

TREATMENT OF MULTIPLE ADJACENT GINGIVAL RECESSIONS THROUGH THE MODIFIED TUNNEL TECHNIQUE USING CONNECTIVE TISSUE GRAFT

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ABSTRACT

Aim of the study One of the most commonly used esthetic periodontal procedures is the coverage of denuded roots. Correction of gingival recession is an important issue in the field of periodontal plastic surgery. The purpose of this study is to evaluate the efficacy and clinical results of the use of connective tissue grafts harvested from the palate in the treatment of Miller Class I and II localized gingival recession through modified tunnel technique. **Material and methods** The study population consisted of 17 patients with multiple adjacent gingival recession that required gingival augmentation. It was recommended the modified tunnel technique that uses tissue graft harvested from the palate. The etiologic factor of the lesions was aggressive tooth brushing. **Results** The healing process was uneventful and much more quickly due to lack of incisions. The average coverage of the recessions was 2.3 ± 0.5 mm. The color of tissues was nearly homogeneous at 2 weeks. **Conclusions** Due to its minimally invasive approach, this technique speeds up the healing process and generate more aesthetic results, it is more easily accepted by patients, ensuring their satisfaction.

Keywords: gingival recession, modified tunnel technique, root coverage

INTRODUCTION

Gingival recession is characterized by loss of periodontal tissue fibers located at the level of cementum and alveolar bone, which leads to root sensitivity, increased risk of root surface caries, impaired aesthetics [1]. The causes of gingival recession are periodontal disease, poor oral hygiene, traction caused by frenums, bone dehiscence, poor restorations, tooth malpositions, viral infection of the gums and subgingival plaque formation [2].

Tissue traumas caused by vigorous

brushing are considered to be a predominant causal factor for the development of the recession, especially in young people. Traumatic toothbrushing and teeth into malposition are the factors most commonly associated with marginal tissue recession.

The disharmony of the gingival margin may be apparent in the patient's smile or even during function (speaking, chewing).

The irregular outline of the gingival margin, even in the absence of tooth hypersensitivity, may make plaque control

more difficult for the patient to perform, especially when the recession is triangular in shape (the so called „Stillman cleft”).

Correction of gingival recession is an important issue in the field of periodontal plastic surgery. Patient's aesthetic concerns are usually the reason why such procedures are performed being a convenient method to improve the facial contour of the alveolar process.

Gingival recession presents significant therapeutic challenges for dentists, such as restoring the protective anatomy of mucous- gingival complex, the restoration of aesthetics, regeneration of cementum, periodontal ligament and of support alveolar bone, treatment of root sensitivity, root surface caries prevention, prevention of periodontal disease progression in areas where proper hygiene can not be maintained [3].

Optimal treatment for progressive gingival recession accompanied by hypersensitivity to heat and compromising aesthetics is the surgical periodontal coverage for defects of Miller's class I and II [4].

When gingiva adjacent to the recession area is not suitable as a donor tissue, soft tissue grafting from another intraoral source may be taken into account.

The use of autogenous connective tissue grafts for root coverage was first mentioned by Langer and Calagna in 1982 [5]. The main challenge of grafting is to obtain an excellent blood supply to the tissues that will cover the root to avoid the possible necrosis and failure of the procedure.

The palatal area is often used for tissue harvesting, ensuring sufficient donor tissue for isolated or multiple areas of recession [6], the color of the tissue graft matches that of the surrounding tissue [7], and palatal postoperative sequelae are minimal [8].

The main donor site for a connective tissue graft is the palate or maxillary tuberosity.

The palatal mucosa thickness varies from individual to individual, and even in the same individual. The mainly used area is between the canine and maxillary first molar because at this level the palatal mucosa is considered to be the thickest. Studer et al. [9] have demonstrated that the palatal root of the first molar and the canine represent the natural anatomical anterior and posterior barriers for graft harvesting because the connective tissue is thinner after these areas. Palatal neurovascular bundle (greater palatine artery and nerve) can be found at a distance of 7, 12, or 17 mm from the cemento-enamel junction of the teeth depending on the hard palate depth (superficial, medium or deep) [10], that distance being absolutely necessary to prevent any intraoperative complications caused by its injury. The palatine artery damage may occur especially in the case of a shallow palate. Mucosal thickness increases from the gingival margin to the palatal suture [11].

It is necessary to evaluate the maximum size of the graft tissue which may be harvested from the palate in terms of height and length in relation to the greater palatine artery [12]. There are various methods to measure the thickness of palatal tissue, such as directly probing to the bone using a periodontal probe, with an endodontic reamer or an injection needle after local anesthesia, but can also be used computed tomography or ultrasound devices [13]. Studer et al.[9] measured directly the palatal tissue thickness in the region of canine-first molar with a periodontal probe and obtained average values ranging from 1.8 and 3.9 mm. Müller et al.[11] used ultrasonography to measure the thickness of masticatory mucosa and found average values ranging from 1.74 and 3.23 mm.

A single incision technique to harvest the graft from the hard palate has been introduced to reduce palatal lesion size and allow

primary closure of the donor site, which may result in reduced postoperative pain [14]. The connective tissue that may be harvested once from the palate is limited, it can be used for root coverage in a small number of teeth. The obtained graft shrink and reduce in size if it is too thin, but there are also problems in revascularization and healing if it is too thick. The success of this technique depends on the thickness of the obtained tissue graft. The thickness should be between 0.5 and 1 mm in order to obtain a better aesthetic result. As a result, the thickness and volume of the tissue to be grafted from the donor site are important factors in determining the appropriate treatment method and estimate prognosis [12].

In root coverage procedures, avascular root surface represents a challenge for wound healing. Obtaining an adequate blood supply from the adjacent tissues to the connective tissue graft seems to be the most important factor for the survival of grafted tissue and applied over the avascular root surface [15].

The tunnel technique can be used to correct multiple gingival recession by means of a surgical intervention in a single step and is indicated for Miller's class I and II recessions.

In choosing this technique are taken into account the thickness of the palatal mucosa and the hard palate height. Its main advantages are : preserving of the integrity of papillae and lack of releasing incisions that interrupt vascularization of connective tissue and periosteum, minimal surgical trauma, eliminates vertical incisions, grafting tissue does not move, is less visible, a minimum post-operative pain, faster healing period, the aesthetic result is achieved in a shorter time and with less scarring.

According to the protocol described by Allen [16], the „tunnel” technique includes preparation of a supraperiosteal mucosal flap with intrasulcular incisions. This allows the

mobilization of the cervical gingiva and therefore, the creation of a "pouch" . By undermining the interdental papillae, a mucogingival tunnel can be elaborated between all adjacent pouches. Subepithelial connective tissue graft is then inserted into the tunnel, partially exposed over recessions and sutured in this position.

On the other hand, the disadvantages are difficulties in preparing the receptor site with an extreme care to not perforate the flap or disrupt papillae as well as the delicate placement of the graft.

The modified tunnel technique [17] is free of incisions, is a minimally invasive method for augmenting the gingiva, the blood supply can be preserved to the maximum and the coverage the graft is optimized, as compared with the former techniques. It requires a muco-periosteal dissection beyond the mucogingival junction and also in each papilla.

Another change is the microsurgical approach that uses small blades and sutures [18], small instruments that have been developed specifically to facilitate the preparation of supra-periosteal tunnel and minimize the risk of iatrogenic perforation and surgical trauma.

The **purpose** of this study is to evaluate the efficacy and clinical results of the use of connective tissue grafts harvested from the palate in the treatment of Miller Class I and II localized gingival recession through modified tunnel technique.

MATERIAL AND METHODS

The study population consisted of 17 male patients and female aged 25-47 years with aesthetic problems, due to exposure root cementum as a result of gingival recession, which have presented at the Private Dental Office „dr. Anca Rusu” Bucharest.

Patient inclusion criteria were: the presence of the face buccal of Miller's class I and II recessions, cemento-enamel junction

was visible, dental hypersensitivity, absence of root surface caries or severe cervical abrasion, no abnormal frenum insertion, good oral hygiene.

Exclusion criteria were: patients who smoke, patients following radiation therapy, chemotherapy, insulin-dependent patients. From anamnesis was noted that lesions etiologic factor was incorrectly horizontal and aggressive tooth brushing, gingival recession was thus traumatic in nature and not microbial.

The main reasons for presentation of patients to the dentist were hypersensitivity and aesthetics, as a result of the etiological factors and their sequelae. The appearance of affected teeth was longer than normal, root cementum was exposed and visible, tooth color has changed (due to the difference in color between the enamel and cementum).

The 17 patients participating in the study had 51 denuded root surfaces. The recession depth was measured preoperatively using a graduated periodontal probe from the cemento-enamel junction to the existing gingival margin. The recession width was



Figure 1. Initial appearance of patient, Miller's class I and II recessions in teeth 13, 14, 15 requiring gingival augmentation

The surgical procedure started with local anesthesia (buccal and palatal) and the realization of sulcular incisions around the affected teeth. With an elevator the gingiva was separated from alveolus through muco-

determined by measuring the mesio-distal dimension of exposed root surface at the cemento-enamel junction. The width of each defect was classified as narrow (2 mm), moderate (3 mm) or large (4 mm).

Localized gingival recession on the buccal surface determined the cementum exposure to the oral environment and the occurrence of hypersensitivity. The optimal treatment was considered the periodontal surgery through the modified tunnel technique using tissue graft harvested from the palate.

The surgical procedures were performed by the same physician. An example of the modified tunneling technique performed in the group of patients is presented below.

Initially, intra- and extraoral antisepsis was carried out using 0.12% chlorhexidine digluconate. It is carry out a gentle mechanical root planing, completed with a chemical treatment based on hypochlorite, applied for 2 to 3 minutes, even before the application of the graft. Thus, the surface of the root is cleaned of its toxins and becomes compatible from biological point of view for reattachment.



Figure 2. Detaching the marginal gingiva and the creation of pockets for inserting the graft

gingival junction and were created "pouches" beyond muco-gingival junction, keeping the tip of the interdental papillae attached to the teeth below the contact point (fig. 2), until a continuous tunnel has been formed (from the

canine to the first molar) for subsequent insertion of the tissue graft. With the help of a periodontal probe was checked the completion and posting of tunneled flap.

The selected area in the hard palate for the harvesting of connective tissue graft extended from the right first premolar and distal to the first molar. After local anesthesia, the thickness of palatal tissue was assessed with a periodontal probe inserted perpendicularly to the surface of the mucosa and bone. Then, the anesthesia of greater palatine and nasopalatin



Figure 3. Preparing the donor site (the area of harvest). Achievement of a single incision in angle of 90° with the bone

The required size of the graft was determined by evaluating the depth and extent of gingival recession. Connective tissue with periosteum was then carefully detached from the bone surface of the palate with a small periosteal elevator. Palatal wound was then closed using sutures.



Figure 5. The connective tissue graft was placed in saline solution

nerves was performed using a local anesthetic.

It was used the technique of a single incision which is made parallel to the gingival margin to harvest the graft, because it produces a reduced discomfort for the patient, requires a reduced number of sutures, does not require any stent or administration of haemostatics postoperatively. The required distance from the the palatal cemento-enamel junction was respected not to damage the palatal vasculo-nervous package.



Figure 4. Detaching the connective tissue and periosteum with elevator

After detachment, the connective tissue graft was placed in saline solution (fig. 5) and kept moist to prevent desiccation until it is inserted into the recipient site. It was then sectioned to the appropriate size.

The connective tissue graft was inserted gently into the tunnel and inside the created pouches using a periosteal elevator and stabilized in place with sutures. The placement of donor connective tissue in the pouches under the papillary tunnel allowed the intimate contact between the donor tissue and recipient site.

Periodontal dressing was not necessary because the tissue graft stability was assured. Analgesics and anti-inflammatory therapy was prescribed according to the needs of each patient. All patients were instructed to discontinue performing tooth brushing for 2

weeks in order to avoid trauma to the surgical site or pressure, but to rinse with Chlorhexidine digluconate 0.2% for 2-3 times a day, and after this period to perform oral



Figure 6. The connective tissue graft inserted into the subgingival tunnel



Figure 8. The connective tissue graft sutured in place and covered with gingival flaps

RESULTS

Because the patients had Miller's Class I and II gingival recession with intact tissues in interproximal area, the potential of complete root coverage was present. Of the 51 examined areas, in 32 of them the initial recession was 3 mm, and in 19 of them was 2 mm.

Patients were recalled at 7 days after the surgical procedure for the removal of sutures from the palate and at 15 days for suture removal of buccal level. The healing process was uneventful and much more quickly due to lack of incisions, and patients did not report the occurrence of pain or discomfort

hygiene procedures with a soft brush.

Percentage of root coverage was assessed at 6 months.



Figure 7. The positioning of the connective tissue graft and its maintenance in position by suture



Figure 9. The appearance after 2 weeks

during the postoperative period.

During the postoperative monitoring was not observed any signs of necrosis or bleeding in the donor area and was not reported the presence of pain or discomfort.

The first signs of graft acceptance occurred especially after the 10th day after the surgical procedure. The color of tissues was nearly homogeneous at 2 weeks.

Complete coverage of root was clinically evaluated upon the following criteria: marginal tissue reached cemento-enamel junction, the presence of clinical attachment, sulcus depth was ≤ 2 mm, no bleeding on probing. The average coverage of the

recessions was 2.3 ± 0.5 mm.

In periodical postoperative examinations at 1, 2, 3, 6 months after the surgical procedure has been observed the gradual adaptation of grafts at surrounding tissue, no remaining scars were observed after the suture, root coverage was observed, the marginal gingiva reaching the cemento-enamel junction.

Patients were informed about proper brushing techniques.

DISCUSSION

The patients participating in this study complained about gingival recession exposure when smiling. Thus, a good aesthetic result was an important goal of the treatment requested by them.

In the last years root coverage has become a predictable procedure periodontal plastic surgery. The predictability of the radicular coverage procedure is dependent on several factors, such as anatomical factors, surgical skills of the operator and the post-operative maintenance of patients. A complete root coverage was reported in Miller's class I and II gingival recessions with connective tissue grafts and is usually considered to be the gold standard, while in the case of class III and IV recessions can only be achieved a partial coverage. In addition, in the class II recession, the defect size also has an important role in root coverage. The treatment outcome is becoming less favorable at sites with width of more than of 3 mm and a depth exceeding 5 mm, because the blood supply to the tissue graft will be insufficient.

The connective tissue grafts remains the most effective and predictable treatment for radicular coverage in the treatment of gingival recession [19].

Blood circulation is compromised in the place where the incisions are made, even if the blood flows in an apico-coronal direction in anterior gingiva [20]. The tunnel technique eliminates the incisions and protects the

interdental papillae, ensuring the aesthetic outcome of the procedure.

One of the difficulties in obtaining the coverage of several recessions using autogenous connective tissue grafts is the obtaining of an appropriate size graft, because of anatomical limitations in the donor area, respectively the hard palate. Careful preparation of the tunnel flap, in particular in patients with thin biotype and small gingival papillae, is essential for avoiding perforations. In some cases, the dissection of extremely thin papillae may be impossible due to the high risk of ruptures [21].

Some people are afraid of surgical use of palate as the donor site. The ultimate goal of this technique was to stop the progression of lesions and increase the amount of keratinized tissue on denuded root surfaces to protect them from abrasion caused by tooth brushing and dental caries [22].

CONCLUSIONS

Correction of gingival recession in the aesthetic area improves the appearance of patients. The gingival recession in the aesthetic zone can be successfully treated using a modified tunnel technique with autogenous connective tissue graft.

Due to its minimally invasive approach, this technique speeds up the healing process and generate more aesthetic results. The modified tunnel technique is a very technique sensitive method that requires experience and skills of the surgeon.

This technique used in the treatment of multiple gingival recession is beneficial meeting the aesthetic and functional desires of patients, it is more easily accepted by patients, ensuring their satisfaction.

The advantage of the graft harvested from the palate is the double blood supply from both the above marginal gingiva, as well as the palatal connective tissue, which increases thus the graft survival.

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