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Review Article

Basal Implants: A Review

Krishna Kishore K[1], Haragopal S[2], Ravi Rakesh Dev J[3], Raghunadh S[4], Saikumar CHVN[5], Lakshmi Mounika K [6]

[1]Professor & HOD, [2,3]Reader, [4,6]Post Graduate Student, [5]Consultant Prosthodontist

Department of Prosthodontics; Sibar Institute Of Dental Sciences, Takellapadu, Guntur, Andhra Pradesh, India

***ABSTRACT*:**
Basal implants were developed primarily for immediate use in the atrophied jawbone. Basal implants are used to support single and multiple unit restorations in the upper and lower jaws. As the use implants can help avoid risky and expensive bone augmentation procedures, these implants are the therapy of first choice in moderately or severely atrophied jaws as well as in those cases, where immediate loading or cheaper treatments are desired. From this review article, we explain about the various aspects of basal implants.

Key words: Basal implants, atrophied jawbone, bone augmentation.

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Corresponding author: Dr. Krishna Kishore K, Department of Prosthodontics; Sibar Institute Of Dental Sciences, Takellapadu, Guntur, Andhra Pradesh, India

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Introduction: Originally, dental implants were considered as "last resort" for treatment of the edentulous patients. As implant dentistry progressed, the original Brånemark protocol required long healing periods of several months for osseointegration to take place before beginning fabrication of the definitive prosthesis[1]. The term 'basal implant' refers to the principles of utilizing basal bone areas free of infection and resorption, and the employing of the cortical bone areas. Treatment with Basal implants is simpler and quicker than conventional implant therapy since no augmentation procedures are invloved[2].

Basal implantology also known as bicortical implantology or just cortical implantology is a modern implantology system which utilizes the basal cortical portion of the jaw bones for retention of the dental implants which are uniquely designed to be accommodated in the basal cortical bone areas. The basal bone provides excellent quality cortical bone for retention of these unique and highly advanced implants. Because basal implantology includes the application of the rules of orthopedic surgery, the basal implants are also called as "orthopedic implants" to mark a clear distinction between them and the well-known term "dental implants." These implants when placed in this bone can also be loaded with teeth immediately. This principle behind has already been proved in orthopaedic implants (Hip/Knee replacements). Once the patient is fitted with the artificial joint, he/she is asked to start using immediately.[3]

Historical Background: Over the years basal implants have been developed and improved in several stages by majorly the German and French dentists. The first single piece implant was developed and used by Dr. Jean-Marc Julliet in 1972 with no basal plate resilience.[4] In1983 French dentist Dr. Gerard Scortecci improved the basal implant system with matching surgical tools and external and internal connections for the prosthetic superstructure; he called them "Diskimplants".[5]In 1997 Dr. Stefan Ihde started manufacturing lateral basal implants like the Diskimplants. These implants had limited shapes and sizes and their surface was initially roughened. Soon Dr. Stefan Ihde improved the basal implant; the round base plates got edges, preventing early rotation of the implants in the bone before integration, in 2002 fracture-proof base plate was invented and later patented in Europe and United States, bending zones in the vertical implant shaft were introduced, in 2005 screwable designs (BCS, GBC) were introduced.[6] In 1999 vertical shaft surfaces were polished, from 2003 the whole basal implant was produced with polished surface, as polished surfaces show no tendency to inflammation, and in case of sterile loosening, reintegration of the implant was possible if the load was adjusted in time. The design was developed to

leave enough elasticity for the development and functional stimulation of bone.[6]

Types:
Basal implants are of two types: Basal osseointegrated and Basal cortical screw type implants. Despite acceptable success rates, these approaches involve unpredictable degree of morbidity at the donor and recipient sites and poor prognosis. The basal implants were specifically designed to utilize strong cortical bone of the jaw without risk of infection.[2]

Advantages of Basal implant
- Single/ monobloc unit
- Utilizes basal cortical bone for support.
- Efficiently used in atrophic and compromised bone conditions.
- Better distribution of masticatory forces.
- Lesser peri-implantitis evidence.
- Better results in medically compromised patients like Diabetics or patients having chronic periodontitis.[3]

Disadvantages of conventional implant
- Requires large amount of bone and hence, generally requires bone augmentation surgeries which increases the cost and time of surgery.
- Mostly placed into poor density spongy bone which cannot be loaded immediately therefore requires healing time of 3-8 months approximately.
- Has a screw connection which may lead to future screw loosening/ breakage under the prosthesis.
- Sensitive infection due to its rough surface area and vertical path of load distribution.
- Maximum load/ stress are over the crestal bone which results in crestal bone loss.
- Wider neck diameter makes it difficult for soft tissue re-epithelisation.[3,8]

Indications of Basal Implant
- In situations when multiple teeth are missing or have to be extracted.
- When a bone augmentation procedure has failed.
- Cases of thin ridges – That is deficiency of bone in buccolingual thickness.
- Cases where bone height is insufficient.[3]

Contraindications of Basal Implants
- Medical conditions like recent myocardial infarction, cerebrovascular stroke, immunosupression.
- Patients on chemotherapy and antiplatelets.[8]

Basal Implants for Atrophied Ridges
- Restoring atrophied ridges poses a challenge for the prosthodontist. Restoration of such cases with basal implantology exclude the need for extensive surgeries. Before restoring atrophied maxilla and mandible following points must be considered:

1. **General Systemic Conditions**
   - The patient should not have recent myocardial infarction, cerebrovascular accident, immunosuppressant therapy, chemo and/or radiotherapy and bisphosphonate therapy. Diabetes and smoking is not a huge concern. [3,6]

2. **Biomechanical Considerations**
   - Bone is a visco-elastic structure and so is this implant, therefore, the phenomena of stress shielding is avoided.[6]

3. **Loading** 4, 15, 16
   - According to basal implantology the cranial bone is permanently in a state of torsion, i.e.; there are constant lateral stresses being applied to the cranial bone at all times due to action of the attached facial muscles, therefore, there is no such thing as an "unloaded" implant as lateral forces will always exist no matter the implant receives a superstructure or not. Considering this phenomena, basal implants can either be left without a superstructure till completion of the healing phase or they can receive a superstructure immediately, after 3 days, 1 week, 6-8 weeks, or temporary restoration can be done for 3-6 months followed by definitive restoration.[6,9,10]

4. **Choice of restoration between both jaws**
   - The stomatognathic system consists of stationery (maxillary bone) which absorbs a considerable amount of the forces applied and a mobile (mandibular bone) component, the role of which is to apply forces and the stationery component. Due to this it become important that the mandible should be restored first, also a conventional mandibular denture on an atrophied foundation is unstable, therefore, chewing function becomes poor and gradually the associated muscles lose their tonicity, because of fixed rehabilitation these adversities are avoided, thus, mandible should be restored first.[6]

5. **Treatment modalities of Atrophied Ridges**

a. Atrophied Mandible-

Over the years two schools of thought have developed regarding implant restorations in atrophied mandible, they are-

i. Multi-Implant Concept of French School
   - Propagated and founded by Scortecci this school favors a large number of basal implants in the mandible mostly around 7-12 implants. According

to this school basal and crestal implants are combined to result in a restoration that is so rigid that it does not permit any torsion across the mandible also this does not allow the jaw system to reorient forces. Since, it is almost impossible to stop mandibular torsion, there is generation of excessive forces on the implant body which leads to overload osteolysis and causes implant failure.[5,6]

ii. Strategic Implant Positioning Concept of German School

- This school was founded by Dr. Ihde. According to this school 4 implants are placed in the mandible preferably in the canine and second molar regions this allows for mandibular torsion and reorientation of forces which gets compensated by flexibility of the prosthesis, thus, overload osteolysis and implant failure is avoided. [6,9]

b. Atrophied Maxilla[5,6,11]

- The pneumatized sinus and the porous bone make implant placement a challenging task. The porous bone is taken care of by the compression screw implants, whereas, for the sinus two techniques have been described, which describe alternate techniques of placement-

i. **Sinus Section Technique**- In this two/three walls of the sinus are sectioned to facilitate placement of the basal disk in the sinus. Basal implantologists leave the option of lifting the sinus membrane and grafting on the operator. The sole purpose of this technique is to gain bi-cortical support; also only one implant can be placed this way in each sinus.

ii. Tuberopterygoid Screws- These implants are placed in the pterygoid bone and aid in providing additional support to the prosthesis. These are used in conjunct with Sinus Section technique and are placed at 20º-45º in the bone and the angulation between Basal osseointegrated implant and **Tuberopterygoid** screw should not exceed 90º otherwise prosthesis placement becomes difficult.

iii. Zygomatic Screw Implant- These are zygomatic implants that are placed in the zygomatic bone and they also have sharp edged cortical screws that gain bi-cortical support.

c. **Cortically Fixed -**This is a introduced by Dr. Henri Diederich in 2013; this protocol is based on basal cortical implantology and is specifically aimed at rehabilitating atrophied jaws irrespective of the amount of bone available without any need for augmentations. This is basically a plate form implant, which looks like mini plates with an abutment platform, this unique design allows them to be bent and adapt to any surface and is anchored to bone using bone expanding mini screws. The number of holes required can be reduced; another advantage is their isoelasticity enabling them to mimic bone.[12,13]

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Complications

- Functional overload osteolysis is one of the complications of basal implants.
- As long as the bone substance is not torn away from the implant and the area is not superinfected, the loss of mineralization remains diffuse but usually reversible. Basal implants in this status have a good chance of getting reintegrated at a high degree of mineralization, if loads are reduced to an adequate amount.[4]

Conclusion

Basal implants can be used for patients with atrophic ridges which can be restores without any extra surgical interventions like bone augmentations thus, reducing the time and cost of the treatment plan and provide immediate loading and also they can be placed with a flapless technique and can be combined with any implant.

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