IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 24, Issue 7 Ser. 6 (July. 2025), PP 18-25
www.iosrjournals.org

Basal Implants And Its Armamentarium – A Review Of Past And Present Concepts

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Abstract
With continuous development and advancements in various aspects of implantology, basal implants have emerged as an asset for the rehabilitation for atrophic ridges. Basal implants are available in various types and have unique design which offers numerous benefits including minimal chances of infection. The present review article focuses on evolution of design of various types of basal implants throughout the years along with the armamentarium required.

Keywords: *Basal implant, armamentarium, Disk implants, cutters*

Date of Submission: 10-07-2025 Date of Acceptance: 20-07-2025

I. Introduction

Implantology is a unique branch of dentistry which aims to rehabilitate edentulous arches in an idealistic manner regardless of atrophy or injury to stomatognathic system.[1,2] However to perform stress free and unrestrictive implant surgery, sufficient alveolar bone should be available i.e minimum 13-15mm length and 5-7 mm width.[3]

Whenever this critical requirement is not met, then there is a need for considering restoration of the lost alveolar dimensions to have an expected outcome of the treatment. To manage these deficiencies, various regenerative techniques were developed. However, these adjunctive measures are more time-consuming and costly for the patient.

To avoid these procedures, the other option for rehabilitation in atrophic jaws is to modify the implant design. Mini Dental Implants and Basal Implants are the two implant designs and protocols recommended for atrophic jaw replacements.[3,4,5]

Basal implant also known as bicortical implants or lateral implants or disk Implants, suggest to the lateral insertion of disk-form implants into basal bone and, more generally, to the implants taking anchorage from the basal bone [e.g., root-form implants placed in the zygomatic and/or pterygoid process].

It works on the principle of using basal cortical bone areas which is spared from infection and resorption and also have high load bearing tolerance. Because basal implantology includes the application of the rules of orthopedic surgery, these are also called "orthopedic implant".[4,5]

The modern basal implant has a sophisticated yet simple design, surgical protocol and is a prosthetic friendly system which has led dentists to practice basal implantology.

II. Historical Review

The bone bonding properties of titanium implant “fixtures” was a chance discovery by a Swedish physician [Dr. Per-Ingvar Brånemark in 1952]. In 1965, the first dental patient was treated with titanium dental implants.[1,8]

Dr. Jean-Marc Julliet created the first single-piece implant in 1972 and it has been successfully used ever since. The only drawback is that there isn't a surgical kit available. Dr. Gerard Scortecci, a French dentist, enhanced the basal implant system in the middle of the 1980s by adding external and internal connections for the prosthetic superstructure as well as corresponding surgical instruments; he dubbed these "Disk implants."[1,8]

Dr. Stefan Ihde began producing lateral basal implants, such as the Disk Implants, in 1997.

Many modifications in the design were introduced which included screwable designs [BCS, GBC] in 2005. The whole basal implant with polished surfaces was introduced in 2003 which showed no tendency to inflammation. [1,8,9]

The abutment design was also developed:

- Prior to the introduction of one-piece designs, basal implants were initially designed as two-piece structures.

- Screw connections inside were created. The fixation of epitheses and maxillo-facial use both benefit from these designs.

In 2013, use of a temporary transpalatal bar for extremely atrophic, eggshell maxillae was generalized in order to guarantee absolute immediate stability of basal bone-anchored fixed full-arch restorations.

Today, basal implants are most often used to treat difficult anatomic situations where conventional implants cannot be placed directly without using adjunctive regenerative procedures. [1,8,9]

Comparison Of Crestal With Basal Dental Implants [2]

CRITERIA	CRESTAL [AXIAL / SCREW] IMPLANTS	BASAL IMPLANTS
Shape and structure	Root form.	Resembles inverted T.
Endosseous section	Screw shaped with machine / HA coated surfaces.	Flat / blade like surfaces with spaces permitting bone in growth.
Technique	Insertion through crestal bone and communication with oral cavity much more than basal implants.	Insertion through lateral aspect of basal bone. Load bearing area of implant has no communication with the oral cavity.
Bone requirement	Vertical bone – both crestal and rarely a small portion of basal bone.	Basal bone is what is needed.
Armamentarium	Complex	Simpler
Bone grafting procedures	Essential.	Not essential.
Bone resorption	Crestal bone is more susceptible to resorption.	Basal bone - highly resistant to resorption.
Mucosal penetration diameter	Larger. More chances of periimplantitis	Smaller
Loading	Two piece crestal implants often require delayed loading & two surgical phases at times.	Immediate loading.
Healing	Prolonged healing time – clinically significant.	Bone healing time not clinically significant.
Masticatory forces	They act in the vertical direction along the sides of the screw structure.	Transferred to the basal plate deep into the cortical bone areas which are able to accept large loads and have great capacity for regeneration.

Rationale For Using Basal Implants

The osseous tissue of the maxilla and mandible beneath the alveolar processes is known as basal bone. It is relatively fixed and unchangeable framework and is heavily corticated. It is rarely subjected to infections and resorption when compared to cortical bone.[9]

The idea behind basal implantology is that implants are placed in the basal bone because it can be loaded instantly and has a load-bearing capacity that is many times greater than that of the spongy crestal bone. Orthopedic implants, such as hip and knee replacements, have already demonstrated this science. The patient is instructed to begin using the artificial joint right away after it is fitted. Basal implants are therefore also referred to as "Orthopedic Implants."[1,2]

Basal Implant Classification

There are four basic types of basal implants available.[9]

Screw Form	Disk Form BOI/ TOI/ Lateral implants	Plate Form	Other Form
• Compression Screw Design [KOS Implant] • Bi-Cortical Screw Design [BCS Implant] • Compression Screw + Bi-Cortical Screw Design [KOS Plus Implant]	According to abutment connection- i. Single Piece Implant. ii. External Threaded Connection. iii. Internal Threaded Connection According to basal plate design- i. Basal disks with angled edges. ii. Basal disks with flat edges also called as S-Type Implant.	BOI-BAC Implant BOI-BAC2 Implant	• TPG Implant [Tuberopterygoid]. • ZSI Implant [Zygoma Screw].

	According to number of disks- i. Single Disk. ii. Double Disk. iii. Triple Disk.		

Types Of Basal Implants

Basal implants come in two varieties that are especially made to take advantage of the robust cortical bone.

- BOI [Basal Osseo Integrated] - These implants are placed in the jaw bone from the lateral aspect. Only the horizontal implant segments and cortical bone structures are subject to masticatory load transmission. Basal implants are region specific.
- BCS [Basal Cortical Screw] - The screw basal implants are flapless implants that are inserted through the gingiva, without giving a single cut, inserted like a conventional implant.[3,4]

Parts Of Basl Implants

To overcome the problems with conventional 2 and 3 piece implants the basal implants are designed as single section implants where the implant body and abutment are fused. These have 3 parts as body, neck and surface.[3,4]

A. BOI Implant Morphology

To increase the implant's strength, the BOI implant is made of either pure titanium or titanium molybdenum alloy. The following are the components of the BOI implant; they can be single or two pieces.

a] Abutment portion

In single piece BOI implants the abutment portion is conical and remains exposed in the oral cavity, whereas in two piece BOI implant the abutment portion can be an externally screw with an external hexagonal or octagonal restorative platform, or an internally threaded screw.

b] Neck

It is the section directly beneath the section of the abutment. The diameter of this section may or may not be constricted; constriction improves gingival adaptation after healing, lowers rigidity, and permits bending by 15° to 25°.

c] Vertical Shaft

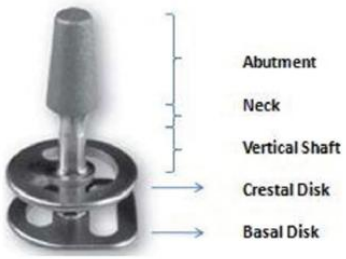
This section serves as the link between all of the implant's parts. Depending on the diameter and type of titanium used, the shaft can be either rigid or elastic. It is kept smooth and polished to prevent inflammation and plaque buildup. The vertical shaft, which is typically 10 to 13.5 mm long, is solely a load-bearing component.

d] Crestal Disk

It is the first disk in the implant. It is called crestal disk as it lies in the crestal bone after placement of the implant. This disk serves a dual purpose i.e.; immediately after implant placement this disk provides and maintains primary stability and after osseointegration this disk converts into a load bearing and distributing component.

e] Basal Disk

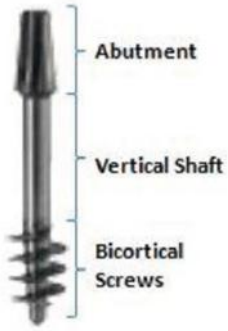
It is the final part of the implant body and the second disk at the base of the device. This part is also kept polished and is a load bearing and distributing component. The elastic portion of the shaft that is attached to the basal disk can bend by 15 to 25 degrees. The crestal and basal disks are typically 5 mm apart.



B. BCS Implant Morphology

These are single-piece implants that resemble the BOI implant in design, but the abutment and implant part are different BCS implant abutment can be Conical Straight, Conical Angled and Multi-Unit abutments. The BCS implant features wide diameter cutting screws that aid in engaging the buccal and palatal/lingual cortical plates. These screws initially give the implant primary stability and load bearing capacity, and later serve as a load bearing and distribution component, in contrast to the BOI implant, which has disks in the implant portion.[4,5]

In addition to being flapless and having a very small mucosal penetration diameter, these implants are highly polished.



C. KOS and KOS Plus Implant Morphology-

Titanium Molybdenum or Titanium Aluminum Vanadium alloys are used to make these single-piece implants. These implants are made similarly to compression screws, which means that when they are screwed into the bone, the surrounding cancellous bone is compressed, creating denser, more compact bone.

i. The Abutment Section It remains exposed in the oral cavity and serves as the restorative platform for these implants. These implants provide a large range of abutment choices, including:

a. Conical In addition to being straight abutments for cemented crowns, these abutments may also have a vertical microgroove that prevents rotation.

b. Conical Angled abutments.

c. Locator abutments.

d. Ball abutments.

e. Multi-Unit abutments.

*[these abutments are part of single piece implant]

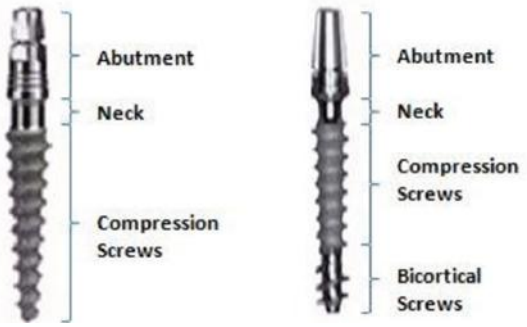
ii. Neck

This portion of the implant is constricted and highly polished to promote better gingival adaptation and prevent plaque build up. The implant's neck can be bent between 15° and 25°.

iii. The Implant Portion

The threads in this section of the implant have a wide structure and wide turns, which allow them to compress the cancellous bone and change it into a denser bone that resembles cortical tissue.[3,5]

The basal cortical screws, which make up the apical third of the KOS Plus implant, help the implant engage the buccal and palatal/lingual cortical plates, assisting in the acquisition of primary stability before serving as a load-bearing and distributing component in the future.



The Diskimplant® System And Its Armamentarium

Unlike traditional implants, the method is straightforward, easy to use, and does not require extensive bone drilling, preventing thermal damage. For most of the cases, a single pilot osteotomy with a "Pathfinder Drill" is sufficient for KOS, KOS Plus and BCS implants.

Surgeons prefer flapless insertion of basal implants as raising a flap will interfere with immediate loading and decreases the blood supply.[10,11]

Pre-implantation Procedures:

Pre-implant procedures should include:

— Phase I periodontal therapy

— Correction of iatrogenic muscle insertions which may result in implant neck exposure

- Botox® Injections are helpful in patients with powerful musculature and prevents future overload and stress.
- Bone Bed Stem Cell Activation with Osseotensors can be manual or rotary and act by promoting angiogenesis and osseogenesis 1 week to 45 days before basal implant surgery. These are helpful in tubero-pterygoid implants and when dealing with the sinus area.

Bone matrix osseotensors that are rotary and manual, made of mirror-smooth diamond-like carbon [DLC].

2) **The Diskimplant® System**

- Diskimplant® Emergence Profiles:

Since 1984, several generations of Diskimplants® have been created, each with a unique emergence profile:

- External thread [M2–0.40, then M2–0.25]
- Internal thread with an external hexagon [M2–0.25]
- Internal M1.4 thread with a Monobloc flat emergence profile
- Internal M2–0.40 thread with an internal octagon.

- The characteristic features of current-day Diskimplants® include:

a. For implants with an external hexagon, a monobloc crestal emergence evolved. A slightly larger vertical cylindrical shaft.

b. A horizontal circular or asymmetrical base

- For severely atrophic jaws, Plate-form Diskimplants® are used, fastened with tiny orthopedic screws [5–6 mm].

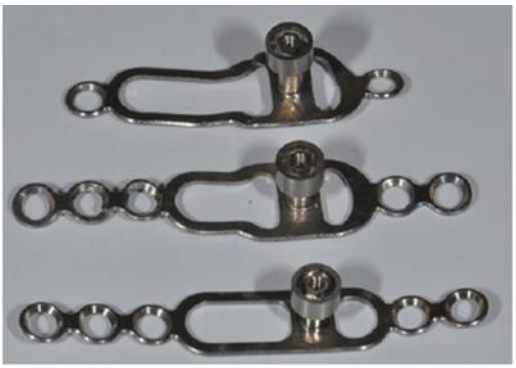


Plate-form Diskimplants® of various dimensions to manage anatomic requirements

3) **Armamentarium**

The instruments required for Diskimplant® placement are as follows:

1. Titanium cutters of different lengths and diameters [1,12,13]
2. High-speed handpiece [160,000 rpm] or air turbine set at ≥3 kgf/cm2/60 psi minimum
3. Scalpels [Bard-Parker® no. 15], resorbable and/or non-resorbable suture thread
4. Periosteal elevators [medium and large]
5. Bone and gum scissors
6. Manual gum retractor, automatic retractor
7. Seating instruments [straight, curved, bayonet]
8. Surgical mallet
9. Needle holder
10. Suture scissors
11. Self-tapping osteosynthesis screws for plate-form Diskimplants® and the corresponding screwdriver[11,12]

Armamentarium for basal implant installation

Advantages Of Basal Implants

1. Safe load transmission in basal bone which is free from infection and resorption process.
2. Less incidence of peri-implant infectionsdue to highly polished implant surface and minimal mucosal penetration.
3. No requirement of bone augmentation procedures.
4. Immediate loading is possible which improves the patient acceptance as well.
5. Lesser appointment visits as compared to conventional implants.

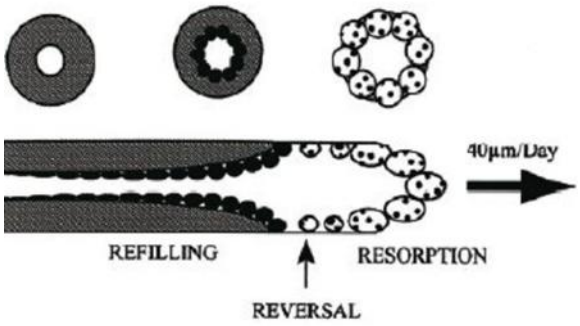
Disadvantages With Basal Implants

1. Compromised aesthetics with single tooth replacement.
2. To perform successful surgery, a skilled surgeon with solid anatomic knowledge is essential.
3. Open flap surgery is required for BOI implants. Gingival incison and suturing are necessary, unlike BCS implants, as BCS implants may be inserted without a flap procedure.
4. Improper load distribution can result in a phenomenon known as overload osteolysis.

Peri-Implant Healing [BOI AND BCS IMPLANT]

Basal implantologists refer to what conventional implantologists refer to as "osseointegration" as "osseoadaptation." This is because the bone undergoes remodeling and adaptation across the implant's surface when it is subjected to constant functional loads, the remodeling of bone under functional loads is considered to be the 4th Dimension.[1,12]

According to philosophy of basal implantology the process of Osseoadaptation is carried out by a “Bone Multicellular Unit” [BMU], it is said to be like a cutting cone with a tail, the cutting cone comprises of osteoclastic cells that eat away the peri-implant bone and the tail comprises of osteoblastic cells that lay down bone, as this unit moves in the bone the osteoclastic activity is subsequently followed by osteoblastic activity.



The development of this BMU occurs when the BOI and BCS implant are immediately loaded, which starts the healing process and creates a thick peri-implant bone.[14,15]

The cascade of processes involved is as follows-
I. Activation Phase - Lasts for 3 days and marks the development of asteoblasts and osteoclasts from the precursor cells/human mesenchymal stem cells.
II. Resorption Phase: Soft and porous bone is revealed by osteoclastic activity, which happens at a rate of 40µm/day.
III. Reversal Phase- Osteoblasts lay down neo bone in the haversian canals at a rate of 1-2µm/day.
IV. Progressive Phase- This phase involves the osteoblasts forming concentric lamella in haversian canals and increased bone density.
V. Mineralization Phase- After 10 days of osteoid formation mineralization phase begins. This phase involves two stages: primary mineralization stage [acounts for 60% of all mineralization] & secondary mineralization stage [lasts for 6-12 months].
VI. Dormant Phase- In this Phase osteoblasts develop into osteocytes and line the haversian canals and take up mechanical, metabolic and homeostatic functions.

Due to continuous functional loading, the peri-implant bone become dense [which increases throughout the implants life] and to adapt over the surface of the implant, thus the term “Osseoadaptation”, and this is where remodeling, sometimes referred to as the "4th Dimension," comes into play.

III. Discussion

The surgeon, prosthodontist, and dental technician must all be trained in the fundamental concepts of basal implantology that differ in many aspects from those for root-form implants. These implants serve a better alternative to crestal Implants in terms of ability to restore almost any type of case, shortened treatment time, less chances of failure. However, the long term results are yet to be proven and further research and more concrete documentation on clinical cases is required to prove their efficacy as a replacement to conventional implants.

References

[1] Ihde Stefan. Principles Of BOI- Clinical, Scientific, And Practical Guidelines To 4-D Dental Implantology. Springer, Heidelberg; Germany, 2005.
[2] 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.
[3] Misch, Carl E. Contemporary Implant Dentistry. St. Louis: Mosby, 1993.
[4] Kumar K, Choudhary S, Singh R, Yadav SK, Kedia NB, Singh AK. Awareness And Perception Of Patients Towards Dental Implants- A Hospital Based Survey. Indian J Conserv Endod. 019;4(4):116-20.
[5] Sharma Rahul, Prakash Jai, Anand Dhruv, Hasti Anurag. Basal Implants- An Alternate Treatment Modality For Atrophied Ridges. IJRID 2016;6:60-72.
[6] Niswade Grishmi, Mishra Mitul. Basal Implants- A Remedy For Resorbed Ridges. WJPLS 2017;3:565-572.
[7] Pal TK. Fundamentals And History Of Implant Dentistry. J Int Clin Dent Res Organ. 2015;7:6-12.
[8] Prasad DK, Mehra D, Prasad DA. Recent Advances, Current Concepts And Future Trends In Oral Implantology. Indian J Oral Sci. 2014;5:55-62.
[9] Scortecci G. (1999) Immediate Function Of Cortically Anchored Disk-Design Implants Without Bone Augmentation In Moderately To Severely Resorbed Completely Edentulous Maxillae. J Oral Implantol25, 70–79.
[10] Yeshwante Babita, Choudhary Neha. Baig Nazish, Tated Gaurav, Kadam Pranit. Basal Osseointegrated Implants. IJAHS 2016;3:1-8.
[11] IHDE Dental. [Online]. Cited 2009 Feburary 2; Available From: URL: Http://Www.Boi.Ch/Index.Php/En/.
[12] Chandrashekar Sajjan. Revisit Basal Versus Crestal Implants And Start Pertaining. Journal Of Indian Prosthodontic Society 18(6),56 (2018)
[13] IHDE Dental. [Online]. Cited 2015 Feburary 2; Available From: URL: Http://Www.Boi.Ch/Index.Php/En/.

[14] Hong DGK, Oh JH. Recent Advances In Dental Implants. Maxillofac Plas Reconv Surg. 2017;39(1):33.)
[15] Nair C, Bharathi S, Jawade R, Jain M. Basal Implants – A Panacea For Atrophic Ridges. Journal Of Dental Sciences & Oral Rehabilitation. 2013:1-4.