in dental procedures Further studies are recommended.

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