

Original Research

Comparison of efficacy of local anaesthetic solution with two different concentration of adrenaline in patients undergoing dental extraction procedures

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ABSTRACT:

Background: Local anesthetics vary in their potency, allowing for concentrations that range typically from 0.5 to 4%. With advent of time and research, a variety of local anaesthetic solutions are used in dentistry. Hence; the present study was undertaken for assessing and comparing the local anaesthetic solution with two different concentration of adrenaline in patients undergoing dental extraction procedures. **Materials & methods:** A total of 50 patients scheduled to undergo extraction of mandibular first molar were enrolled in the present study. All the patients were broadly divided into two study groups as follows: Group 1: Patients receiving local anaesthesia (lignocaine) with 1:80000 concentrations of adrenaline, and Group 2: Patients receiving local anaesthesia (lignocaine) with 1:200000 concentration of adrenaline. Local anaesthesia was administered according to respective groups and various hemodynamic parameters were recorded. The assessment of analgesia was done by the clinical and recorded as 'successful', 'partial success', and 'failure'. All the results were recorded in Microsoft excel sheet and were analysed by SPSS software. **Results:** While comparing the mean pulse rate at different time intervals, it was seen group 2 patients were associated with significantly higher alteration in the mean pulse rate at different time intervals. Also, it was seen that in comparison to group 1, group 2 patients were associated with significantly higher alteration in both systolic and diastolic blood pressure at different time intervals. **Conclusion:** The adrenaline at both the concentrations produced equal anaesthesia, adrenaline with concentration of 1:200000 showed significantly higher rise in hemodynamic parameters.

Key words: Adrenaline, Dental extraction, Local anaesthesia

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INTRODUCTION

It is impossible to provide effective dental care without the use of local anesthetics. This drug class has an impressive history of safety and efficacy, but all local anesthetics have the potential to produce significant toxicity if used carelessly.¹ Local anesthetics vary in their potency, allowing for concentrations that range typically from 0.5 to 4%. This is largely the result of differences in lipid solubility, which enhances diffusion through nerve sheaths and neural membranes. This property is determined by the aromatic ring and its substitutions, along with those added to the tertiary amine.²⁻⁴

Cocaine was the first local anesthetic, discovered in 1860. It is unique among the local anesthetics because, in addition to blocking impulse conduction along axons, it inhibits reuptake of neurotransmitters by adrenergic neuronal endings. Peripherally, this results in an accumulation of norepinephrine within sympathetic synapses leading to vasoconstriction and cardiac stimulation. With advent of time and research, a variety of local anaesthetic solutions are used in dentistry.⁵ Hence; the present study was undertaken for assessing and comparing the local anaesthetic solution with two different concentration of adrenaline in patients undergoing dental extraction procedures.

MATERIALS & METHODS

The present study was conducted with the aim of assessing and comparing the local anaesthetic solution with two different concentration of adrenaline in patients undergoing dental extraction procedures. A total of 50 patients scheduled to undergo extraction of mandibular first molar were enrolled in the present study. Written consent was obtained from all the patients after explaining in detail the entire research protocol. All the patients were broadly divided into two study groups as follows:

Group 1: Patients receiving local anaesthesia (lignocaine) with 1:80000 concentration of adrenaline

Group 2: Patients receiving local anaesthesia (lignocaine) with 1:200000 concentration of adrenaline

Complete demographic details of all the patients were obtained. Complete demographic and clinical details of all the patients were obtained. Local anaesthesia was administered according to respective groups and various hemodynamic parameters were recorded. The assessment of analgesia was done by the clinical and recorded as 'successful', 'partial success', and 'failure'. All the results were recorded in Microsoft excel sheet and were analysed by SPSS software. Chi- square test and student t test were used for evaluation of level of significance.

RESULTS

In the present study, mean age of the patients of group 1 and group 2 was 41.8 years and 39.5 years. There were 15 males and 10 females in group 1 while there were 13 males and 12 females in group 2. While comparing the mean pulse rate at different time intervals, it was seen group 2 patients were associated with significantly higher alteration in the mean pulse rate at different time intervals. Also, it was seen that in comparison to group 1, group 2 patients were associated with significantly higher alteration in both systolic and diastolic blood pressure at different time intervals.

Table 1: Demographic data

Parameter	Group 1	Group 2
Mean age (years)	41.8	39.5
Gender	Males	15
	Females	10

Table 2: Comparison of mean pulse rate

Pulse rate	Group 1	Group 2	p- value
Before administration of LA	80.2	82.3	0.23
Immediately after administration of LA	81.9	89.3	0.00 (Significant)
Immediately Post extraction	79.8	91.4	0.00 (Significant)
Post extraction 20 minutes	75.3	80.1	0.01 (Significant)

Table 3: Comparison of mean systolic blood pressure

Mean systolic blood pressure e	Group 1	Group 2	p- value
Before administration of LA	118.6	120.4	0.12
Immediately after administration of LA	124.5	130.3	0.01 (Significant)
Immediately Post extraction	122.7	132.8	0.02 (Significant)
Post extraction 20 minutes	120.3	125.8	0.01 (Significant)

Table 4: Comparison of mean diastolic blood pressure

Mean systolic blood pressure e	Group 1	Group 2	p- value
Before administration of LA	78.9	80.3	0.71
Immediately after administration of LA	80.4	89.1	0.02 (Significant)
Immediately Post extraction	84.3	90.4	0.00 (Significant)
Post extraction 20 minutes	82.1	86.4	0.02 (Significant)

Table 5: Success rate

Success rate	Group 1 (n)	Group 2 (n)
Success	25	25
Failure	0	0
p- value	1	

DISCUSSION

Local anesthetic agents are chemicals that reversibly block the transmission of action potential of nerve membrane. An essential pre-requisite to success in dentistry is to achieve good quality local anesthesia (LA). Local anesthetic agents are normally associated with absence of pain during surgical intervention in bone and soft tissue. There are many local anesthetic agents, lignocaine being the gold standard available with the wide selection of vasoconstrictive agents that improve the clinical efficacy and the duration LA.^{4, 5} Greater lipid solubility of a drug not only enhances potency but also enables more rapid diffusion through cell membranes. For local anesthetics, this hastens the onset for anesthesia in isolated fibers during in vitro studies, but it must be appreciated that other factors come into play clinically. For example, inherent vasodilating properties may promote systemic absorption before the anaesthetic reaches the nerve membrane.^{6- 9} Hence; the present study was undertaken for assessing and comparing the efficacy of local anaesthetic solutions with two different concentration of adrenaline in patients undergoing dental extraction procedures.

In the present study, mean age of the patients of group 1 and group 2 was 41.8 years and 39.5 years. There were 15 males and 10 females in group 1 while there were 13 males and 12 females in group 2. While comparing the mean pulse rate at different time intervals, it was seen group 2

patients were associated with significantly higher alteration in the mean pulse rate at different time intervals. Managutti A et al compared the efficacy and cardiovascular effects with the use of 2% lignocaine with two different concentrations. Forty patients underwent extractions of mandibular bilateral teeth using 2% lignocaine with two different concentrations - one with 1:80000 and the other with 1:200000. There was no significant difference in the efficacy and duration with the 2% lignocaine with 2 different concentrations. 2% lignocaine with 1:80000 adrenaline concentration has significantly increased the heart rate and blood pressure especially systolic compared with the lignocaine with 1:200000. Though 2% lignocaine with 1:80000 is widely used in India, 1:200000 adrenaline concentrations do not much affect the cardiovascular parameters. So it is recommended to use 2% lignocaine with 1:200000 for cardiac patients.¹⁰

In the present study, it was seen that in comparison to group 1, group 2 patients were associated with significantly higher alteration in both systolic and diastolic blood pressure at different time intervals. However; success rate of anaesthesia in both the study groups was 100 percent. Bansal V et al evaluated the efficacy, safety and clinical acceptability of the local anaesthetic agent ropivacaine 0.75 % in comparison with lignocaine 2 % with adrenaline 1:200,000 in minor oral surgical procedures. Forty-seven patients, who required bilateral extractions in a single arch, were included in this study. One hundred and sixty-six extractions were performed and all the patients were administered nerve blocks/infiltration. Pre and postoperative pulse, blood pressure, random blood sugar, electrocardiogram and partial oxygen pressure were recorded at specified time intervals. Pain score by visual analogue scale, onset of action and depth of anesthesia were also observed. Duration of anaesthesia was assessed by feeling of numbness and first sign of pain. Statistical analysis revealed insignificant difference between both the groups in terms of pulse, blood pressure, random blood sugar, and partial oxygen pressure. The depth of anesthesia was evaluated by pain, comfort during the procedure with visual analog scale and showed no significant difference between the two groups. The onset of action for maxillary infiltration was 33.29 ± 9.2 (ropivacaine), 32.12 ± 6.8 s (2 % lignocaine with adrenaline 1:200,000) and for pterygomandibular nerve block was 181.0 ± 87.5 (ropivacaine), 32.12 ± 6.8 s (2 % lignocaine with adrenaline 1:200,000). Duration of anesthesia when compared was 411.7 ± 66.11 min (ropivacaine) and 107.87 ± 16.54 (2 % lignocaine with adrenaline 1:200,000). On maxillary buccal vestibule infiltration it was also observed that in ropivacaine group there was no requirement of palatal infiltration suggestive of good diffusion property. Ropivacaine is a safe, clinically acceptable long acting local anaesthetic agent with added advantage of effective diffusion property.¹¹

CONCLUSION

From the above results, the authors concluded that all the adrenaline at both the concentrations produced equal anaesthesia, adrenaline with concentration of 1:200000 showed significantly higher rise in hemodynamic parameters.

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