COMPARATIVE EVALUATION OF 2% LIGNOCaine AND 4% ARTICAINE IN INTRAORAL INFILTRATIVE ANAESTHESIA
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ABSTRACT

BACKGROUND
Though lignocaine stands as a time-tested local anaesthetic, articaine is becoming increasingly popular in recent times.

METHODS
This is a prospective double blinded study between 2% lignocaine and 4% articaine both with 1,00,000 adrenaline, carried out on patients reporting for extraction of maxillary premolars for orthodontic reasons. The observations are statistically analysed.

RESULTS
4% articaine is found to have statistically significant difference compared to lignocaine in terms of quicker onset of action and prolonged postoperative pain control. Though the difference exists in terms of depth of anaesthesia favouring articaine the result was not statistically significant.

CONCLUSIONS
4% articaine is found to have superior anaesthetic properties when compared to 2% lignocaine.

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weeks apart. For local anaesthesia, in the first appointment the patients were randomly selected to receive either 2% lignocaine with 1:100,000 adrenaline or 4% Articaine with 1:1,00,000 adrenaline. In the second appointment, the local anaesthetic not used previously was then administered in a crossed manner.

Patients were explained about the visual analog scale (VAS) preoperatively to assess the pain control during the procedure. They were also informed to report the numbness of lip as soon as they feel and similarly about the loss of numbness as soon as noticed to assess the onset and duration of action respectively.

The selected patients were made to sit comfortably on the dental chair and were asked to rinse their oral cavity with chlorhexidine mouthwash. A sterile gauge piece was used to dry the tissues around the site of needle penetration. The cartridges were loaded, and 1.5 ml of the local anaesthetic solution is injected in to the buccal vestibule of the teeth to be extracted. The depth of penetration is limited to the periapex of the involved tooth. The remaining 0.2 ml of the solution is injected in to the palatal mucoperiosteum. All the extractions were performed by a single operator following strict aseptic protocols. During extraction procedure, patients were periodically questioned about pain and were evaluated using VAS.

The patients were assessed for Onset of anaesthesia, Depth of anaesthesia and Duration of anaesthesia.

Onset of anaesthesia – It is the time lapsed from the withdrawal of syringe (after infiltration) to the patient’s first report of numbness of the lips.

Depth of anaesthesia- It is assessed in terms of pain during extraction as measured by VAS ranging from 0- 100.

Duration of anaesthesia - It is the time lapsed from the onset of anaesthesia to the patient’s report on loss of numbness.

The observations were tabulated, and the results were statistically analysed using Independent t-tests

RESULTS

Among the twenty patients who participated in the study 17 patients were in the age between 13-20 years and 3 were in the age between 20-30 years (Figure 1). 8 patients were male and 12 were female (Figure 2)

Time of onset of anaesthesia (Figure 3)

The mean time of onset of anaesthesia in the articaine group was 47 ± 14.44 s and it was 82 ± 18.92 s in the lignocaine group. The difference (P <0.001) was found to be Statistically significant. The time of onset of anaesthesia was significantly faster in articaine group than in lignocaine group.

Depth of anaesthesia (Figure 4)

As mentioned previously the depth of anaesthesia was assessed by the pain ratings during extraction. VAS was used to rate the pain during extraction. The mean pain score in the articaine group was 21.5 ± 8.59 and it was 23.5 ± 9.19 for the lignocaine group. Though the pain scores were less with articaine the results were not statistically significant (P = 0.482).

Duration of anaesthesia (Figure 5)

In articaine group, the mean duration of anaesthesia was 128 ± 15.31 min were as it was 86 ± 13.14 min for the lignocaine group. There was a statistically significant difference (P <0.001) showing that articaine has longer duration of action compared to lignocaine group.

<table>
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</table>

Table 1

![Figure 1. Age Distribution](image1)

![Figure 2. Distribution of Gender](image2)
DISCUSSION

Pain control in dentistry is a challenging task since ancient times and thus many dentists emerged as anaesthetist themselves. The credit of introducing general anaesthesia to the medical world goes to Horace Wells, a dental surgeon who inhaled nitrous oxide and got his tooth extracted in the year 1844. The era of local anaesthetics started with the discovery of Cocaine in 1860. Lignocaine was introduced in the year 1942 by Lofgren and Lundquist. Its high efficacy, low allergenicity and minimal toxicity had made it to a gold standard drug against which all newer local anaesthetics are compared. Later several newer drugs such as Bupivacaine, Etidocaine, Mepivacaine etc. were discovered.

Articaine is an amide type of local anaesthetic discovered by Rusching et al in 1969. It was renamed as articaine when it entered clinical practice in Germany in 1976. The chemical structure of articaine is different from other local anaesthetics due to substitution of the aromatic ring with a thiophenic ring, and the presence of an additional ester chain. This provides Articaine with increased liposolubility, intrinsic potency, as well as greater plasma protein binding when compared to other commonly used local anaesthetics. These differential characteristics are in turn reflected clinically by a shorter latency and increased duration of action, as well as superior bony tissue diffusion.

Demographics

As mentioned previously, among the twenty patients who participated in the study 8 were male and 12 were female. 17 patients were in the age between 13-20 years and 3 were in the age between 20-30 years, suggesting that orthodontic treatment for alignment of teeth is carried out more commonly in females in the second decade of life. This was in concurrence with other previous studies.

Onset of Action

Onset of action is theoretically related to the pka value of the drug. Lesser the pka value shorter is the latency period or in other words quicker the onset of action and hence, articaine with a shorter pka value of 7.8 (compared to lignocaine of pka 7.9) has a rapid onset of action.

Also, rapid diffusion in to the tissues owing to its high lipid solubility is also responsible for quicker onset of action. This has been proved in the previous studies by Hassan et al and costa et al and our study confirms the same. In our study statistically significant variation between the two agents was observed in terms of onset of anaesthesia. The mean time of onset for articaine group was 47 ± 14.44 s and for lignocaine group it was 82 ± 18.92 s. Thus, with faster onset of action, procedure can be started almost immediately after infiltration of articaine.

Depth of Anaesthesia

Depth of anaesthesia is assessed by adequacy of pain control during the procedure. Articaine is found to be 1.5 times more potent than lignocaine in pain control. Measurement of pain is difficult to establish because its perception and intensity are multifactorial, encompassing sensorial and affective factors.

Visual analog scale (VAS) was used to record the pain ratings. Although VAS may show deficiencies regarding understanding and perception, it provides a validated and meaningful measure of anaesthetic efficiency and is used by many authors for this purpose.

According to previous studies by Malamed et al and Rebollodo et al. articaine is found to have better pain control properties than lignocaine. This was evident in our study as well with articaine having a mean pain score of 21.5 ± 8.59 and lignocaine having a score of 23.5 ± 9.19. However, the results were not statistically significant (p = 0.482).

Gregorio et al reported the intra operative analgesia evoked by Articaine is attributed to the presence of thiophene group in the molecule which increases liposolubility and is responsible for ready diffusion of the drug in to the tissues.

Additional interesting fact noted during the study was anaesthesia of the palatal mucoperiosteum by buccal infiltration of articaine, alleviating the need for painful palatal injection. This is again attributed to better diffusion properties of articaine and was in accordance with the article.


CONCLUSIONS

Even after 75 years of its discovery, lignocaine still holds its place as the gold standard drug in our day to day dental practice. This is mainly attributed towards its good pain controlling ability during the procedure as well as to the very low incidence of toxicity and allergic reactions to lignocaine. On the other hand, the clinical application of articaine has shown a gradual increase, especially in the last two decades. The drug has become popular among the dental surgeons because of its good diffusion properties alleviating the need for the painful palatal injection.

Articaine is found to have superior properties compared to lignocaine in terms of quicker onset of action, and prolonged postoperative pain control. Though the difference exists in terms of depth of anaesthesia favouring articaine, it was not statistically significant. Hence, further controlled comparative clinical trials with a larger sample size is needed to evaluate the clinical efficacy of articaine HCl.

REFERENCES