



ring technique

Part 2: Preoperative soft tissue management prior to vertical augmentation with autogenous bone rings

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The transplantation procedure for bone rings, developed by Dr Bernhard Giesenhagen in 2004, makes it possible to augment the bone and place implants in one session. The procedure is vividly and comprehensibly presented in a multi-part series of articles based on different cases. In the first part (see iDENTity 1/2010, pages 8 to 13) the removal of the bone ring was explained step by step. The article also discussed the prerequisites needed for the restoration of a patient's functionality and esthetics using the ring technique and achieving a stable long term result. This second part deals with soft tissue management before applying the ring technique. The focus is thus on the incision direction and the suture technique during the procedure.

INTRODUCTION

The surgical management of peri-implant soft tissue should not be underestimated. On the contrary: on one hand, bone-augmenting measures provoke an increase in volume in the grafted area. On the other hand, establishing a stable peri-implant soft tissue contour around the implant contributes

to the long-term success of the augmentation and thus to treatment predictability. This is crucial, especially in the esthetically sensitive anterior region. For this reason, we always perform surgical procedures – particularly on soft tissue – with magnifying glasses. The following esthetically extremely delicate case impressively demonstrates the entire indication spectrum and the potential of the ring technique.

THE INITIAL SITUATION

The patient, a female aged 40, had received an implant placed alio loco in region 21 as a single denture (Fig. 1). The failure was obvious and the patient's wish clear: recovery of function and front tooth esthetics. From the outset, the clinical inspection showed that an explantation and reconstructive measures would become necessary due to the unfavorable implant position and the extended soft tissue defect. Autogenous material – if available – is always the first choice for re-establishing bone and soft tissues.

Teeth 11, 12 and 22 were crowned. A bridge to replace tooth 21 was not applicable for several reasons: removing the implant



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without grafting procedures would cause a strong vertical and horizontal defect. This bone resorption would even aggravate the pre-existing recessions of the marginal gingiva, in turn provoking unfavorable esthetics at the crown's edge. Filling up the bone defect after explantation with substitute material would probably cause the processes outlined to develop somewhat more gently, but recessions would not be ruled out. The vertical defect must be remedied.

The prognosis for the long-term retention of tooth 11 in the bridge group was not favorable (Fig. 7). As such, this was yet another argument in favor of the implant restoration and against a bridge. For these reasons we opted for the augmentation using the ring technique and an implant-supported crown on an Ankylos implant.

The implant was explanted with a trephine drill as carefully as possible so as not to exacerbate the existing damage. Both, a vertical and horizontal augmentation were indicated due to the considerable hard and soft tissue defect (Fig. 2). We planned to use a suitable bone ring for this. In this difficult case, peri-implant soft tissue esthetics were particularly important. The goal of the reconstruction, respectively the maintenance of the mucosa, was also to rebuild the papillae between the implant and the adjacent teeth.

PRE-TRANSPLANT MEASURES AND SUTURE TECHNIQUE

A sufficient soft tissue dimension had to be created as a prerequisite for durable soft tissue management. As preparation for the augmentation it also had to be taken into account that the

bone augmentation would cause an increase in volume in the grafted area. In the first step the epithelial layer of the gingiva was removed with a diamond bur at the explantation point freshening the edges of the wound (Fig. 3). To prevent the edges of the soft tissue from collapsing, the defect was lined with a collagen sponge.

A free connective tissue transplant from the palatal mucosa was used to cover the defect. It had been sized according to the dimensions of the defect with a scalpel and mucosa scissors (Fig. 4). The more perfectly tailored a free transplant is, the better it is nourished. The transplant must be sutured marginally (Fig. 5). As the suture technique we recommend single button sutures and using 7-0 of monocryl suture material. It is vital that the sutures are placed with absolutely no tension and that they are not too close to the edge of the wound. A distance of approx. two millimeters has been proven ideal. After just one week, the connective tissue transplant had completely integrated and the threads could be removed (Fig. 6). Another six weeks later, the explantation defect had healed enough for us to perform the intended grafting procedure including implant placement (Fig. 7).

FLAP DESIGN AND INCISION DIRECTION

The choice of flap design is of crucial importance for the esthetic result. On one hand, the area to be grafted must be generously exposed and, on the other, the papillae must be largely preserved. Blood circulation to the flap edges has to be maintained. An absolutely tension-free wound-closure is required to avoid esthetically displeasing scarring. Further-

1_ Initial situation: an implantological failure (alio loco)

2_ Condition after explantation

3_ The epithelium is removed with a diamond bur.

4_ Free mucosa transplant without fat

5_ Free mucosa transplant with single button sutures adapted tension-free

6_ The integrated connective tissue transplant after one week

7_ Healed area after six weeks

8_ Arc-shaped, crestal incision direction close to the papillae



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9_ Mobilizing the flap up to within the mucolabial fold and periosteal slitting

10_ Preparation of a double-layer fold from apical to coronal

11_ The enormous bone defects are now clearly visible.

12_ Fitting the bone ring

13_ The bone ring fixed with a membrane screw

14_ Tension-free wound closure by double-layer technique



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more, a necrosis on the flap edges or a suture dehiscence with ensuing bacterial contamination may ultimately even call the success of the entire treatment into question. An apically slightly arc-shaped flap offers some advantages compared to a conventional trapezoid flap under these conditions. It has a larger surface facilitating a passive adaptation of the flap edges. Furthermore, such an incision is less conspicuous in terms of esthetics. Especially since in the current case, it had to be run through the mucogingival junction line. By placing the cuts diagonally, a larger surface is available for primary wound healing and the risk of scarring is reduced. In addition, this kind of flap shape permits wound closure beyond the grafting area, which, in turn, reduces the risk of bacterial contamination during the healing phase.

First, the grafting area was uncovered with the arc-shaped, vestibular mucoperiosteal flap as described. The incision was made in a crestal direction with vertical relief incisions running closely past the papillae (Fig. 8) and swung apically in a disto-aproximal direction (Fig. 9). The flap was mobilized up to within the mucolabial fold and periosteal slits were made in a lateral and vertical direction. Furthermore, a tubed flap was prepared in a split design along the vertical line as a preliminary (Fig. 10). By debriding the mucosa from the periosteum (split design) one gains soft tissue, which when unrolled – as a pedicle flap – is used to securely compress the mucosa. This is necessary to build up soft tissue after grafting and for suturing the area using the double layer technique. A further factor

influencing soft tissue esthetics can be positively affected by careful surgical management. Peri-implant soft tissue is only nourished via the end branches of the larger periosteal blood vessels and not additionally by means of the periodontal gap. Thus its supply per se is not as good as that of soft tissue surrounding a natural tooth.

GRAFTING AND IMPLANT PLACEMENT

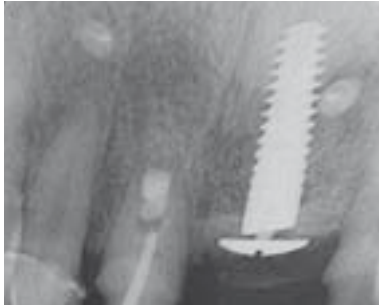
After raising the flap, the overall scale of the defect became apparent (Fig. 11). The buccal lamellae were completely missing and the bone showed heavy vertical atrophy in the palatal direction as well. This made grafting difficult. The defect was eight millimeters in diameter. The bone ring was removed from the chin three millimeters below the root tips (see iDENTity 1/2010). The receptor site was prepared in such a way that the cortical and cancellous bone proportions of the bone ring matched the crestal structures of the adjacent hard tissue (Fig. 12). This is an important requirement for reconstructing interdental papillae and the garland-shaped course of the gingiva. After inserting the Ankylos implant (diameter A, 3.5 mm, length 14 mm), the transplant was immobilized using the membrane screw (Fig. 13). The bone chips collected during preparation and stored in the patient's own blood were used to fill up the basal cavities. The remaining cavities have to be filled up with bone substitute. The entire grafting area was covered with a resorbable collagen membrane and the wound was sutured using the double layer technique (Fig. 14). During this procedure,

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15_ Postoperative radiographic check-up
 16_ Situation after five months and before uncover
 17_ Contoured and stable soft tissue volume
 18_ Irritation-free wound healing of the donor and receptor site
 19_ Solid hard tissue six months after surgery
 20_ Preparation of prosthetic restoration with single crowns –
 Cercon abutment and post-prepared teeth



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the periosteum of the flap is pushed under the palatal mucosa and the mucosa is sutured over it. The final x-ray image shows the successful adaptation of the ring (Fig. 15). A temporary bridge was fabricated for the unrelieved healing phase. The subcrestal placement of Ankylos implants and its tissue-maintaining or tissue-building properties (TissueCare concept) enable the development of esthetically appealing soft tissue conditions with a natural emergence profile (Fig. 16).

UNCOVERY AND RESTORATION

The implant was exposed five months after the implantological procedure. The soft tissue exhibited the desired increase in volume and stability due to the bone construction and the now also correctly positioned implant in terms of “Esthetic Windows” Fig. 17). A temporary Ankylos Balance abutment was used to carry the temporary crown. The incisors had been correspondingly post-prepared and also received temporary single crowns. The success of the treatment began to show after wearing the loaded temporary dentures for just six weeks. Both, the donor and receptor sites had healed without irritation and the soft tissue showed a completely satisfying esthetic result (Fig. 18). Another year after the bone transplant there were no detectable signs of vertical resorption (Fig. 19), which meant that the final restoration on a Cercon Balance Abutment could be made (Fig. 20). All three incisors and the implant received new crowns.

SUMMARY

Flap design and a tension-free wound closure are key to successful soft tissue management after extensive grafting procedures. The rehabilitation and reconstruction of gingival conditions, however, are also subject to implant design. Ankylos offers the best basis for conserving peri-implant tissues. ■



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