



BASAL IMPLANTS: A POSSIBLE NEW ALTERNATIVE TREATMENT MODALITY FOR ATROPHIC RIDGES

Dental Science

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ABSTRACT

This article aims to review the literature of basal implants as an alternative treatment modality with added benefits of ignoring unnecessary augmentation procedures for patients with severely atrophic ridges. Development of basal cortical implant system gave a possibility for the patients with atrophic ridges for the replacement of lost teeth, adding to its advantage the cost effective treatment with positive results.

KEYWORDS

Basal Implants, Crestal Implants, Immediate loading, Atrophic Ridge, BCS Implants, BOI Implants, KOS Implant.

INTRODUCTION

Submission of crestal implantology gave an opportunity to basal implantology to flourish, proving an amazing opportunity to the implantologists in treating cases unable to be treated with the conventional implant systems.^[1]

Traditionally, the techniques used for the replacement of lost tooth require a two-stage surgical approach, involving a period of healing for the integration of implant with a transitional period during which the patient wears a temporary removable prosthesis.^[2] Branemark and colleagues have recommended a stress-free unloaded healing period to ensure the osseointegration of the endosseous implants.^[3] High success rate for the immediate implant placement in an extraction socket is well documented.^[4]

The conventional crestal implants are indicated when an adequate vertical bone height is available, as they are placed into the crestal alveoli of the jaw bone, whose main load transmitting surfaces are vertical. Though, the prognosis is not good as soon as the augmentation becomes part of the treatment plan. Ridge augmentation procedures tend to increase the risk, cost and number of surgical procedures. Thus patients with severely atrophic ridges paradoxically receive little or no treatment.^[5] 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 the retention. They are uniquely designed and highly advanced implant system to be accommodated in the basal cortical bone. These basal implants are also known as lateral implants or disk implants.^[5]

Bicortical screws (BCS) are also considered as basal implants as they transmit masticatory loads deep into the bone, usually into the opposite cortical bone. They provide some elasticity and are not prone to peri-implantitis due to their polished surface and their thin mucosal penetration diameter.^[5,6] Screwable basal implants have been developed with 3.5mm to 12mm thread diameter and length of 10-38 mm.^[5]

With respect to the accepted principle "primum nihil nocere", i.e. limiting treatment, basal implants are the devices of first choice, whenever (unpredictable) augmentations are part of an alternative treatment plan.^[5,6]

Basal Implantology

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. Since the basal implantology includes the application of the rules of orthopedic surgery, the basal implants are

also called as "orthopaedic implants"^[6] to mark a clear distinction between them and the well-known term "dental implant". It has already been scientifically proven in orthopaedic implants (Hip / Knee replacements). Immediate usage is suggested once the patient is fitted with the artificial implant. These basal implants are also called as lateral implants or disk implants.^[1,7]

Conventional Crestal Implantology

Traditional crestal implants use the alveolar bone as a support, which is lost after tooth extraction & continues to decrease throughout the life due to functional loss. Crestal implants load-transmitting surfaces are vertical. For a successful implant placement there is need for sufficient bone availability (at least 13-15mm length, 5-7mm width).^[2,8,9] Not fulfilling this criteria necessitate additional treatment planning which includes inlay or onlay alveolar grafts, nerve repositioning, sinus lift, nasal lift.^[1,2,8] It is a common practice to insert screws of at least 10-13 mm in length in the anterior mandibular region due to sufficient vertical bone. Although, they are contraindicated in atrophic ridges.^[9]

Types of basal implants^[10]

There are four types of basal implants available based on Morphology:

1. Screw Form
2. Disk Form
3. Plate Form
4. Other Forms

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)

Disk Form

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

1. According to the abutment connection:

- a. Single Piece Implant
- b. External Threaded Connection
- c. Internal Threaded Connection
 - i. External Hexagon
 - ii. External Octagon

2. According to basal plate design:

- a. Basal disks with angulated edges
- b. Basal disks with flat edges also called as S-Type Implant

3. According to number of disks:

- a. Single Disk

- b. Double Disk
- c. Triple Disk

Plate Form

- a. BOI-BAC Implant
- b. BOI-BAC2 Implant

Other Forms

- a. TPG Implant (Tuberopterygoid)
- b. ZSI Implant (Zygoma Screw)

The BOI and BCS Implants has a smooth and polished surface due to the fact that the polished surfaces are less prone to inflammation (mucositis, Peri-implantitis) rather than the rough surfaces. While the KOS and KOS Plus implants are surface treated (sand and grit blasting with acid etching), though the implant neck is polished. In KOS Plus implant the neck and basal cortical screw part are polished.^[10,11]

BOI (lateral basal implants)

They are manufactured either from pure Titanium or from Titanium Molybdenum in order to enhance the strength of the implant, having the following parts:^[11]

1. Abutment portion
2. Neck
3. Vertical shaft
4. Crestal Disk
5. Basal Disk

These are inserted into the jaw bone from the lateral aspect. The masticatory load is restricted to the horizontal segment of the implant, fundamentally to the cortical bone.^[12,13]

Anterior implants

For the anterior jaw bone region, if the vertical bone is sufficiently available, two disk implant are commonly used (consisting of basal disk and crestal disk). The basal disk has a diameter of 9 or 10 mm, however the crestal disk is 7 mm in diameter. The crestal disk has the purpose to provide additional stabilization until, the basal disk has ossified to its full load bearing capacity. In case of insufficient vertical bone available, a single disk implant is inserted having 7-9 mm diameter and shafts between 8 to 13.5 mm.^[12,13]

Posterior Implants

The implant placed in the posterior region, have square shape (disk size 9 to 12 mm or 10 to 14 mm) with shafts of 10 to 13.5 mm in length. If the vertical height of available bone is 2 mm above the mandibular nerve, an infra-nerve implant placement (also known as Infraneural/ Infraneural Implantation Technique) is indicated (disk is inserted below the nerve with the threaded carrier located at the side of the nerve).^[5,9,11,12,13]

BCS Implant (Bicortical screw)

BCS Implants are the single piece implants with a little modification in design from BOI Implant, which is the abutment and the implant portion. The abutment is available in various forms, such as conical straight, conical angled, multi-unit abutments. In contrast with the BOI, BCS implant has wide diameter cutting screws helpful in engaging the buccal and palatal/lingual cortical plates, providing primary stability with load bearing capacity.^[8,10] Due to their polished surface and thin mucosal penetration diameter, BCS are not prone to peri-implantitis.^[11]

Parts of BCS Implant:^[13]

1. Implant surface
2. Implant body
3. Implant neck

KOS and KOS Plus Implant (King of single piece basal implant)^[14]

These single piece implants are manufactured from Titanium Molybdenum or Titanium Aluminum Vanadium alloy, designed like compression screws (i.e. when inserted into the bone, they compress the cancellous bone around the implant to form more dense and compact bone).^[8,22]

1. Abutment
2. Neck
3. Implant portion

Table 1: Indications & Contraindications Of Basal Cortical Implants^[1]

INDICATIONS	CONTRAINDICATIONS
When bone grafting has failed(2 stage surgery)	Patient on drug therapy like Cancer drugs, anti-blood clotting drugs such as warfarin & bisphosphonates (a class of drugs used in the treatment of osteoporosis)
In atrophic jaw bone <ul style="list-style-type: none"> • With insufficient bone height • With insufficient bone width 	Systemic Conditions such as Recent MI (heart attack), immunosuppression, cerebrovascular accidents (stroke)
When several teeth are missing, complete edentulous mouth, numerous teeth are to be extracted.	Cases where bilateral equal mastication is not possible (when muscles of mastication or their innervations are partially missing)
It can be placed in already infected sockets.	

Advantages of Basal Cortical Implantology^[1]

- Immediate loading
- Single piece implant system
- Basal bone support
- Minimally invasive, minimal surgical complications
- Advance option for atrophic ridges
- Eliminate the threat of peri-implantitis (98%)
- Medically compromised patients (controlled diabetics, smokers, periodontitis)
- Cost effective
- It avoids the phenomenon of stress shielding (as both bone & implant are visco-elastic)

Disadvantages of Basal Cortical Implantology^[1,15]

- Technique sensitive procedure
- Functional overload osteolysis : Local microcracks in the cortical bone may be created via masticatory forces transmitted through the basal implants. Through a process known as “remodeling” these microcracks are repaired by the osteotomes, which in turn temporarily reduces the degree of mineralization and increasing the porosity of bone. Therefore, if the loads are reduced adequately, the basal implants have a good chance of reintegration.

CONCLUSION

With the development of basal cortical implant system a new era of tooth replacement has began, giving a possibility for the patients with atrophic ridges, adding to its advantage the cost effective treatment with positive results, lesser time span, immediate loading of prosthesis for esthetically concern and functionally compromised patients, without going through the unnecessary augmentation procedures. Since dental implantology became unpredictable and expensive, when the augmentation becomes part of the treatment plan, basal implants become patient's first choice.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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