

AN UPDATE REGARDING THE NON-SURGICAL VERSUS SURGICAL TREATMENT PROTOCOLS IN PERIODONTOLOGY. A NARRATIVE REVIEW.

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ABSTRACT

Non-surgical options preceding the more complicated surgical ones, are less costly and provide less patient exposure to underlying risks. There are several factors determining whether a non-surgical approach is adequate, or a surgical treatment must be executed. Consequently, the primary indication is the request of the patient. For an acceptable clinical outcome to be fulfilled, all of the above principles shall be thoroughly considered, succeeded by a meticulous postoperative management. Surgical management of gingival recessions aims to fulfill complete covering of the denuded root with keratinized gingiva width of 2 mm or more. Surgical wounds surrounding teeth are considered crucial. A basic principle and a surgical step of gingival recession management is this of root preparation. All of the above principles shall be thoroughly considered, succeeded by a meticulous postoperative management.

Keywords: *periodontal health, non-surgical treatment, root preparation, periodontal surgery.*

1. INTRODUCTION

According to Chambrone and Tatakis, "untreated recession defects in individuals with good oral hygiene have a high probability of progressing during long-term follow-up" [1]. In their systematic review it was found that, from a total of 1647 untreated gingival recessions, around 78% presented increased recession depth at follow-up, while only 7.2% presented decreased depth, with the rest presenting no alteration.

Besides, the initial number of gingival recessions was risen by approximately 79% and it was observed a strong likelihood of increase not only in the number of recession-affected patients, but also in the number of recession sites [1]. For this reason, when esthetic results are desired, treatment should not be delayed. Early treatment, apart from enhancing prognosis, it may decrease the amount of operating sites and processes required [2].

2. NON-SURGICAL TREATMENT

Non-surgical options preceding the more complicated surgical ones, are less costly and provide less patient exposure to underlying risks. [3-5]

The treatment of gingival recessions should always start by dealing with the etiologic factor. For a treatment to be successful, the etiologic agent should be recognized and treated or totally eliminated.

That is to say, in the case of a recession defect provoked by forceful toothbrushing, the patient should be instructed to utilize a soft toothbrush. Explaining and justifying the use of the soft toothbrush might motivate the patient and is advisable.

Concerning the different anatomical particularities of every individual, it has been suggested adapting the design of the toothbrush to each patient, along with teaching the patient on how to select the most suitable one.[6]

Moreover, an early diagnosed red cleft, caused by incorrect flossing, will be restored after interrupting flossing and performing chlorhexidine mouthwashes instead, for two weeks.

Correspondingly, in some seldom occasions of young patients affected by gingival recession due to occlusal trauma, the lesion might be totally cured after simultaneous improvement of the occlusion and the toothbrushing technique. Correct toothbrushing technique entails an atraumatic rotation directed apico-coronally. In the same time, the denuded

root surface should be kept free of plaque and carious lesions.

This treatment is fundamental, despite the fact that total healing is not ascertained. Likewise, a patient with recessed gingiva of viral cause, oughts to interrupt toothbrushing and flossing and rinse the oral cavity with chlorhexidine 0.12% three times per day, for a period of two weeks. Thereupon, the patient should restart toothbrushing with an ultrasoft-bristled brush and continue rinsing two times per day, for two more weeks.

This therapy is completed with another four weeks of brushing with a soft-bristled toothbrush and chlorhexidine mouthrinsing one time per day [2].

Non-surgical treatment in the case of bacterial plaque-induced defects has the purpose to remove microbes in plaque and calculus from the tooth and neighbouring soft tissue and includes scaling and root planing with hand and ultrasonic instruments.[7]

In this way, recolonization of pathogens is more efficiently combated through oral home care by the patient.

Those procedures enhance also recession reduction together with attachment gain, which is maximum at areas with primarily profound pockets.[8]

Then, instructions on correct oral hygiene methods must be given, including correct toothbrushing and cleaning of the interdental spaces with special instruments. A brief flowchart of periodontal treatment protocol is illustrated in Figure 1.

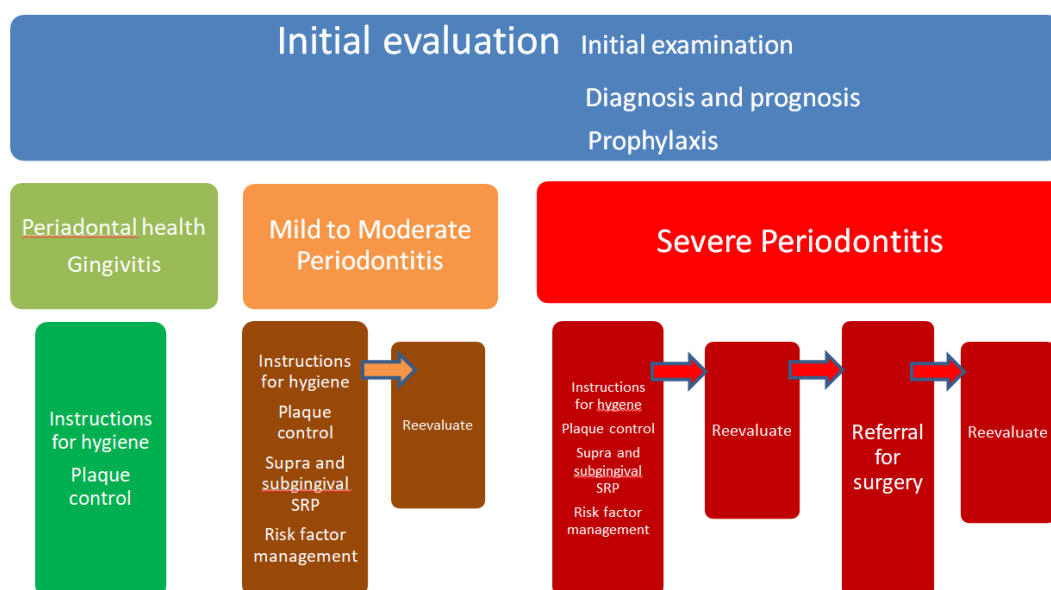


Fig. 1. Schematic brief protocol of periodontal disease according to disease severity

The ability of the patient to apply oral hygiene methods properly, has to be constantly evaluated during follow-up sessions. In the light of the fact that dental hypersensitivity might arise because of either an underlying periodontal condition or the periodontal treatment per se, the patient should be also instructed to use a sensitivity dentifrice in advance of treatment [3].

Once the etiologic factors have been addressed, the symptoms of hypersensitivity are to be ceased or at least diminished. [9-11]

Certainly, more invasive treatment options are implemented only after exhaustion of the less invasive treatments. With this intention, special toothpastes and dentin desensitizers can be utilized.

Desensitizers, such as fluoride varnish, are applied in the dental clinic and only when toothpastes are not adequate anymore. If the symptoms still do not subside, bonding materials are exploited. They are used to etch the surface of the tooth and are

believed to offer optimum diminution in hypersensitivity.[7]

Additionally, more invasive methods of treatment consist in cervical restorative treatment and even endodontic treatment, at long last. Regarding the restorative treatment, it reduces dental hypersensitivity by blocking the dentinal tubules with the use of a restorative material. This is usually glass ionomer, which adheres to both enamel and dentin, releasing fluoride at the same time.[6]

Currently, there is another non-surgical technique for treating gingival recessions that intends, not to decrease hypersensitivity this time, but to substitute missing tissues and reinstate the mucogingival outline, so that esthetics are ameliorated. This is the gingival veneer, a removable partial prosthetic device for the cases of generalised and severe recession caused by periodontal disease.

It is an easy and conservative treatment solution, that shrouds the alveoli, free marginal and attached gingiva, often

expanding to the facial surface of the upper teeth on both quadrants, from central incisor to canine or first premolar. Apart from removable, the gingival veneer can also be fixed and considering the material, it can be flexible, made of silicone, or rigid, made of pink acrylic or composite. Gingival veneer is the treatment of choice when significant amount of tissue is to be replaced and might be a provisional treatment option prior to a more complicated treatment, as well. Similarly, aiming to minimize the interdental gaps, modify the shape of the crown, or rehabilitate the cervix of the tooth, pink or tooth-coloured composite resins can be implemented for cervical restorations.

By the same token, non-surgical treatment incorporates also labial or interproximal partial porcelain veneers and full crowns.[8] As has been stated previously, surgical root coverage is not achievable for gingival recession cases that have been the result of traumatic tooth reduction. (Fig. 2) These cases require new and suitable dentures with their buccal margin located more apically than that of the old dentures, for the purpose of covering the exposed root [2].



Fig. 2. Gingival veneer (after Venugopal et al. 2020).[18]

Finally, root surface irradiation via laser is told to reinforce tissue attachment, having bactericidal and detoxicating properties,

dodging the formation of smear layer. Auspicious results of both soft and hard tissue treatment are obtained by Nd:YAG. However, lasers used incorrectly might damage the periodontal tissue more and remove healthy gingiva and root surface, which when severely impaired, makes the tissue incapable of undergoing healing and reattachment.[8]

3. WHEN DOES SURGERY BECOMES A NECESSITY?

There are several factors determining whether a non-surgical approach is adequate, or a surgical treatment must be executed.[12]

In the first place, what needs to be taken into account is the concern of the patient, mostly regarding root hypersensitivity and esthetics.[13]

In the presence of such concerns, surgical treatment is carried out, always following predisposing factors modification and inflammation subsidence. Interestingly, a study confirmed that less than one third of the diagnosed recession defects had been already noticed by the patient, with some of these accompanied by poor esthetic aspect or hypersensitivity. This deviation can be justified by the lack of symptomatology in most of gingival recession cases and should be taken into consideration whilst proposing a surgical treatment option. The second factor to be contemplated is the activity or progression of the lesion, which can be estimated by the patient or can be defined by the difference in its dimension between the present state and preceding data.

Provenly, recession sites have greater chances for further recession and thereby an advancing lesion might entail surgery not only to enhance attachment, but also to

cease progression. Thereafter, the need of the patient for orthodontic or restorative treatment has to be regarded, along with the presence of predisposing anatomical elements, such as thin gingival biotype. [13]

Patients with the need for additional dental treatment should be checked for gingival recession signs and might be imposed to surgery, particularly when predisposing anatomical elements exist.

In contrast, when none of the above factors is present, surgical treatment is not necessary and recession monitoring, under periodic periodontal care and predisposing factors amendment, is sufficient.[13-15]

4. INDICATIONS OF PERIODONTAL SURGICAL TREATMENT

Consequently, the primary indication for surgical treatment is the request of the patient. The elongated crown of a tooth under recession might be visible during smiling or speaking and the shortening of the crown for esthetic reasons can be realized solely by root coverage.[16]

Likewise, thermal hypersensitivity of the affected teeth generates distress and pain, making correct oral hygiene almost impracticable.

In cases of hypersensitivity coupled with an esthetics-related patient request, gingival recessions should be managed with surgical or restorative-surgical combined procedures. Another indication is this of narrow and deep recessions or the lack of keratinized gingiva, also rendering local application of oral hygiene difficult for the patient. The same difficulty in maintaining oral hygiene might be evident, as a result of root demineralization or caries and

profound abrasion, which may provoke hypersensitivity, as well.

Root carious and non-carious lesions correlated with gingival recession are indicated for surgical or restorative-surgical combined treatment, in accordance with the predictability of coverage. Further, recession morphology may induce gingival margin incompatibility, hindering efficient toothbrushing and hence requiring surgery. Such defects are those expanding over the mucogingival junction, or the solitary and profound defects or the narrow defects with triangular tips, that is to say Stillman clefts. In short, the indications for surgical treatment of gingival recessions comprehend esthetic demands, dentin hypersensitivity, reduced or absent keratinized tissue, root caries or abrasion and irregular gingival margin.[17]

5. OBJECTIVES OF THE PERIODONTAL SURGICAL TREATMENT

Surgical management of gingival recessions aims to fulfill complete covering of the denuded root with keratinized gingiva width of 2 mm or more, alongside an esthetic appearance and a natural gingival form [18]

Complete covering of the root refers to coronal gingival margin position in relation to the cemento-enamel junction, with neither inflammation nor probing depth existence. Correspondingly, attaining a natural gingival form is equally important, since unsatisfactory esthetics may be the result of irregular gingival margin profile, scarring or inferior color blending. [19]

Therefore, periodontal surgery intends, besides, to accomplish optimal matching of color as well as texture among the treatment site tissue and the neighbouring soft tissue.

As can be seen, the principal purpose of surgically treating gingival recessions is an overall esthetic result and is not limited merely to root coverage.[20]

In the same fashion, stated, that mucogingival surgery has two main objectives, based upon which a suitable technique is selected.[21] The first one is augmentation of the soft tissue located coronally to the recessed gingival margin, namely root coverage and the second one is augmentation of the soft tissue located apically to the recessed gingival margin, namely qualification of the already present soft tissue.

Root coverage intends to battle the recession per se, though without being always obtainable or able to provide anticipated results, due to various limitations. On the other hand, the second objective focuses, not on mitigating the actual lesion, but on widening and thickening the attached gingiva, so as to impede lesion progression.[22]

6. GENERAL PRINCIPLES

Surgical wounds surrounding teeth are considered crucial, given that complete and free of contamination healing is not always possible, because of the associated avascular hard tissue structure and the tooth interrupting the epithelial continuity.

Commonly, treatment outcomes are not consistent, highlighting the high sensitivity of the approach. In general, optimum tissue healing and periodontal regeneration lies upon three main factors, that is space maintenance, primary intention healing and wound stability. More precisely, space maintenance is obtained via tissue barriers or subepithelial connective tissue grafts, whilst primary intention healing is obtained

only as long as the flap and the related tissue sustain maximum blood supply.

Respectively, wound stability is determined by early configuration and arrangement of blood clot with no contamination and the adaptation of the clot to provide resistance to mechanical stress.[23] At the initial healing stages, wound stability along with passive closure depend on suturing and healing in an immersed medium. Certainly, optimum healing must be achieved when handling oral wounds and with this intention fundamental surgical principles need to be respected, as for instance proper case selection, adequate pretreatment, gentle tissue manipulation in order to preserve the flap blood supply and sufficient postoperative care.[24]

During case selection, the prognostic factors have to be evaluated and specific patients with unpredictable tissue healing, such as smokers, should be excluded from elective periodontal surgeries. Concerning pretreatment, the conformity of the patient over oral hygiene is indispensable for successful healing.

The reason is that, sound and fibrous soft tissues permit accurate incision and suture placement, decreasing at the same time the likelihood of a wound infection.[24] Usually, patients seeking mucogingival surgery are already motivated as regards oral care, being though overjealous so that brushing and flossing are improperly performed. Thereby, pretreatment includes patient education, with a view to adopt an atraumatic apico-coronal rolling brushing technique using a soft toothbrush and a correct flossing technique using spongy floss. In like manner, the operation site has to be plaque free, without bleeding on gentle probing. Supragingival and subgingival bacterial plaque and calculus

are eliminated by scaling, followed by polishing of the teeth with prophylactic paste and rubbers.

For surgery to be initiated, there must be no soft tissue inflammation around the recession area and the bleeding and plaque indices of the whole oral cavity is necessary to be lower than 20% [2].

Further, multiple aspects are to be reflected at the time of surgical treatment. First of all, the flap thickness plays an important role, since only a flap thicker than 0.8 mm ensures complete root coverage.[25] On the contrary, an excessively thin flap might interfere with the desired flap vascularity. The most frequently applied methods for flap preparation are the split-thickness and the full-thickness flaps. The former offers better results regarding flap mobilization, whereas the latter is less technically complex and both of them stimulate bone remodelling.[24]

Additionally, gingival margin position after treatment should be addressed, as the most coronal the position of the gingiva postoperatively, the highest the probability of complete root coverage. A margin positioned considerably coronal to the cemento-enamel junction will balance the apical gingival migration, taking place throughout the course of healing.[18]

Moreover, minimum tension of the flap is crucial. In fact, it was established in a study that 0.4 g mean tension was correlated with a complete recession coverage in 45% of the total number of patients, while 6.5 g mean tension was correlated with a complete recession coverage in 18%. [18]

The first group resulted from periosteal releasing and the second from flaps that were not released. That is why periosteal releasing is performed as a means of flap tension diminishing, which can also be

accomplished by split-thickness method utilization. Markedly, sutures of small diameter could represent a good tension indicator. (Fig. 3) [24]



Fig. 2. Passive flap placement over the exposure (after Fickl, 2018).[22]

Equally important is the surgical trauma. Atraumatic microsurgical treatment options are associated with superior coverage outcomes than macrosurgical options, which injure soft tissues, not allowing a proper healing process. [24]

To clarify, periodontal microsurgery is a minimally invasive procedure comprising atraumatic preparation of the flap with minimal incisions and reduced flap reflection, requiring explicit presurgical measurements. It is a refinement of conventional surgical approaches, under the use of microsurgical instruments, appropriate suture material and magnifying appliances, as for example microscopes and magnification loupes. Microsurgery expedites both soft tissue closing rate and wound healing and affects in a positive way the revascularization of subepithelial connective tissue grafts. As a matter of fact, periodontal surgery causes disruption of the blood supply, reducing the perfusion of the flap postoperatively.

While with macrosurgical approaches, normal perfusion is regained by the fifteenth day, with atraumatic microsurgical methods, flap revascularization is accelerated to such an extent that perfusion returns to preoperational levels by the

fourth day.[24] Besides, contemporaneous microsurgery not only offers exceptional esthetics with superior marginal profile and scarring results, but also ameliorates the thickness and width of the keratinized gingival tissue. Remarkably, postsurgical pain following this technique is minor compared to traditional techniques. [25]

Another principal factor is the design of the flap, which is mainly predicated upon the vascularization of the mucosa. Surgical flaps are composed of a well defined vascular system and for this reason, retaining the blood supply is essential. It is recommended that marginal and paramarginal incisions are not carried out and that releasing incisions are positioned short and medially, so that the design is as confined as possible. [24]

Particularly, it has been proved that the realization of two vertical releasing incisions does not influence the clinical and the esthetic results of several adjacent recessions treatment through coronally advanced flap and connective tissue graft. In reality, vertical incisions could annihilate the tension and enhance the mobilization of the flap up to approximately 124% of its initial length.

Nonetheless, vertical incisions do not permit adequate revascularization. Hence, in order not to impede the blood circulation, it would be advisable to replace the flaps formed after vertical releasing incisions, with the envelope flap, for instance. The envelope flap, being also less invasive compared to the trapezoidal flap, may yield superior results. Still, a recent study recorded no discrepancies in mean and complete root coverage among envelope and vertical releasing coronally advanced flap, regardless of the presence of connective tissue graft.[26]

Furthermore, the same study evaluated the effect of connective tissue grafting and it was concluded that mean and complete coverage of several adjacent recessions are more predictable when a connective tissue graft is added in the coronally advanced flap process.[26] Indeed, a connective tissue graft accompanying a flap shows the highest stability of the gingival margin and the highest increase in keratinized tissue width at an initial postoperative[27] Therefore, connective tissue grafting is recommended for gingival recessions with thin biotype.[24]

In addition, increasing the thickness of keratinized tissue through gingival augmentation, might diminish the probability for long term relapses [1]. Similarly, gingival augmentation has a positive impact, especially in the case where there is interface between a subgingival restoration and the gingival margin.[25]

Lastly, sutures are substantial during periodontal surgery. More specifically, it is paramount that holding sutures are not placed in the inflammation region. Referring to suture material, it is suggested the use of polypropylene-like monofilament sutures, sized #6-0 or #7-0, that trigger negligible inflammation and accurately reposition fine flaps with no stress. Apart from that, reverse cutting and sharp microsurgical needles shall be utilized, to decrease soft tissue injury.

With regards to the type of suturing, holding sutures like horizontal or vertical mattress, positioned at distance from the incision, are preferred, followed by interrupted sutures, positioned near the incision. Interrupted sutures ensure primary closure, whereas the use of sling or holding sutures stabilizes the wound and annihilates

the pressure over the margins of the wound, distributing it more evenly across the flap, so that there is no tension.

To demonstrate, crossed sling sutures with oral anchorage are implemented to stabilize a subepithelial connective tissue graft together with the flap on the exposed root. Likewise, external horizontal mattress sutures secure the flap and stabilize the surgical wound against forces produced during speech or mastication. [25]

7. ROOT PREPARATION

A basic principle and a surgical step of gingival recession management is this of root preparation, which can be both mechanical and chemical. The former intends to eliminate caries, smoothen the surface and lessen the convexity and cementum toxins. It may also enable a tight fitting of the graft on the smoothened surface, preventing flap shrinking and graft denuding. [25]

Respecting chemical root conditioning, numerous chemical means can be employed, such as phosphoric acid, citric acid, tetracycline hydrochloric acid and ethylenediaminetetraacetic acid. Their goal is detoxification, demineralization and decontamination of the radicular surface.[17] Further, those acids eliminate the smear layer formed by the mechanical instrumentation, that might amend the growth of gingival fibroblasts.

They also expedite the adherence of coagulated blood and the synthesis of connective tissue, through disclosure of the dentinal collagen matrix. In particular, applying citric acid over the denuded root before positioning the gingival graft, hastens graft maturation and healing. Notwithstanding, the effect of the mechanical and the chemical preparation on

predictability of root coverage is controversial.[25]

When root instrumentation is to be performed, the whole region related to the clinical attachment level is operated. Notably, both the exposed radicular surface corresponding to the recession depth and the probe-able surface corresponding to the buccal probing depth have to be prepared. If root planing is executed prior to surgery with no flap reflection, there is the risk of insufficient smoothing, in an effort to protect keratinized marginal gingiva from injury.

By contrast, if root planing is executed once the flap has been reflected, there is the risk of hurting sound cementum, due to incompetence of discriminating anatomical dehiscence, which is not probe-able before surgery, from pathological dehiscence, which is probe-able before surgery. Thus, it is indispensable to assess the buccal probing depth alongside the recession depth in advance of flap reflection and afterwards replicate them when the flap has been reflected [2]. In this way, mechanical instrumentation can be carried out after the reflection of the flap, as recommended.[20]

8. CONCLUSIONS

For an acceptable clinical outcome to be fulfilled, all of the above principles shall be thoroughly considered, succeeded by a meticulous postoperative management. Actually, a surgical process implies higher risks in comparison with a non-surgical approach. Consequently, the chosen treatment option should also consider the potential surgical risks and postsurgical patient discomfort as well as the possibility of a retreatment in case of an unsuccessful result.

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