

# Correlation between Swelling Post Odontectomy in Lower Third Molar with the Increase of Concentration Alpha Amylase Saliva

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**Abstract:** ***Introduction:** Odontectomy is surgical procedure that cause inflammation involving post-operative pain, swelling, and general oral dysfunction during the immediate post-operative phase. There are several methods for identify swelling post odontectomy, such measurement of compositions concentration saliva. Alpha amylase is one of the composition of saliva that considered to have a correlation with post odontectomy swelling. **Objective:** This study aimed to investigate the correlation between the swelling post odontectomy in lower third molar with the concentration level of alphaamylase. **Method:** A consecutive random sampling study involving was performed in 41 patients. Patience were categorized into classification of impacted teeth (class Ia, Ib, Ic, IIa, IIb, IIc). The measurement of facial dimension was performed in preoperative, post-operative day 1, post-operative day 3, post-operative day 7, and the measurement of concentration alphaamylase level was performed in preoperative, post-operative 2 hours, post-operative day 3, post-operative day 7. **Result:** The results of the study, there was no significant relationship between swelling post odontectomy in lower third molar with increased of concentration alphaamylase of class impaction Ia ( $r=0,96$ ;  $p$  value  $> 0,05$ ), Ib ( $r= -0,60$ ;  $p$  value  $> 0,05$ ), Ic ( $r=0,79$ ;  $p$  value  $> 0,05$ ), and significant relationship of class impaction IIa ( $r=-0,66$ ;  $p$  value  $< 0,05$ ), IIb ( $r=-0,82$ ;  $p$  value  $< 0,05$ ), IIc ( $r=-0,19$ ;  $p$  value  $< 0,05$ ) for each variabel. **Conclusion:** In conclusion, there were no significant relationship between swelling post odontectomy in lower third molar with increased of concentration alphaamylase of class impaction Ia, Ib, Ic and significant relationship of class impaction IIa, IIb, IIc.*

**Keywords:** Odontectomy, Swelling, AlphaAmylase

## 1. Introduction

Odontectomy is one of the most common dentoalveolar procedure. Odontectomy is the procedure to remove the impacted tooth that has been done with removing a tooth into few pieces without excessive cutting of alveolar bone. Complications of the odontectomy are swelling, pain, infection, dry socket, trismus, etc. Swelling cause the change of facial dimension and buccal thickness at odontectomy area. Swelling will last for 3 for 4 days and will subside within 5 for 7 days and it can cause the difficulty on the move, normally it will last for the first 3 days post odontectomy.<sup>1-3</sup>

Few factors that influence the complication post odontectomy are ages, smoking habit, oral hygiene instruction, type of impaction, thickness of alveolar bone, duration of operation, operation technique, complication during operation and experience of surgeon. Impacted of lower third molar need the minimal tissue incision, however, the consequence of swelling post odontectomy is the unavoidable, especially if we remember that this procedure will lead to soft tissue trauma that release inflammatory mediator from mast cell, and other cells such as histamine, serotonin, bradikinin and prostaglandin that have a role in inflammation process. Inflammation can cause the swelling that lead to infection, trismus and asymmetrical face and pain.<sup>2,4,5,8</sup>

To identify the swelling post operation, most of them can be evaluated through the clinical examination. Therefore, in little research, the swelling can be identified with the use of different diagnostic criteria such as objective and non-invasive procedure to evaluate the inflammation, like

measuring the concentration composition of saliva that form biology fluid which important to diagnose the oral diseases. This fluid becomes the alternative from blood, serum or plasma and contain of variant protein, hormone, antibody, sitokinin which enter the saliva through the blood, therefore the most component that exist in blood also exist in saliva.<sup>4,6,7</sup>

One of the biomarkers saliva that is related to the swelling post odontectomy of lower third molar is alphaamylase that can be obtained from secretion of saliva under the autonomic nerve. Alphaamylase saliva is the indicator to show the autonomic activity from salivary gland. Secretion of alphaamylase in human is the response to the neurotransmitter stimulus and controlled by nerve of sympathetic and parasympathetic from mouth.

Alphaamylase enzyme is the enzyme that exist in saliva and becoming one of the indicators of inflammatory process. The increase of concentration of alphaamylase saliva in post operation lower third molar, related to inflammation process to operation.<sup>4</sup>

According to the things above, the researcher interest to investigate the correlation of swelling post odontectomy lower third molar with the increase of alphaamylase concentration in patient that will be perform odontectomy in Dental Hospital University of Padjadjaran Bandung.

## 2. Material & Methods

This research conducted in 41 research subjects with the age range 19-45 years old that undergone odontectomy of lower wisdom tooth in Unpad Dental Hospital Bandung.

Ethical clearance was submitted to Ethical Research Committee of Medicine Faculty Padjadjaran University prior to this research. All the research subjects signed the informed consent.

Classification of the wisdom teeth of research subjects was determined and grouped before the odontectomy procedure. The saliva sample for alpha amylase levels measurement was collected using Cocoro Meter Nipra Japan placed under the tongue. Facial dimension measurement was taken by measure the distance between oral commissure to tragus on the odontectomy side(A-C), distance between lateral of eye canthal to the angle of mandible on the odontectomy side(B-E)and the distance between tragus to pogonion (A-D). Measurement was performed using a 4.0 silk yarn. The yarn then measured with rules, and the total of the measurement

recorded as facial dimension. The odontectomy performed and after the odontectomy, the saliva sample was collected again in 2 hours, day 3 and day 7 after odontectomy with the same initial procedure. Facial dimension measurement aslo re-taken at 2 hours, day 3 and day 7 with the same initial procedure. All data collected was analyzed statistically using correlation test and parametric Pearson test.

**3. Result**

This research conducted in 41 research subjects in impacted classification class Ia, Ib, Ic, IIa, IIb, IIc. Below is the table showing characteristic and correlation of swelling, and alpha amylase saliva levels.

**Table 1:** Characteristic Swelling, and Alpha Amylase Saliva in Impacted Classification Class Ia

Variable	Average				Stdev			
	T <sub>0</sub>	T <sub>1</sub>	T <sub>3</sub>	T <sub>7</sub>	T <sub>0</sub>	T <sub>1</sub>	T <sub>3</sub>	T <sub>7</sub>
<b>Facial Dimension (mm)</b>								
Ia	373,66	392,88	384,50	376,33	20,75	13,76	15,45	20,84
Ib	361,38	375,50	397,75	364,86	28,01	28,36	29,51	26,55
Ic	389,60	405,80	400,80	381,20	17,09	17,79	15,58	16,18
IIa	359,77	369,22	370,78	361,11	20,28	19,77	18,86	19,51
IIb	361,00	372,71	372,42	368,57	26,15	22,08	17,98	11,86
IIc	355,83	371,50	374,00	357,83	16,94	17,49	18,21	176,98
<b>Alpha Amylase (KU/L)</b>								
Ia	12,67	54,33	37,00	18,67	10,44	20,81	22,27	4,08
Ib	12,63	38,63	22,50	15,88	10,04	16,01	7,35	7,28
Ic	11,80	57,60	32,20	20,2	11,17	16,09	8,04	3,56
IIa	9,11	38,00	23,89	16,44	5,44	15,40	8,94	9,59
IIb	14,86	40,14	28,29	16,71	16,86	25,87	22,78	8,24
IIc	13,16	28,83	18,50	13,50	9,43	12,67	1,87	5,09

**Facial Dimension**

- T<sub>0</sub> : Pre Operation
- T<sub>1</sub> : 1 Day Post Operation
- T<sub>2</sub>: 2 hours Post Operation
- T<sub>3</sub> : 3 Day Post Operation
- T<sub>7</sub> : 7 Day Post Operation

Based on Table 1, facial swelling measured with facial dimension was seen that facial dimension experienced a stable alteration with the dimension of the facial to increase on 1 day post operation, peaking on 3 day post operation and decreased in 7 day post operation. While alpha amylase saliva level reached was seen that facial dimension experienced a stable alteration with the amylase saliva level to increase on 2 hours post operation, peaking on 3 day post operation and decreased slowly in 7 day post operation.

**Table 2:** Correlation of Swelling, and Alpha Amylase Saliva Levels in Impacted Classification Class Ia

Variable		Alpha Amylase (KU/L)			
		T <sub>0</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>7</sub>
Facial Dimension (mm)					
T <sub>0</sub>	P value	0,46	0,25	0,15	0,003*
	r	-0,05	0,34	0,51	0,94
T <sub>1</sub>	P value	0,33	0,46	0,38	0,001*
	r	0,23	-0,05	0,17	0,96
T <sub>3</sub>	P value	0,35	0,45	0,56	0,005*
	r	-0,21	0,07	0,27	0,92
T <sub>7</sub>	P value	0,43	0,32	0,19	0,001*
	r	-0,09	0,24	0,44	0,96

Based on table 2, the strongest and significant correlation between level of saliva alpha amylase and facial dimension was seen in day 7 post operation. (r=0.96; p=0.001). The positive correlation indicate increased alpha amylase level will be accompanied by increased of swelling based on facial dimension measurement. The decreased in alpha amylase level will be accompanied by decreased of swelling based on facial dimension measurement.

**Table 3:** Correlation of Swelling, and Alpha Amylase Saliva Levels in Impacted Classification Class Ib

Variable		Alpha Amylase (KU/L)			
		T <sub>0</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>7</sub>
Facial Dimension (mm)					
T <sub>0</sub>	P value	0,41	0,34	0,46	0,34
	r	0,10	-0,18	0,04	-0,18
T <sub>1</sub>	P value	0,38	0,33	0,49	0,17
	r	0,13	-0,19	0,01	-0,38
T <sub>3</sub>	P value	0,46	0,13	0,19	0,06
	r	0,04	-0,46	-0,36	-0,60
T <sub>7</sub>	P value	0,42	0,31	0,48	0,26
	r	0,08	-0,21	0,02	-0,27

Based on table 3, the strongest and no significant correlation between level of saliva alpha amylase and facial dimension was seen in day 3 post operation (r=-0.60; p=0.06).

**Table 4:** Correlation of Swelling, and Alpha Amylase Saliva Levels in Impacted Classification Class Ic

Variable		Alpha Amylase (KU/L)			
		T <sub>0</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>7</sub>
Facial Dimension (mm)					
T <sub>0</sub>	P value	0,49	0,27	0,45	0,25
	r	-0,01	0,37	-0,08	-0,41
T <sub>1</sub>	P value	0,42	0,15	0,40	0,36
	r	-0,01	0,59	0,16	-0,22
T <sub>3</sub>	P value	0,12	0,05	0,27	0,31
	r	0,66	0,79	0,36	0,30
T <sub>7</sub>	P value	0,11	0,24	0,33	0,39
	r	0,66	0,42	0,28	0,18

Based on table 4, the strongest and no significant correlation between level of saliva alpha amylase and facial dimension was seen in day 3 post operation. (r=0.79; p=0.05). The positive correlation indicate increased alpha amylase level will be accompanied by increased of swelling based on facial dimension measurement. The decreased in alpha amylase level will be accompanied by decreased of swelling based on facial dimension measurement.

**Table 5:** Correlation of Swelling, and Alpha Amylase Saliva Levels in Impacted Classification Class IIa

Variable		Alpha Amylase (KU/L)			
		T <sub>0</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>7</sub>
Facial Dimension (mm)					
T <sub>0</sub>	P value	0,04*	0,22	0,49	0,45
	r	-0,62	-0,29	0,05	-0,05
T <sub>1</sub>	P value	0,03*	0,20	0,61	0,38
	r	-0,66	-0,32	0,05	0,12
T <sub>3</sub>	P value	0,03*	0,24	0,58	0,40
	r	-0,64	-0,27	0,05	0,10
T <sub>7</sub>	P value	0,04*	0,22	0,49	0,48
	r	-0,62	-0,30	0,02	-0,06

Based on table 5, the strongest and no significant correlation between level of saliva alpha amylase and facial dimension was seen in day 1 post operation (r=-0.66; p=0.03).

**Table 6:** Correlation of Swelling, and Alpha Amylase Saliva Levels in Impacted Classification Class IIb

Variable		Alpha Amylase (KU/L)			
		T <sub>0</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>7</sub>
Facial Dimension (mm)					
T <sub>0</sub>	P value	0,002*	0,03*	0,01*	0,06
	r	-0,72	-0,74	-0,82	-0,63
T <sub>1</sub>	P value	0,001*	0,02*	0,01*	0,05
	r	-0,18	-0,77	-0,81	-0,68
T <sub>3</sub>	P value	0,02*	0,02*	0,02*	0,04*
	r	-0,87	-0,79	-0,79	-0,71
T <sub>7</sub>	P value	0,06	0,12	0,09	0,17
	r	-0,64	-0,51	-0,56	-0,42

Based on table 6, the strongest and no significant correlation between level of saliva alpha amylase and facial dimension was seen in day 1 post operation (r=-0.82; p=0.01).

**Table 7:** Correlation of Swelling, and Alpha Amylase Saliva Levels in Impacted Classification Class IIc

Variable		Alpha Amylase (KU/L)			
		T <sub>0</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>7</sub>
Facial Dimension (mm)					
T <sub>0</sub>	P value	0,11	0,03*	0,11	0,13
	r	-0,60	-0,78	-0,58	-0,63
T <sub>1</sub>	P value	0,29	0,12	0,16	0,29
	r	-0,29	-0,56	-0,50	-0,34
T <sub>3</sub>	P value	0,32	0,15	0,18	0,33
	r	-0,24	-0,51	-0,46	-0,27
T <sub>7</sub>	P value	0,11	0,04*	0,10	0,13
	r	-0,58	-0,77	-0,61	-0,62

Based on table 7, the strongest and no significant correlation between level of saliva alpha amylase and facial dimension was seen in preoperation (r=-0.66; p=0.03).

Based on t test in the research no significant correlation between level of saliva alpha amylase and facial dimension was seen in T0 in impactedclassification class Ia (r=-0,96;p-value> 0,05), Ib (r=-0,6;p-value> 0,05), Ic (r=-0,79;p-value > 0,05). Significant correlation between level of saliva alpha amylase and facial dimension was seen in T0 in impactedclassification class IIa (r=-0,66;p-value< 0,05), IIb (r=-0,82;p-value< 0,05), IIc (r=-0,78; p-value< 0,05)for each variable.

#### 4. Discussion

Odontectomy of lower third molars impaction is one of the most common procedures performed and is usually followed by complications, one of which is a swelling of the region that is undergone odontectomy. The swelling arises after an inflammatory process caused by trauma to the tissue, both at the time of bone removal or caused by trauma to the soft tissue.<sup>8-12</sup>

Preparation before performing the lower third molar surgery is crucial to determine the optimal treatment plan, the length of duration of operation and to minimize post operation complications. In addition to above, swelling which is a post operation complication and arises after the onset of the inflammatory process can also be evaluated by measuring the salivary alpha-amylase enzyme biomarker that can be obtained from the salivary secretion.<sup>10,12-14</sup>

This study aims to analyze the correlation between postoperative swelling of the lower third molar impaction with an increase in alpha-amylase levels. This study includes 41 research subjects with the majority of the female in impacted classification class I of 10 subjects (52.63%) and 9 subjects (47.37%) for men. Likewise, female in impacted classification of class II was 18 subjects (81.82%), and men were 4 subjects (18.18%). This finding is in line with previous studies done by Mansuri S et al., which showed that women had a higher rate of dental visits and dental care.<sup>4,13,15</sup>

The subjects of this study were classified based on the impaction classification of the subjects. The impacted classification of class I consist of the class Ib with 8subjects (42.11%), class Ia with 6 subjects (31.58%) and class Ic with 5 subjects (26, 32%). While the impacted classification class

II consists of class IIa with 9 subjects (40.91%), class IIb with 7 subjects (31.82%) and class IIc with 6 subjects (27.27%).

This study finds that the swelling occurred one day after surgery, peaked at three days after surgery, and subsided seven days after surgery. Alpha-amylase levels in this study increased by 2 hours post operation, then starting to decrease on the 3rd postoperative day to the 7th postoperative day. This study is in line with research conducted by Gutierrez-Corrales A et al., which states that surgery and the occurrence of postoperative swelling of the third molar impaction of the mandible correlate with increased levels of alpha-amylase. This finding means that the inflammatory reaction will stimulate the salivary secretion and increase the level of alpha-amylase in saliva along with an increase in salivary flow velocity. A protein-rich exudate in the tissue after an inflammatory process will produce postoperative swelling of the lower third molar impact.<sup>4,16</sup> In this study, a correlation test between swelling and increased levels of alpha-amylase showed a positive correlation between swelling and increased levels of alpha-amylase. This positive correlation is if there is an increase in alpha-amylase levels, the swelling will increase as well. The negative correlation between swelling and an increase in alpha-amylase levels is when there is an increase in alpha-amylase levels, then the swelling will not increase. However, statistically, the results of the study showed there was no significant correlation between swelling and increased levels of alpha-amylase in impacted classification of class Ia, Ib, Ic and a significant correlation can be seen in the impacted classification of class IIa, IIb, IIc. This study has several limitations, namely only a few patients met the study inclusion criteria as well as an unequal distribution of patients in each impacted classification at the time of its implementation.

## 5. Conclusion

Based on the results of the research, it can be concluded there is no significant correlation between swelling after odontectomy of the third molar jaw impaction with an increase in alpha-amylase levels in the impacted classification of class Ia, Ib, Ic. The study also shows there is a significant correlation between post-odontectomy swelling of the jaw impaction with increased alpha-amylase levels in the impacted classification of class IIa, IIb, IIc. Salivary alpha-amylase biomarkers can be used as an effective, economical, and non-invasive medium for evaluating swelling in patients undergoing lower third molar odontectomy.

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