The placement of angled implants in the edentulous maxillae for the use of overdentures

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Although most retention problems of prostheses are concentrated in the mandible, patients have similar problems in the maxillae. Retention of prostheses can be improved by the use of two or four implants, either with retentive anchors or with a bar in the frontal part of the maxillae. The method of planning and placement of I.T.I. Bonefit implants is described. (J PROSTHET DENT 1991;66:807-9.)

Most denture retention problems arise in the mandible. However, some patients have problems with their maxillary dentures. There are patients who never had problems in the maxilla until they received implants for overdentures in the mandible. Movements of maxillary dentures are apparently not noticed until the mandibular dentures are fixed with implants. Fixation of the maxillary prosthesis is limited to the placement of two or four implants in the frontal region because the maxillary sinuses are usually well extended.1 Even if the Orthopantomograph (Siemens AG, Dental Division, Bensheim, Germany) shows the alveolar ridge to be high enough, the ridge may be very narrow.2 In many patients, the ridge is too narrow to accommodate cylindrical implants with a 3.5 mm diameter.3, 4

Maximal bone height can be found in the maxillary canine region, which provides an ideal place for implants (Fig. 1). The conic shape of the maxillae makes determination of the correct direction of the surgical preparation difficult.1 This problem frequently results in a distinct degree of divergence of the surgical preparation. However, the I.T.I. Bonefit system (Institut Straumann AG, Waldenburg, Switzerland) includes angled implants that can be used to compensate for this divergence.5

Four implants with a bar construction are desirable in the mandible. However, in the maxillae two or four implants with retentive anchors are preferable (Figs. 1 and 2).6-8 The advantage of retentive anchors is that less space is needed for them than for a bar construction. The bulky shape of the prosthesis, which may be uncomfortable for the patient, can be avoided. Furthermore, possible divergences between the implants are less critical with a ball-shaped retentive anchor. A disadvantage is the absence of a direct connection between the implants; this might cause increased loading of the individual implant.

LOCAL PREOPERATIVE DIAGNOSIS

The height of the alveolar crest is investigated on the Orthopantomograph and the width of the alveolar process is determined with the use of a caliper.9 If sufficient bone appears to be available, impressions and records of the jaws

Fig. 1. Edentulous maxillae with two I.T.I. Bonefit implants and retentive anchors.

Fig. 2. Edentulous maxillae with four implants.
Fig. 3. Orthopantomogram of patient with acrylic resin base in situ. Relationship between sinuses and markers can be seen on Orthopantomogram.

Fig. 4. Acrylic resin base in situ with perforations at desired places. Sites are marked with small round bur.

Fig. 5. Exposed maxillae with four bur marks (arrows).

Subsequently a transparent acrylic resin base is made on the stone cast of the maxillae. At the desired locations radiopaque markers are placed. Then an Orthopantomogram of the acrylic resin base is made in situ to determine the relationship of the maxillary and nasal sinuses (Fig. 3). If the placement of the radiopaque markers is not correct, a new design must be developed. If the placement is correct, small perforations are made at the sites of the implants. The base will be used as a stencil during the operation.

SURGICAL PROCEDURE

After the incision and exploration of the maxillae, the acrylic resin base is placed on the maxillae. At the planned location, the upper alveolar crest can be marked with a small round bur (Figs. 4 and 5). If the alveolar ridge is wide enough, the implant preparations can be made. Sometimes, in spite of the preoperative investigations, the surgeon may be surprised by anatomic variations, making a different placement pattern necessary.

Because of the conic shape of the maxillae, the use of angled implants is preferred for the sake of parallelism. The
implants might need to be angled in more than one direction to position the abutments as near parallel as possible. The basic surgical technique is described by Sutter et al.\textsuperscript{5-7} After the implants are inserted and the wound is sutured, a postoperative Orthopantomogram is made to verify the proper position of the implants (Figs. 6 and 7).

DISCUSSION

The conic shape of the maxillae, the extension of the maxillary sinus, and the direction of placement of the prosthesis are all important. Sometimes with a bar splint construction the 15-degree angulation of the angled hollow cylinder implant and the 8-degree angulation of the conical bar abutment are not sufficient to compensate for alignment problems. In those cases, the abutments must be sliced and individual gold caps must be made.

In patients with severe alignment problems the retentive anchors are tolerated more readily.

The choice of two or four implants with retentive anchors in the maxillae is mostly based on financial and anatomic factors. However, four implants are preferred for obvious biomechanical reasons. When the mandible has a natural dentition or oral implants, heavy loading of the implants in the maxillae can be expected.

CONCLUSION

Prosthetic retention problems in the maxillae can be treated with oral implants. In the maxillae, these implants are placed in the frontal region. The height and width of the alveolar ridge are investigated and then a transparent acrylic resin base is made. Radiopaque markers are placed on the acrylic resin base at the desired locations. These are checked on an Orthopantomograph. Small perforations through the acrylic resin base provide the precise locations during the operation. Preferably, four implants should be placed with retentive anchors. Because of the anatomy of the maxillae, angled implants are frequently indicated.

REFERENCES


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