

Basics of Basal Implantology

Goutam Sarin^{1*} Ajay Gupta² Vijay Prakash³ Precily Thomas⁴ Anita Tiwari⁵ Giby Markose⁶

¹Post Graduate Student, Department of Prosthodontics, Divya Jyoti College of Dental Sciences and Research, Modinagar, UP, India.

²Professor and Head, Department of Prosthodontics, Divya Jyoti College of Dental Sciences and Research, Modinagar, UP, India.

³Professor, Department of Prosthodontics, Divya Jyoti College of Dental Sciences and Research, Modinagar, UP, India.

⁴Post Graduate Student, Department of Prosthodontics, Divya Jyoti College of Dental Sciences and Research, Modinagar, UP, India.

⁵Post Graduate Student, Department of Prosthodontics, Divya Jyoti College of Dental Sciences and Research, Modinagar, UP, India.

⁶Post Graduate Student, Department of Prosthodontics, Divya Jyoti College of Dental Sciences and Research, Modinagar, UP, India.

ABSTRACT

Background: Dental implant treatment is a great reliever for people without teeth. But conventional dental implant therapy's biggest drawback has been the length of time required by traditional placement protocols. Moreover Crestal Implant is placed when there is enough vertical bone but with patients with atrophied jaws receive little or sometimes no treatment. In atrophied cases bone augmentation procedures is done which increases the risks and cost of dental implant treatment. This article highlights the use of basal implants and their comparison with the traditional implants.

Keywords: Basal implant, Crestal Implant, Basal osseointegration, Bicortical implant.

INTRODUCTION

Dental skeletal structure is formed by the basal bone which contains most of the muscle attachments.^{1, 2} There is a lack of stimulation to the residual bone when a tooth is lost which causes a decrease in trabeculae and bone density in the area along with loss in external width and then height of the bone volume.³ During the first year, after tooth loss there is a decrease of 25% in the width of bone and an overall 4 mm in height following extractions for an immediate denture.⁴ If the available vertical bone is insufficient, measures are taken to rebuild the morphology of the bone tissue – either by transplantation, by augmentation or by induced growth.¹ Unless aesthetic considerations play a major role these modifications of the bone situation is performed solely to facilitate the use of crestal implants, which would be impossible to insert otherwise.

The first time the term Basal Implantology was mentioned in 1972 by Jean-Marc Julliet who

developed the first single piece implant.⁵ This design was available in two sizes and is still in use.⁶ It is in contrary to Linkow's approach, the low resistance of the spongy bone (in spite of the initial press fit of the blade implant) that will soon give way to masticatory pressure. Thereby, the blade is pressed deeper into the bone and will eventually lodge right on the cortical structure.⁷

In 1991, Gerard Scortecci published a retrospective study on the clinical outcomes of the Disk implant system which showed a cumulative success rate of almost 90% over a 10 years period. This improved basal implant system was developed with standardized cutters for lateral implant cavities. There are two types of implants, called Disk implants, with internal and external connectors to the prosthetic superstructure.⁸ Around 1990's, Prof. Dr. Stefan Ihde (Switzerland) and group of clinicians around the world have continuously improved on the concept of Basal Implantology.⁹

Received: Nov. 23, 2017; Accepted: Dec. 12, 2017

*Correspondence Dr. Goutam Sarin.

Department of Prosthodontics, Divya Jyoti College of Dental Sciences and Research, Modinagar, UP, India.

Email: drgoutamsarin@gmail.com

A modern implantology system which utilizes the basal cortical portion of the jaw bones for retention of the dental implants. Basal implants with the implant technique basal osseointegration has been developed in overcoming the above problems. Basal implantology also termed as bicortical implantology or cortical implantology which are uniquely designed to be accommodated in the basal cortical bone areas. It is based on principle that the load transmitting surfaces of implants are positioned in basal bone areas which is stable and less prone to atrophy.

Basal implants is far safer and cheaper than the conventional crestal implant. The outcome of basal implants is much better than crestal implants because of the survival rates as well the prognosis is better from the start as the blood supply to the bone remains largely intact as a result of skeletized enclosed implant fixture. Surface enhanced crestal implants are susceptible to peri implantitis which may lead to progressive ridge resorption.

TYPES

Dr. Ihde Dental developed improved types of basal implants:

- Previously round base plates got edges, thereby preventing early rotation of the implants in the bone before integration.
- Later in 2002 the fracture-proof design of the base plate was invented and later patented in Europe and the United States.
- Then bending zones in the vertical implant shaft were introduced.
- From 2005 on the experiences with lateral basal implants were transferred to screwable designs (BCS, BOI).

The two types BOI (Basal Osseo Integrated) and BCS (Basal Cortical Screw) basal implants are specifically 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.¹¹

BOI (LATERAL BASAL IMPLANTS)

- They are placed from the lateral aspect of the jaw bone.¹¹ Masticatory load transmission is

confined to the horizontal implant segments and, essentially, to the cortical bone structures.

- In Anterior, the implants with two disks are used if sufficient vertical space is available. The basal disk has a diameter of 9-10 mm and the crestal disk is 7 mm in diameter. The crestal plate provides additional stabilization of the implant and loses its importance once the basal plate has ossified to full load bearing capacity.
- In posterior, the implants used are usually of a square shape, having a disk of 9-12 mm or 10-14 mm with shafts of 10-13.5 mm in length.
- This depends on the desired vertical dimension and the available horizontal bone. If the vertical bone available above the mandibular nerve is, 2 mm, infranerve implant insertion is indicated.

BCS (SCREW BASAL IMPLANT)

- These screwable basal implants are flapless implants and are inserted through gum, without giving a single cut, inserted like a conventional implant. They transmit masticatory loads deep into the bone, usually into the opposite cortical bone, while full osseointegration along the axis of the implant is not a prerequisite. BCS provide at least initially some elasticity and they are not prone to peri-implantitis due to their polished surface and their thin mucosal penetration diameter.

Regarding the surface structure, in 1999 the vertical implant parts were produced polished, and from 2003 on all the basal implant was produced polished. Because polished surfaces show no tendency to inflammation (no mucositis, no peri-implantitis), and in case of sterile loosening, reintegration of the implants was possible if the loads were adjusted in time. It was also observed, that roughened osseous-surfaces have less tendency to re-integrate.

The design was developed into skelleted direction, leaving enough elasticity for the development and functional stimulation of bone.

The abutment design was also developed:

- Initially basal implants were designed as two-piece designs, later one-piece designs were introduced.
- Two head sized became available for cemented constructions.
- Internal screw connections were developed. These designs are important for maxillo-facial use and the fixation of epitheses

INDICATIONS¹³

- When several teeth are missing or have to be extracted and needs to create multiple unit restorations in the upper and lower jaws.
- When conventional implant or bone augmentation has failed.
- Ideal for resorbed ridges

CONTRAINDICATIONS¹³

- 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).*
- Medically Compromised Patients: Recent myocardial infarction (heart attack) or cerebrovascular accident (stroke), Immunosuppression (a reduction in the efficacy of the immune system).
- Those undergoing Chemotherapy, immunosuppressive therapy, leucopenia, and malignant diseases of the blood.
- Patients who haven treated with I.V bisphosphates should be excluded from the treatment unless their bony status proves to be equal to a healthy, unexposed person.

ADVANTAGES OF BASAL IMPLANTS¹³

- Immediate Loading** – in 72 hours of implant surgery the prosthesis is fabricated without undergoing any bone augmentation/bone grafting procedures as in conventional implants which takes around 6 months to 1 year. This eliminates the need for interim dentures.
- One piece implantology** – 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.
- Basal – cortical bone support** – As these implants utilizes the cortical/basal bone which is strong, resistant to resorption and stable repairing capacity.
- Minimally invasive and surgical complications** – the single piece screw type implants can be inserted in a minimally invasive fashion in most of the edentulous patients. This is often flapless and involves minimum bone cutting. Therefore resulting in minimum post-operative edema and healing at the procedure sites would be rapid and often non-eventful.
- In compromised bone situations** - these implants are specifically designed to utilize the available bone unlike in conventional implants where the available bone is modified with bone augmentation/ bone grafting procedures.
- Better distribution of masticatory forces** – As basal implants are anchored in high quality basal bone, the biomechanical loads (masticatory forces etc.) are distributed to the cortical bone regions which are highly resistant to resorption and have very high repairing capacity.
- Peri-implantitis incidence** –The most common cause for failure of conventional implants is peri-implantitis. This is because of the rough implant surface as well as the interface problems between the multiple parts of the implant. Judicious use of monobloc, smooth surface basal implants eliminate the threat of peri-implantitis by almost 98%.
- Medically compromised situations** – Basal implants work well in controlled diabetics, in smokers, in patients suffering from chronic destructive periodontitis.
 - Diabetes Mellitus** –As diabetes is associated with increased susceptibility to infection, impaired wound healing and gum diseases

such as gingivitis, periodontitis etc. it is contraindicated in conventional implants. But, basal implants work absolutely well in controlled diabetic patients because they are smooth surface implants which do not permit bacterial colonization on the implant surfaces.

- **Smoking** – Smoking habit cuts down the blood flow to the oral tissue like the gums, teeth and bone, which in turn results in slower healing of the implant site. Smokers have a high risk of gingivitis and gingival recession which in turn will lead to infection around the implant (peri-implantitis) leading to their failure. 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.
- **Acute Destructive Periodontitis** – Conventional dental implants are contra indicated in patients with acute periodontitis. This is because of the high risk of the patient to contract gingival infections leading to failure of the implants. These patients often present with multiple mobile teeth and painful, inflamed gums which bleed easily. 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).
- 9. **Cost savings** – Avoidance of the bone grafts and second stage surgery, in addition to the phenomenal reduction in the total treatment time helps save costs in a big way.

DISADVANTAGES OF BASAL IMPLANTS ¹³

For Basal Osseointegrated implants open flap surgery is needed. Gum incision and suturing are necessary, unlike Basal Cortical Screw implants, as BCS implants may be inserted without a flap procedure. Only a properly trained prosthodontist can accomplish the surgical procedure without any

complication. If placed by inexperienced or untrained hands, problems are bound to come.

COMPLICATION OF BASAL IMPLANTS¹⁴

Functional overload osteolysis: Masticatory forces transmitted through the basal implants may create local microcracks in the cortical bone. These microcracks are repaired by a process called remodelling. This, however, will temporarily increase the porosity of the affected bone region and temporarily reduce the degree of mineralization additionally. 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.

SURGICAL PROCEDURE OF THE BASAL IMPLANT PLACEMENT¹⁵

Before insertion the oral mucosa is laterally elevated under local anaesthesia. Lateral basal implants are placed from the lateral aspect of the jaw bone. A vertical and a horizontal precision slot are cut into the jawbone to allow placement of the implant. BOI implants are inserted horizontally & transosseously, i.e. their base plate (disc) is designed to touch the outer and inner cortical bone. Basal implants changed treatment options in the upper jaw. Sinus lift procedures have become avoidable because all patients have sufficient horizontal bone naturally, even if vertical bone is missing. Screwable basal implants are flapless implants and are placed through gum, without giving a single cut.

Basal implants get integrated in a totally different way than traditional two-phase implants do. One, the implantation site is different: it is fixed in the solid, bicortical part of the bone, and not in the spongy bone. This layer cannot be reduced to such a level that there would be not enough left for implantation. For another, basal implants can get fixed not only vertically, but also horizontally.

PROSTHETIC PLACEMENT

Proper Prosthetic design demands fulfilment of following aims:

- Six chewing units in each side of the jaw in both jaws

- The premolar and molar chewing units having the width of 6 mm
- The masticatory arches being equally long and wide on both sides of the jaw
- Both the arches having the correct inclination, thus respecting the campers plane, and curves of Spee and Wilson
- The skeletal midline of the maxilla and mandible coincide or will be corrected as much as possible
- The pathways covered during the lateral movements is about the same in both directions
- The mouth opens with a straight vertical movement (this indicates that the rest position of both joints in correct that is while the arches are in full occlusion, the joints are in an acceptable position)

Basal Implants are a one-piece design with two different sizes of abutment heads. The impression caps are firmly splinted in the abutment head with light curing flow composites to prevent the single caps from moving when the impression material flow. Heavy body materials are recommended for taking impression as thin and medium materials may flow underneath the flap which may result in infections. Transfer caps are used to register the relative position of the abutment heads and the soft tissues. The impressions are cast after the impression caps have been equipped with implant analogues and the finishing line of the analogue-head has been protected against the gypsum. This is done e.g. through wax or with the help of gingiva-mask. The intermaxillary relationship will be registered with wax and mounted on a standard articulator with the help of a facebow. Hip-Mount-device can also be used to avoid the usage of facebow because it uses the stable skeletal reference points i.e, the medial hamulus of sphenoid bone and the incisal papilla, therefore this procedure is accurate and reliable. In an immediate loading implant procedure with basal implants it is possible to use the elasticity of the implant and the surrounding bone to overcome non-parallelities between the abutments. After the bridge is down on the implants, the bridge must be passive i.e, tensions are not allowed. During the metal try-in we will get a first overview on future aesthetics especially in the upper jaw the gum line must be regarded, in both the jaws the support of the soft tissues like lips and cheeks must be verified. The

standard result of prosthodontics treatment must always be a bilateral pattern of chewing.

DISCUSSION

Traditional dental implants are inserted vertically from the crest of the alveolar ridge whereas the basal implants are inserted laterally and therefore synonymously called lateral implants or disk implants¹⁵. In Basal implants masticatory forces need not be transmitted to the bone via vertical aspects of the implant. As a T shaped slot is cut into the bone, neither intraoperative nor preoperative infection will threaten the treatment result. As the cortical bone closes during the healing process usually there are no funnel or crater shaped areas of bone collapse and no infection can be transported into the depth of the bone along the smooth threaded pins. Except in functionally related massive vertical bone growth along the threaded pin. Normally, infection originating in the oral cavity does not spread enossally in integrated basal implants as long as they are not mobile to the extent that they can be intruded. Infections can be caused by food retention or impaction or as a consequence of vertical bone growth. However, unlike with crestal implants, they do not spread intraosseously but submucosally.

The prime objective of treatments including basal implants is a fixed restoration with 12 teeth per jaw. Optionally, removable dentures may be inserted as well, as long as enough basal implants are splinted by rigid connectors (i.e. bars). Single crowns are primarily realized on internal or single-unit Basal implants. They may be loaded immediately only in favourable situations. As the use of Basal implants can help avoid risky and expensive bone augmentation procedures, these implants are the therapy of first choice in moderately or severely atrophied jaws as well as in those cases, where immediate loading or cheaper treatments are desired by the patients.

CONCLUSION

Basal implants are used to support single and multiple unit restorations in the upper and lower jaws. They can be placed in the extraction sockets and also in healed bone. Their structural characteristics allow placement in bone that is deficient in height and width. 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.

Therapeutic options for peri-implantitis around crestal implants are limited; usually the disease stops as soon as it reaches basal (i.e. resorption resistant) bone areas. Peri-implantitis is not found with basal implants. The replacement or addition of basal implants is easily possible, since there is usually sufficient cortical bone available for additive therapy.

The correct diagnosis and treatment of problems related to basal implants requires specific clinical experience, specific tools and of course basal implants. The technique of basal implantology solves all problems connected with conventional (crestal) implantology. It is a customer oriented therapy, which meets the demands of the patients ideally.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

REFERENCES

1. Carl E. Misch. Dental Implant Prosthetics. 1st edition;5
2. Freeman E, Ten Cate AR: Development Of The Periodontium: An Electron Microscopic Study, Periodontol 1971;42: 387-395.
3. Pietrokovoski J: The Bony Residual Ridge In Man, J Prosthet Dent 34:456-462,1975
4. Carlsson G, Perddon G: Morphologic Changes Of The Mandible After Extraction And Wearing Of Dentures: A Longitudinal Clinical And X-Ray Cephalometric Study Covering 5 Years, Odontol Revy 1967; 18:27-54
5. Grishmi Niswade: basal implants- a remedy for resorbed ridges, World journal of pharmaceutical and life sci 2017: 3(1)565-572
6. Rahul et al.: Basal Implants – An Alternate Treatment Modality For Atrophied Ridges: IJRID 2016;6(5):60-72
7. Stefan Ihde :Principals of BOI: Clinical, Scientific and Practical guidelines to 4-D dental implantology
8. Yadav et al: An alternative to conventional implants: Basal implants: Rama Univ J Dent Sci 2015 June;2(2):22-28
9. IHDE Dental. [Online]. Cited 2015 February 2; Available from: URL: <http://www.boi.ch/index.php/en/>.
10. Ihde S. Comparison of basal and crestal implants and their modus of application. Smile Dental Journal 2009;4:36-46.
11. Nair C, Bharathi S, Jawade R, Jain M. Basal implants - a panacea for atrophic ridges. Journal of dental sciences & oral rehabilitation. 2013;1-4
12. Advantages of immediate loading basal implants. [Online]. Cited 2015 January 2; Available from: URL: <http://www.dentalimplantskerala.com>.
13. Disadvantages of basal implants.[Online]. Cited 2015 January 30. Available from: URL:<http://drmugavel.in/content/boi-dental-implants-india-basal-dental-implants-india>.
14. Martin R, Burr D, Sharkey N. Skelettal Tissue Mechanics. 1st edition. New York: Springer; 1998.
15. Ihde S: immediate Loading.Guideline to Successful Implantology. 2nd Edition.