Relationship of the gum with the finishing line in the carving of previous crowns

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Abstract

Prosthetic crowns are a feasible option within fixed prostheses when rehabilitating a tooth in the anterior area due to their excellent aesthetics and superior restorations adaptability. For decades dental crowns have been used with a high rate of success in previous teeth that have suffered destruction in a large part of their structure. However, the preparation and pre-cementation carving generate doubts when choosing the lines of termination, this will be the ideal one and less risky for gingival health. The objective of the research is to contrast the relationship of the gum in the anterior crowns carving by comparing the lines of termination to determine the correct management of the biological space. Materials and methods: This research is based on a descriptive-analytical literature review of 40 scientific articles published in journals indexed between 2018 and 2022. Results: It was determined that subgingival carved lines of termination from 0.5 to 1mm subgingival are less likely to develop gingival inflammation and plaque accumulation, which is not the case with preparations that invade the biological space. Conclusions: The bibliographic information analyzed suggests that the lines of termination are not a real concern for gingival health as long as individualized care is provided for each tooth to be treated from the moment of carving to cementation.

Keywords: Lines of termination; anterior crowns; gingival health; crown adaptation; gingival recession.

Theme

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Introduction

The population worldwide is very prone to develop caries in their dental organs, which generates in advanced stages the destruction of much of its structure, so in many cases it is not enough only to restore the dental organ to recover the shape, function and aesthetics, especially in the anterior maxillary sector where the aesthetics and harmony of a smile is projected. [1]

The smile directly influences the self-esteem of people, thus being essential to correct this aesthetic aspect. It is considered aesthetic within restorative dentistry to all those restorations and rehabilitations that simulate in color, shape, thickness and texture to the natural teeth. Aesthetics can be recovered through different treatments one of them is the fixed prosthesis, through dental crowns[2]

In fixed prostheses, the teeth are prepared to be later restored by complete crowns in those fractured dental organs, with large destroyed surface, in multiple failed restorations or endodontic therapy. The crowns are placed on a dental organ, in order to cover it, recover its shape, function, size and improve aesthetics. [3]

One of the most inherent aspects in the manufacture of crowns is the choice of restorative material, it must provide biomechanical properties that guarantee its success and long-term survival, the most used material is ceramic, allowing the dentist to achieve a natural appearance in the patient's mouth, as well as a good marginal adaptation, which is defined as the veracity with which the crown fits on the finishing line previously carved using a high-speed rotary instrument. [4]

The carving of the tooth will depend on certain clinical factors, such as the remaining dental tissue, intermaxillary relationship and aesthetics. The location of the termination line in anterior crowns is

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at the subgingival level, from 0.7 to maximum 1mm below the gingival margin, the carving must be geometric with insisal direction to avoid the possible exit of the fixed prosthesis once cemented. [5]

The gum is part of the masticatory mucosa and covers the periosteum and the alveolar bone surrounding in the same way the cervical portion of the teeth; It is composed of dense connective tissue covered with epithelial tissue, the free gum and the adhered gum are distinguished, the free gum is that of coral pink color of firm consistency, its extension goes from the gingival margin to the gingival groove next to the amelocementary junction. The adhered gum is one that extends from the gingival groove to the mucogingival junction. The invasion of this structure in most circumstances causes gingival retraction, bone loss, gingival hyperplasia, and even loss of the dental organ, all with serious consequences for oral health and aesthetics. [6]

There are several factors that can cause gingival recession around fixed prostheses, such as preparing the termination line too subgingival damaging the gum, generating iatrogenic trauma of the soft tissue during the carving procedure, excessive gingival displacement for the final impression taking, lack of marginal adaptation and the existence of a thin biotype. [7]

One of the crucial points that determine the success of a rehabilitation treatment in fixed prosthesis: it is a correct marginal adaptation, the material selected for the crown and cementation. The carving of the termination lines in previous crowns must be subgingival and this is often associated with gingival recessions and inflammation, for this reason the dental professional is obliged to provide the optimal treatment. [8]

The correct management of the biological space influences proportionally the success of the treatment in previous crowns, it is necessary that the dentist knows the limits that can reach in the preparation, in order to avoid incurring in a bad practice by not respecting the soft tissues that are surrounding and protecting the tooth. It is known as biological space to the physiological separation that exists between the base of the gingival sulcus to the alveolar crest. [9]

The dimension of the biological width varies, dependent on several issues such as the location of the tooth in the socket, the appearance of the tooth, if the tooth is anterior or posterior, although in general terms there is an approximate of between 2.5 to 3mm, although these dimensions vary from patient to patient so it is necessary to determine the correct measurements individually. The location of the termination lines depends on the following factors: oral hygiene of the patient, susceptibility to caries, morphological characteristics of the gum, aesthetics, presence of root caries. [10]

A poorly made finishing line can lead to microfiltration and affect the gingival tissue surrounding the dental organ leading the patient to gingivitis. Gingivitis, is an inflammation of the gum characterized by widening of the gingiva, pain and bleeding; It is a reversible process if it is treated in time by the dentist, although it depends intimately on the collaboration of the patient to maintain efficient oral hygiene. [11]

To maintain proper gingival health the first step is to make a provisional restoration with an adequate marginal adjustment together with an excellent polished forming a smooth surface free of irregularities favoring the elimination of plaque that is one of the etiological factors causing gingival inflammation, it is necessary to visualize that the remains of resin or cement of provisional sealing are eliminated in their entirety before cementing the definitive crown. [12]

Materials and methods

Types of research

The types of research to be used in this article are:

According to your Approach

Qualitative: Based on scientific articles from indexed journals of the last 5 years, which included case studies, review articles; the information was taken from several platforms such as: Google Scholar, Scielo, Medline, Pubmed, Dialnet, Elsevier in English and Spanish; keywords were used for information collection.

According to its Purpose

Applied: Because the present study is focused on contrasting the intimate relationship that exists between the preparations of the finishing lines and the gum of the teeth that have received a crown as a treatment.

According to your Scope

Descriptive: Put to the analysis of the documentation obtained and the description of it through a meticulous work that exposes the possible complications of the gum in front of an indhecuado carving of the finishing line in previous crowns.

Population

As it is a bibliographic review, information was collected from 69 scientific articles and high-impact research published in Scielo, Pubmed, Dialnet, Elsevier valid from 2018 to 2022, subsequently the inclusion and exclusion criteria were applied on that amount.

Sample

40 articles were selected once the inclusion and exclusion criteria were applied, among them; 14 review articles, 12 case reports, 10 systemic reviews, 4 descriptive studies.

Method to be used

For the preparation of this review article, documentary analysis was used, in order to obtain in-

depth information about the content according to the main theme, taking into account the following inclusion and exclusion criteria.

Inclusion criteria

Once the 69 articles were analyzed, it was determined that 40 of them are relevant in their title and content, fulfilling the inclusion criteria detailed below.

✓ High-impact scientific articles published since 2018.
✓ Scientific articles on studies and research on the preparation of termination lines in previous crowns.
✓ Scientific articles on the relationship of the gum and the carving of previous crowns.
✓ Scientific articles published in English and Spanish.

Exclusion criteria

Of the 69 articles analyzed, a total of 29 were excluded because of their poor relationship with the topic or because their information dates beyond the last 5 years and do not have sufficient scientific support, among other criteria described below.

✓ Scientific articles, or case reports published up to 2017.
✓ Scientific articles on the carving of previous pieces for dental veneers.
✓ Report of clinical cases of minor patients.
✓ Report of cases with incomplete clinical record.
✓ Articles in a language other than Spanish or English.

Results

40 articles were selected after applying the inclusion and exclusion criteria. The different articles analyzed on the relationship of the gum with the carving of the termination lines in previous crowns establish the presence of gingival inflammation and accumulation of plaque after cementation of crowns in previous teeth, this inflammation had been observed in the first 6 months after cementation.

According to the data obtained, the largest number of patients who presented gingival inflammation are related to poorly adapted previous crowns, [13, 14] in these cases there was accumulation of subgingival plaque and gingival inflammation, in the same way the results showed that crowns with adequate adaptation show less accumulation of plaque and provide an optimal environment for gingival health. [13, 14, 15, 16, 17]

The information analyzed supports that the level of the termination line (supragingival, subgingival, at the level of the gingival margin) has had a decisive influence on gingival health and its degree of inflammation [18, 19, 20], thus having that the crowns that were at the supragingival level presented plaque accumulation of 7% and gingival inflammation in 5% of cases, The preparations that have been made at the level of the gingival margin presented higher values with an accumulation of plaque of 14% and gingival inflammation in 10% of cases [21, 22], with respect to subgingival preparations in which the dimensions of the biological space have been respected, similar values were found, thus having an accumulation of plaque of 15% and inflammation in 16% of the cases that were analyzed, Finally, the preparations that were made at the subgingival level greater than 1mm and invaded the biological space presented the highest values of plaque accumulation and gingival inflammation with 65% and 85% respectively. [13, 14, 23]

In relation to the subgingival endings in the results obtained by the investigated authors, it is stated that the terminations that respected the established limit of the biological space between 0.5 to 1mm did not incur in a direct inflammation of the gingival tissue [17, 20, 24, which] is not the case of the crowns, whose termination line had been made on 1mm, In these cases, inflammation and accumulation of accentuated plaque were found, thus considering that taking the marginal preparation higher than these values causes the area to be more difficult to sanitize by the patient. 13, 15, [18, 20, 25, 26]

In the previous sector most of the results obtained determine a subgingival termination for aesthetic reasons, the most used material was porcelain, followed by zirconium in 40% and 30% respectively [24, 27, 28], also described cases in which a metal-porcelain crown was used in such cases it is described that a subgingival preparation helped to disguise the metal edge of the porcelain. [29, 30, 31, 32, 33]

In the different documents under analysis, it can be inferred that the hygiene factor is related to both inflammation and gingival recession, a characteristic that can be considered as a determining element to establish the following results: In 98% of patients who presented poor hygiene, inflammation and increased catheterization were determined, In the same way, they exhibited an accumulation of plaque above the average, so several authors consider that the dentist must conceptualize that the best form and location of the termination line is the one in which it is feasible to control the clinical procedures and in which the patient is provided with the necessary conditions to maintain correct hygiene. [31, 32, 33, 34]

Table 1. Degree of inflammation of the gum in relation to the level of preparations of the termination lines in previous crowns.

Termination line level	No inflammation	Mild inflammation	Moderate inflammation
-Supragingival	95%	5%	nonexistent
-Subgingival (0.5-1mm)	84%	14%	2%
-Subgingival (>1mm)	15%	60%	25%
-At the level of the gingival margin	90%	9%	1%

Author: Solá F, Bauxauli M, Roig A.
Fuente: Solá F, Bauxauli M, Roig A. Prospective study of monolithic zirconia zrowns: clinical behavior and survival rate at 5- year follow- up. Rev. Journal of

Prosthodontic Research. [Internet]. 2020 [citado marzo 2022]; 65(3). Disponible en: https://www.jstage.jst.go.jp/article/jpr/65/3/65_JPR_D_20_00034/_article/-_char/ja/

Table 2. Accumulation of plate in relation to the level of preparations of the termination lines in previous crowns.

Termination line level	No plate	Mild buildup	Moderate accumulation	Severe accumulation
-Supragingival	93%	5%	2%	nonexistent
-Subgingival (0.5-1mm)	85%	10%	4%	1%
-Subgingival (>1mm)	10%	25%	40%	25%
-At the level of the gingival margin	86%	11%	2%	1%

Author: Mebin G, Ashu J, Corishettar B.
Fuente: Mebin G, Ashu J, Korishettar B. Evaluation of adhesion of Streptococcus mutans, plaque accumulation on zirconia and stainless steel crowns, and surrounding gingival inflammation in primary molars: randomized controlled trial. Rev. Clinical Oral Investigations. [Internet]. 2020 [citado marzo 2022]; 10(7). Disponible en: https://pubmed.ncbi.nlm.nih.gov/31955271/#:~:text=Conclusion%3A%20Adhesion%20of%20S.,compared%20with%20stainless%20steel%20crowns.

The bibliographic material consulted maintains that the line of termination par excellence in previous pieces is in shoulder because it gives us an unsurpassed aesthetic, although its preparation is usually invasive, another option is a chamfer finish that is less invasive and also recommended for previous teeth, however, aesthetics is its weak point [35, 36]. The most commonly used line of termination in these studies was shoulder with 60%, followed by chamfer 16%, beveled shoulder 15% and biologically adapted termination (BOPT) 9% respectively. There was no significant difference between the direct relationship of a specific form of termination line and gingival health. [26, 37, 38]

Based on the information obtained, it has been demonstrated that overcontoured preparations favor the accumulation of plate regardless of the material with which the crown is made, and the design of the termination lines; In all cases that an overcontoured preparation was presented, gingival inflammation, accumulation of plaque and even increased probing depth were identified. For this reason, the authors recommend that the termination line adapt to the shape of the gum· 17, 20, [21, 27, 39, 40]

The analysis of information indicates that it is very important to use an adequate technique of gingival retraction at the time of carving the finishing lines so as not to incur damage to gingival health in the same way before definitively cementing a crown it should be observed that at the time of removing the provisional ones there is no bleeding or inflammation, as well as making sure in the absence of decayed tissue. [13, 16, 25, 33, 34]

Similarly, it is described that the main area in which a greater accumulation of plate was observed and the depth of the sounding increased was the interproximal zone. Several authors recommend having sufficient amplitude in our interproximal preparations to protect the gingival crest and favor autoclysis, but also narrowness to prevent mobility of teeth and food impaction; facilitating the cleaning of the area through the use of dental floss. [16, 17, 28, 30, 39]

According to several of the authors investigated, the cervical surface of the terminations requires meticulous polishing, because a direct relationship was observed between irregularities and inadequate cementation of the prosthetic crowns, increasing the instability of the crown, allowing the entry of food debris and subsequent accumulation of bacterial plaque and gingival inflammation [9,15,33] Ideally, the carving of the tooth coincides in its entirety with the dental crown made in the laboratory. [16, 17, 20, 25, 32]

Discussion

Mebin, et al[16], mentions that the oral cavity provides a unique environment for microorganisms to form bacterial plaque, the oral mucosa and smooth surfaces have a lower plaque accumulation rate compared to areas where there has been a restorative intervention as in the case of prosthetic crowns, even more so if there have been irregularities in the carving of the marginal endings which promotes bacterial adhesion and accumulation of biofilm, producing gingival inflammation. Trombelli, et al[31], defines gingivitis induced by bacterial plaque as an inflammation of the gingiva of a specific tooth initiated by an excessive accumulation of bacterial plaque, such inflammation is characterized by redness, edema, gingival recession.

According to León, et al[30], there are marginal preparations: horizontal (straight shoulder, beveled shoulder, chamfer), vertical (knife edge) and preparation without termination line or biologically oriented (BOPT). Regarding the location of the termination line in relation to the gingival margin, he mentions that there may be preparations: subgingival, at the level of the gingival margin, supragingivales. The location of the termination line is proportionally involved in the gingival behavior around the teeth that support the prosthetic crowns. Inflammation, plaque accumulation and gingival recession are mostly related to subgingival termination lines, Paniz, et al [36], corroborates this information in his study, to which he adds that the subgingival margins manage to provide adequate gingival and periodontal health if the biological space is respected and is not invaded at the time of carving the subgingival termination lines.

According to Mandilo, et al[18], points out that an effective marginal adaptation is required to minimize the entry of microorganisms causing gingival inflammation, long-term gingival health is directly associated with an excellent marginal adaptation

quality and absence of cement residues in the gingival fold. Generally, the placement of the margin of the preparation at the subgingival level is the one that has the greatest incurrence of gingival inflammation and accumulation of plaque, although it is the one of choice for the retention of crowns of total coverage in the anterior sector.

Serra, et al[29], reports that maintaining an ideal gingival stability in the future is one of the great challenges when restoring teeth with fixed prostheses in the anterior region, one of the most frequent drawbacks is gingival recession associated mostly with iatrogenies at the time of preparation of marginal endings and an improper prosthetic adjustment, that in previous sectors significantly compromises aesthetics and functional difficulty; In the same way, it is essential to take care of gingival health from the placement of the provisional crowns, taking special care to maintain gingival integrity and not injure the gum.

Tharwath, et al[11], highlight that the gingival and periodontal health of patients is largely determined by their hygiene habits giving as substantial results an increase in inflammation, plaque accumulation and gingival recession in patients whose oral hygiene habits are deficient which is an aspect to consider before performing a gingival termination that hinders the cleaning and removal of plaque in patients neglected with their oral hygiene. Lhaiwel, et al[2], demonstrate in their study that metal-ceramic and fully ceramic crowns had a higher success rate in patients whose oral hygiene was adequate.

According to Riccietielo, et[al 22], evidence that the longevity of crowns and gingival health is linked to the quality of carving in the finishing lines, if the finishing line is irregularly shaped negatively affects the mechanical stability of a crown, the carving must be uniform and with meticulous polishing, favoring the seat of the crown without compromising the gingival health or the retention of the restoration, however there must be enough space for the placement of the material with which the crowns will be cemented, in the same way the respective precautions should be established to avoid affecting and injuring the gum at the time of carving.

Almotairy, et al[4], determines that complete dental crowns are considered one of the main contributing factors to periodontal disease, recommending to evaluate the periodontal health of each tooth before treatment with complete crowns, mentions that periodontal health is the basis of success for this type of restorations in the same way recommends using materials that do not need exaggerated wear in the marginal area of the teeth thus minimizing the risk of gingival inflammation and possible periodontal disease.

Conclusions

Subgingival termination lines are the most likely to cause gingival inflammation, accumulation of bacterial plaque and gum recession; affecting aesthetics in the anterior sector, so it is recommended not to invade the biological space in subgingival preparations, reaching a maximum of 1mm from the gingival margin, substantially minimizing the risk and affection of the gum.

It is essential to take care of gingival health from the beginning of marginal carving, avoiding at all costs injuring the remaining gum and eliminating all traces of irregularities in the carving of the finishing lines, because it has been shown that they favor the accumulation of plaque due to the poor adaptation of prosthetic crowns increasing the risk of gingival inflammation and consequently failure in restoration.

Less invasive terminations should be considered in the anterior sector a recommended option is the BOPT termination which is ideal for the anterior sector considerably reducing the risk of gingival inflammation; It is essential to keep an effective control of the patient's hygiene showing him how he should take care of his oral health to avoid possible failures in the treatment.

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