Assessment of basal implants in compromised ridges

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ABSTRACT

Aim: The aim of the present study was to evaluate clinically, radiographically, and functionally the outcomes of immediately loaded basal implants when placed in patients with compromised bone/alveolar ridges. **Materials and Methods:** A total of 18 systemically healthy (9 male and 9 female) subjects with compromised bone with poor quantity or quality were included in the study. A total number of 57 implants was placed, out of which 26 implants were placed in maxilla and 31 implants in mandible. There were 6 patients in which single implants were placed and in rest of the 12 patients, multiple implants were placed, out of which full mouth rehabilitation was done in one patient. In 10 patients, implants were placed immediately in fresh extraction socket and in 7 patients, implants were placed in healed edentulous site. In all the patients, loading was done immediately within 72 h of implant placement. All patients were evaluated for primary and secondary stability, pain, periimplant bone levels using IOPA with grid and CBCT, bleeding, suppuration, sulcular bleeding index, prosthetic complications, and patient satisfaction at specified time intervals. **Result:** All the values obtained during the study were expressed in the form of mean, standard deviation, and standard error of the mean. The parameters were compared between groups using Paired t-test for intragroup comparison at a similar time, i.e., baseline, 1 month, and 3 months. The data collected was comprehensively analyzed using SPSS software. All implants were successful, with no incidence of infection, nil mobility at the end of the study period of 6 months. **Conclusion:** Thus, it can be concluded from the present study, that Basal implants can play a vital role in the rehabilitation of patients, where compromised quality and/or quantity of bone is present and additional augmentation procedures would be required for the placement of conventional root form implants.

Keywords: Alveolar ridge, basal implant, CBCT, sulcular bleeding index, suppuration

Introduction

Rehabilitation of moderate to severely atrophic jaws with conventional implants demands for extensive surgical procedures that are expensive, involves a great deal of postoperative discomfort, and do not assure the success of the procedure done and the rehabilitation intended. In such scenarios that require such procedures, basal implants come to the rescue. Basal implantology also known as bicortical implantology or just cortical implantology 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.[1]

The Basal or the strategic implants are anchored cortically by the surgeon and the process of creating this anchorage has been referred as "osseo-fixation."[2] Secondary osseo-integration into spongious bone areas through which end osseous parts of the implants are projecting is expected to happen in any case later. The primary stability, that decides the success of the treatment, depends on the macro-mechanic anchorage (osseo-fixation) in the 2nd or 3rd cortical.[3]

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Elderly individuals mainly the geriatric patients who have compromised ridges are unable to meet their nutritional requirements because of lack of stability and support from dentures and basic implants due to compromised dental ridges. This study focuses on the application of basal implants for such patients to meet their esthetic and functional needs, thereby taking care of elderly individuals.

History

Dr. Jean-Marc Julliet in 1972 developed and used the first single-piece implant. It was quite demanding as no homologous cutting tools were produced for this implant. French dentist, Dr. Gerard Scortecci, in the mid-1980s invented an improved basal implant system complete with matching cutting tools and later he developed disk-implants.[4] Dr. Stefan Ihde introduced bending areas in the vertical implant shaft. In 2005, the lateral basal implants were modified to screw able designs (BCS).[5]

Types

The two types of basal implants, i.e., Basal Osseo Integrated (BOI) and Basal Cortical Screw (BCS), are specifically designed to utilize strong cortical bone of the jaw.[6] Lateral basal implants are placed from the lateral aspect of the jaw bone. Screw Basal Implants are also known as bicortical screw or basal compressive screw implants. Up to 12 mm thread diameter of Screw able basal implants (BCS) can be inserted into the immediate extraction socket.[5]

Aim and Objectives

Basal implants can be used as an alternate in cases which do not require any bone augmentation or grafting and can be immediately loaded; in addition, this will avoid second surgery, long span of edentulous phase, and overall reduces the expenses.[7] Thus, the purpose of the present study was to evaluate clinically, radiographically, and functionally, the outcomes of immediately loaded basal implants when used in compromised bone conditions.

Materials and Methods

This prospective clinical study was conducted to evaluate stability, soft tissue health, crestal bone changes, and functional outcomes of immediately loaded basal implants both clinically and radiographically in compromised ridges at the Department of Oral and Maxillofacial Surgery.

Study design

A total of 18 subjects with missing teeth fulfilling the inclusion criteria were selected from the outpatient department of Subharti Dental College and Hospital, Meerut, Uttar Pradesh. The following inclusion and exclusion criteria were used for the selection of patients.

Inclusion criteria

1. Age 18–75 years
2. Patients reluctant for removable or fixed partial denture treatment
3. Patients with fair oral hygiene
4. Patients who do not have any systemic disease/limiting condition in which surgery is contraindicated
5. Patients having compromised bone, falling in one or more of the criteria mentioned below:
   a) Bone Height ≤8 mm
   b) Bone Width ≤4 mm
   c) Angulation ≥30°
   d) Crown/Implant (C/I) Ratio ≥1.

Exclusion criteria

1. Patients above 75 years of age
2. Incompliant patients with poor oral hygiene, psychoses, parafunctional habits, TMJ disorder, substance abuse
3. Insufficient vertical inter arch space to accommodate the prosthodontic components available
4. Patients with any systemic disease/limiting condition that contraindicates surgery
5. Patients having ridges in which conventional implants can be placed.

Ethical clearance

The study protocol was approved by Ethical Committee of the institute.

Clinical, radiographic, and functional parameters

All patients were evaluated for primary and secondary stability, pain, periimplant bone levels using IOPA with grid and CBCT, bleeding, suppuration, sulcular bleeding index, prosthetic complications, and patient satisfaction at specified time intervals.

Surgical technique

After assessing the preoperative records, the operative site was anesthetized using 2% lignocaine with adrenaline (1:200000). Teeth if any to be extracted were first extracted and then the socket was properly cleaned. Bony spicules if present were reduced. Now with a 2-mm twist drill, the first cortex (alveolar) was drilled and then drilling was continued till the basal cortex (nasal floor/sinus floor/lingual cortex/pterygoid bone), which was perceived as a dip. The 2nd or 3rd cortex to be involved was decided on the basis of site involvement in the jaw. For placing implants at the site of maxillary central incisors, lateral incisors, and canines, nasal floor was engaged. In the region of maxillary premolars, nasomaxillary buttress was engaged and in the maxillary molars region, pterygoid plate of the sphenoid bone was engaged. Pterygoid implants should have an angulation of 74° in anteroposterior axis and 81° in buccopalatal axis in relation to the Frankfurt plane in order to engage greater quantity of bone. In the cases of full maxillary arch, double pterygoids were placed bilaterally that were parallel to each

other. In the mandibular anterior region, implants were placed in the intraforaminal region vertically and lingual/buccal cortex was engaged in the sites of mandibular molars. While engaging the lingual cortex, finger was kept below the mylohyoid ridge to have the perception of point at which implant is going to engage the cortex. Length was measured at the point where the dip was felt at the time of basal bone engagement and according to this measured length, the length of the basal implant was decided. Then, the implant was inserted and threaded till it engages the basal bone (second cortex).

The primary stability was evaluated by checking mobility after placing the implant. Using two rigid instruments, force of approximately 500 g was applied in labiolingual and buccopalatal direction. After the placement of implant, the implant neck was bent if required to give proper alignment for optimal prosthetic rehabilitation. Then, impression caps were placed and impression was made. Cast was poured and sent for prosthetic lab work. On the second day, metal try in was done and patient's occlusal records/jaw relations were recorded. On 3rd day, the completed prosthesis was fixed using GIC luting cement and occlusal adjustments if required were adjusted.

Statistical analysis

All the values obtained during the study were expressed in the form of mean, standard deviation and standard error of mean. The parameters were compared between groups using Paired *t*-test for intragroup comparison at a similar time, i.e., baseline, 1 month, and 3 months. The data collected was comprehensively analyzed using SPSS software.

Results

A total number of 57 implants was placed, out of which 26 implants were placed in maxilla and 31 implants in mandible. All implants were successful, with no incidence of infection, nil mobility at the end of the study period of 6 months [Table 1].

All patients were satisfied, in terms of chewing ability, speech/phonation, and esthetics. No prosthetic complications were observed, except for cervical exposure of implants in 5 patients but patients did not have any esthetic concerns; hence, no additional procedures were required for its correction.

Discussion

In this study, Basal Screw implants (BCS) or Bi-cortical Screw implants were placed in all the 18 cases. All the implants were of Simpladent's immediate loading dental implant system. Beces and Beces-ex implants were selected for this study. Two different approaches for immediate loading of dental implants are currently known. Both have in common the implicational concept that splinting/stabilization of several implants is accomplished through the prosthetic superstructure. The first approach relies on the compression screw principle. Screw implants of this type can result in lateral condensation of spongy areas. Implant stability is greatly increased by a mechanism that could be regarded as "corticalization" of the spongy bone. The second approach is to establish cortical anchorage of thin screw implants [bicortical screw (Beces) or basal implants]. Excellent primary stability can be obtained along the vertical surfaces of these implants with no need for corticalization.[8]

Table 1: Clinical parameters recorded at specified time intervals						
CLINICAL PARAMETERS	BASELINE	3 days	7 days	1 Mo	3 Mo	6 Mo
1. Mobility	1 day 0±0			0.11±0.47	0.11±0.32	0±0
(P)	0-1 <0.05*(S) 0-3 <0.05*(S) 0-6 >0.05(NS)			1-3 >0.5 (NS) 1-6 <0.05*(S)	3-6 <0.05*(S)	
2. Periimplant bone level with IOPAR	M 1.52±0.78			1.50±0.77	1.59±0.87	
(P for both M & D)	D 1.49±0.71 >0.05 NS			1.46±0.70 >0.05 NS	1.42±0.82 >0.05NS	
3. Periimplant bone level with CBCT	M 1.71±0.55 D 1.55±0.55 B 1.90±0.51 L 1.967±0.53					M 1.78±0.73 D 1.56±0.64 B 1.20±0.49 L 2.01±0.64
(P)	>0.05 NS					>0.05 NS
4. Pain score	6.56±1.1	4.11±1.0	1.95±1.06	0±0	0±0	0±0
(P)	<0.05*(S)	<0.5*(S)	<0.5*(S)	>0.05 NS	>0.05 NS	>0.05 NS
5. Sulcular Bleeding	1.92±0.29				1.49±0.28	1.107±0.25
(P)	<0.05*(S)				<0.05*(S)	<0.05*(S)
6. Suppuration		0	0	0	0	0
7. Bleeding	0	0	0	0	0	0
8. Cervical exposure of implant	0	0	5	5	5	5
9. Overall Satisfaction	Good=18	Good=17 Fair=1	Good=16 Fair=2	Good=18		

P<0.05* Significant, >0.05 Nonsignificant, M-Mesial, D-Distal, B-Buccal, L-Lingual

In a randomized clinical study done by Grandi *et al.*, it was concluded that, if adequate primary stability is achieved, immediate loading of dental implants can provide similar success rates with early or delayed loading.[9]

In the present study, primary stability was evaluated by checking mobility (criteria by Misch) of implant at the time of implant placement. Secondary stability was evaluated by checking mobility at the specified time intervals, except in 3 cases. It was observed that in all the cases, there was no mobility at all the specified time intervals. In one female patient, aged 43 years, who had undergone resection of anterior mandible for central giant cell granuloma and reconstruction with illeaccrest bone, 7 implants were placed out of which, one implant (Beces) was grade III mobile at 3rd day. Hence, it was retrieved and excluded from the present study.

It was observed that pain was maximum on day 1(mean = 6.56 ± 1.01) and decreased significantly on day 7th with a mean value of 1.94 ± 1.06 and finally no pain was present at 1 month, 3 months, and 6 months follow-up. In the present study, the mean periimplant bone loss measured at 6 months postoperative was 0.07 mm on mesial side, 0.06 mm on distal side, 0.07 mm on buccal side, and 0.05 mm over the lingual/palatal side.

In another 24-year-old male patient with a positive history of smoking, single implant (Beces-ex) was placed in fresh extraction socket in maxillary premolar tooth region that got grade 2 mobile at one month follow-up. Bergstrom investigated the long-term (10 years) influence of chronic smoking on the periodontal bone height and demonstrated a bone height reduction of 2.7 times greater in smokers than in nonsmokers, suggesting that smoking induces and accelerates the periodontal bone height reduction.[10] At the end of the study period, none of the 57 basal implants placed had any mobility, which is similar to the study of Ihde and Palka, in which BCS implants were placed in severely resorbed maxilla and had no mobility after 2-year follow-up.[11] Chewing ability and speech or phonation was graded "good" at all the specified time intervals in all patients. Contrary to the findings of Taher and Jabab,[12,13] who discussed about galvanic corrosion of implant, in our study, patients, whether of single implant or multiple implants with long span prosthesis, did not report metallic taste at any of the time intervals.

Conclusion

Thus, it can be concluded from the present study that Basal implants can play a vital role in the rehabilitation of patients, where compromised quality and/or quantity of bone is present and additional augmentation procedures would be required for the placement of conventional root form implants.

Future perspective

Further long-term multicenter studies with a larger sample size can conclusively highlight the role of basal implants in compromised ridge conditions.

Conflicts of interest

There are no conflicts of interest.

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