case report

The Implantologic Care of Circumscribed Upper Jaw Defects After Micromesh-Supported Bone Reconstruction

INTRODUCTION Dental implantology has made great progress over the past two decades. A pillar of this progress is marked by the development of various methods to treat the bone bed pre-implantologically so that an implant can be placed where it can be optimally placed from a prosthetic point of view. In the following paper we will expound the results of the various methods of micromesh-supported bone reconstruction that we have been using for years now at our clinic. The procedure is fit both for transverse and vertical bone reconstruction. By applying the prefabricated Q-Mesh the surgery time can be substantially reduced.

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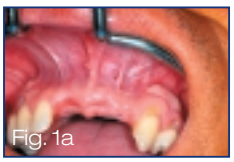
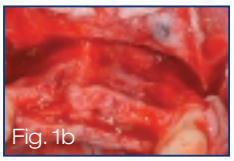


Fig. 1a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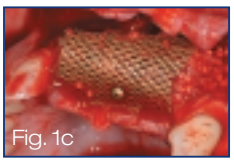
Fig. 1c


Fig. 1d

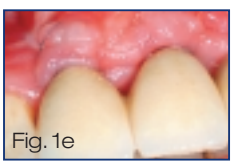
Fig. 1e

Various methods have been developed over the past two decades for the pre-implantologic treatment of circumscribed bone defects.

For dehiscences the width of one or two premolars, the membrane-controlled augmentation[1] is the method of choice for many users. The disadvantage is, on the one hand, that the GBR can correct only the defect in the transverse direction and not vertically.

In addition, when using non-reabsorbable membranes, the premature demarcation of the membrane and the subsequent loss of augmentation were an obstacle to the spreading of this procedure.

Onlay-plasty[2,3] is well documented and has proven to be successful, in particular if the defects have the width of one to three molars. Onlay-plasty not only makes it possible to correct the defect transversally but also vertically, albeit to a minor extent.

An exception is constituted by treatment with a bone graft obtained microsurgically and the following implantation.[4]

Within the framework of the genesis of the distraction, also the use of vertical distraction in treating circumscribed jaw defects has been reported.[5,6]

The application of titanium meshes of various sizes has been used now for more than twenty years with good results in oral maxillo-facial surgery.[7,8,9]

Micromeshes 0.2 mm in size of are applied mainly for treating circumscribed bone defects.[10,11]

Material and methods In the period from 1996 to the end of 2003, 118 patients with circumscribed and total ridge atrophy were treated at the Clinic for Oral Maxillo-Facial Surgery of Karlsruhe with micromesh-supported grafts as a pre-implantologic measure. The age of the 79 patients with a circumscribed defect ranged between 22 and 72 years. Three patients were being treated for diabetes mellitus with an HBc1a value of less than 6.4 as a long-term indicator. All of the other patients were healthy.

The operations were carried out with regional anesthesia. While antibiosis was needed only sporadically for the first patients, starting from 2001 all of the patients have been treated for a week with clindamycin. The antibiosis usually started four hours before the operation.

Two treatment procedures were used:
a) Minor defects

The operation starts by exposing the defect by means of an incision of the ridge running intrasulcularly up to the geometrical equator of the adjacent teeth. From there a trapezoidal cut is made on both sides in the vestibulum and wide-based split flaps are thus obtained. Likewise flaps are cut

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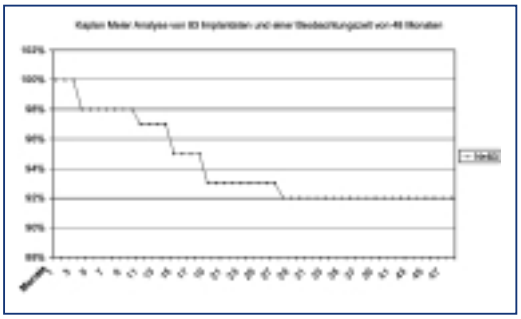

[Table 1]

palatally. Then a corresponding piece of micromesh (Leibinger, Freiburg, or Trinon, Karlsruhe) is cut to measure and then fastened to the palate with one or two screws. Special attention must be paid so that the micromesh is always arranged 2 mm away from the adjacent tooth to avoid an infection of the mesh by means of the palatal cleft. The local bone is refreshened with small perforations; then the overlay is applied and slightly over-contoured. Two or more screws are then applied to fix the mesh to the vestibulum and to press the overlay firmly to its base. After mobilizing the soft parts of the buccal flaps, these are then sewn tension-free and closely. The sutures are removed after 10 days.

b) Major defects

In the case of major defects that have mainly a sinuous configuration, bending the mesh during the operation is quite difficult. In these cases the reconstruction is simulated on the model before surgery, the titanium mesh is bent and, if necessary, stabilized with a laser. Great progress is marked by the prefabricated Q-Mesh titanium mesh by Trinon. This mesh can be adapted to any defect morphology without wasting too much time and in a relatively neat manner.

The application of this prefabricated Q-Mesh, which we use also in the case of total atrophy, substantially reduces the surgery time.

The following surgical procedure is the same as the one described above.

We use autologous bones as overlay; said bones are taken from the protruding ridge and reduced with the bone mill. In addition, we mix bone reconstruction substances under the bone graft in a ratio of 4:1.

In the first ten patients we used "Algipore", a coralline bone reconstruction material, with a thickness of 0.3–0.5 mm by Friadent; in the other patients we used the tricalcium preparation "Cerasorb" on the order of 500–1,000 mB.

5 months after the reconstruction the micromesh was removed and implanted in the same session. This way the dimensions of the overlay were determined both vertically and horizontally (buccally).

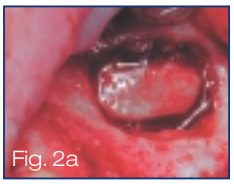
Fig. 2a

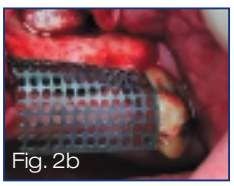
Fig. 2b


Fig. 2c


Fig. 2d

Results Save for four patients, there were no complications in the initial progress of wound healing.

In two patients there was a wound dehiscence in one week's time with an exposed mesh. The infection was cured by means of a local treatment with metronidazole. In two other patients there was extensive wound dehiscence. The mesh had to be removed and most of the overlay was lost. In the further course of treatment, a total of 12 patients registered a circumscribed demarcation of the mesh. These dehiscences were all clinically bland and did not require any further therapy.

In all 77 patients there was a regeneration of the bone after the removal of the mesh and in some cases it was examined histologically.

A scar tissue called pseudo-periosteum develops continuously between the mesh and bone. This pseudo-periosteum is also located under the dehiscences in the mucous membrane with the exposed mesh.

When the mesh was removed, 50 patients achieved restitution, i.e., the bone level had reached that of the neighboring teeth both in terms of height and width. In 13 cases the bone level remained up to 2 mm below the vertical bone level of the adjacent teeth. In these cases as well there were no problems in performing the implant. In 14 cases the vertical bone offer ranged between 2 and 4 mm below the bone offer of the adjacent teeth. Since these were exclusively free-end situations, we were able to apply the implants in functional terms in cases as well.

An inadequate horizontal spreading of the bone bed was observed in a total of 6 patients. By means of bone spreading (twice) as well as lateral plaques without using membranes (4 times), it was possible to perform the implant in these patients as well. In the two patients that lost the mesh and overlay prematurely, a new reconstruction had to be carried out.

In all, 115 implants were applied on the reconstructed bone areas. Table 1 shows the survival rate of a total of 83 implants in 59 patients with an observation period of 48 months.

Discussion In covering local defects with pre-implantology, the question of which is the best treatment concept has been debated for years. The choice of the augmentation

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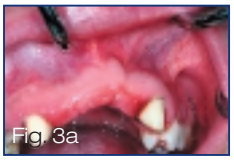
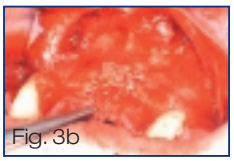


Fig. 3a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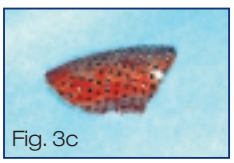
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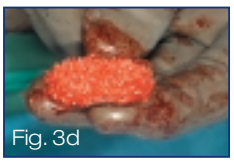
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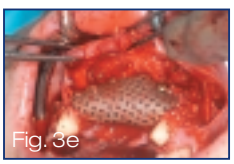
Fig. 3e

material as well as the type of membrane has been debated as well. Today autologous bone is still the favorite, as it is superior to all bone replacement materials in terms of osteoneogenesis, osteoinduction, osteoconduction, remodeling and price as well.[12,13] In general, the second-look operation for the removal of the bone from the retromolar area of the lower jaw does not require any particularly significant limitation for the patients. We then reduce the cortico-spongy block. This favors the preparation of the graft and we can already remove the mesh after five months and start with the implantation. The increase by approximately 20% in the bone reconstruction material, which we apply to circumscribe as much as possible the removal defect, has not proven to be detrimental either clinically or histologically to the quality of the augmented area. In the case of block transplantation, more time is needed in order to prevent the implant breaking away while preparing the implant bed.

Any disturbances to the wound healing after the first two weeks have only minor or no effects on the quality or quantity of the newly created bone. Through the micromesh's pores the implant is also fed on the mucous membrane side and the mesh also provides a structure on which the mucous membrane can attach to. This is to be considered as an advantage compared to ePTFE membranes, which often lead to dehiscences with a partial loss of the overlay.[14,15] Modern collagen membranes do not have this behavior, but there are still doubts as to their long-term stability.[16]

An essential element in the healing process is the mechanical stability of the graft. The micromesh fastens the bone graft to the bed. In particular, the new, pre-modeled Q-Mesh stabilizes the bone graft vertically as well. The stiffness of the mesh is capable of offsetting the pressure of partial prostheses so that approximately 14 days after the transplantation a soft lined prosthesis can be applied.

The mesh can be easily removed after five months and it does not leave any artifacts during Xray exams.

Conclusions The application of titanium micromeshes together with autologous bone transplant and bone reconstruction material blends for the regeneration of bone defects has proven to be very efficient. In particular, pre-modeled Q-Mesh favors the application of complicated defects.

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