A challenging task
Prof Dr Liviu Steier discusses how to restore the aesthetic zone with implant-supported restorations

R estoring the anterior aesthetic zone using implant-supported restorations is one of the most challenging tasks. Knowledge of related literature, impeccable skills, a lot of experience and a well-trained team compliment a successful treatment. Different implant systems claim to offer the only technology leading to success. The author describes a case where an “outdated” system, external hex implant system offers a similar success rate, by only following a correct protocol.

Aesthetic 3-dimensional requirements
For optimal aesthetics, some literature suggests some key factors to be respected as they play an important role for long-term success:
• Availability of two mm buccal bone plate
• Implant tooth distance should be 1.5mm
• Implant to implant distance three mm
• Biologic width is indicated with two-three mm

Clinical case
A 45-year-old male has been referred to the practice for rehabilitation of the anterior aesthetic zone. His medical and dental history, as well as his treatment desires, were recorded.

Dental history
The patient lost tooth 11 due to trauma about 17 years ago. He was advised to restore the gap with a PFM bridge. He also reported multiple recementation sessions. Later, insufficient root canal treatments (X-rays) seemed to have weakened the remaining tooth structure. The clinical picture below demonstrates also fractured adhesive posts.

X-ray diagnosis proved vertical root fracture of both teeth. Poor prognosis led to immediate extraction recommendation, to avoid further infection (leakage) and optional bone loss.

Treatment plan
The following treatment options were identified and discussed with the patient:
• Extraction and no treatment
• Extraction and restoration with a removable device
• Extraction and immediate implant placement.

Benefits and disadvantages of different treatment options

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Extraction and immediate implant placement

Benefits
• Preservation of bone
• Optimal functional and aesthetic rehabilitation

Disadvantages
• Cost implication
• Extended treatment need

Patient decided to go for the extraction and have im-
Immediate implants placed. Impressions were taken so the patient could be offered a removable temporary device once extraction and implants performed for the healing time.

**Treatment procedure**

Retained roots were extracted in local anesthesia (four per cent Articain) using minimal invasive procedure.

The alveolae were thoroughly scooped and cleaned. Available bone was sounded and found adequate for immediate implant placement. Two Biohorizons Ø4.0mm x 12mm external implants were inserted in the alveolae. The remaining buccal gap to the buccal bone wall was less than 1.5 mm so that no further attention (fill) was requested.

Implant in position 11 was performed ad modum flapless surgery. Once drill protocol as recommended by the manufacturer has been performed a Biohorizons Ø4.0mm x 12mm external implant could be seated.

Successful three-dimensional implant placement was performed following the criterias mentioned in the introduction. Bone and soft tissue healing went extremely well also due to available thick gingiva phenotype.

**After treatment**

Allocated healing time was five months. Second stage surgery was performed under local anaesthesia. Temporary abutments were screwed in place and temporary crowns performed. The emergence profile could be nicely shaped during the next visits.

Impression was taken once optimal conditions were achieved. The technician manufactured three zirconia abutments.

The final crowns were cemented while a retraction cord in place to enhance cement excess removal. Occlusion was checked and patient received hygiene instructions. Recall sessions were scheduled.

**Conclusion**

It is of course only of anecdotal value to use a case presentation to exemplify the achievement of predictable aesthetics with conventional implant systems, but doubts might raised today about statements and claims made by modern implantology.

The author recommends the following criteria as mandatory:

• Good treatment planning
• Adequate protocols
• An excellent team (surgeon, restorative and laboratory technician) for predictable long-term success

**About the author**

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Using resorbable barriers to make root recession coverage predictable

Gingival recession is defined as the location or displacement of the marginal gingiva apical to the cementoenamel junction (CEJ). Recession is the exposure of root surface, resulting in a tooth that appears to be of longer length.

From a patient’s perspective, recession means an unaesthetic appearance and is associated with aging. The gingiva consists of free and attached gingival tissue, as seen macroscopically.

The free marginal gingiva, located coronal to the attached gingiva (AG), surrounds the tooth and is not attached to the tooth surface. The AG is the keratinised portion of gingival tissue (KG) that is dense, stippled and firmly bound to the underlying periodontium, tooth and bone.

In ideal health, the most coronal portion of the AG is located at the CEJ, where the most apical portion is adjacent to the muco-gingival junction (MGJ). The MGJ represents the junction between the AG (keratinised) and alveolar mucosa (non-keratinised).5

Reasons for recession

There are numerous etiological factors that may result in recession. Generally, the etiology can be categorised as either mechanical or as a function of periodontal disease progression. Recession usually occurs due to tooth malposition16–18, alveolar bone recession4,8, high muscle attachments and frenal pull, and iatrogenic factors related to restorative and periodontal treatment procedures.18

The detrimental effects of recession include compromised esthetics, an increase in root sensitivity to temperature and tactile stimuli, and an increase in root caries susceptibility due to cementum exposure. Thus, the main therapeutic goal of recession elimination is gingival root coverage in order to fulfill esthetic demands and prevent root sensitivity.

Miller classifies recession defects into four categories:
- Class I: marginal tissue recession does not extend to the MGJ
- Class II: marginal tissue recession extends to the MGJ, with no loss of interdental bone
- Class III: marginal tissue recession extends to or beyond the MGJ; loss of interdental bone is apical to the CEJ but coronal to the apical extent of the marginal tissue recession
- Class IV: marginal tissue recession extends beyond the MGJ; interdental bone extends apical to the marginal tissue recession.

A possible treatment modality for recession includes restorative/mechanical coverage, such as cervical composite restorations. This kind of treatment may effectively manage root sensitivity and root caries. However, such treatment entails a long-term compromise from an esthetic perspective. Composite restorations stain over time, and any marginal leakage may lead to secondary caries, recurrence of sensitivity and/or local inflammatory changes.

Additionally, colour matching can be difficult and such restorations may involve the undesirable removal of vital tooth structure in order to create adequate retention form. Thus, clinicians must determine whether the restorative benefits outweigh the esthetic shortcomings and whether it is possible to employ a treatment modality with few, if any, functional and esthetic disadvantages.

Muco-gingival surgery

Another treatment modality for recession is muco-gingival surgery. Muco-gingival surgery refers to periodontal surgical procedures designed to correct defects in the morphology, position and/or amount and type of gingiva surrounding the teeth.

In the early development of muco-gingival surgery, clinicians believed that there was a specific minimum apical-coronal dimension of AG that was necessary to maintain periodontal health.

However, subsequent clinical19–21 and experimental studies16,22 have demonstrated that there is no minimum numerical value necessary.

However, for esthetics, a uniform colour and value of AG is desirable among adjacent teeth. Some of the earliest techniques for correcting recession involved extension of the vestibule.20 The subsequent healing usually resulted in an increase of AG. However, within six months, as much as a 50 per cent relapse...
of the soft tissue position was reported. Thus, these techniques did not adequately address recession.

In order to improve esthetics and increase KG for root coverage procedures, current periodontal surgery largely involves the use of gingival grafts. There are a multitude of surgical techniques, which can be distinguished based on the relationship between the donor and recipient sites. Gingival graft procedures involve either (a) pedicle soft-tissue grafts, which maintain the pedicle blood supply or (b) free autogenous soft tissue grafts. Techniques involving the latter type require the clinician to prepare two surgical sites; one to harvest the tissue and another to prepare the recipient site.

In this case, the autogenous soft tissue graft has a separate blood supply to the recipient site. Combinations of (a) and (b) have also been reported. Soft-tissue grafts
The pedicle soft-tissue graft was first described by Grupe and Warren in 1956. This involved raising a full thickness flap and laterally positioning and then suturing donor tissue into place from an adjacent area while maintaining a pedicle blood supply. This technique and others that followed were designed to increase the zone of KG.

Later modifications of the technique included the double papilla flap, described later as the coronally repositioned flap. This technique involves mobilising a full thickness flap and repositioning the tissue to the CEJ, thereby covering the exposed recession.

The use of free gingival flaps was described in the 1960s by Sullivan and Atkins. The free autogenous graft can be made up of either epithelialised gingiva or connective tissue. Initially, the therapeutic goal was to increase the zone of KG. The clinical objective was to evolve to covering the recessed root with a zone of attached KG.

This can be achieved in one or two stages. Initially, Sullivan and Atkins described a one-stage procedure in 1965. Its purpose was to increase the zone of KG without concentrating on coverage of a recessed root. In the 1980s, a two-stage modification was suggested for an increase in root coverage, which proved to be more successful with increased predictability. This involved first placing the free gingival graft or the free connective tissue graft apical to the area of recession and using the coronally repositioned technique after healing.

Autogenous grafts
Free tissue grafts are predominantly harvested from the palate. Recently, materials other than gingival grafts have been explored. Using a guided tissue regeneration (GTR) technique, an acellular dermal matrix has been reported to yield favorable outcomes in root coverage. This material may provide the patient with a less invasive alternative than a palatal donor site in order to achieve root coverage.

Procedures combining both free grafts and pedicle techniques have also been detailed. For instance, when a connective tissue graft is employed, the graft is placed sub-epithelially with a coronal advancement of the overlying keratinised tissue. GTR techniques have also been developed more recently. In 1992, Pino Prato et al. described a combination technique of sub-epithelial placement of a membrane with coronal advancement of the flap, such as e-PTFE. The function of the membrane is to maintain space during the healing period for tissue regeneration to occur. From a patient's perspective, biodegradable membranes with GTR techniques by covering the exposed roots. The membrane was first placed on tooth #6 and thus the tooth appeared darker as it absorbed blood. The membrane was placed on tooth #5 second and thus the tooth had not absorbed the blood at the time of the photograph, which accounts for the colour difference at this time.

The coronally repositioned flap was sutured in place with the flap covering the now submerged membranes and previous recession (Figs 5, 4). Periodontal dressing (Coe-Pak, GC) was utilised as a bandage and placed over the surgical area. It was removed a week later at the same time as the sutures. The patient then lavaged and returned to the usual oral hygiene routine, initially lightly and gradually more vigorously.

The coronally repositioned flap is considered predictable root coverage by comparing a GTR technique to a non-GTR technique in a split-mouth procedure involving the same patient.

Case report
A young, adult male patient presented with recession bilaterally in his maxilla. The upper right maxilla had extensive recession on teeth #6 and #7 (Fig 1). The upper left maxilla had similar recession on teeth #11 and #12. Additionally, tooth #11 had a cervical groove, which was stained and hard but not decalcified.

After local anesthesia using lidocaine, the desired flap design was completed. There was an adequate zone of KG present before treatment, which was preserved and repositioned coronally. Upon reflection of the tissue, the full extent of the underlying recession was evident (Fig 2). The area and recession were uncovered following removal of debride ment and granulomatous tissue.

The resorbable membrane material was shaped and placed on the exposed roots. The membrane was first placed on tooth #6 and thus the tooth appeared darker as it absorbed blood. The membrane was placed on tooth #5 second and thus the tooth had not absorbed the blood at the time of the photograph, which accounts for the colour difference at this time.

The coronally repositioned flap was sutured in place with the flap covering the now submerged membranes and previous recession (Figs 4, 5). Periodontal dressing (Coe-Pak, GC) was utilised as a bandage and placed over the surgical area. It was removed a week later at the same time as the sutures. The patient then lavaged and returned to the usual oral hygiene routine, initially lightly and gradually more vigorously.

Once healed and oral health was maintained, the recession was covered and health regenerated. Upon periodontal probing, no pockets were present (Fig 5). The final view presents a visual symmetry of health and colour that is maintainable.

Recession was also present at the maxillary left side (teeth #11 and #12; Fig 6). After local anesthesia of the areas involved, a full thickness muco-periosteal flap was completed. This exposed the extent of the recession defect (Fig 7). Tooth #11 was treated, as was the other side of the mouth, by utilising the GTR technique using an acellular connective tissue membrane to preserve the space for regeneration.

Tooth #12 was treated the same way, except that no membrane barrier, resorbable or non-resorbable, was used (Figs 8, 9). Thus, there was no use of a GTR technique on tooth #12. Both teeth had the flap manipulated with the coronally repositioned graft, covering the recessed root and suturing to the CEJ level.

Both sides were covered with periodontal dressing. Antibiotics (tetracycline) and an analgesic (Tylex-Codene) were prescribed for the first week after the operation.

One week after the surgical phase, the dressing and sutures were removed and the mouth lavaged. Oral Hygiene was restored to good, maintainable habits following the healing phase of over two months. Upon observation, tooth #11, for which the GTR membrane had been employed, had reattached healthy gingiva that was not probable.

The recessed root and the stained cervical groove were covered. In contrast, tooth #12, for which no GTR membrane had been utilised, displayed recession as prior to the surgery (Fig 10).

In summary, this split-mouth technique demonstrated that using an acellular resorbable barrier membrane is more predictable for achieving root recession coverage than coverage of a recessed root without such a membrane.