

ASSESSMENT OF IMPRESSIONS MADE FOR FIXED PARTIAL DENTURE PROSTHESIS IN JORDAN

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ABSTRACT

This study was carried out to assess the quality of impressions sent to dental laboratories in Jordan. A sample of 136 impressions and stone casts were examined for technical errors in 35 laboratories that construct fixed partial dentures. They were sorted into these categories: unusable, unsatisfactory, acceptable or satisfactory. The type of impression material and tray, opposing arch impressions, and occlusal records were noted. Instructions to technicians were assessed for completeness and clarity. Half of the specimens inspected were categorized as unusable or unsatisfactory. These were found in commercial dental laboratories. They showed at least one clinical error such as drags or indefinite finishing lines in impressions and inadequate reduction, undercuts, or obvious taper on stone casts. Alginate impression material was used of 65% up the cases. Only 27% of specimens were accompanied with instructions. Of these 22% were graded poor. No occlusal records were available with 54% of specimens and no articulators were used except in dental school laboratories. The quality of impressions were unsatisfactory or unusable in 50% of cases. Of the 37 available instructions 8 were not clear.

Key words: Commercial dental laboratories, impressions. Fixed partial dentures, quality, institutional

INTRODUCTION

As more patients demand fixed partial dentures for the replacement of missing teeth and endure a high cost, the quality of fixed partial denture therapy becomes of increasing professional and public concern.¹ Likewise, the quality of fixed prosthodontics provided to patients in Jordan is a cause of worry for professionals in this field. Moreover, the technical standards of fixed prostheses constructed in the ministry of health (MOH), the commercial laboratories and to a lesser extent, in dental school laboratories in Jordan are considered disappointing.²

A fixed partial denture of good quality should be designed and constructed. It should restore the function and promote the health of the masticatory unit and provide a long service life. These criteria are influenced by the quality of impressions made by dental practitioners, the standards of the laboratory work, and the oral conditions prevailing in the patient.¹ Abutments that have been prepared and finished carefully require an equally careful and correct impression technique using reliable materials and suitable trays.

Without this the impression stage can nullify earlier achievements in the preparations.³ Provided that the initial tooth preparation and impression techniques are adequate, the esthetics and strength of a fixed partial denture are determined by the skill of the individual technician.⁴ A proficient technician may be able to correct or mask minor faults in a preparation and produce a reasonable restoration. Technicians should be provided with a complete and clear prescription of the design and details of each restoration or component. Moreover, occlusal records should be supplied applicable.⁵ Despite the importance of this broad range of factors, the inferior quality of dental prosthesis has been attributed largely to errors incurred in laboratories.⁶⁻¹⁰

Comparatively, a few studies have been carried out to determine the quality of impression made for crown and fixed partial dentures undertaken by dentists. Impressions for anterior crowns⁵ and fixed partial dentures¹¹ made in general dental practice have been assessed. Over half of the crown impressions exhibited major faults and were recorded to be unacceptable.⁵ Most (72%) fixed partial denture impressions

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were taken with flexible plastic trays and 36% showed defects in the recording of the prepared teeth.¹¹

Few investigations have been designed to examine the quality of impressions made for fixed partial dentures. Therefore a sample of commercial dental laboratories were surveyed to determine the quality of impressions made by dentist to construct fixed partial dentures as received at some dental laboratories.

MATERIALS AND METHODS

A sample of 60 (75%) dental laboratories, which represented the major cities in Jordan, was randomly selected from the register of dental laboratories. They were located as follows: 5 in dental schools, 11 in the MOH, 5 in the RMS, and 39 commercial laboratories (Table 1). A questionnaire was designed following a small pilot study prior to this survey. It included questions related to the qualifications, experience of the laboratory staff, and techniques used during laboratory procedures. The laboratories selected were visited without prior appointment and the chief technicians were interviewed and asked to complete the questionnaire during meeting. In each commercial and dental school laboratory 4 specimens of impressions and stone casts were examined. According to availability, 2 impressions per laboratory were inspected in the MOH and RMS. Specimens were inspected for defects using magnification loupes (2X) and were categorized according to the following criteria:

- 1 Unusable impressions: impressions that displayed obvious drags/were detached from the impression tray, and showed indefinite and interrupted finishing lines around the circumference of the preparation.
- 2 Unsatisfactory casts: the prepared abutments caused occlusal interference's on pink wax placed between the maxillary and mandibular casts in intercuspal position, displayed visual undercuts or demonstrated an increased degree of taper.

TABLE 1: NUMBER (N) AND PERCENTAGE OF SURVEYED LABORATORIES THAT CONSTRUCT FIXED PARTIAL DENTURES

Location	Total	n	%
School	5	4	80
Commercial	39	29	74
MOH	11	1	9
RMS	5	1	20
Total	60	35	53

- 3 Acceptable: minor modifications of inspected impressions or stone casts, blocking minor undercuts, and filling small air bubbles with stone cast material.
- 4 Satisfactory: the impressions or stone casts were free of any of the above errors.

Aspects like the type of impression material and tray, tray suitability to the impression technique used, fixation of the impression to the tray, method of storage in transit, contamination, available occlusal records, and opposing arch impressions of the cases selected were noted. Details of the practitioners instructions to the technician were assessed by the examiner and the chief technician and considered them satisfactory if sufficient, clear instructions were given and poor if a telephone call to the dental practice was required for further information (e.g., the shade details) before the case could be started. The results were analyzed using the chi-squared test.

The impressions were considered acceptable, if they meet the following requirements.

- 1 Provide exact duplication of the prepared tooth or teeth, including all the surfaces of the preparation and enough uncut tooth surface beyond the preparation.
- 2 Accurately reproduce the teeth and tissue adjacent to the prepared tooth.
- 3 The impression of the preparation is bubble free especially in the area of the finish line.

RESULTS

The distribution of cases inspected according to the factors studied and laboratory location is given in Table 2. The data on MOH, RMS and dental school laboratories were pooled and shown under institutions. Only 4 impressions were available for inspection in the 2 MOH and RMS laboratories (2 impressions each). A total of 132 impressions and stone casts were examined in the 33 dental school and (4 specimens each) commercial laboratories. Consequently, 136 specimens were examined in the 35 laboratories involved in fixed prosthodontics. Half of these cases showed clinical errors and were categorized as unusable and unsatisfactory, the other half of the cases were distributed under the acceptable and satisfactory categories. Details of the clinical errors are shown in Table 2.

All of the unusable impressions and unsatisfactory stone casts were found in commercial laboratories. In contrast, the cases inspected in institutionalized dental schools MOH, and RMS laboratories were of acceptable or satisfactory quality. No statistical

TABLE 2: NUMBER (N) AND PERCENTAGE OF CASES INSPECTED ACCORDING TO THE FACTORS STUDIED AND LABORATORY LOCATION

	Institutions*		Commercial		Total	
	n	%	n	%	n	%
Case category						
Unusable	0	0	32	28	32	24
Unsatisfactory	0	0	36	31	36	26
Acceptable	6	30	16	14	22	16
Satisfactory	14	70	32	28	46	34
Impression material						
Alginate	2	10	87	75	89	65
Elastomeric	18	90	29	25	47	35
Impression tray						
Rigid plastic	16	80	88	76	104	76
Metal	4	20	28	24	32	24
Instructions						
Available	17	85	20	17	37	27
Not available	3	15	96	83	99	73
Poor of available Opposing impressions	1	6	7	35	8	22
Available	16	80	74	64	90	66
Not available	4	20	42	36	46	34
Occlusal records						
Available	16	80	47	41	63	46
Not available	4	20	69	59	73	54

* Institutions include school, MOH, and RMS laboratories.

differences were found among laboratories in relation to case category ($P>0.05$). Alginate was used for most cases, while a type of elastomeric impression material was used for the rest. Plastic impression trays of a rigid design (Solo disposable impression trays, cordent) were employed for the majority of cases inspected and metal trays were used for the remainder.

The majority of cases were not accompanied by instruction sheet, and 22% of the available sheets were graded poor and required a telephone call to the dental practice for clarification. A total of 90 opposing arch impressions were available; occlusal records were provided with 63 (70% of them, Table 2).

TABLE 3: NUMBER (N) AND PERCENTAGE OF CLINICAL ERRORS IN IMPRESSIONS AND STONE CASTS

Clinical errors	n	%
Impressions		
Drag	10	15
Detached from tray	17	25
Indefinite finishing line	5	7
Stone casts		
Over reduction	12	18
Undercut	9	13
Increased degree of taper	8	12
Indefinite finishing line	7	10
Total	68	100

DISCUSSION

The sample was randomly selected and represented the major cities of Jordan. The questionnaires were completed by the chief technician and were collected on the day of the visit to the laboratory. This method avoided any problems related to the mailing system and overcame the issue of no response. Consequently, data on 60 (75%) of the 80 registered dental laboratories at the time of this study were collected and a 100% response rate was achieved. This is more than some of the response rates recorded in the literature.^{5,10,12} Moreover, this procedure ensured that the responses of the chief technicians themselves were obtained and eliminated any possible interference from laboratory owners.

Most dentists using commercial laboratories performed unsatisfactory tooth preparation and sent unusable impressions. The majority of impressions were taken with alginate; some impressions were detached from the trays and showed obvious shrinkage. Moreover, in half of the specimens inspected preparation was inadequate and the finishing line were indistinct. These results are in agreement with other reports^{5,11}. Fine details of the preparation and surrounding soft tissues can be recorded accurately when a suitable elastomeric material is used. Clinical procedures of such low quality can only lead to guesswork on the part of the technician and will result in a restoration that is compromised. Even a skillful and experienced technician would fail to produce a restoration of acceptable strength, biologic compatibility, and esthetics from an impression with such errors.⁷

Many authors have reported the importance of using a rigid impression tray,¹³⁻¹⁵ although the rigid plastic trays that were used are better than flexible types, special or metal trays are recommended.^{5,11} The latter are significantly more rigid, can be reused, and are therefore a more satisfactory alternative in terms of both cost and accuracy.

Some of the impressions were pulling away from the tray, a finding that in agreement with previous studies.^{5,10,12} Such impressions can only lead to distorted working dies and ill-fitting restorations.⁵ An adhesive should be applied to the tray and the a manufacturer's instructions should be adhered to while manipulating impression materials.¹⁶

Dentists supplied no prescriptions of the work requested in the majority of cases. This is in agreement with similar studies.^{1,5,11} It seems that a standardized prescription or which is used in dental schools, may solve this problem. Some dentists relied on the technicians to relate casts in proper occlusion and sent no occlusal records. These findings are in accordance with another report¹¹, many practitioners fail to understand that a "high" restoration is not a result of error by the technician but of defective recording of the occlusal surfaces of unprepared teeth. One air bubble is sufficient to alter the articulation and result in a faulty restoration.⁵

CONCLUSIONS

The quality of impressions and casts made for fixed partial denture assessed were considered unsatisfactory or unusable in 50% of cases. These were found in commercial laboratories. They showed at least one clinical error such as drags, or indefinite finishing lines in impressions and inadequate reduction under cuts or

obvious taper on stone casts. No occlusal records were available with 54% of specimens and no articulators were used except in dental school laboratories.

Dental surgeons should perform accurate preparation procedures, use proper materials and trays for taking impressions, and supply technicians with complete, clear instructions. Occlusal records should be sent together with impressions to the laboratories and technicians should use articulators

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