The Comparison of Lidocaine 2% with Adrenaline 1: 100.000 Onset in First or Second Maxillary Molar Extractions in Two Age Groups at Oral Surgery Department Faculty of Dentistry, University of North Sumatera March-April 2017

Ahyar Riza, Yulia Handayani Siregar
Department Oral and Maxillofacial Surgery
Faculty of Dentistry, Universitas Sumatera Utara
Medan, Indonesia

***Abstract*–Local anesthetics are very commonly used in dental extraction procedures. Local anesthetics are performed to relieve pain locally in an anesthetic region for a short period. Lidocaine is one type of local anaesthesia that is often used in the field of dentistry. Infiltration anaesthesia is the most common technique for local anaesthesia of the maxilla. This research aims to look at the difference onset of 2% adrenaline lidocaine 1: 100.000 in first or second molar maxillary tooth extractions in two age groups at the Oral Surgery Department, Faculty of Dentistry, University of North Sumatera. This research is an analytic research. The sampling technique was done by purposive sampling technique which fulfilled inclusion and exclusion criteria. The sample are 24 people, 12 young adults (20-39 years) and 12 middle-aged adults (40-50 years). The data are collected by directly analyzing the onset of lidocaine on sample. The results shows that the onset average of 2% adrenaline lidocaine 1: 100.000 in first or second maxillary molar extractions at young adult age (20-39 years) was 36.08 seconds with a standard deviation of 12.147 (36.08 ± 12,147). The onset average 2% adrenaline lidocaine 1: 100.000 in first or second maxillary molar extractions at middle age (40-50 years) was 56.33 seconds with a standard deviation of 11.696 (56.33 ± 11.696). The results also indicate that there is a significant difference in local anesthetic onset of lidocaine 2% with adrenaline 1: 100.000 in first or second molar of maxillary tooth extractions in two age groups in Oral Surgery Department, Faculty of Dentistry, University of North Sumatera.**

Keywords–onset, local anesthetics, lidocaine, molar tooth, age

I. INTRODUCTION

Local anesthetics are very commonly used in dental extraction procedures [1]. Local anesthetics are performed to relieve pain locally in an anesthetic region for a short period [1,2]. According to Malamed SF, local anaesthesia can control pain in the field of dentistry. The use of specific local anesthetic agents is expected to provide comfort when the patient is undergoing dental treatment.

The advantage of local anaesthesia is that the techniques can be learned easily, doesn't require a lot of instruments and economical. Local anaesthesia also does not interfere with the respiratory tract and can be performed by a general dentist. Another advantage of local anaesthesia is that there is possibility for the patient to cooperate well with the dentist during the treatment. Preoperative preparation for the patient is generally not necessary and the patient can go home immediately after dental treatment [4].

Lidocaine was first introduced in 1949 and is one of the most widely used local anesthetics. Lidocaine causes local loss of sensation with faster onset, greater effect, longer duration of action and wider region than procaine with the same concentration [5]. Combination of lidocaine 2% with adrenaline 1: 100.000 is the most commonly used anesthetic in local anaesthesia [6].

The addition of vasoconstrictor in a local anesthetic solution will help generate hemostatis and provide a clean surgical field that is free from excessive bleeding. The use of vasoconstrictor gives the possibility of long and deep anesthetic effects and can reduce the amount of adrenaline secreted by the patient in response to pain and fear [4,7].

According to Bennet in 1974, there are several factors to be considered in the selection of anaesthesia methods; which is the area to be anesthetized, the depth of anaesthesia, the duration of anaesthesia, the presence of infection, the patient's age, the patient's condition, and hemostatis when necessary. The patient's age is always used in consideration. Older individual's bones might be dense and difficult to penetrate. Younger individual might have opposite reaction that the

anaesthetized area will be wider and feel more comfortable [5].

Thoma in 1969 said that children and younger individual with thinner bones have more and wide Haversian canal, whereas the older individual with thick bones is the opposite. According to Junqueira and Carneiro in 1977, the combination of bone synthesis and bone damage not only occurs within the growing bone but also occurs during adulthood. During growth and even in adulthood, there is always damage and re-establishment of the Haversian system so that the system is often seen with only a few lamellae and a large Haversian canal [5].

There is no significant difference in the administration of local anaesthesia between young and old adults. It should be noted to give a dose far below the maximum dose to the older patient because the patient often has some systemic disease [7].

According to the research by Dewi Fatma Suniarti about the comparison of onset and duration of action of two lidocaine local anesthetics in mandibular molar extraction, it is concluded that the average onset of action for lidocaine is 560,7 second and procaine is 254,8 second. The average duration of action for lidocaine is 124.5 minutes and procaine is 170 minutes [6[.

According to the study of Anak Agung Ngurah Jelantik Andy Jaya about the difference of onset and duration of action of local anesthetic drug lidocaine HCl 2% with adrenaline 0,0125 mg in coffee drinkers and non-coffee drinkers, it is concluded that the average of onset of action for sample group is 2.5 minutes and the average onset of action for control group is 2.6 minutes. The average duration of action for the sample group is 164.5 minutes, while the average duration of action for the control group is 167.7 minutes. There was no significant effect of coffee consumption on the onset and duration of action of local anaesthesia [7].

II. MATERIALS AND METHODS

This type of research is analytical research with posttest only control group design with observation after given treatment. This research was conducted in the Department of Oral and Maxillofacial Surgery in University of North Sumatera Teaching Dental Hospital, Medan. The time of research conducted was from March 1 to April 30, 2017.

The samples used in this study were all the patients underwent the tooth extraction at the Department of Oral and Maxillofacial Surgery University of North Sumatera Teaching Dental Hospital and agreed to participate in this study after signing the informed consent to be the research subject. This study used 24 samples that divided into two age groups, each of 12 samples in each age group, group I age 20-39 years while group II age 40-50 years.

The sampling technique is purposive sample, where the sample meets the inclusion and exclusion criteria. Sample inclusion criteria used in this study were first or second maxillary molar tooth extraction patients at Oral Surgery Department of University of North Sumatera Teaching Dental Hospital, aged 20-39 years and 40-50 years, in good condition and willing to participate in the study.

The material used in this research is a lidocaine 2% with adrenaline 1:100.000 local anesthetic solution in a 1.8 ml ampoule. The instruments used in this research are a stopwatch, disposable needles and carpule.

Samples were selected from patients who came to undergo extraction of first or second maxillary molar at the Department of Oral and Maxillofacial Surgery of University of North Sumatera Teaching Dental Hospital. Patients were given information (informed consent) that consists of actions and possible complications and request of approval that the medical data from anaesthesia onset of action measurement will be used as a research material. Then the patient's oral cavity is ready for local anaesthesia. First do the asepsis procedure and instruments sterilization, preparation of local anaesthesia and the mucous membrane for injection.

Anaesthesia of the first or second maxillary molars can be performed by infiltration techniques (supraperiosteal anaesthesia). The patient's lips is pulled so that the nerves become tight so there is not too much pain when anaesthetized and the vestibular area can be seen clearly. The needle is inserted on the mucobuccal fold with the bevel facing the bone. The needle is inserted through the mucous membrane to the penost (compacta). Stop when the needle reaches the bone. Then the needle is pulled slightly and aspirate the needle, then administer 1 ml of the anaesthetics. Then add a SMIA (submucus infiltration anaesthesia) anaesthesia to the palatal region about 2-3 mm from the tooth cervical by following the bone arch and then administer a few drops or 0.25 ml.

The loss of sensation on buccal and palatal mucosa was observed. Onset of action is counted from the time of injection completed until the presence of loss of sensation. The patient is instructed to give sign and asked when the feeling of loss of sensation arise, along with the examination by the operator using dental explorer. The observations results were measured by using stopwatch.

The techniques of data processing and data analysis in this study is Independent T-Test statistic using computer program to see the difference of the onset of action of the two sample groups anaesthesia by computerization. The processing and analysis of normality test of both group's data in this study was done first with Shapiro-Wilk statistical test. If p value <0,05 then test is significant. If p value> 0,05 then test is not significant.

III. RESULTS

The data obtained from this study is the initial work of local anestheticum lidocaine 2% adrenaline 1: 100.000 in first or second maxillary molars extractions in two age groups can be seen in Table I below.

TABLE I. RESULTS OF ONSET OF LOCAL ANAESTHESIA OF LIDOCAINE IN TWO AGE GROUP

NO.	Onset of Local Anesthetics (seconds)	
	Age 20-39 years	Age 40-50 years
1.	40	60
2.	39	49
3.	25	71
4.	20	56
5.	44	51
6.	41	80
7.	53	45
8.	32	48
9.	20	51
10.	51	66
11.	21	39
12.	47	60

The results of onset of 2% adrenaline lidocaine 1: 100.000 in first or second molar maxillary tooth extractions in two age groups of processed using SPSS computer program and obtained the results of data in Table II below.

TABLE II. THE AVERAGE WORK OF LOCAL ANAESTHESIA IN TWO AGE GROUPS

	Age	Total Sample	The average work of local anaesthesia (seconds)
Onset of Local Anesthetics	20-39 years	12	36,08
	40-50 years	12	56,33

Based on the above table it is known that anaesthesia local lidocaine 2% adrenaline 1: 100.000 in 1 or 2 maxillary molars extraction at young adult age (20-39 years) is 36,08 second with standard deviation 12,147 (36,08 ± 12,147). The average local anesthetic work of 2% adrenaline lidocaine 1: 100.000 in 1 or 2 maxillary molars extraction in middle age (40-50 years) mature age was 56.33 seconds with standard deviation of 11.696 (56.33 ± 11.696). The results of the initial work of lidocaine anaesthesia were tested by normality test to see whether or not the data didn't the normal requirements or to see the existence of extreme data in the observation results obtained

TABLE III. RESULT DATA OF NORMALITY TEST

	Age	Total Sample	p Value
Onset of Local Anesthetics	20-39 years	12	0,192
	40-50 years	12	0,811

The results data of normality test of two groups by using Shapiro-Wilk test, it is known value p for the working time of local anaesthesia 2% lidocaine adrenaline 1: 100.000 in 1 or 2 maxillary molars to early adult / younger age group (20-39 years) is 0.192 and the p-value for the local anesthetic work of 2% adrenaline lidocaine 1: 100,000 in 1 and 2 maxillary molars age maxillary (40-50 years) maxillary age group is 0.811. All values p> 0.05, then the data satisfy the assumption of normality.

Testing the difference of local anesthetic 2% adrenaline lidocaine 1: 100,000 in 1 and 2 maxillary molars extractions in the two age groups was used independent test t samples to if the differentiation of anaesthesia work was significant.

TABLE IV. RESULT INDEPENDENT TEST T-TEST

	Age	Total Sample	Value p
Onset of Local Anesthetics	20-39 years	12	0.000
	40-50 years	12	

Based on the test result of 2 independent samples p = 0,000 <0,05, there was a significant difference in local anesthetic 2% adrenaline lidocaine 1: 100,000 in 1 or 2 maxillary tooth extraction between early adult/ younger adult group (20- 39 years) and middle-aged/ middle-aged adult (40-50 years).

IV. DISCUSSION

The results of onset local anaesthesia lidocaine 2% with adrenaline 1: 100,000 in 1 or 2 maxillary molars extractions in two age groups at Oral Surgery Departement, Faculty of Dentistry, University of North Sumatera March-April 2017 that there is a significant difference in the work of anaesthesia in the two age groups. The average starting rate of anaesthesia work in the early adult/younger adult group (20-39 years) was 36.08 seconds, whereas the average local anaesthesia work in the middle/middle aged (40-50 years) adult age group was 56, 33 seconds.

The results were obtained after the normality test of the research data obtained from 24 samples, 12 samples were early adult/younger (20-39 years) and 12 samples were middle-aged/middle-aged (40-50 years). Normality test conducted on the research data states that the results of the research data meet the normal assumption, it proves that the research data does not contain data of extreme values in the two age groups, or the results of data the research is still said to be normal.

The results of statistical calculations indicate that the average work rate of lidocaine 2% with adrenaline 1: 100,000 anaesthesia in 1 or 2 maxillary molars extraction in two age groups indicates that local anaesthetic lidocaine work in early adolescents (20- 39 years) tend to be faster than middle-aged / middle-aged (40-50 years) with an average time difference of 20.25 seconds.

Clinically, local anaesthesia is differentiated by its potential and duration into 3 groups. Group I includes procaine and chloropocaine which has a weak potential with short working duration. Group II includes lidocaine, mepivacaine and prilocaine with potential and duration of work. Group III includes tetracaine, bupivacaine and ethidocaine which have strong potency with long duration of work [1,7]

Local anaesthesia are also classified according to their initial work. Chloroprocaine, lidocaine, mepivacaine, prilocaine and etidocaine have relatively rapid start-ups. Bupivacaine has a moderate work plan, while procaine and tetracaine begin to slow down. The local anaesthesia drug commonly used in our country for the ester group is procaine, whereas the amide group is lidocaine and bupivacaine [7]. The results of the corresponding study suggest that the local anaesthesia work of 2% lidocain adrenaline 1: 100,000 in molar maxillary or maxillary tooth extraction both age groups are relatively fast. This corresponds to the classification

of local anaesthetics according to their work, in which chloroprocaine, lidocaine, mepivacaine, prilocaine and etidocaine have a relatively rapid start of work [7].

Testing by conducting a sample test-t also states that there is a significant difference in the local anesthetic work of 2% adrenaline lidocaine 1: 100,000 in r 1 or 2 maxillary molars extractions in the two age groups. The results were not in accordance with the proposed hypothesis which states that there is no difference in the action of 2% adrenaline lidocaine anaesthesia 1: 100,000 in 1 or 2 maxillary molars extractions in two age groups.

Local anaesthesia impregnates impulse conduction reversibly along the axons of other exitable membrane nerves using sodium channels as the main generator of action potential. Clinically, local anaesthetics are used to block the sensation of pain from a sympathetic vasoconstrictor impulse to a particular body part [6].

Local anesthetic agents prevent the transmission of nerve impulses (conduction blockade) by inhibiting the delivery of sodium ions through selective sodium ion gates on the nerve membranes [7]. The sodium gate itself is a specific receptor of a local anesthetic drug molecule. The blockage of an open ion gate with a local anesthetic drug molecule contributes slightly to almost all in the inhibition of sodium permeability. The failure of the gate permeability of the sodium ions to increase the deceleration of depolarization velocity such as the potential threshold is not reached so that the action potential is not propagated. Local anaesthetic drugs do not alter the potential for transmembrane breaks or potential thresholds [7].

Some researchers argue that the number and size of channel havers in young people is wider and wider than parents; although some say equally well to young people and parents. Structure of cohesiveness between young people and parents is also different, in young people contain many cartilage, while at older age there is a reduction in bone density and cartilage began to unify and hardened so often easier to fracture [5,8]. Changes in these anatomical structures may affect the mechanism of action of local anaesthesia in inhibiting the transmission of nerve impulses in the parent compared with the anatomical structure in young adults.

Infiltration anaesthesia was more successful in the alveolar process with a large and wide range of havers [5]. In this study 100% infiltration anaesthesia worked and succeeded in the sample, only when the local anaesthetic work was different in each sample.

The difference in the start time of work in each sample is also due to the fact that each person has a different perception of pain that raises subjectivity on the patient's admission when numbness occurs after the injection, where some samples can confidently say when numbness occur and there are some samples a little long to give numbness recognition [5].

The difference in subjectivity to this numbness may be due to physiological changes in the anatomical bone structure of the patient affecting the mechanism of local aneasthetic work, or due to the patient's ability to assess numbness. In dental treatment the reaction to the stimulus is usually influenced by assessment of the treatment procedure, operator and environment [4].

Based on studies conducted on the work of local anesthesia lidocaine to two age groups, obtained mean onset of action of local anesthetic lidocaine 2% with adrenaline 1: 100,000 in molar 1 or 2 maxillary teeth removal in young adult patients (20-39 years) in Oral and Maxillofacial Surgery Department, University of North Sumatera March-April 2017 is 36.08 seconds with a standard deviation of 12.147 (36.08 ± 12.147). Mean onset of action of local anesthetic lidocaine 2% with adrenaline 1: 100,000 in molar 1 or 2 maxillary teeth removal in middle age patients (40-50 years) Oral and Maxillofacial Surgery Department, University of North Sumatera April-April 2017 is 56.33 seconds with the standard deviation of 11.696 (56.33 ± 11.696). There was a significant difference in onset of action local anesthetic lidocaine 2% with adrenaline 1: 100,000 in molar 1 or 2 maxillary tooth extractions in two age groups at Oral and Maxillofacial Surgery Department, University of North Sumatera April-April 2017 is $p = 0,000 < 0.05$.

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