Clinical and Radiographic Evaluation of Median Lingualized Occlusion in Implant Retained Mandibular Complete Overdenture

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Introduction

Some of completely edentulous patients have difficulty to wear complete mandibular denture owing to poor support and retention precipitated by advanced bone resorption, xerostomia, loss of attached keratinized tissue and neuromuscular degeneration. Several methods of treatment for this category of patients have been done for both patients' satisfaction and performance. Some of these methods are the implant-supported mandibular overdenture retained by bar-clip attachments, ball attachments as well as mandibular overdenture retained by magnets.¹

Dental implants are ankylosed to surrounding bone. Moreover, the crestal bone around dental implants may act as a fulcrum point for lever action when a force (bending moment) is applied. Clinical success of dental implants can be achieved by bio-mechanically controlled occlusion.²,³

Literature have claimed to control occlusal overload that may lead to bone loss and subsequently failure of implants.⁴

Control of implant occlusion is so important to ensure minimal and even stress distribution to the osseointegrated abutment fixtures, which cannot move to compensate for possible occlusal and other technical discrepancies so optimal implant load and success can be achieved.⁵

Different types of occlusal forms and posterior teeth arrangements have been used in implant-supported prostheses. There are many controversial opinions concerning the occlusal design and pattern.⁶

In the median lingualized implant retained overdenture, it was emphasized that during the entire lateral movement posterior teeth on both the working side and the balancing side are in contact. This concept was advocated to be used for patients with maxillary complete denture and mandibular implant overdenture; because of its ability to direct the forces of mastication vertically onto the supporting structures, it is a simple concept and can be easily arranged and verified.⁷,⁸

The purpose of this study was to evaluate clinically and radiographically completely edentulous patient rehabilitated by implant-retained mandibular complete overdenture with median lingualized occlusion.
Materials and Methods
Ten completely edentulous male patients free from any local or systemic disease that may contraindicate or affect the prognosis of implants were participated in this study. Each patient received two self-tapping root-form titanium dental implants (13 mm length and 3.4 mm diameter) in the mandibular interforaminal region that were left submerged and unloaded for 4 months.

After osseointegration period of 4 months, the implants were exposed and connected to the healing abutments. The patients were then received conventional maxillary complete denture and mandibular overdenture with ball and socket attachments. The dentures posterior teeth were set according to the median lingualized occlusal scheme (Figures 1 and 2).

Clinical and radiographic evaluations were recorded immediately after overdenture insertion and after 6 and 12 months interval follow-up periods.

The clinical evaluation included probing depth, gingival bleeding index, plaque index, percussion index, and mobility index.

Digital panoramic radiographs were taken for each patient by using the same machine for the assessment of crestal bone level (BL).

Data analysis was performed with one-way analysis of variance ANOVA and t-test as a function of the follow-up period. Statistical analysis was performed using the software Graph pad Prism-4 statistics for Windows.

Results
During the follow-up period, all patients were satisfied regarding denture stability, retention, and esthetics. Percussion on implants revealed Score 0 = high percussion sound throughout the whole follow-up periods. No movement was found in the implants throughout the whole follow-up period. Results of probing pocket depth, gingival index (GI), plaque index (PI), and bone height (BH) changes were summarized in Graph 1.

Probing pocket depth
The mean and slandered deviation values of probing depth at time of insertion (BL), 6 and 12 months follow-up periods were 1.042 ± 0.32, 1.379 ± 0.394, and 1.688 ± 0.73, respectively. The result of the paired sample t-test of the probing depth mean values revealed significant differences from 6 months to BL, 12 months to BL, and from 12 to 6 months.

Gingival index
The mean and slandered deviation values of GI at BL, 6 and 12 months follow-up periods were 0.0, 0.615 ± 0.17 and 0.816 ± 0.32, respectively. The result of the paired sample t-test of the GI mean values revealed significant differences

Graph 1: The clinical and radiographic parameters at the different follow-up periods.

from 6 months to BL and 12 months to BL while there was no significant difference from 6 to 12 months.

Plaque index
The mean and slandered deviation values of PI at BL, 6 and 12 months follow-up periods were 0.0, 0.817 ± 0.3 and 1.261 ± 0.37, respectively. The result of the paired sample t-test of the PI mean values revealed significant differences from 12 months to BL and 12 to 6 months while there was no significant difference from 6 months to BL.
BH
The mean and slandered deviation values of BH at the time of insertion, 6 and 12 months follow-up periods were 13.85 ± 0.08, 13.35 ± 0.14, and 13 ± 0.14 respectively. The result of the paired sample t-test of the BH mean values for ML revealed significant differences from baseline to 6 months, 6 months to 12 months, and from baseline to 12 months.

Discussion
The implant overdenture occlusion is a critical component of success dental implants. In this study two fixtures were implanted in the anterior part of the mandible between the two mental foramina, this region usually presents the optimal bone quality and quantity for implant support. It is entirely formed of dense, thick cortical plates, and dense trabecular bone. Overdentures were attached to the two implants by means of ball and socket attachment. This type of attachment allows a rotation and translation of the overdenture.9,10

As suggested in literature, an occlusal contact on a buccal cusp may be an offset load when the implant is under the central fossa, and the buccal cusp is cantilevered from the implant body. The angled buccal cusp also will introduce an angled load to the implant body. Hence, it was considered in a median lingualized occlusal scheme that the ideal primary occlusal contacts to be resided within the diameter of the implant, within the central fossa. Secondary occlusal contacts to be remained within 1 mm of the periphery of the implant to decrease moment loads.11

The results of this study revealed that there were statistically significant differences in the mean probing depth within all periods of this study. The results revealed that the probing depths were <1 mm during the entire period of this study. These results were in agreement with Roynesdal et al, concluded that a probe penetration of approximately 3 mm is an indicator of successful implants. The author added that if there are pockets deeper than 3 mm, an inflammatory process may take place at the bottom of the defect.12

The gingival and index scores showed statically significant differences during 1 year evaluation period. A mild gingival inflammation was observed. These results agree with Behneke et al. who explained that the increasing incidence of remarkable plaque deposits and gingival inflammation could be attributed to the difficulty of the patients in maintaining a high level of oral hygiene.13

All implants introduced in this study did not show any signs of mobility. Mobility index records showed zero score during all following up periods of this study. This finding may reveal that all implants exhibited better initial stability that promoted successful osseointegration. Consequently, the recorded score may reflect better anchorage of implants to the surrounding bone. Percussion solid ringing sounds that were observed indicating direct contact between the bone and implants, i.e., successful osseointegration.14,15

Under ideal conditions, the implant should lose minimum bone; however, it is not possible to quantify how much bone loss indicates health or absolute failure. In general, if more than one-half of the implant height has lost crestal bony contact, the implant is at significant risk and considered a failure, regardless of the original amount of implant-bone contact.15

The amount of bone loss in the first 6 months was more than that of the second 6 months of the observation period; this is in agreement with Misch.11 Who reported that more crestal bone occurred during the first 6 months healing period. However, the cause of this bone loss may be related to the post-surgical bone modeling and remodeling that controlled by the mechanical environment of strain. Remodeling allows the implant interface to adapt to its biomechanical situation.

The use of proper prosthesis design could account for the lack of mobility change as it has been shown that proper design is effective in transmitting the horizontal loads, by their reducing the stress placed on individual implants.11,17,18 Hence, according to the results of these study the chosen occlusal scheme considered successful.

Conclusions
With the limitation of this study, and according to the results of the mean marginal bone loss and the other peri-implant parameters after 1 year of loading. The implant retained overdenture with median lingualized occlusal schemes may be recognized as being acceptable according to the general implant success rates and criteria.

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