Effectiveness comparison of inferior alveolar nerve block anesthesia using direct and indirect technique

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Abstract

Objective: Local anesthesia is important to do prior to tooth extraction procedure to control the patient's pain. For molar tooth extraction, mandibular block technique is used either direct or indirect. This study aimed to see if there are differences in effectiveness of inferior alveolar nerve block anesthesia techniques between direct and indirect.

Material and Methods: This clinical experimental design study used 20 patients as samples during February-April. 10 patients were taken as a group that carried out direct technique while 10 others group conducted indirect techniques. The sample selection using purposive sampling method. Pain level were measured using objective assessments and subjective evaluation.

Results: The average time of onset in direct and indirect techniques in each sample was 16.88 ± 5.30 and 102.00 ± 19.56

seconds (subjectively) and 22.50 ± 8.02 and 159.00 ± 25.10 (objectively). These results indicated direct techniques onset faster than indirect techniques. The average duration of direct and indirect techniques respectively was 121.63 ± 8.80 and 87.80 ± 9.96 minutes (subjectively) and 91.88 ± 8.37 and 60.20 ± 10.40 minutes (objectively). These results indicated the duration of direct technique is longer than indirect technique. There was no significant difference when viewed from anesthesia depth and aspiration level.

Conclusion: This study indicated that direct technique had better effect than indirect technique in terms of onset and duration, while in terms of anesthesia depth and aspiration level was relatively equal.

Keywords: Alveolar nerve block, Direct and indirect, Local anesthesia

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Introduction

The term anesthesia was introduced by Oliver W Holmes in 1846 which means the loss of pain sensation (pain), accompanied or not accompanied with loss of consciousness.¹ Anesthesia has long been known as an effort to facilitate surgery. Anesthetic technique which is often used in the field of dentistry are topical anesthetic technique, infiltration technique and block techniques. Mandibular block anesthesia can be performed in direct and indirect technique which is Inferior Alveolar Nerve Block (IANB) called Fisher.²

In dentistry, local anesthesia is often used in patient. Local anesthesia is used as a pain reliever so that patients feel comfortable during treatment procedure and dentists feel calm during treatment. Cooperation with patient can also be performed when local anesthesia is conducted since the patient will still be conscious during the treatment. The use of local anesthetic also considered more economical thus, therefore this technique is widely used in dentistry.²

Dentists typically often used Inferior Alveolar Nerve Block (IANB) technique or commonly known as fisher technique which has been introduced by Jorgensen and Hayden in 1967 to anaesthetise

mandibular region thoroughly. However, IANB technique has drawbacks as it depends on the presence and detection of anatomical landmarks. The main reason of failure IANB mandibular anesthesia techniques is the high incidence of positive aspiration and intravascular injection, which reached 10% to 15%. Mandibular anatomy is vary among different patients so failure of IANB technique prone to occur associated with other techniques such as gates gow anesthetic technique and akinositechniques.^{3,4}

Most dentists choose IANB as it is familiar to them and worked in most situations. According to study conducted by Neeta et al³ highest successful rate of IANB performed to 120 people aged 16-50 years was the gow-gates technique, which was 92.5%. Whereas successful rate of akinosi-mouth closed block and classical IANB mandibular or fischer method was 90% and 72.5%. From this study, the author also found that the classical IANB method caused more pain during injection 60%.³

Study about effectiveness comparison of inferior alveolar nerve block anesthetic technique using direct and indirect has not been studied yet, so the author was interested to investigate this subject.

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Material and Methods

This study aimed to observe the differences between IANB direct and IANB indirect technique. Anesthetic procedure was conducted by using anesthetics lidocaine before mandibular molars extraction. This study was conducted to patients whose tooth will be extracted in Dental Hospital Departement of Oral and Maxillofacial Surgery Hasanuddin University, Makassar, Indonesia.

Patients who wish to study were suited with the inclusion criteria including patients carried out closed tooth extraction method, mandibular molars extraction, patient was not suffering from systemic disease, patients were not contra-indications to lidocaine and willing to be the subject of research. This study conducted from February to April, 2015.

The samples obtained was 20 people, which were divided into two group. Each group consisted of 10 patients. First group using direct block anesthetic techniques and the second group using indirect block anesthetic techniques. Simple random sampling technique was used in this study. The data collection was conducted by observing aspiration level, onset (onset) time and duration length of lidocaine. Anesthetic depth was also measured using a visual analog scale.

Anesthetic onset and duration were measured using two measurement methods. One is subjectively measurement with parameter of thickness mucosal perceived by patients and another one was objectively measurement with parameter of the pain felt by the patient when attached gingiva pierced with sonde. After data collected, Statistical tests and analysis were conducted. Afterwards, the result was subsequently compiled in main table.

Results

Data from this study was presented in a table showing the differences between inferior alveolar nerve block anesthesia in direct and indirect technique from observing aspiration level, onset (onset), duration and depth of lidocaine anesthetic is as follows:

Based on the success rate of IANB direct technique using anesthetic lidocaine on the observation of the onset, duration, anesthesia depth and aspiration, we can see that among 10 patients, 8 of them were successful while two others have failed because of pain emergence during tooth extraction. From 10 patients with direct technique, none was found to have positive aspirations [table 1](#).

Based on the success rate of IANB indirect technique using anesthetic lidocaine on the observation of the onset, duration, anesthesia depth and aspiration, we can see that among 10 patients, 5 of them were successful while 5 others have failed because of pain emergence during tooth extraction. From 10 patients with direct technique, none was found to have positive aspirations [table 2](#).

The results of comparative analysis with t-test for the onset subjectively obtained $p=0.001$. Significant values of statistical tests was below 0.05 ($p<0.05$), which means that there are significant differences between inferior alveolar nerve block anesthesia in direct and indirect techniques for subjective measurement of onset (H_0 rejected, H_a accepted) [table 3](#).

The results of comparative analysis with T-Test for the onset objectively obtained $p=0.003$. Significant values of statistical tests was below 0.05 ($p<0.05$), which means that there are significant

Table 1 Observations of onset, duration, anesthesia depth, and aspiration level of technique inferior alveolar nerve block anesthesia is direct with the anesthetic lidocaine

Patient	Onset (second)		Duration (minute)		Anesthesia depth (SVA)	Result	Aspiration levels
	Subjective	Objektive	Subjective	Objektive			
1	15	15	130	98	1	Succeed	negative
2	15	15	123	90	1	Succeed	negative
3	15	30	119	92	1	Succeed	negative
4	15	15	134	101	1	Succeed	negative
5	15	30	X	x	x	Failed	negative
6	15	15	127	102	1	Succeed	negative
7	15	30	112	86	2	Succeed	negative
8	15	60	X	x	x	Failed	negative
9	15	30	120	89	1	Succeed	negative
10	30	30	108	77	1	Succeed	negative

Table 2 Observations of onset, duration, anesthesia depth, and aspiration levels of anesthetic techniques inferior alveolar nerve block is indirect with the anesthetic lidocaine

Patient	Onset (second)		Duration (minute)		Anesthesia depth (SVA)	Result	Aspiration levels
	Subjective	Objektive	Subjective	Objektive			
1	120	180	77	49	3	Succeed	negative
2	105	X	x	X	x	Failed	negative
3	105	165	86	58	2	Succeed	negative
4	120	180	80	52	1	Succeed	negative
5	120	240	x	X	x	Failed	negative
6	150	X	x	X	x	Failed	negative
7	90	150	96	70	2	Succeed	negative
8	75	120	100	72	1	Succeed	negative
9	105	210	x	X	x	Failed	negative
10	150	X	x	X	x	Failed	negative

Table 3 Comparison techniques of inferior alveolar nerve block anesthesia in direct and indirect

Materning	Group	Mean $\pm$ SD	p-value
onset subjective (second)	Direct	16.88 $\pm$ 5.30	0.001
	indirect	102.00 $\pm$ 19.56	
onset objective (minute)	Direct	22.50 $\pm$ 8.02	0.003
	indirect	159.00 $\pm$ 25.10	
duration subjective (second)	Direct	121.63 $\pm$ 8.80	0.000
	indirect	87.80 $\pm$ 9.96	
duration objective (minute)	Direct	91.88 $\pm$ 8.37	0.000
	indirect	60.20 $\pm$ 10.40	
Anesthesia depth (SVA) anesthesia(SVA)	Direct	0.25 $\pm$ 0.07	0.065
	indirect	1.60 $\pm$ 0.17	

differences between inferior alveolar nerve block anesthesia in direct and indirect techniques for objective measurement of onset (h_0 rejected, ha accepted) [table 3](#).

The results of comparative analysis with t-test for the duration subjectively obtained $p=0.000$. Significant values of statistical tests was below 0.05 ($p<0.05$), which means that there are significant differences between inferior alveolar nerve block anesthesia in direct and indirect techniques for subjective measurement of duration (h_0 rejected, ha accepted).

The results of comparative analysis with t-test for the duration objectively obtained $p=0.000$. Significant values of statistical tests was below 0.05 ($p<0.05$), which means that there are significant differences between inferior alveolar nerve block anesthesia in direct and indirect techniques for objective measurement of duration (h_0 rejected, ha accepted) [table 3](#).

The results of comparative analysis with t-test for Anesthesia depth obtained $p=0.065$. Significant values of statistical tests was above 0.05 ($p<0.05$), which means that there was no significant differences between inferior alveolar nerve block anesthesia in direct and indirect techniques for anesthesia depth measurement (h_0 rejected, ha accepted).

In this study, assessment of success rates between IANB direct and indirect technique based on gender, age and extracted tooth were also conducted [table 3](#).

The results indicated that IANB direct and indirect technique were more effective for male rather than female, although the obtained value was not statistically significant ($p=0.197$, ($p=0.527$).

In a comparison of the success rates between IANB direct and indirect techniques based on age, the direct technique found more effective for age <20 and >40 compared to age 21-40 although not

Figure 1 Comparison chart success rates based on age between direct and indirect techniques

Figure 2 Comparison chart success rate is based on revoked element between direct and indirect techniques

significant ($p=0.287$), whereas the indirect technique is more effective at age 21-40 with insignificant value ($p=0.287$) [table 5](#) and [figure 1](#).

Data presented the success rate of anesthetic technique based on the direct and indirect block elements revoked [table 6](#).

In a comparison of the success rates between IANB direct and indirect techniques based on the tooth repealed, the direct technique found more

effective for M2 and M3 compared to M1 although not significant ($p=0.585$), whereas the indirect technique is more effective for M1 with insignificant value ($p=0.292$) [figure 2](#).

Discussion

The aim of this study was to investigate the differences effectiveness of inferior alveolar nerve block

Table 4 Success rates between IANB direct and indirect technique based on gender, age, and extracted tooth

Group			Information		Total	The value p
			Success	Failed		
Direct	Gender	Male	total	4	0	4
			%	100.00%	0.00%	100.00%
	Female	total	4	2	6	0.197
			%	66.70%	33.30%	100.00%
Indirect	Gender	Male	total	3	2	5
			%	60.00%	40.00%	100.00%
	Female	total	2	3	5	0.527
			%	40.00%	60.00%	100.00%

Table 5 The success rate of anesthesia blocks direct and indirect technique based on age

Group			Information		Total	The value p
			Succeed	Failed		
Direct	Age	<=20 year	total	4	0	4
			%	100.00%	0.00%	100.00%
		21-40 year	total	3	2	5
			%	60.00%	40.00%	100.00%
		>40 year	total	1	0	1
			%	100.00%	0.00%	100.00%
Indirect	Age	<=20 year	total	0	1	1
			%	0.00%	100.00%	100.00%
		21-40 year	total	5	3	8
			%	62.50%	37.50%	100.00%
		>40 year	Total	0	1	1
			%	0.00%	100.00%	100.00%

Table 6 Showed the success rate of anesthesia blocks direct and indirect technique based on extracted tooth

Group			Information		Total	The value p
			Succeed	Failed		
Direct	Tooth	M1	Total	5	2	7
			%	71.40%	28.60%	100.00%
		M2	Total	2	0	2
			%	100.00%	0.00%	100.00%
		M3	Total	1	0	1
			%	100.00%	0.00%	100.00%
Indirect	Tooth	M1	Total	5	4	9
			%	55.60%	44.40%	100.00%
		M2	Total	0	1	1
			%	0.00%	100.00%	100.00%

anesthesia between direct and indirect technique. Based on the assessment timing onset (onset) of anesthetics either subjectively or objectively, direct technique averagely have a more rapid onset than the indirect technique.^{5,6} Direct technique require shorter time to block the nervous system as compared with indirect technique.⁷ This is in accordance with the statement of Balaji elaborated that in the working procedure of direct technique, anaestheticum was directly injected on the inferior alveolar nerve so that the onset of action (onset) is faster. Meanwhile when indirect technique was used, the inferior alveolar nerve anestheized does not go directly to the inferior alveolar nerve, so that the onset of action (onset) is slower.⁸

Based on the parameters assessment of length of working time (duration) of anesthetic technique either subjectively or objectively, significantly, inferior alveolar nerve block with direct technique has a longer duration than indirect technique. This indicated that inferior alveolar nerve block anesthesia with direct technique has a longer time to block the nervous system compared to indirect technique.⁹ It is appropriate also in accordance with study conducted by of Jason K et al.¹⁰ and supported by Malamed⁶ on a handbook of local anesthesia, which states that inferior alveolar nerve block with direct technique has longer duration of working. This is because the injection site is closer to the targeted inferior alveolar nerves, so anesthetics can strongly blocking the nerves system.^{6,10}

Meanwhile, based on the depth of anesthetic parameters using visual analog scale, Inferior alveolar nerve block with direct technique averagely have better level of anesthesia depth rather than indirect technique. These result is also consistent with study conusted by Mohammad and Ide that showed average results of anesthesia depth of direct technique is better than indirect although not significant.^{11,12}

Furthermore, based on the overall aspiration level of IANB direct and indirect technique, none positive aspiration was found, but it is different with the study by Neeta et al.³ and Malamed⁶ who states that the rate of positive aspirations in the nevus anesthetic technique inferior alveolar block ranges from 10% -15%. This may happened due to various mandibular anatomy among individual.^{3,6}

In comparison of successful rate based on above mentioned parameters. All showed insignnificant value. This may happened due to the limited sample in recent study.

Conclusion

From this study, we conclude that patients given IANB direct technique more likely to success

compared to IANB indirect technique. IANB direct technique more rapid onset, longer duration and better depth anesthesia, compared to IANB indirect technique, either subjectively or objectively. However, both IANB direct and indirect technique have no positive aspiration level based on gender, age and extracted tooth.

Conflict of Interest

The authors report no conflict of interest.

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