

Original Research

Efficacy of immediate complete denture, tooth and implant supported overdenture on the maintenance of vertical dimension

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ABSTRACT:

Background: Immediate dentures are dental prostheses constructed for insertion immediately following the extraction of the natural teeth and the attendant surgical procedures. Reviewing through the literatures has indicated that immediate denture service has several advantages as the natural facial expression and appearance is maintained because the facial muscles are maintained in their correct position and the patient never appears edentulous. **Aim of the study:** To study efficacy of immediate complete denture, tooth and implant supported overdenture on the maintenance of vertical dimension. **Materials and methods:** The study was conducted in the Department of Prosthodontics of the Dental institution. For the study, 30 patients were selected between age range of 40-75 years. An informed written consent was obtained from each patient after informing them about the procedure and aim of the study. The selected patients were randomly grouped into three groups with 10 patients in each group. Group 1: Three patients receiving conventional acrylic immediate complete mandibular denture (mucosal-supported); Group 2: Three patients who will be receiving acrylic immediate complete mandibular denture supported by reduced root canal treated canines (tooth-supported). Group 3: Three patients who will be receiving acrylic immediate complete mandibular denture supported by osseointegrated fixtures in the canines region (implant-supported). **Results:** The comparison of mean differences in occlusal vertical dimension was done. The mean occlusal vertical dimension changes in Group 1 were -0.49 at time 1, -0.71 at time 2, and -2.93 at time 3; in Group 2 were -0.55 at time 1, -0.66 at time 2, -1.52 at time 3; in Group 3 were -0.39 at time 1, -0.66 at time 2, and -2.11 at time 3. Comparison between mean differences in occlusal vertical dimension for tested times were statistically non-significant. **Conclusion:** Within the limitations of the present study, it can be concluded that immediate implant overdenture prosthesis can be successful with increased clinical efficiency under specific clinical situations. The biting force of masticatory muscle is functionally dependent on maintenance of muscle health and occlusal vertical dimension.

Keywords: Complete denture, implant overdenture, immediate complete denture

Received: 12 Dec, 2019

Revised: 24 Dec, 2019

Accepted: 29 Jan, 2020

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This article may be cited as: Gupta S, Sharma A, Jain P, Sain P, Tikkiwal S, Bansal R. Efficacy of immediate complete denture, tooth and implant supported overdenture on the maintenance of vertical dimension. J Adv Med Dent Sci Res 2020;8(2): 58-61.

INTRODUCTION

Immediate dentures are dental prostheses constructed for insertion immediately following the extraction of the natural teeth and the attendant surgical procedures. Reviewing through the literatures has indicated that immediate denture service has several advantages as the natural facial expression and appearance is maintained because the facial muscles are maintained in their correct position and the patient never appears edentulous^{1,2}. Facial height is retained as the facial muscles will function at their natural length, neutral zone is maintained because the

artificial teeth are arranged in a similar manner to their natural predecessors. Mastication is easy or even better than after a period of edentulousness without dentures and minimal speech impairment as there is minimal loss of masticatory efficiency because patient is not without teeth anytime. Despite several advantages of implant overdenture, biological (e.g., nonosseointegration, mucositis with or without inflammatory hyperplasia, peri-implantitis) and biomechanical complications (e.g., bar fracture, fracture or detachment of the clip anchorage, fracture of the prosthesis or parts of it) can occur during

function.³⁻⁵ Scientific evidence from literature review shows higher frequency of prosthetic complications, particularly for maxillary implant-retained or implant-supported overdentures. On the other hands, short term independent follow-up studies showed lower level of complications with both implant-retained and supported-overdentures.⁶ Hence, the present study was conducted to study efficacy of immediate complete denture, tooth and implant supported overdenture on the maintenance of vertical dimension.

MATERIALS AND METHODS

The study was conducted in the Department of Prosthodontics of the Dental institution. For the study, 30 patients were selected between age range of 40-75 years. Inclusion criteria for the selection of patients was as follows:

1. No signs and symptoms of TMJ dysfunction;
2. No history of systemic diseases;
3. No previous history of prosthesis wearing;
4. Angle’s class I maxillo-mandibular relation.

An informed written consent was obtained from each patient after informing them about the procedure and aim of the study. The selected patients were randomly grouped into three groups with 10 patients in each group.

- Group 1: Three patients receiving conventional acrylic immediate complete mandibular denture (mucosal-supported);
- Group 2: Three patients who will be receiving acrylic immediate complete mandibular denture supported by reduced root canal treated canines (tooth-supported).
- Group 3: Three patients who will be receiving acrylic immediate complete mandibular denture supported by osseointegrated fixtures in the canines region (implant-supported).

For determination of changes in occlusal vertical dimension for patients in all groups; lateral cephalometric radiographs were taken to detect occlusal vertical dimensional changes. Radiographic exposures were made at four occasions:

1. Before dental extraction with only bilateral upper and lower second premolars maintaining centric occlusion, vertical and horizontal relation.
2. Two weeks after transitional removable partial denture insertion (Time 1).
3. Two weeks after complete immediate mandibular denture insertion (Time 2).
4. One year after immediate denture insertion (Time 3).

The statistical analysis of the data was done using SPSS version 11.0 for windows. Chi-square and Student’s t-test were used for checking the significance of the data. A p-value of 0.05 and lesser was defined to be statistical significant.

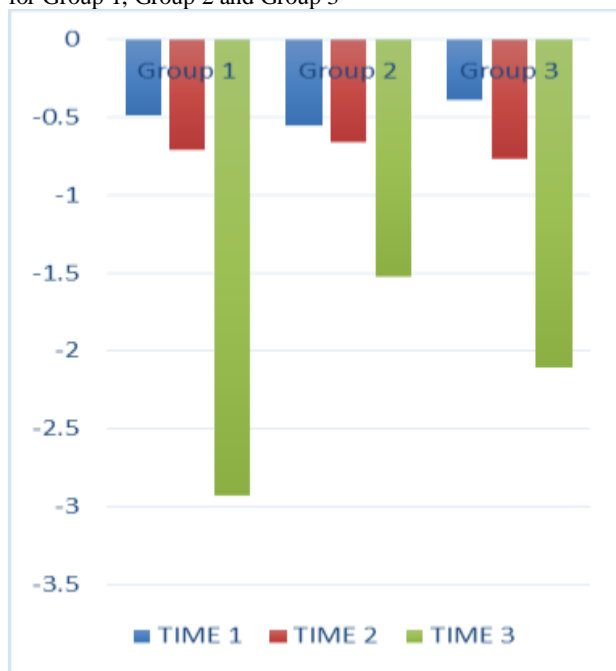
RESULTS:

The analysis of the mean differences in occlusal vertical dimension for all groups,i.e.,Group 1, Group 2, and Group 3 was done at Time 1, Time 2 and Time 3 with the help of lateral cephalometric radiographs taken at different intervals. The comparison of mean differences in occlusal vertical dimension was done. The mean occlusal vertical dimension changes in Group 1 were -0.49 at time 1, -0.71 at time 2, and -2.93 at time 3; in Group 2 were -0.55 at time 1, -0.66 at time 2, -1.52 at time 3; in Group 3 were -0.39 at time 1, -0.66 at time 2, and -2.11 at time 3. Comparison between mean differences in occlusal vertical dimension for tested times were statistically non-significant. [Table 1, Figure 1].

Table 1: Mean differences in occlusal vertical dimension changes for Group 1, Group 2 and Group 3

Groups	TIME 1	TIME 2	TIME 3
Group 1	-0.49	-0.71	-2.93
Group 2	-0.55	-0.66	-1.52
Group 3	-0.39	-0.77	-2.11

Fig 1: Mean differences in occlusal vertical dimension changes for Group 1, Group 2 and Group 3



DISCUSSION

For the study, thirty patients were selected and the patients were borderline cases for whom a particular form of treatment with immediate overdentures or immediate complete dentures was not clearly indicated. The results of this study demonstrated that there was significant decrease of the occlusal vertical dimension in the complete denture group, compared with the overdenture groups (tooth and implant-supported), in the first year after extraction of the

last remaining teeth and after insertion of the dentures. The results were statistically non-significant and were compared with previous studies from the literature. Shah FK et al compared the changes in the occlusal vertical dimension, activity of masseter muscles and biting force after insertion of immediate denture constructed with conventional, tooth-supported and Implant-supported immediate mandibular complete denture. Patients were selected and treatment was carried out with all the three different concepts i.e, immediate denture constructed with conventional (Group A), tooth-supported (Group B) and Implant-supported (Group C) immediate mandibular complete dentures. Parameters of evaluation and comparison were occlusal vertical dimension measured by radiograph (at three different time intervals), Masseter muscle electromyographic (EMG) measurement by EMG analysis (at three different positions of jaws) and bite force measured by force transducer (at two different time intervals). The obtained data were statistically analyzed by using ANOVA-F test at 5% level of significance. If the F test was significant, Least Significant Difference test was performed to test further significant differences between variables. Comparison between mean differences in occlusal vertical dimension for tested groups showed that it was only statistically significant at 1 year after immediate dentures insertion. Comparison between mean differences in wavelet packet coefficients of the electromyographic signals of masseter muscles for tested groups was not significant at rest position, but significant at initial contact position and maximum voluntary clench position. Comparison between mean differences in maximum biting force for tested groups was not statistically significant at 5% level of significance. They concluded that immediate complete overdentures whether tooth or implant supported prosthesis is recommended than totally mucosal supported prosthesis. Gargari M et al compared functional efficiency and patients satisfaction between tooth-supported and implant-supported overdenture through a questionnaire that accurately reflects the real concerns of patients with dental prosthesis. Forty-three patients were selected from the out patient clinic, Department of Dentistry “Fra G.B. Orsenigo Ospedale San Pietro F.B.F.”, Rome, Italy. Their age were ranging from 61 to 83 years. Eighteen patients were rehabilitated with overdentures supported by natural teeth and twenty-five with overdentures implant-supported. The questionnaire proposed one year after the insertion of the prosthesis has showed that there isn't difference statistically significant in terms of function, phonetics and aesthetics between overdenture implant-supported and tooth-supported. The results of the questionnaire showed that the patients generally had a high level of satisfaction concern to the masticatory function, esthetics and phonetics. In addition, on average, they haven't difficulty in removal and insertion of the denture and in oral hygiene. They haven't in both groups problems related to fractures.^{7,8}

Tallarico M et al analyzed implant and prosthetic survival rates, complications, patient satisfaction, and biological parameters of patients rehabilitated with implant overdentures (IOV) on splinted and nonsplinted implants and different attachment systems, in function for one to 17 years. This retrospective study evaluated data collected from patients rehabilitated with implant overdentures between January 2001 and December 2016 in nine different centers. Outcome measures were implant and prosthetic success rates, mechanical complications, marginal bone loss (MBL), oral health impact profile (OHIP), bleeding on probing, and plaque index. A total of 581 implants were installed in 194 patients. Patients were followed for a mean period of 60.6 months (range 6–206). Eighty-nine patients received 296 low profile attachment (OT Equator), 62 patients received 124 ball attachments, and 43 patients received 107 Locator attachments. In eighty-three patients the implants were splinted with computer aided design/computer aided manufacturing (CAD/CAM) or casted bar. At the last follow-up, 10 implants failed in eight patients. Statistical significance was found for failed prostheses and complications, with better values for splinted implants. No statistically significant differences were found in proportion of implant and prosthetic failure. At a five-year follow-up, proportion of complications and failed prostheses were statistically higher for IOV on Locator attachments. No difference was founded in MBL at one- and two-year follow-up between different attachment systems. Statistically significant improvement in all the OHIP categories was reported in all the patients, after one year of function. They concluded that implant overdenture showed high implant and prosthetic survival rates, low complications, high patient satisfaction, and good biological parameters in the long-term follow-up. Splinting the implants may reduce number of mechanical complications. Locator attachments showed higher number of complications. Further studies are needed to confirm these preliminary results. Bakke M et al assessed the outcome of treatment with implant-supported mandibular overdentures in terms of biting and chewing, in entirely satisfied and not fully satisfied patients. Twelve edentulous patients who had worn dentures for at least 5 years participated. They were in good health but had retention problems with their mandibular dentures. First, all patients received new dentures. After 3 months, two Astra Tech implants were placed in the anterior part of the mandible, and 6 months later the abutments were connected. Patient assessment (questionnaire) and functional recordings (chewing ability, bite force, electromyographic activity) were performed with the new dentures, and again 3 months, 1 year, and 5 years after overdenture treatment. After treatment, all patients were able to comminute hard and tough food, the maximum bite force and the chewing activity increased in parallel, and the duration of the chewing cycle was reduced. Every patient felt improved function and reduction of chewing pain. However, the

seven patients not fully satisfied with the function of the implant-supported mandibular overdentures were characterized by lower muscle activity, even before implant placement, than the entirely satisfied patients. They concluded that implant-supported mandibular overdenture treatment permits better biting and chewing function than conventional complete dentures.^{9,10}

CONCLUSION

Within the limitations of the present study, it can be concluded that immediate implant overdenture prosthesis can be successful with increased clinical efficiency under specific clinical situations. The biting force of masticatory muscle is functionally dependent on maintenance of muscle health and occlusal vertical dimension.

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