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BASAL IMPLANTS AS A TREATMENT OPTION FOR ATROPHIC RIDGES

Prosthodontics

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ABSTRACT

Restoration edentulous mandible and maxilla with basal implant supported prosthesis has become frequently implemented treatment in today's clinical practice in situations where adequate alveolar bone is not sufficient for placement of conventional implants i.e. atrophic ridges. The basal implants are termed as the dental implants which engage the basal cortical bone of both the jaws for achieving the retention of implant. These basal implants are specifically designed with alterations for obtaining anchorage from the basal cortical bones from past decades. The modern basal implants are sophisticatedly designed, with simpler surgical protocol and prosthetically compatible system. The purpose of this article is to review type of basal implants systems in detail, classification of basal implants and there utilization for restoration of atrophic ridges along with their indications, contraindications, advantages and limitations.

KEYWORDS

Alveolar bone, Atrophic ridge, Basal Implant, BOI Implants, BCS Implants

INTRODUCTION:

Restoration of the edentulous mandible and maxilla with basal implant supported prosthesis has become frequently implemented treatment protocol in today's successful clinical practice of an implant dentist in the situation where sufficient alveolar bone is available (i.e. 5 to 7 mm in width and 13 to 15mm in length) for the placements of implant.[1,2] In the clinical situations where sufficient bone is not available i.e. in case of resorbed alveolar bone the extensive surgical procedures such as inlay or onlay bone grafts, repositioning of alveolar nerve, sinus elevation in maxillary bone or even lifting of nasal floor were followed for placement of straight conventional implants which were accompanied by their own complications.[3]

The complications of extensive surgical procedures in clinical situation where resorbed alveolar ridge is present can be prevented by changing the treatment plan which includes the placement of dental implants with altered or modified design. The two most frequently utilized implant designs for restoration of atrophic ridges include short dental implants and Basal implants.

The basal bone is termed as osseous tissue of maxilla and mandible underlying the alveolar bone.[4] The basal bone is comparatively fixed and un alterable framework of maxillary and mandibular bone.[5]

The basal implants are termed as the dental implants which engage the basal cortical bone of both the jaws for achieving the retention of implant. These basal implants are specifically designed with alterations for obtaining anchorage from the basal cortical bones from past decades. The modern basal implants are sophisticatedly designed, with simpler surgical protocol and prosthetically compatible system. These features of basal implants have attracted the attention of clinicians around the world to incorporate the use of basal implants in their clinical practice to obtain the longer lasting results.[1,2,6,7]

The purpose of this article is to review type of basal implants systems in detail, classification of basal implants and there utilization for restoration of atrophic ridges along with their indications, contraindications, advantages, disadvantages and limitations.

Historical background:

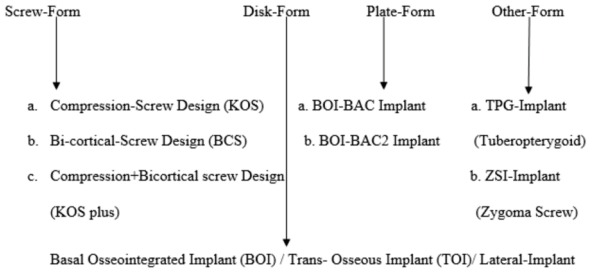
Table1.

Dr. Jean-Marc Julliet (1972)[8]	Introduced first one-piece implant with the disadvantage of lack of surgical kit resulted in the limited use.
Dr. Gerard Scortecci (mid 1980s)[8]	Introduced Diskimplants as modified version of basal implants with surgical tool, internal and external connection for superstructure. These implants were later modified into Basal osseointegrated implants (BOI).
Dr. Stefan Ihde (1997)[6]	Initiated production of lateral basal implants such as Diskimplants with restricted size and shape and their outer surfaces were roughened initially. Dr. Stefan modified basal implants; round base plates were converted to edges which prevented rotation of these implants in early phase of osseiointegration.

Rationale of using Basal Implants:

The basis of basal implantology originates from the two distinct pattern of jaw bones present i.e tooth bearing alveolar bone or crestal bone and the underlying basal bone. The low density tooth bearing crestal bone is subjected to greater exposure of infection from tooth originated diseases, injuries due to various iatrogenic factors leading to higher rate of resorption of this crestal bone on the other hand underlying basal bone is highly corticated and negligibly prone to infection and resorption. The basal implants which gain their support from basal bone resulting in their long-lasting success for rehabilitation of the edentulous jaws simultaneously the load bearing capacity of the basal bone due to presence highly cortical pattern is much higher than the spongy crestal bone. The rationale of using Basal implants originated from orthopedics which suggested importance of cortical bone areas more resistant to resorption, hence Basal-Implants are also termed 'Orthopedic implants'.[6,8,9,10]

Figure1. Classification of Basal Implants according to their morphology[10,11]



The Disk-form basal implants can further be classified as:
1. On the basis of abutment connection:
a. One piece Implant
b. External threaded connection
c. Internal Threaded connection

2. On the basis of plate design:
a. Angled edged basal disks
b. Flat edged basal disks

3. On the basis of number of Disk:
a. Single Disk implant
b. Double Disk implant
c. Triple Disk implant

Basal Implant Morphology: The Basal osseointegrated (BOI) and Basal Cortical Screw (BCS) implants fabricated now a days have polished and smooth outer surface which is less prone to inflammation i.e. periimplantitis and mucositis as compared to rough surfaces.[6,7,8,12]

The surface treatment of KOS and KOS plus implants is carried out with grit and sand blasting techniques followed by etching with acid, although neck of implant is extensively polished in case of KOS Implant whereas in case of KOS-plus implants both cortical screw and neck portion are kept highly polished.[13,14]

1. BOI Implant morphology: The basal osseointegrated implant is fabricated from pure titanium or from Titanium Molybedenum alloy for enhancing strength of implant.[1,6] The one piece or two piece implants with following parts constitutes BOI implant:

I). Abutment portion: This portion in one piece BOI implants consist of conical portion which remains exposed to oral cavity, however in 2-piece BOI Implant abutment portion may be threaded externally to screw with external hexagon or octagon restorative platform.[6,12]

II). Neck: This portion of BOI implant is located directly below the abutment portion. The neck constriction of implant leads to better healing after implant placement surgery and appropriate gingival adaptation which reduces rigidity for bending by 15 to 25°[1,6].

III). Vertical Shaft: This portion connects all components of implant and it should be kept smooth and polished for prevention of accumulation of plaque and inflammation; also this portion should be rigid and elastic depending upon titanium used and diameter of implant.[6]

IV). Crestal Disk: This Disk constitutes first disk and surrounded by crestal bone after insertion of implant. Immediately after implant placement this disc provides primary stability and after osseointegration period disc transforms into load-distributing and load-bearing component.[6,8]

V). Basal Disk: It constitutes last component of implant body and acts as the second disk and load bearing and distributing component. The distance between crestal and basal disk is approximately 5 mm.[8,11]

2. BCS Implant morphology: The BCS implants have design similar to BOI implants with alteration in abutment and implant portion. The different abutment designs for this implant includes straight, conical, angled conically and multi unit abutments. The BCS implants possess cutting screws which provide retention by engaging lingual and buccal cortical plates to impart primary-stability and load-bearing capacity of implant and laterally load distribution upon osseointegration of implant. The BCS implants are polished extensively and are flapless-implants as less mucosal insertion is required with a single drill due to smaller diameter.[10]

Compressive implants KOS and KOS plus Morphology: These implants are one piece implants constitute of Titanium Molybedenum or Titanium Aluminium Vanadium alloy designed as such like compression screw which are compressed into cancellous bone surrounding implant resulting in formation of dense compact bone.[11,14]

The stability of KOS implants depends upon the mechanisms popularly termed as the Corticalization of the spongy bone.[6,7]

Surgical technique for Basal Implants:

The surgical technique involved for placement of basal implants is different from that of conventional implants. The technique is much simpler and easy to be performed by the operator as excessive drilling of bone which results in thermal injury can be avoided.[7] All along the surgical procedure external mode of irrigation is utilized and single pilot osteotomy with Pathfinder drill is enough for compressive KOS and KOS plus basal implant and BCS implants, the kit also include manually operated drills for osteotomy to be directly controlled by the operator as result unnecessary drilling of bone can be prevented.[16,17]

The clinicians frequently utilizing Basal implants do not advocate flap raising during surgical procedure for theses implants as this leads to decreased blood supply and also single drill procedure which is mostly followed do not require raising of flap. The other factor regarding immediate loading should be considered as in case of sutured surgical site is not favorable for immediate prosthesis.[6,8,17] The lateral flap raising technique is followed for placement of BOI implants disk drills are utilized to perform T shaped osteotomy. These implants are then placed laterally followed by closure of flap.[17]

INDICATIONS FOR BASAL IMPLANTS [10]

1. In case where 2-stage implant placement or bone augmentation has failed.
2. Atrophic ridges where insufficient bone is present vertically and horizontally.
3. In restoration of different clinical situations of missing multiple teeth.

Contraindications for Basal Implants[10]

1. In the special conditions of patients when equal mastication bilaterally cannot be achieved i.e. when innervations of chewing muscles is partially or completely missing.
2. Systemic conditions of patient such as patient with recent episode of myocardial infarction or cerebrovascular disease (CVA) and immunosuppressive conditions.
3. Patients under some medications such as patients undergoing cancer treatment, anticoagulants and on bisphosphonates for treatment of osteoporosis.

Advantages of Basal Implants over conventional implants[18]

1. Lower incidence of peri-implantitis as implant surface is extensively polished and constriction of implant at mucosal junction is narrower as compared to conventional implants.
2. Transmission of load is much safer in basal bone as this bone is negligibly prone to infection whereas in case of conventional implants load transmission region i.e. crestal bone is more prone to infection.
3. In situation of atrophic alveolar bone the support is derived from basal bone of patient and extensive ridge augmentation surgical are not required as in case of placement of conventional implants in such situations.
4. Immediate loading can be performed after placement of basal implants as result there is no edentulous span for patient and interim denture prosthesis is not required.
5. The basal implants placement is one-stage surgical procedure and can be performed in one appointment.

Limitations of basal implants[7,19]

1. Implantologist with precise technique and thorough anatomic knowledge can only perform the successful placement procedure of basal implants.
2. Esthetics is compromised in cases of single tooth replacement.
3. Overload osteolysis results if load distribution is not adequate.

Tuberopterygoid implants: these are the type of implants which are inserted in pterygoid bone to support to overlying prosthesis; such implants are utilized in conjugation with sectioning technique of sinus and inserted at 20 to 45 degree angulations in between BOI implants.

Zygomatic screw implant (ZSI): Zygomatic implants are inserted in zygoma and possess sharp edge cortical screws to gain bicortical support.

CONCLUSION: The research conducted on the basal implants have introduced them as a newer treatment modality for rehabilitation of patients with atrophic ridges as the extensive surgical procedures like ridge augmentation and their limitations can be avoided. The surgical procedure followed for placement of these basal implants is flapless so theses implants can be immediately loaded. Although the previous literature and data available regarding basal implants have raised the trust of operators but still future researches should be carried out to accumulate accurate data on clinical situations for trusting the

efficiency of these basal implants for replacement of conventional implants.

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