EFFICACY OF 2% LIDOCAINE WITH 4% ARTICAINE: A COMPARATIVE STUDY

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MASTER OF DENTAL SURGERY

IN

ORAL AND MAXILLOFACIAL SURGERY

By

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Under the guidance of

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(Faculty of Babu Banarasi Das University)

BATCH: 2021-2024

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I hereby declare that this dissertation entitled **EFFICACY OF 2% LIDOCAINE WITH 4% ARTICAINE: A COMPARATIVE STUDY** is bonafide and genuine research work carried out by me under the guidance of **Dr. Hemant Mehra,** Reader, Department of Oral and Maxillofacial Surgery, Babu Banarasi Das University, College.

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Dr. PALLAVI RAI

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LIST OF ABBREVIATIONS

ABBREVIATED FORM	FULL FORM
%	PERCENTAGE
IANB	INFERIOR ALVEOLAR NERVE BLOCK
ASA	AMERICAN SOCEITY OF ANAESTHESIOLOGISTS
VAS	VISUAL ANALOGUE SCALE
BI	BUCCAL INFILTERATION
LA	LOCAL ANESTHETIC
SBP	SYSTOLIC BLOOD PRESSURE
DBP	DIASTOLIC BLOOD PRESSURE

ABSTRACT

Background of the study: Using inferior alveolar nerve method, an investigation was conducted to compare the anesthetic efficacy of 2% lidocaine against 4% articaine, both with epinephrine 1:100,000, during the surgical extraction of bilateral impacted lower third molars.

Design of study: Twenty-five patients scheduled for bilateral surgical extraction of impacted lower third molars participated in a randomized, double-blind clinical study. A local anesthetic solution containing 4% articaine on one side and 2% lidocaine on the other was used, both with the same concentration of vasoconstrictor (epinephrine 1:100,000). The amount of anesthetic solution employed, the haemodyanamic parameters, and the latency (time to onset) and duration of the anesthetic effect were the study factors for both anesthetic solutions.

Materials and Methods: Twenty-five medically sound individuals took part in this double-blind, randomized clinical cross-over trial. Both the patient and the operator were unaware of the identity of the third party that created the local anesthetic solution. On one side of the patient, one of the two types of LA solutions was used for the extraction of the third molar. At a later session, another LA solution that was part of the study was used after the extraction was completed and the different study variables were assessed.

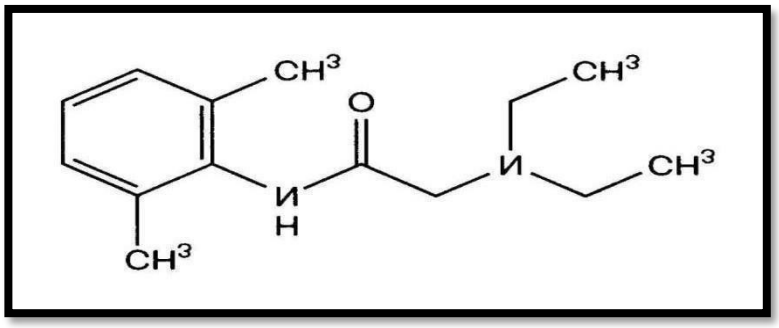
Results: There were statistically significant variations in the duration and time of anesthesia between the 4% and 2% lidocaine solutions. Specifically, the mean time of onset for 4% articaine was 177 seconds, compared to 123 seconds for 2% lidocaine. For 4% Articaine, the average duration of anesthetic is 2 hours 40 minutes, while for 2% lidocaine, it is 2 hours 5 minutes. This demonstrates that the average length of anesthesia was much longer in the 4% Articaine group than in the Lidocaine group. Other hemodynamic measures (blood pressure, oxygen saturation, respiration rate, etc.) did not change.

Conclusion: 4% articaine works better clinically than 2% lidocaine when comparing the latency and duration of the anesthetic action. However, there were no statistically significant differences in the two solutions' anesthetic efficacy based on other hemodynamic features.

Keywords : Efficacy , Articaine, Lidocaine , Impacted, mandibular third molar, Randomized Clinical study

INTRODUCTION

Local anesthesia is the loss of feeling in a particular part of the body caused by a reduction in nerve ending excitation or a process inhibition in peripheral nerves. It leads in sensory loss but does not cause loss of consciousness. Pain control is the main function of local anesthetic in dentistry. Cocaine was the first medication used to treat pain in dentistry, and it was first used in 1884. Adrenaline was discovered by Abel in 1903. Broun suggested using adrenaline as a "chemical tourniquet" to increase the time that local anesthetics work. Einhorn developed the ester anesthetic procaine in 1904. A whole new class of local anesthetics, the amides, were introduced in the 1940s. Diethyl-2, 6-dimethyl acetanilid, or lignocaine, was first produced and marketed by Nils Lofgren in 1943. It is a commonly used local anesthetic that, when combined with adrenaline, can effectively reduce pain and numb tooth tissue for 60 to 90 minutes. Lidocaine is the gold standard anesthetic.



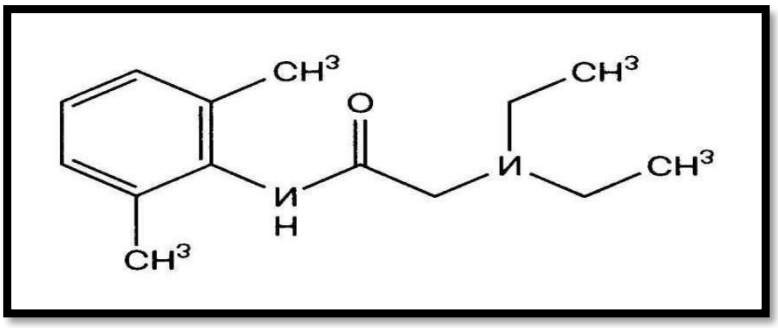
It is an amide anesthetic with a quick start of action and a modest duration of anesthesia when coupled with epinephrine. As the gold standard, the potency of various local anesthetics is currently compared to that of lidocaine. For pulp level and soft tissue, the approximate duration of lidocaine's anesthetic effect in a 2% solution including epinephrine as a vasoconstrictor is 85 minutes and 180 minutes, respectively. Between two and three minutes is the latent period of lidocaine action. Its half-life as an anesthetic is 1.6 hours. 4. Lidocaine is used in both minor surgical operations and dental surgery.

Articaine hydrochloride is a methyl ester of 4-methyl-3-(propyl-amino) propionamido-2-thiophene carboxylic acid, a local anesthetic having an amide structure and a molecular weight of 320.846. Carticaine was first synthesized in Germany in 1969 by Rusching et al. Enhanced bone diffusibility and hemostasis are the main advantages of articaine.8The duration of a drug's effects is contingent upon several factors, including the degree of protein

binding, the site of injection, and the concentration of vasoconstrictor in the anesthetic solution. Block anesthetics and maxillary and mandibular infiltrations are both utilized for routine dental operations. Articaine has been said to have a short half-life, excellent periosteal penetration, strong anesthetic properties, and minimal toxicity.The intent of this research was to evaluate and compare the anesthetic efficacy of 2% lignocaine with 1:80,000 adrenaline and 4% articaine with 1:100,000 adrenaline in adult patients undergoing the conventional inferior alveolar nerve block surgery for the extraction of their mandibular third teeth.

PHARMACOLOGY

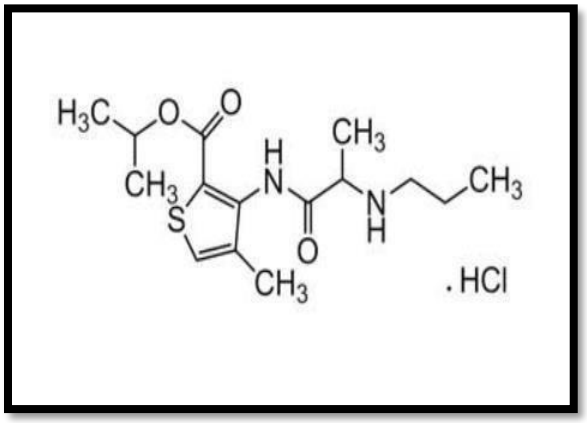
The most widely used amide local anesthetic is lignocaine (2-Diethylamino 2',6-acetoxylidide hydrochloride). Microsomal fixed function oxidases in the liver convert lignocaine to monoethyiglyceine and xylidide. Local anesthetic xylidide has the potential to be harmful. Lignocaine is eliminated by the kidneys, with more than 80% different metabolites and less than 10% unaltered. It has a half-life of 1.6 hours for anesthesia. Manufacturer-recommended maximum doses for lidocaine with epinephrine are 6.6 mg/kg and 4.4 mg/kg, respectively.[2]



Since it has a thiophene ring rather than a benzene one, articaine (4-methyl-3-[2-(propylamino) - propionamido]-2-thiophene-carboxylic acid, methyl ester hydrochloride) is a special type of amide LA. More of a dosage provided can enter neurons thanks to thethiophene ring's increased lipid solubility and efficacy. It is the only amide anesthetic with an ester group, making it hydrolyzable by all blood esterases. The biotransformation of

articaine's amide linkage occurs in the liver, which is a somewhat slow process. Articaine is also quickly inactivated by serum esterases after injection. About 90% of articaine swiftly breaks down through blood-borne hydrolysis into its inactive metabolite, articainic acid, which is eliminated by the kidneys as articainic acid glucuronide.

Articaine has a half-life of 20 minutes in the elimination serum while articainic acid has a half-life of 64 minutes. Articaine can be used at a concentration higher than other amide LAs because it has an equal analgesic efficacy and a lesser systemic toxicity (a large therapeutic range). The beneficial correlation between endurance of the local anesthetic effect and low systemic toxicity is thought to be due to local saturation of serum esterases, which results in slower and longer metabolism. The maximum dosage for articaine and epinephrine is 7 mg per kilogram. The prolonged clinical activity of articaine may be caused by its increased propensity to bind firmly to protein receptor sites, which may contribute to the prolonged duration of the local anesthetic effect. No connection can be made between the local anesthetic action of articaine and its serum levels.



AIM
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OBJECTIVES

AIM

The study's goal is to evaluate the effectiveness of articaine and lidocaine for the surgical removal of an impacted third molar.

OBJECTIVES

- To evaluate the effectiveness of articaine and lidocaine for the surgical removal of an impacted third molar in the mandible.
- To compare with lidocaine and analyze the length of time anesthesia lasts following an injection of articaine
- To observe the effects of the combination of lidocaine 2% and articaine 4% on the cardiovascular system.
- To record subjective and objective symptoms.

REVIEW OF LITERATURE

Kimmo Vahatalo *et al* (1993)[1], conducted a comparative double blind study to assess the anesthetic qualities of lidocaine with 1:80,000 epinephrine and articaine hydrochloride with 1:2,000,000 epinephrine for maxillary infiltration anesthesia., twenty volunteers who were healthy dentistry students participated. At various periods, each participant was given 0.6 ml of each test solution. The upper lateral incisor was used for the infiltration anesthetic procedure. An electric pulp testor was used to track the start and length of anesthesia. The outcome demonstrated that all 40 infiltrations produced total anesthesia. Compared to the 2% lidocaine preparation, the articaine solution had a 14-second lower latency time and a 45-second longer anesthetic duration.For minor dental treatments, both of the tested local anesthetics quickly and sufficiently provide anesthesia. Regarding the onset and duration of action, they could not discover any statistically significant differences between the lidocaine and articaine solutions.

Childers M *et al* (1996)[3], conducted a experimental double blind study The goal was to evaluate the anesthetic effectiveness of intraligamentary injections in mandibular posterior teeth with 4% articaine with 1:100,000 epinephrine and 2% lidocaine with 1:100,000 epinephrine, given using a computer-controlled local anesthetic administration system. Intraligamentary injections of 4% articaine with 1:100,000 epinephrine and 2% lidocaine with 1:100,000 epinephrine were randomly given to 51 subjects on the mesial and distal aspects of a mandibular first molar at two separate appointments using a computer-controlled local anesthetic delivery system. The study design was a crossover design. The mandibular first and second molars as well as the second premolar were tested for anesthesia using a pulp tester every two minutes for a total of sixty minutes. The effectiveness of 4% articaine with 1:100,000 epinephrine for intra-ligamentary injections was found to be comparable to that of 2% lidocaine with 1:100,000 epinephrine, according to the authors' conclusions.

Stanley F. Malamed et al (2001)[2], conducted randomized, double-blind, parallel-group, active- controlled multicenter studies to evaluate the safety and effectiveness of lidocaine and articaine (4% with epinephrine 1:100,000). 1325 participants in all took part in these studies, and 882 of them were given 4% articaine mixed with 1:100000 epinephrine.Excluding post-procedural oral discomfort, the combined studies showed an overall incidence of adverse events of 22% for the articaine group and 20% for the lidocaine

group. These included headache (4%), facial edema,infection, gingivitis, and paresthesia (1%). The frequency of these occurrences matched the data reported for participants administered lidocaine. Paresthesia (0.9 percent), hypesthesia (0.7 percent), headache (0.55 percent), infection (0.45 percent), and rash and pain (0.3 percent each) were the most commonly reported side effects associated with articaine use.The authors came to the conclusion that Articaine is a safe, efficient, and well-tolerated local anesthetic that can be used in clinical dentistry.

Van Eden S P Patel M F *et al* (2002)[4], conducted a recent multicentre single dose randomised double blind multicentre trial which examined the frequency of adverse events in individuals treated with lignocaine and articaine, included 1325 patients. In general, 22% of adverse events occurred in the articaine group and 20% in the lignocaine group. Following the treatment of articaine, the most common adverse effects recorded were rash and discomfort (0.3%), infection (0.45%), headache (0.55%), paraesthesia (0.9%), and hyperaesthesia (0.7%). This multicenter trial's result was that articaine is a safe, effective, and well-tolerated local anesthetic that can be used in clinical dentistry. Its fast breakdown to an inactive metabolite, articainic acid, is said to have several benefits, including low systemic toxicity; a quicker time to surgical analgesia (2.2 min) and faster elimination time than lignocaine; better diffusion through soft tissue and bone than other local anesthetics; and no toxic effects in healthy individuals after an accidental intravascular injection.

Claffey, Elizabeth *et al* (2004)[5] , conducted a prospective, randomized, double-blind study with aim to assess the anesthetic effectiveness of 2% lidocaine with 1:100,000 epinephrine versus 4% articaine with 1:100,000 epinephrine for inferior alveolar nerve blocks in patients with mandibular posterior teeth irreversibly pulpitis. Using a traditional inferior alveolar nerve block, 72 emergency patients with irreversible pulpitis of a mandibular posterior tooth were randomly assigned to receive 2.2 ml of 4% articaine with 1:100,000 epinephrine or 2.2 ml of 2% lidocaine with 1:100,000 epinephrine in a double-blind fashion. Fifteen minutes after the solution was deposited, endodontic access could start, and all patients had to be completely numb on their lips. Success was characterized by minimal or nonexistent discomfort during endodontic access or early instrumentation (visual analog scale recordings). In cases when articaine was used to block the inferior nerve, the success rate was 24%, whereas 23% of cases did not require this method. At $p< 0.89$, the authors came to the conclusion that there was no discernible difference between the solutions containing articaine and lidocaine. In

individuals suffering from irreversible pulpitis, neither solution produced a satisfactory anesthetic success rate.

Oliveira P.C *et al* (2004)[6], conducted a double blind cross-over study to assess the pain experienced following buccal and palatal infiltrative injections using 2% lignocaine and 4% articaine with a 1:100,000 adrenaline ratio, as well as the start of action of pulpal and soft tissue anesthesia. Twenty adult, healthy volunteers were randomly assigned to have an infiltration anesthesia with the solutions in the buccal and palatal regions of the upper right canine during two appointments spaced at least two weeks apart. A pulp tester was used to test the tooth both before and after the injection to see if it returned to the baseline threshold level. The visual analogue scale (VAS) was utilized to confirm the discomfort experienced as a result of the palatal injection. Wilcoxon's test was used to analyze the data (alpha=0.05).Regarding VAS (p=0.45), onset of action (p=0.80), pulpal (p=0.08), and soft tissue (p=0.18) anesthesia duration, there were no statistically significant differences between the solutions; however, if a large number of volunteers had been used, pulpal anesthesia might have achieved stastical significance.The authors came to the conclusion that the anesthetic solutions demonstrated comparable pain perception.

Nusstein J (2005)[7], conducted a prospective ,randomized, double blind study to compare the level of pulpal anesthesia achieved in inferior nerve blocks using 2% lidocaine and 4% articaine with 1:100000 epinephrine. In a double-blind fashion, 57 participants received random administration of inferior alveolar nerve at two distinct sessions using a crossover technique.Pulpal anesthetic rates that were successful with the articaine solution ranged from 2 to 48%. The anesthetic needed for inferior alveolar nerve blocks with 4% articaine and 1:100000 epinephrine was found to be comparable to that of 2% lidocaine and 1:100000 epinephrine, according to the authors' findings.

Costa CG et al (2005)[8], conducted Randomized Controlled Trial study to evaluate the beginning and length of pulpal anesthesia through maxillary infiltration with 2% lidocaine and 1:100,000 epinephrine, 4% articaine and 1:200,000 epinephrine, and 4% articaine and 1:100,000 epinephrine.Twenty fit individuals who underwent surgical dental operations and were given 1.8 ml of one of the three local anesthetics were assessed. An electric pulp tester was used to determine the start and duration. The average times for the pulpal onset and duration of 2.8, 1.6,and 1.4 minutes for 2% lidocaine with 1:100,000 epinephrine, 4%

articaine with 1:200,000 epinephrine, and 4% articaine with 1:100,000 epinephrine, respectively, were recorded. The Kruskal-Wallis non parametric test statistical analysis revealed significant differences between the two articaine solutions and the lidocaine solution, with the former showing better results (shorter onset and longer duration periods).In comparison to the lidocaine solution, the authors found that both articaine solutions generated pulpal anesthesia by maxillary infiltration with a shorter onset and a longer duration.

Berlin J, et al(2005)[9], conducted prospective, randomized, double-blind study to assess the effectiveness of lidocaine and articaine when used in a computer-controlled local anesthetic administration system for a main intraligamentary injection. Using a crossover design, 51 subjects underwent two separate appointments where an intraligamentary injection of 1.4 ml of 4% articaine with 1:100,000 epinephrine was randomly given using a computer controlled local anesthetic delivery system on the mesial and distal aspects of the mandibular first molar. The procedure was double blind. In their investigation, the authors found that for intraligamentary injections, the effectiveness of 4% articaine with 1:100,000 epinephrine was comparable to that of 2% lidocaine with 1:100,000 epinephrine.

Jason Bigby et al (2006)[10], conducted a clinical trial study to evaluate the heart rate impact and anesthetic effectiveness of 4% articaine mixed with 1:100000 epinephrine for further intraosseous injection in mandibular posterior teeth with irreversible pulpitis. After receiving an inferior nerve block and being diagnosed with irreversible pulpitis of the mandibular posterior tooth, thirty-seven patients had moderate to severe pain during endodontic access. According to the results, 86% of patients had success with anesthesia.During the intraosseous injection, the maximum mean heart rate increased by 32 beats per minute. It was determined that in mandibular posterior teeth of patients presenting with irreversible pulpitis, an intraosseous injection of 4% articaine mixed with 1:100000 epinephrine would be 86% effective in producing pulpal anesthesia in cases where inferior alveolar nerve block fails to provide profound anesthesia.

Mohammad Dib Kanna *et al* (2006)[11], conducted a randomized, crossover double-blind trial in order to achieve pulpal anesthesia of mandibular first molar teeth, 31 healthy volunteers were compared between buccal infiltration of 4% articaine with 1:100,000 epinephrine and buccal + lingual infiltration of the same medication. Data were contrasted

with an inferior alveolar nerve block's effectiveness. Examining the literature 27 times using a cohort of 27 volunteers and 2% lidocaine to 1:80,000 epinephrine. Using electronic pulp testing, anesthesia was established. They came to the conclusion that, like an IANB, the discomfort caused by buccal infiltration with articaine was volume dependant ($p = 0.017$).

Paul A. Moore *et al* (2006)[12] , conducted a double blinded, randomized, multi centric clinical trials to compare 4% articaine with 1:1,00,000 (A200) epinephrine to 4% articaine without epinephrine, in order to ascertain the clinical anesthetic properties and efficacy of the latter. Two trials with a total of 126 people were enrolled (63 subjects in each trial).The success rate for profound anesthesia (EPT score >80), the mean start times, and the mean duration of anesthesia were comparable for both epinephrine-containing formulations in the mandibular and maxillary trials.(A100 AND A200). Aw/o, the formulation without epinephrine, had a much lower success rate for profound anesthesia in the subjects who got it. They came to the conclusion that in order to achieve profound anesthesia, epinephrine must be included in formulations of 4% articaine anesthetic. They discovered that A200 offered pulpal anesthesia at a level similar to A100 formulation.

Rosenberg PA *et al* (2007)[13], conducted a randomized, double-blind trial was conducted to Compare the effectiveness of 2% lidocaine and 4% articaine as supplemental anesthetics with 1:100,000 epinephrine. In a double-blind fashion, 48 patients with irreversible pulpitis who needed further buccal infiltration for endodontic therapy were administered 4% articaine with 1:100,000 epinephrine or 2% lidocaine with 1:100,000 epinephrine. The patient's reaction to discomfort following a follow-up injection was assessed using a conventional VAS pain scale.Following supplemental anesthetic, the mean VAS score for 4% articaine with 1:100000 epinephrine and 2% lidocaine with 1:100000 epinephrine was 15.28 and 19.70, respectively. The average percentage change in the VAS score for lidocaine and articaine was 62.2% and 70.5, respectively. They came to the conclusion that, when used as supplemental anesthetic, 4% articaine with 1:00,000 epinephrine and 2% lidocaine with 1:00,000 epinephrine did not differ statistically significantly in the VAS pain score.

Sierra-Rebolledo A, et al (2007)[14] conducted a randomized double-blind clinical trial study to assess the anesthetic effectiveness of 2% lidocaine versus 4% articaine in an inferior nerve block solutions were used in the same volumes (2.7 mL = 108 mg of articaine + 27 μg (A100) or 13.5 μg (A200) of epinephrine). No matter how much bone was removed, the two

solutions gave comparable postoperative analgesic durations (around 200 minutes; P >.05). The duration of anesthetic activity on soft tissues was similar for both solutions (about 250 minutes; P >.05). The intraoperative bleeding was rated by the surgeon as quite near to minimal. Although there were brief variations in hemodynamic parameters, neither the type of anesthetic administered nor its clinical significance could be attributed to them (P >.05).The authors came to the conclusion that the clinical effectiveness of the local anesthetic is unaffected by an epinephrine concentration of 1:1, 00,000 or 1:2, 00,000 in 4% articaine solution. For lower third molar extraction, with or without bone removal, the 4% articaine formulation can be used with a lower dose of epinephrine (1:2, 00,000, or 5 ug/ml) with success.

Evans G, et al (2008)[17] conducted randomized double blind crossover study to assess the anesthetic effectiveness in the maxillary lateral incisor and first molar, 4% articaine with 1:100000 epinephrine and 2% lidocaine with 1:100000 epinephrine were used.In a blinded fashion, 80 participants were assigned to receive maxillary lateral incisor and first molar infiltrations of either 4% articaine with 1:100000 epinephrine or 2% lidocaine with 1:100000 epinephrine at two distinct sessions that were at least one week apart. When compared to lidocaine, which had a 62% anesthetic success rate in maxillary lateral incisors, articaine demonstrated a much greater success rate of 88%. There was no discernible difference between the two solutions in maxillary first molar articaine's success rate (78% vs.73%), which was comparable to lidocaine's. The authors came to the conclusion that, in the lateral incisor but not in the first molar, maxillary infiltration with 4% articaine with 1:100000 epinephrine statistically enhanced anesthetic success.

Haase A, et al (2008)[18] conducted a prospective ,randomized, crossover study comparing the level of pulpal anesthesia attained after an inferior alveolar nerve block using 4% articaine with 1:100000 epinephrine and 2% lidocaine with 1:100000 epinephrine through mandibular first molar buccal infiltrationations of both anesthetic solutions. After receiving a standard IAN block using 4% articaine with 1:100000 epinephrine in a crossover design, 73 blinded adult subjects were randomly assigned to receive buccal infilteration at the first molar site with a catridge of 4:100000 epinephrine at one appointment and a catridge of 2% lidocaine with 1:100000 epinephrine at another appointment. . Following the injections, the first molar was tested for anesthesia by the authors using an electric pulp tester for 60 minutes, broken up

into three- minute cycles. In comparison to 2% lidocaine with 1:100000 epinephrine, the authors found that 4% articaine with that ratio had a better success rate.

IL-Young Jung et al (2008)[19],conducted a crossover study to evaluate the difference in mandibular first molar anesthetic efficacy between buccal infiltration (BI) and inferior alveolar nerve blocks. With two appointments spaced out by at least a week, each participant got a standard IANB or BI of 1.7 ml of 4% articaine with 1:100000 adrenaline (septanest;septodont) using a crossover design.An electric pulp tester was used to measure pulpal anesthesia. Of the IANB, 43% and 54% of the BI were successful; the difference was not statistically significant (p=0.34).With BI, pulpal anesthesia started much more quickly (0.03).Because buccal infiltration (BI) with 4% articaine for mandibular first molars had a faster onset and a similar success rate to IANB, the authors concluded that BI can be a beneficial alternative for physicians.

Ian P. *et al* (2008)[20], conducted a randomized, controlled trial in which 31 healthy volunteers were asked to assess the effectiveness of buccal plus lingual infiltration of the same medication dose in producing pulpal anesthesia in the mandibular first molar teeth between 4% articaine and 1:100,000 epinephrine infiltration. In a cohort of 27 volunteers, data were compared with the effectiveness of an inferior alveolar nerve block using 2% lidocaine and 1:80,000 epinephrine. Electronic pulp testing was used to determine anesthesia. For mandibular permanent first molars, there was no difference in the effectiveness of buccal and buccal plus lingual infiltration of articaine with epinephrine in producing pulpal anesthesia (p=0.17). Compared to buccal infiltration, subjective tooth numbness was more prevalent following IANB (p=0.005). The authors came to the conclusion that an IANB employing lidocaine and epinephrine for a 30- minute research period was more effective at achieving first molar pulp anesthesia than 4% articaine with epinephrine infiltrations.Articaine buccal infiltration caused discomfort that was comparable to an IANB and volume dependant (p=0.017).

Srinivasan N, et al (2009)[21] conducted a randomized, double blind study to evaluate the anesthetic effectiveness of 2% lidocaine and 4% articaine (both with a 1:100000 epinephrine) for buccal infiltration in a patient with maxillary posterior teeth undergoing irreversible pulpitis. Forty patients with first premolar or first molar irreversible pulpitis were split into four experimental groups and given buccal infiltration with either 2%

lidocaine or 4% articaine in a double-blind fashion. In first premolars and first molars, the success rate of maxillary buccal infiltration with articaine to create pulpal anesthesia was 100%; in first premolars and first molars, the success rate with lidocaine solution was 80% and 30%, respectively.The differences between the lidocaine and articaine solutions were highly significant. The authors came to the conclusion that for maxillary buccal infileration in posterior teeth, 4% articaine is more effective than 2% lidocaine.

Jaber A, *et al* (2010)[22] conducted a randomised double-blind cross-over trial research comparing the effectiveness of 1:100000 adrenaline with 2% lidocaine and 4% articaine for anesthesia of the mandibular incisor pulp.The local anesthetic regimens were administered to 31 healthy volunteers next to a mandibular central incisor. Two methods were used to determine the effectiveness of anesthesia:1) Tracking the number of times during the study period that an electronic pulp tester was stimulated to the maximum extent possible; 2) Tracking the number of volunteers who were stimulated to the maximum extent possible within 15 minutes and kept there for 45 minutes without responding. After buccal or buccal plus lingual infiltrations, the authors found that 4% articaine was superior to 2% lidocaine in terms of anesthetic efficacy in the pulp of lower incisor teeth.

Batista da silva C, et al.(2010)[23], conducted prospective randomized double-blind crossover study to assess the anesthetic effectiveness of lidocaine and articaine for mental/incisive nerve blocks.The anesthetic efficacy of 0.6 ml 4% articaine and 2% lidocaine, both with 1;100.000 epinephrine given as IANB to 40 volunteers in two sessions, was compared in this study.Visual analog scales were utilized for the assessment of the injection and pain following surgery.Both the success of the anesthesia and the length of time it took to take effect were measured. Compared to lidocaine, articaine produced analgesia with a better success rate ($p<0.001$) for the lateral incisor (32.5%), canine (55%) and the first (72.5%) and second (80%) premolars. Additionally, it caused analgesia in the canine that started earlier ($p<0.05$) and lasted longer ($p<0.05$) than in the premolars.The pain scores did not differ amongst the solutions ($p>0.05$).The authors of the study found that, for the majority of teeth following IANB, articaine induced more anesthetic success and longer duration of anesthesia than lidocaine, but anesthesia success coul only be regarded clinically relevant for premolars. Longer operations than ten minutes might not be suitable for the amount of local anesthetic utilized in this investigation.

Poorni S, et al (2011) [24]**,**conducted a randomized double blinded cross over trial study to assess the anesthetic effectiveness of 4% articaine for pulpal anesthesia in patients with irreversible pulpitis by employing buccal infiltration and inferior alveolar nerve block procedures. There were two test arms and one control arm in the study. While the subjects in the control arm received a conventional IANB of 2% lidocaine with 1:100,000 epinephrine, the subjects in the test arms received either a regular IANB or buccal infiltration (B Infil) of 4% articaine with 1:100,000 epinephrine. After local anesthetic was administered during access preparation and pulp extraction, the subject's self-reported pain reaction was documented on the Heft Parker Visual Analogue Scale. Even so, 4% articaine IANB and buccal infiltration were similarly successful.The authors came to the conclusion that in mandibular molars with irreversible pulpitis, buccal infiltration can be regarded as a feasible substitute in IANB for pulpal anesthesia.

Brandt RG, et al (2011)[25] conducted a controlled clinical trial wherein they examined adult subjects' responses to lidocaine and articaine solutions directly.They took research characteristics and outcome data and used them as the foundation for a meta-analysis.They finished the subgroup analysis for the mandibular inferior alveolar block and infiltration anesthetic methods. With an odds ratio of 2.44, the results indicated that articaine solution had a higher chance of producing anesthesia than lidocaine.For mandibular block anesthesia, there was less strong but statistically significant evidence that articaine was superior to lidocaine (odds ratio: 1.57). The authors came to the conclusion that articaine is more effective at producing anesthesia and is therefore preferable to lidocaine when it comes to successfully creating pulpal anesthesia.

Silva LC, et al (2012)[26]conducted a study to evaluate the analgesic efficacy of lidocaine and articaine, two distinct anesthetic solutions, during third molar surgery.The pain was measured following each surgical procedure using the visual analogue scale, the McGill pin questionnaire, and the analgesic consumption record.The findings indicated that there was a clinical difference with use of articaine in the duration of the surgery, latency, amount of anesthetic utilized, and analgesic consumption, but no statistical significance was found ($p<0.05$).The authors came to the conclusion that there were no appreciable variations between lidocaine and articaine in terms of how postoperative pain was managed.

Shruti R, et al (2013)[27] conducted a prospective, randomized and clinical study to compare

the efficacy of articaine with that of lidocaine which has proven efficacy.This study was done on 50 subjects. Time of injection, onset of anesthesia , amount of anesthetic solution were recorded. Efficacy was determined using visual analogue scale. The values were statistically analyzed. Result showed that the mean onset time of anesthesia in study group was 2.07±0.22 and
2.18±0.26 minute in comparison group. A mean duration of 4.28+0.78 hours was seen with articaine group and 3.51+0.45 hour with lignocaine group. There is no statistically significant difference in the two groups' experiences of pain. The authors came to the conclusion that articaine can be utilized as an alternative to lidocaine in third molar procedures since it is just as effective and lasts a little bit longer.

Ashraf H, et al (2013)[28] conducted randomized ,double blind study to compare the effectiveness of lidocaine and articaine when used as block and infiltration anesthetic in teeth that have irreversible pulpitis. Participating in the trial were 175 emergency patients whose first or second mandibular was diagnosed with irreversible pulpitis. They were given IANB using a 1:100,000 epinephrine to 2% lidocaine ratio.When their endodontic therapy first started, 102 patients complained of moderate to severe discomfort.When lidocaine was used for the infiltration injections following an incomplete IANB, the success rate was 29%, but with articaine, it was 71% ($p<0.001$). Following the block injections, no statistically significant variations in the success rates of the two anesthetics were found.The authors came to the conclusion that in mandibular molars with irreversible pulpitis, augmenting an incomplete articaine IANB with articaine infiltration increases the anesthetic success more successfully than using lidocaine.

Darawade DA, et al (2014)[29] conducted a clinical study to evaluate the effectiveness of 2% lignocaine hydrochloride and 4% articaine hydrochloride in orthodontic extraction. Fifty individuals between the ages of 15 and 25 who need orthodontic extractions participated in the study. Without using palatal anesthetic, 0.5 ml of 4% articaine HCL containing 1:100,000 adrenaline was injected progressively into the buccal vestibule of the experimental locations. 0.8– 1 milliliters of 2% lignocaine HCL with 1:100,000 adrenaline were injected progressively into the buccal vestibule of the control sites. Each of the following parameters—volume, duration, anesthetic time, and pain rating—was recorded and subjected to statistical comparison. The mean volume of articaine (0.779±0.1305) was less than that of

lignocaine (1.337±0.2369) when compared statistically. The mean duration of articaine onset was 1.012±0.2058 minutes, while the duration of was 1.337±0.2369. The pain assessment did not significantly differ; nevertheless, all individuals in the lignocaine group needed palatal anesthetic.Lastly, the mean duration of anesthesia in the lignocaine group was 55.66±6.414, while it was 69.08±18.247 in the articaine group.The writers came to the conclusion that aricaine has shown to be beneficial in every way.

Rogers BS, et al (2014)[30], conducted a prospective, randomized, double-blind study to assess the effectiveness of lidocaine vs articaine in mandibular teeth with irreversible pulpitis as additional buccal infiltration.An irreversible pulpitis diagnosis was made on 100 emergency cases.Mandibular molar pulpitis was chosen and treated with an IANB containing 4% articaine. Every shot used 1.7 miles and a 1:100,000 epinephrine ratio.A 26% success rate was achieved with IANB using 4% articaine, as 74 patients were unable to establish pulpal anesthesia.For articaine, the success rate for additional BIs was 62%, while for lidocaine, it was 37% ($p<0.05$).The authors came to the conclusion that articaine supplemented buccal infiltration was noticeably more successful than lidocaine. The published statistic was validated by the IANB success rate of 4% articaine. On PROSPERO, a protocol was created and registered. Using rigorous inclusion and exclusion criteria, electronic searches were performed in MEDLINE, Scopus, the Cochrane Library, and ClinicalTrials.gov. Two impartial reviewers evaluated the work for inclusion and quality. Using a random-effects model, weighted anesthetic success rates and 95% confidence intervals (CIs) were calculated and contrasted. After a search turned up 275 papers, 10 double- blind, randomized clinical trials were deemed eligible for inclusion. In the combined investigations, articaine had a higher probability of successfully achieving anesthesia compared to lidocaine (Odds ratio[OR], 2.21:95% CI,1.41-3.47:P=.0006:I(2)=40%). A comparison between articaine and lidocaine using maximal infiltration subgroup analysis revealed no discernible differences.After a successful mandibular block anesthetic, the authors found that articaine was much more effective than lidocaine when administered for supplemental infiltration.No negative incidents were reported.

Luqman U, et al (2015)[31], conducted a Single blinded randomized control trial study for simple maxillary exodontia, to compare conventional lignocaine with a single buccal articaine injection. The study included patients (20–60 years old) undergoing straightforward

extractions in the maxillary arch. Two groups (A and B) were randomly assigned to the patients using the toss method. Three groups were created out of maxillary teeth: group-1 consisted of the first, second, and third molars on each side; group-2 consisted of the middle teeth and the premolars; and group- 3 consisted of the anterior teeth, which included the canines and incisors. Group B (control group) got buccal and palatal infiltration of 2% lignocaine / HCL with 1:100,000 adrenaline, while Group A (study group) received buccal infiltration of 4% articaine with 1:200,000 adrenaline. The objective and subjective measures of post-operative pain were measured using the visual analog score (VAS), respectively.The trial comprised 194 patients in total. There were 100 patients in group A and 94 patients in group B. The sample as a whole had an average age of 41.12±13.6 years. For groups A and B, there was a statistically significant difference in the anterior (p=0.9), premolar (p=0.2), and molar (p=0.2) VAS scores. The authors concluded that for maxillary exodontia, lignocaine buccal and palatal infiltrations as well as buccal infiltration with a single articaine injection were equally efficacious.

Kung J, McDonagh M (2015)[32], conducted a research that offers a population, intervention, comparison, and outcome (PICO) review and meta-analysis to address the following question: To what extent can articaine, as opposed to lidocaine, reduce pain and the incidence of adverse events in adults receiving endodontic treatment for symptomatic irreversible pulpitis? On PROSPERO, a protocol was created and registered. Using rigorous inclusion and exclusion criteria, electronic searches were performed in MEDLINE, Scopus, the Cochrane Library, and ClinicalTrials.gov. Two impartial reviewers evaluated the work for inclusion and quality. Using a random-effects model, weighted anesthetic success rates and 95% confidence intervals (CIs) were calculated and contrasted. Initially, 274 studies were found through the search; 10 double- blind, randomized clinical trials were deemed eligible for inclusion. When combining studies, articaine had a higher probability of successfully achieving anesthesia than lidocaine (odds ratio [OR], 2.21; 95% confidence interval [CI], 1.41-3.47; P =.0006; I(2) = 40%). There was no discernible difference between lidocaine and articaine according to the maximal infiltration subgroup analysis (OR, 3.99; 95% CI, 0.50-31.62; P =.19; I(2) = 59%). In studies including combined mandibular anesthesia, articaine outperformed lidocaine (OR, 2.20; 95% CI, 1.40- 3.44; P =.0006; I(2) = 30%). However, mandibular block anesthesia did not vary from the control group (OR, 1.44; 95% CI, 0.87-2.38; P =.16; I(2) = 0%) according to additional subgroup analysis. Articaine was

substantially more efficacious than lidocaine when used for supplemental infiltration following successful mandibular block anesthesia (OR, 3.55; 95% CI, 1.97-6.39; P <.0001; I(2) = 9%).The authors concluded that For supplemental infiltration following mandibular block anesthesia, articaine is far superior to lidocaine; however, there is no benefit when using articaine for mandibular block anesthesia on its own or for maxillary infiltration.

Jain NK ,John RR (2016)[33] conducted a comparative prospective study to compare the clinical effectiveness of 2% lignocaine and 4% articaine when surgically extracting an impacted third molar. Seventy subjects participated in the research.A random combination of the two local anesthetics was given to the subjects. Both the patient and the observer taking the measurements were unaware of the anesthesia administered. The scientists came to the conclusion that lidocaine, which is strong and useful in small surgical procedures like the extraction of mandibular third molars, was not as safe an alternative as articaine, which had a significantly faster start of action and longer duration of action when compared to lignocaine.

Chopra R, et al (2016)[34], conducted a double blind study to compare inferior alveolar nerve blocks with lignocaine to buccal infiltration with articaine and IANB with lignocaine for pulp treatment in mandibular primary molars.Thirty patients (4–8 years old) who had at least two primary mandibular molar indications for pulp treatment were chosen.On the first appointment, patients were assigned at random to receive either lignocaine or articaine for nerve block, and on the second appointment, a different solution.When comparing the pain score at the time of injection to infilteration, there were noticeably more movements with block ($p<0.001$).The authors came to the conclusion that main mandibular molar IANB may be repaired with articaine infiltration.

Bartlett G, Mansoor J. (2016)[35] conducted a randomised controlled study to evaluate the efficiency of lidocaine inferior alveolar nerve blocks and articaine buccal infiltrations in causing pulpal anesthesia in mandibular molars. Included were only studies that made use of permanent mandibular molars. Using the databases MEDLINE, EMBASE, and the Cochrane Central Register of Controlled Trials, a comprehensive literature search was conducted to find studies that compared articaine BIs with lidocaine IANBs. Included were only studies that made use of permanent mandibular molars. Two of the papers were approved for evaluation.The authors came to the conclusion that lidocaine IANBs and articaine BIs are

equally effective, and that the best course of action should be determined by patient selection, cost, and time efficiency.

Da Silva-Junior GP,et al (2017)[36] conducted a double blind study in which 160 patients with bilateral asymptomatic impacted mandibular third molars were chosen for a study comparing the effectiveness of lidocaine and articaine for pain management during third molar surgery. During an inferior alveolar nerve block, group 1 received 1.8 ml of 2% lidocaine with 1:100000 epinephrine, and group 2 received 0.9 ml of 4% articaine with 1:100000 epinephrine on the contralateral side. Non-paired t test and chi square test (alpha=5%) were used to evaluate the data.It was determined that when combined with inferior alveolar nerve block, buccal infiltration of 4% articaine with 1:100000 epinephrine was more effective than lidocaine in managing intraoperative pain following surgery on an impacted mandibular third molar.

Bansal SK, *et al* (2018) [37]conducted a controlled comparative clinical study to evaluate the anesthetic effectiveness of 2% lignocaine HCL with 1:80000 adrenaline against 4% articaine HCL with 1:100000 adrenaline when extracting a maxillary premolar for orthodontic reasons.In 50 patients, the study was conducted. The amount of drug used, the start and length of anesthesia, injection pain, and complications following the anesthesia were noted for every patient. The paired t-test was utilized for statistical analysis and comparison of the values. The statistical analysis revealed a significant difference in the mean pain rating (for palatal injection), as well as in the onset and duration of anesthesia for articaine ($p<0.001$).The authors came to the conclusion that articaine HCL is just as effective as gold standard lignocaine, but with a longer duration of action and a quicker start time.

Ghazalgoo A, et al (2018)[38] conducted a randomized clinical study to assess how utilizing lidocaine versus articaine local anesthetics for IANB affected pain following a randomized controlled trial.We chose 88 patients who had been diagnosed with mandibular first molar irreversible pulpitis. Using IANB, the patients were assigned at random to receive either an articaine or lidocaine catridge. Fifteen minutes after the injection, RCT was started. Using a 170 mm visual analogue scale, the postoperative pain was measured 0, 2, 4, 6, 12, 18, 36, and 48 hours after the procedure.The statistical program SPSS 22 was used to examine the data.In the lidocaine group, the mean total post-treatment pain was 37.1±32.9, but in the articaine group, it permanent mandibular molars. Two of the papers were approved for evaluation.The

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Soysa NS, et al (2019)[39], presented systematic review and meta analysis to evaluate the

effectiveness of lidocaine and articaine in maxillary and mandibular infiltration during adult dental treatment. The weighted anesthetic success rates and 95% confidence intervals (CIs) were determined using RevMan software, and a random-effects model was used to compare the results. Compared to lignocaine, articaine had a higher chance of successfully achieving anesthesia for combined investigations (N = 18, odds ratio [OR]: 1.92, 95% CI: 1.45-2.56, P < 0.00001, I2 = 32%). Articaine clearly outperformed lignocaine in maxillary and mandibular infiltration experiments (N = 8, OR: 2.50, 95% CI: 1.51-4.15, P = 0.0004, I2 = 41%). There was no discernible difference between articaine and lignocaine according to the maximal infiltration subgroup analysis (N = 5, OR: 1.69, 95% CI: 0.88-3.23, P = 0.11, I2 = 19%). The results of the combined mandibular anesthesia studies showed that articaine was superior to lignocaine (N = 14, OR: 1.99, 95% CI: 1.45-2.72, P < 0.0001, I2 = 32%). Subgroup analysis also revealed significant differences in mandibular infiltration (N = 3, OR: 3.87, 95% CI: 2.62-5.72, P < 0.00001, I2 = 0%) and mandibular block anesthesia (N = 11, OR: 1.55, 95% CI: 1.19-2.03, P = 0.001), I2 = 0%). Based on these findings, the authors concluded that articaine is more effective than lignocaine in providing anesthetic success throughout routine dental procedures.

Zhang A, et al (2019) [40]conducted a meta-analysis and systematic review to determine whether articaine is more effective than lidocaine as an anesthetic during the extraction of the lower third molar.Five assessment indices were taken out in order to evaluate the anesthesia efficacy of the two solutions: the success rate of anesthesia, the objective onset time of anesthesia, the duration time of anesthesia, and the intraoperative pain assessment.In this review, nine studies were included.For inferior alveolar nerve blocks during LTME, the authors found that 4% articaine with 1:100000 epinephrine has a better anesthetic efficiency than lidocaine.

Amorim KS, Fontes VTS (2019)[41] conducted a randomized double blind study to evaluate the efficacy, onset, length of pulp and soft tissue anesthesia, and pain during injection of 2% buffered articaine and 4% non-buffered articaine solutions. Maxillary supraperiosteal anesthetic infiltrations were administered twice to each subject in the canine region. Every session used a different local anesthetic solution, and the injection speed of the anesthetic was constant at 1 mL/min. The infiltrations were carried out at two distinct times. By using the pulp electrical test "pulp tester" and the esthesiometer kit, respectively, it was possible to

determine the beginning and duration of pulpal and soft tissue anesthesia. With the exception of injection pain, which decreased when buffered 2% articaine was used (p = 0.001) and pH, there was no difference between the two anesthetic solutions (onset of soft tissue anesthesia, p = 0.5386; length of soft tissue anesthesia, p = 0.718; onset of pulpal anesthesia, p = 0.747; depth of pulpal anesthesia, p = 0.375).The authors concluded that The injection discomfort was significantly reduced when using the 2% buffered articaine solution, which had the same anesthetic qualities as the 4% unbuffered articaine.

Aggarwal V. et al (2019)[42] conducted a randomized double blind study to evaluate the anesthetic efficacy of 4% articaine versus 2% lidocaine given as supplemental intraligamentary injections after a failed inferior alveolar nerve block. One hundred six adult patients underwent an initial inferior alveolar nerve block using 2% lidocaine and 1:80,000 epinephrine for symptomatic irreversible pulpitis in a mandibular first or second molar. Using the Heft-Parker visual analog scale, endodontic treatment pain was measured. Eighty-two unsuccessfully anesthetized patients were divided into two treatment groups at random: the first group got 2% lidocaine with 1:80,000 epinephrine and 0.6 mL/root of supplemental intraligamentary injection of 4% articaine with 1:100,000 epinephrine. The success rate of patients who received additional intraligamentary injections of 4% articaine was 66%, whereas 78% of patients who received injections of 2% lidocaine had positive results. Statistically speaking, there was no significant change ($\chi 2 = 1.51$, P
=.2). The heart rate was not significantly affected by any of the anesthetic drugs.The authors concluded that both 4% articaine and 2% lidocaine improved the success rates after a failed primary anesthetic injection, with no significant difference between them.

Naghipour A, *et al* (2020) [43]conducted a split-mouth double-blind randomized clinical trial study research to determine the most effective way to administer anesthesia by contrasting the impact of applying lidocaine alone with applying both lidocaine and articaine at the same time on the incidence of complications during and after surgery to remove an impacted mandibular third molar. Thirteen individuals with comparable difficulty on both sides and bilateral impacted mandibular third molars were referred for elective surgical removal for the purpose of this

study.Prior to surgery, each patient was randomly assigned to receive either 2% lidocaine alone for conventional inferior alveolar nerve block and 4% articaine for local infiltration on

one side (group A) or 2% lidocaine alone on the other side (group B). As a consequence of the procedure, group A experienced far less discomfort on the first postoperative day than group B. hence the authors came to the conclusion that lidocaine plus articaine may considerably better control a patient's pain than lidocaine alone.

Jorgenson K et al (2020) [44]conducted a randomized controlled pilot study to compare the clinical effects of 2% lidocaine inferior dental block (IDB) and 4% articaine buccal infiltration (BI) on children's mandibular first permanent molar anesthesia. Individuals between the ages of 8 and 15 who needed invasive dental work done on a lower molar tooth were assigned at random. The type of LA utilized was hidden from both the patient and the dental operator. Throughout the injection and treatment, the patient recorded their level of pain using a visual analogue scale. Thirteen articaine and thirteen lidocaine were used to anesthetize 26 teeth. Every treatment was successfully finished with the use of an IDB. One time, an attempt at anesthesia with a BI of articaine was considered unsuccessful. Regarding the perceived pain of the injection or treatment, there was no statistically significant difference in the mean VAS.The authors concluded that a BI of articaine can be used to successfully perform invasive dental treatment on a child's mandibular molar tooth. Furthermore, while employing a BI of articaine, the reported pain of the injection and the course of treatment is similar to that of an IDB with lidocaine.

Martin E, et al (2021),[45] conducted a randomised controlled trials study regarding the safety and effectiveness of articaine in dental procedures as opposed to lidocaine.Using the Cochrane Review Manager 5 software, 12 studies were included for the meta-analysis. Using random effect models, the anesthetic success odds ratio was computed. The findings indicated that, in general, and across all subgroup analyses with differing degrees of significance, articaine had a better probability of achieving anesthetic success than lidocaine.It was determined that articaine is a safe and effective local anesthetic for all routine dental procedures in patients of all ages. It is also more likely than lidocaine to produce successful anesthesia in routine dental treatment, and neither anesthetic agent has a higher likelihood of adverse effects related to anesthetics.

Khushboo J. *et al* (2021)[46] conducted a prospective, split-mouth, randomized controlled trial study to assess and compare the superior alveolar nerve block (IANB) with 2% lignocaine for

primary mandibular molar extractions in terms of anesthetic efficacy. This randomised controlled experiment comprised 46 healthy children aged 5-10 years who had bilateral symmetrical carious primary mandibular molar extractions (n = 92). Two separate appointments were made to execute extraction on one side (with 4% articaine buccal infiltration) and the other side (using 2% lignocaine IANB). Using the Frankl Behavior Rating Scale, the Modified Behavior Pain Scale (MBPS), and the Wong-Baker Faces Pain Rating Scale, pain and behavior were measured at baseline, during injection, and after extraction. The resulting values were then subjected to a one- way analysis of variance test and an independent samples test for statistical comparison.The authors came to the conclusion that for primary mandibular molar extractions, buccal infiltration with 4% articaine can be used as a successful substitute for 2% lignocaine IANB.

Gholami M. et al (2021)[47] conducted a randomized controlled clinical study to ascertain the efficacy of buccal injection of articaine compared to lidocaine in inducing palatal anesthesia in different maxillary regions. In this randomized, double-blinded clinical study, 300 individuals were referred for one maxillary tooth extraction. Based on the extraction location (anterior, premolar, molar), the patients were divided into 3 strata. Based on the medication given, they were then randomly assigned to 2 groups. 0.6 mL of 2% lidocaine was infiltrated into the first group's buccal cavity, while 0.6 mL of 4% articaine was delivered to the second group's buccal cavity. The instrumentation technique was used to determine whether or not palatal anesthesia was achieved after a two-minute waiting period. 82.7% of the articaine group and 1.3% of the lidocaine group successfully achieved palate anesthesia with buccal infiltration. When employing either medicine, there was no significant difference observed between different maxillary regions (P >.05), but there was a significant difference in the success rate and drug volume necessary to induce palate anesthesia between the 2 groups (P <.001).The authors concluded that when it comes to removing painful palatal infiltration during maxillary tooth extraction, articaine is a good substitute for lidocaine.

Al-Mahalawy H. *et al (*2022)[48] conducted a prospective, randomized-controlled, study. This study comprised adult patients in good health who were seeking bilateral extraction of mandibular anterior teeth. The study group received a solitary labial injection with 4% articaine, whereas the control group received 2% lidocaine. Randomly assigned to two equal groups, each group had tooth extractions. 14 days later, the second local anesthetic was

used to remove the

mandibular anterior tooth. There was a random process involved in choosing which anesthetic to administer during the initial session. Once the tooth was pulled, each patient was instructed to use the Visual Analogue Scale (VAS) to record the level of discomfort they experienced following the five-minute injection of local anesthetic. The authors came to the conclusion that while 2% lidocaine and 4% articaine applied buccal infusion could provide an equivalent anesthetic effect for the extraction of mandibular anterior teeth, 4% articaine would provide more consistent and successful results.

Singhal N et al (2022)[49] conducted a randomized study to evaluate the effectiveness of mepivacaine versus articaine used as alternative supplemental local anesthetic methods in patients with irreversible pulpitis following a failed inferior alveolar nerve block (IANB) using lidocaine. The study comprised a total of 120 patients. Individuals received IANB at a dosage of

2 milliliters containing 2% lidocaine hydrochloride and 1:80,000 epinephrine. Subjects exhibiting subjective indicators of IANB but failing to achieve pulpal anesthesia were randomized by random sampling to one of four groups for additional local anesthesia: Group 1 received buccal infiltration (BI) with 4% articaine and 1:100,000 epinephrine; Group 2 received four-site intraligamentary (IL) injection with 4% articaine and 1:100,000 epinephrine; Group 3 received BI with 2% mepivacaine and 1:100,000 epinephrine; and Group 4 received random assignment to one of the aforementioned groups for supplemental local anesthesia. Group 1: Anesthesia was successfully achieved in 27 cases (90%, n = 30) with BI combined with articaine. Group 2: Twenty instances (66.67%, n = 30) of IL injection with articaine resulted in successful anesthesia. Group 3: In 21 cases (70%, n = 30), BI combined with mepivacaine produced successful anesthesia. Group 4: In 15 (50% of the 30 instances), anesthesia was successfully achieved by IL injection combined with mepivacaine.The authors concluded in comparison to mepivacaine, articaine exhibited superior performance.

Gaudin A et al (2023)[50] conducted a randomized controlled trial study to compare the cardiovascular effects [heart rate, oxygen saturation (SpO_2), systolic and diastolic blood pressure] and the anaesthetic efficacy of intraosseous computerized anaesthesia (ICA) versus

inferior alveolar nerve block (IANB) in Symptomatic irreversible pulpitis (SIP). The standard IANB injection (n = 36) or the ICA injection (n = 36) for the 72 mandibular molar teeth with SIP were

randomly assigned to receive 1.8 mL of 4% articaine with 1:100 000 epinephrine. The main goal was to measure the cardiovascular parameters (blood pressure, oxygen saturation, and heart rate) prior to, during, and following the anesthesia. Comparing the success and three-day postoperative results of ICA and IANB were the secondary goals. In terms of sex, age, or anxiety, there were no statistically significant differences (p >.05) between the groups. ICA had a substantially better overall success rate (91.43%) than IANB (69.44%) (p =.0034).The authors concluded that ICA is effective and safe when used as intended to treat mandibular molar SIP.

Gülnahar Y., et al (2023)[51] conducted study is to assess how 4% articaine and 2% lidocaine affect inferior alveolar nerve block (IANB) during posterior mandibular implant surgery. Two groups— one for lidocaine and the other for articaine—were created from patients who had implants placed in their posterior mandibles for IANB. The following factors were examined using t-tests, Mann- Whitney U tests, Spearman's coefficients, Pearson's chi-squared tests, and other statistical methods: VAS = visual analog scale, pain during surgery and injection, lip numbness time, mandibular canal-implant apex distance, age, gender, bone density, implant number, release incision, adjacent teeth, and length of surgery. There were 577 patients total, and 1185 dental implants were examined. Regarding injection and operation VAS scores, there was no discernible difference between the two groups (p>0.05).The researchers came to the conclusion that, in posterior mandible implant applications, there was no discernible difference in pain perception between %4 articaine and %2 lidocaine. Adequate anesthesia was supplied by both anesthetics for the implantation process.

Haider M., et al (2023)[52] conducted a randomized controlled trial study to evaluate the differences between 4% and 2% lidocaine in terms of injection discomfort and anesthetic efficacy when treating molar incisor hypomineralization (MIH) in permanent mandibular first molars (PMFMs). Furthermore contrasting the side effects of local anesthetic for the two approaches. Twenty kids were in the sample. At random, each kid received either 2% or 4% articaine during their first session; the other solution was administered during the second

session. The Wong-Baker Faces® Pain Rating Scale and the Face, Legs, Activity, Cry, and Consolability (FLACC) scale were used to measure the pain of injections and the efficacy of anesthetic. The authors came to the conclusion that an injection of articaine (4% vs. 2% lidocaine) hurt more.

MATERIALS & METHOD

METHODOLOGY

A total sample size of 25 patients undergoing extraction of Mandibular Bilateral Impacted teeth reporting to Dept. of Oral and Maxillofacial Surgery, Babu Banarasi Das Dental college , Lucknow were planned for our study. Each patient required similar surgical treatment on opposite sides of the mandible, which was performed in two visits, 1 to 2 months apart. For local anesthesia, in the first appointment the patients were randomly selected to receive either 2 % lidocaine or 4 % Articaine both with 1:100,000 epinephrine . In the second appointment, the local anesthetic not used previously was then administered in a crossed manner.The patient was checked each 10 seconds with blunt instrumentation after the subjective symptoms of the patient to notice fading away of local anesthesia to note the duration of anesthesia.The data obtained in the study was tabulated under two groups assigned to each of the local anesthetic agent used in the study. Group A was Articaine and group B was Lidocaine.

The data obtained in the study included:

1. Onset of anesthesia—recorded from time of injection to the onset of anesthesia of the lip as subjective and objective symptoms.
2. Duration of surgery—measured from time of placing the incision to the last suture placed.
3. Duration of anesthesia—The duration of anesthesia was in turn recorded as the time from initial patient perception of the anesthetic effect to the moment in which the effect began to fade.
4. Blood pressure, oxygen saturation and heart rate were recorded before the administration of local anesthetic and after 5, 15,30 minute.
5. Any signs of systemic toxicity like talkativeness, slurred speech, apprehension, localized muscular twitching and tremor of the hand and feet, rise in blood pressure, heart rate and respiratory rate were noted.
6. Intra operatively pain was scored on visual Analog scale (0–10) (e.g. none, slight, mild, moderate, severe)

The statistical analysis of the results was carried out with the Student t- and Chi-square tests.

ELIGIBILITY CRITERIA

Inclusion criteria: -

- Patients falling under ASA Ⅰ classification
- Patient having bilateral impacted Mesio-angular mandibular third molar
- Patients with age group between 18-50 years of age
- Patient with no signs of inflammation or infection at extraction site

Exclusion criteria: -

- Allergic reaction to L.A. belonging to amide group
- Pregnant or lactating mothers
- Alcoholics
- Drug addict

MATERIALS: -

Armamentarium:

- 2% lidocaine HCL with1: 100000 adrenaline
- 1.7 ml of 4% Articaine HCL with 1: 100000 adrenaline
- Disposable syringe with 26 gauge needle
- Sterile drape
- Periosteal elevator - Howarth
- Diagnostic instrument
- No. 15 bp blade on a bard parker handle
- Adson’ s tissue holding forceps

- Elevators
    - Bur: straight fissure 703 no.
    - Austin retractor
    - Needle holder
    - Suture cutting scissor
    - Curette
    - Bone file
    - Micro motor with hand piece
    - Tissue dissecting scissor
    - Mersilk (3-0) suture

EVALUATION CRITERIA

1. Time of onset

- Site 1 for Articaine
- Site 2 for lidocaine

2. Amount of L.A. (in millilitres)

- Site 1
- Site 2

3. Intraoperative pain (visual analogue scale 0-10)

Site 1

Site 2

4. Duration of anaesthesia

- Site 1
- Site2

5. Blood pressure (mercury barometer)

- Prior to administration of L.A.

- 5 minutes post administration 15 minutes post administration 30 minutes post administration

6. Oxygen saturation (pulse oximeter) Prior to administration of L.A.

- 5 minutes' post administration 15 minutes' post administration 30 minutes' post administration

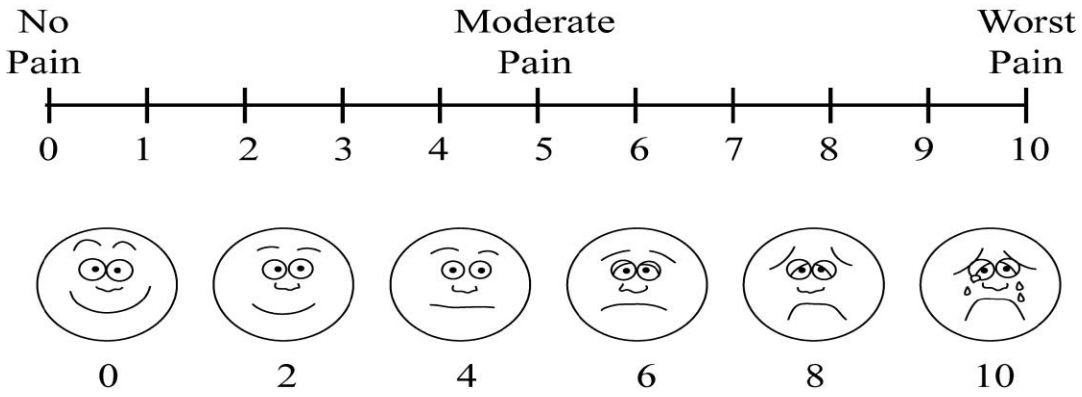
7. Pulse rate (in beats per minute)

- 5 minutes' post administration 15 minutes' post administration 30 minutes' post administration

8. Respiratory rate (in cycles per minute)

- 5 minutes' post administration 15 minutes' post administration 30 minutes' post administration

9. Visual Analogue scale scoring sheet



- 0– No pain
- 1-3 –Mild pain
- 4-6 - Moderate pain
- 7-9 - Severe pain
- 10 – Worst pain

ARMAMENTARIUM

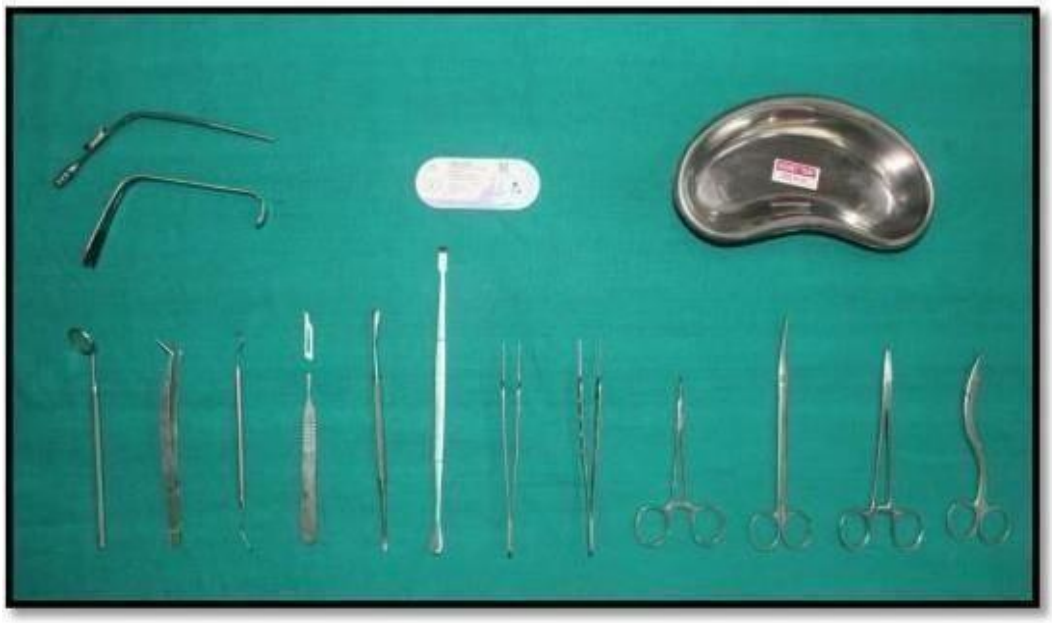


Fig. 1 SURGICAL INSTRUMENTS

4 % ARTICAINE WITH 100000 EPINEPHRINE

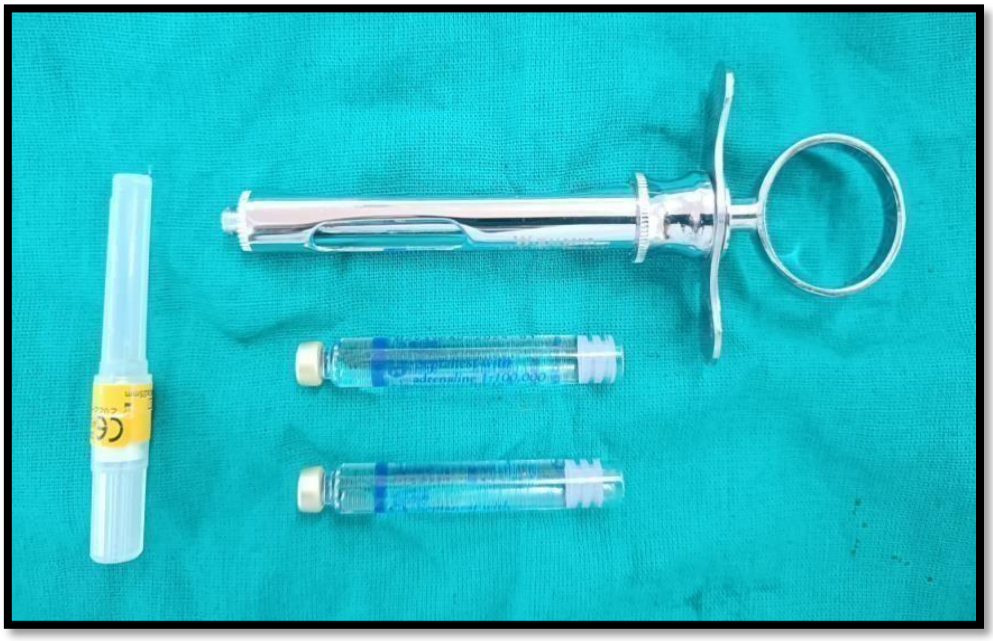


Fig.3: BREECH LOADED METALLIC ASPIRATING TYPE SYRINGE , 4% ARTICAINE

WITH 1:1,00,000 ADRENALINE CARTRIDGE , DISPOSABLE NEEDLE

Fig.4: 2% LIGNOCAINE WITH 1:80,000 ADRENALINE

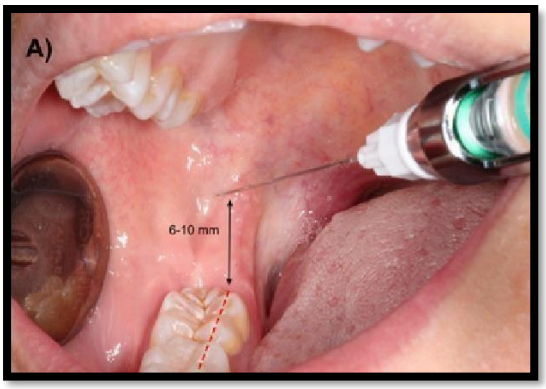
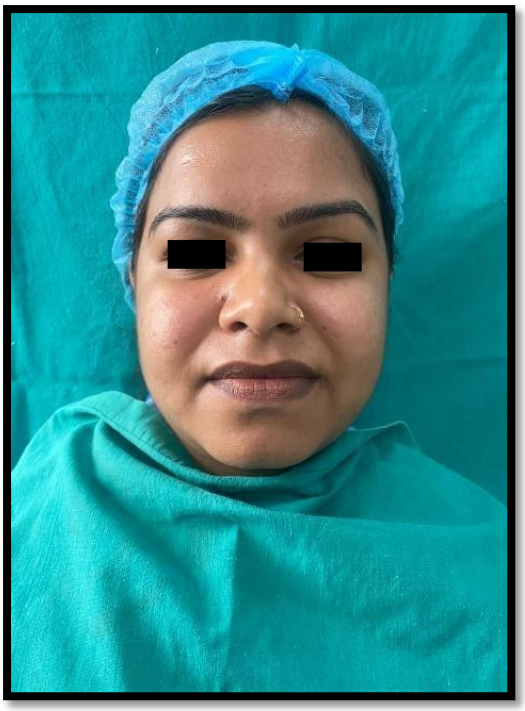


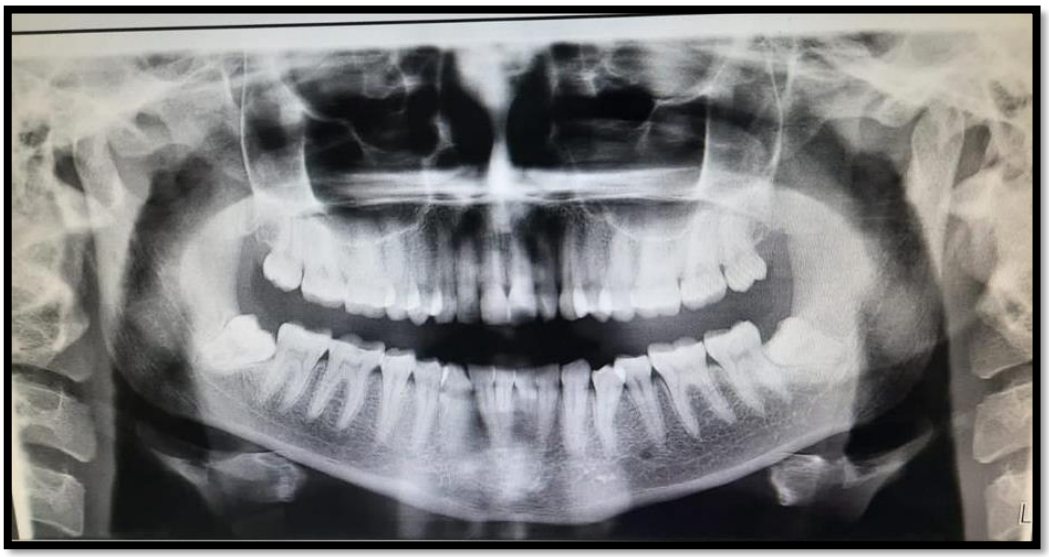
Fig.5: CLASSIC INFERIOR NERVE BLOCK

CASE -1

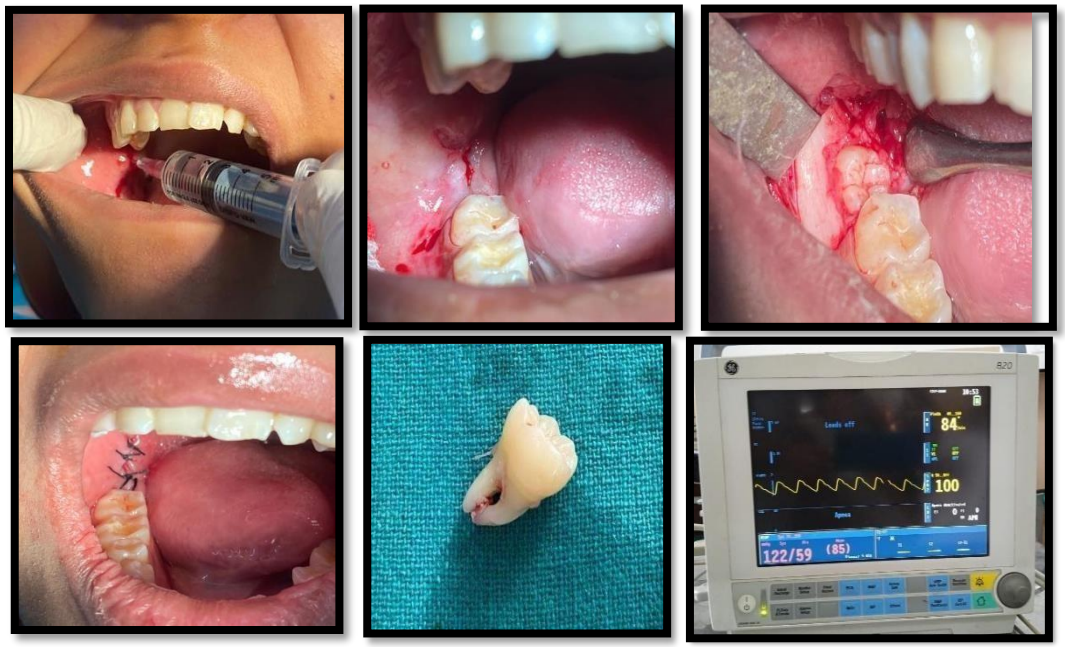
PRE-OPERATIVE PHOTOGRAPH



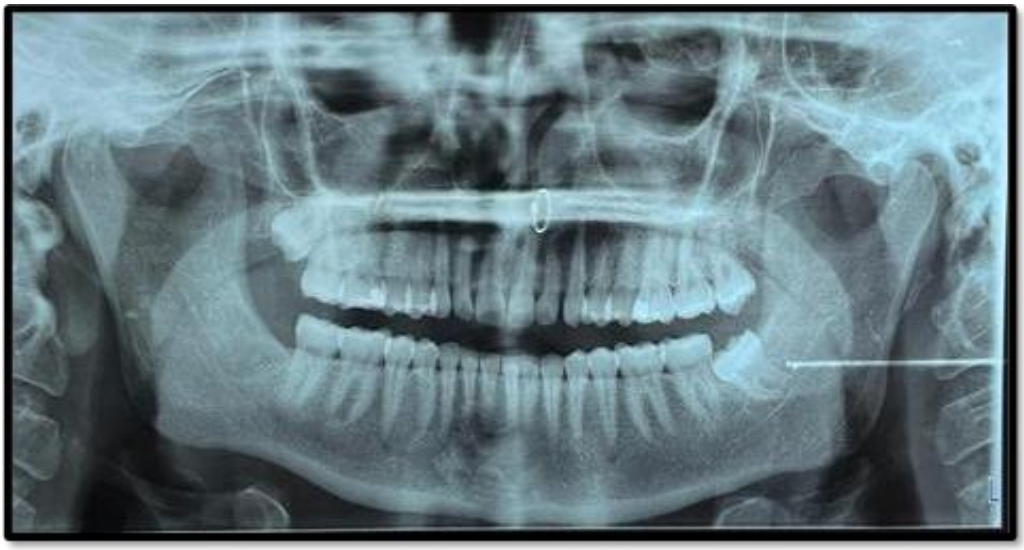
PRE-OPERATIVE RADIOGRAPH



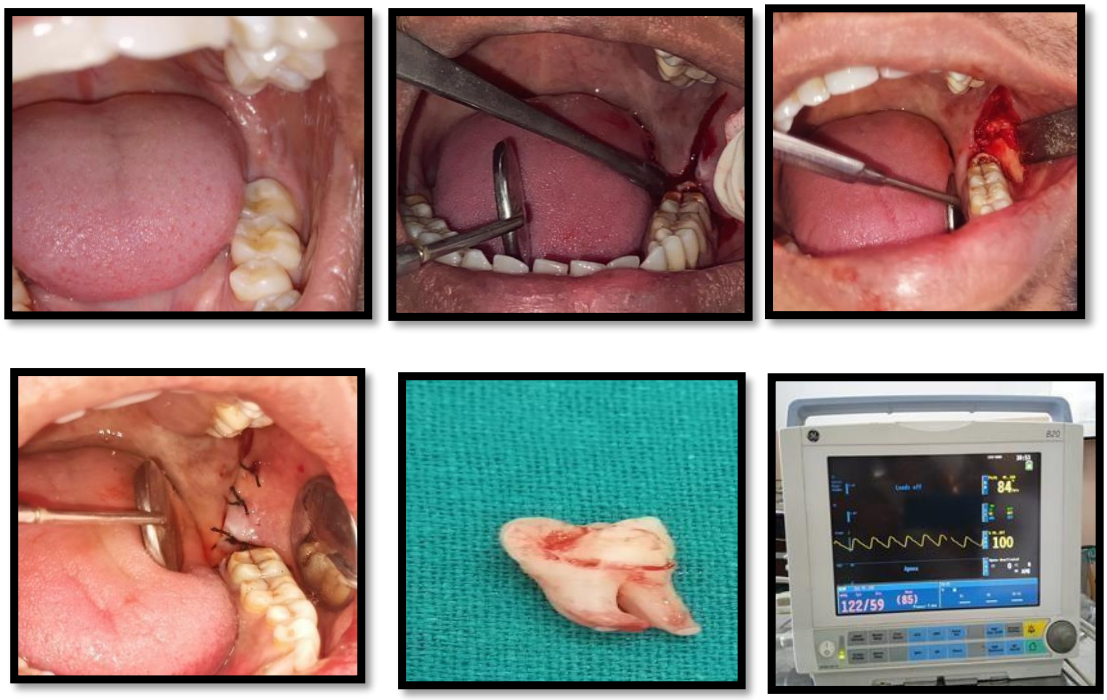
INTRA-OPERATIVE PICTURES [LIGNOCAINE]



POST-OPERATIVE RADIOGRAPH



INTRAOPERATIVE PICTURES (WITH ARTICAINE)



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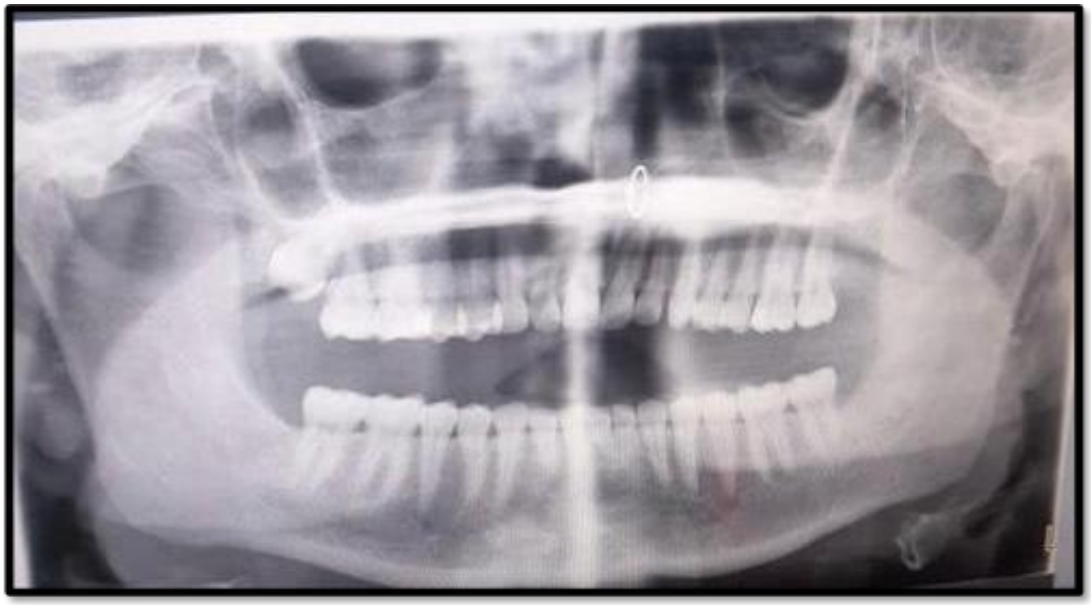
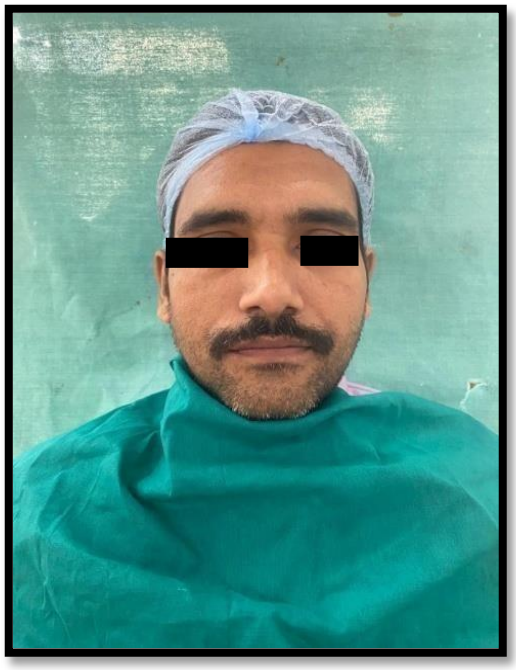
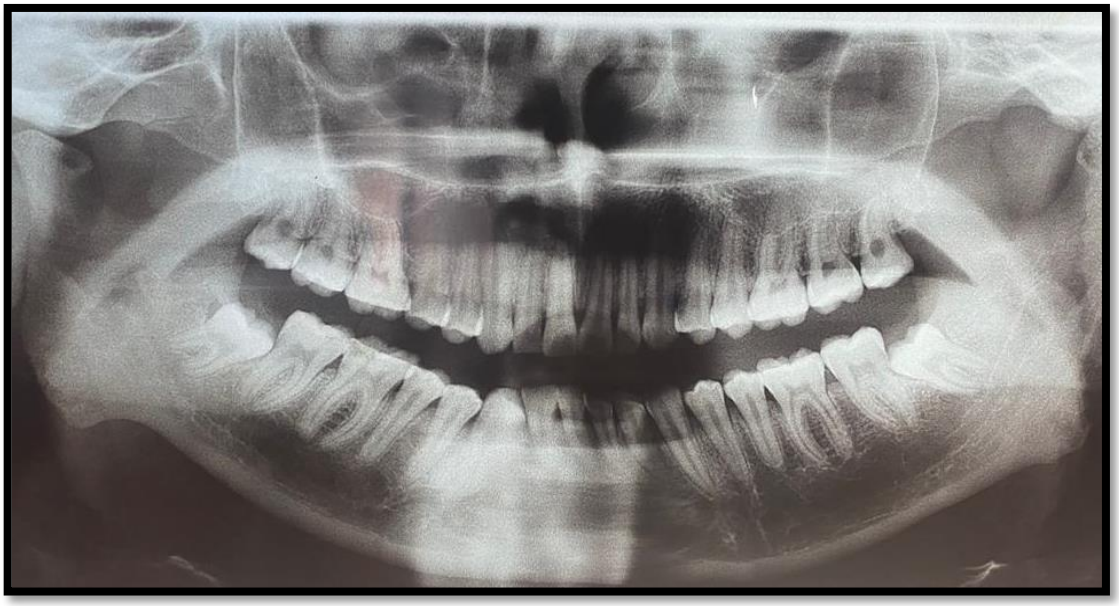


Case-2

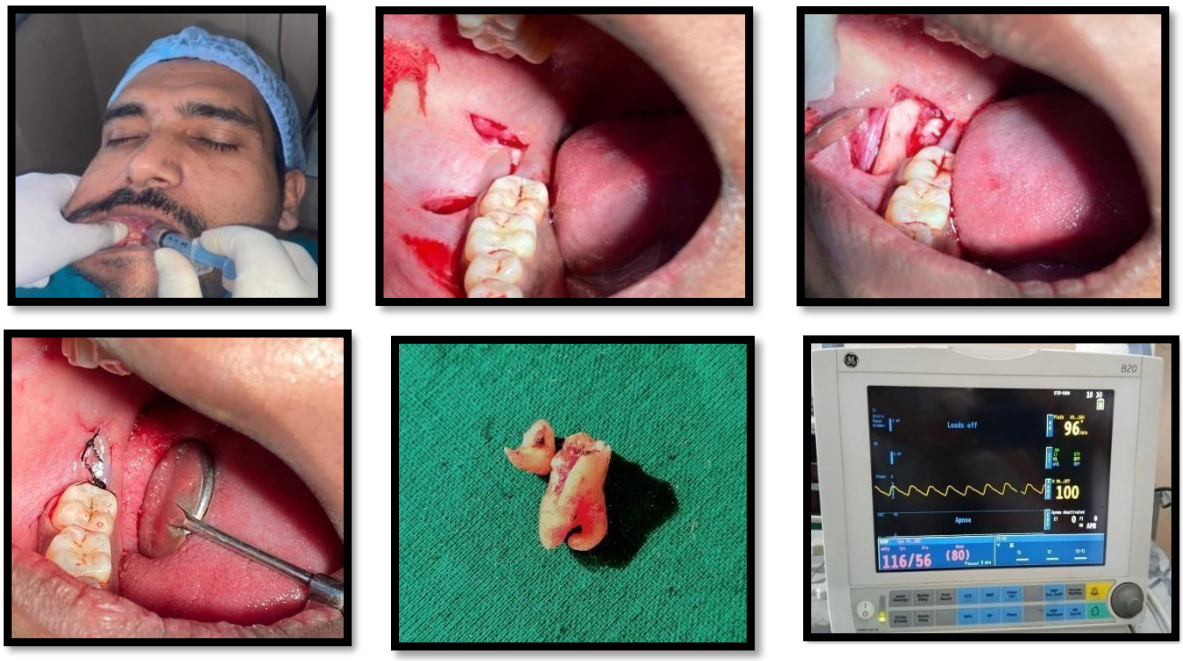
PRE-OPERATIVE PHOTOGRAPH



PRE-OPERATIVE RADIOGRAPH



INTRA OPERATIVE PICTURES (WITH LIDOCAINE)



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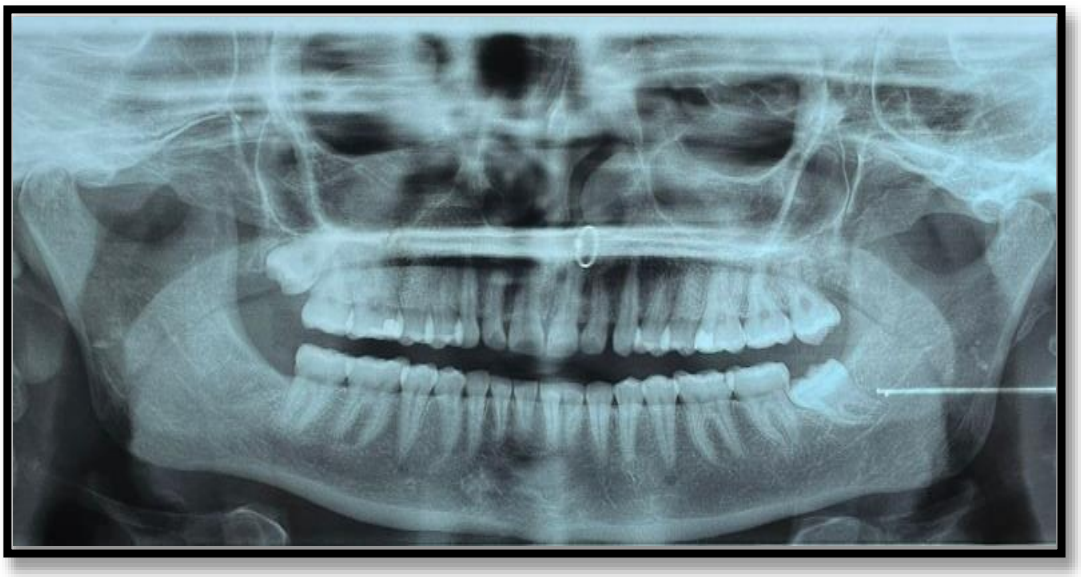
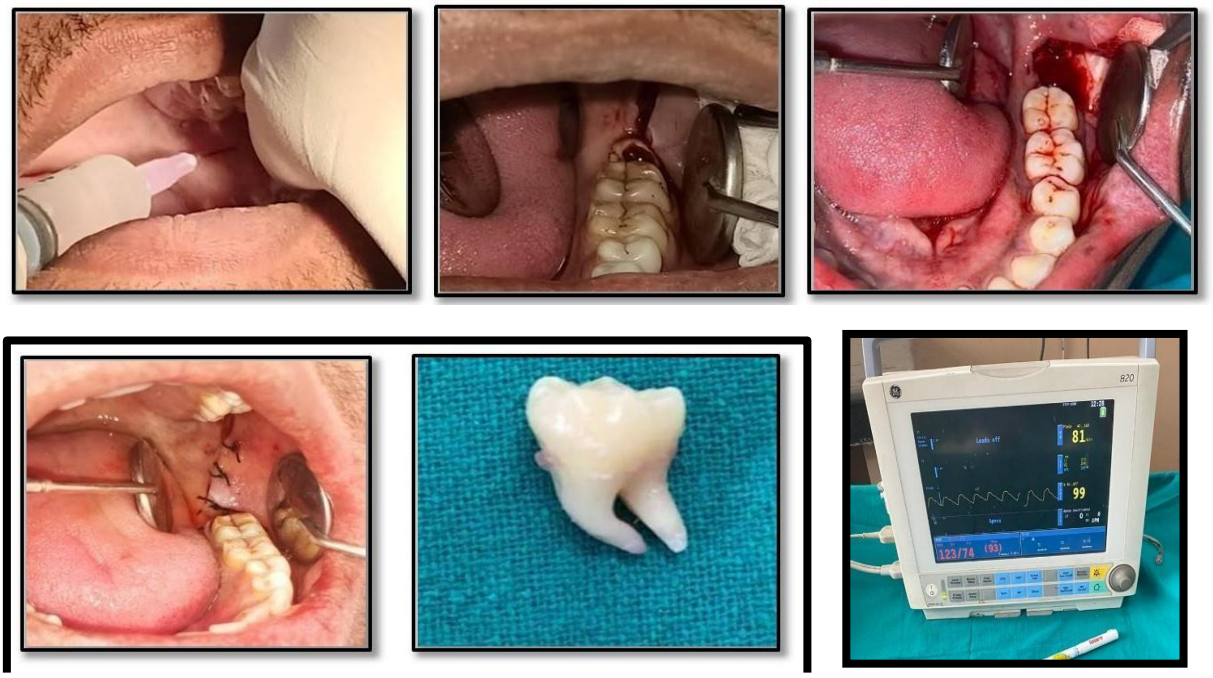
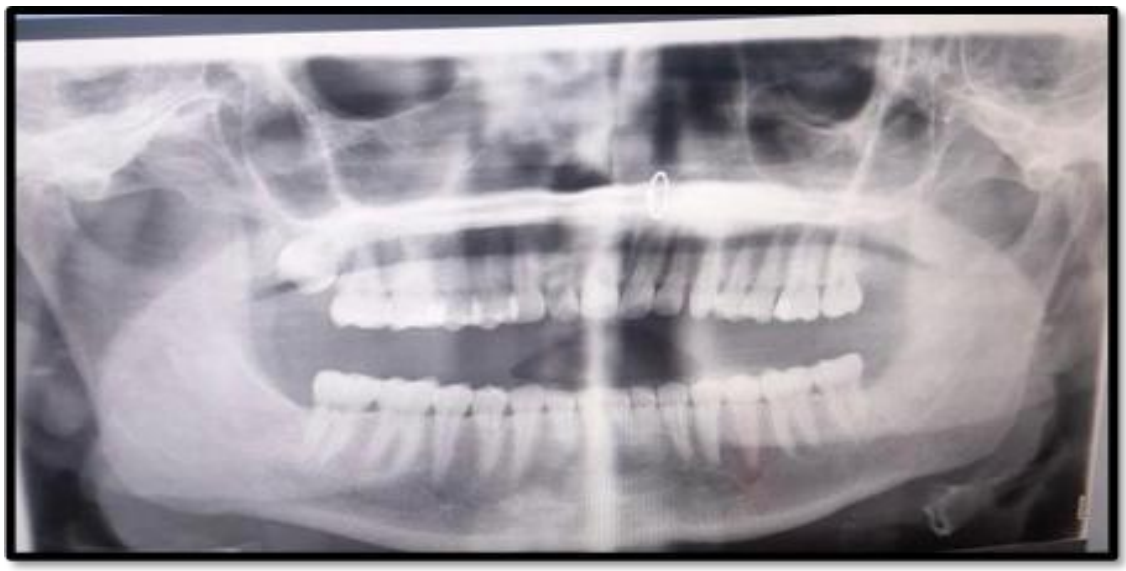


INTRAOPERATIVE PICTURE (WITH ARTICAINE)



POST OPERATIVE RADIOGRAPH



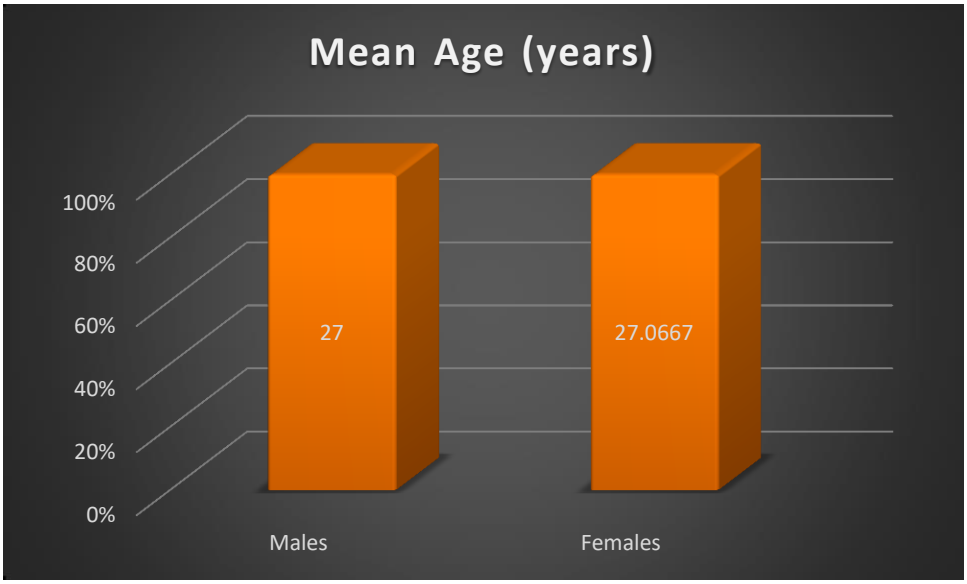
RESULT

RESULTS:

Tb 1:

Mean Age (years)					
gender	N	%	Mean	Std. Deviation	P value
Males	10	40%	27.0000	7.43864	0.980, NS
Females	15	60%	27.0667	5.93376	

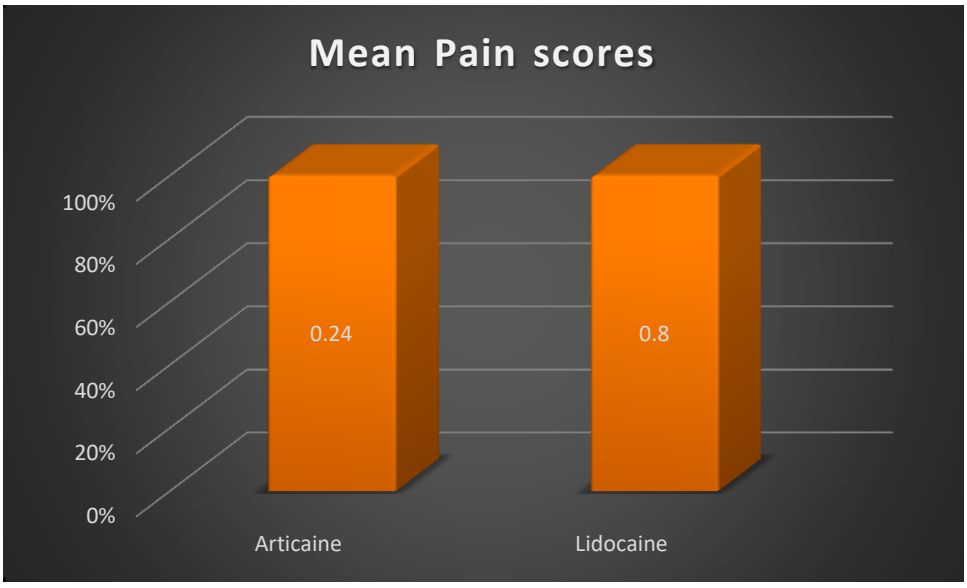
The study population was comprised of 40% males and 60% females. The mean age of males and females was not found to be significantly different.



Tb 2:

Pain						
	N	Minimum	Maximum	Mean	Std. Deviation	P value
4 % ARTICAINE WITH 1:100000 Adr	25	.00	2.00	.2400	.59722	0.107, NS
2 % LIDOCAINE WITH 1:100000 Adr	25	.00	5.00	.8000	1.47196	

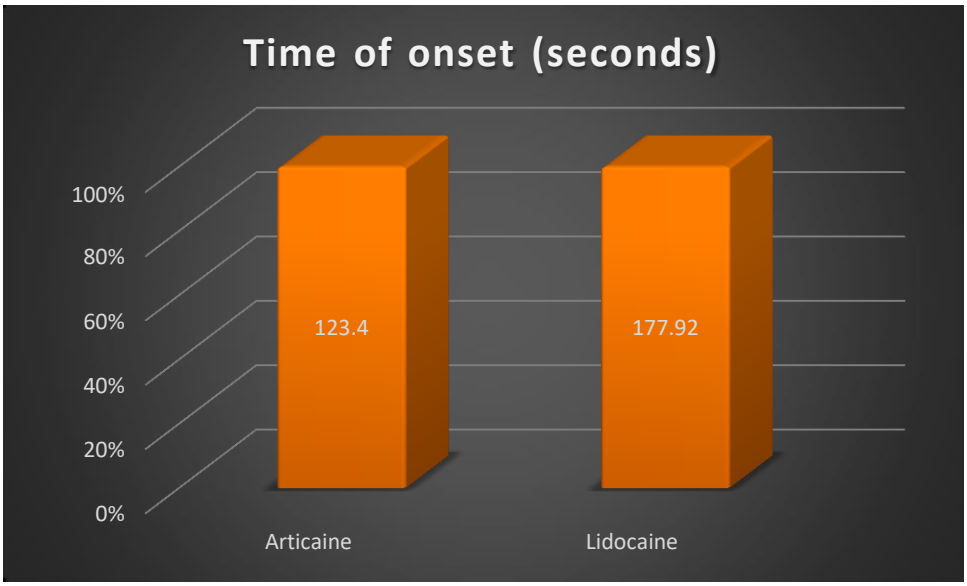
Intergroup comparison of pain scores was done by using Mann Whitney U test. The mean pain scores among two study groups were not found to be significantly different.



Tb 3:

Time of Onset (seconds)				
	Mean	N	Std. Deviation	P value
4 % ARTICAINE WITH 1:100000 Adr	123.4000	25	19.79478	<0.001, S
2 % LIDOCAINE WITH 1:100000 Adr	177.9200	25	21.10276	

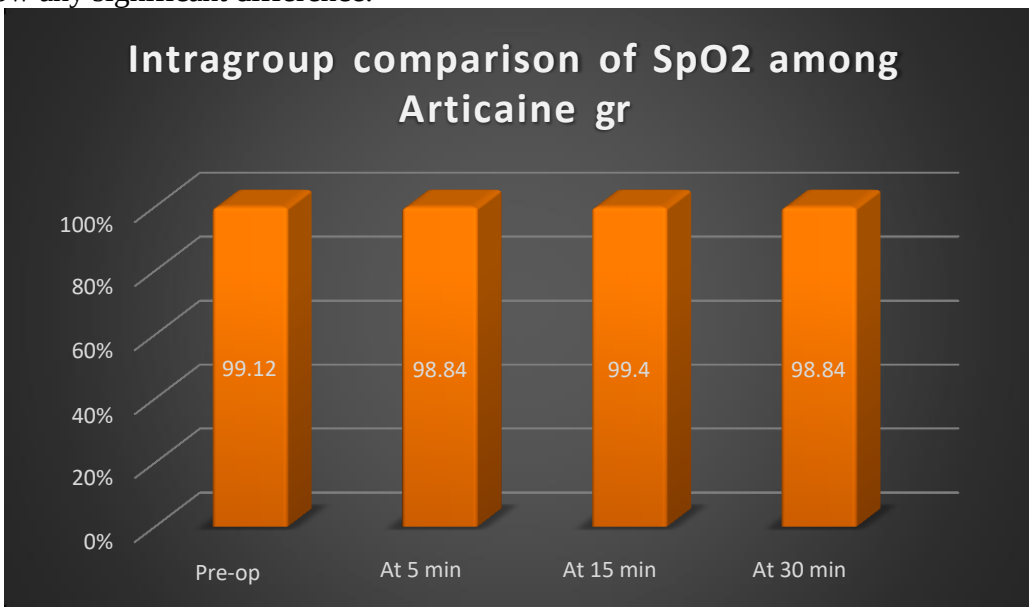
Intergroup comparison of time of onset (in seconds) was done by using Independent t test. The mean time of onset was significantly less with respect to 4% Articaine group.



Tb 4:

Intragroup comparison of SpO2 among Articaine gr					
	N	Minimum	Maximum	Mean	Std. Deviation
Pre-op	25	97.00	100.00	99.1200	.88129
At 5 min	25	98.00	100.00	98.8400	.74610
At 15 min	25	96.00	100.00	99.4000	1.04083
At 30min	25	96.00	100.00	98.8400	1.02794
P value					0.02, S
Post hoc pairwise comparison					Preop*5min – 0.151, NS Preop*15min –0.159, NS Preop*30min – 0.298, NS 5min*15min – 0.016, S 5min*30min – 0.098, NS 15min*30min – 0.05, S

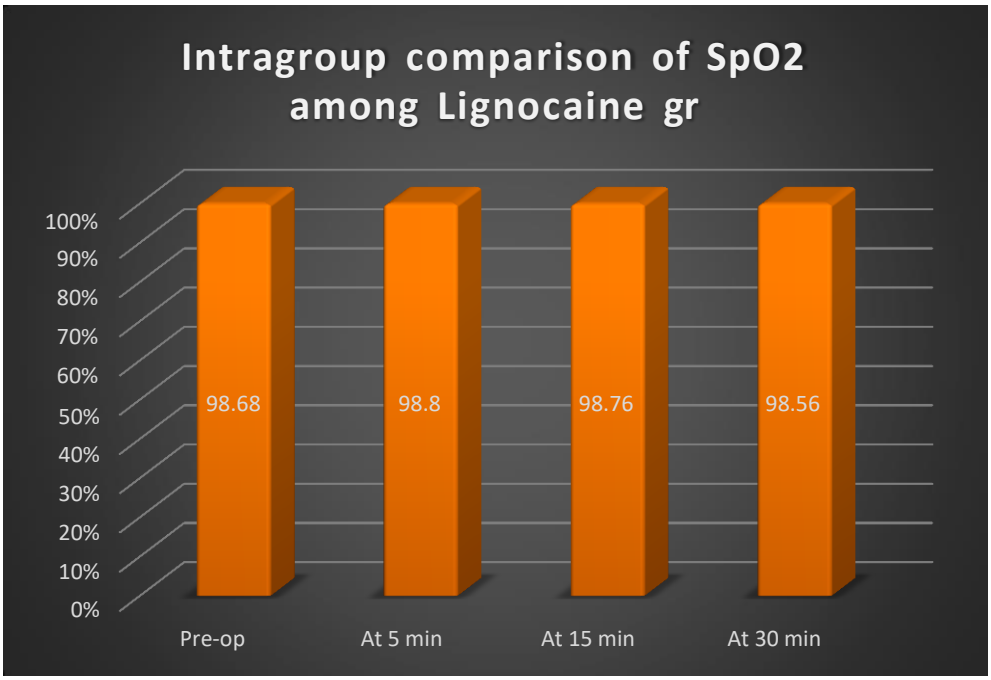
Intragroup comparison of SpO2 among Articaine group was done using Friedman test. There was a statistically significant difference in Mean SpO2 at different follow up points among Articaine group. Post hoc pairwise comparison was done using Wilcoxon test, and it was found that the mean SpO2 at 5 min & 30 min were significantly less than that at 15 min. Rest all the pairs did not show any significant difference.



Tb 5:

Intragroup comparison of sPO2 among Lignocaine gr					
	N	Minimum	Maximum	Mean	Std. Deviation
Pre-op	25	96.00	100.00	98.6800	1.14455
At 5 min	25	96.00	100.00	98.8000	.95743
At 15 min	25	96.00	100.00	98.7600	1.20000
At 30 min	25	97.00	100.00	98.5600	.86987
P value					0.593, NS
Post hoc pairwise comparison					NA

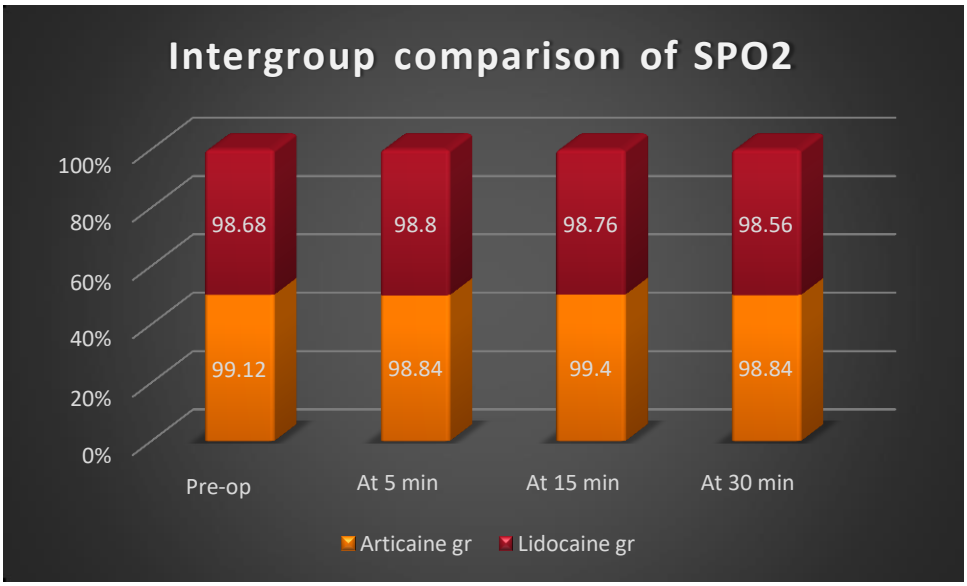
Intragroup comparison of SpO2 among Lignocaine group was done using Friedman test. Mean SpO2 at different follow up points among Lignocaine group were not found to be significantly different.



Tb 6:

Intergroup comparison of sPO2						
	N	Articaine gr		Lignocaine gr		P value
		Mean	Std. Deviation	Mean	Std. Deviation	
Pre-op	25	99.1200	.88129	98.6800	1.14455	0.226, NS
At 5 min	25	98.8400	.74610	98.8000	.95743	0.943, NS
At 15 min	25	99.4000	1.04083	98.7600	1.20000	0.009, S
At 30 min	25	98.8400	1.02794	98.5600	.86987	0.052, NS

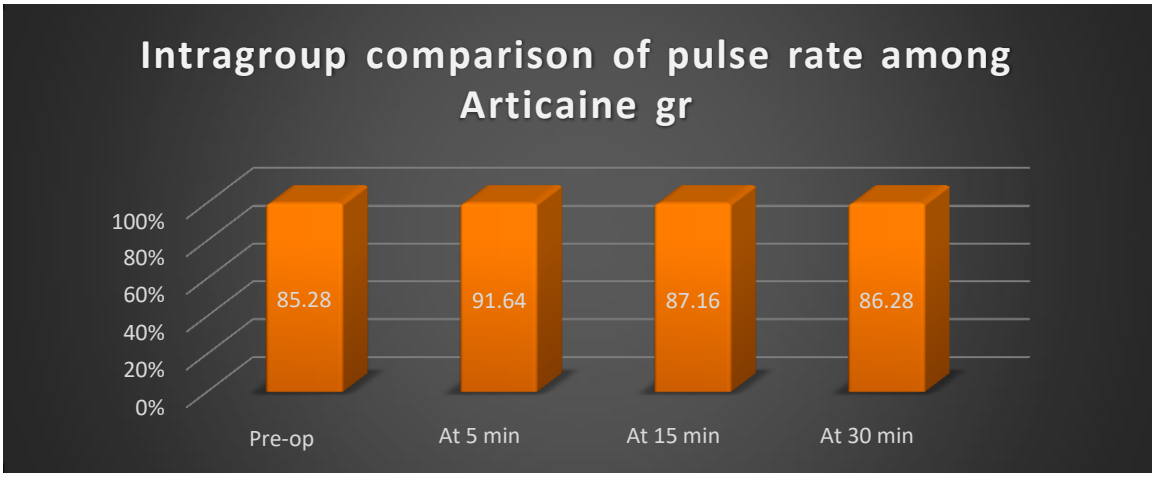
Intergroup comparison of sPO2 was done using Mann Whitney U test. It was found that at 15 min, the mean SpO2 among Articaine group was significantly higher than that among Lignocaine group. At pre-op, 5 min & 30 min, no statistically significant difference could be detected.



Tb 7:

Intragroup comparison of pulse rate among Articaine gr					
	N	Minimum	Maximum	Mean	Std. Deviation
Pre-op	25	72.00	107.00	85.2800	8.76318
At 5 min	25	85.00	102.00	91.6400	3.65011
At 15 min	25	68.00	99.00	87.1600	8.19898
At 30 min	25	65.00	97.00	86.2800	9.77463
P value	0.026, S				
Post hoc pairwise comparison	Preop*5min – 0.003, S Preop*15min –0.330, NS Preop*30min – 0.637, NS 5min*15min – 0.058, NS 5min*30min – 0.033, S 15min*30min – 0.784, NS				

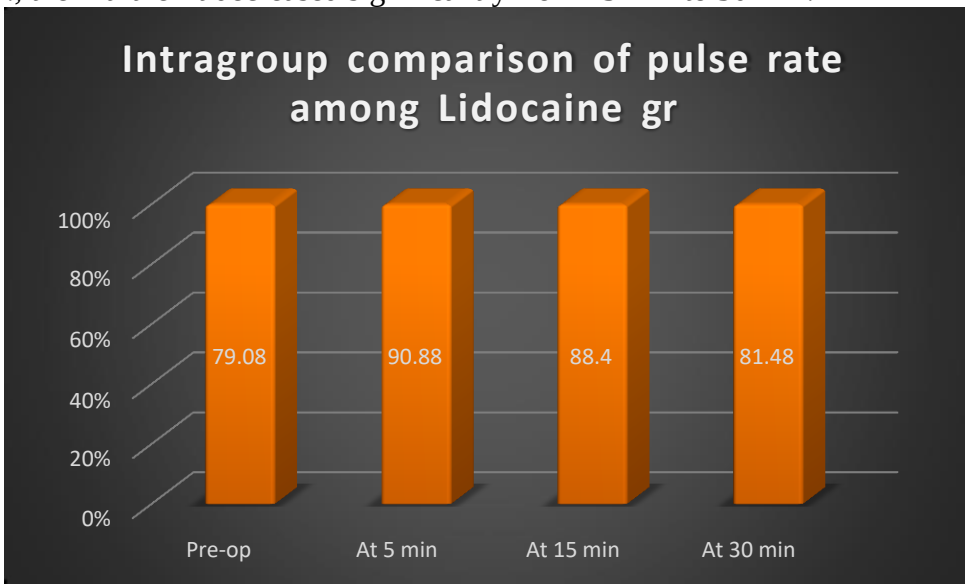
Intragroup comparison of pulse rate among Articaine group was done using Friedman test. There was a statistically significant difference in Mean pulse rate at different follow up points among Articaine group. Post hoc pairwise comparison was done using Wilcoxon test, and it was found that the mean pulse rate at pre-op& 30 min were significantly less than that at 5 min. Rest all the pairs did not show any significant difference.



Tb 8:

Intragroup comparison of pulse rate among Lignocaine gr					
	N	Minimum	Maximum	Mean	Std. Deviation
Pre-op	25	65.00	103.00	79.0800	9.38492
At 5 min	25	76.00	113.00	90.8800	8.20224
At 15 min	25	68.00	113.00	88.4000	9.24211
At 30 min	25	68.00	97.00	81.4800	8.48096
P value	<0.001, S				
Post hoc pairwise comparison	Preop*5min – <0.001, S Preop*15min –0.012, S Preop*30min – 0.518, NS 5min*15min – 0.310, NS 5min*30min – <0.001, S 15min*30min – 0.01, S				

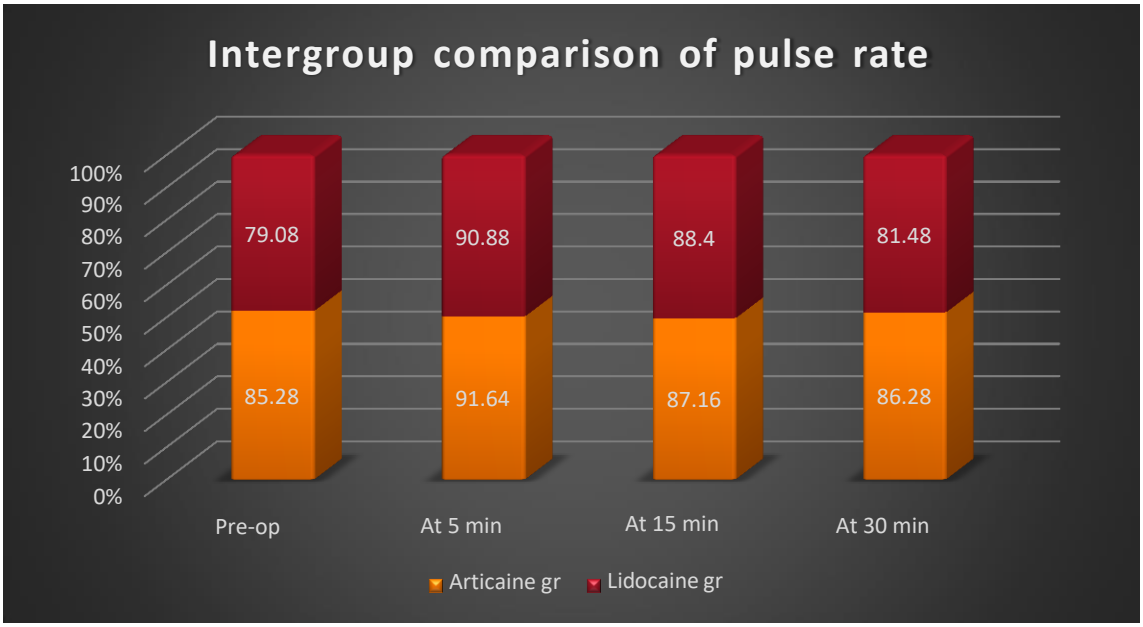
Intragroup comparison of pulse rate among Lignocaine group was done using Friedman test. There was a statistically significant difference in Mean pulse rate at different follow up points among Lignocaine group. Post hoc pairwise comparison was done using Wilcoxon test, and it was found that the mean pulse rate increased significantly from pre-op to 5min, then it did not change till 15 min., then further it decreased significantly from 15 min to 30 min.



Tb 9:

Intergroup comparison of pulse rate						
	N	Articaine gr		Lignocaine gr		P value
		Mean	Std. Deviation	Mean	Std. Deviation	
Pre-op	25	85.2800	8.76318	79.0800	9.38492	0.026, S
At 5 min	25	91.6400	3.65011	90.8800	8.20224	0.635, NS
At 15 min	25	87.1600	8.19898	88.4000	9.24211	0.754, NS
At 30 min	25	86.2800	9.77463	81.4800	8.48096	0.028, S

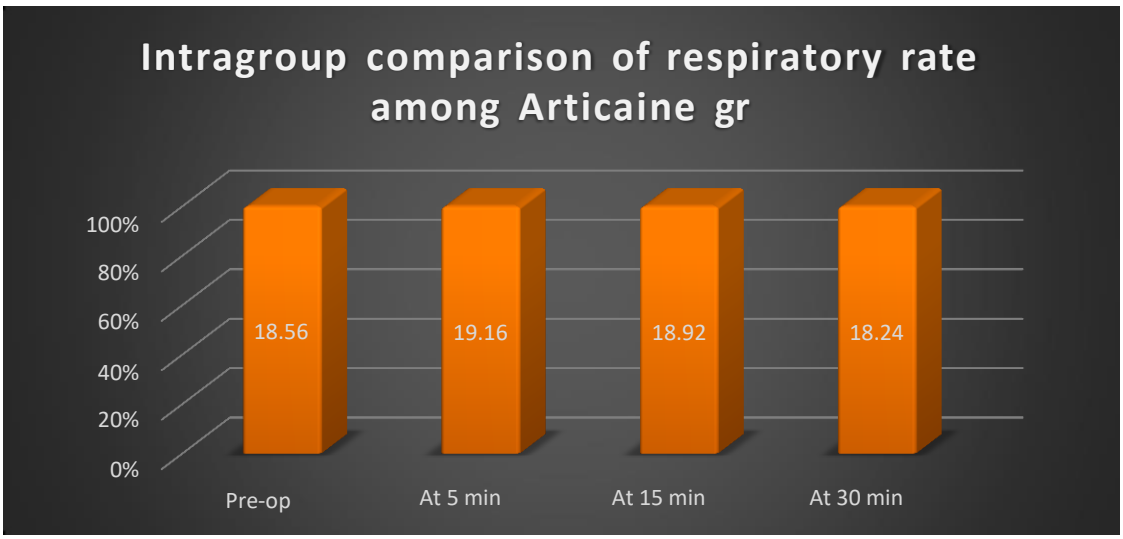
Intergroup comparison of pulse rate was done using Mann Whitney U test. It was found that at 15 min, the mean pulse rate among Articaine group was significantly higher than that among Lignocaine group. At pre-op & 30 min, the mean pulse rate was found to be significantly higher than that among Lignocaine group.



Tb 10:

Intragroup comparison of respiratory rate among Articaine gr					
	N	Minimum	Maximum	Mean	Std. Deviation
Pre-op	25	15.00	22.00	18.5600	1.60935
At 5 min	25	17.00	21.00	19.1600	1.02794
At 15 min	25	17.00	20.00	18.9200	.70238
At 30 min	25	17.00	21.00	18.2400	.96954
P value					0.004, S
Post hoc pairwise comparison					Preop*5min – 0.103, NS Preop*15min –0.360, NS Preop*30min – 0.339, NS 5min*15min – 0.257, NS 5min*30min – 0.006, S 15min*30min – 0.003, S

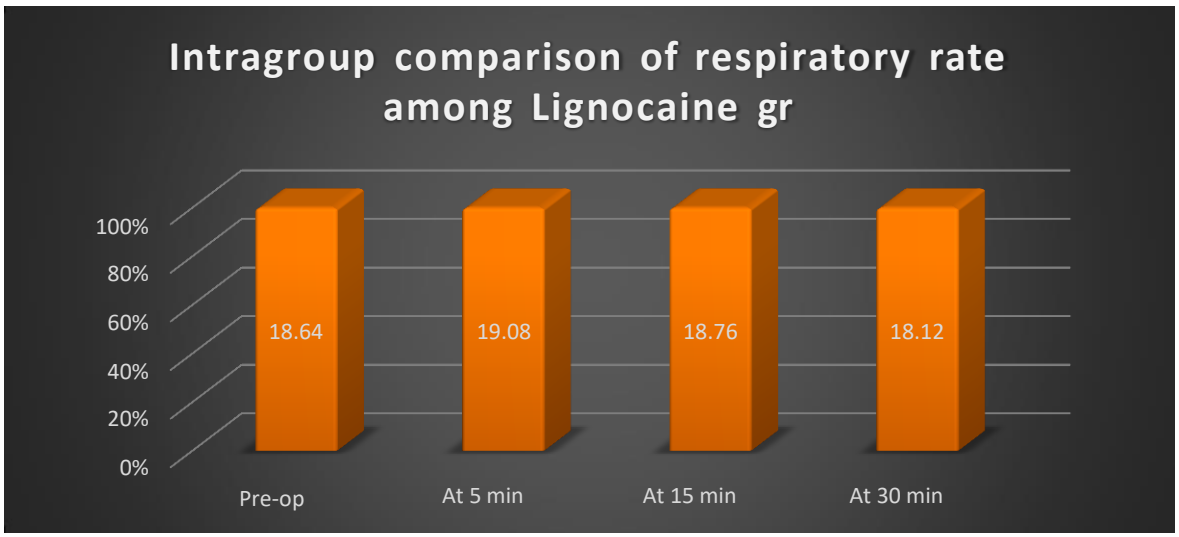
Intragroup comparison of respiratory rate among Articaine group was done using Friedman test. There was a statistically significant difference in Mean respiratory rate at different follow up points among Articaine group. Post hoc pairwise comparison was done using Wilcoxon test, and it was found that the mean respiratory rate at 30 min was significantly less than that at 5 min& 15 min. Rest all the pairs did not show any significant difference.



Tb 11:

Intragroup comparison of respiratory rate among Lignocaine gr					
	N	Minimum	Maximum	Mean	Std. Deviation
Pre-op	25	15.00	23.00	18.6400	1.75309
At 5 min	25	16.00	21.00	19.0800	1.28841
At 15 min	25	17.00	20.00	18.7600	.77889
At 30 min	25	17.00	21.00	18.1200	1.01325
P value					0.007, S
Post hoc pairwise comparison					Preop*5min – 0.186, NS Preop*15min –0.610, NS Preop*30min – 0.249, NS 5min*15min – 0.114, NS 5min*30min – 0.009, S 15min*30min – 0.004, S

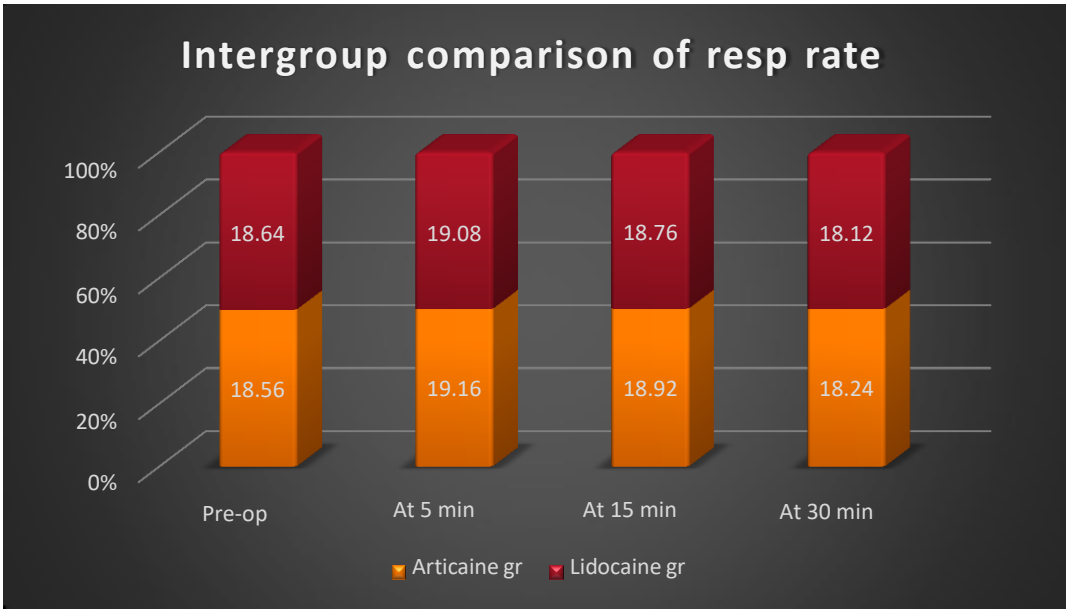
Intragroup comparison of respiratory rate among Lignocaine group was done using Friedman test. There was a statistically significant difference in Mean respiratory rate at different follow up points among Lignocaine group. Post hoc pairwise comparison was done using Wilcoxon test, and it was found that the mean respiratory rate at 30 min was significantly less than that at 5 min & 15 min. Rest all the pairs did not show any significant difference.



Tb 12:

Intergroup comparison of resp rate						
	N	Articaine gr		Lignocaine gr		P value
		Mean	Std. Deviation	Mean	Std. Deviation	
Pre-op	25	18.5600	1.60935	18.6400	1.75309	0.413, NS
At 5 min	25	19.1600	1.02794	19.0800	1.28841	0.581, NS
At 15 min	25	18.9200	.70238	18.7600	.77889	0.194, NS
At 30 min	25	18.2400	.96954	18.1200	1.01325	0.180, NS

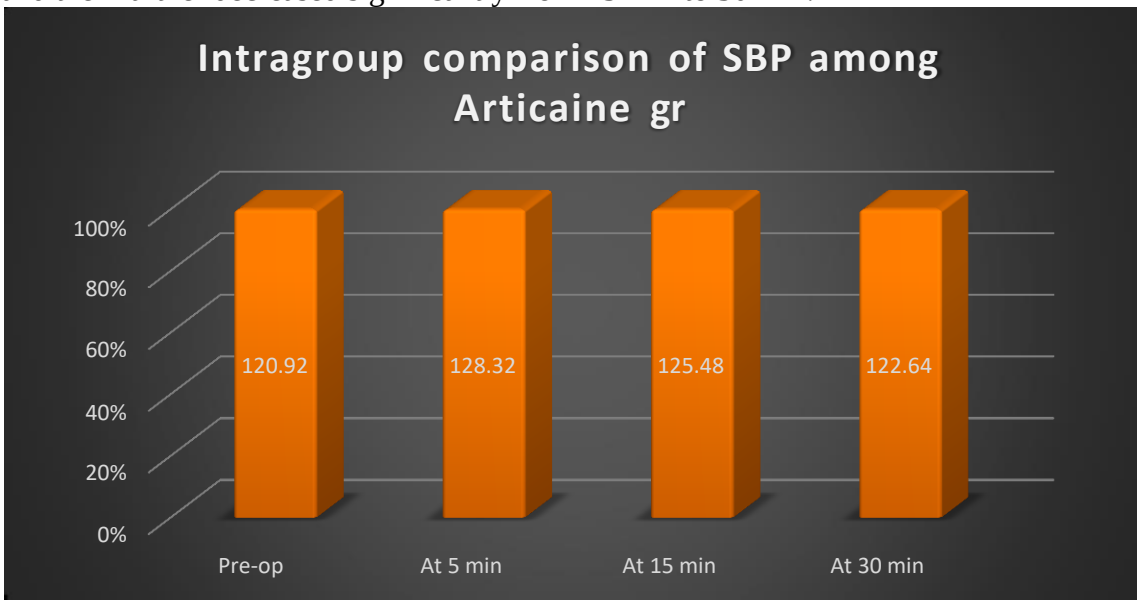
Intergroup comparison of respiratory rate was done using Mann Whitney U test. No statistically significant difference in respiratory rate could be found among articaine group & lignocaine group



Tb 13:

Intragroup comparison of SBP among Articaine gr					
	N	Minimum	Maximum	Mean	Std. Deviation
Pre-op	25	109.00	130.00	120.9200	5.14717
At 5 min	25	110.00	135.00	128.3200	5.93521
At 15 min	25	114.00	135.00	125.4800	4.90000
At 30 min	25	110.00	129.00	122.6400	4.52659
P value	<0.001, S				
Post hoc pairwise comparison	Preop*5min – <0.001, S Preop*15min –0.001, S Preop*30min – 0.227, NS 5min*15min – 0.015, S 5min*30min – 0.002, S 15min*30min – 0.028, S				

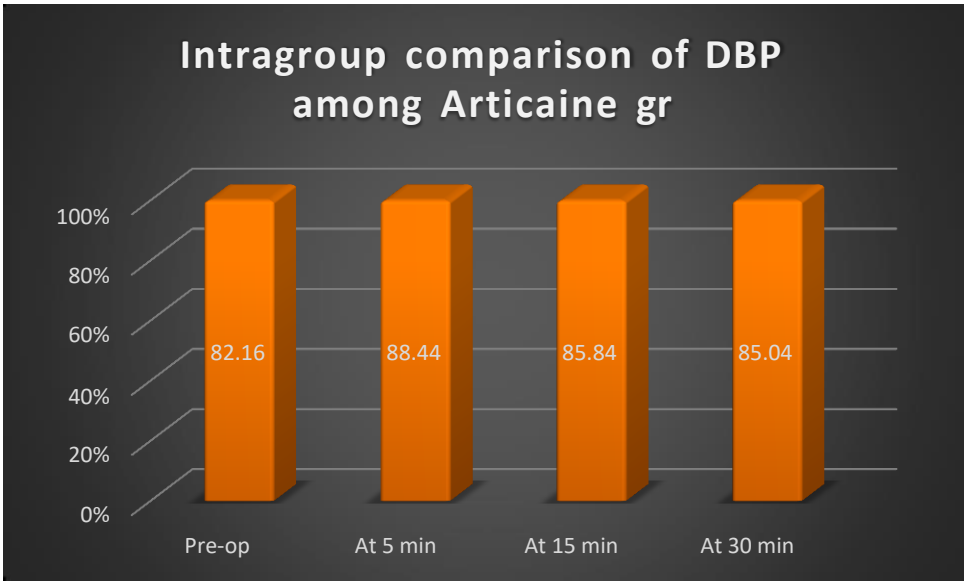
Intragroup comparison of SBP among Articaine group was done using Friedman test. There was a statistically significant difference in Mean SBP at different follow up points among Articaine group. Post hoc pairwise comparison was done using Wilcoxon test, and it was found that the mean SBP increased significantly from pre-op to 5 min., then further increased from 5 min. to 15 min. and then further decreased significantly from 15 min to 30 min.



Tb 14:

Intragroup comparison of DBP among Articaine gr					
	N	Minimum	Maximum	Mean	Std. Deviation
Pre-op	25	55.00	99.00	82.1600	10.59355
At 5 min	25	60.00	99.00	88.4400	9.73858
At 15 min	25	70.00	99.00	85.8400	7.40878
At 30 min	25	60.00	100.00	85.0400	13.45511
P value					0.071, NS
Post hoc pairwise comparison					NA

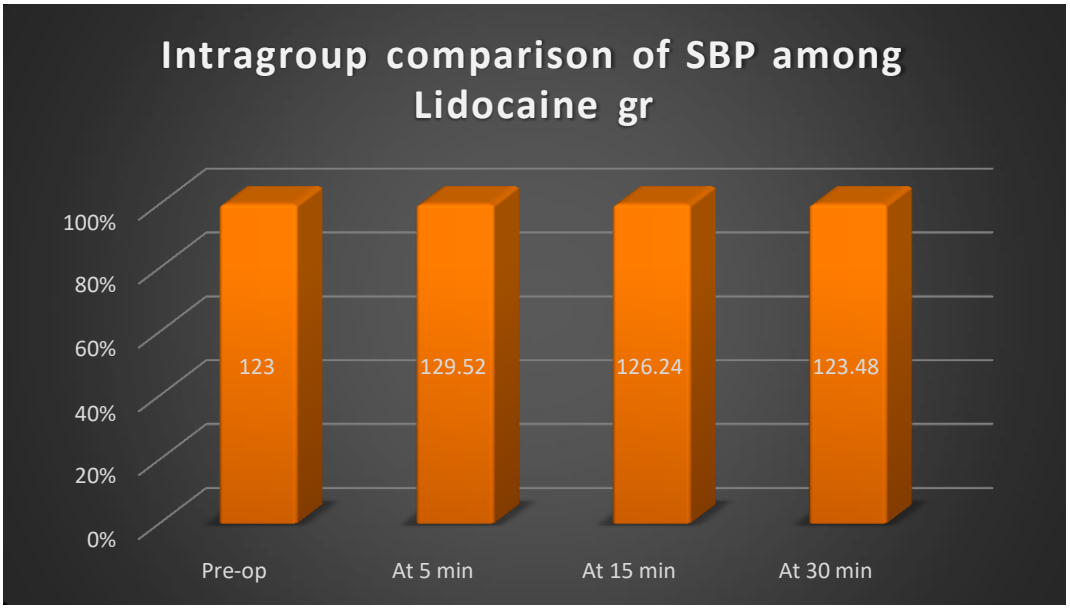
Intragroup comparison of DBP among Articaine group was done using Friedman test. A statistically significant difference could not be found in Mean DBP at different follow up points among Articaine group.



Tb 15:

Intragroup comparison of SBP among Lignocaine gr					
	N	Minimum	Maximum	Mean	Std. Deviation
Pre-op	25	109.00	156.00	123.0000	9.63501
At 5 min	25	109.00	150.00	129.5200	9.32792
At 15 min	25	114.00	136.00	126.2400	5.91805
At 30 min	25	119.00	131.00	123.4800	3.46554
P value	<0.001, S				
Post hoc pairwise comparison	Preop*5min – 0.001, S Preop*15min –0.057, NS Preop*30min – 0.337, NS 5min*15min – 0.034, S 5min*30min – 0.001, S 15min*30min – 0.083, NS				

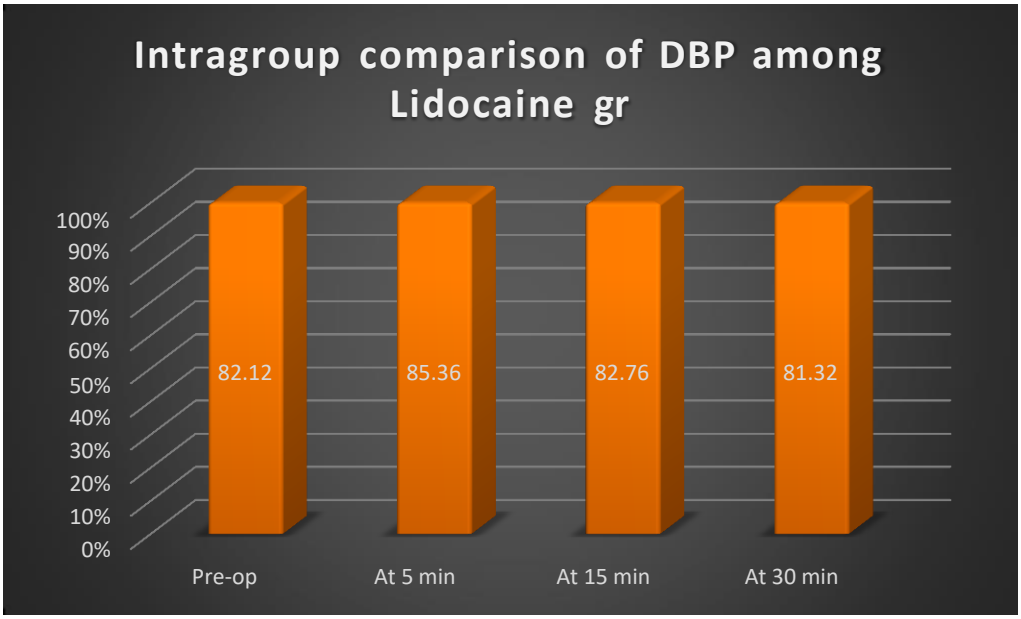
Intragroup comparison of SBP among Lignocaine group was done using Friedman test. There was a statistically significant difference in Mean SBP at different follow up points among Lignocaine group. Post hoc pairwise comparison was done using Wilcoxon test, and it was found that the mean SBP increased significantly from pre-op to 5 min., then further decreased from 5 min. to 15 min. and then further decreased significantly from 15 min to 30 min.



Tb 16:

Intragroup comparison of DBP among Lignocaine gr					
	N	Minimum	Maximum	Mean	Std. Deviation
Pre-op	25	55.00	90.00	82.1200	8.10514
At 5 min	25	53.00	99.00	85.3600	12.74062
At 15 min	25	57.00	99.00	82.7600	10.26434
At 30 min	25	60.00	99.00	81.3200	12.31097
P value					0.220, NS
Post hoc pairwise comparison					NA

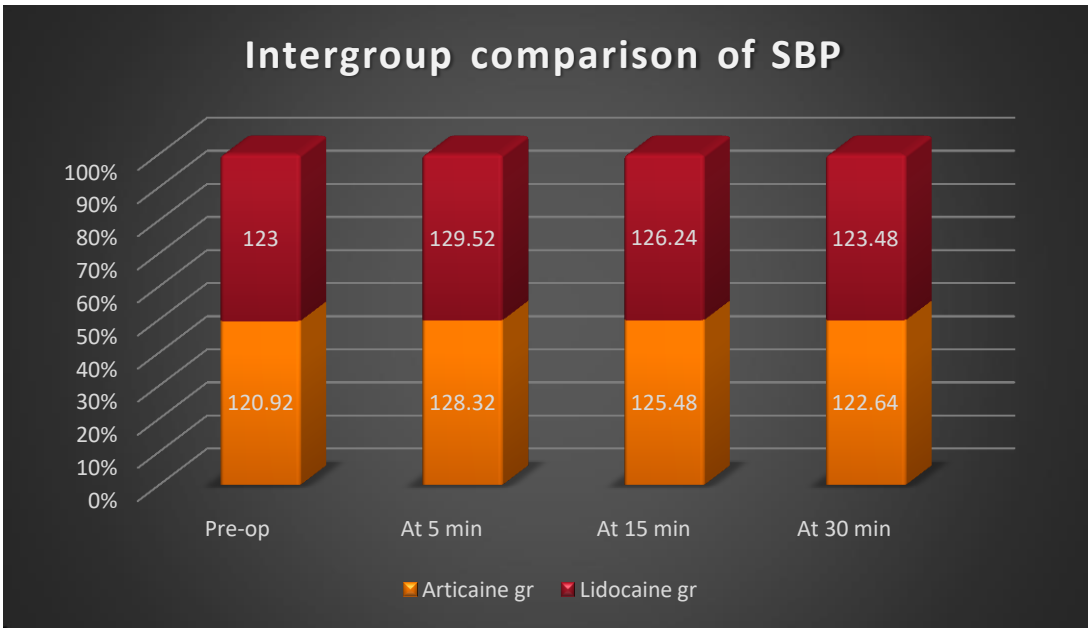
Intragroup comparison of DBP among Lignocaine group was done using Friedman test. A statistically significant difference could not be found in Mean DBP at different follow up points among Lignocaine group.



Tb 17:

Intergroup comparison of SBP						
	N	Articaine gr		Lignocaine gr		P value
		Mean	Std. Deviation	Mean	Std. Deviation	
Pre-op	25	120.9200	5.14717	123.0000	9.63501	0.338, NS
At 5 min	25	128.3200	5.93521	129.5200	9.32792	0.674, NS
At 15 min	25	125.4800	4.90000	126.2400	5.91805	0.635, NS
At 30 min	25	122.6400	4.52659	123.4800	3.46554	0.407, NS

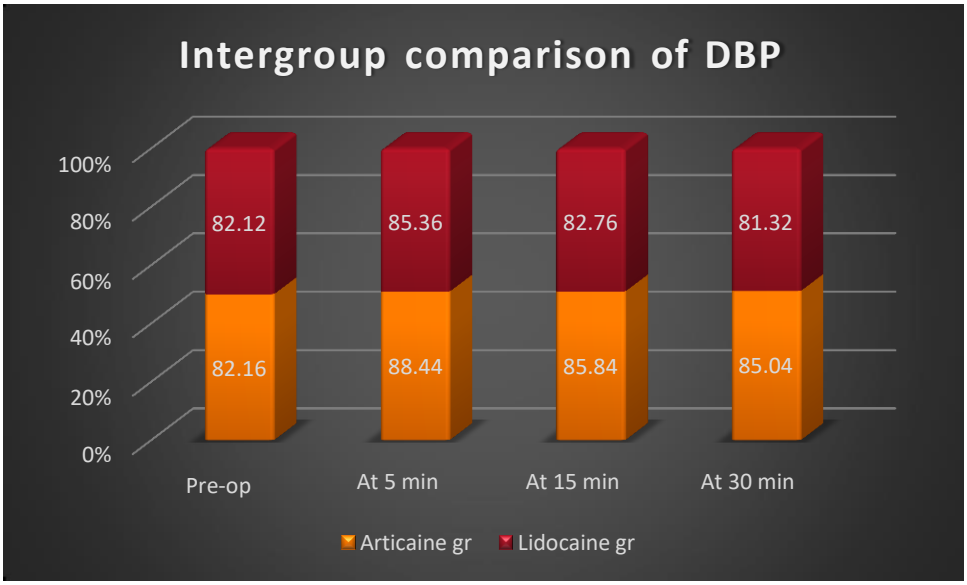
Intergroup comparison of SBP was done using Mann Whitney U test. No statistically significant difference in blood pressure could be found among articaine group & lignocaine group



Tb 18:

Intergroup comparison of DBP						
	N	Articaine gr		Lignocaine gr		P value
		Mean	Std. Deviation	Mean	Std. Deviation	
Pre-op	25	82.1600	10.59355	82.1200	8.10514	0.875, NS
At 5 min	25	88.4400	9.73858	85.3600	12.74062	0.237, NS
At 15 min	25	85.8400	7.40878	82.7600	10.26434	0.123, NS
At 30 min	25	85.0400	13.45511	81.3200	12.31097	0.121, NS

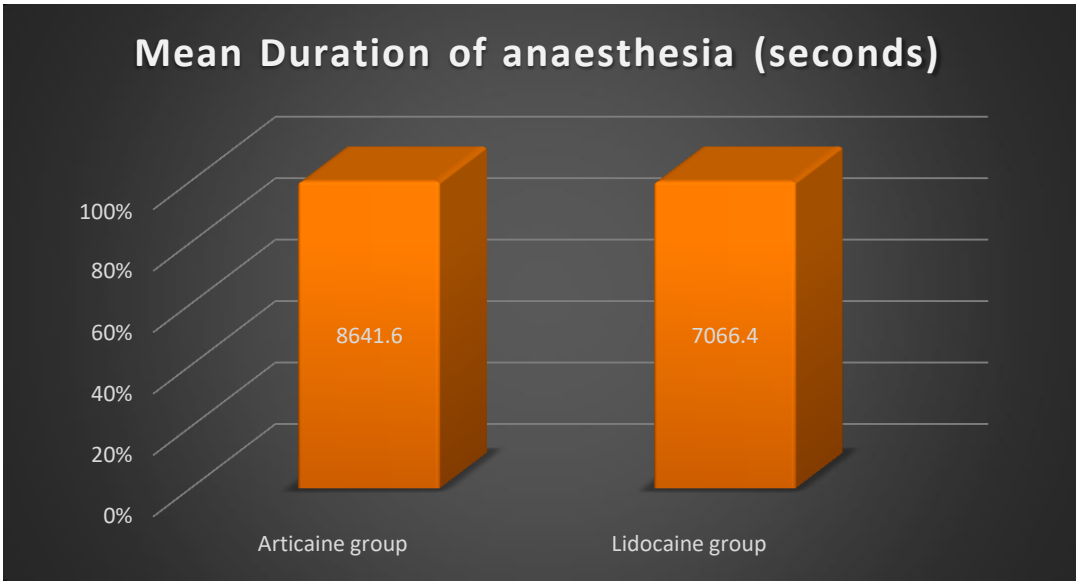
Intergroup comparison of DBP was done using Mann Whitney U test. No statistically significant difference in blood pressure could be found among articaine group & lignocaine group



Tb 19:

Duration of anaesthesia (seconds)				
	Mean	N	Std. Deviation	P value
4 % ARTICAINE WITH 1:100000 Adr	8641.6000	25	937.67301	<0.001, S
2 % LIDOCAINE WITH 1:100000 Adr	7066.4000	25	1148.82143	

Intergroup comparison of duration of anaesthesia (in seconds) was done by using Independent t test. The mean duration of anaesthesia was significantly more with respect to 4% Articaine group as compared to Lidocaine group.



DISCUSSION

For a long time, managing pain during oral surgery procedures has been a challenging issue of continuing study interest. Based on how well they manage pain, a number of local anesthetics have been assessed to determine whether ones are better than those that are currently on the market. Due of articaine's comparable safety and potency to lignocaine, this new local anesthetic has drawn a lot of attention and comparison testing. Local anesthetic injections into the skin or oral mucous membranes are frequently uncomfortable. Many factors, including the volume of solution, tissue density, deposition rate, and a significant amount of psychology, are blamed for this discomfort. The acidic pH of the anesthetic solutions is one major factor causing discomfort during local anesthetic application. A solution containing a vasoconstrictor has a pH of approximately 4.5, but a local anesthetic without one has a pH of about 5.5. Additions of alkalinizing ingredients such as sodium bicarbonate or carbon dioxide should make the anesthetic easier to administer. Additionally, at higher pH levels, anesthetics are more potent and have a shorter half-life.

The chemical structure of articaine is different from that of other local anesthetics because it has an additional ester ring and a thiophene ring in place of the aromatic ring. As a result, compared to other commonly used local anesthetics, articaine has greater liposolubility, intrinsic potency, and plasma protein binding. Clinically, these unique characteristics include superior bone tissue diffusion, a shorter latency, and an extended duration of anesthesia. Two factors influence an anesthetic's delay: the inherent properties of the pharmacological material used and the anesthetic technique employed. It is commonly recognized that latency is directly influenced by the matching pKa value, with lower pKa values being associated with shorter latency. Thus, 4% articaine (pKa = 7.8) should theoretically show less latency than 2% lidocaine (pKa = 7.9).

The length of anesthesia depends on how well an anesthetic solution binds to proteins. Additionally, it is intimately correlated with the injection site and the anesthetic solution's vasoconstrictor concentration. This implies that articaine has a longer-lasting anesthetic effect than other long-acting local anesthetics.

In our analysis, we discovered that just 40% of the patients were male and that 60% of the patients overall were female. According to the Mendelian explanation of impacted third molars, we think the higher inclination for females may be caused by the fact that females have a higher incidence of impacted third molars since their jaw sizes are smaller than those of males.Our study's outcome is similar to that of Al-Mayali, et al.'s (2020) investigation.[55]

The patient was asked to rate the degree of their intraoperative discomfort using a visual analog

scale (VAS). The greatest intra-operative VAS for articaine in our study is 2, whereas the maximum VAS for lidocaine is 5. And the Intergroup comparison of pain scores was done by using Mann Whitney U test. The mean pain score of 4 % articaine is 0.24 and 0.8 for lidocaine. These results, however, do not have statistical significance. Our study's findings are similar to those of studies done by Malamed et al. [2] and Rebolledo et al. [18]. Gregorio et al. [21], Haase et al. [21], Sumer et al. [22], and Nusstein.

The thiophene group in the molecule, which increases liposolubility and may be the explanation for the drug's ability to enter tissues quickly, is what causes reduced discomfort during the 4% articaine deposit. Lidocaine and articaine have pH values of 5-5.5 and 4.4-5.2, respectively.A topical anesthetic solution with a low pH causes increased discomfort and a burning sensation. Nonetheless, there was no discernible difference between the two anesthetic solutions.

The average onset time for 4% articaine and 2% lidocaine in our study is 123 seconds and 177 seconds, respectively. This indicates a considerable reduction in the onset time for the 4% Articaine group compared to the 2% lidocaine group. Our study's findings are consistent with those of Dugal et al. [31] and Moore et al. [16]. Gregorio et al. [21], Rebolledo et al. [18], and Colombini et al. [12].In our study, the average time for subjective symptoms to start for Articaine was 2.05 minutes (1-2) minutes. In contrast, it takes 2.96 min (1-3 min) for lidocaine.

Because 2% lidocaine has a higher pKa value (7.9) than 4% articaine, whose pKa value is discovered to be (7.8), the higher latency of 2% lidocaine is responsible for its longer time of onset. Consequently, they have a shorter latency period and a quicker anesthetic action beginning.

The oxygen saturation change was evaluated after the local anesthetic was administered and compared to the baseline value in both groups. For 4% articaine and 2% lidocaine, the preoperative Spo2 values were 99.12% and 98.6%, respectively. Intraoperatively, the values recorded at 5, 15, and 30 minutes were 98.8%, 99.4%, and 98.84% for 4% articaine and 98.8%, 98.7%, and 98.5 % for 2% lidocaine, respectively. At five and thirty minutes, there was no statistically significant difference in the spo2 value for either 4% articaine or lidocaine; however, at fifteen minutes intraoperatively, articaine was shown to have a slightly greater spo2 value than lidocaine. Nevertheless, there was no discernible difference between the two groups' sp02 values. Our study is in accordance with the study done by Martinez et al. [24] , Colombini et al. [12] , Santos et al. [20]. ,Vasconcellos et al. [28].

Our investigation's findings indicate that the mean pulse rate prior to the administration of 2% lidocaine and 4% articaine was 85.2 for articaine and 79.02 for lidocaine preoperatively. Intraoperatively, the values were recorded at 5, 15, and 30 minutes. For 4% articaine, the values were 91.64, 87.16, and 86.28, respectively, while for 2% lidocaine, the values were 90.88, 88.40, and 81.48, respectively. It was discovered that the Articaine group's mean pulse rate at 15 minutes was noticeably higher than the Lignocaine group's. The mean pulse rate was observed to be considerably greater in the gnocaine group at 30 minutes and before surgery. Nonetheless, there was no discernible variation in the heart rates of the two groups. An elevation in heart rate immediately upon injection is likely a sign of endogenous catecholamine triggered by injection discomfort. The research conducted by Moore et al. [16], Martinez et al. [24], Vasconcellos et al. [28], Meral et al. [8], and Nusstein et al. [21] is consistent with our findings.

Comparing respiratory rates, we discovered that in our investigation, the mean respiration rates prior to surgery for lidocaine and articaine were, respectively, 18.56 and 18.64. Intraoperatively, the values were recorded at 5, 15, and 30 minutes. For 4% articaine, the values were 19.16, 18.92, and 18.24, and for 2% lidocaine, the values were 19.08, 18.76, and 18.12, respectively. The respiration rates of the lignocaine and articaine groups did not differ statistically significantly. We think that tension and worry throughout the extraction process may have contributed to the respiratory rate change.

The change in both groups' systolic and diastolic blood pressure during the local anesthetic injection was measured and compared to the baseline value. For 4% articaine and 2% lidocaine, the preoperative mean blood pressure readings were 120.92/82.16 and 123/82.12, respectively. Intraoperatively, the values were recorded at five, fifteen, and thirty minutes. For articaine, the results were 128.32/88.44, 125.48/85.84, and 122.64/85.04, respectively, while for lidocaine, they were 129.52/85.36, 126.24/82.76, and 123.48/81.32, respectively. No statistically significant change was observed in the blood pressure readings between articaine and lidocaine. However, after five minutes, there was a modest increase in blood pressure for both groups intraoperatively. This could be explained by the anesthetic solution's vasoconstrictor, which acts as a counterbalance to the patient's increased anxiety brought on by the extraction operation.As with Santos et al. [20], Martinez et al. [24], Vasconcellos et al. [28], Colombini et al. [12], and Malamed et al. [2], our study's outcome was equivalent. Whereas Moore et al. [16] contradict our study. In their investigation, Hersh et al. [29] noted that after a few minutes after surgery, the

systolic and diastolic blood pressure dropped by 2–6 mmHg and 2-4 mmHg, respectively.

In our study, we found that the mean duration of anesthesia was substantially longer in the 4% Articaine group compared to the 2% Lidocaine group, with a duration of 2 hours, 40 minutes, for 4% Articaine and 2 hours, 5 minutes for 2% Lidocaine. The outcome is similar to research conducted by Vahatalo et al. [1], Costa et al. [9], Moore et al. [16], Colombini et al. [12], and Haas et al. [21]. Gregorio et al. [21], Re Bolledo et al. [18].The length of anesthesia resulting from 4% articaine is longer than that of 2% lidocaine due to the direct correlation between the anesthetic solution's concentration of vasoconstrictor, injection location, and degree of protein binding. Articaine has higher protein binding percentage as compare to other local anesthetics and hence the increased duration of anesthesia as compared to 2% lidnocaine.

In this study, 2% lidocaine was found to be better suited for re-anesthesia during surgery than 4% articaine. This may be the result of Articaine's characteristics, which include reduced latency, increased liposolubility, and superior bone tissue diffusion—that is, higher penetration because of the thiophene ring—which increase the depth and duration of analgesia achieved and, consequently, reduce the need for additional anesthetic throughout the entire procedure. This research is similar to that of Uckan et al. [14], Foster et al. [15], Kanaa et al. [13], Robertson et al. [19], and Haase et al. [25].

CONCLUSION

Local anesthetics are medications that provide a temporary loss of sensation in a particular place by inhibiting the conduction process in peripheral nerves and depressing nerve ending excitement. The amide local anesthetic agent lignocaine is widely used. combination of lidocaine and epinephrine, which counteracts the local vasodilatory effects of lidocaine and works as a vasopressor, extending its duration of action at a site. After 1.6 hours, it has a half-life.

The only amide local anesthetic with an ester group and thiophene rather than benzene ring is articaine.The thiophene ring renders articaine more lipid soluble, which promotes more effective anesthetic solution diffusion through the lipid membrane of nerve cells and into surrounding tissue. The serum half-life of articaine is 20–30 minutes, and it's shorter than that of other amide LAs because the ester group in plasma hydrolyzes more quickly. Its potency is 1.5 times higher than that of lidocaine.

The results of our investigation suggest that articaine is similarly effective as lidocaine, exhibiting identical characteristics to the gold standard drug and superior cardiac stability in hemodynamic measures. However, the anesthesia's duration and onset of action vary between them both. Articaine is the ideal anesthetic agent for use in dentistry because of its advantages, such as a quicker time of onset, a longer duration of action, and a greater diffusion property due to enhanced liposolubility.

Although some research papers indicate an increased incidence of paresthesia with 4% articaine inferior alveolar nerve block[21], no adverse effects or complications were reported in our investigation. Neither during nor after the surgery, we discovered any negative effects. This indicates that articaine is a more stable local anesthetic.

We came to the conclusion that 4% articaine outperforms 2% lidocaine pharmacologically, particularly in terms of latency and anesthetic effect duration.

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ANNEXURES

BABU BANARASI DAS UNIVERSITY

BBD COLLEGE OF DENTAL SCIENCES, LUCKNOW

INSTITUTIONAL RESEARCH COMMITTEE APPROVAL

The project titled **"Efficacy Of 2% Lidocaine With 4% Articaine: A Comparative Study"** submitted by **Dr Pallavi Rai** Postgraduate student in the **Department of Oral & Maxillofacial Surgery** for the Thesis Dissertation as part of MDS Curriculum for the academic year 2021-2024 with the accompanying proforma was reviewed by the Institutional Research Committee in its meeting held on **14th September, 2022** at BBDCODS.

The Committee has granted approval on the scientific content of the project. The proposal may now be reviewed by the Institutional Ethics Committee for granting ethical approval.

Prof. Dr. Puneet Ahuja
Chairperson

Dr. Mona Sharma
Co-Chairperson

BABU BANARASI DAS UNIVERSITY
BBD COLLEGE OF DENTAL SCIENCES, LUCKNOW

BBDCODS/IEC/09/2022 **Dated: 16th September, 2022**

Communication of the Decision of the Xth Institutional Ethics Sub-Committee Meeting

IEC Code: 20

Title of the Project: Efficacy Of 2% Lidocaine With 4% Articaine: A Comparative Study.

Principal Investigator: Dr Pallavi Rai **Department:** Oral & Maxillofacial Surgery

Name and Address of the Institution: BBD College of Dental Sciences Lucknow.

Type of Submission: New, MDS Project Protocol

Dear Dr Pallavi Rai,

The Institutional Ethics Sub-Committee meeting comprising following members was held on 15th September, 2022.

1.	Dr. Lakshmi Bala Member Secretary	Prof. and Head, Department of Biochemistry
2.	Dr. Praveen Singh Samant Member	Prof. & Head, Department of Conservative Dentistry & Endodontics
3.	Dr. Jiji George Member	Prof. & Head, Department of Oral Pathology & Microbilogy
4.	Dr. Amrit Tandan Member	Professor, Department of Prosthodontics and Crown & Bridge
5.	Dr. Rana Pratap Maurya Member	Reader, Department of Orthodontics & Dentofacial Orthopaedics

The committee reviewed and discussed your submitted documents of the current MDS Project Protocol in the meeting.
The comments were communicated to PI, thereafter it was revised.

Decisions: The committee approved the above protocol from ethics point of view.

Forwarded by:

16/9

Prof. Dr. Puneet Ahuja
Principal
BBD College of Dental Sciences
BBD University, Lucknow

PRINCIPAL
Babu Banarasi Das College of Dental Sciences
(Babu Banarasi Das University)
BBD City, Faizabad Road, Lucknow-226028

Lakshmi Bala 16/9/22

Dr. Lakshmi Bala
Member-Secretary
Institutional Ethics Sub-Committee (IEC)
BBD College of Dental Sciences
BBD University, Lucknow

Member-Secretary
Institutional Ethic Committee
BBD College of Dental Sciences
BBD University
Faizabad Road, Lucknow-226028

बाबू बनारसी दास कॉलेज ऑफ डेंटल साइंसेज (बाबू बनारसी दास विश्वविद्यालय)
बीबीडी सिटी, फैजाबाद रोड, लखनऊ - 227105 (भारत) प्रतिभागी सूचना दस्तावेज़

1.अध्ययन का शीर्षक

4% आर्टिकेन के साथ 2% लिडोकेन की प्रभावकारिता: एक तुलनात्मक अध्ययन

2.निमंत्रण पैराग्राफ

आपको एक शोध अध्ययन में भाग लेने के लिए आमंत्रित किया जा रहा है। निर्णय लेने से पहले आपके लिए यह समझना महत्वपूर्ण है कि अध्ययन क्यों किया जा रहा है और इसमें क्या शामिल होगा। कृपया निम्नलिखित जानकारी को ध्यान से पढ़ने के लिए समय निकालें और यदि आप चाहें तो दोस्तों, रिश्तेदारों और अपने इलाज करने वाले चिकित्सक/पारिवारिक डॉक्टर के साथ इस पर चर्चा करें। किसी भी स्पष्टीकरण या अधिक जानकारी के लिए हमसे पूछें। आप भाग लेना चाहते हैं या नहीं, यह आपका निर्णय है।

3.अध्ययन का उद्देश्य क्या है?

इस अध्ययन का लक्ष्य हैप्रभावित जबड़े की तीसरी दाढ़ को शल्य चिकित्सा से हटाने के लिए आर्टिकेन और लिडोकेन की प्रभावकारिता तक पहुँचना।

4.मुझे क्यों चुना गया है?

आपको इस अध्ययन के लिए चुना गया है क्योंकि आप इस अध्ययन के लिए आवश्यक मानदंडों को पूरा कर रहे हैं।

5. क्या मुझे भाग लेना होगा?

शोध में आपकी भागीदारी पूर्णतः स्वैच्छिक है। यदि आप ऐसा करते हैं, तो आपको यह सूचना पत्रक रखने के लिए दिया जाएगा और एक सहमति प्रपत्र पर हस्ताक्षर करने के लिए कहा जाएगा। अध्ययन के दौरान आप अभी भी किसी भी समय बिना कोई कारण बताए अपना नाम वापस लेने के लिए स्वतंत्र हैं।

6. यदि मैं भाग लूंगा तो मेरा क्या होगा?

प्रतिभागी को लाभ होगा क्योंकि स्थानीय एनेस्थीसिया प्रभावी होने पर आवश्यक दंत चिकित्सा उपचार किया जाएगा। इससे मरीजों को बिना दर्द, डर और चिंता के इलाज कराने में भी मदद मिलेगी।

7. मुझे क्या करना होगा?

इस अध्ययन में भाग लेने के लिए, रोगी को एएसए I में आना चाहिए, 18-50 वर्ष की आयु के बीच द्विपक्षीय मेसियोएंगुलर प्रभावित तीसरी दाढ़ होनी चाहिए और निष्कर्षण स्थल पर सूजन या संक्रमण का कोई संकेत नहीं होना चाहिए।

8.वह कौन सी प्रक्रिया है जिसका परीक्षण किया जा रहा है?

और का मूल्यांकन करने के लिए अध्ययन किया जाएगादंत रोगियों के प्रभावित जबड़े के तीसरे दाढ़ को शल्य चिकित्सा द्वारा हटाने के लिए 2% लिडोकेन और 4% आर्टिकेन की दर्द धारणा और संवेदनाहारी प्रभावकारिता की तुलना करें।रोगी का चयन एएसए I स्थिति के आधार पर 18-50 वर्ष की आयु समूह के साथ किया जाएगा

9.अध्ययन के लिए क्या हस्तक्षेप हैं?

दंत चिकित्सा प्रक्रियाओं में स्थानीय एनेस्थीसिया के प्रशासन की आवश्यकता होती है।

10.भाग लेने के दुष्प्रभाव क्या हैं?

हालाँकि प्रक्रिया के गंभीर दुष्प्रभावों की कोई रिपोर्ट नहीं है, लेकिन प्रतिभागी को मतली या पोस्ट-ऑपरेटिव उल्टी जैसे दवाओं के न्यूनतम दुष्प्रभाव हो सकते हैं। यदि प्रक्रिया के दौरान कुछ भी होता है तो किसी भी आपात स्थिति से निपटने के लिए हमारे पास कुशल कर्मचारी और विशेष उपकरण हैं।

यदि ऑपरेशन के बाद प्रतिभागी को कोई अन्य लक्षण महसूस होता है, तो मरीज को तुरंत डॉक्टर से बात करनी चाहिए।

11.भाग लेने के संभावित नुकसान और जोखिम क्या हैं?

इस अध्ययन में भाग लेने के कोई नुकसान नहीं हैं, दवा के न्यूनतम दुष्प्रभाव हो सकते हैं।

12.भाग लेने के संभावित लाभ क्या हैं?

प्रतिभागी को लाभ होगा क्योंकि स्थानीय एनेस्थीसिया प्रभावी होने पर आवश्यक दंत चिकित्सा उपचार किया जाएगा। इससे रोगियों को दर्द, भय और चिंता के बिना इलाज कराने में भी मदद मिलेगी।

13. यदि नई जानकारी उपलब्ध हो जाए तो क्या होगा?

यदि शोध के दौरान अतिरिक्त जानकारी उपलब्ध हो जाती है तो आपको इनके बारे में बताया जाएगा और आप अपने शोधकर्ता के साथ इस पर चर्चा करने के लिए स्वतंत्र हैं, आपका शोधकर्ता आपको बताएगा कि क्या आप अध्ययन जारी रखना चाहते हैं। यदि आप वापस लेने का निर्णय लेते हैं, तो आपका शोधकर्ता आपकी वापसी की व्यवस्था करेगा। यदि आप अध्ययन जारी रखने का निर्णय लेते हैं, तो आपसे एक अद्यतन सहमति प्रपत्र पर हस्ताक्षर करने के लिए कहा जा सकता है।

14.जब शोध अध्ययन बंद हो जाता है तो क्या होता है?

प्रतिभागियों को कुछ नहीं होगा.

15.अगर कुछ गलत हो गया तो क्या होगा?

समस्याओं/शिकायतों को एचओडी या आईआरसी द्वारा नियंत्रित किया जाएगा। यदि कुछ गंभीर होता है तो संस्थान समस्याओं का ध्यान रखेगा।

16. क्या इस अध्ययन में मेरी भागीदारी को गोपनीय रखा जाएगा?

हां इसे गोपनीय रखा जाएगा.

17.शोध अध्ययन के परिणामों का क्या होगा?

अध्ययन के परिणामों का उपयोग इसकी प्रभावकारिता की तुलना करने के लिए किया जाएगादंत रोगियों में 2% लिडोकेन और 4% आर्टिकेना।किसी भी रिपोर्ट/प्रकाशन के मामले में आपकी पहचान गोपनीय रखी जाएगी।

18.अनुसंधान का आयोजन कौन कर रहा है?

यह शोध ओरल और मैक्सिलोफेशियल सर्जरी विभाग, बीबीसीओडीएस में किया गया है। अनुसंधान स्व-वित्त पोषित है। प्रतिभागियों को संस्था द्वारा दिए गए प्रक्रियात्मक शुल्क का भुगतान करना होगा।

19.क्या अध्ययन के परिणाम अध्ययन समाप्त होने के बाद उपलब्ध कराए जाएंगे?

हाँ

20.अध्ययन की समीक्षा किसने की है?

संस्थान के एचओडी और आईआरसी/आईईसी के सदस्यों ने अध्ययन की समीक्षा की और अनुमोदन किया।

21.अधिक जानकारी के लिए संपर्क करें

डॉ. पल्लवी राय

ओरल और मैक्सिलोफेशियल सर्जरी विभाग बाबू बनारसी कॉलेज ऑफ डेंटल साइंसेज।

लखनऊ-227105 मोबाइल- 7054156645

डॉ. लक्ष्मी बाला

संस्था की एथिक्स कमेटी के सदस्य सचिव, बाबू बनारसी कॉलेज ऑफ डेंटल साइंसेज।

लखनऊbbdcods.iec@gmail.com

दस्तावेज़ों को पढ़ने और अध्ययन में भाग लेने के लिए अपना बहुमूल्य समय निकालने के लिए धन्यवाद।

पीआई के हस्ताक्षर.....

नाम.....।

तारीख.....

Babu Banarasi Das College of Dental

Sciences(Babu Banarasi Das University)

BBD City, Faizabad Road, Lucknow – 227105 (INDIA)

PARTICIPANT INFORMATION DOCUMENT

1. **Study Title**

Efficacy of 2% Lidocaine with 4% Articaine: A comparative study

2. **Invitation Paragraph**

You are being invited to take part in a researchstudy. Before you decide it is important for you to understand why the study is being done and what it will involve. Please take time to read the following information carefully and discuss it with friends, relatives and your treating physician/family doctor if you wish. Ask us for any clarifications or further information. Whether or not you wish to take part is your decision.

3. **What is the purpose of the study?**

This study aims to access the efficacy of articaine and lidocaine for surgical removal of impacted mandibular third molar.

4. **Why have I been chosen?**

You have been chosen for this study as you are fulfilling the required criteria for this study.

5. **Do I have to take part?**

Your participation in the research is entirely voluntary. If you do, you will be given thisinformation sheet to keep and will be asked to sign a consent form. During the study you are still free to withdraw at any time and without giving a reason.

6. **What will happen to me if I take part?**

The participant will be benefited as the required dental treatment will be carried out once the local anaesthesia is effective. This will also help the patients to get the treatment done without pain, fear and anxiety.

7. **What do I have to do?**

To participate in this study,patient must be fall in ASA Ⅰ,having bilateral mesioangular impacted third molar between age of 18-50 year of agewith no signs of inflammation or infection at extraction site

8. **What is the procedure that is being tested?**

The study will be carried out to evaluate and compare pain perception &anesthetic efficacy of 2% lidocaine & 4% articaine in for surgical removal of impacted mandibular third molar of dental patients.Patient selection will be done on basis of ASA I status With age group of 18-50 year of age

9. **What are the interventions for the study?**

Dental procedures requiring administration of local anaesthesia.

10. **What are the side effects of taking part?**

Although there are no reports of serious side effects of the procedure, but the participant may have minimum side effects of the drugs like nausea or post-operative vomiting. If anything happens during the procedure we have skilled personnel and specialized equipments to manage any emergency.

If the participant suffers any other symptom post operatively, the patient should immediately talk to the doctor.

11. **What are the possible disadvantages and risks of taking part?**

There are no disadvantages of taking part in this study, there can be minimum side effects of the drug.

12. **What are the possible benefits of taking part?**

The participant will be benefited as the required dental treatment will be carried out once the local anaesthesia is effective.This will also help the patients to get the treatment done without pain, fear and anxiety.

13. **What if new information becomes available?**

If additional information becomes available during the course of the research you will be told about these and you are free to discuss it with your researcher, your researcher will tell you whether you want to continue in the study. If you decide to withdraw, your researcher will make arrangements for your withdrawal. If you decide to continue in the study, you may be asked to sign an updated consent form.

14. **What happens when the research study stops?**

Nothing will happen to the participants.

15. **What if something goes wrong?**

The problems/complaint will be handled by the HOD or the IRC.If something serious happens the institute will take care of the problems.

16. **Will my taking part in this study be kept confidential?**

Yes it will be kept confidential.

17. **What will happen to the results of the research study?**

The results of the study will be used to compare the efficacy of 2% lidocaine & 4% articaine in dental patients. Your identity will be kept confidential in case of any report/publications.

18. **Who is organizing the research?**

The research is been done in the DEPARTMENT OF ORAL AND MAXILLOFACIAL SURGERY , BBDCODS. The research is self -funded. The participants will have to pay for procedural charges as given by the institution.

19. **Will the results of the study be made available after study is over?**

Yes

20. **Who has reviewed the study?**

The HOD and the members of IRC/ IEC of the institution has reviewed and approved the study.

21. **Contact for further information Dr. Pallavi Rai**

Department of Oral & Maxillofacial Surgery Babu Banarasi College of Dental Sciences.
Lucknow-227105 Mob- 7054156645
Dr. Laxmi Bala

Member Secretary of Ethics Committee of the institution,Babu Banarasi College of Dental Sciences.
Lucknow bbdcods.iec@gmail.com

THANK YOU FOR TAKING OUT YOUR PRECIOUS TIME FOR READING THEDOCUMENTS AND PARTICIPATING IN THE STUDY.

Signature of PI……
Name…….
Date……..

Babu Banarasi Das College of Dental Sciences

(Babu Banarasi Das University)
BBD City, Faizabad Road, Lucknow – 227105 (INDIA)

Consent Form (English)

Title of the Study .....

Study Number.....
Subject's Full Name.....
Date of Birth/Age .....
Address of the Subject.....
Phone no. and e-mail address.....
Qualification .....
Occupation: Student / Self Employed / Service / Housewife/
Other (Please tick as appropriate)
Annual income of the Subject.....
Name and of the nominees(s) and his relation to the subject..... (For the purpose of compensation in case of trial related death).

1. I confirm that I have read and understood the Participant Information Document dated .....for the above study and have had the opportunity to ask questions. **OR** I have been explained the nature of the study by the Investigator and had the opportunity to ask questions.
2. I understand that my participation in the study is voluntary and given with free will without any duress and that I am free to withdraw at any time, without giving any reason and without my medical care or legal rights being affected.
3. I understand that the sponsor of the project, others working on the Sponsor's behalf, the Ethics Committee and the regulatory authorities will not need my permission to look at my health records both in respect of the current study and any further research that may be conducted in relation to it, even if I withdraw from the trial. However, I understand that my Identity will not be revealed in any information released to third parties or published.
4. I agree not to restrict the use of any data or results that arise from this study provided such a use is only for scientific purpose(s).
5. I permit the use of stored sample (tooth/tissue/blood) for future research. **Yes [ ] No [ ] Not Applicable [ ]**
6. I agree to participate in the above study. I have been explained about the complications and side effects, if any, and have fully understood them. I have also read and understood the participant/volunteer's Information document given to me.

Signature (or Thumb impression) of the Subject/Legally Acceptable Representative:.....
Signatory's Name..... Date .....
Signature of the Investigator..... Date.....
Study Investigator's Name..... Date.....
Signature of the witness..... Date.....
Name of the witness.....
Received a signed copy of the PID and duly filled consent form
Signature/thumb impression of the subject or legally Date.....

Babu Banarasi Das College of Dental Sciences
(Babu Banarasi Das University)
BBD City, Faizabad Road, Lucknow – 227105 (INDIA)

सहमति पत्र

अध्ययन शीर्षक.....
अध्ययन संख्या.....
प्रतिभागी के पूर्ण नाम.....
जन्म तिथि / आयु.....
प्रतिभागी का पता .....
फोन नं. और ई-मेल पता .....
योग्यता .....
व्यवसाय: छात्र / स्व कार्यरत / सेवा / ग्रहिणी .....
अन्य (उचित रुप मे टिक करें) .....
प्रतिभागी की वार्षिक आय .....
प्रत्याशीयो के नाम और प्रतिभागी से संबंध...(परीक्षण से संबंधित मौत के मामले मे मुआवजे के प्रयोजन के लिए)

1. मेरी पुष्टि है कि मैने अध्ययन हेतु सुचना पत्र दिनांक ..... को पढ व समझ लिया तथा मुझे प्रश्न पुछने या मुझे अध्ययन अन्वेषक ने सभी तथ्यों को समझा दिया है तथा मुझे प्रश्न पुछने के समान अवसर प्रदान किए गये।

2. मैंने यहॉ समझ लिया कि अध्ययन में मेरी भागीदारी पूर्णतः स्वैच्छिक है और किसी भी दबाव के बिना स्वतंत्र इच्छा के साथ दिया है किसी भी समय किसी भी कारण के बिना , मेरे इलाज या कानूनी अधिकारो को प्रभावित किए बिना , अध्ययन में भाग न लेने के लिए स्वतंत्र हुँ ।

3. मैंने यह समझ लिया है कि अध्ययन के प्रायोजक , प्रायोजक की तरफ से काम करने वाले लोग, आचार समिति और नियामक अधिकारियों को मेरे स्वास्थ्य रिकार्ड को वर्तमान अध्ययन या आगे के अध्ययन के सन्दर्भ देखने के लिए मेरी अनुमति की जरूरत नही है, चाहे मैने इस अध्ययन से नाम वापस ले लिया है। हॉलाकि मै यह समझता हुँ कि मेरी पहचान को किसी भी तीसरे पक्ष या प्रकाशित माध्यम में नही दी जायेगी।

4. मै इससे सहमत हूँ कि कोई भी डेटा या परिणाम जो इस अध्ययन से प्राप्त होता है उसका वैज्ञानिक उद्देश्य (ओं) के उपयोग के लिए मेरी तरफ से कोई प्रतिबंध नही है।
5. भविष्य के अनुसंधान के लिए भंडारित नमूना (ऊतक/रक्त) पर अध्ययन के लिए अपनी सहमति देता हुँ।

हॉ [ ] नही [ ] अनउपयुक्त [ ]

6. मै परीक्षण की अनुमति देता हुँ। मुझे इसके द्वारा यदि कोई परेशानी होती है, इसके बारे में जानकारी दे दी गई है। मैने रोगी जानकारी सूचना पत्र को पढ तथा समझ लिया है।

प्रतिभागी / कानूनी तौर पर स्वीकार्य प्रतिनिधि का हस्ताक्षर (या अंगूठे का निशान.....

हस्ताक्षरकर्ता का नाम..... दिनांक .....अन्वेषक के हस्ताक्षर ..... दिनांक .....

अध्ययन अन्वेषक का नाम .....

गवाह के हस्ताक्षर ..... दिनांक .....गवाह के नाम .....

मैनें पीआईडी और विधिवत भरे सहमति फार्म का एक हस्ताक्षर की नकल प्राप्त की.

प्रतिभागी कानूनी तौर पर प्रतिनिधि का हस्ताक्षर/ अंगूठे का निशान ..... दिनांक.....

CASE SHEET

DATE:-

OPD NO.:-

PATIENT NAME:-

AGE/SEX:-

FULL PERMANENT POSTAL ADDRESS:-

TELEPHONE NO.:-

CHIEF COMPLAINT:-

FAMILY HISTORY:-

PERSONAL HISTORY:-

HABITS:-

HISTORY OF PAST ILLNESS:-

HISTORY OF PRESENT ILLNESS:-

PAST DENTAL HISTORY:-

SYSTEMIC EXAMINATION:-

LOCAL EXAMINATION:-

INVESTIGATIONS & RECORDS:- HBsAg, HIV- I ,II and HCV ; OPG

DIAGNOSIS:-

TREATMENT:-

PRE-OPERATIVE RECORD

S.No.	Criteria	Articaine	Lidocaine
1	Blood pressure		
2	Oxygen saturation		
3	Pulse rate		
4	Respiratory rate		

INTRAOPERATIVE RECORD

S.No.	Criteria	Articaine	Lidocaine
1	Time of onset		
2	Blood pressure		
3	Oxygen saturation		
4	Pulse rate		
5	Respiratory rate		
6	VAS Score		

POST-OPERATIVE RECORD

S.No.	Criteria	Articaine	Lidocaine
1	Duration of anesthesia		

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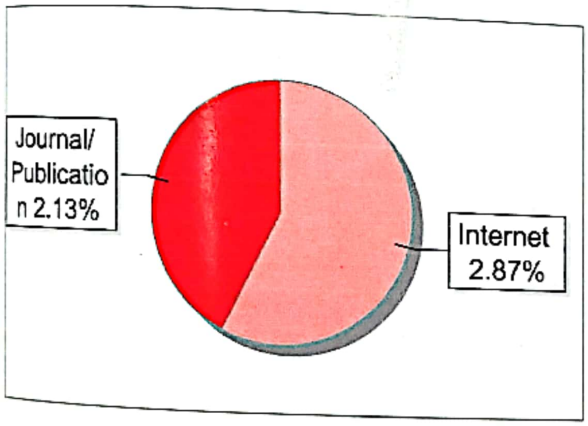

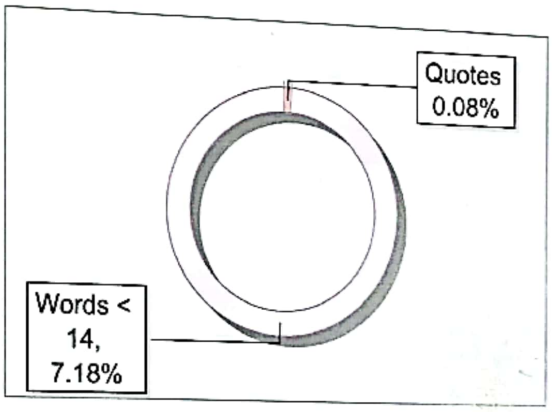

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