Basal Implants- A Panacea For Atrophic Ridges

Chandana Nair†, Swarajya Bharathi††, Rashmi Jawade†††, Meenu Jain††††

† Reader, Department of Prosthodontics, Institute Of Dental Sciences, Bareilly (U.P).
†† Professor & Head, Department of Prosthodontics, Institute Of Dental Sciences, Bareilly (U.P).
††† Reader, Department of Periodontics, M.I.D.S.R, Dental college, Latur, Maharashtra, India.
†††† Professor, Department of Prosthodontics, Institute Of Dental Sciences, Bareilly (U.P).

Abstract: According to the well-known implantological rules for dental restorations, crestal implants are indicated in situations when an adequate vertical bone supply is given. Crestal implants function well in patients who provide enough bone when treatment starts, but results are not predictable as soon as augmentations become part of the treatment plan. In such cases basal implants is a viable treatment option. This article discusses the value of using basal implants in atrophic ridge cases.

Key words: Basal implants, Crestal implants, Overload osteolysis.

INTRODUCTION

Implant supported prosthesis have opened many possibilities of replacing lost tooth. Crestal and basal implants are endosseous aids to create osseointegrated points of retention for fixed or removable dentures. Crestal implants (i.e. implants inserted from the top of the alveolar crest into the bone such as cylinders and blade implants) are indicated in situations where an adequate vertical bone supply is present. Basal implants, i.e. BOI®, Diskos® by contrast, were developed primarily for immediate use as well as for use in the atrophied jawbone. These basal implants are synonymously called lateral implants or disk implants. These two types of implants are not only differentiated by the way they are inserted and also by the way forces are transmitted. For this reason, the literature on basal implants has introduced the terms “orthopaedic technique” and “orthopaedic implant” to mark a clear distinction between them and the well-known term “dental implant”.

RATIONALE

The term “basal implant” refers to the principles of utilizing basal bone areas free of infection and resorption, and the employing of the cortical bone areas. This rationale stems from orthopedic surgery and from the experience that cortical areas are needed in the structure, therefore, are resistant against resorption and reconstitute itself easily. At the same time, load bearing capacities of the cortical bone are many times higher than those of the spongious bone. In basal implants, the vertical implant parts (which connect the base plate(s) with the abutment) do not participate in load transmission to bone primarily, and that is why they are provided thin and polished. Lateral basal implants (Fig 1) which are inserted from the lateral aspect of the jaw bone, provide a disk-diameter of 7mm or more, and are inserted through a T-shaped slot into the jaw bone (the T-shape slot is inverted in the mandible). Screnabl basal implants (BCS® brand) have been developed with up to 12mm thread diameter can be inserted into immediate extraction socket. (Fig 2) The polished smooth surface especially in the area of gingival penetration is a built-in prophylaxis that makes peri-implantitis preventable forever.

INDICATIONS

1. Through utilizing horizontal, vertical and oblique bone support, these devices can be implanted under all anatomical conditions, even immediately postextraction. No bone buildup is required and that is freeing the implantologist from performing all augmentations including “sinus lifts”. 2. When planned and carried out properly with enough implants, the devices allow immediate loading even in cases exhibiting severe jaw bone atrophy.

REVIEW OF LITERATURE

Over the years, controversy has existed between advocates of immediate implant loading and proponents of delayed protocols. Early research on immediate loading with root-form implants was conducted with vitallium screws in the 1930s by Alvin and Moses Strock and was often criticized for inducing fibrosis and increased implant failure. The two-stage surgical approach of Branemark, using a submerged healing period,became the treatment of choice for root-form implants from 1980 to 1990. Schnitman reintroduced the concept of immediate loading for completely edentulous patients in the mandible with a threaded titanium implant in 1990. Tarnow also published a pilot study and expanded the procedure for fixed restorations in completely edentulous maxillae. These combined trials of 19 patients over a 9-year period have resulted in implant survival of over 93% (21 of 25 implants for Schnitman and 67 of 69 implants for Tarnow). Gerald Scortecci evaluated the safety and efficacy of immediately loading a fixed implant-supported prosthesis without bone augmentation in moderately to severely resorbed, completely edentulous maxillae. Over a 41-month period, 783 titanium
implants (627 laterally inserted disk implants, with or without 156 axially inserted Structure implants) were placed in 72 consecutive patients with completely edentulous maxillae using an immediate loading protocol. After 6 months of function, the fixed restorations were removed and each implant status was verified using radiographs, Periotest evaluations, clinical osseointegration criteria, and torque testing at 20 N-cm. Six months postoperatively, 98% of the implants were radiologically and clinically osseointegrated. This clinical trial demonstrates that immediate loading of nonsubmerged, laterally inserted disk-design implants may provide adequate primary anchorage and longterm osseointegration in completely edentulous maxillae.

25 implants for Schnitman and 67 of 69 implants for Tarnow). Gerald Scorteccl evaluated the safety and efficacy of immediately loading a fixed implant-supported prosthesis without bone augmentation in moderately to severely resorbed, completely edentulous maxillae. Over a 41-month period, 783 titanium implants (627 laterally inserted disk implants, with or without 156 axially inserted Structure implants) were placed in 72 consecutive patients with completely edentulous maxillae using an immediate loading protocol. After 6 months of function, the fixed restorations were removed and each implant status was verified using radiographs, Periotest evaluations, clinical osseointegration criteria, and torque testing at 20 N-cm. Six months postoperatively, 98% of the implants were radiologically and clinically osseointegrated. This clinical trial demonstrates that immediate loading of nonsubmerged, laterally inserted disk-design implants may provide adequate primary anchorage and longterm osseointegration in completely edentulous maxillae.

IN RECENT YEARS, TWO SCHOOLS OF THOUGHT HAVE EMERGED IN THE AREA OF BASAL OSEOSERIZATION

1. The French school of Scortecchi and others favours restoring even severely atrophied mandibular ridges by using a large number of basal osseointegrated implants (BOI), usually 7 to 12 implants. This school combines BOI with screw implants, both in the maxilla and in the mandible. The implant systems thus established are immobile and do not allow jaw regions to change their relative orientation.  

2. In the German-speaking countries there is a tendency to favour restoring the edentulous mandible using only a few BOIs, usually inserting four implants in regions 47, 43, 33, and 37, even when providing fixed dentures. This type of implant system is referred to as “flexible” because it permits mandibular shifts and flexion below the fixed superstructure, despite the fact that the load-transmitting segments of the basal implant osseointegrate. The long threaded pins between the load-transmitting osseointegrated disks and the bridge serve as flexible interfaces.

Several basal implant systems with different platforms are available today; internal systems that can be secured against rotation and that have an internal screw connection (Fig. 3) and external systems that do not have a rotation-protected external thread. (Fig 4) With basal implants, the terms internal and external thus refer to the thread and not as with crestal implants to the type of the surfaces that protect against rotation.

ANTERIOR IMPLANTS

If sufficient vertical space is available, the implants used are usually the ones with two disks. The basal disk has a diameter of 9 or 10 mm, whereas the crestal disk is 7 mm in diameter. If the insertion of double disks fails due to the lack of available bone, a single BOI with a 7- to 9-mm diameter and shafts between 8 and 13.5 mm can be used instead.

If sufficient vertical space is available, the implants used are usually the ones with two disks. The basal disk has a diameter of 9 or 10 mm, whereas the crestal disk is 7 mm in diameter. If the insertion of double disks fails due to the lack of available bone, a single BOI with a 7- to 9-mm diameter and shafts between 8 and 13.5 mm can be used instead.

POSTERIOR IMPLANTS

The implants used here are usually of a square shape, having a disk of 9 mm or 10 mm with shafts of 10 to 13.5 mm in length, depending on the desired vertical dimension and the available horizontal bone. The height of the disk itself is 0.6 mm: this allows the implant to participate in the flexion of the mandible and provides safe ground for the fixed bridge.

Maxillary arch: The number of necessary basal implants for a full maxillary reconstruction is between 4 and 12. Four implants require meticulous masticatory control, sufficient and good quality of bone in the strategic implant positions, as well as perfect patient compliance. The more implants are placed in the maxilla, the safer treatment develops. Due to the greater softness of the maxillary bone, it is recommended never to under-equiping this jaw with implants, especially when loading it immediately.

Mandibular arch: As a rule, 2 to 3 implants can be inserted in the anterior segment, whereas one implant can be accommodated in each distal mandibular segment.

TEMPORARY BRIDGE

The existing complete denture is cut back to the bridge and cemented onto the abutments. In the absence of procedural obstacles or significant postoperative swelling, the definitive bridges are integrated as early as on the third or fourth postoperative day. Often a temporary bridge is not needed, further reducing the risk of wound edge contamination.

DEFINITIVE RESTORATION

The metal framework has to be exceedingly stable. To withstand the bending stress, it should preferably be cast from a non-noble alloy. This ensures that ceramic material cannot chip off. Typical dimensions providing enough stiffness are 2.5mm width x 3mm height. The physiological movement of tubular bones such as the mandible involves significant travelling of the bone itself. Medial and caudal flexion will bend and twist the mandible by up to 2 mm. Hence Richter postulated that prosthetic structures in the mandible should always be divided into three parts. This prosthodontic approach is supported for crestal implants, which osseointegrate and transmit loads along their vertical axis. In the case of Basal implants the vertical implant segments do not have to osseointegrate for it to be functional. It is only the basal horizontal load transmission surfaces that have to osseointegrate and transmit masticatory loads. The flexible threaded shaft between the basal disk and the prosthetic structure constitutes a perfectly serviceable interface that follows the torsion movements of the mandible.
also be more favourably distributed between the bar and the implants relative to each other. Masticatory shear forces will interface and result in a very stable direct fixation of the implants.

COMPLICATION OF BASAL IMPLANTS

1) Functional overload osteolysis:- The masticatory forces transmitted via the basal implants to an enossal location create local microcracks in the cortical bone. Microcracks are repaired by the formation of secondary osteones, 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 microcracks 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(fig 5). 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.

THERAPEUTIC CONSIDERATIONS FOR OVERLOAD OSTEOLYSIS

First and foremost, the prognosis of the implant must be determined according to the consensus on basal implants. As long as implant removal is not indicated there are several therapeutic strategies that can be followed:
- First of all, it must be determined whether or not the masticatory pattern is evenly balanced and symmetrical. If this is not the case, the first therapeutic step must be aimed at achieving a bilaterally balanced situation with regard to bone mineralization tendencies.
- In some cases, extensive occlusal adjustment will therefore be required. Deficiencies in vertical dimension must be treated prosthodontically.

The development of anterior masticatory patterns must be prevented with all means and immediately. Existing anterior masticatory patterns can usually be corrected by increasing the vertical dimension; however, the optimum bite plane must be retained or created and this determines, in which jaw the addition has to be made.
- Furthermore, the question must be evaluated whether or not remineralization by way of self-healing or supported by a suitable therapy can be expected at the existing mobile implants. Possible therapeutic steps are temporary isolation of individual implants from the superstructure and thus facilitating remineralization of the bone surrounding these implants.
- If excessive parafunctional habits or nocturnal positional deviations of the mandible are suspected, the fixed denture can be replaced, permanently, temporarily or prophylactically, by a bar-supported denture. This type of denture is supposed to be removed by patients at night. This will help avoid peak nocturnal pressure on the bone/implant interface and result in a very stable direct fixation of the implants relative to each other. Masticatory shear forces will also be more favourably distributed between the bar and the denture.

2) Infection:- It spreads submucosally(fig 6) This may result in infected vertical parts if the implants are submerged below the mucosal level over time, eliminating the necessary gateway for suppuration as the area of penetration is closed with scar tissue. Any inflammation of this type will spread just like a submucosal abscess and is treated in the same way. It is recommended to make generous incisions to open the abscess. The mucosal area immediately adjacent to the threaded pin can be excised by electrosurgery. In rare cases, reduction osteotomies or the replacement of implants will be required if vertical bone growth becomes excessive.

CONCLUSION

Immediate loading of laterally inserted disk-design implants with a fixed, functional prosthesis is a safe and reliable method for management of the completely edentulous maxilla and mandible. 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.

REFERENCES


Corresponding Address:
Dr. Chandana Nair
Email: drchandana89@yahoo.com
LIST OF PHOTOGRAPHs

(Figure 1) A typical basal implant for lateral insertion (BOI® brand) with a stable base plate, reduced vertical implant portions, two integrated bending areas, reduced and polished mucosal penetration diameter

(Figure 2) A typical basal compression screw (BCS® brand) with large and polished threads, for cortical engagement

Fig 3: Internal BOI implants can have different platforms. Left: AnITI-compatible Diskos® implant with octagon. Right: A French “Diskimplant” with an external hex. These implants feature all advantages and disadvantages of screw implants with internal connection

Fig 4: One piece external basal implants for cortical engagement in vertical or horizontal bone morphology.

Fig 5: Diagram showing a diffuse zone of low mineralization around the base plate of a functionally overloaded basal implant.

Fig 6: Submucosal spread of infections