



Impression Techniques Used in the Fabrication of Fixed Prosthesis: A Study Among Private Sector Dentists in Casablanca, Morocco

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Abstract

Background: The variety of impression materials and the diversity of clinical situations sometimes complicate the choice of impression technique. The objective of this article was to determine the impression techniques in fixed prosthodontics, the criteria for their selection, the causes of impression failures and the training needs expressed by private sector dentists in Casablanca regarding impression techniques. **Materials and Methods:** A descriptive cross-sectional epidemiological study was conducted over five months using a questionnaire distributed to 262 private sector dentists in Casablanca. **Results:** The most used impression technique was the two-stage impression (78.2%), followed by the single-stage double-mix impression technique (68.7%). The main criteria for choosing the impression technique were mastery of the technique (97.3%) and degree of accuracy (95.4%). Among the causes of impression failures, clinical reasons related to the practitioner were noted at 86.3%. The most cited reason for needing further training was to stay updated with the current evolution of impression techniques (25.2%), followed by the desire to improve skills (14.1%). **Conclusion:** This study identified the most frequently used impression techniques in fixed prosthodontics by private sector dentists in Casablanca. Strict respect for the protocols and the indications for each impression technique ensures its success. It would be interesting to encourage practitioners to integrate optical impressions into the digital workflow.

Subject Areas

Dentistry

Keywords

Impression Technique, Dentist, Dental Prosthesis, Fixed Partial Denture

1. Introduction

Impressions represent a first step in the fabrication of dental prostheses. Whether physical or digital, an impression must allow for the precise transfer of clinical data and the exact form of oral tissues to the prosthetics laboratory [1]. Diagnostic impressions are of paramount importance when planning the treatment of fixed partial prostheses. The working models derived from these impressions enable the evaluation of necessary treatments before proceeding with dental preparations and previewing the final result after wax-up procedures. Accurate arch impressions are significantly affected by a clinician's skill and techniques and are considered essential for the overall fit of fixed dental prostheses (FDPs) [2].

Making a fixed prosthesis involves the accurate reproduction of the dental preparation, the cervical margins, and, in some clinical cases, the canal preparations. One of the major deficiencies is that the prepared subgingival margins of tooth preparations are frequently inadequately recorded in the impression [3]. The variety of impression materials and the diversity of clinical situations sometimes complicate the choice of impression technique.

The objective of this article was to determine the various impression techniques (dental preparation impression techniques, cervical margin access techniques and canal impression techniques), the criteria for their selection, the causes of impression failures, and the training needs in impression techniques expressed by private sector dentists in Casablanca.

2. Material and Methods

A descriptive cross-sectional epidemiological study was conducted among 320 private sector dentists in Casablanca over a period of approximately 5 months (from October 2022 to March 2023).

For data collection, the study was carried out using an anonymous individual questionnaire.

Inclusion criteria

Private sector dentists in Casablanca registered with the Southern Regional Council of Dentists.

Dentists who practice fixed prosthodontics.

Exclusion criteria

Dentists specializing in dento-facial orthopedics.

Dentists specializing in pediatric dentistry.

To obtain the list of private sector dentists in the city of Casablanca, a request was submitted to the Southern Regional Council of Dentists.

A survey team composed of two students (L.L, Y.F) prepared a questionnaire.

Discrepancies were resolved by consensus with a third examiner (H.M). The questions cover the following areas: types of impressions made by dentists, criteria for choosing impression techniques, techniques for accessing cervical margins, canal preparation impression techniques, causes of impression failures, and the training needs expressed by study participants regarding impression techniques.

The survey team visited the dental offices of the dentists selected through random sampling to distribute the questionnaire.

A preliminary survey was conducted among 10 private dentists in Casablanca to assess the acceptability and validity of the questionnaire by the study participants. Following this preliminary survey, no modifications were made to the questionnaire. The average response time to the questions was about 5 minutes.

Data entry was performed using Microsoft Excel 2019. The statistical processing of this data was carried out using SPSS 20.0 software at the Community Health Laboratory: Epidemiology and Biostatistics of the Faculty of Dentistry in Casablanca. The variables were expressed as percentages and the number of study participants.

3. Results

Among the initial sample of 320 dentists, only 262 practitioners agreed to respond to the presented questionnaire, resulting in a participation rate of 81.9%.

The survey results are presented in **Tables 1-6**. **Table 1** presents the impression techniques used by the dentists participating in the study and **Table 2** presents the criteria for choosing the impression techniques. Access to the cervical margins being a prerequisite for impression taking, **Table 3** presents the techniques for accessing the margins used by the participants.

Table 1. Types of impression techniques.

Type of impression technique	(N)	(%)
Two-stage impression (Wash technique)	205	78.2
Single-stage double-mix impression	180	68.7
Optical impression	50	19.1
Single-stage monophasic impression	37	14.1

Table 2. Criteria for choosing impression techniques.

Selection Criteria	(N)	(%)
Mastery of the technique	255	97.3
Degree of accuracy (Compressibility, risk of pull)	250	95.4
Indications	226	86.3
Comfort for the patient	207	79
Quickness of completion	199	76
Need for an assistant	148	56.5

Table 3. Techniques for accessing cervical margins.

Technique	(N)	(%)
Retraction cord technique	177	83.1
Provisional prosthesis technique	111	52.1
Rotatory curettage	42	19.7
Expasyl type paste	27	12.7
CO ₂ Laser	10	4.7
Electrosurgery	3	1.4
Magic Foam Cord	0	0

Table 4. Impression techniques for canal preparation.

Type of technique	(N)	(%)
Indirect technique:		
Injected impression (lentulo) with post	138	52.7
Direct technique:		
Post and calcined resin technique	76	29
Indirect technique:		
Impression with calibrated post (calibrated drills)	69	26.3
Indirect technique:		
Injected impression (lentulo) without post	60	22.9
Optical impression	6	2.3

Table 5. Impression failure.

Variable	(N)	(%)
Impression failure:		
Yes	256	97.7
No	6	2.3
Frequency of failure:		
Rarely	232	92.1
Often	18	7.1
Always	2	0.8
Causes of failure:		
Clinician-related errors	215	86.3
Patient-related reasons for errors	177	71.1
Laboratory errors	131	52.6

Continued

Clinical reasons		
Pull distortion	202	84.2
Bubble	95	39.6
Material tears	77	32.1
Impression deformation	69	28.7
Material detachment from the tray	68	28.3
Incomplete setting of the material	64	26.7
Inaccuracy	1	0.4

Table 6. Motivation for training.

Reasons	(N)	(%)
Staying up to date	25	25.2
Improving one's skills	14	14.1
Addressing the lack of basic training	3	3
Training in optical impression	3	3

In cases of endodontically treated teeth where the post and core are needed for the retention of the prosthesis, an impression of the canal preparations is required. **Table 4** presents the impression techniques for canal preparations.

Tables 5 and **Tables 6** correspond to the causes of impression failures and the need for training in impression techniques expressed by the practitioners participating in the study, respectively.

4. Discussion

According to our results, the two-stage impression or wash technique (78.2%) and the single-stage double-mix impression (68.7%) were the most commonly performed techniques. In contrast, the monophasic impression (14.1%) was the least used (**Table 1**). The most used impression technique in Saudi Arabia and Chennai was the wash technique, with respective percentages of 80% and 66% [4].

On the other hand, in Kenya, practitioners opted for the monophasic technique (41.1%) [5].

Among the impression techniques used in fixed prosthodontics, the two-stage impression technique appears to have superior precision compared to other techniques. This technique offers many advantages: it is compressive, applicable to almost all cases, feasible without the help of an assistant and presents a low risk of bubbles [6].

Our study reported that the percentage of practitioners using optical impressions did not exceed 19.1% (**Table 1**). This low rate could be explained by the high cost of installing this technology or by the lack of familiarity of dentists with this technique during their basic training.

The accuracy of intraoral scanners is superior or equivalent to that of the conventional method, and optical impression can be clinically applicable for recording multiple edentulous areas to replace up to 4 teeth. The advantages of this technique include high reproducibility, information processing capability, storage capability and simplicity and speed of communication [7].

Practitioners in our sample adopted optical impressions for various reasons: the accuracy of the recording, ease of recording, time savings, patient comfort and the image of the dental office.

The most cited criteria for choosing impression techniques by dentists in our survey were mastery of the technique (97.3%), degree of precision (95.4%) and indication (86.3%) (Table 2).

The importance of these three criteria can be explained by the fact that they reduce the risk of impression failure, as they are the main factors that condition its quality.

Following our survey, we found that for techniques to access cervical margins before taking the impression, 83.1% of practitioners preferred using retraction cords, while only 1.4% used electrosurgery (Table 3). This result is consistent with a study conducted in Chennai [8], where the preferred technique for accessing cervical margins was also retraction cords (85%).

The recording of preparation limits is a crucial step in the design and manufacture of computer-assisted fixed prostheses. Its quality is directly related to the highlighting of cervical limits [9].

According to the literature, retraction cords have been commonly used for a long time to retract the gingiva before taking an impression for fixed prosthetics. The advantage of their use is that they are cost-effective and allow for different degrees of retraction. However, they can be painful and uncomfortable for the patient. Additionally, the sulcus may collapse after removal, which can lead to a rupture of the epithelial attachment. Electrosurgery can also be used as a gingival retraction technique, although it is not recommended because the concentrated electric current at the electrode tips can generate heat, which can cause bone or mucosal necrosis and lead to gingival recession. These disadvantages may explain the low affinity of practitioners for this method [10] [11].

Among the impression techniques for canal preparation, the optical impression was the least used impression technique (2.3%) (Table 4).

Indeed, cameras only record what they see, which limits their use in scanning post-space depth. There are devices specifically designed to record canal preparations. However, their use remains limited because this recording is optimal only if the depth of the preparation does not exceed 14 millimeters and its diameter exceeds 2.2 millimeters [12].

Although the different impression techniques in fixed prosthodontics are defined by specific protocols, the various parameters involved, such as clinical parameters related to the practitioner, parameters related to the laboratory, or even to the patient, mean that the risk of failure remains significant. Our survey confirmed the existence of this risk. Indeed, 97.7% of practitioners admitted that

they sometimes had to retake the impression, while 92.1% reported that they rarely encountered this problem. Causes of failure related to the practitioner accounted for 86.3%, patient-related reasons for 71.1%, and laboratory errors for 52.6% (**Table 5**).

The clinical reasons for this failure were: pull distortion (84.2%), bubbles (39.6%), tearing of the material (32.1%), deformation of the impression (28.7%), detachment of the material from the tray (28.3%) and incomplete setting reaction of the material (26.7%) (**Table 5**).

A study conducted in Riyadh, Saudi Arabia, among intern dentists reported that 91% had faced situations where they had to retake the impression, mostly for clinical reasons (67%) [13].

These various reasons, among others, were also found in a 2020 survey in Yemen, which aimed to evaluate the quality of fixed prosthodontic impressions in private dental laboratories. Regarding cervical margins, among the observed errors were the presence of bubbles (69.1%), voids (43%), pulling (32.7%), and tears (17.6%). Concerning errors that occur in the preparation area, bubbles (34%), inaccuracies (6.3%) and detachment of the material from the tray (4.8%) were observed [14].

According to the literature, recording defects can result from inappropriate handling or heterogeneous mixing of impression materials [15]. Inadequate distribution of materials on the surfaces to be recorded or premature removal of the impression before the complete setting of the material are also contributing factors. Automatic mixers can be invaluable in significantly reducing the risk of impression defects [16].

To improve the quality of impressions, we tried to determine the training needs of the practitioners in our study in this regard. Four main motivations justified this: staying up to date (25.2%), remedying the lack of basic training (3%), improving their skills (14.1%) and training in optical impressions (3%) (**Table 6**).

5. Conclusions

This study identified the impression techniques most commonly used in fixed prosthodontics by private practitioners in Casablanca while highlighting the criteria for their selection. Strict respect for the protocols and indications of each impression technique ensures its success.

It would also be interesting to encourage practitioners to use optical impressions to overcome the sources of errors found with conventional physico-chemical impressions. Also, optical impressions are integrated into the digital workflow for fabricating dental prostheses.

Conflicts of Interest

The authors declare no conflicts of interest.

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