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# Use of 2% Lignocaine with two different dilutions of Epinephrine in the extraction of mandibular anteriors and premolars

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**Abstract**
**Objective:** This study intended to evaluate efficacy of 2% lignocaine with two different dilutions of epinephrine in equal volumes (1ml), used as infiltration anaesthesia in the extraction of mandibular anteriors and premolars. The following parameters were evaluated: onset, depth and duration of anaesthesia, hemostasis during the procedures, and complications, if any.
**Methodology:** Forty patients underwent extractions of mandibular teeth (anteriors and premolars) using local infiltration anesthesia of 2% lignocaine. 20 patients received 2% lignocaine with 1:80000 adrenaline and another 20 patients received 2% lignocaine with 1:200000 adrenaline.
**Results:** It was found that there was statically significant difference in the onset of anesthesia and the duration of action of local anesthesia in study group but not in efficacy and depth of anesthesia.
**Conclusion:** Longer duration of anaesthesia can be achieved with the use of local infiltration 2% lignocaine with 1:80000 dilution of adrenaline when compared with equal volume of 2% lignocaine with 1:200000 dilution of adrenaline. Hence it can be a choice of local anaesthetic in patients who require longer duration of anaesthesia.

**Keywords:** Infiltation anaesthesia, 2% lignocaine, 1:80000 and 1:200000 dilutions of adrenaline

## Introduction
Local anesthetics are considered to be the most commonly used drugs in dental practice. Various anesthetic drugs have been used with different dilutions of adrenaline, over past few decades. Among all local anaesthetics, lignocaine is the most widely used in dentistry [1]. It is considered by WHO on essential drug list, is efficacious, safe and cost-effective for any health-care system [2]. It gives a rapid onset of action as it diffuses rapidly and reaches the nerve membrane. Like all local anaesthetic agents it has vasodilating effect. Adrenaline acts as both α and β adrenergic receptors agonist. Addition of adrenaline prolongs the duration as well as the depth of anaesthesia it is effective in preventing or minimizing blood loss during surgical procedures [3]. The duration of action with the use of plain lignocaine for 10 mins.

## Material and Methods
The present study was undertaken in the Department of Oral & Maxillofacial Surgery, School of Dental Sciences, KIMSDU, Karad, after due approval of the Institutional Ethics Committee. All the cases requiring extraction of mandibular anterior and premolar teeth were included in the study.

### Inclusion Criteria
1. Patients of age group 18-55 years of both the genders.
2. Patients willing to participate in the study and who were prepared to come for follow up
3. Mandibular anteriors and premolars with minimal caries and restorations with no abnormal finding on periapical radiograph and normal probing depth

### Exclusion Criteria
1. Patients with H/O known allergy to local anesthetic agents or to their constituents
2. Medically compromised patients
3. Patients taking sedative drugs

4. Patients on anti-anxiety medications within 2 weeks prior to the study
5. Patients taking any other drug(s) that could affect pain perception

All the patients were informed about the nature of the study and a written informed consent was obtained before participating in the study.

**Type of Local Anesthetic Drug**

2% lignocaine with 1:80 000 adrenaline and 2% lignocaine with 1:200 000 adrenaline.

**Armamentarium**

2.5 ml disposable plastic syringes and 26 gauge disposable needles

A total of 40 patients were enrolled in the study and were divided into 2 groups:

Study Group (n=20) comprised of patients in whom 2% lignocaine with 1:80 000 adrenaline was used.

Control Group (n=20) comprised of patients in whom 2% lignocaine with 1:200 000 adrenaline was used.

0.5 ml of local anesthetic solution was infiltrated in the buccal mucosa. Similarly 0.5 ml of the solution was used for lingual infiltration in the vicinity of the tooth to be extracted.

The following parameters were studied: time of onset of anesthesia, complete lip anesthesia, efficacy of local anesthesia, Duration of local anesthesia, depth of local anesthesia, frequency of supplementary injection, hemostasis and complications, if any.

**Statistical Analysis**

The data were entered in to Microsoft Excel 2007 software. All analyses were performed using SPSS (Statistical Package for Social Sciences) software version 17. Descriptive statistics were expressed as mean ± Standard Deviation (SD) for each group for onset of anesthesia (in minutes), lip anesthesia (in minutes) and duration of local anesthesia (in minutes). Comparison of the two groups for onset of anesthesia (in minutes), lip anesthesia (in minutes) and duration of local anesthesia (in minutes) Independent 't' Test. Comparison was done for pain on probing on buccal aspects (Present/Absent), depth of anesthesia (Excellent/Good/Poor) and Frequency of Supplementary Injection (Yes/No) and Haemostasis at the end of 30 mins (Present/Absent) was done with Mann Whitney 'U' Test. In the above tests, p value less than or equal to 0.05 ($p$<0.05) was taken to be statistically significant.

**Results**

It was seen that the mean difference for duration of local anesthesia (in minutes) among Control Group and Study Group was found to be statistically significant with $p$< 0.001 (Table1). The mean difference for onset of anesthesia (in minutes) among Control Group and Study Group was found statistically insignificant with p=0.23 (Chart 1, Table 1). The mean difference for lip anesthesia (in minutes) among Control Group and Study Group was found statistically insignificant with p=0.93 (Chart 2, Table 1). There was no statistically significant difference among the two groups for Pain on Probing on buccal aspects (Present/Absent)**,** Depth of anesthesia (Excellent/Good/Poor) and Frequency of Supplementary Injection (Yes/No) and Hemostasis at the end of 30 min (Present/Absent) with p=1.000 (Table 2).

**Table 1:** Comparison of onset of anesthesia (in minutes), lip anesthesia (in minutes) and duration of local anesthesia (in minutes) among the two groups.

| Groups | Minutes (Mean ± SD) | t | df | p value | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Lower | Upper |
| Control Group | 1.24 ± .217 | 1.21 | 38 | .23 | .09 | .07 | -0.06 | 0.25 |
| Study Group | 1.14 ± 0.26 | | | | | | | |
| Control Group | 1.42 ± 0 .23 | .08 | 38 | 0.93 | .006 | .07 | -.141 | .15 |
| Study Group | 1.41 ± 0.23 | | | | | | | |
| Control Group | 26.70 ± 4.7 | -8.24 | 38 | <0.001* | -14.80 | 1.79 | -18.43 | -11.16 |
| Study Group | 41.5 ± 6.5 | | | | | | | |

**Table 2:** Comparison of pain on probing on buccal and lingual aspects, depth of anesthesia, frequency of supplementary injection and hemostasis at the end of 30 mins among two groups

| Test Statistics[a] | | | | | |
|---|---|---|---|---|---|
| | Pain on Probing on Buccal aspects | Depth of Injection | Frequency of Supplementary Inj | Hemostasis at the end of 30 mins | Complication |
| Mann-Whitney U | 200.000 | 200.000 | 200.000 | 200.000 | 200.000 |
| Wilcoxon W | 410.000 | 410.000 | 410.000 | 410.000 | 410.000 |
| Z | .000 | .000 | .000 | .000 | .000 |
| Asymp. Sig. (2-tailed) p value | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| Exact Sig. [2*(1-tailed Sig.)] | 1.000[b] | 1.000[b] | 1.000[b] | 1.000[b] | 1.000[b] |
| a. Grouping Variable: group | | | | | |
| b. Not corrected for ties. | | | | | |

**Table 3:** Descriptive Statistics for onset of anesthesia (in minutes), lip anesthesia (in minutes) and duration of local anesthesia (in minutes) among the two groups.

| Descriptive Statistics | | | | | | |
|---|---|---|---|---|---|---|
| Groups | | N | Minimum | Maximum | Mean | Std. Deviation |
| Control Group | onset | 20 | .550 | 1.490 | 1.23800 | .217270 |
| | lip anesthesia | 20 | 1.150 | 2.010 | 1.42300 | .232245 |
| | duration of anesthesia | 20 | 20.000 | 35.000 | 26.70000 | 4.702743 |
| Study group | onset | 20 | .480 | 1.480 | 1.14550 | .260556 |
| | lip anesthesia | 20 | 1.150 | 2.010 | 1.41650 | .230086 |
| | duration of anesthesia | 20 | 30.000 | 60.000 | 41.50000 | 6.509103 |

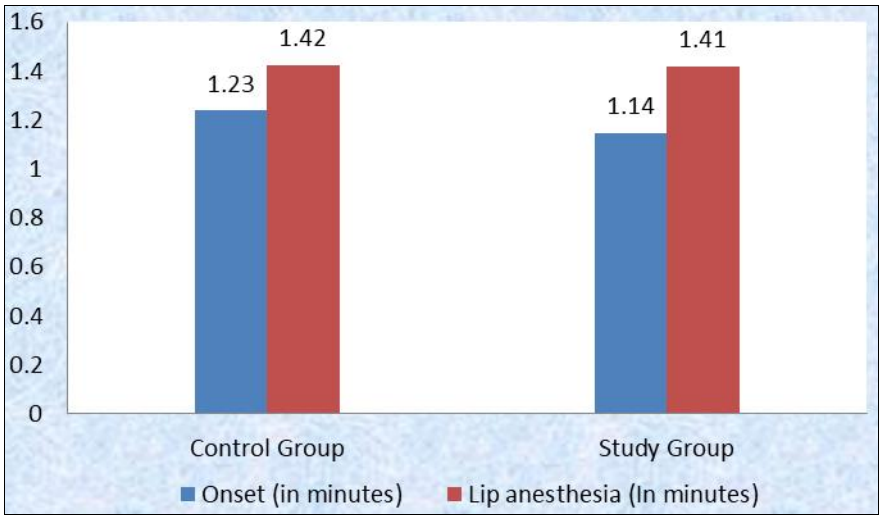


**Chart 1:** Mean Onset of anesthesia (in minutes), lip anesthesia (in minutes) among two groups.

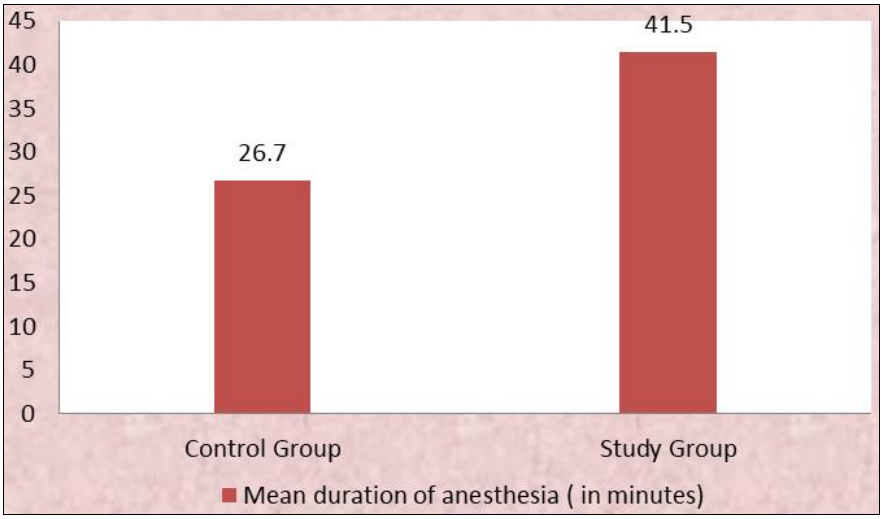


**Chart 2:** Mean Duration of anesthesia (in minutes) among two groups.

## Discussion

In our study, statistically significant difference seen was in the duration of anesthesia. Maximum duration of anesthesia in Control Group was seen as 35 min and minimum 20 min while that on Study Group maximum was 55 min and minimum was 30 min. Though values were insignificant statistically in the Study Group showed earlier onset of action as compared to Control Group. There was no statistically significant difference in the time of onset of anesthesia, complete lip anesthesia, efficacy of local anesthesia, duration of local anesthesia in the two groups. Pain on probing at the buccal aspect of the tooth at the end of 5 mins was absent in all the patients in both groups. Depth of anesthesia achieved was excellent in both the groups. No supplementary injections required in any of patients in both groups. Haemostasis was achieved in all cases in both the groups at the end of 30 mins. There were no complications encountered in the present study.

Sood *et al.* [2] compared the anesthetic efficacy of 4% articaine with 1:100,000 epinephrine and 2% lidocaine with 1:80,000 epinephrine for inferior alveolar nerve block in patients with irreversible pulpitis. They concluded that the pulpal anaesthesia success for articaine (76%) was slightly more than with lidocaine (58%) as measured with pulp tester. However, they compared different local anaesthetic solutions with two different dilutions and not the single solution.

Lignocaine diffuses readily through interstitial tissues and lipid rich nerves, giving rapid onset of action. Its vasodilating effect is more than that of prilocaine and mepivacaine. Adrenaline prolongs the duration of anaesthesia as well as the depth of anesthesia. It is effective in preventing or minimizing blood loss during surgical procedures. Due to vasoconstrictive effects of adrenaline, absorption of local anaesthetic agent and then systemic toxicity are reduced. If adrenaline is not added to lignocaine, vasodilating effect of lignocaine limits pulpal anesthesia to only 5-10 min. 0.2 mg of adrenaline is a safe maximum dose in healthy patients and it is best to limit the total dose to 0.04 mg in cardiac patients. It should be kept to a minimum amount capable of producing adequate results. Adrenaline acts directly on both α and β-adrenergic receptors.[1] Systemically adrenaline like drugs can cause a number of cardiovascular disturbances while most are short lived, permanent injury or even death may follow by causing drug induced ventricular fibrillation, myocardial infarction or cerebro-vascular accidents [2].

Lignocaine has a total plasma clearance of 0.95 L/min, a volume of distribution at steady state of 91L, an elimination half-life of 1.6 h and an estimated hepatic extraction ratio of 0.65. The clearance of lignocaine is almost entirely due to liver metabolism, and depends both on liver blood flow and the activity of metabolising enzymes. The elimination half-life in neonates (3.2 h) is approximately twice that of adults [4]. Studies have proved that 2% lignocaine with adrenaline 1:80,000 has a rapid onset of action after infiltration,

averaging 2-3 minutes. Inferior alveolar nerve block requires 5 minutes or more to take full effect. The duration of effective anaesthesia varies in individuals and depends on the type of anaesthetic technique. The average duration of useful anaesthesia after infiltration is 60 minutes. After successful regional anaesthesia, e.g. inferior alveolar nerve block, anaesthesia lasts for 2 hours or longer [4].

## Conclusion

2% lignocaine with 1:80000 adrenaline has longer duration of anesthesia as compared to 2% lignocaine with 1:200000 adrenaline. It has equal onsent and shows equal hemostasis when given as local infiltration. Hence it can be used as alternative to routinely used 2% lignocaine with 1:200000 adrenaline in healthy patients. But this study only highlights the local effect of drug after infiltration, the systemic effect of 1:80000 adrenaline should be considered before administrating the drug.

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