

Comparison Between Cortical and Conventional Implants: Review

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Abstract

Implantology is the highly advanced, acceptable procedure with extremely satisfactory results in health, function and aesthetics. The conventional implant system though widely used, but the basal implants are the modern system of implantology. This utilizes the basal cortical portion of the jaw bones and provides an excellent quality of retention. The cortical implant system is very useful in cases of severely atrophied ridges and medically compromised patients. These implants can not only placed immediately but also loaded immediately. In this implant system, the implant and the abutment are fused to a single piece which minimizes the failure unlike the conventional system.

Keywords: Basal Implants; Conventional Implants; Cortical Bone; Retention

Introduction

Sufficient amount of bone is required for complete rehabilitation of the edentulous jaws (at least 13 - 15 mm length and 5 - 7 mm width) [1]. In case of severely atrophic jaws implant placement is challenging due to the poor quality and quantity of the future implant bed [2]. Several techniques like nerve shift, bone grafts, sinus lift, all on four are often used to overcome the initially unfavorable anatomical and mechanical conditions [3-5]. But these procedures may result in unpredictable limits of implant failure despite of acceptable success rates [6]. The main problem in this thing is the patient's willingness for the procedures, cooperation and extra finance [7]. Ultimately the patients with severely atrophied jaw bones receive no treatment paradoxically. To overcome all the drawbacks of the conventional implants, the trend of cortical or basal implantology is rising the head to the top. Here the comparison of the conventional and cortical implants is discussed by following various articles and case reports of famous surgeons.

Conventional crestal implantology

In crestal implantology, implants are inserted into the jaw bone coming from the crestal alveoli and the direction of the main load-transmitting surfaces are vertical. The traditional implants use the alveolar bone which is lost after teeth are removed and the reduction process continues as the functions are getting reduced. The mandibular anterior segment has the maximum bone level of at least 10 - 13

mm, these implants are usually placed in this region. However, in patients with very little available vertical bone, but crestal implants are contraindicated in patients with severely resorbed ridges.

Draw backs with conventional root form implant

- 1) Large amount of bone is required for this.
- 2) The required wider crestal bone for the accommodation of its neck is often absent due to bone loss.
- 3) Mostly require bone augmentation procedures at the time or before the implant insertion which increase the cost, surgery time, no. of surgeries and treatment span.
- 4) Most part of the implant is placed into the poor density spongy bone which cannot be loaded immediately-may require healing time up to 3 - 8 months.
- 5) Because of vital structures such as maxillary sinus and mandibular canals in the back region of jaws, these implants may require large amount of bone augmentations (sinus augmentation, block grafting, nerve repositioning), multiple surgical steps, higher cost and longer healing times.
- 6) Has a screw connection which may lead to future screw loosening/screw breakage problems under the prosthesis.
- 7) Sensitive to infection-These implants have rough surface which is prone to collect infection once exposed to oral environment or placed at the infected region.
- 8) Being rough surface, these implants are prone to peri-implantitis.
- 9) Crestal bone loss-maximum stress/load comes on the bone crest which may cause crestal bone loss.
- 10) Wide neck diameter and rough surface of these implants require thick, keratinized and stable/non mobile gums around its neck to avoid the problems such as soft tissue.

Basal implantology

Basal implantology is also known as corticobasal implants or bicortical implantology or just cortical implantology. It utilizes the dense basal cortical portion of the jaw bones for retention of the dental implants. The basal bone provides excellent quality cortical bone for retention of these unique and highly advanced implants. This implant technology involves the rules of orthopedic surgery so it is also called as "orthopaedic implant" and hence can be categorized to be an "oral division of orthopaedic surgery". These basal implants are also called as lateral implants or disk implants. This system has an advanced design, surgical rule and is a prosthetic favourable system.

Classification of single piece dental implant (basal implant) based on morphology [8]

There are four basic types of basal implants:

- 1) Screw form
- 2) Disk form
- 3) Plate form
- 4) Other forms.

Screw form:

- a) Compression screw design (KOS implant)
- b) Bi-cortical screw design (BCS implant)
- c) Compression screw + Bi-cortical screw design (KOS plus implant).

Plate form:

- a) BOI-BAC implant
- b) BOI-BAC2 implant.

Disk form:

- a) Basal osseo-integrated implant (BOI)
- b) Trans-osseous implant (TOI)
- c) Lateral implant.

Other forms:

- a) TPG implant (Tuberopterygoid)
- b) ZSI implant (Zygoma screw)

Indications [9]:

- 1) All kinds of situations when several teeth are missing or have to be extracted.
- 2) When the procedure of 2-stage implant placement or bone augmentation has failed.
- 3) In cases of severe bone deficiency either horizontal or vertical.

Contraindications [9]

- 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: Recent myocardial infarction (heart attack) or cerebrovascular accident (stroke), Immunosuppression (a reduction in the efficacy of the immune system).
- 3) Medicines: Drugs of concern are those utilized in the treatment of cancer, drugs that inhibit blood clotting and bisphosphonates (a class of drugs used in the treatment of osteoporosis).

Advantages of basal implants

- 1) Safe load transmission in basal bone-Load transmission is deep in the infection free basal bone.
- 2) Less incidence of peri-implant infections-Implant surface is polished in basal implants and also the mucosal penetration diameter is less as compared to conventional dental implants.
- 3) Patient's own alveolar bone is required-Basal implants require the patient's own alveolar bone and no bone augmentations are required.
- 4) There is no edentulous phase as there is immediate loading.
- 5) One stage procedure-Extractions and implant placement can be carried out in one appointment even if the teeth are periodontally infected.
- 6) Patient compliance is not an issue.

Disadvantages with basal implants

- 1) Skilled surgeon with sound anatomic knowledge is required.
- 2) Single tooth replacement has issues of compromised aesthetics.

- 3) Excess sound bone reduction in cases of good bone support.
- 4) If load distribution is not done properly then osteolysis can be seen.

Basal Vs Classic Implants		
Implants	Basal Implants	Classic Implants
Success rate	98 - 99%	95%
Loading	Immediate loading	Delayed loading in multiple stages
Duration of time	72 hours	3-8 months
Sizes and Designs	Wide range of sizes and designs are available to suit various bone types and help avoidance of bone augmentation and sinus lifts	Limited sizes and designs are available thereby limiting their application
Eligibility to patients	Almost everyone	Not suitable for diabetes, smokers, and patients with uncontrolled periodontal (gum) disease
Bone used	Basal bone that is highly dense, mineralized and less prone to bone resorption and infections	Crestal alveolar bone which consists of bone of less quality and it is more prone to resorption
Additional surgery (bone augmentation, sinus lift, bone graft)	No	Yes
Cost	More affordable due to its one piece immediate loading implant and one visit to the dentist	More expensive due to the implant and the abutment, the healing time and multiple visits required

Discussion

Julius Wolff in 19th century stated that the bone in a healthy person or animal will adapt to the loads under which it is placed i.e. when load on a particular bone increases, the bone remodels and become stronger to resist the force. According to this law, bone is strengthened and undergo continuous remodeling due to a tooth or an implant [11].

Basal implant system is a new era in implant dentistry which uses the cortex of the bone which is less prone to resorption and free from infection offering more durable and stable treatment option with both immediate functional loading as well as nonfunctional loading, in case of single tooth replacement or in case of full mouth rehabilitation.

Shakhawan., *et al.* 2021 stated that basal implants derives support from a basal bone area which usually remains free from the infection and less prone to resorption.

Singh., *et al.* 2020 found that the cortical implant system is associated with a special occlusal scheme which demands rigid fixation of implants to the stable cortex.

Ghalaut., *et al.* 2015 published in this case report that immediate loading of basal implants can be done, when they are placed in the dense cortical bone. Though there is high chances of crestal bone loss as remodeling of bone starts within 72h and the peri-implant bone get weakened, rigid splinting of the framework should be done to distribute the masticatory forces evenly.

Singh, *et al.* 2013 explained in his result that the crestal bone loss in case of immediate functional loading or immediate non-functional loading of cortical implants are within acceptable limits.

Patel, *et al.* 2021 from his clinical study resulted that the cumulative survival rate of basal implants was 97.5% and it aids application in patients with smoking, diabetes and aggressive periodontitis with a better prognosis as its support is obtained from cortical bone.

Rathee, *et al.* 2020 concluded in her case report that basal implants are single piece implants that reduce the failure risk due to abutment-fixture interface related problems that exist in conventional implant system [10].

Thukral, *et al.* 2016 discussed in her report that basal implants provide excellent primary stability along the vertical surface of these implants with no need for corticalization. So, the basal implants are well suited not only for immediate loading but also for immediate placement.

Conclusion [12]

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. Basal implants are the devices of the first choice, whenever (unpredictable) augmentations are part of an alternative treatment plan. 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.

Bibliography

1. Yadav RS, *et al.* "An Alternative to Conventional Dental Implants: Basal Implants". *Rama University Journal of Dental Sciences* 2 (2015): 22-28.
2. Scortecchi G, *et al.* "Implants and Restorative Dentistry". Martin Dunitz, London (2001): 79-85.
3. Shakhawan MA, *et al.* "All-on-Four Treatment Concept in Dental Implants: A Review Articles". *Surgery and Case Studies: Open Access Journal* 2.4 (2019): 175-179.
4. Neamat AH, *et al.* "An Indirect Sinus Floor Elevation by Using Piezoelectric Surgery with Platelet-Rich Fibrin for Sinus Augmentation: A Short Surgical Practice". *International Journal of Case Reports* 8 (2017): 380-384.
5. Misch CE, *et al.* "Mechanical Properties of Trabecular Bone in the Human Mandible. Implications of Dental Implant Planning and Surgical Placement". *Journal of Oral and Maxillofacial Surgery* 57.6 (1999): 700-706.
6. Misch CE. "Contemporary Implant Dentistry". Mosby Elsevier, St Louis (2008): 1034-1035.
7. Odin, *et al.* "Rehabilitation of Severely Atrophic Jaws Using Basal Disk Implants". *Journal of Oral Implantology* 38.5 (2012): 611-616.
8. Shahed SSA, *et al.* "Basal Implants: A Breakthrough for Atrophic Ridges: Review". *Journal of Applied Dental and Medical Sciences* 4.1 (2018): 2454-2288.
9. Gupta AD, *et al.* "Basal Osseointegrated Implants: Classification and Review". *International Journal of Contemporary Medical Research* 4.11 (2017): 2329-2335.
10. Rathee M, *et al.* "Basal implants: an alternative treatment modality for geriatric patients- a case report". *Journal of the West Bengal University of Health Sciences* 1.1 (2020): 85-89.

11. Frost HM. "Wolff's Law and bone's structural adaptations to mechanical usage: An overview for clinicians". *Angle Orthodontist* 64.3 (1994): 175-188.
12. Tulasne JF. "Osseointegrated fixtures in the pterygoid region". In: Worthington P, Branemark PI, editors. *Advanced Osseo-Integration Surgery: Applications in the Maxillofacial Region*. Chicago, Ill: Quintessence Publishing (1992): 182-188.

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