Clinical Case Reports

CASE REPORT

A novel suturing approach for tissue displacement within minimally invasive periodontal plastic surgery

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Key Clinical Message

This paper describes a novel suturing approach that achieves harmonious and atraumatic soft tissue displacement in periodontal plastic surgery and soft tissue management around implants. The technique relies on a combination of horizontal and vertical mattress that are anchored at the splinted incisal contact points.

Keywords

mini-invasive surgery, micro-surgery, periodontal plastic surgery, tunnel, connective tissue graft, suture technique.

Introduction

Over the years, periodontal plastic surgery procedures have gradually evolved through constant refinements of flap and suture designs, leading to greater esthetic outcomes. One of the most important developments in terms of flap design was the mini-invasive tunneling technique [1–3]. Suture designs have also undergone substantial changes in parallel with this.

Sutures allow for wound adaption, as well as tissue displacement and stabilization during the healing process [4, 5]. Historically, vertical traction has been difficult to achieve with conventional interrupted sutures, leading to the subsequent introduction of "suspended" sutures, also referred as "anchored" sutures. Suspended sutures surround an immobile anchor point to bring the flap into its correct position and secure it. The anchor point may be the circumference of the tooth, the palatal mucosa, an orthodontic bracket placed on the buccal aspect of the tooth, or an interdental contact point. In scientific dental literature, the most frequently described suspended sutures are modified vertical mattress sutures localized in the papillae area.

Recessions can present different shapes related to their wideness and symmetry. In cases of wide and/or asymmetric recessions, vertical mattress sutures in combination with the tunneling technique fail to ensure proper soft tissue harmonization around the cemento-enamel junction, especially in the central region of the teeth. In this situation, complementary stitches become necessary.

The present case series describes a combination of suspended sutures and assesses their efficiency in terms of soft tissue coronal positioning and display as well as their influence on wound compression.

Clinical Considerations

Preparation of the surgical site

Preoperatively, interdental contact points are temporarily splinted with a light-curing flow resin to enable suspension of the sutures (N'Durance Dimer Flow; Septodont, Saint-Maur-des-Fossés, France). Etching and bonding are not necessary due to the existing undercuts in the interproximal areas. Following anesthesia, the roots are decontaminated using an ultrasonic scaler. A tunnelization procedure is then performed in a partial thickness manner [1–3] with specialized micro-surgical instruments (TKN 1, TKN 2, K012KP03A6, PH26M; Hu-Friedy Mfg. Co. Ltd., Chicago, IL). This preparation aids coronal advancement of the buccal gingivo-papillary complex and its repositioning along

the cemento-enamel junction without tension. If deemed necessary for biotype thickening, a connective tissue graft may be harvested from the palate and inserted into the tunnel prior to suturing. In the procedures described here, the suture material used is Polypropylene (Perma Sharp; Hu-Friedy Mfg. Co. Ltd., Chicago, IL), diameter 6.0 or 7.0 according to the thickness of the biotype.

Modified anchored vertical mattress

Anchored vertical mattress sutures are placed in the papillary region of every tooth benefiting from the tunneling preparation. The needle is inserted buccally through the flap (and the graft if present) adjacent but not apical to the mucogingival junction (Fig. 1). The needle reappears approximately 1 mm apically to the tip of the papillae. The needle is then recaptured, slid underneath the contact point to reappear at the lingual side and wrapped around the splinted contact point. The knot is tied on the buccal aspect of the suture with gentle pressure, allowing displacement of the gingivo-papillary complex. The procedure is repeated for each interdental area to stabilize the buccal tissues.

Modified anchored horizontal mattress

After completion of all vertical sutures, horizontal sutures are performed in order to complete the buccal gingivo-papillary complex display. The adjustment of these sutures varies depending on the axis of the recession.

In case of wide symmetric recession, the needle is inserted through the flap (and the graft if present) 1–2 mm apical to the flap margin at the distal root line, and reappears 1–2 mm apical to the flap margin at the mesial root line (Fig. 2A). The needle is then recaptured, guided palatally over the splinted contact point, and slid from the palatal to the buccal region into the embrasure. The needle is recaptured buccally, passed in front of the buccal aspect of the crown, and inserted into the distal embrasure underneath the contact point. The needle is once again recaptured and passed over the contact point to reappear buccally. The knot is tied until the desired tissue displacement is reached.

In the case of asymmetric recession, the suture is laid out on both sides of the gingival recession axis (Fig. 2B); thereafter, the same procedure is followed. This design helps to compensate recession asymmetry.

Protection of the surgical site, postoperative recommendations, and medications

No periodontal dressing is used to protect the operating site. Patients are instructed to consume soft food and
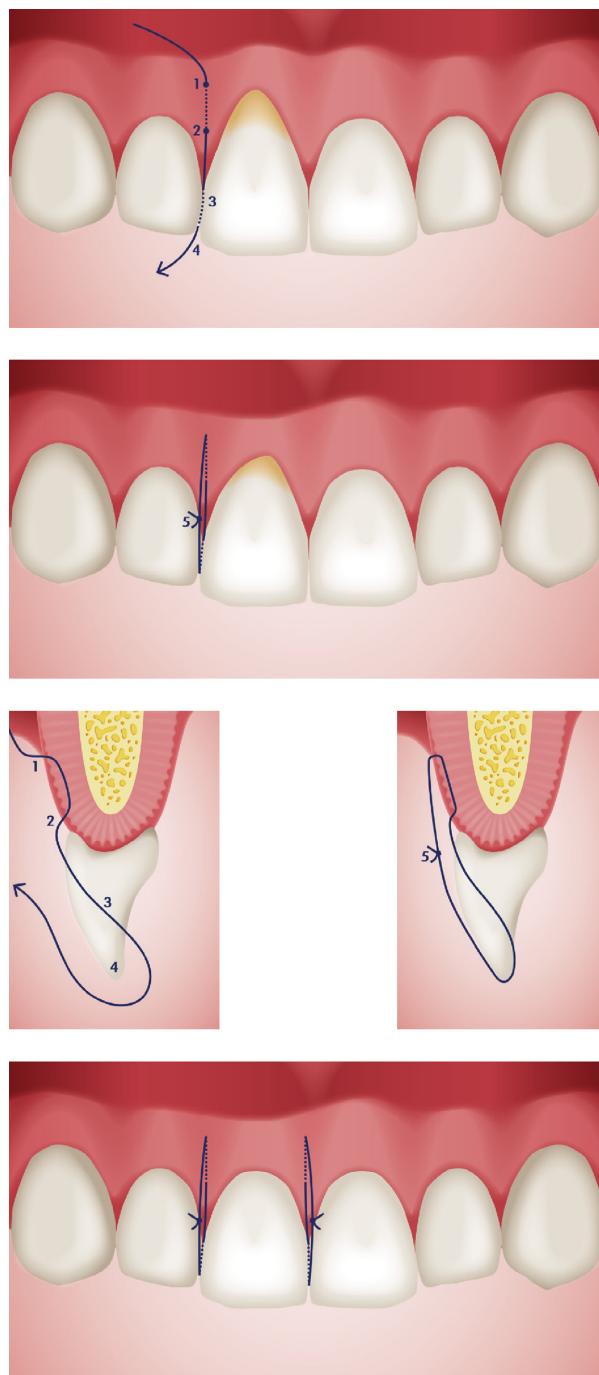

Figure 1. Modified vertical mattress sutures.

avoid brushing the operated area during the first postoperative week. Cleaning is ensured by mouthwash and local antiseptic gel with chlorhexidine (Eludril and Elugel; Pierre Fabre, Boulogne-Billancourt, France). Sutures are removed after 7 days, after which brushing is allowed using an extra soft brush (Inava 7/100; Pierre Fabre SA,
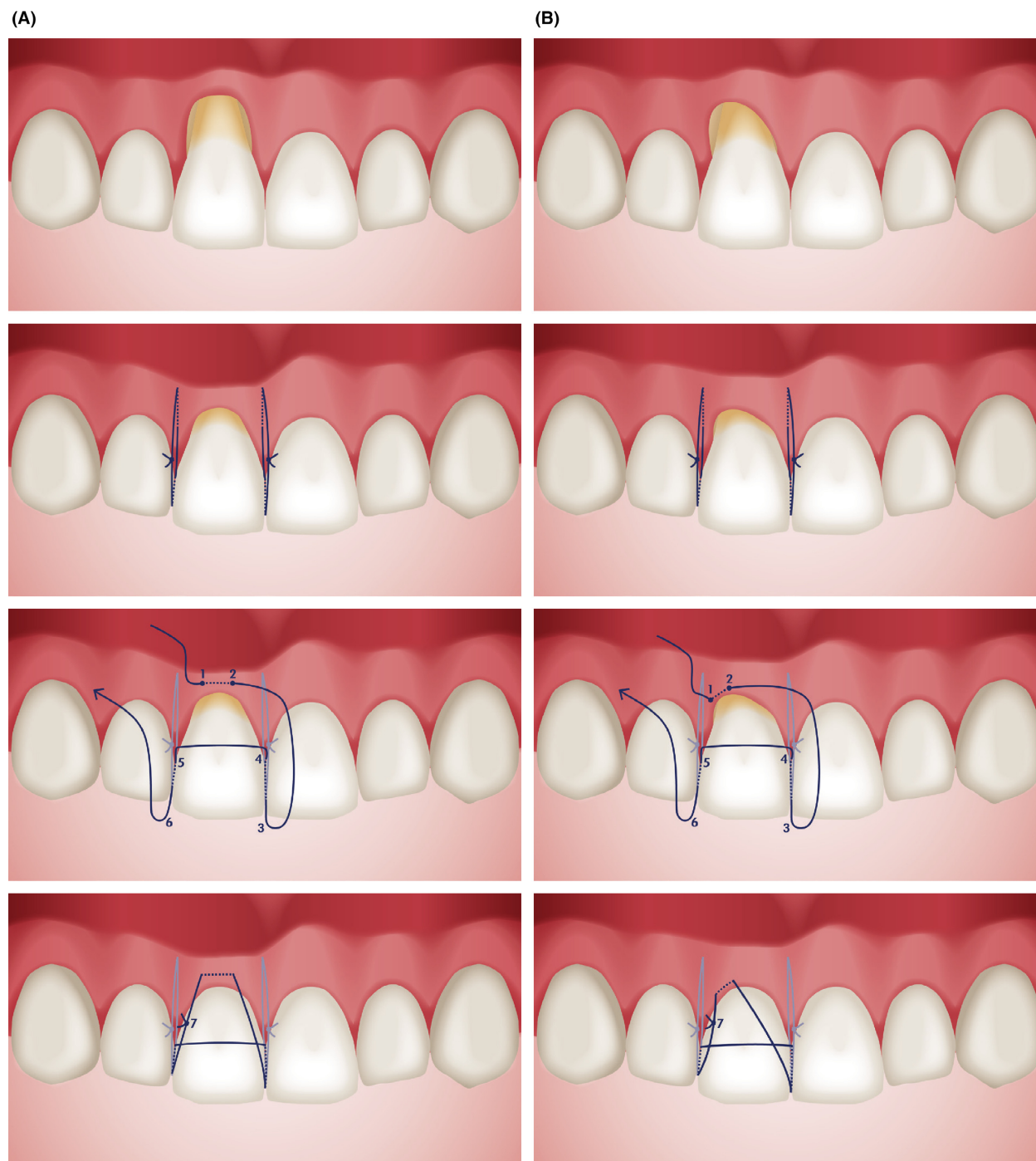
(A)   **(B)**

Figure 2. (A) Modified horizontal mattress sutures (for wide symmetric recession defects). (B) Modified horizontal mattress sutures (for asymmetric recession defects).

Castres, France) before resuming normal hygiene after 2 weeks. An antibiotic (Amoxicillin, 2 g/day) is administered for 7 days. For patient comfort, corticosteroid (Methylprednisolone, 16 mg/day) and analgesic (paracetamol) medications are included in the prescription for 4 days.

Clinical case 1

Preoperatively, this patient complained of tooth sensitivity and impaired esthetics as a result of Miller class I recession defects. Because of the thick gingival biotype and sufficient keratinized tissue height, we decided to cover

the roots by *coronal translation*, that is, a tunnel preparation was performed to release and displace the buccal gingivo-papillary complex (Fig. 3). The recessions were wide and symmetric at the upper canines, shallow and asymmetric at the upper central incisors, and shallow and symmetric at the upper left lateral incisor.

Postoperatively, each involved tooth benefited from suspended vertical mattress sutures (6.0 polypropylene sutures). Modified horizontal mattress were added at the upper canines to compensate wideness (green arrows) and at the upper central incisors to compensate asymmetry (blue arrows), as illustrated in Fig. 4.

One week following suture removal, favorable soft tissue relocation and integrity could clearly be observed (Fig. 5).

Clinical case 2

Preoperatively, this female patient complained about the impaired esthetic aspect of her smile. She presented with several Miller class I recession defects with resin reconstructions at the upper right canine and at both upper left incisors and upper left canine. We decided to surgically cover the roots and align the gingival collars (Fig. 6).

At the beginning of treatment, resin material was removed from the roots for biocompatibility reasons. This was followed by sculpting of a cemento-enamel-like line

within the resin before polishing (Fig. 7). A tunnel preparation was then performed to allow the release and displacement of the buccal gingivo-papillary complex from the upper right canine to the upper right canine without any visible incision (Fig. 8). Connective tissue grafts were harvested from the palate and trimmed to compensate for root concavities at upper left central incisor and canine (Fig. 9).

Each involved tooth received modified vertical mattress suturing (6.0 polypropylene sutures). Modified horizontal mattress sutures were also added to compensate for recession wideness (green arrows in Fig. 10) at the upper right canine and upper left lateral incisor and canine and asymmetry (blue arrow in Fig. 10) at the upper left central

Figure 5. Case 1 – Clinical view 1 week after suture removal.

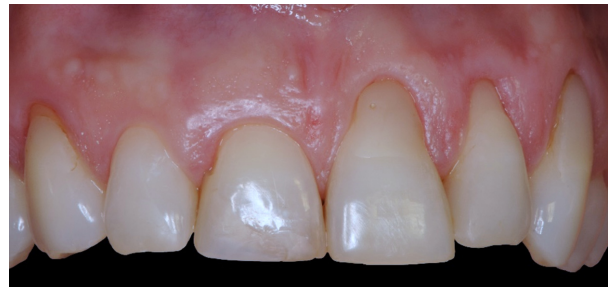**Figure 3.** Case 1 – Preoperative situation showing several Miller class I recession defects.

Figure 6. Case 2 – Preoperative situation showing several Miller class I recession defects with resin reconstructions.

Figure 4. Case 1 – Postoperative situation.

Figure 7. Case 2 – Sculpting of a cemento-enamel-like line after resin material removal from the roots.

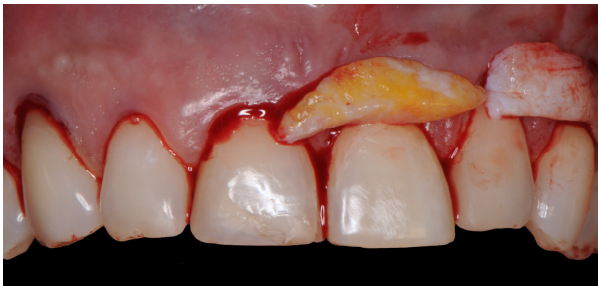**Figure 8.** Case 2 – Tunnel preparation.

Figure 9. Case 2 – Connective tissue grafts.

Figure 10. Case 2 – Postoperative situation.

incisor. Since the remaining gingiva was <2 mm prior to surgery, connective tissue graft was partially exposed to create new keratinized tissue at the upper left canine, whereas the connective tissue was fully covered at the upper left central incisor.

One week postoperatively, favorable soft tissue relocation and integrity could clearly be observed (Fig. 11).

Clinical case 3

This patient presented with a thin gingival biotype, and the lateral left incisor was to be extracted due to a recent root fracture (Fig. 12 left). The upper left central incisor was carefully extracted with periotomes (Fig. 12 center) and a connective tissue graft was inserted buccally into a partial thickness pocket (Fig. 12 right).Sutures used were 7.0 polypropylene due to the thin buccal fibromucosa.

Figure 11. Case 2 – Clinical view at 1 week.

We decided to place an implant immediately (Nobel Active; Nobel Biocare, Zürich, Switzerland) (Fig. 13 left), with a temporary abutment (Fig. 13 center) and a temporary resin cemented crown (Fig. 13 right).

Modified suspended horizontal mattress sutures were used to complete the buccal soft tissue display. Figure 14 illustrates frontal (left) and occlusal (right) views. Postoperative healing at 1 week can be seen in Fig. 15.

Discussion and Conclusions

Sutures are one of the key components of success in periodontal plastic surgery. During the healing process, they allow intimate contact between the operated tissues, proper wound stabilization for rapid primary healing, traction for coronal repositioning, and harmonious gingival tissue display [6–8]. The selection of the suture type and its distribution along the surgical site are therefore vitally important. The anchored suture approach described here meets these expectations and is suitable for a wide variety of challenging clinical situations where treatment with tunnel flap preparation may be indicated, including wide and asymmetric recession defects. This approach may also be considered suitable for soft tissue management around dental implants.

Within the weeks following a periodontal surgical procedure, the healing process induces a significant contraction of the soft tissues. The usual recommended approach is to over-cover recessions when complete coverage is triggered, with the gingiva surgically placed at least 1 mm coronally to the cemento-enamel junction. Over-covering can improve the chance of reaching complete root coverage after completion of the healing phase [9]. Throughout the postoperative period, the buccal tissues will naturally relocate to the cemento-enamel junction [9–11] since gingiva does not have the capability to adhere to the enamel. Consequently, it seems to be crucial that the suture system allows for optimal coronal traction of the gingivo-papillary complex. By surrounding a fixed anchor point, suspended sutures bring the flap to the desired

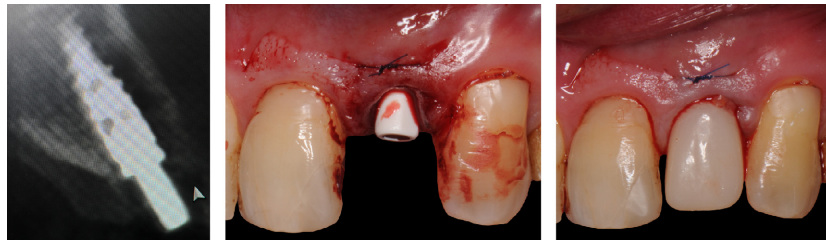**Figure 12.** Case 3 – Preoperative situation illustrating.

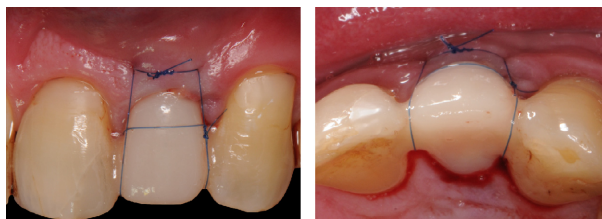**Figure 13.** Case 3 – Immediate implant placement.

Figure 14. Case 3 – Frontal (left) and occlusal (right) view showing the modified suspended horizontal mattress sutures.

Figure 15. Case 3 – Postoperative healing at 1 week.

location and secure it there [12]. As interdental contact points are located coronally to the root surface, the suture combination described here allows for an optimal coronal repositioning.

In situations with wide or asymmetric recessions, tunneling procedures associated with vertical mattress sutures localized in the papillae region fail to provide sufficient tissue displacement at the tip of the recession [13]. The anchored horizontal mattress suture presented in this article provides additional vertical traction and harmonious display of the gingiva, recreating the round anatomy of the gingiva all along the cemento-enamel junction.

Gentle flap compression onto the deep planes (dental root and periosteum) enhances intimate contact between the affected tissues. This results in improved wound stability, reduction of blood clot thickness, and subsequently faster vascular anastomosis. Dental contact points are not only located coronally but also palatally to the surgical site. This anatomical position ensures vertical traction of the gingivo-papillary complex, as well as gentle flap compression. The suspended suture combination described here benefits from this. Extra compression, which may be required in some clinical cases, can be achieved by the double-crossed suture [8]. However, such techniques should be used with care for the thinnest papilla and biotypes since the sutures pass twice through the papilla.

A large number of sutures is usually considered undesirable in mucogingival surgery because sutures are considered to be a source of trauma. However, we wish to emphasize that the impairment for soft tissues is not only related to the number of sutures. The tension applied to the sutures, the diameter of the slings, and the contact area between the slings and the soft tissues are more likely to be the determining factors. Indeed, application of excessive forces, large diameter slings, and lining sling can result in soft tissue tearing and/or ischemia of the flap. In contrast, the technique described here spreads tension evenly over all microsutures (diameter 6.0 or 7.0) and avoids harmful contact between the slings and the soft tissues because of suspension. Tissue integrity is therefore respected and vascular collapse is avoided. These observations are in concordance with Burkhardt and Lang [14], who demonstrated the importance of suture management on vascularization and healing.

Scar formation can be related to iatrogenic suturing. The importance of using both a refined suture material and an appropriate suturing technique should therefore be emphasized [8, 14]. With particular respect to tissue integrity preservation, 6.0 or 7.0 polypropylene monofilament anchored sutures seem to be particularly effective. Anchorage at the tooth contact point drastically reduces mechanical contact between the sling and the tissues. In addition, the characteristics of polypropylene monofilament are such that the tissue heals over the sutures leaving very little visible evidence, even immediately after suture removal [15–17]. After suture removal, there remains little or no evidence of visible cleft [18]. However, follow-up control visits remain necessary to assess whether any abnormal soft tissue aspects appear in the long term.

In conclusion, the combination of sutures in the approach described could be applied in a large variety of challenging clinical situations where tunneling flap preparation is indicated. The technique seems to offer the ability to move, harmonize, and stabilize the gingivo-papillary complex in the desired position along the cemento-enamel junction, while soft tissue integrity and vascular potential are preserved. An extended follow-up would be ideal to assess the long-term stability of the repositioned soft tissues and comparison with the already published suturing techniques.

Conflict of Interest

None declared.

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