

Versatility of Placing Tilted Implant in Atrophied Maxilla and Mandible

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Abstract

Background: This study was undertaken to evaluate the efficacy of tilted implants for restoring atrophied maxilla and mandible and its future prognosis. **Materials and Methods:** In this study, total 24 implants placement in atrophied edentulous maxilla and mandible was done. Each patient received a full arch bridge assessed up to 6th month. The implant stability was tested by reverse torque testing. Two anterior and two posterior implants were placed. Patient received both anterior implants in an axial position as per lateral incisors. The tilting or axial placement of the distal implants depended on the relation to the anatomic morphology of the supramental bone quantity. Radiological examination was done by cone beam computed tomography. **Results:** The data were analyzed and show that no significant difference was seen in mean intraoperative insertion torque when axial or tilted implants were placed in mandible. No significant difference was seen in mean intraoperative insertion torque when axial or tilted implants were placed in maxilla. No significant difference was seen in mean reverse torque at 6 months when axial or tilted implants were placed in maxilla. No significant difference was seen in the mean marginal bone loss at 6 months on mesial, buccal, distal, and lingual side when either axial or tilted implants were placed in maxilla. **Conclusion:** Authors concluded very significant outcomes. Within the limitation of the study, it was concluded that both axial and tilted implants placed in the atrophied edentulous/partially edentulous maxillary and mandibular arches exhibit similar levels of implant stability. The marginal bone loss seen with axial and tilted implants was found to be comparable, however, following a 6-month follow-up, the mean marginal bone loss on the distal side was shown to be considerably higher with tilted implants.

Keywords: Abutment, Bone loss, Cone beam computed tomography, Implant, Mental foramen, Peri-implantitis.

INTRODUCTION

Dental implants also constitute a complex and multifactorial treatment in the reconstruction of the edentulous maxilla and mandible. It requires the proficiency and collaboration of the surgeon and the prosthodontist. Atrophied ridges are defined as the diminishing quantity and quality of the residual ridge/reduction of the residual ridge of alveolar bone. An atrophic maxillary or mandibular ridge, although fairly common in occurrence, its rehabilitation poses a challenging clinical situation.^[1-3] Prosthetic rehabilitation of completely/partially edentulous patients with implants is a well-established and reliable mode of treatment. Availability of good quality and quantity of bone for implant placement is very important aspect. Patients with severe resorption of alveolar bone require prior surgical intervention in the form of bone augmentation and sinus lift procedures for its successful outcome.^[4-7] Conventionally, it is well established that the masticatory forces must be directed along the long axis of the tooth or

implant which increases the longevity and reduces the amount of bone resorption. Due to lesser amount of bone available in severely resorbed alveolar ridges, researchers have been trying to find a suitable alternative to bone augmentation and sinus lift procedures so that additional surgical procedures could be avoided.^[2] The technique of tilting implants in the residual crestal bone of patients with maxillary atrophy has been shown to provide several clinical advantages.^[4] The combined use of axially placed and tilted implants represents another possible alternative for the treatment of the edentulous mandible, which has been documented in the recent years. Implant inclination

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Received: Apr. 15, 2023; **Accepted:** May, 04, 2023; **Published:** May. 30, 2023

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How to cite this article: Shamurailatpam I, Khare G, Verma VK, Sahoo S, Baruah P, Singh R. Versatility of Placing Tilted Implant in Atrophied Maxilla and Mandible. J Res Adv Dent 2023;14(4):1-4.

Access this article online

Website:
www.jrad.co.in

DOI:
<https://doi.org/10.53064/jrad.2022.14.4.369>

may be carefully planned by the surgeon to avoid damage to important anatomical structures. At the same time, with proper implant length and insertion axis, primary stability of the implants may be achieved.^[5,8,9] The present study aims to evaluate the efficacy of tilted implants for restoring atrophied maxilla and mandible and its future prognosis.

The aim and objectives of this study are to evaluate the use of tilted implants for restoring horizontal and vertical atrophic maxilla and mandible, to evaluate the success rate in tilted implants with immediate loading, and to evaluate the marginal bone loss in tilted implants with immediate loading after 6 months.

MATERIALS AND METHODS

A randomized prospective study was conducted in the Department of Oral and Maxillofacial Surgery of Shree Bankey Bihari Dental College and Research Center, Ghaziabad, Uttar Pradesh, India. Ethical clearance number was SBBDC/2020/152118-A (dated 22 December 2020). 24 implants placement in atrophied partially/fully edentulous maxilla and mandible were included in the study. Each patient received a full arch bridge supported by tilted implants. Patients were scheduled for follow-up at 6th month. Preliminary screening was performed using cone beam computed tomography (CBCT). Marginal bone loss was assessed by estimating the change in the marginal bone level on radiographic readings. It was measured from the distance between the implant platform and the most coronal level of the bone in contact with the implant surface. The implant stability was tested by reverse torque testing is the application of a reverse or unscrewing torque to the implant at the time of abutment connection. The torque measurements were ≥ 60 Ncm. Various complications were also noticed like peri-implantitis, implant loss, oral hygiene problems, detachment of prosthesis, fracture of prosthesis, fracture of the resin components. All the 3 factors were checked during implant placement (intraoperatively), immediately post-operatively, and 6th-month post-operatively. All surgical procedures were performed under local anesthesia with full-thickness flap. Two anterior and two posterior implants were placed. Patient received both anterior implants in an axial position corresponding to the position of the lateral incisors. The posterior implants were placed as close as possible to the mental foramen approximate position of 1st or 2nd premolar and bilaterally either in a tilted or in an axial direction. Tilting or axial placement of the distal implants depended on the relation to the anatomic morphology of the supramental bone quantity and the location of the mental foramen. Immediate loading was done and 6th-month post-operative follow-up was also done with reverse torque assessment and delivery of final definite prosthesis [Figures 1 and 2]. Radiological examination was done by CBCT.

RESULTS

The data were analyzed by the Statistical Package for the Social Sciences (21.0 version). Data were not normally



Figure 1: Multiunit abutment placement in maxilla and mandible



Figure 2: Denture insertion

distributed (P -value was more than 0.05). Table 1 shows that no significant difference was seen in mean intraoperative insertion torque when axial or tilted implants were placed in mandible. No significant difference was seen in mean reverse torque at 6 months when axial or tilted implants were placed in mandible. No significant difference was seen in mean intraoperative insertion torque when axial or tilted implants were placed in maxilla. No significant difference was seen in mean reverse torque at 6 months when axial or tilted implants were placed in maxilla. Table 2 shows that the no significant difference was seen in the mean marginal bone loss at 6 months on mesial, buccal, and lingual side when either axial or tilted implants were placed in mandible. However, on distal side, mean marginal bone loss was seen to be significantly more with tilted implants. No significant difference was seen in the mean marginal bone loss at 6 months on mesial, buccal, distal, and lingual side when either axial or tilted implants were placed in maxilla. None of the study subject was found to have the infection in mandible immediately post-axial or tilted implant placement. None of the study subject was found to have the infection in mandible 6-month post-axial or tilted implant placement. At 6 months, one subject was found to have infection when tilted implants were placed in maxilla. None of the study subject was found to have nerve injury and implant

Table 1: Comparison of intraoperative of insertion torque in mandible

Torque Mode	N	Mean	Standard deviation	Standard error
Intraoperative insertion torque				
Axial	6	56.67	5.164	2.108
Tilted	6	56.67	5.164	2.108
P value				1.000

Table 2: Comparison of marginal bone loss at 6 months in mandible

	N	Mean	Standard deviation	Standard error	P value
Mesial					
Axial	6	0.350	0.8573	0.3500	0.215
Tilted	6	1.050	0.9711	0.3964	
Distal					
Axial	6	0.367	0.8042	0.3283	0.039*
Tilted	6	1.300	0.5329	0.2176	
Buccal					
Axial	6	0.783	1.1179	0.4564	0.253
Tilted	6	0.217	0.2483	0.1014	
Lingual					
Axial	6	0.867	0.8595	0.3509	0.573
Tilted	6	0.617	0.6047	0.2469	

failure in mandible, maxilla immediately post-operatively axial, or tilted implant placement.

DISCUSSION

Today, oral implantation is a well-established treatment method. The increased request for implant therapy results from a combination of various factors, including age-related tooth loss, anatomic condition of edentulous ridges, psychological needs, decreased performance of removable prostheses, predictable long-term results of implant-supported prostheses, and increased awareness of both clinicians and patients about the benefits of implants.^[5,10-12] The rehabilitation of severely atrophic maxilla and mandible using implant-supported prosthesis is often challenging because of the poor quality and quantity of residual jawbone, especially in atrophied ridges.^[13-15] Conventionally, it is well established that the masticatory forces must be directed along the long axis of the tooth or implant which increases the longevity and reduces the amount of bone resorption. Due to lesser amount of bone available in severely resorbed alveolar ridges, researchers have been trying to find a suitable alternative to bone augmentation and sinus lift procedures so that additional surgical procedures could be avoided.^[16-18] Success of an implant depends on various factors, beginning with the diagnosis and case selection up to prosthetic rehabilitation and maintenance. After being placed in the selected site, implant must achieve primary stability in the surrounding bone which is important in the bone healing,

by resisting micromovement and the resultant damage to the bone healing process.^[19-21] The introduction of a tilted implant protocol in full-arch fixed rehabilitation utilizing immediate loading puts into question the need for universal axial implant placement. Since that time, these two implant positioning regimens have been compared throughout the literature. However, it is clear that in many instances, tilting of posterior implants in full-arch rehabilitations provides significant benefits. It has now been thoroughly established that the use of tilted implants in an immediate loading protocol does not induce more bone loss compared to the use of an axially placed implant. Many studies have indicated that the inclination of implants in a splinted structure aids in decreasing the stress in the arch.^[22-26] Successful outcome of implant placement can be attributed to primary stability. It is determined by the density of the bone at site, the surgical technique used to place the implant, and the implant design. It can be measured by non-invasive clinical methods such as periotest, resonance frequency analysis, and insertion torque. Insertion torque can provide assessment of bone quality as a function of density and hardness, either subjectively in experienced hands or quantitatively by electronic drill devices which measure the torque required to insert implant in the bone. In our study, insertion torque ranging from 50 to 65 Ncm (mean 56.67 Ncm) was placed which showed primary stability in all the 24 implants placed in atrophied maxillary and mandibular arches. Reverse torque test of 30 Ncm allowed the clinical identification of the stability of 40 dental implants on the lower jaw, during the Stage 2 surgery. On the contrary in our study, the secondary stability was assessed 6 months post-operatively by reverse torque ≤ 65 Ncm on the upper and lower jaw 6th month post-operatively in which 23 out of 24 implants showed secondary stability. In our study, marginal bone loss was calculated post-operatively 6th month on mesial, distal, buccal, and lingual aspect which were assessed through CBCT and no significant difference was seen in the mean marginal bone loss at 6 months on mesial, buccal, and lingual side when either axial or tilted implant were placed on mandible. No significant difference was seen in the mean marginal bone loss at 6 months on mesial, buccal, distal, and lingual side when either axial or tilted implants were placed in mandible. However, on distal side, mean marginal bone loss was seen to be significantly more with tilted implants in mandible. Likewise in our study, complications such as infection, sinus perforation/nerve injury, and implant failure were assessed immediately post-operatively and post-operatively 6 months when axial and tilted implants were placed in maxilla and mandible. Out of 24 implants, one subject was found to have infection. Implant failure was there 6 months post-operatively in the maxilla.

CONCLUSION

Atrophied maxilla and mandible can be treated successfully with tilted implants, according to this study's findings. Both axial and tilted implants placed in the atrophied edentulous/partially edentulous maxillary and mandibular arches exhibit similar levels of implant stability. In this study, the marginal

bone loss seen with axial and tilted implants was found to be comparable, however, following a 6-month follow-up, the mean marginal bone loss on the distal side was shown to be considerably higher with tilted implants which lay emphasis on the fact that surgical protocol should be followed immaculately to minimize the loss. Within the constraints of this short-term study, extremely technique sensitive encouraging results in favor of the use of tilted implants in atrophied maxilla and mandible, bolstering the viability of this treatment option. It thus can be deduced that tilted implants exhibit the same evaluative behavior as axial implants.

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