

Gingival Retraction Techniques: Epidemiological Study among Dentists in Casablanca

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Abstract

Introduction: The aim of our study was to determine which gingival retraction techniques are frequently performed in daily practice by dentists from the private sector in the city of Casablanca, Morocco. The criteria for choosing these techniques, the knowledge of the different techniques as well as the desire for training on this subject were also investigated.

Materials and Methods: A cross-sectional study was conducted among 273 dentists practicing in Casablanca by using an anonymous questionnaire.

Results: 80.2% of dentists used cervical margin access techniques in daily practice. For the 19.8% who avoid it, the main reasons were loss of time, high cost and non-benefit of these techniques. The most common method used was the retraction cords (75.8%), followed by the temporary crown technique (53.4%). Few practitioners used gingival retraction pastes and very few dentists used laser and electrosurgery. 85% of the dentists in our sample were satisfied with the cervical adaptation of their joint prostheses with gingival retraction techniques and 59.3% of the dentists wished to receive further training on this subject.

Conclusion: Similar to some studies conducted on gingival retraction techniques, our study showed that the use of these techniques is considered necessary by a large proportion of practitioners. Practitioners even stated the need for continuing education in order to stay current with new techniques in dentistry and improve the quality of prosthetic care provided to patients.

Keywords: *Gingival Retraction; Private Practice; Casablanca*

Introduction

The objective in fixed prosthesis is to restore the physiology, the function and the aesthetics of the teeth. The practitioner must consider both the immediate result (aesthetic integration) and the medial result (biological and periodontal integration), which are the

guarantors of the durability of the prosthesis [1]. Of all the elements of the preparation for a fixed prosthesis, the cervical margin is undoubtedly the most sensitive area of a prosthetically restored tooth. Its registration is one of the essential steps of the prosthetic act. It allows the practitioner to record the entire preparation of the tooth in order to give a faithful copy to the laboratory technician. This step requires both mastery of technical gestures and knowledge of the biological consequences of each act [2]. While it is easier to fabricate a prosthesis when the cervical margins are supra-gingival, intra-sulcular margins are a therapeutic compromise to meet aesthetic or retention requirements. The emergence profile is deep in the sulcus and the clinician must manage the periodontal structures that interfere with the registration of this important area. This makes prosthetic design more complicated and increases the risk of iatrogenic damage to the periodontium. It is therefore essential to use a technique that allows access to the cervical limits. Dentists are looking for a simple technique that combines efficiency, rapid implementation, low cost and reproducibility, in order to obtain reliable and quality impressions, while associating concepts of biological integration and respect of the attachment system [3].

Several techniques and different materials, used according to specific indications, allow the realization of different impressions in fixed prosthesis, in various clinical situations. Thus, various gingival retraction techniques (GRT) are used and can be classified into two main categories:

- Deflection access techniques or non-surgical techniques: the principle consists of mechanically spreading the free gingiva, by compression of the gingival rim, and thus opening the sulcular space either immediately or mediately. These techniques include: the cord technique, the use of retraction pastes and the temporary crown technique [4].
- Tissue eviction access or surgical techniques: consist on the removal of superficial epithelial and connective layers on the inner side of the free gingiva, providing the necessary space for the impression material to penetrate the sulcus and thus record the cervical margin and root emergence profile. Surgical techniques include electrosurgery, rotary curettage and laser [4,5]. It should be noted that the choice of a technique is mainly related to the state of the periodontium (thickness of the marginal gingiva) and its safety with respect to the gingiva. The ease of implementation and the cost of the material are also factors that influence dentist's choice [1].

Aim of the Study

The aim of this study was to determine which gingival retraction techniques are frequently performed in daily practice by dentists in Casablanca, Morocco. The criteria for choosing these techniques, the knowledge of the different techniques as well as the need for training on this subject were also investigated.

Materials and Methods

An epidemiological, cross-sectional, descriptive study was conducted on a sample of 312 dentists practicing in the liberal sector in Casablanca and practicing fixed prosthesis. Dentists who refused to fill out the questionnaire and doctors specializing exclusively in orthodontics, surgery or pedodontics were excluded. Participants were randomly selected from a list provided by the Southern Regional Council of the Order of Dentists of Morocco.

Data were collected using an anonymous questionnaire containing 21 questions divided into 2 parts:

- The first one was dedicated to the identification of the dentist,
- The second was dedicated to gingival retraction techniques used in daily practice.

A pre-survey was necessary to test and validate the questionnaire. It was conducted among 10 dentists practicing in the private sector who were not included in our sample. The objective was to detect possible difficulties of comprehension and to test the value of the content of the questionnaire.

The results were entered using the Excel program and analyzed using SPSS software within the Laboratory of Community Health Epidemiology and Biostatistics of the Faculty of Dentistry of Casablanca. Data analysis was done descriptively for all variables.

Results

The initial sample was 312 dentists, 273 practitioners responded to our questionnaire, representing a participation rate of 87.5%. The sample was composed of 58.2% female dentists. 78.4% of them graduated from the Faculty of Dentistry of Casablanca and 90.8% were general practitioners. The results of the study concerning the practices of access to cervical limits are summarized in table 1-4.

	Number	Percentage
Use or not of GRT		
Yes	219	80.2
No	54	19.8
Time of use		
During the preparation	143	65.3
During the adaptation of provisional	47	21.5
During the conventional impression	122	55.7
During the optical impression	21	9.6
During the bonding	36	16.4

Table 1: Use of gingival retraction techniques.

	Number	Percentage
Techniques used daily by dentists		
Retraction cords	166	75.8
Temporary crowns	117	53.4
Electric scalpel	6	2.7
Expasyl	35	15.9
Magic Foamcord	2	0.9
Rotary curettage	59	26.9
Laser	19	8.7
Technique considered the most traumatic		
Retraction cords	10	3.7
Temporary crowns	15	5.5
Electric scalpel	91	33.3
Expasyl	6	2.2
Magic Foamcord	0	0
Rotary curettage	74	27.1
Laser	17	6.2
No answer	60	22

Criteria for choosing a technique		
Easy to perform	166	60.8
Thickness of the gum	97	35.5
Number of teeth prepared	39	14.3
Depth of the sulcus	110	40.3
Degree of gum irritation	70	25.6
Cost of the material	23	8.4
Other: effectiveness	1	0.4
Location of teeth	2	0.8

Table 2: Gingival retraction techniques.

	Number	Percentage
Use or not		
Yes	168	61.54
No	50	18.32
No answer	55	20.14
Types of cords used		
Self-impregnated	54	19.38
Pre-impregnated	64	23.4
Not impregnated	49	17.9
No answer	105	38.5
The impregnation solution		
Pre-impregnated cords	64	38.1
Epinephrine	6	4.9
Aluminum chloride	25	20.3
Astringedent	23	18.7
Aluminum	6	4.9
Potassium Sulfate		
Technique used		
Single cord	68	40.4
Double cord	50	29.8
Both of them	50	29.8

Table 3: Use of retraction cords.

	Number	Percentage
Necessity of using of GRT for		
Impression's quality	238	87.2
A good adaptation of prosthesis	235	86.1
No answer	3	1.1
Reasons for not using GRT		
Waste of time	26	9.5
No profit	6	2.2
Additional cost	22	8.1
No answer	239	87.5
Satisfaction with the cervical adaptation of prosthesis		
With access techniques		
Yes	232	85
No	34	12,5
Without access techniques		
Yes	54	19,8
No	217	79,5
No answer	2	0.7
Redoing impressions		
Yes often	3	1.1
Yes sometimes	80	29.3
Rarely	151	55.3
No	39	14.3
Need for ongoing training on access techniques		
Yes	162	59.3
No	111	40.7

Table 4: Contributions of gingival retraction techniques.

Discussion

The objective of this study was to determine which gingival retraction techniques were frequently performed in daily practice by dentists in Casablanca. Criteria for choosing these techniques, knowledge of the different techniques, and the desire for training on this subject were also investigated.

A questionnaire was developed based on four studies of private dentists [2,6-8]. For the mode of distribution, we chose to give the questionnaire directly to the practitioner rather than sending the questionnaire online; this allowed us to obtain more significant results. The participation rate recorded was 87.5%, a rate that remains very satisfactory compared to other studies with online questionnaires such as the study conducted in 2017 in Saudi Arabia on a sample of 1846 dentists with a participation rate of 20.2% [9].

Our study showed that 80.2% of dentists used GRT techniques in daily practice. This result showed that the majority of dentists were aware of the necessity of using GRT techniques. The rate found remains lower than that found in other studies: 95.5% in 1985 in the USA [10], 94% in 2017 in England [11], 100% in Midi-Pyrénées in 2014 [6].

Regarding the time of use, 65.3% of the dentists used GRT techniques during the teeth preparation, 55.7% during the physicochemical impression, while 21.5% of the practitioners used it during the cervical adaptation of provisional prostheses, 16.4% during bonding, and 9.6% during the optical impression. The relatively high rate of practitioners using GRT techniques at the time of preparation reflects their awareness of the need to protect the sulcular epithelium against the aggression by a rotating instrument at the time of preparation. Indeed, the placement of a non-twisted deflector cord (mesh or braided) allows the protection of the free marginal gingiva and epithelial attachment and the displacement of the marginal gingiva to safely access the sulcus [5]. Even in the case of a juxta gingival margin where the preparation is not buried in the sulcus, the rotary instruments graze the periodontium when making the margin and therefore a gentle gingival deflection is required [5]. The rate of practitioners using GRT techniques prior to making physicochemical impressions remains low. It is therefore necessary to emphasize to physicians and students the value of using these GRT techniques to obtain a quality impression.

The most common method used in our study was the retraction cord, followed by the temporary crown technique. Donovan, *et al.* found that 95.5% of dentists used the corded technique daily [10]. Hansen's team showed that 98% of dentists surveyed used retraction wires [12]. In another study conducted in Abidjan, 45.6% of dentists used cord techniques, 28.1% used temporary prostheses, 24.6% used rotary curettage, and 1.8% used copper rings. However, no practitioner used the new paste-type sulcular opening techniques such as Expasyl and magic foam cord [2]. Mc Cracken, *et al.* found that 70% of dentists used cord techniques, 16% used injectable techniques and 9% used other techniques [11]. In the study by Bennani, *et al.* in New Zealand, access to the sulcus was most often achieved by surgery (electrosurgery, laser, and rotary curettage) and/or cording by 82% of study participants. Impregnated cords were used by 63% and the single cord technique by 37% [13]. These results show that the most commonly used technique is the cordon technique. This can be explained by its ease of use and effectiveness. The absence or lack of recourse to surgical techniques is due to the fact that these procedures require a significant investment in equipment and mastery of gestures and present a significant risk of recession.

The techniques considered the most traumatic were the electric scalpel (33.3%) and the rotary curettage (27.1%). Similar results were found in the study conducted by Pesson, *et al.* (50.88% for rotary curettage and 36.8% for electrosurgery) [2]. Azzi, *et al.* compared the methods of gingival retraction and found that the cord technique was the least traumatic for the periodontium in terms of recession and loss of epithelial attachment and that rotary curettage caused more recession than the electrosurgery technique [14]. Previously, in 1981, Ingraham, *et al.* compared rotary curettage with the double cord technique and electrosurgery and concluded that under controlled conditions and with the appropriate burr, rotary curettage was a reliable technique that produced excellent impressions with minimal initial and long-term damage to the periodontium [15]. However, we may wonder if the results of this study are not somewhat biased by the fact that Ingraham is the inventor of the rotary curettage bur. In addition, the application of excessive heat during electrosurgery is likely to result in burned areas on the root surface and destruction of the cementum covering the root. The result may be loss of epithelial and connective attachment, with apical positioning of the junctional epithelium and loss of crestal alveolar bone. This can cause significant recession of the marginal gingiva. These data are also confirmed by the team of Gherlone who showed that the number of gingival recessions was highest in the electrosurgery group (12.7%), followed by the double cording (7.3%) [16].

Electrosurgery is therefore an irreversible method of the gingivectomy type, and cannot be recommended for temporary retraction of the gum. Moreover, it presents numerous contraindications related to the general condition of certain patients (heart disease, pacemaker wearers, Addison's disease) and is not within the reach of all dentists [3]. Gherlone's team concluded that the laser produced correct results in terms of gingival deflection with maximum respect for the surrounding anatomical structures [16].

For the criteria for choosing a GRT technique, according to our study, the criteria were mainly the ease of execution (60.8%), depth of the sulcus (40.3%) and thickness of the gingiva (35.5%). The study done by Pesson and all found that simplicity and ease of execution (73.7%) as well as the thickness of the gingiva (64.9%) were the major criteria for the choice of GRT. The safety of the technique was also one of the criteria taken into account by 54.4% of the practitioners [2].

Thus, in the practitioners' reasoning, there is both a technical and a biological approach to the implementation of sulcular opening methods. The choice of the most frequently used techniques did not seem to be correlated with the location of the abutment teeth. Indeed, some practitioners used sulcular opening techniques only for anterior teeth, others exclusively for posterior teeth, and still others regardless of location. Similarly, the sulcular opening techniques used did not appear to be related to the number of abutment teeth [1]. Some dentists actually perform the sulcular opening only for single dentures, others only for multiple dentures, while others perform it regardless of the number of abutment teeth [17]. Biologically, while the provisional prosthesis technique is more appropriate for thin periodontal tissues with a shallow sulcus and the single-cord method is of interest for thick, fibrous periodontal tissues, the double-cord method can be used in almost all clinical situations. Moreover, when properly conducted, the retraction cord techniques are not very aggressive and do not generally cause intraoperative bleeding [17]. For this reason, Armand insists that the technique chosen must always be compatible with a return to normal periodontal function. With the new paste-type sulcular opening techniques, the benefits are the absence of aggression at the gingival level, the absence of the need for anesthesia, the rapidity of the technique, hemostasis, and the possibility of combining with other techniques [18].

For our participants, the most chosen technique was the retraction cords and the temporary crown technique. For the study of Bailon, *et al.* the technique chosen was retraction with Expasyl® for 34% of the practitioners aged 25 to 35 years and curettage with rotary instrumentation for 43% of the practitioners aged over 50 years [6]. It should be noted that in this study, practitioners between the ages of 25 and 35 had more recent and therefore more extensive training, which justifies the use of more methods than practitioners older than 35 years. Following these studies of the practices in terms of obtaining access to the sulcus, it appears that the practices of the dentists differed according to their country and their age.

Regarding the practice of the cording technique, 23.4% of the dentists used pre-impregnated cords, 19.8% used self-impregnated cords, 17.9% used non-impregnated cords, and 38.5% did not respond. In the Pesson's study, 28.1% used impregnated cords and 17.5% used non-impregnated cords [2]. Furthermore, in the study by Tosches and Salvi in 2009, most dentists preferred the use of wires without added chemicals, followed by wires impregnated with aluminum chloride and adrenaline [3]. Based on a comparative study of gingival retraction methods, it was reported that unimpregnated cords could be used for gingival retraction with minimal damage to the gingival tissue. If gingival retraction with the cord is limited to a duration of 10 minutes, there is no gingival injury. However, if the cord is left in place for 30 minutes, the sulcular epithelium is damaged. This damage is repaired within 10 days [19]. On the other hand, Kumbuloglu, *et al.* showed that the use of unimpregnated cords did not cause bleeding [20]. However, other authors do not recommend purely mechanical gingival retraction with wires without chemical additives, because the duration of vertical and lateral gingival retraction is considered insufficient [21] and hemostasis unreliable, as evidenced by the fact that 60% of the impressions had to be redone [22].

For the impregnation solution used, our study showed that the most used solution was Aluminum chloride such as Gingivasol, followed by ferric sulfate (Astringedent). Epiniphine and aluminum/potassium sulfate or alum were used by few dentists. For Tosches and Salvi, the most popular auxiliary agent was a buffered solution of aluminum chloride [3]. The frequent use of aluminum chloride may be justified by the fact that it is the least irritating of the hemostatic agents and causes no permanent damage to the gingival tissue when the solution is left in the sulcus for up to 15 minutes [23]. It does not penetrate the cells and affects only the superficial layer of the mucosa. However, prolonged contact time with gingival tissues may result in delayed healing or tissue damage. Also, in animal experiments, it has

been shown that concentrations above 10% can cause severe tissue destruction [21]. In addition, iron sulfate is an effective substance for hemostasis. The application for one minute of sutures impregnated with 13.3% iron sulfate (Astringedent®, Ultradent Products Inc USA) has been shown to be a sufficient measure to achieve adequate gingival reflow. Iron sulfate causes blood to coagulate so rapidly that it is necessary to bring it into direct contact with the tissue; otherwise it is immediately removed with the oozing of coagulated blood, leaving the hemorrhagic surface of the tissue visible. The recommended application time is approximately 1 to 3 minutes. The resulting tissue spacing is expected to persist for at least 30 minutes. The soft tissue temporarily turns bluish to black. These discolors are reversible and disappear within one to two days [22]. A potential problem with this procedure could be that the short duration of action of the sutures would only produce insufficient lateral spreading of the gingiva.

For the cording technique used, the placement of a single cord was the most used in our study. Petrie., *et al.* found that 43% of dentists used the double cord technique [24]. Albaker., *et al.* showed that 98% of prosthodontists used cords, with 48% using a double-cord technique and 44% using a single-cord technique [23]. Hansen., *et al.* showed that 43% of practitioners used the double-cord technique for more than half of their impressions [12]. The more frequent use of the single-cord technique in our study can be explained by the high rate of practitioners who use it at the time of finishing the cervical margins and at this stage, a single cord is sufficient and allows the gingiva to spread. While the double cord technique is less used which could be explained by the fact that it requires more time.

The reasons for not using GRT techniques according to some of the physicians interviewed were loss of time, additional cost and lack of benefit. This attitude may, however, lead to a high rate of repeated impressions and consequently to more loss of time. Concerning the satisfaction of the doctors with the cervical adaptation of their joint prosthesis, 85% of the dentists in our study were satisfied with the cervical adaptation of their joint prosthesis with the techniques of access to the cervical limits while 12.5% were not satisfied. On the other hand, 19.8% of the dentists were satisfied with the cervical adaptation of their dentures without cervical access techniques, while 79.5% were not satisfied. In Baillon's study [6] regardless of the age of the practitioners or the technique used, 83% of them were generally satisfied with the cervical adaptation of their fixed prostheses during placement and over time. 17% of the practitioners reported that the cervical adaptation of their prostheses was not perfect (gap at the dento-prosthetic joint, over and under contours, long-term gingival recession) [6].

These results must be put into perspective, because it depends solely on the subjective assessment of the practitioners. No clinical protocol allowing to judge objectively the quality of the cervical adaptation of fixed prostheses was set up during our study.

For the frequency of redoing impressions due to lack of information on cervical limits, according to our study, 55.3% of dentists rarely repeat their impressions following the request of the prosthetists, and only 14.3% never repeat the impressions. In the Midi-Pyrénées region, the frequency of practitioners taking back impressions at the request of the prosthetist due to lack of information was as follows: 80% rarely, 9% sometimes and 11% never [6]. This can be explained either by lack of experience or because some physicians did not use the cervical margin access techniques for all their clinical cases.

As for the need for continuing education, 59.3% of the dentists surveyed wished to receive continuing education on cervical margin access techniques. In the study carried out in the Midi-Pyrenees region [6], only 40% of the practitioners wished to deepen their knowledge of the techniques of access to cervical limits in fixed prosthesis. Given the continuous evolution of dentistry, continuing education remains an obligation to improve daily practice.

Based on the results of this study, the following recommendations are proposed:

- Strengthening the practical and clinical teaching of the different types of GRT techniques during the university curriculum, which could encourage freshly graduated dentists to perform them in their practice to obtain a quality impression and reduce the risk of prosthetic failure.

- Organizing conferences and seminars to encourage physicians to use cervical limit access techniques more frequently before taking impressions for fixed prosthesis preparations.
- Making practitioners aware of the need for a pre-operative examination to assess the periodontal situation in order to choose the most suitable sulcus access technique, combining effectiveness, rapid implementation, low cost and reproducibility, in order to have reliable and quality impressions, while associating the concepts of biological integration and respect of the attachment system.
- Organization of continuing education for practitioners to be able to follow the evolution of materials and obtain more sustainable results over time.

Conclusion

The majority of dentists used cervical margin access techniques in daily practice. The most commonly used CLA technique was the corded technique, followed by the temporary crown technique. The criteria for choosing cervical margin access techniques were mainly ease of performance, sulcus depth and gingival thickness. More than half of the dentists wished to take continuing education courses to update their knowledge and to follow the prosthetic revolution.

Data Availability

The data are conserved in the fixed prosthesis department of the Faculty of Dentistry of Casablanca, University Hassan II of Casablanca, Morocco.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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