Treatment of Single and Multiple Adjacent Mandibular Recession using the **Modified Coronally Advanced Tunnel with Alloderm**

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Case series

From a clinical point of view the treatment of the gingival recession in the mandibular anterior area has been considered a very challenging procedure. A recent systematic review by Zucchelli et al[1] reported a complete coverage of the mandibular anterior teeth ranging form 33.3% to 75%. Such a wide range can be attributed to the local anatomical conditions such as: high frenulum attachment, high muscle pull, shallow vestibule, that are very frequently encountered in the mandibular incisor area. [2] These limiting factors are considered to negatively influence the outcome of periodontal plastic surgery. Additionally, other predisposing factors present in the mandibular anterior area, thin tissue phenotype, minimal or no keratinized tissue apical and lateral to the area to be grafted, thin and narrow papillae's, exacerbate the problem.[3]

Various surgical techniques have been described for the treatment of multiple adjacent gingival recession in the mandibular anterior area: fully or partially epithelialized grafts (FGG) or subepithelial connective tissue grafts (SCTG) in combination with different types of flaps (envelope, coronally advanced flap with or without the removal of the labial submucosal tissue or the modified coronally advanced tunnel). A recent meta analysis reported that the greatest mRC is associated with laterally positioned flap (LPF) + connective tissue graft (CTG) (91.2%) and tunnel (TUN) + CTG (89.4%), whereas LPF alone, coronally advanced flap (CAF) + CTG, and free gingival graft (FGG) showed lower mRC (79.1%, 78.9%, and 68.5% respectively). TUN + CTG provides significantly greater mRC compared to CAF+CTG. No difference among the procedures could be observed in terms of keratinized tissue width gain. [4]

In the mandibular anterior area, the sole split surgical technique is very challenging to perform and increases the risk of decreasing the flap thickness, and/or of flap perforation. In order to reduce these potential complications, a modification of the supra-periosteal flap (tunnel) has been developed consisting of a full thickness flap extending beyond the mucogingival junction, followed by a partial/split thickness flap and a coronal advancement of the pouch/tunnel.

The coronally advanced flap in combination with subepithelial connective tissue grafts is widely considered as the gold standard of root coverage[5, 6] Unfortunately the harvesting of the autogenous grafts form the palate requires a second surgical site, therefore increasing the patient morbidity and also the surgical treatment time [7], prolonged intra-operative and post-operative

bleeding, palatal sensory dysfunction.[8] Furthermore, the donor site is limited in the amount of the graft that can be harvested[7], limiting the number of recession sites that can be treated in a single visit. To overcome these disadvantages, a soft tissue graft substitute, Acellualr Dermal Matrix (ADM), has been used for gingival augmentation procedures. The ADM is derived from donated human skin tissue supplied by tissue banks in the United States utilizing American Association of Tissue Banks standards and FDA guidelines.[9] Currently ADM is routinely used for root coverage procedures and soft tissue augmentation around teeth and implants[10] having the most similar outcomes to the CTG[11] A recent long-term study suggested that the treatment with ADM results in similar root coverage outcomes to the CTG in the presence of a distinct amount keratinized tissue width at baseline (> 2mm) [10].

The aim of this case series therefore to present a step-by-step procedure and to clinically evaluate the healing of the multiple recession defects following treatment with MCAT and ADM in the mandibular anterior area.

Treatment protocol

One hour before the surgery, the patients were administered 600 mg of ibuprofen 8mg of Dexamethasone, and 500 mg of Azithromycin. After profound anesthesia was obtained the flap elevation was performed in a minimally invasive fashion,[12] using the technique reported in Allen (2010).[13] The surgical procedure selected was a minimally invasive coronally advanced tunnel technique . The surgical loupes enhanced the visibility to ensure that the entire composite or carious lesion was removed. After thorough debridement the surgery started with a intrasulcular incision made with an end-cutting intrasulcular knife (Allen End-Cutting Intrasulcular Knife Hu-Friedy HF-KPA) from the base of the sulcus to the crest fo the bone. The intrasulcular incision was carried interproximally. This was followed by a supra-periosteal blunt dissection beginning in the sulcus past the mucogingival junction using an Allen Periosteal elevator (Periosteal Allen Elevator, Hu Friedy, HF-PPAEL). Then, a partial thickness dissection with modified Orban knife (1/2 Orban Knife, Hu Friedy, HF-KO12KPO3A6) was continued apically, approximately 10 mm from the gingival margin, to allow for a passive advancement of the pouch. During the tunnel dissection the flat surface, the Modified Orban knife was maintained in contact with the bone surface in order to create a immobile surface for the graft. The same Orban knife was used in a sliding motion to cut not only any remaining fibrous/muscle attachment that might prevent the insertion of the graft but also to cut in a sharp dissection the frenal attachment from the alveolar surface. The pouch was extended laterally to include the papillae of the adjacent teeth. The non-incised papillae were elevated and detached from the interdental bone using the 7/8 Younger Good Curette (Hu Friedy). The exposed root surface was treated with 17% ethylene-diaminetetraacetic acid (EDTA) applied for 1 minute with a cotton tip applicator, to remove the smear layer and to expose the dentinal collagen fibers/tubules. The allograft (Alloderm, BioHorizons) was rehydrated according to the instructions for a minimum of ten minutes. The Alloderm was trimmed lengthwise to the site's adjacent line angles, and vertically, to a dimension of 8 mm. The graft was placed in the pouch and aligned with the gingival margin (Figure 3). The connective tissue site of the Alloderm was placed against the tooth surface, as recommended by the manufacturer. The tension free pouch was coronally positioned to cover the ADM and 2mm of tooth enamel. Double sling sutures (5.0 polypropylene) were used around each tooth to secure the graft in place and to coronally position the graft and the pouch simultaneously.

Post operative care and wound healing

Analgesics were prescribed to control postoperative discomfort (Ibuprofen 800mg q6h for one week, Tylenol #3 q6h as needed). Azithromycin (500 mg) was prescribed; two tablets were taken the day of surgery, followed by one tablet per day for 3 days. To control the swelling, steroids were also prescribed (Dexamethasone 8mg 2 hours before surgery, 6mg on the second day, 4mg on the third day and 2mg on the fourth day). No brushing or flossing at the surgical site was performed for 3 weeks. Chlorhexidine gluconate (0.12%) mouth rinse twice daily was prescribed for three weeks after the surgery to control plaque buildup. The patient was seen postoperatively at three weeks when the sutures were removed. Oral hygiene instructions were given, and professional cleanings were performed at each of the follow up visits if indicated (i.e. visible plaque present). The patient was followed up after 3 months and after 6 months to monitor the surgical healing.

Case One


Fig. 1


Fig. 2


Fig. 3


Fig. 4


Fig. 5

6 month follow up


Fig. 6

10 year follow up

Case Two


Fig. 7


Fig. 8


Fig. 9

Three week follow up and suture removal


Fig. 10

8 year follow up

Case Four


Fig. 11


Fig. 12

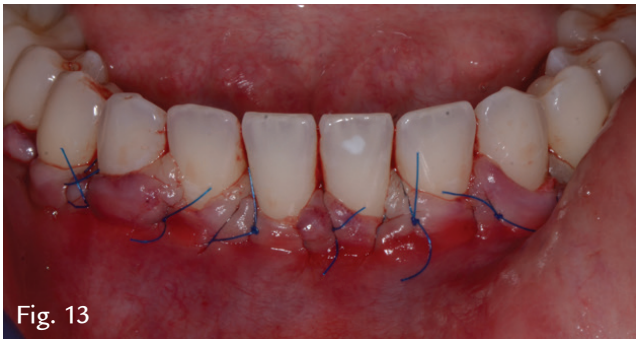
Fig. 13


Fig. 14

Case Five


Fig. 15


Fig. 16


Fig. 17


Fig. 18


Fig. 19


Fig. 20

One year follow up


Fig. 21

10 year follow up

Case Six


Fig. 22

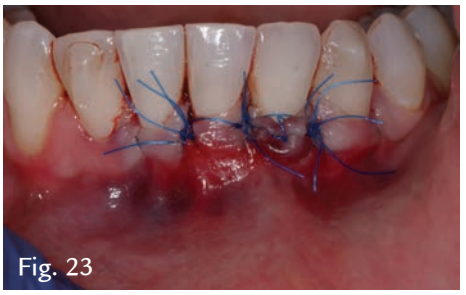
Fig. 23


Fig. 24

Discussion

The findings of this present case series show that multiple adjacent recession defects associated with the mandibular incisors can be successfully treated with an MCAT in conjunction with a soft tissue substitute, such as Acellualr Dermal Matrix (ADM). In all the cases the healing was uneventful, with minimal inflammation and no ADM exposure, with or without infection, and no ADM loss was observed. Complete root coverage was obtained in all the cases and maintained for a long period of time (over 8 years). To the best of the author's knowledge these are the first case reports evaluating the treatment of single and multiple adjacent recession defects (RT1) using MCAT+ADM for the treatment of recession in the mandibular anterior area. The excellent results obtained in these cases are due to proper case selection.

In this case series the recession defects treated with this approach were diagnosed as Miller class I, II recession defects, relative thick tissue phenotype (> 1 mm), wide based papillae's and > 2mm attached KT. Our results are in accordance with other studies that suggest that the use of ADM with a CAF or MCAT produces the same clinical results as the CTG in the presence of a distinct amount of the keratinized tissue baseline (> 2 mm).[10]

Furthermore, the addition of the ADM increases the tissue thickness, resulting in a stable gingival margin over time. The surgical techniques employed in the treatment of multiple adjacent gingival recession in the mandibular arch (MCAT) adds to the clinical success. By avoiding the vertical releasing incisions, the subsequent flap, in this case the modified coronally advanced tunnel, provides a greater wound stability.[14] Full thickness flap performed supra-periosteal, beyond the MGJ, preserves the thickness of the facial tissues of the teeth that will cover the graft to the level of the CEJ[15]. The preference of a thicker flap is in accordance with the results of clinical study by Baldi[15] in which a thicker flap (0.8 mm) leads to better clinical outcomes. During this full thickness flap preparation, the periosteum is maintained in the flap, augmenting the tissue thickness of the flap over the avascular areas of the roots. Furthermore, the inclusion of the periosteum in the coronal aspect of the flap increases the flap stability during the suturing over the root surface. Tension free coronal mobilization of the soft tissue achieved not only by extending the flap to the adjacent teeth next to the recession defect, but also by the full/split flap design. This deep dissection (almost 10 mm from the CEJ), not only provides a release of frenum and muscle attachments, but also creates large and stable surgical recipient for the graft increasing its vascularization. We can speculate that the supra-periosteal split flap approach creates an 8-10 mm area of the periosteum on which the ADM is fixated.

Papillae elevation from the interproximal bone facilitates the coronal advancement of the flap and also preserving the intact blood supply interdentally. In the mandibular anterior region, the greatest tension occurs in the mandibular midline. By preserving the midline papillae intact, the tension that occurs during the early stages of healing is greatly reduced improving the post-surgical period and the outcome. By extending the MCAT to the teeth adjacent to the recession defect the tension is distributed over a wider surface area leading to a better wound stability. Position of the flap and the soft tissue substitute (ADM) at the level of the CEJ prevent the overextension of the flap and also the formation of a dead space over the enamel of the tooth.[16 17] The double sling sutures

are applied around each tooth to stabilize the entire soft tissue complex (flap and graft) at the level the CEJ or slightly above. The sutures are placed at the root line angles of the teeth to coronally position the tissue margin with the graft substitute at the level of the CEJ.[18 19] In all the cases presented there was an increase in the vestibular depth. We can speculate that the deep supra-periosteal dissection, separating the periosteum form all the muscle fibers, creates a stable surgical bed on which the ADM can be fixated, preventing the muscle fibre re-attachment. Another possible explanation for the vestibular extension is that the addition of the ADM creates a immobile connective tissue that extends the entire vertical dimension of the graft (defined as the apico-coronal distance from the free gingival margin to the most apical extent to the mucosa that is resistant to probing) past the mucogingival junction. [20]

Clinical significance

Soft tissue grafting in the mandibular anterior region presents with anatomical challenges including a strong frenal attachment, shallow vestibule, and thin tissue. These features may be successfully managed with a free gingival graft, but that procedure results in an uncomfortable experience for the patient. The results of this case series suggest that flap designs such as the MCAT or TUN may provide less tension and reduce the chance of flap mobilization and graft exposure in proximity to the recession defect. Furthermore, this case series supports the use of the ADM in the treatment of mandibular recession defects.■

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