The modified coronally or laterally displaced tunnel for the treatment of singular and multiple recessions

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The predictable coverage of recessions often poses a particular challenge to the practitioner. With the development of tunneling techniques, results can be achieved today that were unthinkable a few years ago. In the following, clinical cases are used to demonstrate the surgical technique and the results of MCAT and LVT in the treatment of singular and multiple recessions in the mandible and maxilla.

Exposure of the root surface due to a gingival margin retreating apically to the cementoenamel junction (CEJ) is defined as a gingival recession. It may be isolated or generalized, occurring in both older and younger individuals with good but also with suboptimal oral hygiene. Several factors may favour the development of gingival recession, such as the presence of bony dehiscences covered by a thin and fragile gingiva or marginally attached labial or buccal frenula. These may prevent successful and atraumatic plaque control, making it difficult to perform oral hygiene and promoting the development of gingivitis or root caries and the progression of bone/attachment loss.

They can also impair the aesthetic appearance or cause cervical hypersensitivity. Other factors commonly associated with gingival recession include orthodontic therapy, as well as oral jewellery such as lip or tongue piercings.

Primary indications for gingival recession therapy are a need to improve oral hygiene and aesthetics and, in some patients, to treat cervical hypersensitivity.

Predictable coverage of singular and multiple recessions can be a significant challenge for the practitioner. However, different variants of the tunnel technique have now been developed so that results can be achieved that would have been unthinkable a few years ago.

Modified coronally advanced tunnels (MCAT) and laterally closed tunnels (LCT)

Variants of the tunnel technique include the modified coronally advanced tunnel (MCAT) and the laterally closed tunnel (LCT). In both approaches, a mucoperiosteal flap is prepared, the tunnel flap is displaced coronally or laterally without tension, and the graft or soft-tissue substitute is covered (Sculean, 2018; Sculean and Allen, 2018; Sculean et al., 2014, 2016, 2017).

Surgical technique and results

This article presents, based on clinical cases, the surgical technique and results of MCAT and LCT in the treatment of singular and multiple recessions in the mandible and maxilla (Figs. 1 to 3). In both these procedures, minor scaling of the exposed root surfaces to remove any biofilm is followed by intrasulcular incisions in the recession area. The buccal soft tissue (i.e., the gingiva and the mobile mucosa) is detached using special tunnelling instruments and mobilized beyond the mucogingival margin (mucoperiosteal preparation). The papillae are undermined and mobilized, and a so-called tunnel flap is formed (Figs. 4 to 8).

To mobilize the tunnel flap in a tension-free manner up to or even coronal to the CEJ or laterally to the recession, adherent frenula are detached from the inside of the flap using a mini-scalpel or sharp curette.

In the case of deep recessions, biological materials such as enamel matrix proteins or hyaluronic acid can be applied to root surfaces to support periodontal wound healing and regeneration (Fig. 9) (Sculean and Allen, 2018; Sculean et al., 2014, 2016; Guldener et al., 2020; Lanzrein et al., 2020). For maximum stabilization, a subepithelial connective-tissue graft or a soft-tissue substitute is then introduced into the tunnel using single interrupted or mattress sutures and secured to the CEJ of the respective teeth with sling sutures (Figs. 10 to 12). Finally, the tunnel flap is repositioned coronally or laterally and secured above the teeth or the previously splinted contact points using sling sutures (Figs. 13 to 15).

Avoiding complications

Mucoperiosteal preparation minimizes the risk of flap perforation or flap necrosis, a complication that may occur particularly at sites with extremely thin soft tissue. Avoid-

Abb. 1: Isolated RT2 recession in the mandibular anterior region, preoperative view. – **Abb. 2:** Multiple adjacent RT1 mandibular recessions, preoperative view. – **Abb. 3:** Multiple adjacent RT1 maxillary recessions, preoperative view. – **Abb. 4:** Tunnelled mesial papilla on tooth 31 (case shown in Fig. 1). – **Abb. 5:** Tunnelled distal papilla on tooth 31 (case shown in Fig. 1). – **Abb. 6:** Tunnelled mesial papilla on tooth 33 (case shown in Fig. 2). – **Abb. 7:** Tunnelled distal papilla on tooth 33 (case shown in Fig. 2). – **Abb. 8:** The fully mobilized tunnel flap can be advanced mesially or distally above the recession on tooth 31 without tension (case shown in Figs. 1, 4 and 5). – **Abb. 9:** Application of hyaluronic acid to promote wound healing (case shown in Figs. 2, 6 and 7).

ing vertical and papillary incisions ensures an adequate blood supply to the mucoperiosteal flap. Tension-free coronal or lateral advancement of the tunnel allows complete or partial coverage of the soft-tissue grafts, improving their vascularization and chance of survival.

The laterally closed tunnel (LCT)

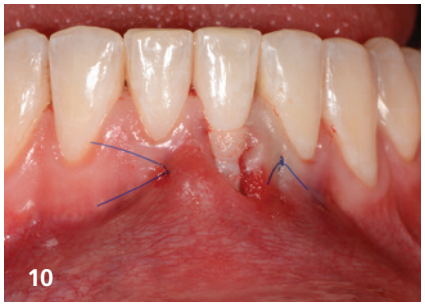
The LCT is a variant of MCAT and is primarily indicated for the treatment of deep, isolated RT1 and RT2 recessions in the mandible, where coronal displacement of a flap is particularly difficult due to traction forces exerted by the labial ligaments and muscles (Sculean and Allen, 2018). The LCT is prepared in the same was as a MCAT, except that the wound edges are closed laterally using single interrupted sutures or double-loop sutures to cover the graft and recession (Figs. 4, 5 and 8).

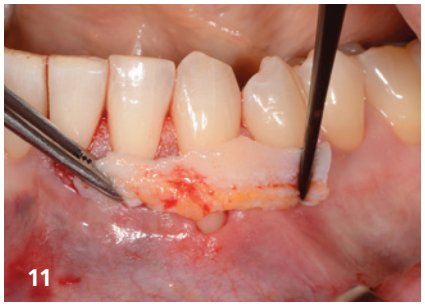
For singular and multiple Miller class I, II and III recessions (current designation: RT1 and RT2 recessions), MCAT and LCT combined with a subepithelial connective-tissue graft result in a mean root coverage of 83% to 96% (Figs. 16 to 18). Recent results have shown stable outcomes over a period of five to ten years (Fig. 18).

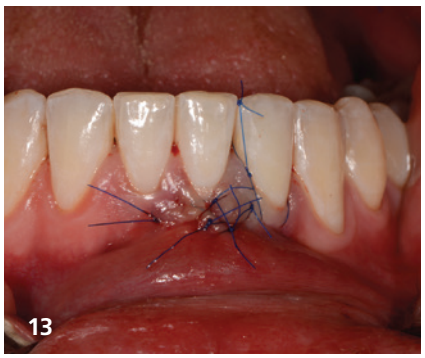
It has also been shown that MCAT delivers excellent results in the treatment of gingival recessions on teeth restored with crowns. The treatment yielded a mean root coverage of 92.62% one year after treatment (Sculean et al., 2017).

Surgical technique and results

In conclusion, both MCAT and LCT ensure good vascularization of the coronally or laterally advanced flap and the







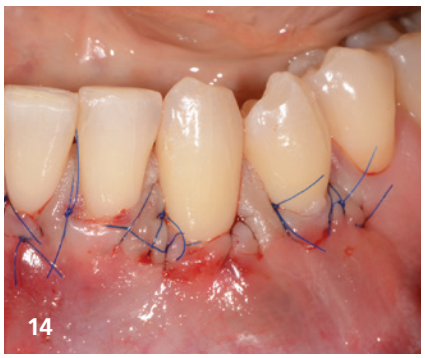


Abb. 10: The graft was introduced into the tunnel and attached to tooth 31 above the recession using sling sutures (case shown in Figs. 1, 4, 5 and 8). – **Abb. 11:** A sufficiently long and wide subepithelial connective-tissue graft supports the papillae and reinforces the buccal soft tissue (case shown in Figs. 2, 6, 7 and 9). – **Abb. 12**: The graft was introduced into the tunnel and secured above the recessions on teeth 32, 33 and 44 using sling sutures (case shown in Figs. 2, 6, 7, 9 and 11)**.** – **Abb. 13:** Tension-free lateral closure of the recession and graft on tooth 31 (case shown in Figs. 1, 4, 5, 8 and 10). – **Abb. 14:** Tension-free coverage of the recessions and graft on teeth 32, 33 and 44 using sling sutures (case shown in Figs. 2, 6, 7, 9, 11 and 12) – **Abb. 15:** Tension-free coverage of the recessions and graft on teeth 13, 14 and 15 using sling sutures (case shown in Fig. 3). – **Abb. 16:** One year after treatment, good root coverage and optimal shade and thickness were evident (cf. the preoperative situation in Fig. 1). – **Abb. 17:** Clinical outcome one year after treatment of the recessions shown in Fig. 2. Excellent root coverage and a natural shade and thickness was achieved. – **Abb. 18:** Clinical outcome five years after treatment of the recessions shown in Fig. 3. Stable and complete long-term root coverage with a natural shade was achieved.

underlying graft, improving wound healing and the clinical outcome. Eliminating vertical incisions improves the blood flow to the surgical area for scarless healing and optimal aesthetic results. Notwithstanding the absence of vertical relief incisions, MCAT can result in complete and tension-free mobilization of the flap and complete coverage of the recessions. Long-term stability is best ensured by providing a subepithelial connective-tissue graft or a collagen-based soft-tissue substitute to reinforce the flap and to protect the underlying blood coagulum (Cosgarea et al., 2020; Sculean, 2018).

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