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Review Article

Current Concepts and Guidelines for Clinical Management of Atrophic Maxilla using Pterygoid and Zygomatic Implants: A Review

Veeragani Manideep[1], Twinkle Sarma[2], Shivani Bhalwara[3], Nishat Khan[4], Pranjal Pramanick[5], Dr. Prince Kumar[6]

[1,2,3,4,5]BDS (Intern), Bhabha College of Dental Sciences, Bhopal, Madhya Pradesh, India;
[6]Professor, Bhabha College of Dental Sciences, Bhopal, Madhya Pradesh, India

ABSTRACT:
In the dynamic field of dental implantology, the advancements continually push the boundaries of what's possible in oral healthcare. In an attempt to treat the atrophic maxilla many treatment modalities have been emerged along the years and among the most notable breakthroughs are innovations the zygomatic and pterygoid implant techniques haverevolutionized the treatment options for patients facing complex dental challenges, and hence this review article is an attempt to summarize the recent advancements and emerging concepts for managing such complex caseswith such implant options.
Keywords: Pneumatization, Sinus Augmentation, Schneiderian Membrane, Ncm {Newton Centimetres}

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Corresponding author: Twinkle Sarma, BDS (Intern), Bhabha College of Dental Sciences, Bhopal, Madhya Pradesh, India

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INTRODUCTION

The anatomy of the maxilla changes significantly following tooth loss due to alveolar ridge resorption and maxillary sinus pneumatization, resulting in reduced alveolar bone width and height. Of the numerous bone grafting techniques used to increase vertical bone height, sinus augmentation provides the most predictable implant survival rates with the reduced need for a donor site and thus is the most common bone grafting procedure used in the posterior maxilla. But sinus lifting is not always a suitable choice when considering placement of multiple implants, which require greater bone support for bearing the occlusal and masticatory forces. Due to the lack of bone in the maxillae, conventional implants often cannot be inserted without preceding hard tissue augmentation, and rehabilitation of severely resorbed maxillae with endosseous implants remains a challenge. Hence comes the role of the support of zygomatic and pterygoid bones for the placement of implants and acquiring support. This review paper sought to explore the current concepts and guidelines for clinical management of atrophic maxilla using pterygoid and zygomatic implants.

ZYGOMATIC IMPLANTS

Zygomatic implants are an evidencebased surgical and prosthetic solution for both two stage and immediate loading protocols. To ensure acceptable success rates for standard dental implants without any bone augmentation procedures, the minimal bone height in the posterior region of the maxilla needs to be at least 10 mm.Although in the posterior atrophic maxilla where the height of residual bone is at least 6–7 mm, and where the width of any residual ridge permits placement of at least 5-mm-diameter implants, short implants can be a safe choice.Nevertheless, there are reports that short implants, alone or in conjunction with sinus floor elevation, less than 6 mm significantly diminished implant survival rate of conventional dental implants, here ZIs (abbreviation of zygomatic implants) can be considered.

INDICATIONS

Zygomatic implants are widely used as an alternateoption for sinus augmentation procedure in moderate to severely resorbed maxillary alveolus. Researchers have also successfully experimented the

placement of zygomatic implants in failed sinus augmentation procedures and in case of failure of conventional implants,Ingeneral, one zygomatic implant is placed on each side of the maxilla, in combination with 2-4 conventional implants in the anterior region, cases with Unilateral cleft palate have also been successfully treated with the zygomatic implant supported prosthesis.

CONTRAINDICATIONS

The definitive contraindications include the following:

A restricted mouth opening not allowing proper instrumentation and an inability of the patient to tolerate anaesthesiaand in cases of known pathologies in maxillary alveolus.

The relative contraindications include the following:

Active maxillary sinus pathologies (chronic sinusitis when patient is under proper medication is acceptable); and the use of bisphosphonates and radiation (no definitive studies).

Clinical recommendations:

In the classical protocol, zygomatic implants are advanced through the alveolar crest and maxillary sinus involving the zygoma for anchorage. For visualization of the correct implant position access to the maxillary sinus is necessary. Access preparation to the maxillary sinus is performed at a lateral posterior aspect at the later implant position and the Schneiderian membrane is elevated in an anterior direction.The implant is placed subsequently and is located at the inner aspect of the sinus wall, often without membrane perforation. Alternatively, the extrasinus placement approach has been described in order to reduce incidence of sinus complications and to improve the implant location and position of the emergence profile more crestally. Due to the long drilling distance to the zygomatic bone and in order to protect critical adjacent anatomical structures, placement of zygomatic implants requires considerable surgical training and experience and meticulous diagnostic planning. To receive an adequate overview over the anatomical structures, presurgical 3D planning with CT or CBCT scans is a must. The drill protocol is applied in order to achieve an implant insertion torque between 35-45 Ncm in all bone densities for optimal primary stability in immediate function protocols. Use of optional drill steps such as the twist step drills are recommended in case the insertion torque is surpassing 45 Ncm. Caution: Never exceed an insertion torque of 45 Ncm. Overtightening may lead to damaging of the implant and fracture or necrosis of the bone.

Complications and success rate of ZI:

The Zygomatic implants are been used for rehabilitation of the edentulous atrophic maxilla as an alternative to bone grafting for almost two decades now they result in satisfactory clinical outcomes. However, the patients with edentulous atrophic maxilla treated using this technique may present serious complications that could put the prosthetic implant restoration at risk. In an article published based on the data collected after a15–year period, where ten patients (six men and four women, age range: 37-72 years) were treated with two zygomatic implants, one on each side, in combination with conventional implants in the anterior maxilla. Complications occurred in four patients, two e zygomatic implants were completely removed, one was sectioned and partially removed and one was treated with removal of its apical part but it remained functional. In conclusion, 3 out of 20 zygomatic implants were lost, resulting in a survival rate of 85%. The success rate for zygomatic implants obtained by different authors varies between 82% and 100% (1). From the systematic review of 25 studies with a mean follow-up of 42.2 months (range 0–144 months) and a total of 1541 zygomatic implants, Goiato et al. found a survival rate of 97.86% after 36 months. This value remained constant up to the last follow-up period. Chrcanovic and Abreu reviewed 42 studies including 1,145 patients and 2402 zygomatic implants. A total of 56 zygomatic implants were reported as failures and the cumulative success rate (CSR) over a 12-year period was 96.7%. The preliminary data show that the zygomatic implant technique is predictable with satisfactory clinical outcomes. Compared with major bone grafting, it is still a less invasive technique and can be used in cases where bone grafts cannot be harvested for some reason. Nevertheless, the procedure is associated with serious complications which, although rare, may jeopardize the treatment plan. Limited intraoperative visibility, complexity of anatomical structures and intricacies of zygomatic curve render this procedure a clinically demanding task, hence, patients have to be informed of possible complications. It seems that during the clinical procedure of implant placement zygomatic-facial nerve is encountered frequently; therefore, its injury is possible. The same applies to infraorbital nerve. Due to reflection of the soft tissue over it, sensitivity disorders of the malar skin following implant placement in the zygomatic bone have been reported

PTERYGOID IMPLANTS

Pterygoid implants were first described by Tulsane in 1989 as a solution for atrophic posterior maxilla. These are long implants (15-20mm) that pass through the **maxillary tuberosity** and **palatine bone** and then **engage the pterygoid process of sphenoid bone**. The implant enters in the maxillary first or second molar region and follows an oblique direction proceeding posteriorly to find anchorage in the pterygoid fossa of the sphenoid bone.

INDICATIONS

Pterygoid implants are usually thetreatment of choice in cases with limited bone quantity (atrophic maxilla), and they are seen to be effective in cases when the maxillary sinus lining is close to the alveolar bone.

CONTRAINDICATIONS

They are contraindicated in patients with trismus or reduced mouth opening and are not feasible when the maxillary tuberosity is absent or when the presence of an impacted maxillary third molar obliterates access to the pterygomaxillary region.

ADVANTAGES

The main advantage is to overcome the need for maxillary sinus elevation and bone grafting procedures. Surgical placement of pterygoid implants is straightforward for an experienced clinician and can be performed under local anaesthesia in a dental office. This is in contrast to zygomatic implants, which usually entail a larger surgical procedure and require sedation or general anaesthesia. This can shorten the treatment time and allows immediate loading of the pterygoid implant. Furthermore, it allows the fabrication of a partial arch or complete arch prosthesis which allows for sufficient posterior extensions, eliminating the need for detrimental distal cantilevers, and is biomechanically advantageous.

DISADVANTAGES

The disadvantages of the pterygoid implant are the learning curve and technique sensitivity associated with the procedure and proximity to certain vital anatomic structures. Clinicians must understand surgical anatomy before placement of implants in this region. Additionally, use of cone beam computed tomography (cbct) imaging is helpful during treatment planning. Due to the significant posterior location of these implants, they are more challenging to access for clinicians and patients.the use of non-angulated abutments is helpful to mitigate the access in complete arch fixed prostheses. Non-angulated abutments allow a rotational path of insertion of the prosthesis. Additionally, it is radiographically difficult to assess the marginal bone loss around these implants due to their position.

CONCLUSIONS

In the attempt of exploration ofCurrent concepts and guidelinesfor the clinical management of atrophic maxilla using pterygoid and Zygomatic implants seemsto be a predictable treatment modality. Moreover, the survival rates of these implantsas comparedto conventional implants are clinically similar and hence acceptable. Prosthesis acceptance and comfort was satisfactory and similar to that of prostheses supported by conventional implants, with somewhat similar complications.Sinusitiswas the most frequently encountered biological complication.Therefore, considering all these intermingling facts authors stated that the overall success rate of pterygoid and Zygomatic implantsupported prosthesisrelies on various factors such as patient overall health status, experience and expertise of the surgeon, mental attitude and post operative care.

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