

## STATISTICAL STUDY REGARDING THE PUTTY-WASH TECHNIQUE IMPRESSIONS RECORDED BY STUDENTS

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### ABSTRACT

**Introduction** The impression record is an issue with many problematic aspects that can be manageable with correct understanding of circumstances involved. The putty-wash technique is the most frequent dental impression used in fixed prosthodontics. **Aim of the study** The purpose of the study is to evaluate the most common mistakes that are encountered by 4th year dental medicine students of U.M.Ph Iași during the impression record by putty-wash technique. **Material and method** 39 students of the 4th English section recorded on each other 78 maxillary and mandibular impressions, using the wash-technique, and then casted it. The materials used were "Zetaplus" and "Oranwash" condensation silicones (Zhermach, Italy). After the impressions and casts evaluation, the records were ranked in 3 classes: Class 1 (excellent), Class 2 (acceptable) and Class 3 (poor). The evaluation criteria involve aspects regarding different stages of the record: chosen tray, material manipulation, record, impression examination and casts examination. **Results** Considering that the records were performed on patients without prepared teeth, the study is focusing on the general errors, which impairs on the quality of the impressions and casts, leading to indirect restoration faults. **Conclusions** This study was a very good instrument in exposing the possible mistakes during impression record, making the students more aware of the problems that can arise, even in non-problematic, non-stressful clinical conditions.

**Keywords:** silicon impression materials, impression errors, impression record

### INTRODUCTION

The impression record is an issue with many problematic aspects that can be manageable with correct understanding of the circumstances involved. There is no single procedure that a dentist can do, or any single procedure that a lab can do for the dentist, that will improve the final result of indirect restorations more than improving the quality

of the impression [1].

The open-bite, two-steps, putty wash technique is one of the most popular impressions with wide range of clinical indications [2].

The aim of the study is to evaluate the most common mistakes that are encountered by the 4th year dental medicine students during the putty-wash technique impression

record.

## MATERIAL AND METHODS

All the 39 students of the 4th Year English section “Grigore T. Popa” U.M.Ph. recorded on each other 78 maxillary and mandibular impressions, using the putty-wash technique, and then casted them.

In order to obtain accurate and reproducible results, a standardized algorithm of teaching, supervision and evaluation was considered.

The students assisted to one demonstration performed by an instructor, receiving adequate information about the impression technique, materials handling and exogenous factors that can interfere with the final result [3, 4].

In order to obtain accurate and reproducible results, a standardized algorithm of teaching, supervision and evaluation was considered.

### *Standardization of the materials*

All students used the same materials and trays, and worked under the same conditions: clean, quiet and comfortable environment in order to avoid mistakes due to psychological stress.

The materials used were “Zetaplus” and “Oranwash” condensation silicones (Zhermach, Italy).

### *Standardization of the technique*

In order to obtain accurate and reproducible results, a standardized algorithm of teaching, supervision and evaluation was considered.

An evaluation form was designed, covering all the possible reasons for failure.

The instructor supervised the whole process including the 3 evaluators, assuring the objectivity and offering expertise.

### *Standardization of the evaluation*

The evaluation data were recorded in Microsoft Excel according to the form presented in table 1. The database then was transferred in Statistica 8.0.

The evaluation criteria involved aspects regarding different stages of the record: chosen tray, material manipulation, record, impression examination and casts examination (Table 1):

*Patient* - For the students, instead of names we used codes obtained considering the number of the group and the position on the evaluation list that only the evaluators and the supervisor had.

*Impression tray* - In this category we aimed to evaluate if the student chose the correct tray according to the materials, technique and also the patient.

On the first field, the types are:

- Type I: Maxillary tray thick enough to sustain deformation
- Type II: Maxillary tray not thick enough
- Type III: Mandibular tray thick enough to sustain deformation
- Type IV: Mandibular tray not thick enough.

The second field evaluates if the tray is appropriate due to the fact that the students didn't have access to additional retentive features so a non-retentive tray would be a wrong choice leading to a probable detachment of the impression during the removal of the 1st impression from the oral cavity.

The 3rd field evaluates if the tray is of appropriate size in every plan.

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**Table 1. Distribution of types of implants and prosthetic restorations according to the jaw**

Evaluation table											
Patient: I II III IV - 1 2 3 4 5 6 7 8 9 10					Doctor: I II III IV - 1 2 3 4 5 6 7 8 9 10					Evaluator: A B C	
<b>Impression tray</b>	<b>Type of tray:</b> Type I Type II Type III Type IV	<b>Retention:</b> Retentive tray Non-retentive tray		<b>Size:</b> Correct Small (Horizontal / Vertical) Big (Horizontal / Vertical)							
<b>Putty preparation</b>	<b>Type of gloves used:</b> Nitrile Latex	<b>Mixing Time:</b> Correct Short Long	<b>Mixing:</b> Complete Incomplete	<b>Consistency:</b> Correct Hardened	<b>Quantity:</b> Correct Less material More material						
<b>Insertion of the tray in the oral cavity</b>	Dried the arch Didn't dry	<b>Insertion Technique:</b> Pulling the cheek & Rotation Incorrect		<b>Insertion axis:</b> Correct Incorrect	<b>Setting time:</b> Correct Faster Slower	<b>Removal Technique &amp; Axis:</b> Correct Incorrect					
<b>Evaluation of the 1<sup>st</sup> impression</b>	<b>Complete Distortion or Rapture::</b> Yes No	<b>Centered</b> Yes No	<b>All teeth are recorder:</b> Yes No	<b>Peripheral anatomy is recorded:</b> Yes No	<b>Absence of Negative faults and "Pulls":</b> Yes No	<b>Occlusal / Incisal stamps:</b> Absence Presence		<b>Material Consistency:</b> Correct Incorrect			
<b>Conditioning of the 1<sup>st</sup> Impression</b>	<b>Complete removal of undercuts:</b> Yes No		<b>Liquid elimination grooves:</b> Sufficient Present but Insufficient Absent								
<b>Liquid silicone preparation</b>	<b>Mixing Time:</b> Correct Short Long	<b>Mixing:</b> Complete Incomplete	<b>Consistency:</b> Correct Hardened	<b>Quantity:</b> Correct Less material More material							
<b>Insertion of the tray in the oral cavity</b>	Dried the arch Didn't dry	<b>Insertion Technique:</b> Pulling the cheek & Rotation Incorrect		<b>Insertion axis:</b> Correct Incorrect	<b>Setting time:</b> Correct Faster Slower	<b>Removal Technique &amp; Axis:</b> Correct Incorrect					
<b>Evaluation of the Final Impression</b>	<b>Complete Distortion or Rapture::</b> Yes No	<b>Centered</b> Yes No	<b>Thickness</b> Uniform Thick Thin	<b>Marginal Record:</b> Correct Incorrect	<b>Absence of Negative faults and "Pulls":</b> Yes No	<b>Polymerization level of liquid silicone:</b> Correct Partial polymerization					

*Putty preparation* - This category aimed to evaluate if the students have the theoretical knowledge to choose the correct type of gloves for this type of material, if they know how to mix the material and if they can estimate the quantity of material they need.

*Insertion of the tray* – For this category the study aimed to find out if the students know that they must dry the arch due to the hydrophobic properties of this type of material; if the technique was correct or if they induced discomfort to the patient.

*Evaluation of the 1<sup>st</sup> impression*

This category addresses to the result after the 1<sup>st</sup> part of the technique. Due to the fact that the impressed teeth were not prepared, all the teeth are important and mistakes are

recorded no matter their position.

*Conditioning of the 1<sup>st</sup> impression*

In this category the discharge grooves and also the removal of undercuts were evaluated. They are very important for the re-insertion and fitting of the impression in the mouth during the second step of the technique (hydraulic pressure).

*Liquid silicone preparation*

In this category we aimed to find out if the students have the theoretical and practical knowledge to mix the material and also if they can estimate the quantity of material they need [5, 6, 7].

*Insertion of the tray*

In this category the following aspects were considered: if the students know that they

must dry the arch due to the properties of this type of material; if the technique was correct in order the patient to feel comfortable; if something can lead in poor recording results.

*Evaluation of the final impression*

In this category the final result was evaluated. The evaluator with the supervisor had to state if the result is:

- Unacceptable so the impression cannot be used.
- Acceptable so the impression can be used even if there are some minor faults.
- Perfect so the impression can be used and has almost no visible faults.

The last stage was the *evaluation of the models*.

Casts evaluation considered [6, 7, 8]:

- negative faults
- positive faults
- pulls
- peripheral anatomy
- recorded teeth
- tearing
- compression
- dimensional inaccuracy.

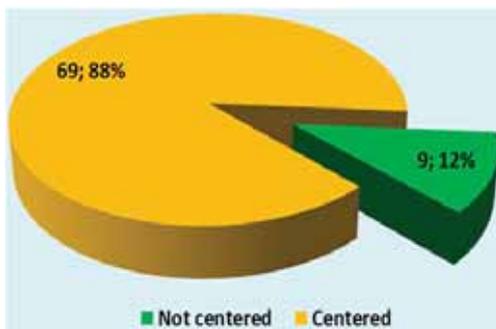


Figure 2.

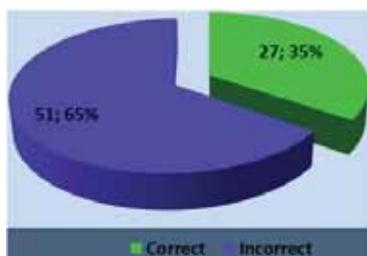


Figure 4.

**RESULTS AND DISCUSSION**

After the impressions and casts evaluation, the records were ranked in 3 classes (fig. 1):

- Class 1 (excellent) – 18 impressions, 23%
- Class 2 (acceptable) – 43 impressions, 55%
- Class 3 (poor) – 17 impressions, 22%.

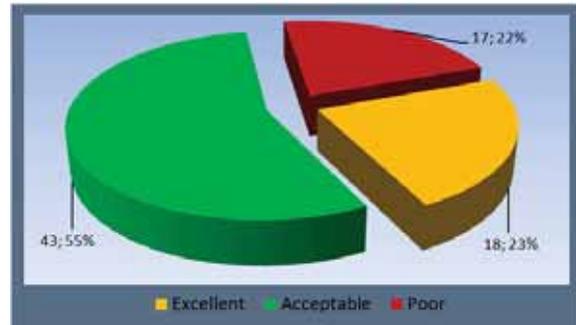


Figure 1.

The most frequent mistakes were:

*Not centred tray on the arch*

This mistake can make the tray on one quadrant to “hit” the buccal surface of the posterior teeth and on the other quadrant to “hit” the oral surface. The ununiformed thickness of materials will lead to distortions, so to an unacceptable impression. 69 of recorded impressions were correctly centred (88%) and 9 were not correctly positioned (12%) (fig. 2, 3).

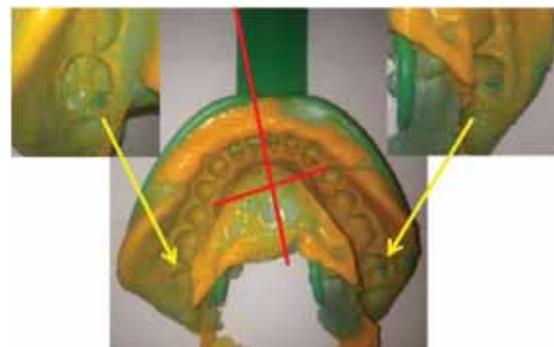


Figure 3.



Figure 5.



Figure 6.

*Insertion technique*

The technique the students followed to insert the tray in the mouth had also faults: 51 cases – 65% correct insertion; 27 cases – 35% incorrect insertion (fig. 4). The movement in most of the cases was rotation which is correct but instead of using the inactive hand to pull the cheek of the patients they tried to fit by pushing the cheek with the tray (fig. 5). There were also few cases where the students tried and unfortunately managed to insert the tray in the mouth with a straight forward movement (fig. 6).

This mistake even if it doesn't affect the result makes this experience very unpleasant for the patient and also can cause trauma on the patient's labial commissure.

*Insufficient liquid silicone elimination*

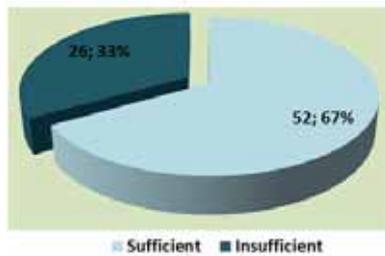


Figure 7.



Figure 8.



Figure 9.

Summary Frequency Table (Sheet1 in Database Marked cells have counts > 10 (Marginal summaries are not marked)				
	I - Liquid Elimination grooves	II - Marginal Record 2MRC	II - Marginal Record 2MRI	Row Totals
Count	1LEGs	39	13	52
Column Percent		75,00%	50,00%	
Row Percent		75,00%	25,00%	
Total Percent		50,00%	16,67%	66,67%
Count	1LEGpi	13	13	26
Column Percent		25,00%	50,00%	
Row Percent		50,00%	50,00%	
Total Percent		16,67%	16,67%	33,33%
Count	All Grps	52	26	78
Total Percent		66,67%	33,33%	

Table 2.

*"Pulled" teeth*

This mistake has to do with the type of movements made during the insertion against the arch or with the consistency of the material. The fact that some impressions came up with pulls shows that in some cases there were multiple movements and in other cases the putty material was too hard to be used. This mistake will lead to a model

*grooves*

This is one of the major mistakes one can make during the impression taking procedure. In case that one does not prepare sufficient grooves on the putty material, the result will be a thick layer of liquid silicone on the occlusal surface (fig. 7 and 8) instead of a thin, transparent layer (fig. 9). This is going to happen due to the fact that the material will not have a way out of this area which will increase the hydraulic pressure. This will affect the result because the position of the impression the second time will not be the same with the first and the increased thickness of the fluid material is prone to deformations. This parameter is strongly correlated with the final marginal adaptation of the restorations (Table 2 and 3) [5-12].

Summary Table: Expected Frequencies (Sheet1 in Datab Marked cells have counts > 10 Pearson Chi-square: 4,87500, df=1, p=,027251			
I - Liquid Elimination grooves	II - Marginal Record 2MRC	II - Marginal Record 2MRI	Row Totals
1LEGs	34,667	17,333	52,000
1LEGpi	17,333	8,667	26,000
All Grps	52,000	26,000	78,000

Table 3.

without a correct record on lateral and/or occlusal surfaces, especially in cervical area. In case of pulled teeth on oral and/or buccal surface of teeth that we are not interested, the impression might be considered as acceptable. In other cases this impression shouldn't be used. Also in case of pulls on the occlusal surface it would be unacceptable due to the fact that it affects the casts mounting in

the articulator.

*Occlusal/Incisal stamps*

If the student applied excessive force on the tray there was a risk some teeth to hit the tray. This will lead to a model with some



Figure 10.

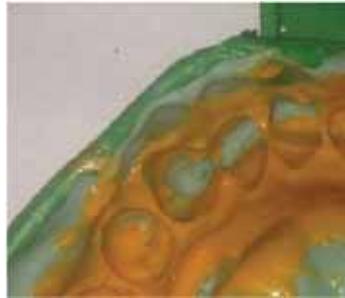


Figure 11.



Figure 12.

teeth which will not have correct incisal or occlusal morphology. In case that we are interested in these teeth, it will make the impression unacceptable (fig. 10, 11, 12).

Summary Frequency Table (Sheet1 in Database) Marked cells have counts > 10 (Marginal summaries are not marked)				
	I - Consistency of Liquid Silicone	I - Marginal Record 2MRC	I - Marginal Record 2MRI	Row Totals
Count	CcL	52	22	74
Column Percent		100,00%	84,62%	
Row Percent		70,27%	29,73%	
Total Percent		66,67%	28,21%	94,87%
Count	IcL	0	4	4
Column Percent		0,00%	15,38%	
Row Percent		0,00%	100,00%	
Total Percent		0,00%	5,13%	5,13%
Count	All Grps	52	26	78
Total Percent		66,67%	33,33%	

Table 4.

Summary Frequency Table (Sheet1 in Database) Marked cells have counts > 10 (Marginal summaries are not marked)				
	II - Thickness	II - Marginal Record 2MRC	II - Marginal Record 2MRI	Row Totals
Count	2U	48	13	61
Column Percent		92,31%	50,00%	
Row Percent		78,69%	21,31%	
Total Percent		61,54%	16,67%	78,21%
Count	2TK	4	13	17
Column Percent		7,69%	50,00%	
Row Percent		23,53%	76,47%	
Total Percent		5,13%	16,67%	21,79%
Count	All Grps	52	26	78
Total Percent		66,67%	33,33%	

Table 6.

*Compressive impression*

Due to excessive force applied on the tray we can also get a compressive impression. In case that we are recording in order to make a removable prosthesis the impression is unacceptable. In case of fixed prosthesis it depends on the position and extent.

*Incorrect preparation of putty material or liquid silicone*

When we do not follow the material's recommendations about mixing time, mixing technique and material's ratio it will cause either the material to set earlier or later. This

Summary Table: Expected Frequencies (Sheet1 in Database) Marked cells have counts > 10 Pearson Chi-square: 8,43243, df=1, p=,003687			
I - Consistency of Liquid Silicone	II - Marginal Record 2MRC	II - Marginal Record 2MRI	Row Totals
CcL	49,333	24,667	74,000
IcL	2,667	1,333	4,000
All Grps	52,000	26,000	78,000

Table 5.

Summary Table: Expected Frequencies (Sheet1 in Database) Marked cells have counts > 10 Pearson Chi-square: 18,2025, df=1, p=,000020			
I - Thickness	II - Marginal Record 2MRC	II - Marginal Record 2MRI	Row Totals
2U	40,6666	20,3333	61,0000
2TK	11,3333	5,6666	17,0000
All Grps	52,0000	26,0000	78,0000

Table 7.

will result to a very poor impression which most of the times is unacceptable, impairing on the reproduction of clinical situation, especially on marginal record (Table 4 – 7) [5-12].

*Negative faults on the model*

Beside the faults mentioned before made by the dentist, a technician's fault is the negative fault on the cast.

This occurs either when the casting procedure is too fast or when the technician didn't use a vibrator. In those cases air can be trapped in the plaster forming a bubble. Those

faults depending on their position can lead to unacceptable model (Fig. 13).



Figure 13.

## CONCLUSIONS

The intention of this study was to make students aware of their mistakes and their consequences on the model that the dental technician will use for final restoration. So, in few words, we aim to build a better collaboration with our partner.

On the other hand, the results of this research have shown that we do not care about our partners as much as we should.

The most common mistake the students made was that even that most of them care enough about their patients to disinfect the trays before use; almost none of them disinfected the impression at the end. This is a major mistake because we put in enormous risk the technician, who doesn't have any idea about the patients and the infectious diseases they may suffer of.

This study was a very good instrument in exposing the possible mistakes during impression record, making the students more aware of the problems that can arise, even in non-problematic non-stressful clinical conditions.

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