Review Article

Basal implants - A review

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ABSTRACT

The primary indication of implant prosthesis, essentially the endosseous implants, is to replace the missing tooth or teeth structure with a prosthesis that mimics the morphology of an original tooth and facilitates function and aesthetics. However, the main disadvantage of this prosthesis is that it shows very less success rate in the areas with less residual bone present. One of the designs to combat this problem is the use of basal implant in areas of very less bone height. This review aims to elaborate the features of the basal implant design.

KEY WORDS: Basal implant, Bone height, Design, Ridge, Structure

INTRODUCTION

The most common implant standards in the present-day dental practice are based on crestal implantology where the implants are placed in the crestal alveoli of the jaw bone, and they transmit load primarily in the vertical direction from their surfaces. Thus, this term encompasses the cover screws, cylinders, and blade implants. These screws are usually 10–13 mm in case they are placed in the anterior mandibular region as this part of the mandible usually has sufficient vertical bone height. However, this design cannot be implemented in patients with severely atrophied mandibular ridges.[1] Thus, the basal implantology, which is also known as cortical, or biocortical implant system, was developed and it involves the placement of implants in the basal cortical bone, which provides excellent quality cortical bones for retention of these advanced implants. They are also known by other terms such as orthopedic implants as they apply rules of orthopedic surgery unlike the standard dental implants available.[2,3] They are also called as disk or lateral implants.[4] A major reason to use the basal bone to place the implants instead of the alveolar bone is that, the stress-bearing area of particular dental implant placement site in the basal bone can also be loaded with teeth immediately.

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HISTORY OF BASAL IMPLANTS

Dr. Jean-Marc Julliet developed the first single-piece implant in 1972. Since no homologous cutting tools were produced for this implant, this implant was rarely used. In the 1980s, a French dentist named Dr. Gerard Scortecci introduced an improved basal implant with its own set of cutting tools. In collaboration with a group of dental surgeons, he developed the disk implants. Based on this design, many dentists from Germany have developed new implant types with appropriate tools. This leads to the development of basal osseointegrated (BOI) implants. Based on its design, this implant bears load transmission from both the vertical and basal implant parts.[5] Later, bending areas in the vertical shaft was introduced by Ihde.[6] Other improvements include the fracture proof base plate design in the year 2002 and the introduction of screw designs in the lateral base implants. The surface of the basal implant was polished in the year 2003 for reasons such as the implants showed no tendency to mucositis, peri-implantitis and also reintegration of the implant was possible in case there was loosening. It was observed that roughened osseous surfaces have reduced the tendency to reintegrate. The two-piece abutment design was also changed to one-piece implants. The cemented implants were later changed to internal screw connections. These designs are mainly used in maxillofacial surgeries and fixation of epitheses.

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TYPES OF BASAL IMPLANTS

There are two types of basal implants, namely BOI and basal cortical screw (BCS) implants. The BCS has been developed up to 12 mm diameter and can be inserted immediately into extraction socket.[6]

Lateral basal implants are the type of implants that are placed in the lateral aspect of the jawbone and are confined to the cortical bone structures, and the load transmission is mainly transferred to the horizontal implant segments.[6] Anterior implants are placed in cases with sufficient vertical space; implants with two disks are placed. They usually have a basal disk of 9 or 10 mm in diameter, and the crestal disk is about 7 mm in diameter. The multidisc implants have a crestal and basal plate. The crestal plate mainly provides stabilization of the implant. The crestal implant loses its purpose once the basal plate of the implant fully ossifies to its maximal load bearing capacity.[6] Posterior implants are usually square shaped. Based on the available vertical dimension and horizontal bone, they can have a disk of dimension of 9 mm × 12 mm or 10 mm × 14 mm with lengths 10–13.5 mm. The disk is usually 0.6 mm in height, which helps in its participation in the flexion of the mandible, and thus provides a safe ground for the fixed bridge. The use of a square implant is more favorable as, when the threaded pins inserted from the side, it has a good medial position. This placement of the implant helps to compensate the absorption of the distal mandible in a centripetal direction. Primary stability of the implant is due to its longitudinal shape. If the vertical bone height available above the mandibular nerve is <2 mm, the disk is placed below the mandibular nerve with the threaded carrier located at the side of the nerve. For this purpose, the unilateral square implant or older round implants are used.[6,7] Basal screw implants are flapless implants and are directly inserted through the gums without placing a single cut. Biocortical implants are also considered basal implants as they impart masticatory loads deep in the bone, usually in the opposite cortical bone where the osseointegration along the axis of the implant is not a prerequisite. They initially have elasticity and are not prone to peri-implantitis primarily due to their polished surface and their thin mucosal penetration diameter.[2]

Parts of a Basal Implant

Basal implants are single piece implants where the abutment and the implant are fused into one piece. This design minimizes failure of implants due to interface problems, which is associated with conventional two- and three-piece implants.[7] Implant surface is observed to be a polished surface that helps prevent bacteria and plaque adherence to the implant neck or body. The implant body is usually thin and associated with wide thread turns. This design helps increase vascularity around the implant and mechanical bone implant contact as well. Based on the length of the implant, the implant neck can be bent from 15 to 25°, if the implant is placed in dense cortical bone.

Indications of Basal Implants

BOI implants are mainly used in many situations as in long edentulous span or in situations where multiple teeth have to be extracted or when the conventional 2-stage implant placement or bone augmentation has failed. It is also used in case of very thin ridges due to reduced buccolingual thickness of the bone or in patients with insufficient bone height. These above-mentioned conditions of bone atrophy mainly develop due to the many reasons such as usage of removable dentures for many years contribute to bone resorption and reduced available bone height, ignorance to replace missing teeth post extraction for many years also leads to bone resorption, trauma that affects the jawbone also affects the alveolar bone that lodges the teeth, or untreated periodontal disease due to uncontrolled systemic conditions such as diabetes also enhances bone resorption.

Contraindications of Basal Implants

In special cases such as bilateral mastication, where the innervations or the chewing muscles are partly missing. These conditions may intervene in immediate loading protocols. Systemic medical health also plays a pivotal role in the success of an implant. Some of these conditions include recent myocardial infarction, cerebrovascular accident, and immune suppression. A complete drug history of the patient is necessary for the dental surgeon before implant planning of the patient. The primary drugs of concern are drugs used in the treatment of cancer, bisphosphonates, and drugs that prevent blood clotting.

Advantages of Basal Implants

Immediate loading is a major advantage of basal implants.[8] The prosthesis can be fixed within 72 h of implant surgery. This is time saving when compared to cases of conventional implant placements which require bone augmentation or grafting as a total of 1 year or 6 months is needed for treatment completion with a need for interim prosthesis. Since basal implants have a one-piece design where the abutment and body are fused together, the interface problems usually faced with two or three-piece conventional implants are avoided. The basal implant mainly gains support from the basal bone, which is resistant to bone resorption unlike the conventional implant that gains support from crestal bone. It is also seen that basal bone has faster and stable repairing capacity. The placement of a single piece implant in an edentulous space is often planned as flapless protocol which involves minimum bone cutting. This helps in reduced post-operative

Table 1: Comparison of basal implant and crestal implant[15-20]

Criteria	Basal implant	Crestal implant
Structure and shape	Inverted T-shape	Mimics root morphology
Endosseous section	Flat- or blade-like surfaces with spaces to permit bone in growth. No prepared surface	Screw shaped with machine or HA-coated surfaces
Bone displacement	Displaces 60% less bone substance. More resistant to resorption	Considerable bone displacement and loss occur that vary with size and length of the implant. More susceptible to resorption
Mucosal penetration diameter	1.9 to 2.3 mm only. The vertical implant body is polished reducing chances of post-operative problems	Larger than basal implants and chances of peri-implantitis, vertical bone loss, crater-like bone loss, and infections is relatively high
Masticatory forces	They are transferred to basal plates in the cortical bone that can bear large loads and greater capacity for regeneration	The forced act in the vertical direction along the sides of the screw structure

HA: Hydroxyapatite

edema and healing at the placement site is rapid and uneventful.[9-12] The primary reason for the failure of an implant is due to peri-implantitis that is caused due to roughened surface of the implant body and the interface problems in the conventional implants. The smooth surface monobloc implant design reduces the chances of peri-implantitis by 98% in basal implants. The basal implants are observed to be well suited in patients with systemic conditions such as controlled diabetes and in patients who are smokers or in patients suffering from chronic destructive periodontitis. The use of conventional implants in diabetic patients is contraindicated mostly due to susceptibility to infection, improper wound healing, and gum problems. However, in case of basal implants, these problems are prevented due to their smooth surface.[13] In case of basal implants, the area where the implants are placed is far away from the areas of the oral cavity affected by smoking and thus adapt well to the surrounding bone. However, the wound healing will be affected in cases where the patient smokes immediately after basal implant placement surgery.[14,15] The total treatment cost is potentially reduced in case of basal implants.

Disadvantage of Basal Implant

The BOI implants require flap elevation unlike BCS that can be inserted without a flap procedure. Furthermore, proper training and precision are required to perform the surgical procedure without any complications.[10,11]Another common complication seen with basal implant is functional overload osteolysis. The transmission of masticatory forces through basal implants creates local micro cracks in the cortical bone, which is usually repaired by remodeling [Table 1].

CONCLUSION

The use of basal implants to restore function in an atrophied mandibular alveolar ridge is an effective alternative to the use of conventional implant techniques. These implants can be subjected to moderate loading after immediate insertion. It is also advantageous to the patient in the aspects of faster reconstruction of masticatory function, cost effective, and reduction of additional surgical invasive procedures. Thus, the frequent use of this technique to help in providing a fixed solution to patients who cannot be indicated for conventional implant designs is possible. However, proper knowledge and training are required to completely ensure the success of these implants.

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