



Quad Zygomatic Implants for Rehabilitation of Atrophic Maxilla: A Case Report and Review

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Article History	Abstract
Received: 06 June 2023 Revised: 05 Sept 2023 Accepted: 11 Oct 2023	<i>Patients with moderate to severe atrophic maxilla challenge the surgeon to discover alternative ways to use existing bone or resort to augmenting the patient with autogenous or alloplastic bone materials. Many procedures have been suggested for these atrophied maxillae before implant placement, which include Le Fort I maxillary downfracture, onlay bone grafts and maxillary sinus graft procedures. A zygomatic implant can be an effective device for rehabilitation of the severely resorbed maxilla. If zygomatic implants are used, onlay bone grafting or sinus augmentation will not be necessary. The purpose of this paper is to review the indications of zygomatic implants placement techniques, stabilization, and prosthodontic procedures.</i>
CC License CC-BY-NC-SA 4.0	Keywords: Zygomatic Implant, Atrophic Maxilla, Graftless Solution, Edentulous Maxilla

1. Introduction

Dental implant is the one of the most predictable options for tooth replacement. The primary predictor for implant to success depends on the quality and quantity of available bone. The conventional implants treatment cannot be performed in edentulous maxilla because of extensive bone resorption and presence of maxillary sinus close to the crest of ridge leading to inadequate bone for anchorage of the implant. Such cases often require some kind of bone augmentation procedure in order to increase the volume of bone available. The pneumatization of sinus and bone resorption is one of the causes of insufficient bone volume (Baig et al., 2012; Aparicio, 2011). Hence, the insertion of the implant in the region is extremely unpredictable. To ensure acceptable success rates bone height of posterior maxilla should be 10 mm for conventional implant placement. Many patients present maxillary ridge with a bone height of 0.8mm to 6mm. Such cases require bone augmentation procedure such as onlay / inlay bone grafting.

The 'graft-less technique', also called the 'Zygoma technique' uses the cheekbone (Zygoma bone) to anchor the longer zygomatic implants. The implant is a titanium endosteal implant. These are self-tapping screw-shaped implants in commercially pure titanium with a well-defined machined surface. They are available in eight different lengths ranging from 30 to 55 mm. The earlier system presented a unique 45° angulated head to compensate for the angulation between the zygoma and the maxilla. The portion that engages the zygoma has a diameter of 4.0 mm, and the portion that engages the residual maxillary alveolar process a diameter of 4.5 mm. The later development came up with 0-degree zygomatic implants in which the angulation correction was done using angulated multi unit abutments.

Classification

Proposed a classification for zygomatic implant patients based on the zygoma anatomy guided approach (ZAGA). The morphology of the lateral sinus wall, residual alveolar crest and the zygomatic buttress was taken into major concern (Aparicio, 2011).

The five basic anatomical groups were named as ZAGA 0, ZAGA 1, ZAGA 2, ZAGA 3 & ZAGA 4.



Classification Description Inference

ZAGA 0 The anterior maxillary wall is very flat.

Inference; The implant body has an intra-Sinus path

ZAGA 1 The anterior maxillary wall is slightly concave.

Inference; The implant can be seen through the wall, most of the implant body has an intra-sinus path.

ZAGA 2 The anterior maxillary wall is concave.

Inference; The implant can be seen through the wall and most of the body has an extra-sinus path.

ZAGA 3 The anterior maxillary wall is very concave.

Inference; Most of the implant body has an anterior extra-sinus path.

ZAGA 4 The maxilla and the alveolar bone show extreme vertical and horizontal atrophy.

Inference; Most of the implant body has an extrasinus/extra-maxillary path. Just the apical part of the implant is surrounded by bone.

Review

Sudhakar et al. (2011) in 1997 first developed a specific implant called the zygomaticus fixture to provide fixed solutions even when the conditions for implant insertion were poor in the posterior maxilla. The classic technique of zygomatic implants was first introduced and used in eighty-one patients with a 97% success rate where standard implants and zygomatic implants were placed on each side of the posterior maxilla (Sudhakar et al., 2011). This new technologic development offers alternatives to bone grafting or sinus-lifting procedures, which involve rather invasive surgery. Stella and Warner presented a modification (the “slot technique”) that featured a minimal opening of the sinus wall and implant placement that was better suited to the prosthetic design (Stella & Warner, 2000).

Bothur et al presented a new technique that used multiple zygomatic implants in critical conditions, and the use of four zygomatic implants has been confirmed as a viable alternative with a high success rate (Bothur et al., 2003). Petruson examined the maxillary sinus of fourteen patients with zygomatic implants using sinuscopy and found no signs of adverse reactions (Petruson, 2004). Penarrocha et al confirmed the success of the “sinus slot technique” of zygomatic implant placement by Stella and Warner in 21 patients (Penarrocha et al., 2007). Aparicio et al proposed extrasinus placement of the zygomatic implant, which further simplified the surgical technique and reduced patient discomfort. In the extrasinus approach, no opening of the sinus wall is made and the implant path is along or lateral to the sinus wall, so that the zygomatic bone can be visualized and the implant engaged in it (Aparicio et al., 2010).

Aparicio proposed classification for zygomatic implant patients based on the zygoma anatomy guided approach (ZAGA).

Indications of Zygomatic Implants

1. Treatment of severely atrophic edentulous maxillae without using any bone augmentation, sinus lifting or other grafting procedures.

2. There may be two different clinical situations:

There is enough bone in the frontal maxillary region to allow the placement of at least two short implants; or

There is not enough bone in the frontal regions and two to three zygomatic implants can be used in each upper quadrant to hold a fixed prosthesis without using any conventional dental implants.

3. Free-end situations in maxilla with insufficient bone height.

4. Total edentulism together with reduced bone height.

5. Pneumatization of maxillary sinus. In cases with very severe resorption of anterior 6

6. Maxillary reconstruction after partial or total maxillectomy. Zygomatic implants can be used to fix maxillary obturators as an alternative to non-implant retained obturators, local and regional flaps, and microvascular free flaps.

Contraindications of Zygomatic Implants

1. Medically compromised patients

2. Acute sinusitis

3. Adequate maxillary bone for conventional implants

4. Severe trismus (relative contraindication)

5. Previous history of head and neck radiation therapy (relative contraindication)

Advantages of Zygomatic Implants

1. Avoids use of grafts in atrophic maxilla

2. No additional donor site surgery and morbidity

3. Zygomatic implants placed with two to four traditional premaxillary implants can be either immediately loaded, or, more traditionally, a final fixed prosthesis can be placed after a 6-month healing period.

4. Good anchorage from tough zygomatic bone which enhances stability of prosthesis.

5. Zygomatic implants do not necessarily require hospitalization, which is usually needed for autogenous bone harvesting from the iliac crest.

6. The total treatment time is routinely 6 months or less for zygomatic implants compared with grafting with subsequent implant placement.

7. Less number of patient visits.

8. Fewer implants are required to support a prosthesis compared with traditional bone grafting and implant placement.

Complications of Zygomatic Implants

1. The reported complications associated with zygomatic implants include postoperative sinusitis, oroantral fistula formation, periorbital and subconjunctival hematoma or edema, lip lacerations, pain, facial edema, temporary paresthesia, epistaxis, gingival inflammation and orbital penetration/injury.

2. post-operative concerns regarding difficulty with speech articulation and hygiene caused by the palatal emergence of the zygomatic implant and its effect on the prosthesis suprastructure.

3. The zygomatic implant prosthesis system is complex from the biologic point of view as a result of the interfaces towards different tissues such as bone, oral mucosa and sinus mucosa.

4. Zygomatic implants were associated with periimplant bleeding and increased probing depths, possibly caused by difficulties in implementing appropriate hygiene because of the positioning of the zygomatic implant head and abutment, and the design of the prosthesis. Thus, the risk of soft tissue problems and sinusitis should not be underestimated.

Case Report

A 38 year old male patient [Fig 1] came to oral and maxillofacial surgery department in Rajarajeswari Dental College and Hospital with a complain of mobility of Right and Left back tooth region from last 4 years and patient had undergone periodontal surgery 5 years back. Patient wanted fixed prosthesis for the same. On clinical and radiographic examination [Fig 2] there was generalized grade three mobility in all the teeth with bone loss i.r.t upper and lower arch. Patient was advised extraction of all the teeth. A month after total extraction [Fig 5], CBCT [Fig 4] was taken to evaluate the bone healing. As there was inadequate bone in the maxilla a CT scan [Fig 3] was advised to evaluate the zygoma for feasibility of zygomatic implant placement. Placement of Quad zygomatic implants for maxilla and All on four implant concepts for mandible was advised.



Fig 1: Preoperative Frontal View



Fig 2: Preoperative OPG Showing Severe Bone Loss

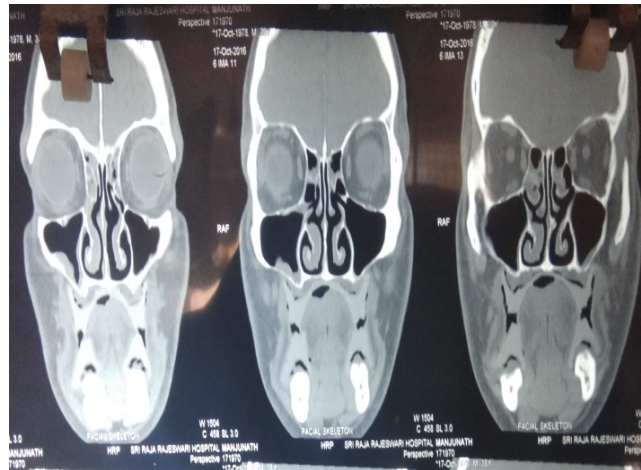


Fig 3: CT Scan After Extraction

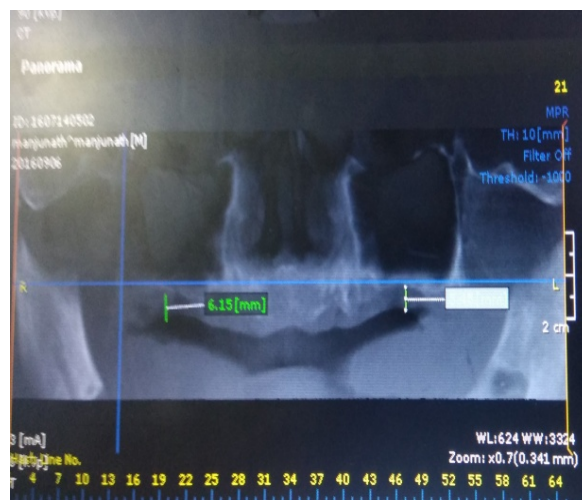


Fig 4: CBCT Showing Bone Level less than 6mm in posterior Maxilla.



Fig 5: Pre-Operative residual alveolar ridge

Surgical Procedure

Under strict aseptic condition patient was taken for surgery under G.A with nasotracheal intubation. Intraoral crestal incision [Fig 6] given from right 1st molar to left 1st molar with bilateral buccal vertical releasing incision. Buccal mucoperiosteal flap was reflected to expose the zygoma. zygomatic implant of 45 mm length and 4.5mm crestal diameter was placed through molar approach and 50 mm length

and 4.5mm crestal diameter zygomatic implant was placed through canine-premolar approach with extra sinus technique on each side [Fig 7]. Multiunit abutments were placed [Fig 8] to correct the angulation and flap was closed using 3-0 vicryl. 2 straight and 2 tilted implants were placed in the mandible using All on Four concept [Fig 9]. Postoperative day healing was satisfactory [Fig 10] and the implant positioning were confirmed with an OPG [Fig 11].

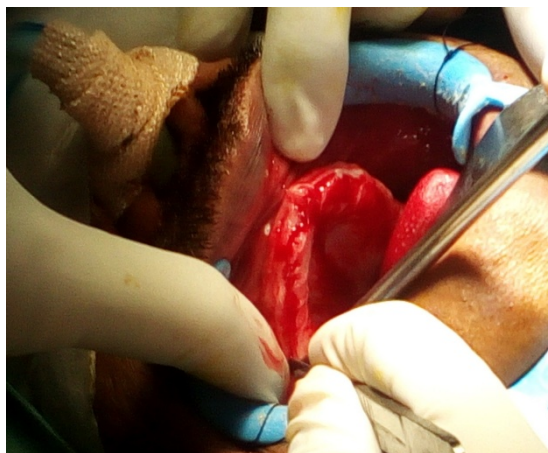


Fig 6: Crestal incision from molar to molar



Fig 7: Surgical placement of Zygomatic implant

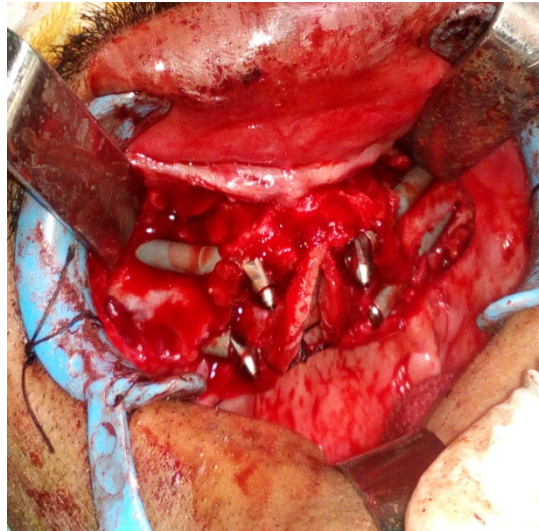


Fig 8:Zygomatic Implants with Multiunit Abutment



Fig 9: Mandibular ALL ON FOUR Implants



Fig 10: 2nd Day Post Operative Introral View

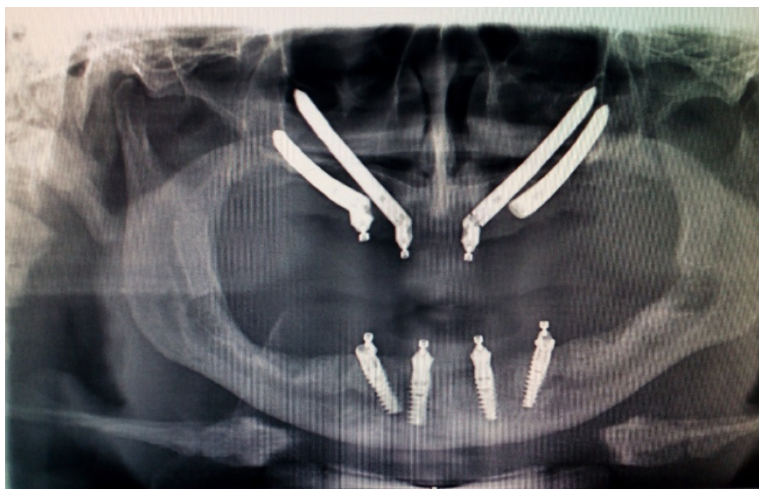


Fig 11: 2nd Day Postoperative OPG



Fig 12: Six months post operative OPG

Prosthetic Phase

Prosthetic phase was started after 6 months with an OPG [Fig 12] to confirm osseointegration. Impression copings were placed over the implants and connected using pattern resin [Fig 13] and open tray impressions were made. Jig verification [Fig 14] and Jaw relation [Fig 15] were done. Final prosthesis [Fig 16,17] was delivered. Postoperative OPG [Fig 18] was taken. Maintenance instructions and follow up protocols were given to the patient.

PROSTHETIC PHASE PHOTOGRAPHS

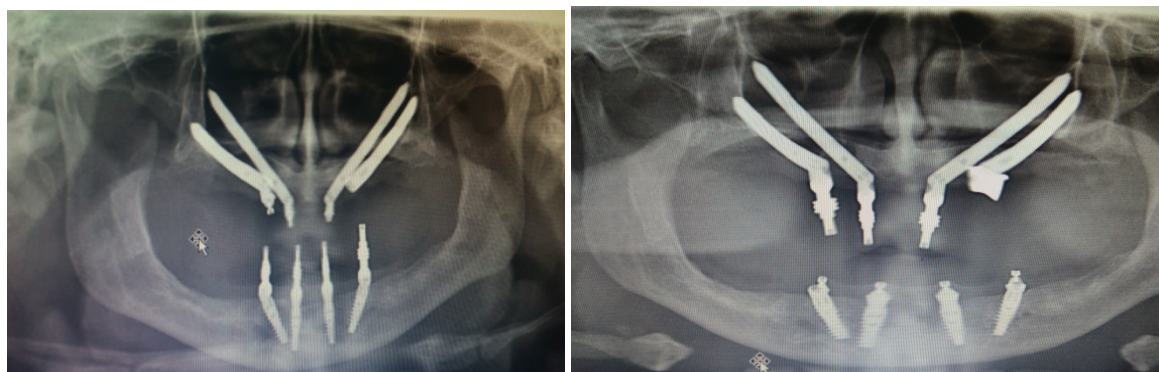




Fig 13: Impression copings in position for impression making

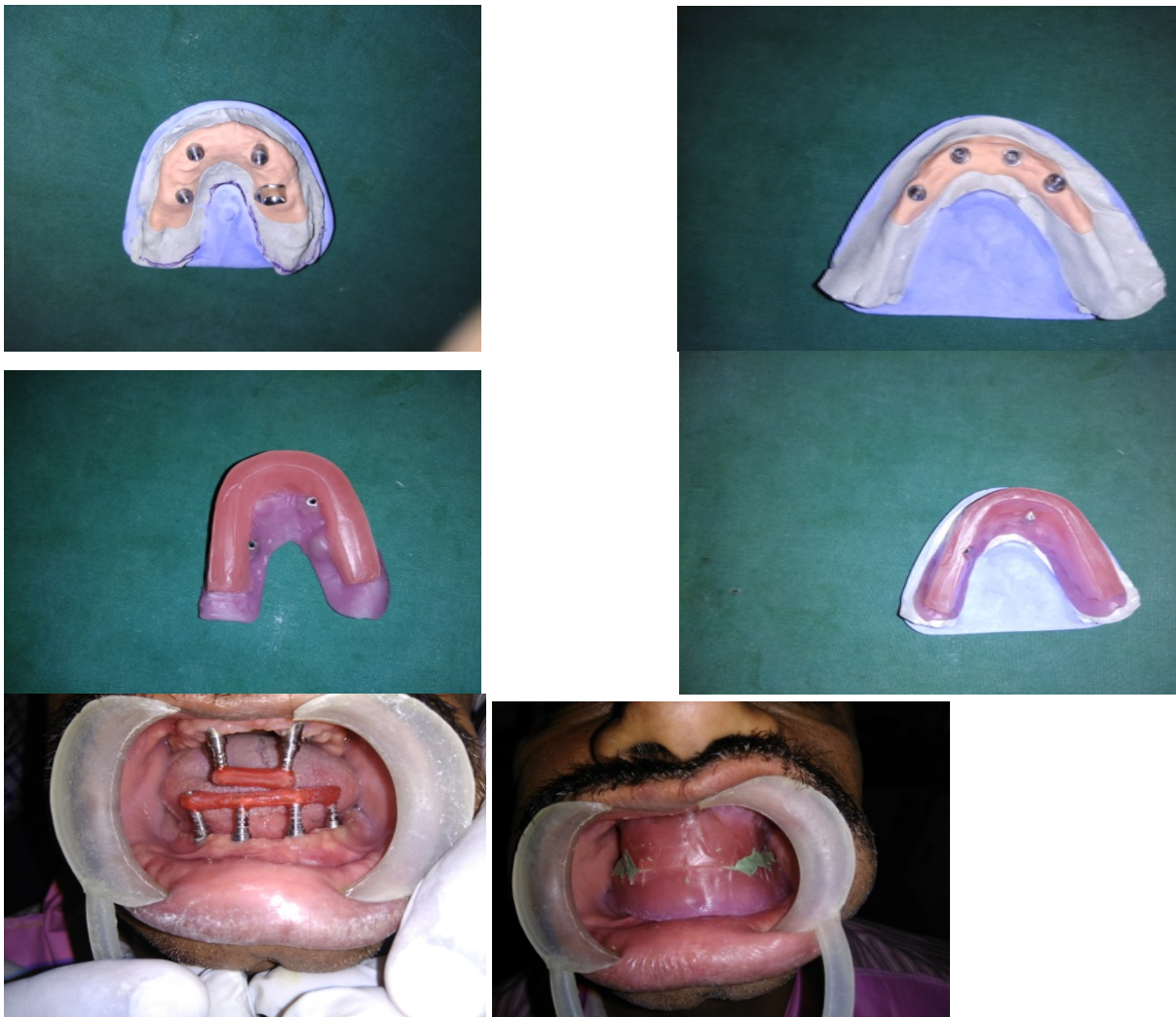


Fig 14: Jig trial

Fig 15: Jaw relation

Final Prosthesis



Fig 16: Profile Views

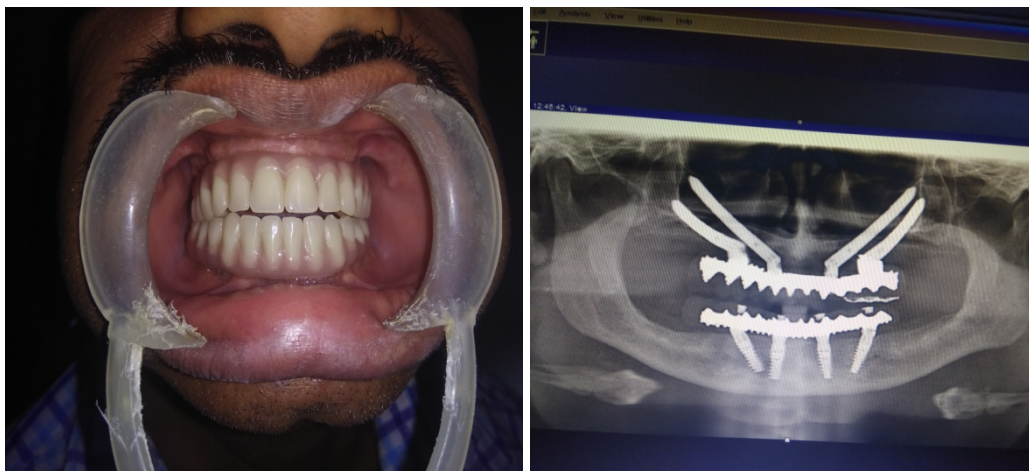


Fig 17: Final prosthesis in Occlusion Fig 18: OPG with Final Prosthesis

Insufficient bone volume in posterior maxilla can be due to bone resorption as well as pneumatization of the sinus or a combination of both. In any case, insertion of implants in this region remains extremely unpredictable. Treatment with zygomatic implants was introduced for the rehabilitation of atrophic maxillae without the use of grafts. Zygomatic implants are long screw shaped titanium endosteal implants ranging in length from 30 mm to 55 mm & inserted through the posterior alveolar crest passing through or externally to the maxillary sinus to engage the body of zygomatic bone. A couple of conventional dental implants may also be added in the anterior maxilla to stabilise the prosthesis. The potential advantages of zygomatic implants are that, bone grafting may not be needed and a fixed prosthesis could be fitted sooner. Another specific indication for zygomatic implants could be maxillary rehabilitation after maxillectomy in cancer patients.

2. Conclusion

Zygomatic implant, the zygomaticus fixture appears to be a promising development in implant technology. It offers an interesting alternative solution to heavy bone grafting in the severely resorbed posterior maxilla. It has been in use for more than 10 years and gives a predictable outcome in the rehabilitation of totally as well as partially edentulous patients without the use of bone grafts from extragenous donor sites.

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