BULLETIN OF STOMATOLOGY AND MAXILLOFACIAL SURGERY
Volume 21, Issue 9

DOI:10.58240/1829006X-2025.21.9 -189

CASE REPORT

THE USE OF THE MODIFIED DE-EPITHELIALIZED FREE GINGIVAL GRAFT WITH MODIFIED CORONALLY ADVANCED TUNNEL IN THE AESTHETIC REHABILITATION OF THE ANTERIOR DENTITION. CASE REPORT

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Received: *Sep.2 28. 2025;* ***Accepted:*** *Sep. 30, 2025;* ***Published:*** *Oct 2,2025*

ABSTRACT

Background: The frequency of gingival recessions is very high. The treatment of RT1 defects often results in complete root coverage. Often gingival recessions are associated with chronic periodontitis, i.e. RT2 and RT3 defects. Interproximal bone loss in periodontitis patients leads to papillary volume loss with visualization of black triangles in the interproximal spaces. The aesthetic demands of dental patients became more sophisticated last decades. Periodontal plastic surgeries became very popular because of overmentioned aesthetic demands and high frequency of recessions both in people with high and low level of individual hygiene. It is stated, that RT1 defects can be treated with complete root coverage. But there is no much data about treatment results of RT2 defects and almost no data about treatment of RT3 defects. Although RT2 defects in some cases can be fully covered, it cannot be guaranteed to the patient in all cases. It is obvious, that dental patients complain not only on root denudation and hypersensitivity, but also interdental black spaces, which appear mostly as a consequence of interproximal bone loss. Although complete root coverage cannot be guaranteed in all patients with RT2 and RT3 defects, patients can demand aesthetic improvement.
Objective: The purpose of this clinical report is to evaluate the effectiveness of the coronally advanced tunnel in combination with modified deepithelialized free gingival graft (MDFGG) in the treatment of RT2 and RT3 defects.
Results: The scalloped form of the deepithelialized free gingival graft in combination with the coronally advanced tunnel helped to solve two problems simultaneously: recession closure and papillary reconstruction.
Conclusion: The results lead to further research for the treatment of RT2 and RT3 defects, and also papilla reconstruction techniques.

Keywords**:** gingival recession; periodontal surgery; interproximal bone loss; de-epithelialized free gingival graft; modification; papillary reconstruction; MDFGG ; tunnel technique; RT3, RT2 defect treatment.

INTRODUCTION

Gingival recessions (GRs) are defined as the presence of an apical shift of the free gingival margin (FGM) with respect to the cementoenamel junction (CEJ).[1]

The prevalence of gingival recessions (GR) is very high.[2]

According to Marini MG et al. (2004), more than 60% of the population under 20 years old in Western Europe, including Norway, has been reported to have at least one site with gingival recession.[3]

The high prevalence of GRs in populations with high standards of individual hygiene shows that mechanical factors play role in recession formation and progression. [4]

In populations deprived of dental care, the occurrence of recessions was even higher. [2]

In a study by Romandini M et al., the present study, including a total of 10,676 participants, representing a weighted population of approximately 143.8 million civilian non-institutionalized American adults, 30 years of age and older,[5] the prevalence of mid-buccal gingival recession (GR) of all types was 91.6%. The prevalence of GRs, according to the types defined in the 2018 classification system, RT1 gingival recessions, the prevalence for the whole mouth was 12.4%. RT2 and RT3 GRs, respectively, 88.8% and 55.0% of the population. Multiple gingival recessions affected 71.7% of the adults, although the prevalence of multiple RT1 was only 3.1%[5].

According to the study age, gender, ethnicity, dental

care exposure, tooth types and arch were identified as risk indicators for RT1 GRs, while the risk indicators of the RT2/RT3 ones were mostly the same ones of periodontitis.[5]

According to Khocht et al.[6] maxillary teeth have fewer surfaces with recession than mandibular teeth. Receded surfaces are significantly higher on facial surfaces than on lingual surfaces and the upper right and lower anterior sextants have the highest number of receded surfaces.

Generalized chronic periodontitis is often associated not only with bone loss and periodontal pockets, but also with tooth loss, migration of the existing teeth, tooth extrusion and gingival recessions. The aesthetic view can be severely influenced by loss of the papillary height, enlargement of the interproximal black triangles, formation of diastemas and tremas. While there are many methods for pocket therapy, including conservative and surgical periodontal treatment methods, the elimination of black interproximal triangles, i.e. papilla reconstruction with existence of interproximal bone loss and recession stays one of the controversial and complex issues in periodontal therapy[7] (Suzuki M., 2022).

Mandibular teeth can be affected more by recessions because of a thinner gingival biotype[8].

Beside this the frenulum and muscular attachments near the gingival margin not only play role in recession formation, but also interfere with recession treatment.[8]

Exposed root surfaces due to recession are associated with root sensitivity [9] (Rees & Addy 2002), increased risk for non-carious cervical lesions[10] (Pini-Prato et al. 2010) and root caries[11] (Bignozzi et al. 2013). Recession may also impair adequate plaque control[12](Smukler & Machtei, 1987). Furthermore, exposed facial root surfaces may present an aesthetic problem that could interfere with the well-being of the patient[13] (Nieri et al. 2013),

Gingival recessions are surgically treated to improve aesthetics, reduce root hypersensitivity. Many techniques have been developed to treat single and multiple recessions of various severity. [14] These are the free gingival graft, coronally and laterally advanced flaps with or without use of connective tissue graft (CTG) or other substitutes. Grafting may provide a scaffold to support wound healing and provide an increase of thickness of the wound area, favoring coverage [15] (Baldi et al. 1999). Acellular Dermal Matrix (ADM) has shown to provide a stable grafting when added to coronally advanced flap (CAF) for multiple recession defects, being only minimally inferior to CTG (Hirsch et al., 2005) [16]. In a 5-year follow-up, non-randomized, controlled study, the use of CTG significantly increased the chance of obtaining complete root coverage (CRC) in the long term, when compared to CAF alone where a recession recurrence was noted (Pini Prato et al. 2010)[10]. The envelope modification of CAF (Zucchelli & De Sanctis 2000)[17] appears as well associated with high performance. Zucchelli et al. (2009)[18] showed a marked improvement of CRC at both site- and subject-level and for aesthetic outcomes, when compared to traditional CAF. [19]

The concept of preserving-flap techniques and flap vascularization is also ensured by the tunnel modified CAF [20,21,22] (Allen 1994, Azzi et al. 1998, Zabalegui et al. 1999), enriched by a CTG. This technique, named as Modified Coronally Advanced Tunnel (MCAT) has also shown a high level of efficacy (Aroca et al., 2010, Aroca et al., 2013) when compared to CAF plus CTG or MCAT plus a bio-resorbable collagen matrix.[23,24]

Analyzing both randomized clinical trials (RCTs) and case series, it was suggested that periodontal plastic procedures (PPP) may predictably determine CRC in multiple Miller class I and class II recessions.[25,26] Recent initial data on the treatment of both single (Cairo et al. 2012)[27] and multiple (Aroca et al. 2010)[23] gingival Miller class III recessions showed that complete root coverage is feasible also in case of recession associated with minimal interdental attachment loss.

Encouraging findings have been noted also in terms of mean root coverage (MRC).

There are additional anatomical characteristics that are of paramount importance when compared with Miller's class I and class II recessions. These include increased avascular surfaces, increased root prominence, reduced periosteal bed and, sometimes, deeper periodontal pockets with multiple adjacent recession type defects (MARTD).[23]

This study is a part of a big 13 – years old study, which tends to optimize the treatment of recessions, associated with interproximal bone loss. All these recessions were associated with papillary volume loss, which usually correlates with black triangles and aesthetic complaints of the patients. Our previous article[14] was dedicated to the use of the MDFGG with CAF. Here in case report, we will show long-term results of treatment of another difficult (RT3 – RT2) recession defects in a periodontitis patient with the help of MDFGG and a MCAT.

All these cases are done with customization of techniques and grafts to help obtaining as much papillary volume gain as possible. All patients have given written consent to apply a modified technique.

CASE REPORT

Patient, R.G., 50 years old, female, admitted to our clinic in 2017, with complaints of pain and some pus coming out from gingival pockets (Fig.1A). According to difficulty of the case and severe bone loss, deep pockets, a CBCT was requested (Fig. 1B).

The clinical examination revealed tooth loss, bleeding on probing, pocket depths from 9 to 12 mms on the upper jaw, purulent exudation, tooth mobility, recessions, furcation involvement of molars. Generalized chronic severe periodontitis was diagnosed.

The patient did not have general health problems, but was smoking 10-15 cigarettes a day.

The teeth NN 15,26,27,28 and 37 were extracted. The frontal teeth were already splinted. Scaling and root planing were performed, reinforced by Amoxycillin, 500mg, Clavulanic acid, 125 mg, twice a day, and Metronidazole, 250mg, three times in a day, for a week. After 3 months the pocket measurement revealed pockets 6-9 mms in depth.

A regenerative osseous surgery was performed on the upper jaw, frontal teeth (Fig. 1C, D), and some bone reconstruction - on the lower jaw, again frontal teeth. The healing period was uneventful. Several months after the surgeries the patient did not have any complaints beside the aesthetic complaints and ineffective chewing function.

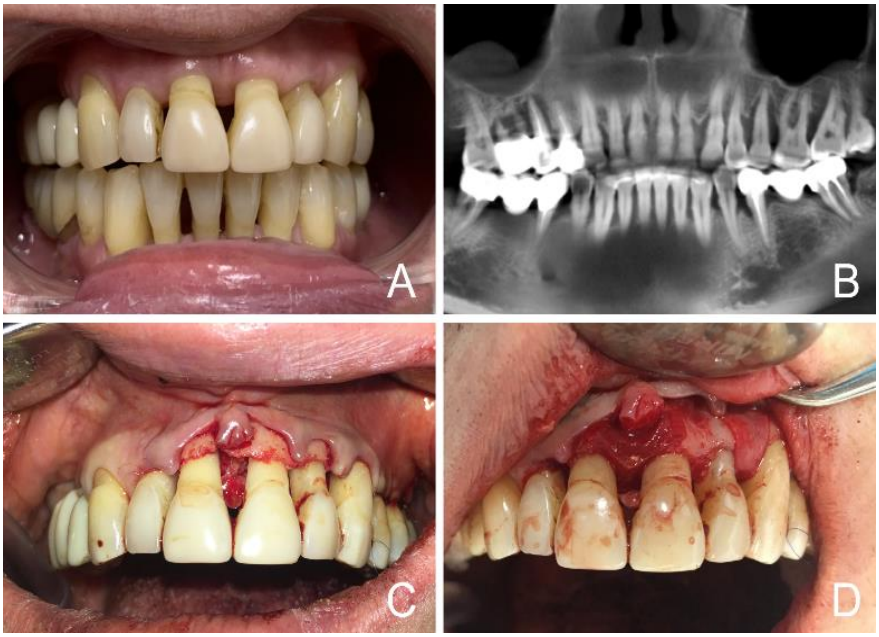

Figure 1. A. The situation after initial periodontal treatment. B. CBCT screenshot. Deep bony craters are visible both on upper and lower jaws. C. Regenerative periodontal surgery on the upper jaw. D. Bony craters are filled with bone substitute and covered with collagen membrane.

A new CBCT was performed, also because implant surgery was planned at molar areas. Bone remodeling is seen on the new CBCT, especially on the upper jaw, the frontal zone (Fig. 2A).

Implant surgery was performed on the left side, then prosthetic rehabilitation was done. After prosthetic rehabilitation, the patient returned with aesthetic complaints, especially from the recessions of the upper frontal teeth, and big open interdental spaces. The interdental triangles were so big, that their prints were seen on the upper and lower lips (Fig. 2B, C).

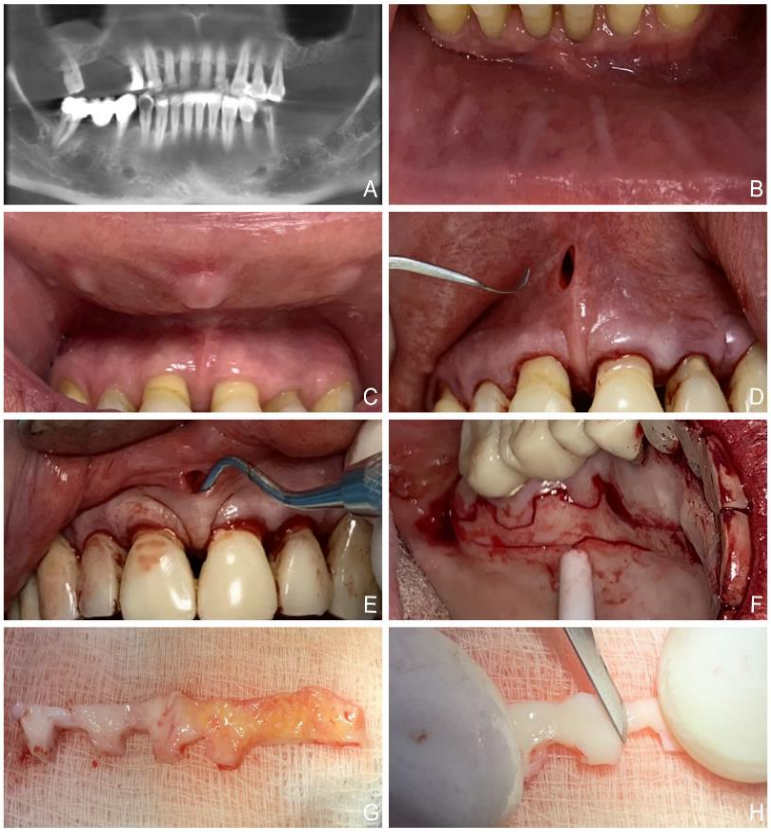

Figure 2. A. CBCT Scan screenshot after regenerative periodontal therapy. Bony craters mostly disappeared both on the upper and lower jaws. B, C The prints of huge open interproximal triangles are seen on the upper and lower jaws. D, E. VISTA approach tunnel technique was applied to cover the recessions and reconstruct the papillae. F, G. Special form, modified free gingival graft with papillary overextensions is taken to ensure recession closure. The papillary overextensions are taken to reconstruct the papillae. H. Special care is applied while de-epithelializing the graft with overextensions, trying not to overthin it.

After discussion with the patient, it was decided to perform recession coverage with the help of a Modified Coronally Advanced Tunnel technique and a connective tissue graft in our modification (MDFGG[14]), because simultaneously we planned to perform also papillary reconstruction. The patient agreed in a written form to use the CTG in our modification (see the previous article). The surgery was performed under local block anesthesia. Primarily, intrasulcular incisions were made around incisors and canines from vestibular side, trying to penetrate palatally as much as possible. Some full thickness flap elevation was done through the intrasulcular incision, then an incision was made through the labial frenulum, as in VISTA technique (Fig. 2D). The rest of the flap elevation was done through this incision (Fig. 2E), as described in original VISTA technique. Special effort was applied to elevate the papillae as much palatally as possible. Different instruments can be used for flap elevation for such cases beside VISTA instruments. For example, small periosteal elevators, periosteals for tunnel techniques. Also composite instruments can be used, after being precurved into a bayonet form. It helps to penetrate into narrow interdental spaces, without perforating the flap from the palatal side. Special attention was paid to the flap mobilization, especially the papillae. The connective tissue graft was then taken. Primarily the space between the canines and the interproximal spaces were measured and all these measurements have been transformed to the palate and tuberosity region. It was decided that the graft will begin from the tuberosity and then extend to the palate, reaching the premolar area (Fig. 2F). As described in the previous article, the structure of the connective tissue graft was planned to fill the interproximal black triangles between frontal teeth – from canine to canine. So the graft had 4 papillary overextensions, designed to suite to the size of 4 interproximal gaps. In this particular case, the papillary overextensions were designed from the coronal part of the graft (Fig. 2F), but they can be taken also apically.

Often a template can be made, for example, from the suture material package, to cut the graft of proper size.

The incision on the palate is first made superficially, just to see the graft margins, then we go deeper, approximately 2-

2.5 mms. Attempt is made not to go too deep not to take the adipose and glandular tissues and not to traumatize the donor area unnecessarily.

We begin the graft elevation from mesial coronal angle of the graft, trying to obtain mean 2 -2.5 mms thickness. While making the incision and elevating the flap at the extensions part attempt is made not to make the deeper part smaller in width or thinner (Fig. 2G). We have to also keep in mind, that the de-epithelization of the overextensions part is more difficult, so we can lose more tissue volume while de-epithelializing it. After the Modified Free Gingival Graft was taken it was thoroughly deepithelialized. We begin the de-epithelization from the main part of the graft (Fig. 2H), then we de-epithelialize the papillary overextensions, trying not to overthin them. Then the graft is fitted to the recipient area. If necessary, it has to be trimmed to fit the recipient site. For this clinical case, it was not easy to fix the MDFGG in the correct position because of the papillary overextensions. First we fixed the papillary overextensions at right sites, pulling them with sutures from palatal side, each papillary overextension with a separate suture, trying to insert the whole graft from VISTA incision so that it does not rotate underneath the flap. When the graft is not inserted yet, the right and left extremities of it are also taken, as during the MCAT technique, with holding sutures. Then the threads are pulled simultaneously, beginning from those pulling the papillary overextensions, and, finally, the ends of the flap (Fig. 3A). We make sure that all parts of the graft are seated in their planned positions and tie the sutures.

Finally, we encouraged the stabilization of the MDFGG with suspensory sutures, taking the papillae and the underlying MDFGG (Fig. 3B). This leads to additional coronal advancement of the tunnel flap.

The healing was uneventful both at recipient and the donor sites (Fig. 3C, D). The sutures were removed at 2 – 3 weeks. One month after the surgery there is significant coronal advancement of the flap, the interdental papillae look much better (Fig. 3E). After 3 more weeks there is some apical migration of the central papilla, but again, the patient is satisfied with the esthetic result of the surgery (Fig. 3F).

Figure 3. A. The MDFGG is pulled into the recipient area through the VISTA incision. B. Immediately after suturing. The suspensory sutures are passing over the fiber splint, taking also the MDFGG, trying to obtain more coronal advancement of the flap with papillae. C, D. The situation 3 weeks post-surgery. E. One month post-surgery. F. After 7 weeks post-surgery. Note some papillary loss between central incisors.

Three months post-surgery the splint was fractured, and, during repair, some aesthetic readjustments were done with composite. 1 Year after periodontal plastic surgery (PPP) it is obvious, that almost all interdental triangles at upper frontal teeth are closed, beside the one between the central incisors (Fig 4A). There is even some soft tissue excess around teeth NN 21, 22. A Panoramic X-Ray was performed.

On the Panoramic X-Ray there is a flat bony architecture (Fig. 4B). Almost no bony craters are seen at the upper and lower frontal teeth. As the patient was satisfied with the result of the PPP on the upper jaw, it was decided to perform

another PPP surgery on the lower jaw, with the same goals, i.e. recession closure, reconstruction of interdental papillae. The patient gave written consent to use the same surgical technique, i.e. MDFGG with coronally advanced flap (Fig 4C, D). The surgery and the postoperative period were uneventful, with obvious thickening of gingival tissue, particularly the papillae, 3 months post-surgery (Fig. 4E, F).

Figure 4. A. One year after PPP on the upper jaw. There is even some gingival overgrowth around teeth NN 21, 22. It is obvious, that there is a need of another PPP on the lower jaw. B. A Panoramic X-Ray after conservative and surgical periodontal treatment, and implantation, with prosthetic rehabilitation over implants. C. The modified free gingival graft for recession closure on the lower jaw. D. The situation after suturing. E. Three months after surgery. F. Lateral view. It is obvious, that gingival tissue is thickened. Note the volume of the papillae. 3 Years after the PPP on the upper jaw the excess tissue around teeth NN 21,22 was removed (Fig. 5A, B). Interestingly, there was sound bone underneath.

Figure 5. A. Gingival tissue correction over teeth NN 21, 22. Interestingly, sound bone was very close to the free gingival margin. B. After suturing in order to control bleeding and fasten healing.

After 3 more months the patient decided to finalize all the work with aesthetic prosthetic restorations both on the upper and lower jaws. Porcelain fused to zirconia bridges were performed on the upper and lower jaws 6 years after beginning the periodontal treatment (Fig. 6 B, D).

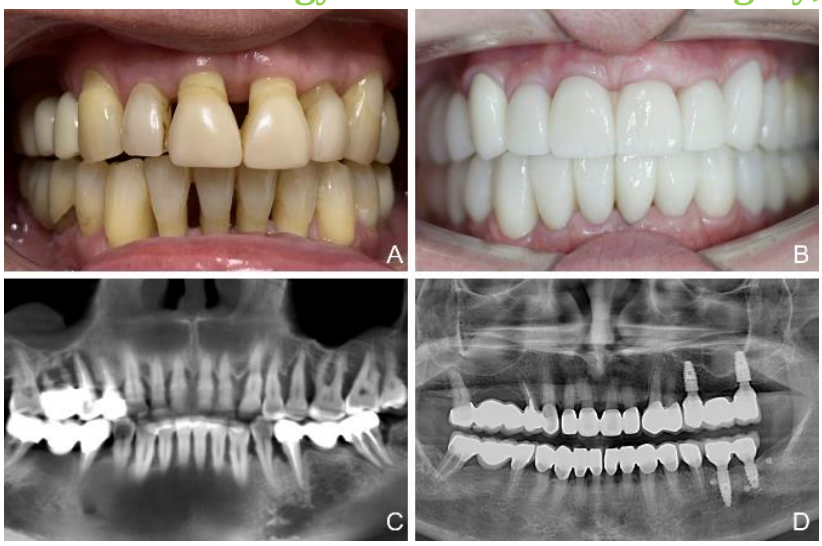

Figure 6. A. The situation before treatment. B. The situation after full mouth rehabilitation. C. CBCT screenshot before treatment. D. Panoramic X-ray after final prosthetic rehabilitation.

DISCUSSION

At 1 year, the MCAT technique gives predictable results for the treatment of multiple Miller's class Ill recession defects.[23]

Emerging data indicate that it is possible to obtain complete root coverage at sites with some inter-dental attachment loss.[28] It was highlighted that periodontal plastic procedures are complex, technique-sensitive interventions that require advanced skills and expertise.[28] According to Miller Class IV recession defects, data from a limited number of case reports suggest that these defects may be improved, but outcomes are not predictable.[29]

Patients with maxillary recessions recorded statistically superior outcomes than patients with mandibular recessions.[25]

It is stated, that the root coverage was higher if the initial gingival thickness was more than 0.5 mms.[30]

Initial tissue thickness directly correlates with the predictability of complete root coverage.[29]

As we can see, recession closure is possible in Miller class III and class IV cases, or Cairo RT2 and RT3. Simultaneously, papilla reconstruction was done. If the papillae were not reconstructed, possibly, the recessions wouldn't be fully closed. By our experience, the tunnel techniques work better with MDFGG, then the MCAF. The use of MDFGG with MCAF is enough easy, but we cannot be sure, that the cut edges of the flap will not be necrotized, as they are separated from the underlying connective tissue recipient bed by the MDFGG. Thus, the papillary volume gain is not predictable. At the same time, the tunnel technique is easier to perform on the upper jaw, then on the lower jaw, because the thickness of the gingiva is more on the upper jaw. On the other hand, the usage of MDFGG with a tunnel is difficult, especially, if the graft has more, then 2 papillary overextensions. Although we see interesting results with these techniques immediately after surgery and in the nearest follow – up period both on the upper and lower jaws, at late follow – up period we see less favorable results at the point of papillary reconstruction on the lower jaw. But we see recession closure and soft tissue thickening. So, theoretically, another surgery can be planned on the lower jaw for additional papillary volume augmentation. The literature review also points less favorable results on the lower jaw compared to the upper jaw.

All the way, the patient management requires changes in oral hygiene to ensure optimal non-traumatic dental biofilm removal.

Summarizing, it can be stated, that the treatment of RT2 defects can be successfully done with the help of MCAT and MDFGG, and papillary volume can be fully reconstructed. All the way, the results can not be guaranteed, especially on the lower jaw. Also this type of PPP is quite technique sensitive and requires advanced skills and experience.

DECLARATIONS

Ethics approval and consent to participate

Not applicable

Consent for publication

Not applicable.

Competing interests

The authors declare no conflict of interest.

Funding

This research received no external funding.

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