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Evaluation of faults encountered in recording final impression

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الخلاصة

الأهداف:تقييم الأخطاء الحاصلة عند عمل الطبعة النهائية للجسور الثابتة والطقوم المتحركة الكاملة والجزئية عن طريق احتساب لأخطاء السريرية. **المواد وطرق العمل:**تم تقييم 250 طبعة من قبل شخصين بعد أخذها مباشرة. وثلاث مواد للطبعة قد استخدمت. وقد تم احتساب بيانات الأخطاء بالنسبة لصنع حاملة الطبعة ومادة الطبعة والأخطاء المرتكبة عند اخذ الطبعة.**النتائج:**بالنسبة للطقوم المتحركة الجزئية، فان نسبة 90% من اصل 100 طبعة بمادة ال (الجنيت) تحوي على خطأ أو أكثر ونسبة 50% من طبعات السليكون تحوي خطأ أو أكثر. أما ما يخص الطقوم الكاملة فان طبعات السليكون تحوي اقل الأخطاء بينما طبعات اوكسيد الزنك وال (الجنيت) تحوي أكثر الأخطاء. بالنسبة للجسور الثابتة أخذت الطبعات بمادة السليكون وكانت الأخطاء كالتالي:فقاعات في خطوط الانتهاء بنسبة 20%، انفصال بنسبة 6.6% ، تمزق بنسبة 6.6% ، ورفع الطبعة قبل الوقت اللازم بنسبة 10% ومناطق ضغط بنسبة 3.3%. **الاستنتاجات:** مادة ال (الجنيت) تحوي على أعلى النسب من الأخطاء**الكلمات المفتاحية:**مواد الطبعة، أخطاء الطبعة، الجنيت، سليكون.

ABSTRACT

Aim: To evaluate the quality of the impressions recorded for fixed and removable partial dentures and for completely edentulous patients by describing the frequency of clinically detectable errors. **Materials and Methods:** A total of 250 impressions were evaluated immediately after they were recorded by two examiners. Three different impression materials were employed. Data relating to errors and faults including those related to tray construction, or related to impression materials used and those related to the operator were evaluated and analyzed. **Results:** Of 100 irreversible hydrocolloid impressions for partially edentulous arches, 90% had one or more detectable errors; while for condensation type of silicon 50% had one or more detectable errors. For complete denture impressions, silicon rubber base showed the least errors than zinc oxide eugenol paste impression and irreversible hydrocolloid that showed the highest errors. For fixed partial denture, impressions were recorded by silicon rubber base; the occurrence of faults were as follow: Voids in finish line 20%, detachment 6.6%, tearing 6.6%, premature removal 10% and pressure area 3.3%. **Conclusion:** Irreversible hydrocolloid impression material showed the higher detectable errors.

Key Words: Impression materials, faults of impressions, irreversible hydrocolloid, silicon impression.

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INTRODUCTION

An impression "according to the Oxford English Dictionary" is an imprint produced by the pressure of one thing upon or into the surface of another. In dentistry, is defined as the negative form of the teeth and/or other tissues of the oral cavity.(1)

Improper impressions account for the majority of dental problems.(2) Transfer of an accurate replication of the patient hard and soft tissues is important for successful construction of prosthesis,(3) and for preservation of the tissue supporting that prosthesis.(4)

The clinician must be able to identify the anatomy of the edentulous dental arches, and to identify and analyze the accurate impressions is the key to successful restoration.(5)

Faults in impression for completely edentulous patients mainly encountered in lower resorbed edentulous ridge when the periphery of the floor of the mouth and functional form of the mylohyoid muscle can not accurately recorded.(6) A modification of custom trays and techniques have been made for that reason to capture functional impression.(7, 8)

Saliva may affect the fine details reproduction, some materials are hydrophobic and may be repelled by moisture in a critical area of the impression and result in porosity.(9) Irre-versible hydrocolloid impressions repelled by saliva; also any con-

taminated mix or change in water temperature may result in rapid set or rupture of material on removal from the mouth, also removal before complete gelation may result in distortion.[10, 11] The impression technique and custom tray accuracy may affect fine detail.[12]

The aim of the present research was to evaluate the quality of impressions and the frequency of clinically detectable errors.

MATERIALS AND METHODS

The total of 250 impressions (recorded by fifth year and post graduate students) were examined. One hundred and fifty impressions were for removable partial dentures (100 impressions were recorded with irreversible hydrocolloid, while 50 impressions were recorded by condensation type of silicon with double step technique). Seventy impressions were for completely edentulous patients (38 impressions were recorded by light body rubber base, 28 impressions were recorded by zinc oxide eugenol and 4 impressions by irreversible hydrocolloid) and 30 impressions for fixed bridges were recorded by silicon rubber base.

All impressions were evaluated immediately after recording by two examiners according to special form designed for this study. Three impression materials were employed: Irreversible hydrocolloid, zinc oxide eugenol, and elastomeric impression with two steps impression (Table 1).

Table (1): Impression materials used

Materials	Batch No.	Expiration	Manufacturer
Irreversible Hydrocolloid	5145	2008	Major, Italy
Zinc Oxide Eugenol Impression Paste	960532	July 2010	S.S White Group, England
Heavy Body	C100610	2010	Zhermack, Italy
Light Body	C100660	2010	Zhermack, Italy

The evaluation included faults related to custom tray, over and under extension, sharp border and poor adaptation.

Faults related to impression materials were porosity, rough surface, poor flow and detachment on removal.

Faults related to operator were improper insertion, premature removal, poor muscle moulding, finish line detail and pressure area.

Each impression was evaluated in relation to its reference (patient mouth anatomy). Any deviation from the control was recorded as error.

The collected data were examined for the frequency of occurrence of each observation and calculated as percentage of the whole sample.

RESULTS

The occurrence of various detectable errors were listed in Table (2).

Table (2): Occurrence of various detectable errors for partially edentulous arch

Impression Material	Number	Criteria	No. (%) of Errors
Irreversible Hydrocolloid	100	Voids	70 (34.31%)
		Detachment of material from tray	30 (14.71%)
		Impression insertion	20 (9.80%)
		Poor muscle moulding	25 (12.26%)
		Over extension	25 (12.26%)
		Under extension	15 (7.35%)
		Rough surface	10 (4.90%)
		Pressure area	9 (4.41%)
Condensation Type of Silicon	50	Voids	15 (17.24%)
		Putty exposure through wash	13 (14.94%)
		Pressure area	10 (11.49%)
		Flow problem	5 (5.75%)
		Detachment of material from tray	15 (17.24%)
		Over extension	17 (19.54%)
		Under extension	3 (3.45%)

The frequency distribution of errors of the 100 impressions were recorded by irreversible hydrocolloid were as follows: 90% of them had one or more detectable errors. From those, 16.67% had one error, 27.78% had two errors, 31.11% had three errors, 13.33% had four errors, 8.89% had five errors and 2.22% had six errors. The frequency distribution according to the number of errors was shown in Figure (1).

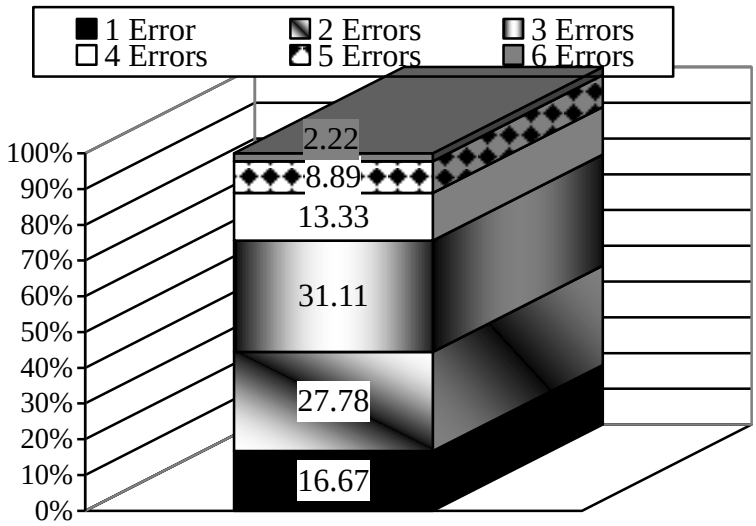

Figure (1): Percentage of number of errors for impressions recorded by irreversible hydrocolloid materials

The frequency distribution of errors of the 50 impressions recorded by condensation type of silicon (heavy and light body) were as follows: Only 50% had one or more detectable errors. From those, 40% had one error, 24% had two errors, 16% had three errors, 12% had four errors and 8% had five errors. The frequency distribution according to the number of errors was shown in Figure (2).

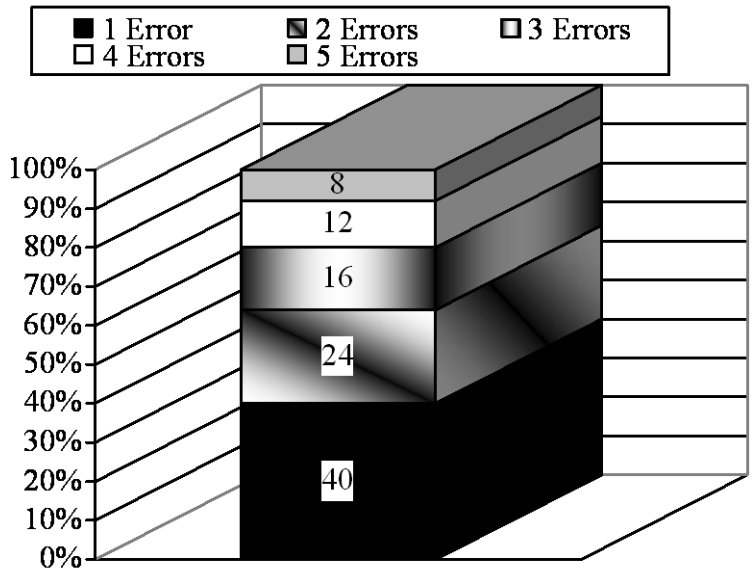

Figure (2): Percentage of number of errors for impressions recorded by condensation type of silicon materials

From 38 impressions which were recorded by silicon rubber base, 16 of them had over extension in the region of retromylohyoid space, 8 impressions had under extension in the retromolar pad area and sublingual region of the lower impression and near the tuberosity in the upper impression, 9 impressions had pressure area in the post dam area and incisive papillae region in the upper impression and the lingual flange of the lower impression, and 5 impressions had sharp periphery which was seen in the lingual flange of lower impression.

For 28 impressions which were recorded by zinc oxide eugenol impression paste, 14 impressions had voids, 8 impressions had under extension and 6 impressions had pressure area.

The 4 impressions which were recorded by irreversible hydrocolloid had thick periphery with voids.

The percentage of each error was listed in Table (3).

Table (3): Occurrence of various errors in full arch

Impression Material	Number	Criteria	No. (%) of Errors
Silicon Rubber Base	38	Over extension	16 (42.11%)
		Under extension	8 (21.05%)
		Pressure area	9 (23.68%)
		Sharp periphery	5 (13.16%)
Zinc Oxide Eugenol Paste	28	Voids	14 (50.00%)
		Under extension	8 (28.57%)
		Pressure area	6 (21.43%)
Irreversible Hydrocolloid	4	Thick Periphery with Voids	4 (100%)

Of the 30 impressions which were recorded for fixed partial denture by using silicon rubber base, 6 impressions had voids in finish line, one impression had pressure area, 2 impressions had detachment from trays, 2 impressions had tearing and 3 impressions were prematurely removed. The occurrence of faults was shown in Table (4).

Table (4): Occurrence of various faults for fixed partial denture

Impression Material	Number	Criteria	No. (%) of Errors
Silicon Rubber Base	30	Voids in finish line	6 (42.85%)
		Pressure area	1 (7.14%)
		Detachment	2 (14.29%)
		Tearing	2 (14.29%)
		Premature removal	3 (21.43%)

DISCUSSION

Dental students face numerous clinical challenges, and evaluating self–performance for quality assurance can be demanding.

This research showed that 90% of the partially edentulous arch had one or more errors. These findings were in agreement with Samel *et al*.[3] These errors were more frequent in occurrence with alginate than with rubber base. This could be due to poor mixing, wrong water/powder ratio and premature removal of impression, and these errors may be due to difficulties in obtaining an intimate contact between the impression material and the teeth in an area in which biological fluids and air are present.[3]

There is a good relation between material type and voids or tears around the abutment teeth. The condensation type of silicon had less voids and tears around the teeth. This could be explained by the high tear strength of silicon impression in comparison to irreversible hydrocolloid. This was in accordance with other studies.[9, 10]

Irreversible hydrocolloid is very sensitive to water/powder ratio. Improper water/powder ratio result in entraption of air and finally formation of voids especially around the teeth while silicon impression was easier in mixing and manipulation. So, less chance of voids to be occurred than irreversible hydrocolloids.[10]

High percentage (14.71%) of irreversible hydrocolloid showed inadequate retention of material or detachment, an error that can be readily avoided by the proper removal technique. It is difficult to determine whether lack of knowledge or lack of attention in the student could resulted in these errors of impression.

Students were not aware of the anatomical landmarks of the study cast during tray construction. Most of them prepare under extension tray especially in retromolar pad or post dam area which account for most of the under extension of impression.

Improper muscle moulding and exaggeration in tongue movement during impression might result in under extension in sublingual area. This is more clear in impressions recorded by stock tray. This was in line with other studies.[3, 8]

This research examined only the impression, but further researches are needed to evaluate the quality of casts and the outcome of the definitive restorations.

It is possible that the students will, upon reviewing the final cast and detecting possible problems, understand the frequent errors that may happen any day and have to overcome such errors by improve material manipulation, good construction of custom tray and good selection of impression material's type according to its indications.

CONCLUSION

With the limitation of the research, impressions made with irreversible hydrocolloid had the most detectable errors.

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