Basal Implants: An Emerging Technique For Rehabilitation of Atrophied Ridges

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Abstract
Dental implants have now become the first line of treatment for replacing missing teeth. Crestal and basal implants are endosseous aids to create Osseointegrated points of retention for fixed or removable prosthesis. However crestal implants are indicated, when an adequate vertical bone height is present. Whenever bone is lacking, instead of using adequate implants, bone augmentations are advocated and even risky bone transplants, wherein patient begins to suffer. Basal Implantology has shown the way out of this dead end road. Basal implants are a panacea for atrophic ridges. This article discusses the indications, and values of basal Implantology.

Introduction

Implant placement in severely atrophic jaws is specially challenging because of the poor quality and quantity of the future implant bed. Calvarial or iliac bone grafts, mental nerve displacement, and sinus lift procedures are often used to overcome the initially unfavourable anatomical and mechanical conditions[1]. Despite the acceptable success rates, these approaches involve unpredictable degrees of morbidity at the donor and/or recipient sites. Furthermore, patients are sometimes reluctant to undergo such procedures.

Basal Implants also known as bicortical implantology or just cortical, allows immediate loading as long as a balanced masticatory function can be achieved and maintained. Basal implant system surgery has been used in dentistry for over 25 years. It includes the application of the rules of orthopaedic surgery, it is also popularly known as "oral division of orthopaedic surgery.[2]" 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. The basal bone provides excellent quality cortical bone for retention of these unique and highly advanced implants. [3]

Basal bone is defined as the osseous tissue of the mandible and maxilla underlying the alveolar processes.[4] Implantologist can now place implants in regions where traditional implants would not be possible.

Definitions[3]

Basal Implants: Consists of several base-plates or aggressive (retentive) threads, which are connected to a vertical implant part (or shaft), the latter holding an abutment (one piece) or an internal or an external thread for abutment connection.

Cortical Implants: These are inserted vertically form the top of the crest of the jaw bone and are anchored in the cortical crestal bone as well as in the spongious bone.

Cortical screws: These are special type of screw-able basal implant: they are considered from a functional point of view as basalimplants, because they are anchored in basal and /or cortical bone regions and they provide some structural elasticity.

Lateral basal implants: are inserted from the side into the jaw bone. They are placed Trans-osseously and rest on cortical bone areas only.

Rationale Of Basal Implantogy

Physiological and bio-mechanical foundation of basal implantology.

The basilar bone, the teeth, the periodontium and the temporomandibular articulation are the structural axis of the stomatognathic system. The masticatory mechanism is highly adaptive to changing functional patterns and retains high degree of regenerative capability.[5]

The cardinal principle of bone structure is maximal strength with minimum mass, what means, that the bone is available only where it is necessary. In the event of teeth loss, the alveolar bone loses its functional stimulus, what leads to the resorption of already unnecessary alveolar process. The edentulism causes overall decrease of the functional stimulus in the stomatognathic system and along with the hormonal influences causes decrease of muscle and bone mass as a whole. It is important, that decrease of the bone mass is at the expense of the metabolically active parts of the jaw bones. The structural parts are relatively metabolically resistant.

The fundamental difference, between the basal and conventional dental Implantology, is the bone areas (fractions), what are being utilized in order to harbour the implants. In the conventional dental Implantology, the implants are being placed in the crestal bone, i.e. metabolically active, hence structurally unstable bone fraction. This type of bone is lost after teeth are removed and decreases through life as function reduces. The basal bone is always present throughout life; it is very strong and forms the stress bearing part of our skeleton.

Placement of basal Implants

The basal Implantology utilizes the basilar (basal) bone segments, which are metabolically

resistant and because of that structurally stable.
In the lower jaw such structurally stable areas are the basis and the symphysis of the mandible.
In the upper jaw metabolically, and hence resorption stable areas are: the nasal spine, the floor of the nose, the mesial and the distal parts of the maxillary sinus, the palatal process of the maxilla and the pterygoid plate (where the sphenoid bone is connected to the maxilla). [2,3]

The basal Implantology makes no use of the spongy (trabecular) bone, but if it still exists, the trabecular bone can be compressed laterally, and in that way, additional stability for the compression screw implants can be achieved. This process is called "lateral corticalisation".

The cortical anchorage and the lateral corticalisation, combined with simultaneous implant splinting, provide stable foundation for the immediate loading of the intraosseous dental implants.

History Of Basal Implants

The first endosseous implants implant design that relied on lateral placement and relied on stability of the inner and outer cortical bone as developed in Italy. The first single unit implant was use by Jean-Marc Julliet (1972), France. The Scope and areas of his design was limited to areas where the basal plates reached both cortical structures.

Dr. Gerard Scortecci, 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 BOI (Basal Osseointegrated Implants) or lateral basal implants. In this design, load transmission was supposed to take place both in the vertical and in the basal implant part.[6] Soon Dr. Stefan Ihde introduced bending areas in the vertical implant shaft.[7]

In 2005 the lateral basal implants were modified to screwable designs (BCS)[8] .The modern Basal Implants, typically the BOI/TOI Implants have added macro and micro-design of load-transmitting framework areas. These have shaft, which is round and 1.9mm in diameter, in shape, with smaller side projecting into insertion direction. This design was introduced in 2007. The latest development is the 4D implants, with only one edge and oval vertical part, allowing turning of implant inside the osseous cavity, leading to greater stability.[3]

Designs

The two types BCS (Basal Cortical Screw) and BOI (Basal Osseo Integrated) (figure 1,2) basal implants are designed to utilize strong cortical bone of the jaw. Screwable basal implants (BCS brand) have been developed with up to 12 mm thread diameter can be inserted into immediate extraction socket. [3]

BOI Lateral basal implants are placed from the lateral aspect of the jaw bone. Masticatory load transmission is confined to the horizontal implant segments and, to the cortical bone structures.

Figure 1:BOI/TOI Figure 2:BCS/GBC

Indications [4,8,9]

1. Several missing teeth or when they have to be extracted.
2. When the procedure of 2-stage implant placement or bone augmentation has failed.
3. Atrophied ridges.

Contraindications [4]

1. Special Cases: Cases where bilateral equal mastication cannot be arranged, e.g. when chewing muscles or their innervations are partly missing (these cases may lead to problems under immediate load protocols).
2. Medical conditions: There are a number of medical conditions that preclude the placement of dental implants. Some of these conditions include: Recent myocardial infarction (heart attack) or cerebrovascular accident (stroke), Immunosuppression (a reduction in the efficacy of the immune system)

Advantages

Crestal Implants no doubt offers optimal ways of restorative treatment in situations where the implants can be inserted without any delay and with no need for adjuvant procedure. Unfortunately many patients do not meet criteria, especially true for maxillary &mandibular posterior segments. The advantages of Basal Implants are [2-4,6,8]:

1. Low degree of invasiveness (no augmentation, distraction), requires only patient's residual bone for anchorage.
2. Avoiding risky bone augmentations completely- Avoiding the time delay caused by bone augmentations
3. Safe load transmission in the basal bone to basal bone Well designed for immediate loading.
4. One- step Procedure No intermediate dentures, no edentulous phase No secondary operations Extremely good patient acceptance
5. Simple and straight surgical phase: Extractions and implant placements on the same appointment and immediate placement of at least a provisional bridge. Patients are never without teeth- Even if periodontal involvement is present, BOI and BCS implants can be placed immediately after the teeth and infected tissues have been removed
6. Combination with natural teeth and implant possible implants
7. BOI & BCS implants provide thin and polished mucosal penetration diameters. Hence the demand for the patient`s cleaning effort and compliance is reduced.
8. Cost and time saving
9. High success rate in patients with less bone height, smokers and those with gum disease.
10. Employs cortical bone areas which are resistant to infection and resorption.

Disadvantages [2,4,8]:

1. The major difficulty with this technique concerns training of the surgical and prosthetic teams.
2. The prosthesis must be completed before the 10th postoperative day because osteoclast activity increases exponentially from day 10 to approximately day [21].
3. Functional overload osteolysis:-The masticatory forces transmitted via the basal implants to an endosseal location create local micro cracks in the cortical bone. Micro cracks are repaired by the formation of secondary osteons, a process called remodelling. This, however, will temporarily increase the porosity of the affected bone region and temporarily reduce the degree of mineralization additionally. If micro cracks accumulate at the bone/implant interface, the reduction in mineralization can also be detected on radiographs where the osteolytic area initially exhibits only diffuse radiological borders. As long as the bone substance is not torn away from the implant and the area is not superinfected, the loss of mineralization remains diffuse but usually reversible.

Conclusion

The installation of Basal implants today is a routine procedure. The philosophy of this treatment differs from conventional implantological thinking, since the possibility of mounting prostheses does not depend on the presence of vertical bone, alveolar bone or the presence of bone in the area of the desired tooth. They can be placed with flap or flapless technique. A thorough understanding of the maxillofacial anatomy is recommended so that bi-cortical engagement is achieved. They can be used to bypass the mandibular nerve in the mandible and for engagement of the cortical bone at the fusion of the pterygoid with the maxilla.

References

References are available on request at editor@healtalkht.com