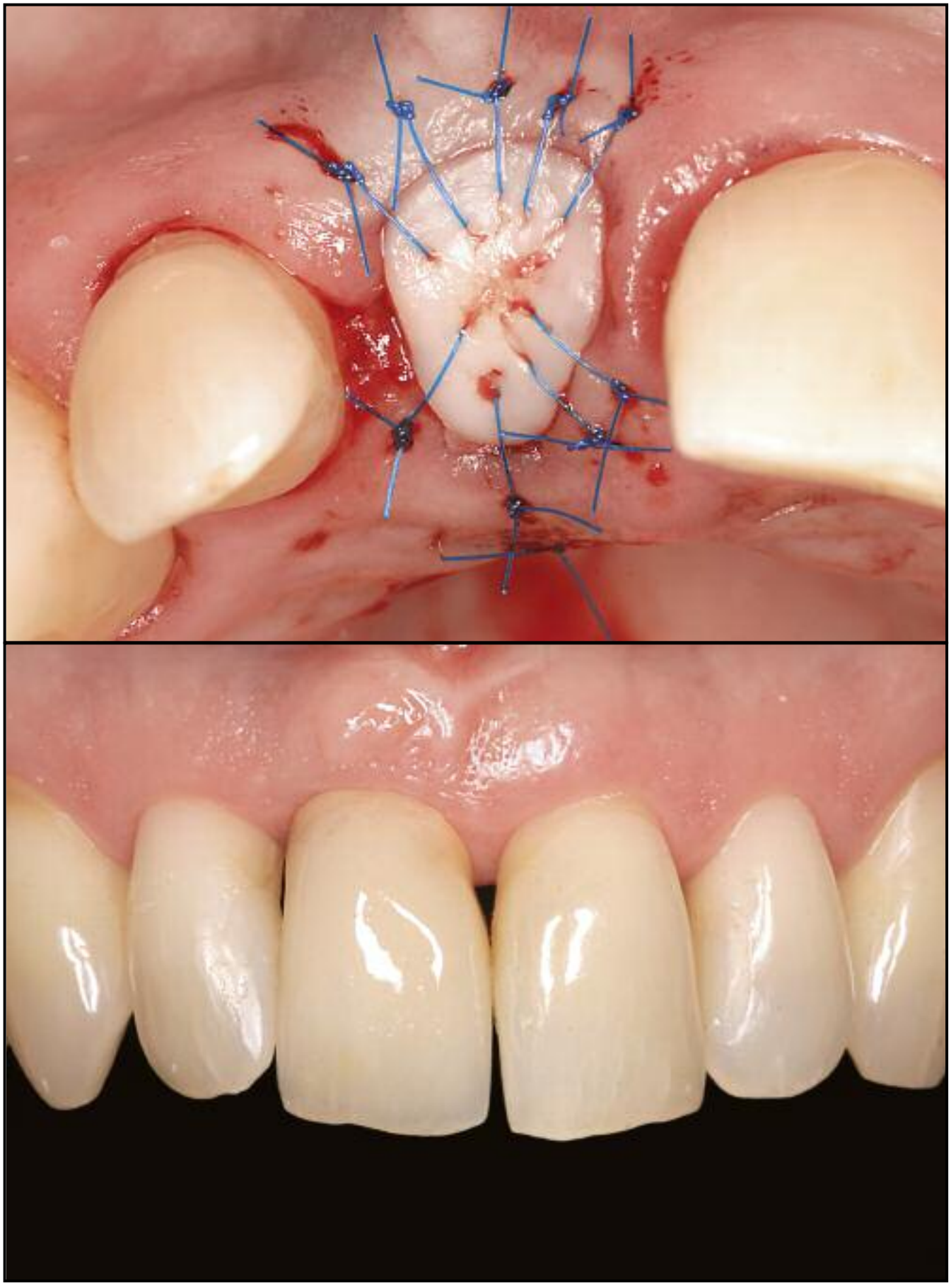

Use of a Combination Epithelized-Subepithelial Connective Tissue Graft for Closure and Soft Tissue Augmentation of an Extraction Site Following Ridge Preservation or Implant Placement: Description of a Technique

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An esthetic implant-supported rehabilitation continues to be a major challenge in patients with a thin periodontium. Ridge preservation and immediate implant placement are intended to preserve the hard tissue volume and prevent preimplant bone loss following tooth extraction. Since these techniques are almost always combined with bone grafting, primary wound closure is indispensable. Therefore, a technique for reliable wound closure was developed. This technique employs a combined epithelized-subepithelial connective tissue graft, leaves the mucogingival line in its place, and has the added advantage of thickening the buccal soft tissue with the resultant local conversion of a thin marginal gingiva to a thick marginal gingiva. (Int J Periodontics Restorative Dent 2010;30:375–381.)

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Implant dentistry has recently seen a paradigm shift, with the focus on esthetics rather than on function alone. As a result, replacing single or multiple teeth in an esthetically sensitive region has become a major challenge. Tooth extraction or tooth loss is often followed by facial soft and hard tissue resorption.[1,2] This may eventually lead to gingival recession around subsequently placed implants.[3,4] Gingival conversion of a thin periodontal phenotype A_1[5,6] into a stable gingival phenotype B[5–7] is key for successful esthetic implant therapy. That means localized thickening of the facial gingiva by keeping the genetic phenotype.[8] Both for immediate implant placement[9–11] and for ridge preservation,[12–15] the host bone and the gingival soft tissue should be protected and stable. To do so, primary wound closure of extraction sockets is required.[16]

Coronally advanced flaps[17] are one option for primary soft tissue closure over extraction sites. But since they shift the mucogingival junction coronally with resultant esthetic

Fig 1 (above) *Dark discoloration of the maxillary right central incisor resulting from an injury and endodontic treatment 38 years ago.*

Fig 2 (right) *Pretreatment radiograph of the maxillary right central incisor. Note the clearly defined granuloma.*

impairment, they should not be used in esthetically sensitive areas.

Palatal pedicle flaps[14,18,19] are an alternative for primary wound closure following extractions in the maxilla. But since the palate receives its blood supply from the posterior through the palatal artery and the flaps are pedicled anteriorly and have to be rotated 90 degrees, blood flow is severely compromised.[7] Thus, these palatal pedicle flaps are hardly any better supplied than free connective tissue grafts. In addition, the technique for raising palatal pedicle flaps is much more demanding than harvesting for free grafts. Thus, a free graft technique is the more desirable option.

Free gingival grafts have been used to cover extraction sockets since 1994.[20,21] The problem with these grafts, however, is that their blood supply depends on the gingival wall of the socket and the subjacent blood clot.[22] Similar to Landsberg and Bichacho,[21] the authors found this technique to have a very high failure rate. In addition, free gingival grafts do not thicken and thus stabilize the facial soft tissue. Together with the high failure rate, the high resorption of the upper parts[23] of onlay grafts—including free gingival grafts—prompted the development of a combination onlay-interpositional graft procedure.[24] These combination grafts were used for augmenting edentulous ridges and proved to be much less prone to resorption because of a better blood supply.

For these reasons, the authors applied the rationale of the onlay-interpositional graft procedure to a graft technique for covering an extraction socket for alveolar ridge preservation. This technique, originally used in a single-pouch and later in a double-pouch design, was developed for closing extraction sockets, and the combination graft was found to be less fragile than onlay grafts. This is attributable to the improved blood supply by the two inlay components. In addition, the facial connective tissue portion was seen to thicken the facial soft tissue, with the resultant local conversion of a thin gingival morphotype A into a thick type B, which is key for an esthetically attractive implant-supported rehabilitation.[3] However, changing the genetic periodontal phenotype, based on sulcus depth, tooth form, and the length and width ratio of the teeth, is not possible naturally.[8]

The following case report details the surgical procedure step-by-step.

Method and materials

A healthy 56-year-old man sustained an injury to the maxillary right central incisor while playing football 38 years prior to his initial visit. At that time, he underwent endodontic treatment (Fig 1). On July 4, 2006, examination of the patient revealed an internal granuloma (Fig 2). On May 31, 2007, the patient presented with a transverse tooth fracture.

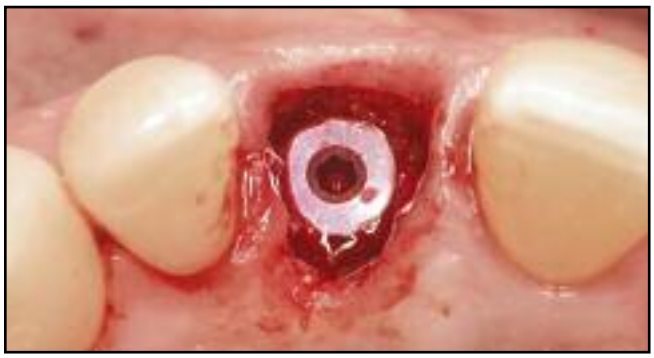

Fig 3 *The implant was placed and circular augmentation was performed with an autogenous bone–Bio-Oss mixture.*

Figs 4a and 4b (left) *Labial and* (right) *palatal tunnels were dissected, with care taken to leave the periosteum attached to the bone to prevent resorption.*

Extraction and implant placement

Under systemic antibiotic coverage, the maxillary right central incisor was extracted as atraumatically as possible and the socket was debrided of all inflammatory and granulation tissue with a curette. The remaining sulcular epithelium was removed from the soft tissue margin. This was followed by exploration of the bony extraction socket. Since the socket proved to be intact, an implant (Camlog Screwline Promote Plus; 4.3 mm in diameter, 13 mm in length) was placed immediately. The space between the implant and the alveolar bone was packed with a 50:50 mix of autogenous bone from the right retromolar region and Bio-Oss (Geistlich; particle sizes of 0.25 to 1.00 mm) (Fig 3).

Graft site preparation

After immediate implant placement and bone augmentation, a supraperiosteal tunnel was made labial and palatal to the socket (Fig 4). These tunnels, used to accommodate the connective tissue portions, were dissected sharply with a 15c blade (Swann Morton). Care was taken to leave the periosteum attached to the bone during dissection. Then, the mesiodistal

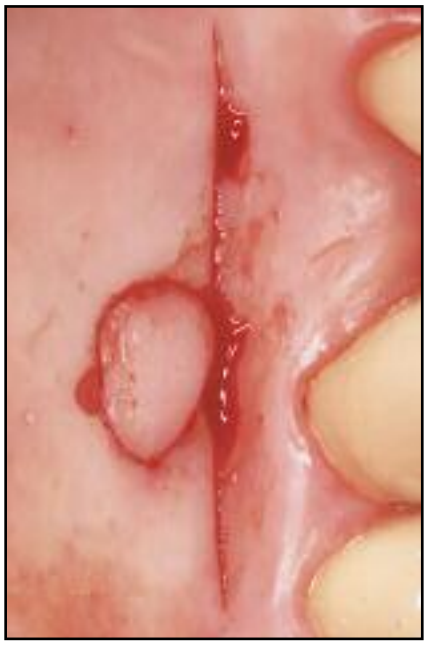

Fig 5 *The crestal area of the extraction site was outlined with a blade at a depth of about 1 mm for the epithelized graft portion and incisions were made to access the labial and palatal subepithelial connective tissue portions.*

Fig 6 *The subepithelial connective tissue portions were outlined with a blade.*

Fig 7 *The combination epithelized-subepithelial connective tissue graft was harvested by elevating another supra-periosteal split flap.*

and vestibulo-oral extents of the socket opening were measured using a periodontal probe.

Graft harvesting and placement

The epithelized-subepithelial connective tissue graft was harvested from the hard palate in the left first premolar to the second molar region, leaving the palatal rugae alone. First, the crestal area of the extraction socket was transferred to the hard palate and outlined. Then, a 1-mm-deep incision was made perpendicular to the palatal surface for outlining the epithelized component of the graft with a blade. This was followed by 1-mm-deep mesial and distal horizontal relieving incisions to provide access to the subepithelial connective tissue portions (Fig 5). Through these relieving incisions, a split flap was raised toward the midline. Then, the anterior and posterior subepithelial tissue components were outlined with a blade using an incision straight through to the bone (Fig 6) so that the combination epithelized-subepithelial connective tissue graft could be harvested without the periosteum with another split flap parallel to the palatal bone (Fig 7). The donor site was sutured with a transverse row of single sutures (Trofilene 6-0, Stoma). To approximate the gaping margins and improve wound healing, a crossed horizontal mattress suture was used over the open wound left by the epithelized graft component.

The labial connective tissue component was then introduced into the labial tunnel of the extraction site. This was done by placing a suture at the apical end of the tunnel from the outside in and leading it out of the tunnel at the crestal end. Then, the connective tissue component was picked up with a horizontal mattress suture. The thread was carried back through the tunnel from the crestal to the apical portion and exited at the apical end. By pulling at the ends of the thread, the clinician completed the mattress suture and

Fig 8 *Subepithelial connective tissue portion inserted labially and secured with horizontal mattress suturing.*

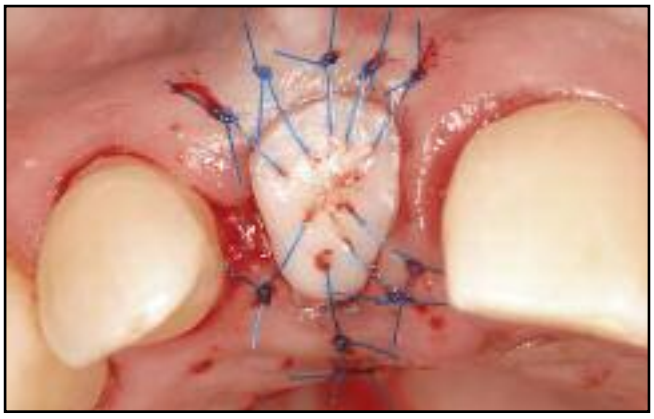

Fig 9 *Wound margins were adapted with single sutures to stabilize the graft.*

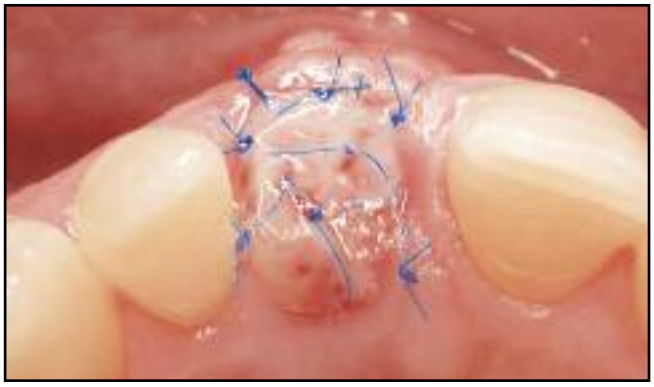

Fig 10 *The graft 8 days postoperative. Note the capillary ingrowth and adequate graft flow deep to the sloughed epithelium.*

Fig 11 *The graft 14 days postoperative. Note the re-epithelialization of half of the graft and uneventful graft healing.*

pulled the graft into the tunnel. The knot came to lie in the labial vestibulum (Fig 8). This suturing technique was also used for pulling through and securing the subepithelial connective tissue component of the combination graft on the palatal side. To complete the procedure, the sulcular margins and the epithelized component of the combination graft were adapted and secured with interrupted sutures (Fig 9). Monophilic 6-0 suture material (Trofilene) was used throughout.

The patient was provided with a removable denture. It was important that no pressure from the denture was placed on the graft. To facilitate wound healing, the donor site was covered with a palatal stent (Erkodent 1.5 mm, Erkodent) for 3 days.

Results

Wound healing was uneventful. The single sutures on the palatal donor site and along the epithelized graft portion were removed on day 8; the mattress sutures on the palate and the fixation of the subepithelial portions of the graft were removed on day 14. While there was some superficial epithelial sloughing (Fig 10), early capillary ingrowth from the two connective tissue components apparently produced adequate blood flow in the graft. At 2 weeks, half of the exposed portion of the graft was re-epithelialized (Fig 11). At 4 weeks postoperative, a normal appearance was restored without any sign of inflamation (Fig 12).

Fig 12 *The graft 4 weeks postoperative. Note the optimal graft healing, tight peri-implant and perigraft seal, and volume maintenance.*

Fig 13 *The definitive all-ceramic abutment and crown was delivered.*

Five months were allowed for the implant to fully integrate. Then, the implant was uncovered with a modified Abrams roll technique to thicken the labial soft tissue.[25,26] The implant was first restored with a provisional crown for soft tissue contouring and healing. The definitive restoration was fabricated 12 months later with an all-ceramic abutment and crown (Fig 13).

Discussion

Between April 2006 and January 2009, the authors performed 58 combination epithelized-subepithelial connective tissue grafts. In only one patient, in whom ridge preservation was performed on a maxillary right lateral incisor, was there a soft tissue dehiscence and secondary wound healing. In this patient, simultaneous covering of recessions from the maxillary right to left first premolars was performed using a tunnel technique. This additional procedure may have compromised the blood supply and caused partial loss of the graft. Each of the other 57 grafts integrated completely by primary wound healing.

In all patients, the epithelized portion of the graft was maintained a little wider in the mesiodistal dimension than the crestal area of the extraction socket. By doing so, the mesial and distal papillae were elevated.

The advantage of the combination epithelized-subepithelial connective tissue graft in comparison to a simple connective tissue graft placed in the same manner is that the epithelized portion enhances the seal and protects the underlying connective tissue portion that is protecting the implant or bone graft. However, the combination graft donor site shows more morbidity than a simple connective tissue graft donor site because of the secondary wound healing required in the open wound area.

The combination epithelized-subepithelial connective tissue graft provided a tight primary seal for the wounds resulting from immediate implant placement and bone augmentation without displacing the mucogingival junction. This is key for uneventful bone graft healing. Thickening of the labial soft tissue proved to be an added advantage. The resultant optimal three-dimensional volume maintenance facilitates esthetic implant-supported restorations. The technique is also useful for ridge preservation.

In the future, epithelized-subepithelial combination grafts may obviate coronal advancement techniques for closing other defect sites created by tooth extraction, such as oroantral communication, thereby preventing vestibular flattening.

Conclusions

Based on the placement of 58 epithelized-subepithelial connective tissue grafts, the following conclusions can be drawn:

- Reliable primary wound closure was provided after ridge preservation or immediate implant placement.
- The papillae of the neighboring teeth were supported.
- Displacement of the mucogingival junction was prevented.
- The labial and crestal soft tissue was thickened.
- Survival of the onlay component of the graft was ensured.

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