ring technique

Part 1: Vertical bone augmentation and immediate insertion

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In the case of advanced atrophy or jaw defects, extensive vertical bone augmentation is often unavoidable to enable patients to be fitted with implants. These implantological procedures are usually two-stage and are very time-consuming for patients. The method of grafting bone rings developed by Bernhard Giesenhagen in 2004 makes it possible to augment the bone and insert implants in one single session. There are virtually no limitations to the indications for applying this technique. Compared with the classic, two-stage augmentation using bone blocks, the bone ring technique shortens the overall treatment time by several months. The method will be clearly and graphically presented in a multiple-part series of articles with the aid of various case studies. In the first part of the series, a case is presented to illustrate the procedure step by step in the anterior maxilla. The conditions required for successful application of the bone ring technique, in terms of achieving a restoration with long-term stability, will also be explained.

THE METHOD AT A GLANCE

First mark the bone ring with a trephine drill (Helmut Zepf Medizintechnik) at a suitable intraoral donor site – in this case the chin area. The central hole of the ring is drilled into the bone before the transplant is harvested. Only after this step, the ring graft should be dissected and harvested with the trephine drill. Insert the detached bone ring into the prepared receptor site. Then prepare the implant site in the local residual bone through the ring opening. Insert the Ankylos implant, at the same time fixing the bone ring. Cavities should be filled with autogenous bone chips or bone regeneration material. Cover the wound with a membrane and carry out primary wound closure. While the grafted bone ring firmly attaches to its surroundings, the implant osseointegrates in the local bone and in the bone ring. After an appropriate healing period, fit a prosthetic restoration onto the implant in the usual way.

THE PROCEDURE STEP BY STEP

The 20-year-old patient had sustained a crown fracture to teeth 11 and 12 in a sports accident (Fig. 1). Both of the roots were extracted, a mucoperiosteal flap was mobilized and the bone situation was exposed (Fig. 2). The bone in region 12 was totally absent on the buccal surface and was actually perforated through to the alveolar cavity.

Compensation of the defects by the ring technique with simultaneous placement of two Ankylos implants (3.5 mm x 14 mm) in region 11 and 12 was planned. The chin was chosen as the donor site. There is usually very good bone quality and adequate volume in this region. Three to five grafts can be obtained between the labial and lingual cortical bone, depending on the anatomical conditions. Bone harvesting from the interforaminal region of the mandible is technically straightforward.

To avoid causing any paresthesia, the following incision direction is recommended in the dentate anterior mandible: horizontal incision 1 to 2 mm below the mucogingival junction from canine to canine because the mental nerve usually has three branches and the mesial branch loops widely in a mesial direction. A vertical relieving incision can be made right in the middle between the two central incisors.

1_The initial situation
2_The situation after raising the flap clarifies the extent of the bone defects.
3_Measuring the diameter of the graft

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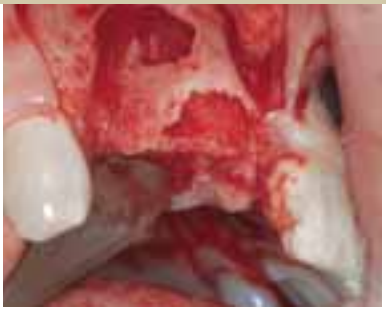

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STEP 1

A trephine drill is first used on the defect to determine the diameter for the ring-shaped graft, which in this case was six millimeters (Fig. 3). The internal diameter selected at the receptor site is one millimeter smaller than the external diameter of the graft. This is the only way to achieve a precise fit ("press fit") of the graft. When choosing the position of the graft it is important to maintain a three millimeter distance from the root apices of the lower incisors and canines and from the edge of the chin.

STEP 2

The trephine drill is used to trace a marking about one millimeter deep into the bone at the planned donor site (Fig. 4 and 5). At seven millimeters, the diameter of the trephine drill is one millimeter larger than the diameter at the receptor site.

STEP 3

The implant site is prepared inside the marked ring according to the drilling protocol using the instruments for the Ankylos system (Fig. 6 to 8). In this respect the ring technique does not differ from the familiar method, even if this is not the eventual insertion site. The internal diameter of the ring is thus precisely matched to the implant diameter. Finally the cortical bone at the donor site is widened with the next largest diameter of shank drill to allow subcrestal placement of the implant (Fig. 9). Caution: During drilling, a sensitive approach is required to avoid perforating the cortical bone on the lingual side (opposing cortical bone). The drill glides through the cancellous bone effortlessly. Tangibly hard resistance is felt when the opposing cortical bone is reached.

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STEP 4

The final core drilling is performed with the trephine drill (Fig. 10). Caution: To avoid overheating, drilling must be performed intermittently at slow speed (max. 200 r.p.m) and with ample cooling. A sensitive approach, as described above, is again absolutely essential to avoid risk-prone vascular defects.

STEP 5

The cancellous base of the ring is detached from the cortical wall of the opposing cortical bone with the "ring knife" (Fig. 11) and lifted out with the "ring breaker" (Fig. 12 to 14). Provided the procedure is carried out with caution and due sensitivity, there is no risk of the ring fracturing because of the very hard cortical cover.

STEP 6

Before preparation of the receptor site to receive the graft, the position of the graft is checked (Fig. 15). Preparation of the ring bed is then performed with the trephine drill (Fig. 16 and 17). The preparation depth should be guided by the bone level of the adjacent teeth. To ensure gap-free fitting of the graft (Fig. 18), it should again be noted that the diameter of the trephine drill is one millimeter smaller (in this case 6 mm), as mentioned above.

STEP 7

Owing to the smaller diameter at the receptor site, press fit ensures that the graft is firmly seated (Fig. 19). This is a prerequisite so that the implant site can be prepared through the ring according to the protocol (Fig. 20). The parallel-walled implant design of the Ankylos system, which has no threads in the implant collar, ensures a perfect fit of the transplant. Furthermore, the bone ring is not rotated at the last threee millimeters when inserting the implant.

4, 5_Tracing the ring on the graft donor site
6, 7, 8_Preparation of the implant site in the graft
9_Final trephine drilling through to the lingual cortical bone
10_Preparation of the final depth of the bone ring
11, 12, 13, 14_Detaching and removing the bone ring
15, 16, 17_Positional check and preparation of the receptor site
17, 18, 19_The implant site is prepared through the ring

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STEP 8

Insertion takes place through the bone ring (Fig. 20), with the Ankylos implant being placed subcrestally (Fig. 21). On insertion, the graft is finally fixed (Fig. 22). It now has optimum circular and basal contact with the surrounding bone. These are the best conditions for uncomplicated healing and osseointegration of the implants.

If the ring is not absolutely stable, it can be fixed with the membrane screw (DENTSPLY Friadent) (Fig. 23). The progressive thread in the apical area guarantees the necessary primary stability in the cancellous bone – even with only two or three threads. As the diameter of the screw head of the membrane screw is larger than the diameter of the implant, the membrane screw causes compression on the ring and fixes it onto the recipient bone with absolute stability. This prevents any loss of volume occurring during the healing phase as a result of adaptation atrophy.

STEP 9

Cavities and exposed thread courses are filled with harvested bone chips (Fig. 24) and covered completely with a thin layer of slowly resorbing or non-resorbable bone regeneration material (Fig. 25). A membrane acting as a barrier fixes the augmentation material and provides additional protection again resorption processes (Fig. 26).

STEP 10

Totally tension-free wound closure is an absolute condition (Fig. 27). It depends on the individual case which suturing technique is used for this. Suturing without tension is essential to avoid dehiscence. Otherwise there is a risk of inflammation which can lead to loss of the graft and hence also the implant. Six months after surgery the radiographic image shows complete bony regeneration (Fig. 28). The soft tissue was also entirely irritation-free at that stage. The final prosthetic restoration can now be started (Fig. 29).

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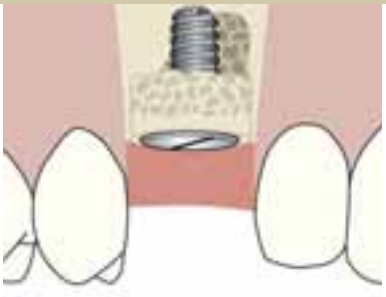

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SUMMARY

If the recommended treatment protocol is followed and the anatomically risk-prone regions are respected, bone grafting and implant placement can be safely performed by the ring technique.

As well as the chin, the palate and the retromolar region may be considered as donor sites for the ring technique.

Harvesting from these regions as well as risks in soft tissue management (incision direction, suturing techniques) will be presented and discussed in the next part of this series. ■

INFORMATION ON EVENTS

For information on courses on the subject of the bone ring technique, please contact your local distributor or visit www.dentsply-friadent.com

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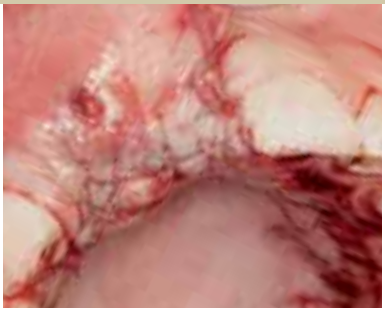
20, 21, 22_Insertion and fixation of the Ankylos implant
23_Fixation with a membrane screw
24, 25, 26_Filling the defect with bone chips and covering with a membrane
27_Tension-free wound closure with interrupted suture
28_Radiographic image six months post-operatively
29_Final prosthetics in place



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