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Is Articane and Lidocaine the Same? Which is Safer?

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Abstract: ***Background: Ever since the inception of lidocaine into dentistry, it has been considered as a gold standard. But with the upcoming advancements, it is not the only choice these days. This study aimed to investigate and compare the efficacy of articaine (4%) buccal infiltration with lidocaine (2%) posterior superior alveolar nerve block in cases of maxillary teeth extraction. Methods: Twenty six subjects (in their middle-age) were recruited into this study and were referred for a simple dental extraction of maxillary second molar. They were divided randomly using double blind method into two groups that received standard posterior superior nerve block (2% lidocaine with 1:100,000 epinephrine) and buccal infiltration (4% articaine with 1:100,000 epinephrine) respectively followed by descriptive analysis of data using SPSS software. Results: Articaine as buccal infiltration produced faster onset and shorter duration of anaesthesia than lidocaine as PSA nerve block. Moreover, lidocaine group needed more supplemental injections. Conclusion: Buccal infiltration with 4% articane has high success rate. It avoids complications that occur due to the use of supplemental injections and therefore, can be considered as a good alternative for PSA nerve block.***

Keywords: Articaine, Lidocaine, Extraction

1. Introduction

Local anaesthetics are the most frequently used injectable form of drugs in practice that reversibly impede nerve impulse conduction and produce reversible loss of sensation at their administrated site. When a local anaesthetic solution is injected near the nerve, the solution interferes with the uptake of sodium from outside to inside the nerve. It blocks the specific sodium channels, thereby blocking the sodium uptake. This decreases the nerve excitability below a critical level and nerve impulses fail to propagate along the axon. Since axons carry pain sensations, these sensations will not be carried and a blockage of pain results. There are two types of local anaesthetics, amides and esters. Articaine and lidocaine, both are amides. However, articaine is chemically unique in that it has an ester group attached to its molecule which can be acted upon by plasma cholinesterase to render it ineffective. Therefore, it is the only amide which is metabolized in the blood stream, not in the liver. Rapid metabolism of this ester bond gives it a short duration. Unlike benzene ring, it has a thiophene ring which aids in better lipid solubility and efficiently aims at the target receptors due to increased diffusion across the lipophilic nerve membrane making it a fast onset anaesthesia. Protein binding of articaine is high (94%) and it may provide a longer duration of anaesthesia.

Articaine was first derived from carticaine by Rusching in 1969. It came into dental practice in 1973 and became popular among dentists in around 1977. Articaine is supplied as articaine HCL 4% solution with epinephrine 1:100,000 and as articaine HCL 4% solution with epinephrine 1:200,000. It is indicated for local, infiltrative, or conductive anaesthesia in both simple and complex dental and periodontal procedures. Articaine is considered to be a safe drug to be used in patients of any age group or patients on anticoagulants and antiplatelet drugs that might be prone to heavy bleeding. Hence, regional nerve block should be discouraged to prevent unnecessary hematoma and bleeding. Furthermore, single buccal infiltration with 4% articaine produces profound pulpul, buccal and palatal anaesthesia without the need of palatal anaesthesia due to its high diffusion capability. PSA nerve block is associated with some complications. Most common complication is injury to pterygoid venous plexus that leads to formation of hematoma. Other complications of PSA nerve block include trauma to sensory and motor nerves, trismus and blurred vision. The earlier studies proved articaine to be the safest local anaesthetic as it is metabolized rapidly in blood. On the contrary, recent studies said that it is associated with permanent paraesthesia in case of mandibular teeth because of the close proximity of nerve trunk to its administration site. But, such complications can be avoided by using infiltration technique and aspirating the syringe.

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LA	MAXIMUM RECOMMENDED DOSAGE (mg/kg)
ARTICAINE	7
LIDOCAINE (with vasoconstrictor)	7
LIDOCAINE (without vasoconstrictor)	4.5

This study compared the efficiency of buccal infiltration using 4% articaine (1:100,000 epinephrine) with posterior superior alveolar nerve block using 2% lidocaine (1:100,000 epinephrine) in cases of maxillary tooth extraction.

2. Patients and Methods

This study was a randomized double-blind clinical trial that compared the anaesthetic efficacy of articaine with buccal infiltration (4% articaine with 1:100,000 epinephrine) and lidocaine with PSA nerve block (2% lidocaine with 1:100,000 epinephrine). Patients included in the present study were referred to an oral and maxillofacial surgeon for simple dental extraction of maxillary second molar. Twenty six patients in their middle age were selected and included in the study. Patients were told about the procedure and an informed consent was duly signed by them before participating in the study. The study was carried out at Narula's Dental and Implant Clinic, Patiala, Punjab, India in accordance with the ethical standards.

Inclusion Criteria:

- Patients who needed simple tooth extraction.
- No history of systemic disease and allergy.

Exclusion Criteria:

- Refused to sign the consent.
- H/O systemic illness.
- H/O allergy to LA and bisulfites.

Patients were split into two groups, buccal infiltration (4% articaine with 1:100,000 epinephrine) was given to one group and posterior superior alveolar nerve block (2% lidocaine with 1:100,000 epinephrine) supported with greater palatine nerve block (2% lidocaine and 1:100,000 epinephrine) was given to the second group. Dental syringe with 27 gauge needle was used to inject the local anaesthesia. Extractions were carried out by an oral surgeon without knowing the local anaesthetic drug and injection technique. Also, the patients were not aware of local anaesthetic drug being used and were asked to rate the pain experienced during the procedure.

3. Results

Total 26 patients (11 women and 15 men), in their middle age were included into the study. All subjects completed the study and none was excluded from it. In the articaine group, 3 patients (23%) reported pain and 10 patients (76.9%) reported no pain. In contrast, 4 patients (30.7%) of lidocaine group reported pain and 9 patients (69.2%) reported no pain.

	PAIN (number of patients)	NO PAIN (number of patients)	TOTAL
ARTICAINE	3	10	13
LIDOCAINE	4	9	13
TOTAL	7	19	26

Calculations:

$X^2 = 0.195$
$n = 1$
$p = 0.66$

However, no statistically significant difference was seen after evaluation through Chi-square test as p-value is greater than 0.05 ($p = 0.66$).

4. Discussion

The study compared the efficacy of buccal infiltration using 4% articaine (1:100,000 epinephrine) with posterior superior alveolar nerve block using 2% lidocaine (1:100,000 epinephrine). Both proved to be equally effective since there was no statistical significant difference between them. It has showed that articaine had faster onset of anaesthesia than lidocaine because of its greater lipid solubility and diffusion capacity and thus, penetrates better into the bone. Therefore, single buccal infiltration using 4% articaine (with 1:100,000 epinephrine) produced pulpal, buccal and palatal anaesthesia without the need of palatal anaesthesia. Articaine produced shorter duration of anesthesia (60 minutes) than lidocaine (90 minutes) as it is metabolized in blood.

4% articaine is a safer dose to be used in children. Buccal infiltration with 4% articaine is more effective during primary dentition because bone covering primary maxillary molars is thin. In addition to it, the effectiveness of articaine with buccal infiltration has observed in anaesthetizing mandibular teeth with buccal infiltration supported with lingual nerve block. Studies have showed that the success of infiltration of articaine with lingual nerve block was almost similar to the outcome of inferior alveolar nerve block (2% lidocaine) and also reduces post anaesthetic complications, such as lip biting associated with IANB.
The use of 4% articaine for simple extraction procedures has been advocated safe in this study. However, further research needs to be conducted to test the efficacy of articaine in complex surgeries.

5. Conclusion

The present study has proved that 4% articaine (1:100,000 epinephrine) with buccal infiltration and 2% lidocaine (1:100,000 epinephrine) with PSA nerve block produces similar effects. So, buucal infiltration with 4% articaine can be used as a good alternative option for PSA nerve block with 2% lidocaine. It is safe, reduces number of injections and also avoids the complications related to PSA nerve block like hematoma.

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