THE EFFECT OF BUFFERED AND NON-BUFFERED 2% LIDOCAINE: CLINICAL RESULTS

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ABSTRACT

Aim of the study. The goal of buffering is to shorten the latency time of the anaesthesia and reduce the duration time of the anaesthesia.
Materials and methods. The study included 43 patients undergone mandibular nerve block with buffered and non-buffered 2% lidocaine. The researched parameters were latency period in seconds (speed of onset of anaesthesia) and anaesthesia duration time measured in minutes.
Results. When latency time of buffered and non-buffered 2% lidocaine was investigated, results revealed statistically significant difference in advantage of buffered anaesthetic. No statistically significant difference was determined when assessed duration of anaesthesia.
Conclusions. Buffered 2% lidocaine provided faster speed of anesthesia than non-buffered analog.

Key words: anaesthesia duration, buffering, latency time, lidocaine

INTRODUCTION

Local pain control is a mainly aspect in most dental procedures to provide patient comfort [1]. The lidocaine is one of the most widely used local anaesthetics in dentistry [2]. The goal of buffering is to reduce the latency time of the anaesthesia and decrease the duration time of the anaesthesia. [3, 4, 5, 6, 7].

The most frequently using method for buffering (alkalinization) of dental local anaesthtics is conventionally with hand-mixing technique. The objective of this investigation is to apply method for buffering of dental local anesthetics and to show effectiveness of their alkalinization.

MATHERIALS AND METHODS

The design was double-blind randomized study performed in the Department of Dental, Oral and Maxillofacial Surgery, Dental Faculty, Medical University of Plovdiv, Bulgaria. A 43 patients were included in the clinical investigation undergone mandibular nerve block with 2% buffered and non-buffered 2% lidocaine (20 men, 23 women; mean age - 45.81±15.10 years; mean body weight – 77.36±12.57 kg). The mean dose injected for non-buffered and buffered lidocaine was 0,72 mg/kgbw. Inclusion criteria - signed informed consent for the anaesthesia [8], age – 18-78 years, non-smokers, patients upon inferior alveolar nerve block, visit at least two appointments. Exclusion criteria – allergy to lidocaine, dental acute infections, patients with medical diseases. Mucoperiosteal flap extraction of retained and semiretained lower

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third molars was provided. The studied parameters were latency period in seconds (speed of onset of anaesthesia) and anaesthesia duration time in minutes. The buffered method was performed conventionally by hand-mixing technique. 0.2 mL dental local anaesthetic was withdraw from dental carpule with sterile needle followed by injection of same quantity, 8.4% sodium bicarbonate into the cartridge. The ratio between dental local anaesthetic and 8.4% sodium bicarbonate was 9:1 [9]. The used statistical method was an unpaired t-test. For statistically significant difference, the level of significance was 0.05. All statistically analyses were performed by the usage of SPSS software, version 21.

RESULTS AND DISCUSSIONS

The results of latency time (period from the time of injection of the local anaesthetic until the onset of numbness of lower lip) in seconds for anaesthesia with 2% non-buffered lidocaine showed minimum range 5 sec. and maximum range 900 sec. The minimum latency time for anaesthesia with 2% buffered lidocaine was 1 sec., whereas maximum was 300 sec. Results from unpaired t-test revealed statistically significant difference in mean scores for latency time of buffered and non-buffered 2% lidocaine (t=2.1219; df=71; SED - 38.259; p=0.0373; p<0.05) (Figure 1).

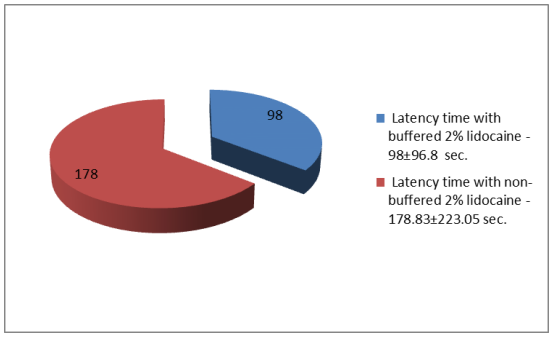

FIGURE 1. Mean scores for latency time in seconds (onset of anaesthesia) with buffered and non-buffered 2% lidocaine

The minimum range of duration time of anaesthesia (the time at which the lower lip numbness disappeared) in minutes with 2% non-buffered lidocaine was 30 min., while maximum range – 180 min. The minimum range of duration time of anaesthesia with 2% buffered lidocaine was 20 min, maximum range – 240 min. Results from unpaired t-test showed no statistically significant difference in mean scores for duration of anesthesia of buffered and non-buffered 2% lidocaine (t=0.4163; df=71; SED - 11.545; p=0.6785; p>0.05) (Figure 2).

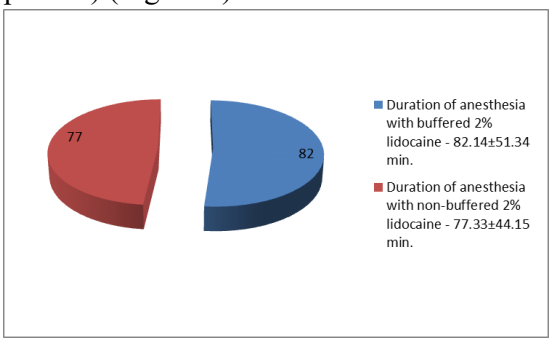

FIGURE 2. Mean scores for duration time of anaesthesia in minutes with buffered and non-buffered 2% lidocaine

Our research revealed mean scores for the latency time 178.83±223.05 sec. of non-buffered 2% lidocaine, and 98±96.8 sec. of buffered agent with statistically significant difference (P=0.0373; P<0.05). Researchers concluded that speed of action of anesthesia had a faster by the usage of buffered lidocaine compared with non-buffered analogue showed on Table 1.

Table 1. Latency time with statistically significant difference (p<0.05)

Study	Buffered anaesthetic measurements	Non-buffered anaesthetic measurements	P
2020, Chumpitaz-	105.72±9.7 sec.	157.52±12.1 sec.	0.002

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Cerrate V, et al [10]			
2022, Jain TK, et al [15]	1.24 0.31 min.	1.71 0.51 min.	0. 0001
2022, Rana V, Fernandes J, Gupta S. [14]	1.49 min.	2.30 min.	< 0.05
2022, Shivakote e SP, Singh S, Verma L. [18]	1.39 sec.	3.33 sec.	< 0.00 1

Our results for latency time were differed from results received from another group of authors that no determined statistically significant difference between buffered and non-buffered lidocaine showed on Table 2.

Table 2. Latency time with no statistically significant difference (p>0.05)

Study	**Buffered anaesthetic measurements**	**non-buffered anaesthetic measurements**	**P**
2016, Chopra R, et al [17]	84.2± 28.9 sec.	86±27.8 sec.	0 .824
2019, Meincken M, et al [13]	2.22± 0.9 min.	2.53± 1.04 min.	0 .052
2019, Pranitha V, et al [11]	118.9 sec.	132.3 sec.	0 .43
2020, Hemmanur S, Nasim I. [16]	2.842 5 min.	3.416 3 min.	0 .105
2020, Palanivel I, et al [12]	2.00± 0.167 min.	1.99± 0.948 min.	0 .320
2021, Baker SD, et al [5]	3.4±1 .3 min.	4.4±3 .7 min.	0 .22

Regarding to mean scores of anesthesia duration time measured in minutes we received 77.33±44.15 min. for the non-buffered 2% lidocaine, and 82.14±51.34 for the buffered analog without statistically significant difference (P=0.6785; P>0.05). Our results were similar to researches provided by following authors group showed on Table 3.

Table 3. Duration of anaesthesia with no statistically significant difference (p>0.05)

Study	**Buffered anaesthetic measurements**	**Non-buffered anaesthetic measurements**	**P**

Our investigation regarding to duration of anesthesia were differed from another studies showed on Table 4.

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2020, Chumpitaz-Cerrate V, et al [10]	194.44±8.5 min.	205.4±11.6 min.	0.114
2021, Baker SD, et al [5]	218±60 min.	241±91 min.	0.17

Table 4. Duration of anaesthesia with statistically significant difference (p<0.05)

Study	**Buffered anaesthetic measurements**	**Non-buffered anaesthetic measurements**	**P**
2020, Hemmanur S, Nasim I. [16]	56.75 min.	43.75 min.	0.020
2022, Jain TK, et al [15]	327.18 min.	129.08 min.	0.0001
2022, Jessica JY, et al [19]	196±73.25 min. - buffered articaine 276±27.86 min. - buffered lignocaine	159±63.911 min. - lignocaine hydrocholoride with adrenaline 1:80,000 solution 215± 63.46 min. - 4% articaine in 1:100,000 solution	0.000
2022, Rana V, Fernandes J, Gupta S. [14]	108.75 min.	72.50 min.	<0.05
2023, Torres-Rojas K, et al [7]	148.24±36.24 min., fastly injected	170.82±43.75 min., slowly injected	0.041

CONCLUSIONS

Buffered lidocaine provided faster speed of anesthesia than non-buffered analog but duration of anesthesia did not show difference when compared both formulations.

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Conflict of interest

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The authors declare no conflict of interest.

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