Clinical, microbiologic and radiologic assessment of soft and hard tissues surrounding zygomatic implants: a retrospective study

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Objectives. To assess the clinical, microbiologic, and radiologic status of soft and hard tissues surrounding zygomatic implants.

Study Design. Patients who had at least two zygomatic implants were eligible for the study. Their soft tissues were analyzed, and microbial samples were collected. Cone beam computed tomography (CBCT) and orthopantomography were used to measure bone levels. The patients were also asked to complete a Visual Analogue Scale (VAS) questionnaire assessing their satisfaction.

Results. A total of 65 zygomatic implants placed in 20 patients were assessed. As one zygomatic implant was lost, the cumulative survival rate was 98.5%. All the prostheses were successful. Peri-implant soft tissues were generally in a healthy condition. The patients with a history of periodontitis had worse mean peri-implant clinical parameters and showed more bacterial colonization with respect to their nonperiodontal counterparts. The implant recipients had low levels of crestal and zygomatic bone loss and high VAS scores indicating their general satisfaction.

Conclusions. Although zygomatic implants were confirmed to be a reliable treatment option, patients with a history of periodontitis were, nevertheless, found to have special needs, such as frequent dental hygiene sessions. (Oral Surg Oral Med Oral Pathol Oral Radiol 2016;122:537-546)

Treatment of patients with moderate to severely reabsorbed maxilla constitutes a challenge to implant-supported rehabilitation in view of alveolar bone loss and excessive sinus pneumatization. Conventional implants often lead to an unfavorable biomechanical situation as a result of an association of risk factors, such as limited quantity and quality of available bone, particularly in the posterior regions of the maxilla.[1] Higher failure rates have, in fact, been noted in patients with edentulous maxillae and inadequate bone volume/density.[2,3]

The most studied of the numerous surgical procedures that have been proposed to increase bone volume are lateral sinus floor augmentation, onlay bone grafting, Le Fort I osteotomy with interpositional bone grafting, and free revascularized flaps.[4-10] These techniques may, nevertheless, cause or be associated with long treatment periods, considerable donor-site morbidity, and long-term inability to wear a prosthesis, and need for hospitalization; all or any of these variables may reduce patient compliance and willingness to undergo surgical procedures.

First described by Brånemark in 1988, the zygomatic implant (Nobel Biocare, Göteborg, Sweden) was originally introduced as an alternative to grafting procedures and to solve prosthetic reconstruction problems in patients presenting with severe maxillary bone resorption.

Constructed in titanium, implants ranging in length from 30 to 52.5 mm are placed through the palatal bone in the second premolar region and are fixed into the body of the zygomatic bone. In some cases, the implants reach the zygomatic bone traversing the maxillary sinus.

Statement of Clinical Relevance

Zygomatic implants require strict professional oral hygiene protocols.

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These implants were originally utilized in patients subjected to resection for oncologic reasons,[11] but the indication for their use was later expanded to include complete edentulism with severe maxillary atrophy. The bone of the zygomatic arch can be used as an anchor for epistheses, obturators, and/or fixed prostheses.[12]

Zygomatic implants have been used in clinical practice alone or in association with conventional implants. The first protocol that was utilized involved placement of a minimum of two premaxillary implants or, ideally, four premaxillary fixtures in the canine and the central incisor positions.[13] The use of prostheses fully supported by multiple zygomatic implants was proposed later.[14]

In light of these considerations, the purpose of this study was to assess the clinical, microbiologic, and radiologic status of soft and hard tissues surrounding 66 zygomatic implants placed in 20 patients with atrophic, completely edentulous maxillae.

MATERIALS AND METHODS

Study design and sample

The study was designed as a retrospective clinical investigation, and the study population was composed of patients who had at least two zygomatic implants placed between June 2007 and May 2014 at the Section of Dentistry and Maxillofacial Surgery of the Department of Surgery of the University of Verona (Italy). Because of the retrospective nature of this study, it was granted an exemption by the University of Verona Institutional Review Board. All patients gave written informed consent agreeing to participate in the present study.

A patient was considered eligible if he or she satisfied the following criteria:

- Completely edentulous maxillae with class V/VI/VII resorption according to the classification of Cawood and Howell[15]
- Local and general health that did not preclude implant placement
- At least two zygomatic implants
- Followed an implant-supported rehabilitation characterized by a minimum follow-up of 6 months after prosthetic loading

Patients with all of these characteristics who were, however, unwilling to participate in the study after the protocol was explained to them were excluded.

Brånemark System ZygomaTiUnite Implants (Nobel Biocare AB, Gothenburg, Sweden) were used in this study.

The study patients were rehabilitated by using two to three zygomatic implants in conjunction with conventional implants or using exclusively four zygomatic implants.

Study variables

The following study variables were assessed:

- Demographic characteristics: The patient's gender and age at the time of implant placement were recorded.
- Health status: The patient's general health status was classified according to the American Society of Anesthesiologists (ASA) physical status classification system (ASA PS). Patients were categorized as healthy (ASA PS1), as having mild systemic disease (ASA PS2), or as having moderate to severe systemic disease (ASA PS3). Current smoking habits were recorded.
- Clinical history: The cause of atrophy was recorded. Patients with a history of periodontitis were classified as "perio," and those without were classified as "non-perio."
- Prosthetic rehabilitation: The type of rehabilitation used—overdentures or full-arch fixed prosthesis—was registered.
- Complications: Implant failure and mechanical/biologic/functional complications were recorded.

Surgical protocol

Preoperative panoramic and intraoral radiographs, lateral cephalograms, and cone beam computed tomography (CBCT) scans were obtained to assess the size and conformation of the zygomatic and maxillary bone and to exclude maxillary sinus pathologies.

A blood test, electrocardiography, and chest radiography were carried out to evaluate the patients' general health status.

A mucoperiosteal incision along the crest of the ridge and buccal vertical releasing incisions were made to expose the zygomatic−maxillary buttress and the prominence of the zygoma. Flap reflection made it possible to observe the lateral aspect of the zygomatic bone and prevented invasion of the adjacent structures.

The palatal mucosa was then detached to permit visualization of the insertion path from the second premolar/first molar and the canine/lateral incisors to reach the zygomatic bone traversing the maxillary sinus. In a few cases, the implants were inserted by using an external technique, in which the implant was positioned externally into the maxillary sinus before it was anchored in the zygomatic bone.

After penetrating the maxillary bone, the preparation went through the cortical layer of the anterosuperior aspects of the zygomatic bone. The zygomatic implant was placed using low speed until its tip engaged the