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Dento-Supported Impressions in Fixed Prosthesis: Study by Cap Survey of Burkinabe Dental Surgeons

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Abstract

Introduction: The impression is a key stage in the success of the prosthetic process. Taking an impression remains the most difficult and delicate phase in the prosthetic chain. The aim of this study was to assess the attitude and knowledge of dental surgeons regarding impression taking in dental practices in Burkina Faso.

Materials and Methods: This was a descriptive cross-sectional study carried out in the city of Ouagadougou. A self-administered questionnaire was distributed to all dentists registered with the National Order of Dentists of Burkina Faso. The study included all dentists practising fixed prostheses who agreed to participate in the survey.

Results: Impressions without unitary guidance are the most commonly used (68.29%) in dental practices, and double-mixing (67.50%) is the most popular technique for taking impressions, whatever the type of impression. About a third of the dentists (29.28%) said that the dental technicians were always satisfied with the quality of their impressions, and more than half of them (56.12%) said that they provided additional information to the dental technician when processing the impressions.The main reasons for repeat impressions were poorly made prostheses (34.15%) and difficulties in processing the impression by the dental technician (34.15%).

Conclusion: The quality of the impression depends on its clinical application. It is important to use a technique that is appropriate and well mastered for each clinical situation. Both in the practice and in the laboratory, a rigorous protocol must be followed to ensure that the impression and master model give reliable results.

Keywords: Impressions; Sulcus access; Prosthetist; Fixed prosthesis.

Introduction

To rehabilitate a tooth with a fixed prosthesis, an impression must be taken to provide the dental technician with all the information required to manufacture the prosthetic part or component [1]. The impression is a key stage in the success of prosthetic fabrication. Prosthetic success depends on the accuracy and precision of the impression, and on the degree of conformity between the working model and the clinical situation [2]. Taking an impression remains the most difficult and delicate phase in the rehabilitation process, since the value of the registration determines the manufacture and reliability of the final prosthetic element, and therefore its biological integration [3].

Practitioners use two main impression techniques in dental practices. These are conventional techniques and digital intra-oral impressions. In recent years, optical impressions have been gaining ground as a response to the many inaccuracies in the prosthetic chain. It is distinguished from conventional techniques by the digital conversion of the data obtained. Despite the advent of optical impressions and digital workflow, physico-chemical impressions are still omnipresent in dental practices. Today, with the development of impression materials, it appears that the impression technique has a greater impact on dimensional accuracy and precise recording of detail than the material [1, 3], although this remains a controversial issue. As far as surface impressions (physico--chemical) are concerned, the debate over the most accurate method between the double-mix or one-step technique and the wash or two-step technique seems eternal [4].

The dentist has a host of impression materials available for making impressions in fixed prosthodontics, implant dentistry, and operative dentistry. With proper material selection and manipulation, accurate impressions can be obtained for fabrication of tooth- and implant-supported restorations [5]

For several authors, impressions are the main source of error in failed prosthetic treatment [6]. This makes it difficult to apportion responsibility between the dental surgeon and the dental technician. For this reason, the present study set out to review the attitudes, knowledge and practices of dental surgeons with regard to impression taking.

Materials and Methods

A descriptive cross-sectional study was carried out in the city of Ouagadougou over a 3-month period. The sample consisted of forty-one (41) dentists out of a total of one hundred and three (103) in Burkina Faso. The inclusion criteria were :

- To be specialist or non-specialist dentists who have been practicing fixed prosthetics for one year,

- Be registered with the National Order of Dentists,

- practise in a private or public practice in Burkina Faso.

A self-administered questionnaire survey was carried out. The questionnaire was distributed to dentists attending the "dental cafe" workshop organized by the office of National Order of Dentists. For clinicians not présent at the "dental cafe", the questionnaire was left in their dental practices. The forms were collected from the clinics. In some cases, an interview was necessary to complete the questionnaire. The variables studied were as follows :

- Socio-demographic characteristics: identification of the practitioner, including age, gender, professional seniority and practice area,

- Cervical margin : situation and techniques of access to the sulcus,

- Impression taking : types of impression, impression techniques, prosthetist satisfaction with impressions, prosthetist need for additional information on impressions, frequency of repeat impressions, difficulties in using impressions, causes of impression failure, practitioner participation in continuing education courses on impressions.

The data collected were entered and processed using EPI INFO software version 7.2.2.6. and Excel 2013. The statistical study of the data was carried out by calculating the frequencies and percentages relating to the variables studied with a 95% confidence interval. Given the small size of our sample, the significance level was set at $p < 0.05$.

Results

Socio-Demographic Characteristics

Our study population was 78% male, with a sex ratio of 3.55. The majority (49%) were between 35 and 50 years of age. Only 17.07% had less than 10 years' professional experience.

Clinical Aspects

Sub gingival margins were performed by 43.9% of dentists, compared with 39% for juxta-gingival margins and 14.63% for intramuscular margins.

Techniques for Accessing Cervical Margins

For the sulcus opening, clinicians preferred the simple cord method (63.41%) and the sulcus burr technique (41.46%).

Impressions

- Type of impression

Non-unit-guided impressions are the most commonly used (68.29%) in dental practices (tab I).

Table 1: Sample distribution by impression type

Type impression	Frequency	Percentage
Global impression with unit guidance	6	14.63%
Global impression without unit guidance	28	68.29%
Unit impression	7	17.07%
Total	41	100.00%

Impression Technique

One-step putty-wash technique (58.97% and 67.50%) is the most popular impression technique, whatever the type of impression (tab II).

Table2: distribution according by impression technique

Impression technique	The preferred technique for unit impression	The preferred technique for global impressions
Global impression with impression coping	0%	2.50%
One-step putty-wash technique	58.97%	67.50%
Triple mix	2.56%	2.50%
Putty wash	38.46%	27.50%
Total	100.00%	100.00%

Around a third of dentists (29.28%) stated that their dental technicians were always satisfied with the quality of their impressions (tab III).

More than half of clinicians (56.12%) reported that they provided additional information to the dental technician when processing the impressions (tab IV).

Table 3: Prosthodontics satisfaction with impressions

Prosthetist satisfaction	Frequency	Percentage
Sometimes	28	68.29%
Always	**12**	**29.28%**
Not specified	01	2.44%
Total	41	100.00%

Table 4: prosthetist's need for further information

Information request	Frequency	Percentage
Never	14	34.16%
Sometimes	**23**	**56.12%**
Often	3	7.32%
Not specified	1	2.44%
Total	40	100.00%

The vast majority of practitioners (71.79%) said they took impressions only a few times, compared with 25.64% who said they took them routinely.

The main reasons for repeat impressions were poorly made prostheses (34.15%) and difficulties in using the impression by the dental technician (34.15%).

With regard to participation in continuing education courses, 58.54% of practitioners stated that they had never taken part in this type of training.

Based on our results, we can draw the following conclusions :

- a large number of practitioners continue to perform subgingival margins, despite the fact that they are prohibited. The cervical subgingival margin can damage the biological space, leading to a reaction of the gingival tissues, usually manifesting itself as gingi-

val inflammation opposite the prosthetic abutment teeth.

- rotary curettage was one of the preferred techniques for accessing the sulcus. Tissue eviction with a burr is quick and easy to perform. However, there is a risk of damage to the biological space, as it remains aggressive to the periodontium.

- Global impressions without guidance are the most popular, yet they are responsible for a significant increase in error rates, such as occlusal maladjustment.

- the preferred choice of impression technique was the double-mix technique. This technique reduces chairside time for the practitioner and inconvenience for the patient.

- repeat impressions were frequent, increasing the discomfort of patients who often found the conventional impression-taking stage too aggressive.

- a third of the impressions sent to the laboratory are difficult to use, with errors resulting in deformed recordings and, consequently, ill-fitting prostheses requiring numerous alterations, leading to patient dissatisfaction.

Discussion

Cervical Limitations

Preparing the dental abutment is an essential step in prosthetic treatment. It must respect the pulpal and periodontal environment, including the biological context, that is to say the pulp and periodontium [7]. Our results show that practitioners prefer to use subgingival margins, which are iatrogenic. Some practitioners use an intrasulcular margin. However, if an intrasulcular margin is performed without due care, it crosses the biological space and exposes the tooth and its periodontium to severe inflammation, which can lead to gingival recession or periodontal pockets [8]. Practitioners seem to prefer it because the dento-prosthetic marginal joint is buried beneath the free gingiva, thus completely masking chromatic anomalies and structural defects in the tooth [9]. The juxta-gingival margin appears to be a better compromise, since it offers better retention than a supra-gingival situation, but not as good as that of an intra-sulcular or intra-cervical preparation [10].

Sulcus Access

The impression is taken after the sulcus has been opened, as the precision and positioning of the limits will determine a large part of the impression. In this study, the sulcular opening is all the more important as the majority (58.53%) of dentists take intra-sulcular and sub-gingival limits. To highlight these margins, practitioners most often used the simple cordonet technique (63.41%) and the sulcus burr (41.46%). Studies by Chaudhari et and al. showed that gingival rétraction was better with the aluminum chloride-impregnated cordonet technique than with expasyl and the use of tetrahydrozoline [11]. Despite the advantages of the expasyl paste system, which has over 20 years' clinical experience, it is still little used by practitioners to access the sulcus (19%) [12]. The cost and availability of deflection pastes seem to justify their low use in our practices.

Impressions

In the prosthetic chain, an ideal preparation is useless if it is not followed by a quality impression. The impression is a key step in the creation of the prosthetic part. It must ensure accurate transfer of clinical data to the laboratory, where the prostheses will be made [13]. Global impressions without unit guidance are preferred (68.29%) to those with unit guidance (14.6%). In a single clinical session, they enable both preparations and adjacent teeth to be reproduced. The sectorial impression, long used by a large number of practitioners, now seems to have been superseded by the global impression, thanks to its simplicity and speed of execution [14].

For both unit and global impressions, practitioners prefer the double-mix technique, also known as the "one-step, two-viscosity technique" (65.88% and 56.12%). With this technique, the two materials polymerize simultaneously, reducing the time spent in the chair. According to the literature, the one-step technique with vinyl polysiloxanes or polyethers delivers highly accurate impressions [15,16,17]. This choice may be justified by the fact that double-mixing offers a wide range of clinical indications.

Around a third of the sample (29.3%) were still satisfied with their impressions, 56% acknowledged that they had been contacted by the prosthetist for further information, and 68% admitted to having occasionally re-taken impressions sent to the laboratory. Kouamé and al., in their study of impression validation in the laboratory, found that out of 600 impressions, 132, or 22% of impressions, had at least one defect [23]. RAU and al. evaluated 1153 impressions in dental laboratories with calibrated examiners and found that 86% of impressions examined had at least 1 detectable error, and 55% of errors noted were critical cervical margin errors [24]. Other studies confirm the trend that the quality of impressions received in the prosthetic laboratory was not always satisfactory, and that these often had to be repeated [13,25,26 ,27]. In contrast, Mitchell and al. rated 85% of impressions submitted to a commercial laboratory as good or excellent [28].

The major cause of impression reworking remains the difficulty of using the impression by the dental technician (34%). Defects force laboratory technicians to guess at the limits of preparations, resulting in imprecise and erroneous prosthetic designs. Practitioners cite patient non-cooperation as a limitation. For Kouamé, the defects observed can be linked, on the one hand, to the time taken to process impressions and, on the other, to the type of impression material used [23]. Inadequate peripheral dental preparations and poor soft-tissue management by clinicians are also causes that need to be taken into account.

In view of our results, the quality of impressions needs to be improved. The practitioner must bear in mind that the success of an impression depends on upstream work.

Need for Training

This study has shown that impression returns due to lack of information are a reality in the daily practice of most practitioners. Selva has shown that 80% of practitioners return impressions due to lack of information [29]. Despite improvements in material properties and precision, the quality of dental impressions received by laboratories has remained distinctly unsatisfactory. Many technicians report a decline in the quality of the impressions they have received over the years. They associate impression defects with unfamiliarity with impression material handling protocols, poor choice of impression tray and inappropriate choice of impression technique [30]. All these errors lead to registration deformations and, consequently, to ill-fitting prostheses requiring numerous alterations. Of the 41 practitioners, 58.5% had never attended a continuing education course, and 90.3% needed to improve their knowledge of impression taking. It is therefore essential to enhance practitioners' skills through modular continuing education courses.

This Study Highlighted:

-the common practice of making subgingival margins, which results in the creation of subgingival prostheses. These prostheses are directly responsible for inflammatory reactions, as they encourage plaque retention. This endangers periodontal health and exposes the tooth and its periodontium to severe inflammation, which can lead to gingival recession or periodontal pockets [31].

-defective impressions taken in the office. These often contain defects which influence the accuracy of the master model on which the technician will produce the final fixed prosthesis. These defects force the dental technician to guess at the cervical limits of the preparations, resulting in imprecise prosthetic designs. The consequences of these inaccuracies can lead to over- or under-contouring, insertion problems and prosthetic adaptations, as well as occlusal problems, all of which will increase patients' complaints (occlusal, periodontal and aesthetic) once the finished prosthesis has been fitted. In the long term, these errors can have irreversible consequences, leading to the loss of supporting teeth and consequent disruption of the oral and masticatory functions of the oral cavity [32].

These results point us in the direction of finding appropriate solutions to improve the quality of impressions, which is the key to the success and survival of fixed prostheses. In addition, practitioners need to attend regular continuing education courses to ensure that their clinical skills, knowledge of biomaterials and understanding of impression material handling protocols and impression techniques are constantly updated.

Conclusion

Impressions are ubiquitous in dental practices, but practitioners recognize that their impressions often have defects that affect the accuracy of the replica. However, they blame patients for their lack of cooperation and laboratory technicians for casting defects. Also, the lack of ongoing training contributes to the depreciation of clinicians' skills. The quality of the impression depends on its clinical application. It's important to use a technique that's appropriate and well mastered for each clinical situation. Both in the office and in the laboratory, a rigorous protocol must be followed to ensure that the impression and master model produce reliable results.

Risk Assessment and Ethical Issues

The study did not involve any risks for the respondents. Anonymity was ensured by the protection of patient files, and the study was conducted in accordance with the rules in force in health establishments.

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