

BASAL IMPLANTS : AN ALTERNATIVE TREATMENT MODALITY TO CONVENTIONAL DENTAL IMPLANTS.

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ABSTRACT

The use of dental implants to provide support for replacement of missing teeth has a long and multifaceted history. Conventional implants are indicated in situations when an adequate vertical bone is present. Restoration of moderate to severely atrophic jaws with conventional implants requires extensive and expensive surgical procedures, like ridge augmentation, sinus lift. Basal implants are specifically designed to allow fixed rehabilitation in severely atrophic jaws. They derive support from the basal bone area which usually remains free from the infection and less prone to resorption. Through this article we propose a classification for basal implants and enlighten on their morphology and also explain in detail about the various aspects of these implants.

KEY WORDS

Basal Implants, disc implants, atrophic ridge, osseointegration

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INTRODUCTION

The replacement of missing teeth with implant-borne restorations has become a treatment modality accepted by the scientific community for fully and partially edentulous patients.^{1,2} For trouble free and successful implant (conventional one) placement it becomes imperative that sufficient bone to be available (at least 13-15mm length and 5-7 mm width)^{3,4} incase this criteria is not sufficed then the treatment planning for placing conventional implants becomes robust, i.e.; restoring the lost alveolar dimensions needs to be considered to have a predictable successful outcome of the treatment. Such procedures would involve inlay or onlay alveolar grafts, nerve repositioning, sinus lift and even nasal lift, without which treatment with conventional implants might not be very successful.⁵ Such extensive surgical procedures also have their own indications and contraindications. Furthermore, patients are sometimes reluctant to undergo such extensive procedures. To avoid all such consequences, the other viable option for replacement in atrophic jaws is to change the implant design. From past few decades a very successful implant designs and protocols have been demonstrated for replacement in atrophic jaws which is known as Basal Implants. Basal implants are dental implants that take anchorage from the basal cortical portion of the jaws for implant retention. Since basal implants include the application of the rules of orthopaedic surgery, the basal implants are also called as "orthopaedic implant"⁶ to mark a clear distinction between them and the well known term "dental basal implant". These basal implants are also called as "Lateral implants" or "Disk implants".⁷ These implants when placed in the bone, can also be loaded with teeth immediately. The modern basal implant has a sophisticated yet simple design, surgical protocol and is a prosthetic friendly system. These properties have led several practitioners around the globe to include basal implants in their practices and so far this system has delivered fairly successful results. This article will review this unique implant in detail and will provide an insight into the philosophy of basal implants.

INCEPTION:

Over the years basal implants have been developed and improved in several stages by majorly the German and French dentists. First single-piece implant was developed and used by Dr. Jean-Marc Julliet in 1972. Because no homologous cutting

tools are produced for this implant, its use is fairly demanding. In the mid-1980s French dentist, Dr. Gerard Scortecchi, invented an improved basal implant system complete with matching cutting tools. Together with a group of dental surgeons, he developed disk-implants. Since the mid-1990s, a group of dentists in Germany have developed new implant types and more appropriate tools, based on the disk-implant systems. These efforts then gave rise to the development of the modern Basal Osseointegrated Implant (BOI) or lateral basal implants. In this design, load transmission was supposed to take place both in the vertical and in the basal implant part.⁸ Soon Dr. Stefan Ihde introduced bending areas in the vertical implant shaft.⁸ In 2005 the lateral basal implants were modified to screwable designs (BCS).⁹

TYPES OF BASAL IMPLANTS :

Basal Implant Types Based on Morphology:

There are four basic types of basal implants available:

I. 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)

II. Disk Form

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

III. Plate Form

IV. Other Forms

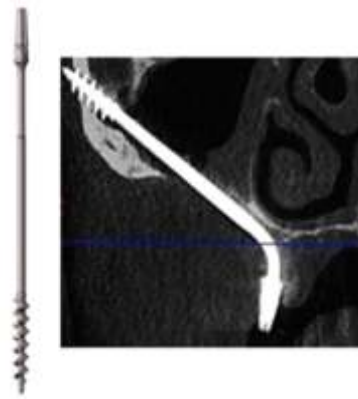
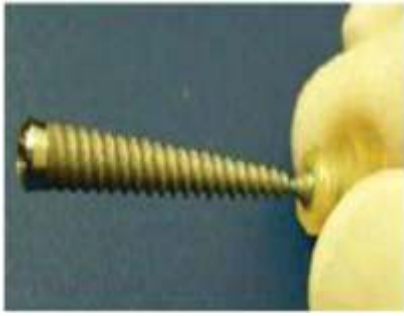
- a. TPG Implant (Tuberopterygoid).
- b. ZSI Implant (Zygoma Screw)

MORPHOLOGY:

The BOI and BCS implant being produced today with either from pure Titanium or from Titanium Molybdenum alloy,^{3,8} has a smooth and polished surface as it was found that polished surfaces are less prone to inflammation (mucositis, peri-implantitis) than rough surfaces.^{8, 10, 11} The neck portion and basal disk portion of BOI is elastic and allows for bending by 15°-25°.^{3, 8} Which allows a better adaptation. The crestal 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^{8,11}. Unlike the BOI, the BCS implant has wide diameter cutting screws (instead of crestal disc) which helps in engaging the buccal and palatal/lingual cortical plates and initially provide primary stability and load bearing capacity .

The KOS and KOS Plus implants are surface treated (sand and grit blasting with subsequent acid etching), however, the implant neck is kept highly polished in KOS implant.⁸ In the KOS Plus implant, its neck and the basal cortical screw part are kept heavily polished.⁸ The end portion of KOS implant has the threads which have wide structure and wide turns this enables 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 comprises of the basal cortical screws these additional screws which aid the implant in engaging the buccal and palatal/lingual cortical plates and help in gaining primary stability and later function as a load bearing and distributing component.^{3,8}





SURGICAL PROCEDURES

Basal implants have a different surgical approach than the conventional one. This surgical technique is simple and easy to execute and does not involve extensive drilling of bone thus avoiding thermal injury.^{8,12} Throughout the surgery the mode of irrigation used is external and usually for almost any case a single pilot osteotomy with a “Pathfinder Drill” is sufficient for KOS, KOS Plus and BCS implants, the kit also consists of manual drills for a controlled osteotomy preparation.^{12,13} There is no need to raise a flap for these implants as it results in a decreased blood supply. Another factor to be considered in these implants is the immediate loading ; as a sutured site is not a favourable area to receive an immediate prosthesis.^{8,12,13} For the BOI implant the approach towards the bone is gained by raising a flap laterally and cutting into the bone with disk drills of required size in a lateral direction to form a “T” shaped osteotomy. The implant consequently is placed laterally and the flap is closed over it.¹⁴⁻¹⁷

INDICATIONS¹⁸:

1. Various situations when several teeth are missing or have to be extracted.
2. Where 2-stage implant placement or bone augmentation has failed.
3. All kinds of bone atrophy i.e.,

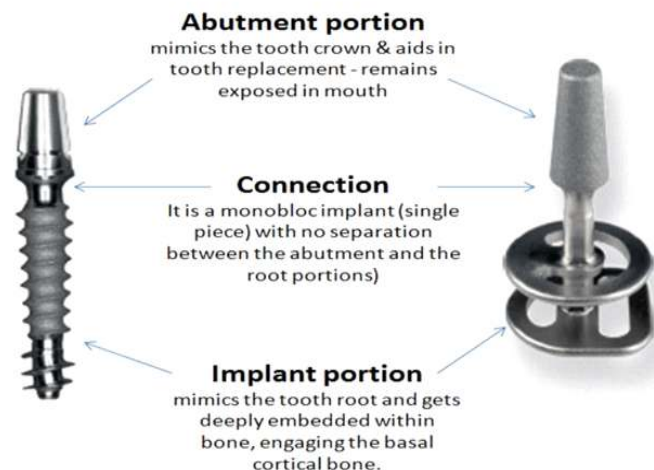
In cases of very thin ridges- i.e. deficiency of bone in buccolingual thickness.

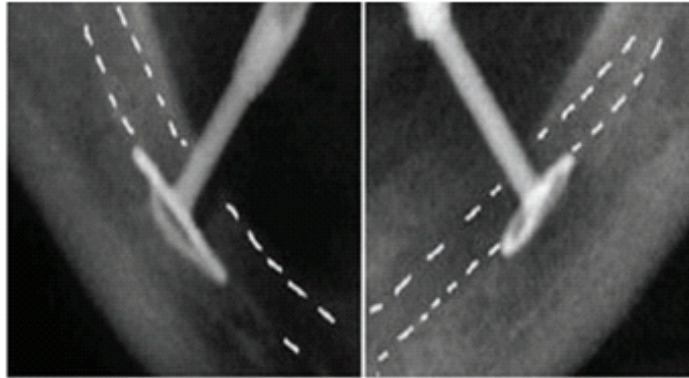
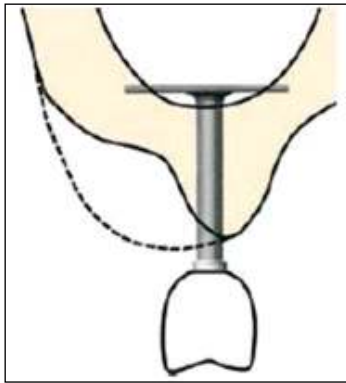
In cases of insufficient bone height.

These two situations develop due to the following reasons:

- a. Using removable dentures for so many years will resorb the bone and reduce the height available.
- b. After extraction of teeth, not replacing the teeth, living without teeth for many years will also resorb the bone.
- c. Untreated periodontal disease(especially in diabetics) will resorb the available bone.
- d. Trauma to jaw which damages not only the teeth but also the alveolar bone.

Single Piece (Monobloc) Basal Implants





Sinus section technique n infraneural implantation

CONTRAINDICATIONS¹⁸:-

1. Medical conditions: Recent myocardial infarction (heart attack) or cerebrovascular accident (stroke), Immunosuppression (a reduction in the efficacy of the immune system) these are few conditions where implant placement is contraindicated .
2. Medicines: Drugs of concern are those utilized in the treatment of cancer, drugs that inhibit blood clotting and bisphosphonates (a class of drugs used in the treatment of osteoporosis).
3. Special Cases: In some cases where equal mastication load cannot be arranged bilaterally , e.g. when chewing muscles or their innervations are partly missing (these cases may lead to problems under immediate load protocols).

ADVANTAGES¹⁹:

1. Basal- cortical bone support – These implants take support from the basal bone which is a lot more resistant to resorption, unlike the conventional implants which mostly take support from the crestal bone. Basal cortical bone also has a much faster and stable repairing capacity.
2. Immediate Loading – In basal implants prosthesis can be fixed within 72 hours of implant surgery ,saving time and costs considerably. In case of conventional implants associated with bone augmentation / grafting procedures, the total treatment time will be about 6 months to 1 year. The need for interim dentures / provisionilization is totally eliminated.
3. Minimally invasive, minimal surgical complications – in most edentulous situations, the single piece screw type implants can be inserted in a minimally invasive fashion – often flapless and involving minimum bone cutting. Being minimally invasive, they are also associated with minimum post-operative edema and healing at the procedure sites are rapid and often non-eventful.
4. One piece implants – Basal implants are one piece implants in which the implant and the abutment are

fused into one single piece. This minimizes failure of implants due to interface problems between the connections which exist in conventional two and three piece implants.

5. Works well in compromised bone situations - Avoidance of bone augmentation / grafting, sinus lifts and nerve trans-positioning – These implants are unique in that they can be made to utilize the available bone in the best possible manner to avoid bone augmentation procedures.

6. Peri-implantitis incidence –Peri-implantitis is the single most common cause for failure of conventional implants. This happens mostly because of the rough implant surface as well as the interface problems between the multiple parts of the implant. Thr use of monobloc, smooth surface basal implants eliminate the threat of peri-implantitis by almost 98%.

7. Medically compromised situations –Basal implants work well in controlled diabetics, in smokers, in patients suffering from chronic destructive periodontitis.

a. Diabetes Mellitus – As diabetes is associated with increased susceptibility to infection, impaired wound healing and gum diseases (gingivitis, periodontitis etc.) the conventional dental implants are generally contraindicated. However, basal implants work absolutely well in such patients because they are smooth surface implants which do not permit bacterial colonization on the implant surfaces.

b. Smoking – Smoking negatively affect the implant procedure because it cuts down the blood flow to the oral tissue, which in turn results in slower healing of the implant site. There is a high risk of gingivitis and gingival recession which in turn will lead to infection around the implant (peri-implantitis) leading to their failure. But in case of basal implants, since the load bearing areas are far away from the areas of the mouth affected by smoking, they take up well. (However, it should be borne in mind that smoking immediately after implant surgery will be unfavourable for wound healing even in the case of basal implants.)

c. Acute Destructive Periodontitis—As there is high risk of the patient to suffer from gingival infections (painful inflamed gums which bleed easily; with multiple mobile teeth), it is contraindicated to conventional implants. However, smooth surface basal implants work wonderfully well in such patients owing to the fact that they are less prone to bacterial attack (the load bearing area is far away from the area prone to infections in the gum regions and the smooth surface implants do not permit bacterial colonization and multiplication).

DISADVANTAGES¹⁸:

1. For BOI implants open flap surgery is needed. Gum incision and suturing are necessary, unlike BCS implants. Only a properly trained prosthodontist can accomplish the surgical procedure without any complication. So this procedure is technique sensitive.

2. It is always necessary to keep a few more implants handy to avoid extensive planning including three-dimensional exploration of bone conditions.

COMPLICATION OF BASAL IMPLANTS²¹

Functional overload osteolysis:

Local microcracks may occur in the cortical bone as masticatory forces transmitted through the basal implant and these are repaired by a process called remodelling. Which however, will temporarily increase the porosity of the affected bone region and temporarily reduce the degree of mineralization. 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.

CONCLUSION

Modern research on Basal implants have made them a viable option for restoring atrophied jaws with or without some systemic disease cases as they don't require extensive surgical procedures and allow for immediate loading, also, they can be placed with a flapless technique and can be combined with any implant. Despite of the data available on their success in treating a variety of cases these implants have gained little trust among conventional implantologists, it seems further research and development and more concrete data on clinical cases is required to prove their efficacy as a replacement to conventional implants.

However, it cannot be denied that basal implants fits the principle “Primum Nihil Nocere”, i.e., “First Do No Harm”. Whenever robust surgical procedures are involved (conventionally), basal implants come to the rescue. Sometimes the best solutions are found in the unconventional. In this study, with the

proposed classification we have tried to broadly categorize basal implants chiefly based on their morphology/structure, this classification might help the reader in understanding the designs that exist and will give a better understanding of the applications and implications of each implant design.

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