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# A Review On Basal Implants

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**ABSTRACT:**

The primary indication of implant prosthesis, essentially the endosseous implants, is to replace the missing tooth or teeth structure with a prosthesis that mimics the morphology of an original tooth and facilitates function and aesthetics. However, the main disadvantage of this prosthesis is that it shows very less success rate in the areas with less residual bone present. One of the designs to combat this problem is the use of basal implant in areas of very less bone height. This review aims to elaborate the features of the basal implant design

**Keywords:** Basal Implant, BOI Implant, BCS Implant, Disk Implant, Basal Implantology

## INTRODUCTION

In present day dental practice restoring edentulous maxilla and mandible with dental implants based on crestal implantology become normal predictable treatment, where the implant placed in crestal alveoli. For successful dental implant placement minimum 10-13mm vertical bone height should be available. However, if the adequate bone height is not available in edentulous areas ridge argumentation procedures needs to be done to restore lost alveolar bone dimension for placing a successful dental implant. Such procedures involve autologous or allogenous bone graft placements, nerve repositioning, sinus lift procedures or even nasal lift. These above-mentioned procedures have their own indications and contraindications. In severely atrophic ridge patients to avoid these procedures implant design needs to be altered. Mini implants and basal implants can be used as an alternative.

Thus, basal implantology also known as cortical or bicortical implant system which the implant placed in the cortical portion of jaw gains a excellent retention from the basal cortical bone. In past several decades the basal implants undergone changes and modifications and designed specifically to for the purpose of gaining anchorage from the basal cortical bone. Now at present available basal implants are simple, less surgical protocol and can be loaded with immediately

## REASON FOR USING BASAL IMPLANTS

As indicated by the idea of basal implantology the jaw bone contains two sections the tooth bearing alveolus or crestal part and the basal bone. The crestal bone is less thick in nature and presented to contaminations from tooth borne pathologies, wounds or iatrogenic factors and is consequently dependent upon higher rate of resorption while the basal bone is heavily corticated and less chances subject to contaminations and resorption.

It is this, i.e.; the basal bone that can offer a good supportto the implants on account of its thickly corticated nature, at a similar time the load bearing limit of the basal bone is ordinarily higher than that offered by the spongy crestal bone. Basal implants are additionally called as "Orthopedic Implants"[3, 4, 5, 6].

**Basal Implant Types Based on Morphology**

There are four fundamental kinds of basal inserts available

I Screw Form.

II Disk Form.

III Plate Form.

IV Other Forms.

Both of the kinds can be additionally arranged into.

1. Screw Form

a. Compression Screw Design (KOS Implant)

b. Bi-Cortical Screw Design (BCS Implant)

c. Compression Screw + Bi-Cortical Screw Design (KOS Plus Implant)

2. Disc Form

Basal Osseointegrated Implant (BOI)/Trans-Osseous embed (TOI)/Lateral Implant1)

According to Abutment connection.

i. Single Piece Implant.

ii. External Threaded Connection.

iii. Internal threaded Connection

a) External Hexagon.

b) External Octagon.

2) According to basal plate design.

i. Basal circles with angled edges.

ii. Basal circles with level edges called as S-Type Implant.

3) According to number of disks.

i. Single Disk.

ii. Twofold Disk.

iii. Triple Disk.

III. Plate Form

a. BOI-BAC Implant.

b. BOI-BAC2 Implant.

IV. Different Forms

a. TPG Implant (Tuberopterygoid).

b. ZSI Implant (Zygoma Screw).

**Implant Morphology**

The BOI and BCS implant being delivered today has a smooth and polished surface as it was discovered that polished surfaces are less inclined to irritation (mucositis, periimplantitis) than unpleasant rough surfaces[4, 5, 6]. The KOS and KOS plus Implants are surface treated (sand and coarseness with acid etching), in any case, the implant neck is keptprofoundly polished in KOS implant[4]. In the KOS Plus implant, its neck and the basal cortical screw part are kept vigorously polished4

A. BOI Implant Morphology

The BOI implant is produced either from unadulterated pure Titanium or then again from Titanium Molybdenum combination to upgrade strength of the implant[1, 4]. These can be either single piece or two pieces, following are the pieces of the BOI implant.

a) Abutment portion

In single piece BOI abutment the projection divide is tapered and stays uncovered in the oral cavity, though in two-piece BOI implant the abutment bit can be aexternallythreaded screw or an internallythreadedscrew with either an outer hexagonal or octagonal restorative platform[4].

b. Neck

It is the bit lying straightforwardly underneath the abutment portion. This part could be constricted in diameter; constriction gives better post-operative gingival healing and furthermore reduce inflexibility and permits for bending by 15°-25°1, 4.

c. Vertical Shaft

This is that portion that associates all the segments of the implant. The shaft is kept smooth and polished to debilitate plaque collection and irritation; moreover it tends to be either flexible or inflexible relying upon the kind of titanium utilized. The vertical shaft is simply a load bearing part and is typically 10 – 13.5 mm long[4].

d. Crestal Disk

It is the principal plate in the implant. It is called crestal disk as it lies in the crestal bone after positioning the implant. This disk serves a double purpose i.e.; following implant placement this disk gives and keeps up the primary strength and stability and after osseointegration this disk changes over into a load bearing and distributing component[4,6].

e. Basal Disk

It is the second disk at the base of the implant and is the last part in the implant body. This part is additionally kept polished and is a load bearing and distributing segment. The piece of the shaft associated with the basal disk is versatile and can likewise be bent by 15°-25°[4,6]. Distance between the crestal and basal disk is typically 5 mm.

B. BCS Implant Morphology

These are single piece implantssimilar to the BOI implant with alterations in the abutment and the implant portion. BCS implantabutment can be Conical Straight, funnel shaped Angled and Multi-Unit abutments. In contrast to the BOI implant which contains disc in the implantportion, the BCS implant has wide diameter cutting screws which makes a difference in connecting with the buccal and palatal/lingual cortical plates also, at first give primary stability and load bearing ability to the implant and later on go about as a load bearing and distribution component[4,6]. These implantsare heavily polished and are flapless implants with a little mucosal infiltration diameter[3,6].

C. KOS and KOS Plus Implant Morphology

These implants are single piece implant and are produced from Titanium Molybdenum or Titanium aluminum Vanadium alloy. These implants are planned like compression screws, i.e.; these implants when screwed into the bone will pack the cancellous bone encompassing the implant to formmore compact and denser bone[1, 4, 8].

I. Abutment Portion[1, 4]

This is the restorative platform of these implants and stays uncovered in the oral cavity. These implant offer a wide assortment of abutment choices which are-

a. Conical shaped Straight abutment for cemented crowns, this abutment may likewise have a vertical microgroove that fills in as an anti rotational component.

b. Conelike Angled abutment.

c. locator abutment.

d. Ball abutment.

e. Multi-Unit abutment.

*(these abutments are essential for single piece implant)

ii. Neck[1, 4]

This piece of the implant is vigorously polished and is contracted to help in better gingival adaptation and to debilitate plaque aggregation. The neck of the implant is bendable by 15°-25°.

iii. implant Portion[1, 4]

This part of the implant has the thread which have wide construction and wide turns this empowers them to apply compressive forces on the cancellous bone and convert it to a denser cortical like bone. In KOS Plus the apical third of the implant contains the basal cortical screws these

additionalscrews which help the implant engaging in the buccal and palatal/lingual cortical plates also, help in acquiring primary stability and later capacityas a load bearing and distributing part. It ought to be noticed that in KOS Plus implant the BCS part is consistently exceptionally polished.

SURGIAL TECHNIQUE

Not at all like ordinary implants, basal implants have an alternate surgical methodology. The method is straightforward and simple to execute and doesn't include extensive penetrating of bone drills prevents thermal injury[4, 9]. All through the surgical procedure the mode of water irrigation utilized is external and practically for any case of single pilot osteotomy with a "Pathfinder Drill" is adequate for KOS, KOS Plus and BCS implants, the kit additionally comprises of manual drills for a controlled osteotomy preparation[9,10].

Basal implantologists don't advocate raising a flap for these implants as it brings about a diminished blood supply and a sutured site is certifiably not a favorable place for the placement of immediate prosthesis[4, 9, 10]. For the BOI implant the methodology towards the bone is acquiredby raising a flap laterally and cutting into the bone with disc drills of required size a lateral direction to frame a "T" shaped osteotomy. The implant thus is placedlaterally and the flap is shut over it.[11, 12, 13, 14.]

Peri-Implant Healing (BOI and BCS Implant)

since these implants have an extraordinary design their peri-implanthealing is also unique. What regular implantologists call as "Osseointegration" is called as "Osseo adaptation" by basal implantologists, this stems from the way that the bone with nonstop functional loads remodels and adjusts over the outside of the implant, the redesigning of bone under utilitarian burdens is viewed as the fourth Dimension[4] . As indicated by reasoning of basal implantology the interaction of Osseoadaptation is done by a "Bone Multicellular Unit" (BMU), it is supposed to resemble a cutting cone with a tail, the cutting cone contains osteoclastic cells that destroy the peri-implant bone and the tail contains osteoblastic cells that lay down bone, as this unit moves in the bone the osteoclastic activity is along these lines followed by osteoblastic action. The formation of this BMU happens when the BOI and BCS implant are immediate loading and tends to remodeling of the bone under functional stress prompting improvement of this unit, and subsequently starts to healing phase and prompts formation of a thick peri-implant bone[4,15]. The course of cycles included is as per the following (4)-

I.Activation Phase

In this stage the precursor cells/human mesenchymalundifferentiated cellsform into osteoblasts and osteoclasts. This stage goes on for 3 days.

II. Resorption Phase

During this stage osteoclastic movement happens which uncoverssoft and porous bone. Osteoclastic activity happens at a pace of 40µm/day.

III. Reversal Phase

In this stage osteoblastic movement happens. Theosteoblasts set down neo bone in the haversian channels at a pace of 1-2µm/day.

IV. Progressive Phase

This stage includes the osteoblasts shaping concentric lamella in haversian channels, which prompts decrease in diameter of the canal and expansion in bone thickness. At this stage the breadth of the haversian trench is 40- 50µm. The bone shaped is a Non-Mineralized Matrix Osteoid and this stage goes on for a very long time.

V. Mineralization Phase

After 10 days of osteoid arrangement mineralization stage starts. This stage includes two stages

a) Primary Mineralization Stage
   This stage confers primary hardness to the osteoid furthermore, represents 60% of all mineralization.
b) Secondary Mineralization Stage
   This stage confers final hardness and final morphology of bone. This stage goes on for 6-12 months.

VI. Dormant Phase

In this stage osteoblasts form into osteocytes and line the haversian canals and take up mechanical, metabolic furthermore, homeostatic capacities.

It ought to be noticed that all through these stages the implants are under functional loads and due to which there is a continuous stimulations of the BMU for the duration of the existence of the implant, which causes the peri-implant bone dense (which increments all through the implant life) and to adjust over the surface of the implant, in the term "Osseo adaptation", and this is the manner by which rebuilding plays a key role and is called as the "fourth Dimension"[4] .

In basic terms it tends to be expressed that the peri-implant healing is a lifelong process using the idea of miniature movement furthermore, bone compression, that is the reason these implants are too called as "Orthopedic Implants" as they utilize the equivalent standards of peri-implanthealing and bone densification[4]. To the extent the KOS and KOS plus implants are concerned, since these implants are surface treated, peri-embed healing happens as indicated by idea of osseointegration and remodeling is a lifelong process.

Basal Implants for Atrophied Ridges

Restoring atrophic edges is a challenge for theprosthodontist be it fixed or removable. Restoration of such cases includes broad planning including the choice of pre-prosthetic surgical procedure; basal implantology prevents any need for surgical procedures. Dissimilar to regular implantology where ridge augmentation shown to empower the placement of implant with suitable measurements, basal implants can be utilized in any size and in combination with any implant. In any case, there is a certain procedure to how atrophicridges should be restored. Following are the focuses that are considered before restoring atrophic maxilla and mandible

I. General Systemic Considerations[1,2]

As per basal implantologists it doesn't make any difference until the patient has had a recent myocardial infraction,cerebrovascular accident, immunosuppressant therapy, chemo or

radiotherapy and bisphosphonate treatment. Diabetes is certifiably not an immense worry insofar as glucose levels are in control, likewise it doesn't make any difference if the patient is a smoker or not.

II. Biomechanical Considerations[4]

The evaluations of bone thickness given by Dr. Carl E. Misch are not relevant to basal implantology as the drilling succession and technique for placement is totally unique.Bone is a visco-versatile structure as is this implant, consequently, the stress shielding is dodged.

III. where to load? [4, 15, 16]

As per theory of basal implantology the cranial bone is for all time in a condition of torsion, i.e.; there are consistent lateral stress being applied to thecranial bone consistently because of activity of the joined facial muscles, hence, there is nothing of the sort as an "unloaded" implant as lateral forces will consistently exist regardless of the implant gets a superstructure or not. Thinking about this, basal implants can be left without a superstructure till completion of the healing stage or they can get a superstructure quickly, following 3 days, 1 week, 6-8weeks, or temporary restoration can be possible for 3-6 months followed by finalrestoration.

IV. Which Jaw to Restore First???[4]

The stomatognathic framework comprises of stationary (maxillary bone) and a mobile (mandibular bone) part, the role of the mobile segment is to apply forces and the stationary part absorbs[3]a lot of the forces applied. Due to the previously mentioned purposeof the jaws, it becomes basic that the mandible ought to be restored first, likewise a conventional mandibular denture on aatrophied foundation is unstable, in this manner, chewing capacity becomes poor and continuously the related muscles lose their tonicity, on account of fixed restoration these afflictions are avoided, mandible ought to be restored first.

V. Treatment of Atrophied Ridges

a. Atrophic Mandible

Over the years two ways of thinking have created in regards to implant restoration in atrophic mandible, they are

i. Multi-Implant Concept of French School[4, 6]Engendered and established by Scortecci this school favors countless basal implants in the mandible generally around 7-12 implants. As indicated by this school basal and crestal Implants are joined to bring about a result that is rigid to the point that it doesn't allow any torsion across the mandible additionally this doesn't permit the jaw framework to reorient forces. Since, it is nearly difficult to stop mandibular torsion, there is generation of extensive forces on the implant body which prompts over-load osteolysis and causes implant failure.

ii. Strategic Implant Positioning Concept of German School[4, 15] This school was established by Dr. Ihde. according to this school 4 implants are placed in the mandible ideally in the canine and second molar region this takes into account mandibular tortion and reorientation of forces which get compensated by flexibility of the prosthesis, in this manner, over-load osteolysis and implantfailure in prevented.

Infranerval Implantation Technique[4, 15, 17]

In the atrophic mandible with advancing resorption the IA nerve lies nearer to the crest, in such cases it gets troublesome toput crestal implants without bone augmentation or nerve repositioning. BOI implants don't need such procedures prior to the placementof the osteotomy preparation can be modified, i.e.; the osteotomy preparation for the basal disc is prepared approx. 2-3 mm below the nerve, this way the basal disc gets inserted beneath the nerve and need for extensive techniques is avoided. This strategy is likewise called as Infraneural Implantation.

b. Atrophic Maxilla[4, 6, 18]

The resorbed maxilla represents an extensive test for embed reclamations. The pneumatized sinus and the permeable bone make embed arrangement a difficult assignment. The permeable bone is dealt with by the pressurescrew inserts, though, for the sinus two procedures Have been portrayed, which depict substitute strategies of placement

i. Sinus Section Technique
In these two/three walls of the sinus are segmented to facilitate placement of the basal disc in the sinus. Basal implantologists leave the alternative of lifting the Sinus membrane and grafting on the operator. The sole motivation behind this procedure is to acquire bi-cortical support; additionally, just one implant can be put this route in each sinus.

ii. Tuberopterygoid (TPG) Screws
These implants are put in the pterygoid bone and help in offering support to the prosthesis. These are utilized in conjunct with Sinus Section procedure and are placed at 20º-45º in the bone also, the angulation between BOI implant and TPG screw ought not surpass 90º otherwise prosthesis placement gets troublesome.

iii. Zygomatic Screw Implant (ZSI)-
These are zygomatic implant that are placed in the zygomatic bone and like the BCS implant these likewise have sharp edged cortical screws that acquire bicorticalsupport

c. Cortically Fixed @ once [19, 20]

This is a new convention presented by Dr. Henri Diederich in 2013; this convention depends on basal cortical implantology and is explicitly pointed toward restoring atrophic jaws regardless of the measure of bone available with no requirement for augmentations. This isbasically a plate structure implant, which resembles smaller than usual plates (used for fracture reduction) with a abutment stage, this unique design permits them to be twisted and adapt to any surface and is anchored to bone utilizing bone expanding miniscrews . The quantity of holesrequired can be reduced; another advantage position is their isoelasticity enabling them to imitate bone. These implants are sub-periosteal implants thus far this convention has shown great outcomes however more clinical research is required.

**Prosthetic Rehabilitation**[4, 6, 15, 19, 20]

The point of prosthetic rehabilitation is to provide esthetics,enables hygiene practice and principally to stay away from over-load osteolysis. Esthestics are taken care with following the three FPs given

by Dr. Carl E. Misch. Over-load osteolysis is prevented by providing suitable occlusal plans which can be reciprocal adjusted, group function, lingualized occlusion.

**Conclusion**

The innovative work these implants have gone through have made them a suitable choice for reestablishing atrophic jaws as they don't need extensive augmentation and aloe immediate loading and, they can be placed with a flapless method and can be joined with any implant. Regardless of the information accessible on their achievement in treating anvariety of cases these implants have acquired nearly nothing trust among conventional implantologists.However, it can't be rejected that basal implantology fits the guideline "Primum Nihil Nocere", i.e., "First Do No harm". At whatever surgeries are involved (conventional), basal implantcame as rescue. Additionally, with the proposed characterization we have attempted to extensively arrange basal implants primarily dependent on their morphology/structure, this grouping may help the in understanding the design that exist and will give a better comprehension of the applications and ramifications of each implant design.

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**REFERENCES**

1. Yadav R. S, Sangur R, Mahajan T, Rajanikant A. V, Singh N, Singh R. An Alternative to Conventional Dental Implants: Basal Implants. Rama Univ J Dent Sci, 2015;2:22-28.

2. Misch, Carl E. Contemporary Implant Dentistry. St. Louis: Mosby, 1993.

3. Sharma Rahul, Prakash Jai, Anand Dhruv, Hasti Anurag. Basal Implants- An Alternate Treatment Modality for Atrophied Ridges. IJRID 2016;6:60-72.

4. Ihde Stefan. Principles of BOI- Clinical, Scientific, and Practical Guidelines to 4-D Dental Implantology. Springer, Heidelberg; Germany, 2005.

5. NiswadeGrishmi, Mishra Mitul. Basal Implants- A Remedy for Resorbed Ridges. WJPLS 2017;3:565-572.

6. YeshwanteBabita, Choudhary Neha. BaigNazish, Tated Gaurav, Kadam Pranit. Basal Osseointegrated Implants. IJAHS 2016;3:1-8.

7. Nair Chandana, Bharathi Swarajya, Jawade Rashmi, Jain Meenu. Basal Implants – A Panacea for Atrophic Ridges. J Dent Sci Oral Rehab 2013;1-4.

8. Gupta Amit, Madan Bhanu, BakshiMansha, Garg Meenu. Full Mouth Rehabilitation with Immediate Loading Basal Implants. IJPCDR 2017;4:1-3.

9. Otoum Ahmad, BsoulThamer. Basal Screw Implantology without Sinus Lifting. Pak Oral Dent Jour 2014;34:414-416.

10. Khairnar Mayur, Gaur Vivek. Evidence of Bone Formation in the Nasal Floor around Polished Surface Bi-Cortical Screw Implants after Indirect Nasal Lift in an Atrophied Maxilla: Cone Beam Computed Tomography- Based Case Report. J Ind Soc Perio2015;19:236-238.

11. Scortecci Gerard. Immediate Function of Cortically Anchored Disk – Design Implants without Bone Augmentation in Moderately to Severely Resorbed Completely Edentulous Maxillae. Journal of Oral Implantology, 1999;25:70-79.

12. Ihde Stefan, Eber Miroslav. Case Report: Restoration of Edentulous Mandible with 4 BOI Implants in and Immediate Load Procedure. Biomed Papers, 2004;148:195-198.

13. Odin Guillaume, Misch Carl E., BindermanItzak, Scortecci Gerard. Fixed Rehabilitation of Severely Atrophic Jaws using Immediately Loaded Basal Disk Implants after In situ Bone Activation. Journal of Oral Gupta, et al. Basal Osseointegrated Implant Implantology, 2012;38:611-616.

14. Diederich Henri. Immediate Loading of a Maxillary Full – Arch Rehabilitation Supported by Basal and Crestal Implants. Implant Directions, march 2008;3:61-64.

15. Ihde Stefan. Comparison of Basal and Crestal Implants and their Modus of Application. Smile Dental Journal, 2009;4:36-46.

16. Haedecke, F. Immediate Function and Graftless Solution for Complete Loss of Alveolar Ridge in the Molar Region after Infection of Two Crestal Titanium Implants: Description of a Case Treated with an Individualisable New Implant Type and the New Implant Material PEEK. Presented at 46th Annual Congress of French Society of Maxillofacial and Oral Surgery, Versailles, France, 2012.

17. Ghazaei, F, Spahn, F. Treatment Concept for Extremely Atrophic Mandibula Renouncing on Grafts and Heavy Surgery in Bone Heights of Less than 5mm. Presented and Published at EACMFS Congress, Prague, Czech Republic, September 2014.

18. David, A, Ghazaei, F. Case Description of a New Graftless Solution for a Patient with Complete Alveolar Ridge Loss in the Molar Part of the Maxilla. Presented at Polish Association of Implantologists, Poznan, Poland, 2013.

19. Vares Yan, Diederich Henri, Ansel Alain. Posterior Maxilla Implant Rehabilitation: A Challenging Task. http://www.dentaltown.com/magazine/articles/5247/ceposterior-maxilla-implant-rehabilitation-a-challengingtask

20. Diederich Henri, Marques Alexandre Junqueira, Soares Léo Guimarães. Immediate Loading of an Atrophied Maxilla using the Principles of Cortically Fixed Titanium Hybrid Plates. Adv Dent and Oral Health, 2017;3:001-004.