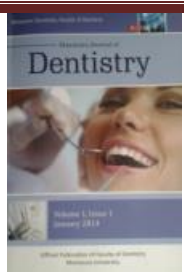

Fixed Dentures versus Milled Bar Overdentures Supported by Implants placed according to All On Four concept . Clinical Evaluation of Peri-Implant Tissue

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Abstract:

Objectives*:* the aim of study is to compare soft tissue conditions, , mucositis, and peri-implantitis for implants supporting bar-retained overdentures and fixed denture placed on implant according to the All On Four concept

Materials and methods*:* Six edentulous patients with or without complete denture were selected, each patient received four implants in the mandiable; 2 implants in canine area and 2 implants in second premolar area. Three patients received implant supported screw-retrained fixed prosthesis and the other three patients received a milled-bar overdenture, clinical evaluation of the mandiabuler dentures in terms of plaque index, gingival index, pocket depth ,width of keratnized mucosa and implant stability quotient..

Results: There was a significant difference in PI between groups at T6(p=.048) only. No difference in plaque score between groups was noted at T0 and T3. MB recorded the higher plaque score than FP at T6. Plaque scores significantly increased with advance of time for FP (p=.048 and MB (p=.045).

No significant difference in GI between observation times was noted for both groups.There was no significant difference in GI between groups at T3 and T6 (p>.05). There was no significant difference in Probing depth between groups at T0, T3 and T6 (p>.05).Probing significantly increased with advance of time for FP (p=.005) and MB (p<.008).There was a significant difference in KM between groups at T6 only (p=.046). MB recorded Lower width of KM at T6 than FP Implant stability showed no significant difference between observation times for both groups

Conclusion: Within the limitation of this short-term study, it could be concluded that both FP and MB could be used successfully for All-on-Four® implant rehabilitations of edentulous mandiable opposing complete denture in maxilla as both prostheses were associated with favorable clinical peri-implant tissue health after 6 months of prosthesis insertion. However, MB may be advantageous than FP in terms of reduced plaque accumulation and peri-implant bone preservation around anterior implants.

Introduction

Being edentulous is a huge proplem, and the main objective of implant placement is to provide support of fixed prostheses or to stabilize complete dentures in the edentulous jaw. The traditional way for treating edentulous patients is a complete removable denture. Such prostheses, especially the lower denture, have common problems as decreased stability and retention, which affected by the form of the ridge.[1] Loss of alveolar bone occur continuously with time, making the stable dentures ill-fitted. However, the progressive tissue changes occur due to wearing the denture should be compensated by adjusting it.[2] Patients with severely resorbed alveolar ridge always having problems with their conventional dentures because of a reduced load bearing capacity, poor in there masticatory action, impairment of the motor control of the tongue, bite force decrease and weakened oral sensory function.[3.4]

Patient satisfaction with a mandibular complete denture (CD) is frequently low due to its limited retention and stability, which negatively affects oral function and comfort. To help edentulous patients in their search for a stable and comfortable complete denture, many treatments have been tried; that is, denture adhesives, cushions, and soft liners. All these attempts have been met with limited success Where the alveolar ridge is minimal, a procedure offering a functional, retentive and stable complete denture is the implant retained overdenture.[5.6] Branemark's initial focus on use of dental implants was restricted to edentulous patients, specifically patients with extremely resorbed mandibles. Restoration of the edentulous mandible by implant restorations can be accomplished by one of 2 treatment protocols. Four to five inter foraminal implants supporting fixed cantilever prosthesis is the first option protocol .Alternatively, for patients requiring support of their facial tissues, a removable and flanged implant-retained overdenture has been described.[7.8]

The All-on-4 clinical solution has been developed to maximize the use of available bone and to allow for Immediate. The “All-on-Four” concept is based on the placement of four implants (two axial and two tilted implants) in the anterior part of fully edentulous jaws to support a provisional, fixed, and immediately loaded full-arch prosthesis. Combining tilted and straight implants for supporting fixed prostheses can be considered a viable treatment modality[9] leading to a simpler and less time-consuming technique, significantly less morbidity, reduced financial costs and a more comfortable postsurgical period for the patients.[10]

Using only four implants in edentulous jaws, the solution takes advantage of the benefits of tilting the posterior

implants to afford a secure and most favorable prosthetic support for a prosthetic bridge, even with lowest bone

volume. The overdenture, which is removable, is accurately and rigidly adjusted to the bar; restrict its lateral and rotary movements. Its rigid anchorage system equally distributes stresses caused by the different forces along the implant complex.. Hybrid prostheses and implant supported milled bars overdentures make it easier to get better aesthetic outcomes in clinical cases where there have been losses of hard and soft tissues.[11.12.13]The implant supported milled bar overdenture is a very exciting treatment choice for patients. They provide the benefits of removable prostheses with the stability and retention of fixed prostheses. A custom-fabricated bar could be precisely milled to provide guide strategies that allow exact adaptation for the denture base to the bar offering steadiness and resistance against rotational and lateral forces.[14.15]Studies on immediately loaded implant supported full arch fixed prosthesis viewing high success rates as good as to conventionally loaded implants. It also provide shorter treatment time and eliminate the provisional stage, in addition to the second stage surgery. Although it is possible to noticeably differentiate a success from a failure, it is not easy to define in-between stages. The presence of peri-implant radiolucency and mobility characterize a failure, while implants in the process of failure present progressive marginal bone loss and clinical signs of peri-implant infection, even without mobility[16] Therefore the aim of study is to compare soft tissue conditions, , mucositis, and peri-implantitis for implants supporting bar-retained overdentures and fixed denture placed on implant according to the All On Four concept

Materials and methods

Six completely edentulous patients age ranged between 55-65 years, were selected from out patient clinic of the Prosthodontic Department, Faculty of Dentistry, University of Mansoura according to the following criteria.

Inclusion criteria:

All patient wearing maxillary and mandibular conventional denture. They were unsatisfied by the retention and stability of the denture.They were free from any systemic diseases.Sufficient bone quantity and quality in interforminal area.Sufficient available restorative space of at least 15 mm to accommodate all types of planed prosthesis.At least one year passed after thelast extraction.

Exclusion criteria:

Patients with head and neck radiotherapy, bleeding disorders, hepatic patients and metabolic disorders that affect osseointegration.Long term corticosteroid drug therapy and immunosuppress.Abnormal parafunctional habits, e.g. bruxism and clenching. Smoking patient.Neuromuscular diseases and patient with TMJ problems.

After the patients were informed about the line of treatment and they all signed a written consent also informed about the need for regular and frequent recalls. The study was conducted according to the ethical principles stated and approved by the ethical committee of the faculty of dentistry.

Surgical phase

A customized surgical template will be constructed according to the preoperative CBCT, Surgery is performed under local anesthesia, they received four dental implants located inter forminal area , anteriorly, two axially placed

implants and two distally tilted implants by about 30 degree, all implants will be placed flaplessly.

Immediate loading of implants

Implants were immediately loaded by provisional acrylic dentures. The old mandibular denture was modified by removal of all denture flanges buccal and lingual , removal of the second molar artificial teeth and make four hollows opposite to the multiunit abutments. Temporary abutment metal caps were shortended and screwed to the multiunit abutment then auto polymerized acrylic resin was used to picked up the temporary metal abutment. The metal caps were unscrewed, the denture was removed, and denture was finished and polished. The occlusal contact of first molar with opposing denture was removed to relieve the pressure on the inclined posterior implants.

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Prosthetic procedures for final restoration

After 3 months of osseointegration period, obtaining a master cast by open tray impression procedure on which hybrid or milled bar prosthesis was constructed. The abutment level long transfer copings were screwed to the multiunit abutment, and splinted using splinting bar of duralaye acrylic resin sperated out side and assembly in the patient mouth , custom tray was perforated over the transfer coping. Light body rubber base impression was injectedthen the tray filled with heavy body impression material inserted intraorally. Abutment analogues were screwed to the transfer coping and the impression was poured to obtain master cast. Plastic caps were screwed to the abutment analogues on the master cast. For fixed prosthesis, plastic caps were secured in abutment analogue and the frame work desigened by wax . The frame pattern was sprued, invested and casted with molten Co-Cr alloy. After inevesting and cleaning the fit of the bridge is then verified intro-orally using a single screw test. For milled bar overdenture,the plastic abutment prepared and checked for taper and path of insertion and scanned the bar designed virualy by exocad software then printed by 3d printer in acrylic patter to check passivtty by single screw test in the patient mouth. The bar pattern was sprued, invested and casted with molten Co-Cr alloy. The fit of the restoration is then verified intro-orally using a single screw test. The bar was seated to the master cast. The retentive clip applied to retentive mean on the bar and the all scanned again for designing the housing peek for overdenture.the desigen was finished and the peek was milled by milling machine. The retentive yellow plastic clips were fixed to the peek housing using appreciate adhesive. By a regular manner the acrylic teeth bonded to their sites in prepared teeth in peek and pink acrylic was appliead to the flange to mask the white color of peek and was verified for vertical dimension, esthetics and occlusion. The denture

was flasked, acrylic resin was packed, and the denture was finished and polished.

Evaluation

Evaluation of peri-implant tissue health were made immediatelyafter overdenture insertion (T0) and 3 months after overdenture insertion(T3) 6 months after overdenture insertion(T6) . The parameters for peri-implant tissue health evaluation included: plaque index, bleeding index, peri-implant probing depth and implant stability.

Results

A. Plaque scores: Descriptive statistics [median (minimum-maximum)] of plaque scores at different observation times for groups are shown in table 1. Plaque scores significantly increased with advance of time for FP (p=.048 and MB (p=.045). Multiple comparison between each 2 observation times are presented in the same table. No significant difference between T0 and T3 was noted but the significant difference was observed between T0/T3 and T6 for both groups. There was a significant difference in PI between groups at T6 (p=.048) only. No difference in plaque score between groups was noted at T0 and T3.**B. Gingival scores** Descriptive statistics [median (minimum-maximum)] of plaque scores at different observation times for groups are shown in table 2. No significant difference in GI between observation times was noted for both groups .There was no significant difference in GI between groups at T3 and T6 (p>.05).

C. Probing depth: Probing significantly increased with advance of time for FP (p=.005) and MB (p<.008). Multiple comparison between each 2 observation times are presented in the same table. For FP, no significant difference between T3 and T6 was noted but the significant difference was observed between T0 and T3/T6. For FP, no significant difference between T3 and T6 was noted but the significant difference was observed between T0 and T3/T6. There was no significant difference in Probing depth between groups at T0, T3 and T6 (p>.05). Descriptive statistics [mean (SD)] of Probing depth at different observation times for groups are shown in table 2. **D. Implant stability :**Implant stability showed no significant difference between observation times for both groups. Multiple comparison between each 2 observation times are presented in the same table. For both groups, no significant difference between observation times was noted. There was no significant difference in implant stability between groups at different observation times .

Table 1: Comparison of Plaque scores between different observation times and between groups

	T0 M(min-max)	T3 M(min-max)	T6 M(min-max)	Freidman test (P value)
FP	1.00a (1.00-2.00)	1.00a (1.00-2.00)	1.00b (1.00-1.00)	.048*
MB	1.00a (1.00-2.00)	1.00a (1.00-2.00)	1.00b (1.00-2.00)	.040*
Mann Whitney test (P value)	.29	1.00	.048*	

M; median, min; minimum, max; maximum, * p is significant at 5% level.

Table 2: Comparison of probing depth between different observation times and between groups

	T0 X±SD	T3 X±SD	T6 X±SD	Friedman test (p value)
FP	1.41±.24 a	1.65±.33 b	1.76±.35 b	.005*
MB	1.25±.31a	1.50±.31 b	1.60±.27 b	.008*
Mann Whitney (p value)	.094	.27	.10	

X: mean, SD: standard deviation. * p is significant at 5% level.

Discussion

Plaque scores significantly increased with advance of time for FP (p=.048 and MB (p=.045). In contrast with this finding Mustafa Ayna et al.,[17] found that the plaque score was greater in the group restored by the bar-retained overdenture. And it is arisk factor for patient with bad oral hygien. No difference in plaque score between groups was noted at T0 and T3. FP recorded the higher plaque score than MB at T6.This might be attributed to the fact that difficult inadequate oral hygiene performance is especially in the region of abutments and under the prosthesis,that screwed in the abutment .patient cant remove it and still in its place until the follow up visit but in the other hand retained over denture patient can remove it and maintain oral hygien. In contrast with this finding, Agliardi et al.,[18]found a progressive decrease in bleeding and plaque scores in the first year. No difference in plaque score between groups was noted at T0 and T3. There was a significant difference in PI between groups at T6(p=.048) only This might be attributed to presence of 1 mm hygiene space under the bar. No significant difference in gingival scores between groups was noted. In contrast with this finding, Agliardi et al.,[18] found a progressive decrease in bleeding scores was

observed. This can be explained by the splinting of the implants by bar attachments or fixed prosthesis which distribute the functional loads equally on all implants.[19]This findings was in agreement with the results of Del Fabbro et al.,[20] and Maló et al.,[21] .Pocket depth significantly increased with advance of time in both groups.At T6, FP recorded significant higher pocket depth than MB at for anterior implants at distal site. The increased pocket depth could be attributed to the increased VBL at anterior implants of FP. In agreement with this finding, Elsyad el al.,[22] reported that the PD significantly increased at distal and labial sites of anterior implants. They stated that this could be due to increased strain values on bone tissue around the implants at these sites that may reach pathologic levels. For MB at posterior implants no significant difference in pocket depth between observation times was noted, this might be attributed to our finding that there is no significant difference in plaque scores was noted between observation times for MB. For FP, pocket depth of posterior implant was higher than anterior implant. In agreement with this finding Alvarez et al., [23] found that the stress was located in the distal and lingual areas of the coronal third of the peri-implant bone surrounding the posterior implants in one-piece fixed implant prosthesis lead to more VBL, respectively PD will increase. For both groups, there was a significant difference of pocket depth between peri-implant surfaces at T6 for anterior implants (mesial and distal site recorded the highest scores, and lingual site recorded the lowest). In agreement with finding Elsyad et al.,24 found that immediate loading group recorded significant vertical bone loss and probing depth at distal and labial sites than the conventional loading. There was no significant difference in implant stability between groups at different observation times. Meredith et al. [(25)] described a noninvasive clinical method: the resonance frequency analysis (Osstell method) Resonance Frequency Analysis (RFA) is a noninvasive intraoral method designed to assess bone-implant interface and may therefore provide clinical evidence of implant stability [(25)]. Due to its high reproducibility and soundness, this technique has progressively, in the last years, outperformed the all techniques previously proposed to monitor implant stability [(26)] This could be explained that early loading protocol used permitted the implants under functional loading to achieve a greater density of bone at the crestal level. The lack of difference in implant mobility between groups reflects the increased bone density in the interforaminal region and the increase of implant anchorage to the bone due to new bone formation. This seems to be consistent with Pae et al [(27)].Another reason of good implant stability in both groups was the splinting of the implants by bar attachments which distribute the functional loads equally on all implants .This explanation is agreed with Shafie& Obeid [(28)] In agreement with this study DEL BARRIO et al. implant stability expressed in terms of ISQ values was registered and did not show a significant time effect. This could be considered logic as immediate loading was pursued for which proper stability is required. It has been described by Sennerby & Meredith (**2008**) that implants with high initial stability may not show further increase of ISQ values.[29]

Conclusion

Within the limitation of this short-term study, it could be concluded that both FP and MB could be used successfully for All-on-four® implant rehabilitations of edentulous mandible opposing conventional denture in maxilla as both prostheses were associated with favourable clinical peri-implant tissue health after 6 months of prosthesis insertion. However, MB may be advantageous than FP in terms of reduced plaque accumulation and peri-implant soft tisuue implants.

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