|| ISSN(online): 2589-8698 || ISSN(print): 2589-868X ||
International Journal of Medical and Biomedical Studies
Available Online at www.ijmbs.info
NLM (National Library of Medicine ID: 101738825)
Index Copernicus Value 2021: 70.61
Original Article
Volume 7, Issue 4; April : 2023; Page No. 47-51

Segmental Rehabilitation of Partially Edentulous Sites with Basal Cortical and Conventional Implants – A 1 Year Clinical Trial

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Received: 27-02-2023 / Revised: 09-03-2023 / Accepted: 05-04-2023
DOI: https://doi.org/10.32553/ijmbs.v7i4.2692
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Conflict of interest: No conflict of interest.

Abstract
Rehabilitation of atrophied/resorbed edentulous jaws by placing implants is a challenging procedure. Although various bone augmentation procedure like ridge augmentation, sinus lift is in practice but it may lead to the morbidity of donor's site. Sometimes patient is not willing for such extensive surgical procedures. In such cases Cortical/basal implants is a viable treatment option. Basal implants gives support from the basal bone area which usually remains free from the infection and less prone to resorption. This study was undertaken to assess clinically and radiographically the bone levels in rehabilitation of immediate loading and delayed loading in opposite arch in an occlusion for a period of 1 year. After placing the implants, immediate loading was done within 72 hours for basal implants and conventional implants were placed in the lower partially edentulous sites.
Key Words: Basal implant, atrophic ridges, bone augmentation, end-osseous implants

Introduction

Restoration of moderate to severely atrophic jaws with conventional implants requires extensive surgical a procedure that is expensive, involves a great deal of post-operative discomfort, and does not assure success of the procedure done and the rehabilitation intended. For trouble free and successful implant placement has become imperative that sufficient bone is available (at least 13-15mm length and 5-7 mm width), in case this criteria is not sufficed then the treatment planning for placing implants becomes robust, i.e.; restoring the lost alveolar dimensions needs to be considered to have a predictable successful outcome of the treatment[1]. 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[2]. Such extensive surgical procedures also have their own indications and contraindications. To avoid these procedures the other viable option for replacement in atrophic jaws is to change the implant design. Two very successful implant designs and protocols have been demonstrated in the past few decades for replacement in atrophic jaws which are Mini Dental Implants and Basal Implants[3].

Basal implants are specifically designed to allow fixed rehabilitation in severely atrophic jaws and several designs of these implants exist today that have made basal implantology flexible enough to accommodate any situation. These implants are uniquely and specifically designed for the sole purpose of gaining anchorage from the basal cortical bone and have gone through several changes and modifications in the past several decades[3]. Basal bone is defined as the osseous tissue of the mandible and maxilla underlying the alveolar processes[1]. It is relatively fixed and unchangeable framework of the mandible and maxilla. Using the Basal Bone, implantologist can now place implants in regions where traditional implants would not be possible. The traditional Implants use the alveolar bone - 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. Dental implants when placed in this bone can also be loaded with teeth immediately. This science is already proved in orthopedic implants (Hip / Knee replacements). Once the patient is fitted with the artificial joint he is asked to start using it immediately[1].

Basal implantology is also known as bicortical implantology or just cortical implantology. It 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[4].

History of Basal Implants

The first single piece implant was developed and used by Dr. Jean-Marc Julliet in 1972 and has been used to this very day successfully, the only disadvantage is the lack of a surgical kit[5]. To overcome this disadvantage in mid 1980s French dentist Dr. Gerard Scortecci improved the basal implant system with matching surgical tools and external and internal connections for the prosthetic superstructure and called them “Disk implants”. New implant systems and surgical tools based on Dr. Gerard Scortecci’s Disk implant, gave rise to the development of the modern Basal Osseointegrated Implant (BOI), also known as Lateral Implant. These implants were designed to enable masticatory load transmission in the vertical as well as its basal part. Dr. Stefan Ihde improved the basal implant; the round base plates got edges, preventing early rotation of the implants in the bone before integration, in 2002 fracture proof base plate was invented[3, 5].

The jaw bone comprises of two parts: the tooth bearing alveolus or crestal part and the basal bone. The crestal bone is less dense in nature and is exposed to infections from tooth borne pathologies, injuries or iatrogenic factors and is therefore subject to higher rate of resorption whereas the basal bone is heavily corticated and is rarely subject to infections and resorption. Basal bone can offer excellent support to the implants because of its densely corticated nature, at the same time the load bearing capacity of the basal bone is many times higher than that offered by the spongy crestal bone. This rationale stems from Orthopedic surgery and from the experience that cortical areas are essential, since, they are resistant to resorption, as a result basal implants are also called as “Orthopedic Implants”[6].

In cases where there are no atrophic ridges and adequate bone support for the placement of implants is there, then conventional implants are considered.

Basal Implant Types Based on Morphology[3]

Basic types of basal implants available: Screw Form, Disk Form, Plate Form.
Both screw and Disk form of implants can be further categorized into

I. Screw Form – a) Compression Screw Design (KOS Implant), b) Bi-Cortical Screw Design (BCS Implant) and c) Compression Screw + Bi-Cortical Screw Design (KOS Plus Implant)

II. Disk Form - Basal Osseointegrated Implant (BOI) / Trans-Osseous Implant (TOI) / Lateral Implant)

Plate Form - BOI-BAC Implant and BOI-BAC2 Implant.

Other Forms - TPG Implant (Tuberopterygoid) and ZSI Implant (Zygoma Screw).

Case Report

A 65 years old female patient came to the Department of Periodontology and oral Implantology with the chief complaint of missing teeth in upper and lower left back region from last 3 years. An OPG was advised before planning the implant surgical procedure and on viewing OPG it was found that the bone quality was D2 and D3 in posterior maxilla according to bone density classification by Lekholm and Zarb. So keeping the quality of bone in mind for posterior maxilla, the procedure for placing basal implant was planned and for the mandibular arch conventional implants were planned. Patient was recalled after 3 days for the procedure to be performed. All the parameters for blood investigation were in normal limits. The procedure started after giving local anesthesia to the patient in the posterior maxilla and 3 basal implants (2 BCS and 1 KOS basal implant) were placed. After placement of the implant, putty impression was made for maxillary and mandibular arches on the same day. Then impression was sent to the laboratory for the preparation of the crown. The crown was delivered within 72 hours.

After 2 days, second surgery was planned for placement of implant in mandibular edentulous site w.r.t. 36 regions. Keeping the quality of bone in mind at the time of implant placement, it was planned to place 2 conventional implants considering the mesio-distal space of the edentulous site, instead of 1 implant for additional stability in 36 edentulous region. Following the flapless approach 2 implants were placed. Patient was sent home and was called up for follow the very next day. 3 months time period was given for the osseointegration to occur.

Figure 2: Pre-Operative Radiograph

Figure 3: Pre-Operative Clinical Photograph

Figure 4: Basal Implants in Edentulous Region



Figure 5: Post-Operative Radiograph Placing Crown over Basal Implants In Maxilla and Conventional Implants in Mandibular Region.

Figure 6: Crown Insertion

Figure 7: After 1 Year Follow

Discussion

Basal implantology is also known as bicortical implantology or just cortical implantology. The basal bone provides excellent quality cortical bone for retention of these unique and highly advanced implants.. These implants when placed in this bone can also be loaded with teeth immediately. Cortical implants works very well even in the most unfavorable bone situations by avoiding of bone augmentation or 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[7].

In the above mentioned case report, due to long standing edentulism, there was reduced amount of alveolar bone support for implant placement due to which a close sinus proximity in the posterior maxilla was there, at first it was planned to undergo sinus lift procedure, but after explaining the patient regarding the procedure, patient was unwiiling for the additional cst of the treatment, so the decision of basal implant insertion was taken. Total of 3 basal implants were placed at the edentulous site and the prosthesis was given immediately after 3 days which is totally opposite to placing conventional implants for which osseointegration takes place after 3 months of placement.

In the mandibular edentulous site, after performing radiographic examination carefully, it was seen that the extraction socket unhealed even after 1 year of extraction and there was a broader mandibular canal inferio-superiorly. The concept of placing basal implant could have come to the mind of the author, but due to the close nerve proximity beneath the edentulous area, nerve has to be bypassed in order to place an implant, but it was considered better to go with the conventional approach of placing implants. After measuring radiographically the width of the extraction socket, the mesio-distal dimension of the edentulous site was found to be greater than the adjacent distal tooth. Keeping in mind the tapering nature of the roots of extracted molar seen radiographically, it was served as the guide for the placement of implant.

Evidence based decision was made to place 2 conventional implants in the mandibular posterior segment for the following reasons:

1) Radiographic examination depicted the broad mandibular canal (inferio-superiorly), which has to be bypassed in order to place implants. Since basal implants are narrower or pointed they may injure the canal. Due to the availability of adequate available bone width and after taking all the measurements, suitable implant plan came out

to be conventional in the extraction socket, so as to take the advantage of the bony walls of the extraction socket, avoiding creation of jumping gap

2) Instead of creating osteotomy site in the centre of the extraction socket, which is in the inter-radicular bone, 2 conventional implants were planned to be placed in the extracted root areas. Placing single implant would have created jumping gap.

In the same mandibular edentulous site, after 3 months of osseointgegration final prosthesis was given to the patient. While giving the final prosthesis in the 36 region, all the occlusal prematurity's were corrected. Even at every follow up visit, again all the high points for the crown were corrected. Proper cuspal inclinations of maxillary basal and mandibular conventional implants's crown were made. From placement of implants and prosthesis to today, the implants and crowns are stable and functional as per the statements from the patient causing no complications to the patient.

There is no edentulous phase in Basal implants since they have an advantage of immediate loading within 72 hours, whereas there is delayed loading of 3-6 months in conventional implants. This basal bone is less prone to bone resorption and infections. It is highly dense, corticalized, and offers excellent support to implants. The conventional implants are placed in the crestal alveolar bone which comprises bone of less quality and is more prone to resorption.

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 the healed bone. Their structural characteristics allow placement in the bone that is deficient in height and width, whereas conventional implants are preferred in the areas of adequate bone width and height. Basal implants are the devices of the first choice, whenever (unpredictable) augmentations are part of an alternative treatment plan. These implants have made them a viable option for restoring atrophied jaws as they don't require extensive augmentation and allow for immediate loading, also, they can be placed with a flapless technique and can be combined with any implant.

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