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Various Implant Rehabilitation Options in Atrophic Ridges

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ABSTRACT:

The atrophic and edentulous jaw can pose various challenges for the dentist. A variety of treatment strategies can be used to enable implants to be placed despite the lack of bone. These strategies follow one of two pathways: either augmentation of the bone, or utilization of the remaining bone.[1] This article will discuss the range of various new implant options available toenable fixed implant-based rehabilitation of each of the ridges.

Introduction

The main aim of implant dentistry is to restore patient`s oral health and function. The completely edentulous patient may be unable to recover normal function, esthetics and speech with a conventional prosthesis. Whereas, implant prosthesis allows normal tooth function also, the facial features and soft tissues are not compromised due to lack of bone support. As aresult of continued research, diagnostic tools and techniques predictable success is now a reality for the rehabilitation of many challenging clinical situations.[2,3]

Complications of Edentulism

In a 25-year study it is shown that there is continuous bone loss during first 25 years. There is a four times greater bone loss observed in the mandible as compared to maxilla. A removable denture (complete or partial) does not maintain bone but it accelerates the bone loss.[3] Table 1 shows various edentulous patient complications.

Table 1: Various Edentulous Patient Complications

	Edentulous patient complications
1.	Continued loss of supporting bone width and possible nerve impairment fromdehiscent mandibular neurovascular canal
2.	Prominent mylohyoid and internal oblique ridges.
3.	Progressive decrease in mucosa surface

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4.	Prominent superior genial tubercles with sore spots and increased denturemovements
5.	Elevation of prosthesis with contraction of mylohyoid and buccinator musclesserving as support

Edentulous Ridges Rehabilitation Options: There are various techniques that have been described to augment maxillary alveolar ridge width and height in severe bone atrophy. Whereas, the mandibular ridge atrophy can sometimes be so advanced that the mandibular height in the inter-foraminal region may be less than 10mm also result in exposure the inferior alveolar nerves.[4] Table 2 enumerates various techniques and implant-based rehabilitation options both in maxilla and mandible ridges.

Table 2: Techniques and Implant-Based Rehabilitation Options

Maxillary RehabilitationOptions	**Augmentation of theremaining bone**	**a) Sinus floor elevationwith bone grafting**
	Utilization of theremaining bone	a) Short implants b) Zygoma implants c) Pterygoid implants
Mandibular Rehabilitation Options	Augmentation of the remaining bone	a) Autogenous bone grafting
		b) Vertical distraction osteogenesis
	Utilization of the remaining bone	a) Nerve lateralization
		b) Short implants
		c) Basal implants

Maxillary Rehabilitation Options:

a) **Sinus Floor Elevation with Grafting**: This approach is used in the maxillary posterior edentulous region and indicated when at least 5 mm of vertical bone and sufficient width is present between the antral floor and the crest of the residual ridge in the area of intended prosthesis abutment.[4,5]

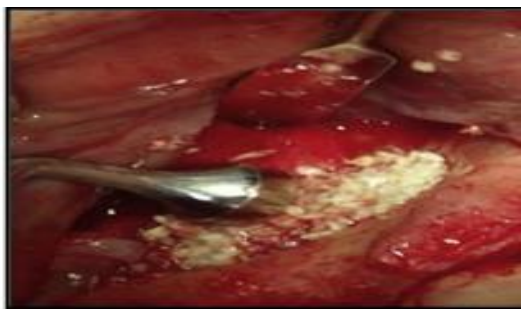

Fig A: The graft layer consists of allograft (i.e., 70% mineralized, 30% demineralized freeze-dried bone), PRP 10 mL of whole blood and Antibiotic (Ancef 500 mg/mL)

b) Short Implants

The short implants are usually about 8–10 mm length. The SSID (State of the Science in Implant Dentistry) conference sponsored by the Academy of osseointegration in Chicago, Illinois in August of 2006 defined a "Short" implant as one 8.0 mm or less in designed intra-bony length (DIL). The length of the implant in the bone defines a "shortimplant."[6]

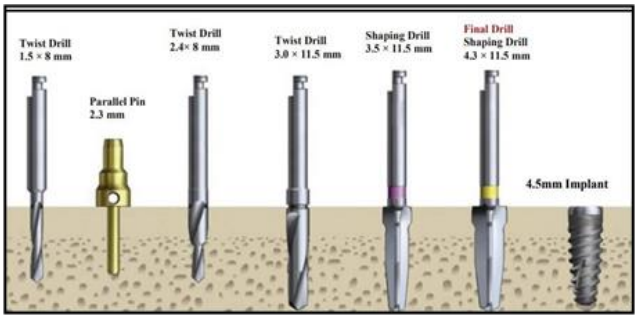

Fig B: Low density (D3 type) bone implant placement protocol

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c) Zygoma Implants: It was first introduced by PI Branemark. The lack of bone at the dentoalveolar level for conventional implants is overcome by utilizing bone higherup beyond the bone that normally houses teeth.[7,8]

1. Zygoma Quad: Current Technique: Quad zygoma is known as 'prosthetically driven' technique in which complete prosthetic preparation takes place before implant placement.[8]

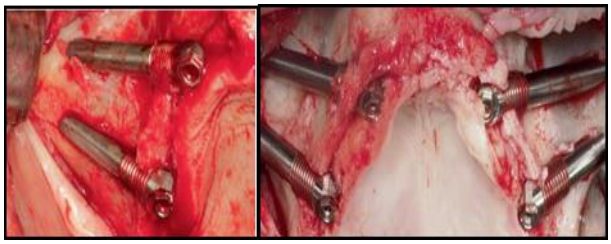

Fig C: (a) The pre-angled 55º implant head (b) Typical arrangement of implants for "Quad" procedure according to ZAGA prosthetically driven

(d) Pterygoid Implants

Pterygoid implants were first proposed by Linkow in 1975, but the method was first described by JF Tulasne in 1992. These implants are relatively long and specifically manufactured considering the anatomy of pterygoid region.[9]

Fig D: A typical pterygoid implant fig b: - Pterygoid implants of 4.5mmand 3.5 mm diameters of 20,18& 16mm length

Surgical Placement

The pterygoid implant placement of a length (up to 22 mm) through the tuberosity pyramidal process into the pterygoid plate with a distal angulation of between 35° and55° is done. During placement special attention must be given to the internal maxillary artery which crosses 10- 23mm above the pterygomaxillary suture.

Fig E: Radiographic imaging (CBCT)of pterygoid implant placement

Mandibular Rehabilitation Options

A) Khoury's mandibular augmentation technique: Khoury et al described the stabilizing of two split autologous bone graft by micro-screws and filling the gap withautogenous bone chips. These split bone blocks are obtained, either from the mandibular symphysis or ramus or using piezoelectric surgery.[6]

Fig F: Khoury's mandibular augmentation technique where bone is harvested fromthe ramus region of mandible

B) Vertical Distraction Osteogenesis: The alveolar distraction osteogenesis is a form of bone transport technique introduced by Ilizarov in 1989. It is a procedure that slowly separates two segments of a bone by performing osteotomy in an abnormal bone. A distractor was attached to both sides of the osteotomy. The distractor is adjusted over aperiod.[5]

C) Short Implants: The short implant placed in the mandible is considered a safe treatment option for the restoration of atrophic mandibles with predictable outcomes.

D) Basal Implants: This term refers to the lateral insertion of disk-form implants into basal bone and to obtain anchorage of implants (e.g., root-form implants

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placed in the zygomatic and pterygoid process) in the basal bone with different range of designs suchas single, double and triple-disk implants also horizontal plate-form implants securedwith osteosynthesis screws.[8]

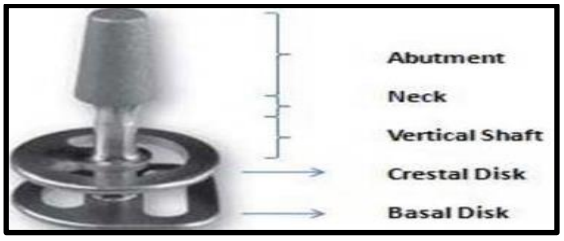

Fig G: Basal Disk Implant

Surgical Placement: The Plate-form disk-implants of various dimensions are used to match the anatomic requirements then a titanium cutter used under copious irrigation is used to prepare the recipient bone bed in this atrophic mandible. A long internal lingual notch is prepared to engage the implant. Then the implant is tapped laterally into the lingual mandibular bony notch and then a 5-mm-long orthopaedic screws is being placed in order to ensure absolute primary stability.

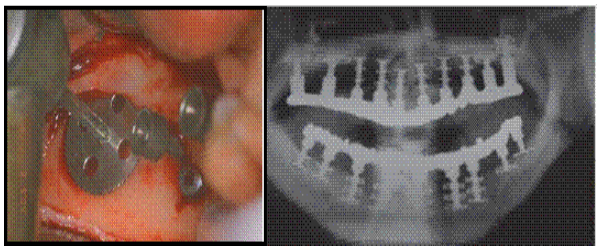

Fig H: Placement of basal implant continued with post-operative OPG taken after 6 months Prosthesis placement: For completely edentulous patients, a pick-up impression canbe taken without an impression tray

Fig I: a) Placement of the implants b) Full zirconia permanent prosthesisafter one year

Then 6 months later, a new pick-up impression is taken. The full zirconia bridge is selected and it is screw-secured directly to the implant or to transgingival abutments.

Conclusion

The areas with severe bone resorption and limitations in bone height and thickness represent a challenge for oral rehabilitation with conventional dental implants. Recently, short implants have been proposed as a simpler, cheaper and faster alternative for the rehabilitation of atrophic edentulous areas to avoid the disadvantages of surgical techniques and postoperative complications. The basal implants have made them a viable option for restoring atrophied jaws as they don't require extensive augmentation and allow for immediate loading.[9] The use of zygomatic implants to avoid the need for sinus lifts procedures. Studies have shown that the zygoma implanthas proven to be a best option in the management of the atrophic edentulous maxilla.

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