Efficacy of Single Piece Basal Implant in Maxillo-Mandibular and Dentoalveolar Rehabilitation

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Abstract

Background: For over a thousand years, dentists have dreamed of restoring lost teeth with artificial replicas. Concept of basal implantology the jaw bone comprises of two parts the tooth bearing alveolus or crestal part and the basal bone. The basal bone is heavily corticated and is rarely subject to infections and resorption. The first single piece implant was developed and used by Dr. Jean-Marc Julliet in 1972.

Aim: The aim of this study was to evaluate the success of single piece basal implant (Basal Cortical Screw) in maxillo-mandibular & dentoalveolar rehabilitation.

Materials and methods: A total of 93 Basal implants (BCES) which comprised of 18 males and 10 females, with ages ranging between 16 and 78 years. Efficacy of implants were evaluated by pain, implant stability, mean probing depth, gingival inflammation, nerve injury and marginal bone loss at 0, 1, 3 & 6 months.

Results: This study out of 93 implants, 89 implants were free of mobility, peri implant radiolucency, sinus discharge for the first 4-6 months. 4 implants were failed after 1 month due to overload osteolysis and non-achievement of bilateral equal and symmetrical occlusion. All the 89 implants were perfectly engaged in cortical bone except for 1 implant that was not engaged in cortical bone and was replaced after 7 days. The overall survival rate of implants in the present study was 95.6%, which was in accordance with most of the long term clinical studies done on implants.

Conclusion: Basal implant is successful treatment modality in cases of immediate loading. Since the study was of a very short duration with a small sample size further longitudinal clinical studies with large sample size and also with histological evaluation are required to

actually assess the changes in crestal bone level around implants.

INTRODUCTION

According to the concept of basal implantology 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. It is this, i.e.; the basal bone that 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.

First single-piece implant was developed and used by Dr. Jean-Marc Julliet in 1972. In the mid-1980s French dentist, Dr. Gerard Scortecci, invented an improved basal implant system complete with matching cutting tools. Together with a group of dental surgeons, he developed Disk-implants. Since the mid-1990s, a group of dentists in Germany have developed new implant types and more appropriate tools, based on the Disk-implant systems. These efforts then gave rise to the development of the modern BOI (Basal Osseointegrated Implant or lateral basal implants. **Dr. Stefan Ihde** introduced bending areas in the vertical implant shaft. In 2005 the lateral basal implants were modified to screwable designs (BCS).[1]

For BCS implants Basal implantologists do not advocate raising a flap for these implants as it results in a decreased blood supply and also because of the design of these implants raising a flap is pointless, another factor to be considered is the immediate loading of these implants; a sutured site is not a favorable area to receive an immediate prosthesis.[2]

For the BOI implant the approach towards the bone is gained by raising a flap laterally and cutting into the bone with disk drills of required size in a lateral direction to form a "T" shaped osteotomy. The implant consequently is placed laterally and the flap is closed over it.[3]

What conventional implantologists call as "Osseointegration" is called as "Osseoadaptation" by basal implantologists, this stems from the fact that the bone with continuous functional loads remodels and adapts over the surface of the implant, the remodeling of bone under functional loads is considered to be the 4th Dimension.[4]

According to philosophy of basal implantology the process of Osseoadaptation is carried out by a "Bone Multicellular Unit" (BMU), it is said to be like a cutting cone with a tail, the cutting cone comprises of osteoclastic cells that eat away the peri-implant bone and the tail comprises of osteoblastic cells that lay down bone, as this unit moves in the bone the osteoclastic activity is subsequently followed by osteoblastic activity. The formation of this BMU takes place when the BOI and BCS implant are subject to immediate loading which leads to remodeling of bone under functional stresses leading to development of this unit, and thus initiates the healing phase and leads to formation of a dense peri-implant bone.

AIM

The aim of this study was to evaluate the success of single piece basal implant (Basal Cortical Screw) in maxillo-mandibular & dentoalveolar rehabilitation.

METHODOLOGY

The Present study was conducted on 28 Patients (18 Male and 10 Female) in the Department of Oral & Maxillofacial Surgery RUHS College of Dental Sciences, Jaipur to clinically evaluate the basal cortical implant. A total of 93 basal implants (BCES) were placed.

Inclusion Criteria

- Patient above age of 16 years and medically fit.
- Two stage implant or bone augmentation has failed.
- All kind of bone atrophy, Poor prognosis or missing teeth.

Exclusion Criteria

- Medically unfit patient for implant surgery
- Patient with large periapical pathology, Irradiated cancer patients
- Medicines- drugs like Biphoshphonates
- If immediate loading is contraindicated like deep bite, bruxism etc.

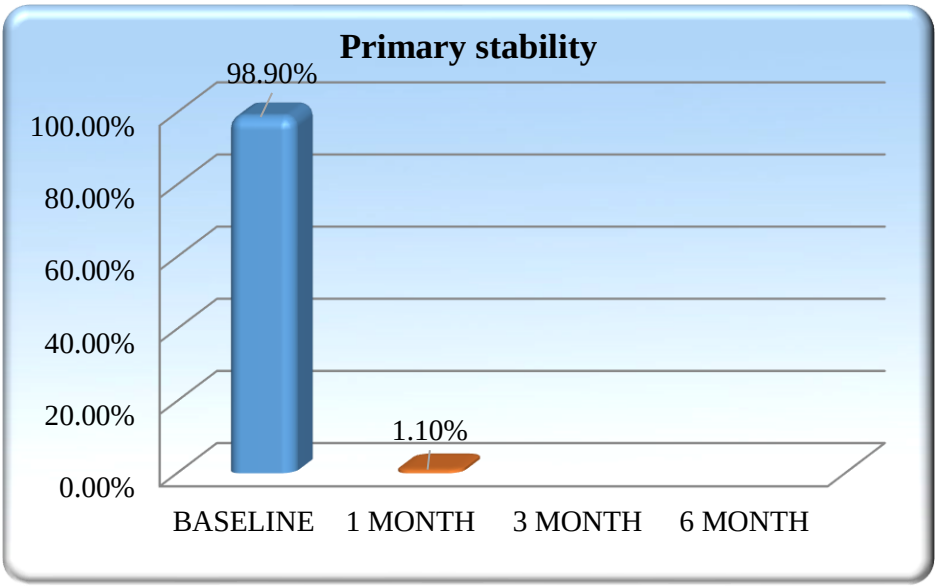
Criteria for Implant Success

Clinical and radiographic interpretation was done prior to and after placement of implants and follow up. The following parameters were evaluated on the recall visits to determine the success of the implant

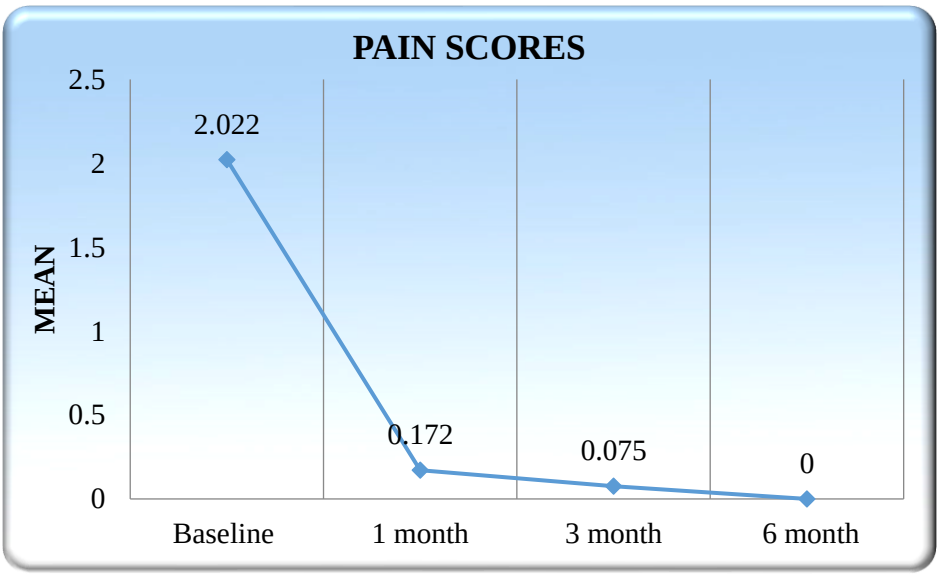
1) **Implant Stability- Present/Absent** The individual implant was tested clinically by reverse torque (Present/ absent).
2) **Inflammation Present/absent:** Gingival index by Loe and Silness (1963) was used.
3) **Pain (Visual analogue scale) and Swelling present or absent**
4) **Radiograph taken at 1, 3 & 6 month.** Marginal bone loss (in mm) of each implant was assessed by periapical radiographic examination. The marginal bone level of each implant was evaluated from the standardized periapical radiographs and was measured as the distance in 0.1 mm increments from the implant shoulder to the most coronal point where the marginal bone met the implant.
5) **Plaque -** Mombelli Plaque index was used
6) **Periodontal pocket**
7) **Nerve injury: Present/Absent**

RESULTS

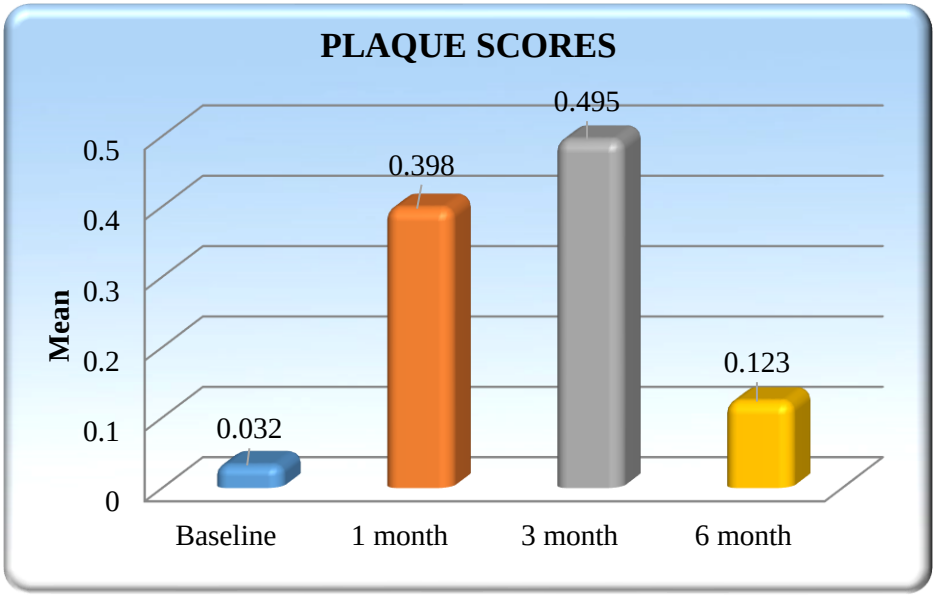
The data obtained was analysed by SPSS (21.0 version). Shapiro Wilk test was used to check which all variables were following normal distribution. None of the study subject were found to have nerve injury.



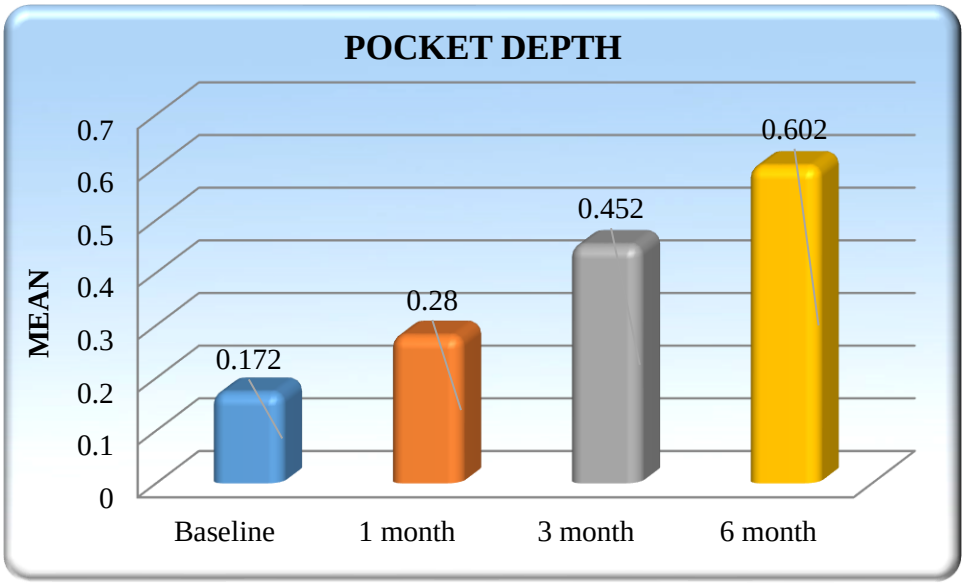
Graph 1: Distribution according to Primary Implant stability



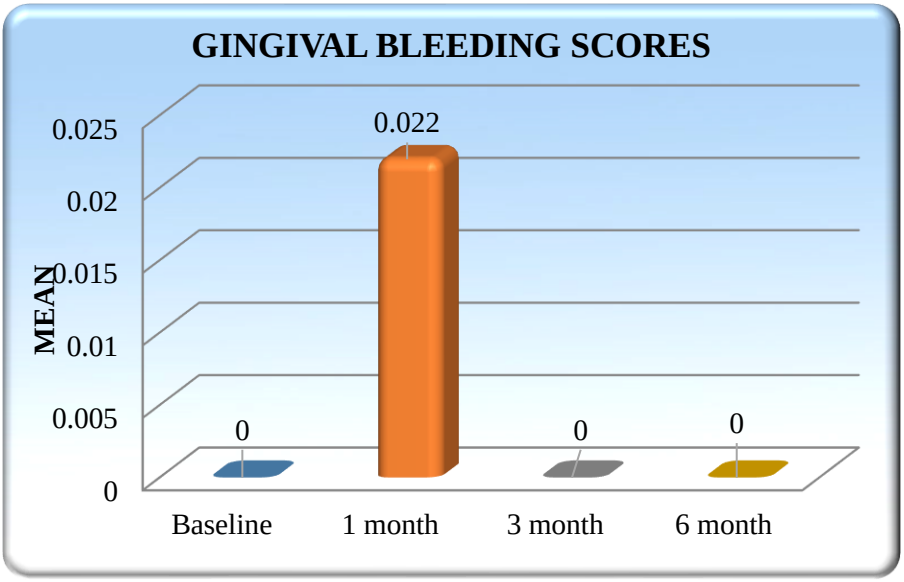
Graph 2: Distribution of Mean Pain scores



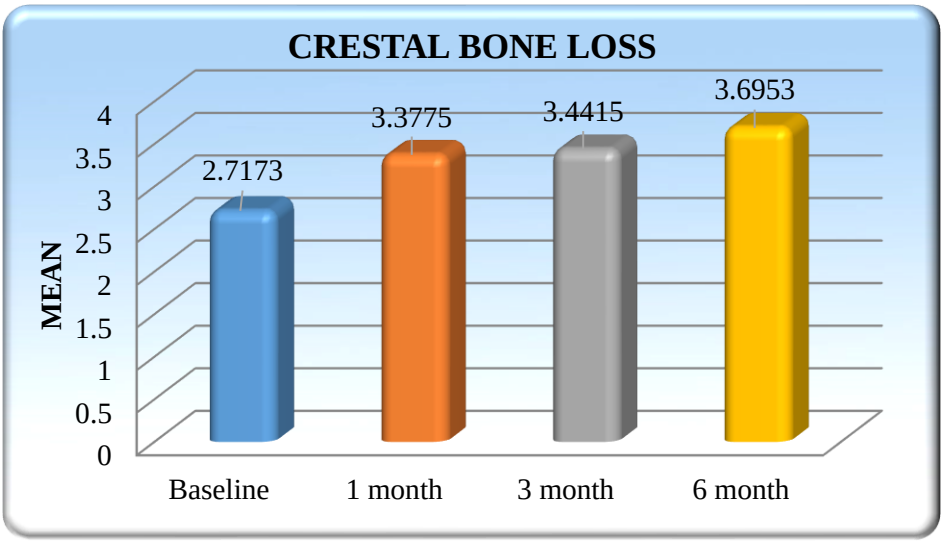
Graph 3: Distribution of Mean Plaque score



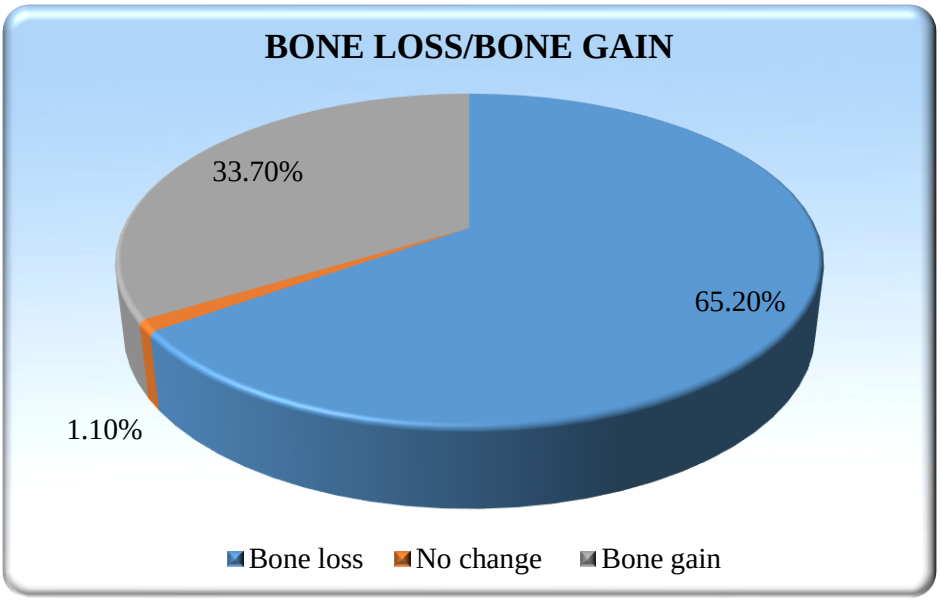
Graph 4: Mean pocket depth



Graph 5: Mean Gingival bleeding



Graph 6: Mean crestal bone loss



Graph 7: Frequency distribution according to bone gain or loss from baseline to 6 months

DISCUSSION

Present study examined in vivo the clinical and radiographic results of 93 basal cortical screw implants placed in various 2nd corticals of mandible ad maxilla in extraction as well as healed socket. Out of which 89 are successfully in function and 4 implants are failed. Bone loss present in 58 implants and bone gain present in 30 implants.

Subjective findings of pain and tenderness associated with an implant body are more difficult to assess than these conditions with natural teeth. In our study the pain score ranges 1 to 4 on visual analogue scale on the next post operative day to 1 week after placement of implant, this was highest than any other time in our follow ups. Pain can have several origins: the skill of the surgeon the procedure used, flap design, trauma to periosteum. Pain can be experienced by postoperative edema or hematoma, it is also related to patients anxiety and stress. Just like pain mild swelling also seen in 1st week only.

This finding is supported by **Carle Misch** according to them pain from implant body does not occur unless the implant is mobile and surrounded by inflamed tissue or has rigid fixation but impinges on nerve.

Probing depth around implants is an important diagnostic process for the assessment of peri-implant soft tissue health and increased probing depth could be correlated with a higher degree of inflammation of the peri-implant mucosa. Since the soft tissue seal inhibited probe tip penetration in healthy and only slightly inflamed periimplant soft tissues, but did not do so in periimplantitis, probing around oral implants must be considered as a sensitive and reliable clinical parameter for long-term clinical monitoring of periimplant mucosal tissues.

In this study gingival inflammation are also documented in every follow up appointment, mean gingival bleeding noted at 1st month is 0.022 for single piece basal implants which is gradually decrease with time and at the time of 6 months of follow up it is decreased upto 0.0 this result shows the improvement In gingival health over time.

The marginal bone around the implant crestal region is usually a significant indicator of implant health. The most common method to assess bone loss after healing is by radiographic evaluation. Of course conventional radiographs only monitor the mesial or distal aspect of bone loss around the implant. In general the long cone paralleling technique supported by positioning device is used.

Daiel-Tamas Szava (2017)[5] average Bone resorption was 1.59mm after 6 months of functional loading and 2.05mm after 12 months. Bone resorption was slightly higher in the mandible than in maxilla. Bone resorption was higher near single tooth implants (2.18) than in case of multiple splinted implants (1.99). **Aleksandar Lazarov (2019)[6] stated** that mean bone level around the single implant did not change after up to 57 months of functional loading.

Sumit Narang (2014)[7] The immediate-loading dental implants are more predictable than before, though the chances of crestal bone loss are comparatively higher. In order to achieve primary stability, osteotomy was done 3mm apical to extraction socket, which is the main factor determining the success of immediate implants. Single-piece implants work well in D1 and D2 bone. So, the BCS implants are well suited not only for immediate loading but also for immediate placement.

Pankaj Ghalaut (2019)[8] Immediate loading of basal implants can be done, when they are placed in the dense cortical bone, as they attain high primary stability there. Since the remodeling of the bone starts within 72 h and weakens the peri-implant bone structures, rigid splinting of the metal framework should be done as early as possible. The splinting distributes the masticatory forces from the bone around the implants to other cortical areas as well. This procedure and its principles are known in Traumatology.

The overall survival rate of implants in the present study was 95.6%. **Pankaj Ghalaut(2018)[8]** reported a 100% survival rate, **Ashish (2020)[9]** have reported a high success rate of 97.7% with corticobasal implant, **Dobrinin (2019)[10]** reported Immediate

functional loading using multiple, cortically anchored basal screw implants for fixed full arch demonstrated an implant survival rate (95.7%) after an average observation period of 18.93 months, **Aleksandar et al (2019)[6]** reported a cumulative survival rate for cortically anchored screw implants was 97.5% after 4 years.

CONCLUSION

We can say that though the survival rate in present study was good and the study shows some amount of gain in crestal bone level in 33.7% patients, yet since the study was of very short duration with small sample size and no histological evaluation was done to measure the crestal bone level changes and bone implant integration and success rate of the implants. Further longitudinal clinical studies with large sample size and also with histological evaluation are required to actually assess the change in crestal bone level around implant. The chance for survival of the individual implant depends on the location of 2nd cortical anchorage, and the prosthetic construction to which it was connected.

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