SURVIVAL AND COMPLICATION RATES OF COMBINED TOOTH-IMPLANT-SUPPORTED REMOVABLE PARTIAL OVERDENTURES

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ABSTRACT

Combined tooth-implant removable partial overdenture may provide good and simple solution for long span partially edentulous cases regarding support, retention, aesthetic, as well as patients’ satisfaction. The response of the anchoring mechanism of both natural tooth and implant to biological and mechanical effects of the partial overdenture prostheses may show difference over long follow up period. AIM OF THE STUDY: was to evaluate survival and complication rates of combined tooth-implant removable partial overdenture over long follow up period. MATERIALS & METHODS: The 5-selected patients were long span bounded lower partially edentulous mandibul with very few remaining teeth with canine or premolar remaining unilaterally. Simple & hygienic design partial denture frameworks were delivered. Those frameworks were supported and retained anteriorly with ball attachment superstructure on both natural abutment and osseointegrated implant while posteriorly with classical conventional Akers’ clasp assembly. Then cases were followed up both clinically and radiographically. RESULTS: Significant changes in mean values of both epithelial attachment and bone height changes around natural tooth supporting structure were found, while those changes were not significant for implant one. CONCLUSION: Combined tooth-implant removable partial overdenture showed improved patient’ satisfaction regarding retention, stability and aesthetic. However, the implant anchoring supporting structures are not sensitive to overdenture plaque pathogens as natural tooth one. Implant fixture with ball attachment superstructure are successful abutment for properly designed removable partial overdenture.

INTRODUCTION

Implant-retained removable partial dentures (RPDs) have made treatment options available to patients who previously may not have been able to benefit from total–support implant dentistry because of limitations in health, anatomy, finances, or social issues. This conservative treatment modality provides options for additional treatment in the future and accommodates changes in the remaining natural dentition.1-3

Limitations to conventional fixed prosthesis are often a result of advanced ridge resorption, with concurrent loss of facial esthetics caused by lack of facial support of
the lips and soft tissues of the face, as well as inadequate ridge form that precludes ideal implant placement. Other limiting factors to be considered in fixed implant-supported restorations include lack of hygiene access, multiple surgical procedures, and cost. Moreover, Li-Ching Chang et al., 2007 added that Implants are expensive and therefore many patients cannot afford them, particularly those with large edentulous areas. In addition, these patients may require several surgeries to increase bone mass, thus making the entire treatment extraordinarily expensive and complicated.

However, limitations of conventional, non-implant-supported RPD therapy include a lack of stability, minimal retention, periodontally compromised abutment teeth, and unaesthetic clasps. These limitations frequently are accompanied by discomfort (of the underlying edentulous ridge), accelerated tooth loss, and traumatic forces, as well as patient reluctance to use the appliance routinely. Further, if a critical abutment tooth is lost, these appliances can be rendered useless.

A recent literature review indicated that the use of implants in conjunction with remaining natural teeth in the form of an implant-retained RPD provides patients with exceptional service and benefits not attainable with more conventional treatment options. Mijiritsky and colleagues found that patients receiving this treatment had only minor prosthetic complications, great satisfaction, and improved chewing efficiency. The researchers determined that the treatment modality is viable and cost-effective. Other studies have confirmed improved esthetics, fewer patient visits, and the ability to avoid additional surgical procedures. The placement of dental implants in an edentulous space not only provides the biologic benefit of reducing bone resorption, but in the case of an implant-retained RPD, also provides distinct biomechanical advantages. The responses of combined implant and tooth supporting structure to overdenture biologic and mechanical conditions are factors needed to be studied.

**MATERIALS AND METHODS**

Five patients were selected from Outpatients-Clinic Faculty of Oral and Dental medicine Cairo University. Selected patients were long span bounded lower partially edentulous patients with very few remaining teeth with canine or premolar remaining unilaterally. Selected patients were systemically indicated for dental implant installation. Un-restorable or severely periodontal affected teeth were extracted. Mal-posed teeth that interfere with proper selected prostheses path of insertion were also extracted Fig.(1).

For all patients, upper and lower primary impressions were made and poured into stone casts. Then mounted according to recorded jaw relations. Trial setting up of teeth was made for mounted casts. Edentulous area in lower canine or premolar was selected regarding anatomy as well as bone height& width for one implant installation. Ball attachment abutments were screwed properly to successfully osseointegrated implant, then tooth opposite to implant installed in the same arch was endo-dontically treated and prepared to receive cast post with OT cap ball attachment. The OT cap ball attachment was placed parallel to ball attachment abutment screwed in successfully osseointegrated implant using dental surveyor Fig. (2,3).
Both ball attachment abutments and prepared opposite natural tooth with its OT cap ball attachment coping were used to provide both retention and support for the removable partial over-denture prostheses. Then, upper and lower primary casts were made and surveyed to select path of insertion compatibles with previously placed ball attachments on both tooth and implant, and then, needed mouth preparations for remaining teeth were made according design selected. Selected design of the removable partial overdenture of all cases was kept to most simple and hygienic design Fig.(4,5).

Pick up of female metal housing of ball attachments using self cure acrylic resin was made at the delivery time of removable partial overdenture Fig.(6).
Opposing arches were restored with conventional removable prostheses. Adjustment of occlusion was made and ensured to be uniform and harmonious in both centric and lateral movements. All patients were instructed regarding oral hygiene and periodic follow up. Nylon cap of attachment were changed for all patients every year. All patients were followed up every year for 4 years, both biologically “attachment loss” and radiographically “digital radiographically”. The results were tabulated and statistically analyzed.

**RESULTS**

All patients expressed great satisfaction to delivered prosthesis after implant installation regarding retention, stability and aesthetics more than the previous conventional one. However, they gave history of repeated gingival inflammation related to free gingival margins of natural tooth side prepared with ball attachment. Moreover, 4 of selected 5 patients showed gradual increased in grade of mobility of the anterior natural teeth with complete looseness at the end of the follow up period. On the other hand, installed implants showed clinically and radiographically successful conditions to the end of the follow up period.

- **Changes in attachment level**

1) **Natural tooth with ball attachment**

The mean value of attachment level changes were 10.5, before partial overdenture wearing and 12.5, 13.5, 14.4, 16.5 one, two, three, four years after delivery (*statistically significant increase P value < 0.001*)

- **Changes in attachment level**

2) **Implant with abutment ball attachment**

The mean value of attachment level changes were 9.8, before partial overdenture wearing and 11.0, 11.3, 11.8, 12.3 one, two, three, four years after delivery (*statistically non-significant increase P value > 0.001*)

- The difference in the mean value of attachment level changes between natural tooth with ball attachment and that of implant with abutment ball attachment was significant P value < 0.001 (student T-test was used)
- Changes in bone height changes

1) natural tooth with ball attachment

The mean value of attachment level changes were 2.8, before partial overdenture wearing and 4.2, 5.3, 6.9, 8.2 one, two, three, four years after delivery (statistically significant increase $P$ value < 0.001)

- Changes in bone height changes

2) implant with abutment ball attachment

The mean value of attachment level changes were 1.9, before partial overdenture wearing and 3, 3.4, 3.9, 4.1 one, two, three, four years after delivery (statistically non-significant increase $P$ value > 0.001)

- The difference in the mean value of bone height changes between natural tooth with ball attachment and that of implant with abutment ball attachment was significant $P$ value < 0.001 (student T-test was used)

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**DISCUSSION**

Aim of this study was to study the survival and complication rate of combined tooth-implant supported removable partial overdenture; therefore, effort was made to standardize conditions for both the tooth and the installed implant supporting the partial overdenture regarding position in same the arch, the type of attachment super-structure used and the parallel long axes of both super-structure “so, common path of insertion could be achieved”, therefore, no extra unwanted forces transmitted to tooth or implant during insertion or removal of overdenture prosthesis. For the same reason, the path of insertion of the designed prosthesis was made parallel to long axes of the super-structure of both implant and natural tooth. The selected design of the partial overdenture prosthesis was kept to most simple and hygienic design; therefore, avoiding mal-effects of complicated design on both oral hygiene maintenance and increase of plaque accumulation that may affect the survival rate of both teeth and implant supporting structure. Moreover, strict oral hygiene instruction were given and followed up during observation period to avoid human factor variations that affect rate of plaque accumulation.
and its destructive effect on periodontal or peri-implant structure. Follow up was made depending on change of clinical attachment level, as well as, radiographic change in bone height, where, both of them are highly related to each other.

It is known and documented that denture plaque and over-stresses than normal have a negative effect on both attachment level and bone height of supporting structure of both natural tooth and implant. However, the results of the study revealed that implant anchored structures are not sensitive to dental plaque pathologic microorganism formed under overdenture prosthesis in the same degree as natural dentations over long follow up period for 4 years. This is in accordance with Prieskel et al 1996 that mentioned that the implant may be less susceptible to plaque-related diseases than roots of natural teeth. Also, the significant decrease in both bone height and attachment level recorded with natural tooth at the end of follow up period may also attributed not only to the effect of plaque pathogens but also to that most of loading during function was transmitted to natural tooth side, where, the natural tooth is the primary recipient of occlusal stresses as the periodontal ligament of natural tooth absorbs most of stresses, thus, relieving the implant from being subjected to overloading, moreover, natural tooth side is always the preferred chewing side of patient which, in turn lead to extra load on natural tooth supporting structure that may on long time of follow up leads to more bone resorption and even tooth loss. This finding is supported by that mentioned by Gunn 1997, who recorded less marginal bone loss when implant are combined with natural tooth.

**REFERENCES**


