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Rehabilitation of resorbed maxilla with zygomatic implants- A review

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Abstract

Zygomatic implants were designed for situations where atrophy of the posterior maxilla complicates or prevents the placement of conventional implants. The use of zygomatic implants avoids the need for bone grafting, shortens treatment time and reduces morbidity. The success rate obtained by different authors varies between 82% and 100%, indicating this technique as a valid treatment option. The objective of this review is to revise the literature with the aim of updating the subject.

Keywords: Zygomatic implants, Resorbed maxilla

Introduction

Successful osseo-integration is limited by the amount of bone volume available for the implant anchorage. Implant rehabilitation in atrophic maxilla has been considered a prosthetic and surgical challenge due to the small quantity and low quality of bone and anatomic constraints such as presence of the nasal fossa along with the frequent need of maxillary sinus augmentation [1]. Zygomatic implants have been considered as an alternative treatment approach for prosthetic rehabilitation of patients with an atrophied maxilla without a need for bone augmentation procedures. These implants have also been widely used for rehabilitation of maxillary defects as a result of tumor resections, congenital defects, trauma and in cases of severe atrophy of the maxilla [2, 3]. Zygomatic implants represent a simplification of the conventional treatment options available for atrophic maxilla which is largely done by bone augmentation procedures and placement of dental implants. These implants involve a less invasive surgical technique, reduction of costs and duration of treatment compared to conventional procedures for rehabilitation of atrophic maxilla. Several studies have reported high success rates related to the zygomatic implants ranging from 94% to 100% as against conventional dental implants [4-6].

Methods of placement for Zygomatic Implants: Two methods of placement of zygomatic implants have been described in the literature. The original technique was devised by Branemark *et al* and is called intra-sinus technique. Recently, extra-sinus or exteriorized technique has also been developed.

Intra-sinus technique: The implant passes through the maxillary sinus with a classic sinus window technique. This technique is indicated when the concavity formed between the maxillary sinus, ridge crest and region of implant insertion is small.

Extra-sinus technique: In this technique, the implant passes outside the sinus. This technique is indicated when the concavity formed between the maxillary sinus, ridge crest and region of implant insertion is big [7].

Indications for Zygomatic Implants [8]

1. Partial and total maxillary edentulism with extreme resorption in the sinus area.
2. Patients with systemic diseases associated with atrophy of the posterior maxilla.
3. Reconstruction of maxillary defects following tumor resection.
4. Unilateral cleft palate and generalized maxillary atrophy.
5. Nasal reconstruction.

Contraindications for Zygomatic Implants: The patients with zygomatic implants are more prone to develop upper respiratory tract infections because of proximity to the maxillary ostium, resulting in recurrent sinusitis; when this occurs, the sinusitis can become chronic and it is necessary to surgically restore ventilation to the sinuses^[9, 10].

Exploration techniques for Zygomatic Implants: There should be no sinus pathology and oro-dental condition should be healthy. A pre-operative computed tomographic study is recommended with axial cuts every 2mm parallel to the palatal arch and conventional tomography with frontal tomograms perpendicular to the hard palate every 3-4mm. Any anomalies should be detected in addition to estimating the amount of sinus penetration into the zygomatic bone^[9].

Surgical and Prosthetic Techniques in Zygomatic Implants: The original procedure, intra sinus technique, consists of insertion of a 35-55mm long implant anchored in the zygomatic bone following an intra-sinus trajectory approach. Many authors have varied this technique slightly^[11]. Stella and Wagner described a variant of this technique in which the implant is positioned through the sinus via a narrow slot following the contour of the malar bone and introducing the implant in the zygomatic process ruling-out the need for fenestration of the maxillary sinus. The implant emerges over the alveolar crest at first molar level with a more vertical angulation^[12]. Panarrocha *et al* described the use of this technique and discussed the advantages of the Stella and Wagner system over the original Branemark technique^[13]. Boyes-Varley *et al* disagreed with the sinus slot technique since perforation of the posterior antral wall was possible due to a lack of visibility^[14]. The extra-sinus technique has various advantages over the original Branemark technique for zygomatic implant placement. It requires shorter surgical time, has a lower risk of sinus complications such as sinusitis and has simpler restorability and cleansability. It allows an increased length for a longer zygomatic implant which in turn results in greater mechanical stability for the implant and probably, better stress distribution^[15]. As most of the implant is external to the maxillary bone, the technique relies in the soft tissue adhesion to aid in stability. Several studies have also shown that an oxidized implant surface aids with soft tissue adhesion. Malo *et al* demonstrated a 98.5% survival rate of implants via the extra-sinus technique after one year^[7]. The zygomatic implants should be combined with implants in the anterior (canine buttress area) or pterygoid areas for the later fixing of fixed prosthesis or overdentures. The reconstruction is made using bars that connect the zygomatic and anterior implants. Finally, a complete fixed prosthesis or overdenture is placed. Bedrossian and Stumpel simplified this clinical protocol by reducing the loading time^[16].

Prognosis and success rates for Zygomatic Implants: In 1998 Branemark published a study presenting the technique for zygomatic implants after following a series of 164 zygomatic implant placements in 81 patients over an average 1-10 year period and obtained a success rate of 97%. Parel *et al* made a retrospective study of 65 zygomatic implants placed in 27 patients^[17]. A series of 22 patients were presented by Bedrossian *et al* in which 44 zygomatic implants and 80 pre-maxillary implants were placed. After a 34 month follow-up, there was 100% success for the zygomatic and 91.25% for the conventional implants^[18]. Becktor *et al* studied 16 patients over an average period of 46 months and found that of 31

zygomatic implants placed, 9.7% were lost due to recurrent sinusitis while out of 74 conventional implants placed, 4.1% failure rate was seen during the osseointegration period. Poor hygiene was identified as the main reason for failure of the zygomatic implants in majority of the patients^[19]. Since Branemark, developed the technique, the success rates obtained by the diverse authors has varied between 82% and 100%. Also, the lowest success rates corresponded to the studies done on patients suffering with various types of cancers that had led to resorbed maxillae.

Drawbacks of Zygomatic Implants: Some disadvantages have been related to zygomatic implant treatment such as difficult surgical accessibility as well as the potential risk of orbital injury, mainly in cases with an extremely atrophic maxilla^[6]. Other complications included infections in the maxillary sinus, hyperplasia of soft tissues, paraesthesia and fistula formation^[20].

Conclusion: Zygomatic implants are an alternative treatment option to bone augmentation, maxillary sinus lift procedures and bone grafts in patients with posterior atrophic maxilla. A zygomatic implant in the rehabilitation of extremely atrophic maxilla is a safe and predictable technique and an excellent alternative to bone augmentation procedures. However, the placement of these fixtures must be considered a complex surgical procedure which requires experienced surgeons considering that important anatomic structures might be involved.

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