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MARGINAL BONE LEVEL EVALUATION OF IMPLANT SUPPORTED KENNEDY CLASS I PARTIAL OVERDENTURE USING TELESCOPIC CROWNS VERSUS EXTRA CORONAL ATTACHMENT RETAINERS

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ABSTRACT

Objectives: This study was conducted to evaluate and compare marginal bone level for abutments of implant supported Kennedy class I partial overdenture using Telescopic Crowns versus OT unilateral attachment after 18 month of clinical use.

Materials and Methods : Ten male partially edentulous patients (Kennedy class I) with the premolars are the last standing abutments were selected and all patients were rehabilitated with metallic partial denture supported by two osseointegrated implants one on each side of the lower arch positioned in the area of second molar and were randomly divided into two equal groups according to type of abutments retainers, Group I; Patients were rehabilitated with Tooth Implant Supported partial overdenture with two telescopic crowns at each side, Group II: Patients were rehabilitated with Tooth Implant Supported partial overdenture with extra coronal OT attachments. The two groups are evaluated by measuring marginal bone level for main abutments. Measurements were made at the time of insertion, after 6 months, after 12 months and last after 18 month using radiographic evaluation.

Results: Partial overdentures retained by telescopic crowns showed no significant difference in marginal bone loss as compared with extracoronal OT attachments retainers.

Conclusion: Using tooth implant partial overdentures retained by extracoronal OT unilateral attachments shows better effect on supporting structure as compared by partial dentures with telescopic crowns retainers

INTRODUCTION

Extracoronal attachments were successfully used in unilateral distal extension base cases since they provide good esthetics, retention, and favorable distribution of stresses to the abutment teeth. They are also well tolerated by the patient and they are easy to maintain and clean.[1-3]

Precision attachment has remarkable characteristic of being a removable prosthesis with enhanced aesthetics, reduced post-operative

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modifications and improved patients comfort. The overwhelming indication for the attachment RPD is aesthetics. Elimination of the buccal or labial direct retainer or clasp arm is a key factor in establishing an esthetically acceptable design. [4,5]

They are strongly recommended in long span, distal extension bases and improper abutment parallelism. Plenty of recent researches greatly recommended that when abutments were of adequate clinical crown height to receive attachment; multiple abutments were splinted anterior to edentulous span to aid in better distribution of stresses. [4,6]

The use of telescopic crowns on natural teeth, is a treatment option that has been mostly used for supporting dentures. telescopic crowns were first introduced in the 1970s. They provide easy access for better cleansing around the abutments as well as easy management of the overdenture. The comparatively high retentive forces leads to good masticatory function and proper phonetics. Therefore, they often provides higher properties than other types of attachments. [7,8]

The cast partial denture has been the option of choice because the lack of posterior abutments in Kennedy Class I cases thus excluding the possibility of fixed bridge treatment option. The design of a direct retainer is considered a prominent factor that controls the force applied to the abutment teeth. Studies conducted under a simulated condition have suggested that telescopic retained designs produce less torque on abutment teeth than extracoronal attachments. A removable partial denture retained by telescopic crowns is an alternative treatment option to a conventional clasp retained removable partial denture. [9-12]

Extracoronal attachments have part or all of their mechanism outside the contour of the tooth. Their main application is in distal extension prosthesis. Although they provide superior retention, esthetics and the stresses acting on a denture base of an attachment denture was less than that of clasp denture. However, the application of these attachments exerted excessive torque to the most distal abutment, which may necessitate splinting to minimize the hazardous effects of excessive loading. [13,14]

It was stated stated that kennedy class I removable partial denture cases can be greatly enhanced by the addition of posterior implants. These enhanced removable partial dentures have been called implant-supported removable partial dentures. [15]

Cone-beam computed tomography has been used for several important oral and maxillofacial surgery applications especially at implant placement. All modern researches revealed excellent image quality and information acquired with Cone-beam computed tomography devices for different anatomical structures. [16,17]

MATERIALS AND METHODS

Ten partially edentulous class I Kennedy's classification patients with age ranged from 40-50 years were selected from the out-patient clinic, Faculty of Oral and Dental Medicine, Future University. all patients were rehabilitated with metallic partial denture supported by two osseointegrated implants one on each side of the lower arch positioned in the area of aasecond molar and were randomly divided into two equal groups according to type of abutments retainers,Group I; Patients were rehabilitated with Tooth Implant Supported partial overdenture with two telescopic crowns,Group II; Patients were rehabilitated with Tooth Implant Supported partial overdenture with extracoronal OT unilateral attachments.

Surgical procedures

A) Pre-surgical preparation

- Surgical stents were constructed.
- A hole was drilled in the implant site corresponding to the second molar area in the preoperative radiographic template.

B) Implant selection

A color guided implant system; V-TPS (Vacuum-Titanium Plasma Spray) coating root form, cylindrical screw, internally hexed titanium implants and self-tapping expansion thread system were used. They are available in five diameters and five lengths ranging from 8 to 16 mms. The 10 mm length and 3.75 mm diameter was used.

C) Surgical procedures

- Mandibular nerve block, as well as, ring infiltration anesthesia was given at the corresponding side to the surgical region
- The autoclaved surgical stent was seated in the patient's mouth to identify exact area for implant insertion. Mucoperiosteal flap was made.
- Surgical stent was modified and introduced in the patient's mouth, to mark the exact fixture site.
- Osteotomy was made using successive drills at predetermined implant site and Implant fixtures were inserted in place and titanium cover screws of the same diameter of the implant were screwed into implant fixture. The flap was irrigated with saline, repositioned and secured by interrupted sutures.
- Three months after implant placement, the patient was recalled, and Fixture position was detected by palpation with the aid of surgical stent and the site was marked and exposed.
- The cover screw was unthreaded and a healing collar of 4mm length was selected, inserted and threaded into the implant by the aid of implant driver and tightened well.

Prosthetic procedures:

The selected patients were randomly divided into two equal groups, five patients each:

Group I

Patients were rehabilitated with metallic partial denture supported by two osseointegrated implants one on each side of the lower arch positioned in the area of second molar retained by two telescopic crowns retainer.

Group II

Patients were rehabilitated with metallic partial denture supported by two osseointegrated implants one on each side of the lower arch positioned in the area of second molar retained by extracoronal OT unilateral attachments on each side.

For group I

Patients were rehabilitated with metallic partial denture supported by two osseointegrated implants one on each side of the lower arch positioned in the area of second molar retained by telescopic crowns direct retainer on each side.

- Proper preparation of lower premolars to receive telescopic crowns retainers.

- Upper and lower primary and secondary impressions were made for all patients.

- Cementation of crowns and proper try in and insertion for denture and telescopic crown. (Fig.1)

Fig. (1) Telescopic crowns in place

For group II

Patients were rehabilitated with metallic partial denture supported by two osseointegrated implants one on each side of the lower arch positioned in the area of second molar retained by OT unilateral attachment on each side.

The lower premolars on each side were prepared with a deep chamfer finish line extended subgingivally (0.5-1mm) with sufficient occlusal (2-2.5mm) and circumferential reduction (1-1.5mm) to receive two full porcelain veneered crowns. Dual impression was carried out in the conventional manner. Positioning the attachment carefully using the surveyor. The patrix (male part) was connected to wax pattern of the last prepared abutment tooth to be parallel to the long axis of the abutment tooth vertically perpendicular to the underling ridge and above the residual ridge by about 1mm. The attachment was positioned carefully and fixed with wax or adhesive component. UNI Box (female part) was fit exactly on the attachment and flushed smoothly with abutment wax coping. The positional ring was applied over the attachment to assure stability for the female cap.

The completed wax pattern of the crown-attachment assembly was sprued, invested and cast into a cobalt-chromium* metal.

Centric occluding relation following the inter-occlusal wax wafer technique was made and a try in stage was made successfully for both groups.

Final partial denture was finished, polished and delivered to the patient in the usual manner after clinical adjustments (Fig.2).

Post insertion evaluation

Marginal bone level was measured at the time of delivery, then after six months, twelve and lastly after eighteen months using cone beam C.T

Fig. (2) Close view of the porcelain crown-attachment assembly inside patient's mouth

Radiographic evaluation:

- Cone beam C.T. were developed and image processed. (Fig.3)
- A line tangential to the apex and perpendicular to abutments long axis was drawn. Two lines were drawn one on the mesial and the other on the distal side of the abutment starting from the alveolar crest extended along tooth lamina dura till the tangential line at the tooth apex.
- The same procedures were done for the posterior implants.

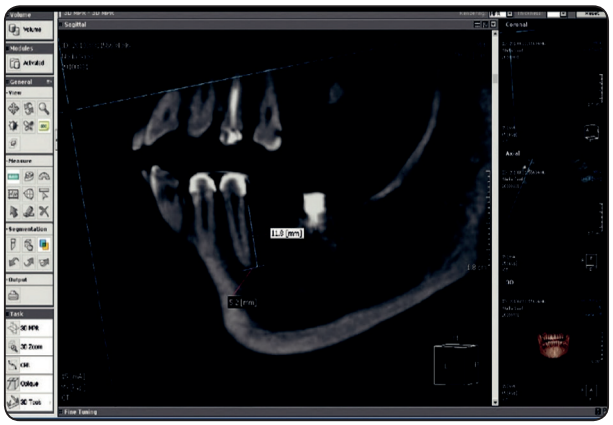

Fig (3) Image analysis by using long cone beam.

* Cobalt Chromium metal framework, Vita, Swizerland.

RESULTS

Relation in marginal bone level between telescopic crowns and OT unilateral retainers

TABLE (1) Relation in marginal bone level of Abutment teeth for telescopic crowns and OT Unilateral retainers:

Treatment modality	RPD with ***Telescopic crown*** (Group I)		RPD with ***OT Unilateral*** Attachment (Group II)		
Time	**Mean**	**S.D.**	**Mean**	**S.D.**	**P-Value**
Zero-time –6 M	1.12	0.15	1.34	0.32	1.05
Zero-time –12 M	1.94	0.21	2.38	0.37	1.9
Zero-time–18 M	2.1	0.19	2.98	0.347	1.6
S.D.= Standard deviation. ***P-Value < 0.05 is significant value***					

The amount of bone loss was calculated by subtracting the measured distances between each radiographic evaluation made at the time of denture insertion and the recall appointments.

TABLE (2) Relation in marginal bone level for implants supporting partial denture for both groups :

Treatment modality Time	Implant supporting RPD with Telescopic crown (Group I)		Implant supporting RPD with OT unilateral (Group II)		P-value
	Mean	S.D.	Mean	S.D.	
Zero-time –6 M	1.04	0.280	0.87	0.27	0.09
Zero-time –12 M	1.7	0.290	1.9	0.36	0.1
Zero-time–18 M	2.1	0.287	2.4	0.33	0.19
S.D.= Standard deviation. P-Value < 0.05 is significant value					

DISCUSSION

The design of the finished partial denture was the same for all patients of both groups for more reliable results. The design was formulated according to the common principles and concepts followed in distal extension cases.[18]

In this study the mean values for the amount of marginal bone loss around the abutments teeth in group I telescopic crowns retained group was 1.94 mm while in group II OT Unilateral retained group was 2.38 mm, twelve months after wearing the partial overdenture. The insignificant difference between the two groups at the end of one-year follow up period may be due to the strain concentrated on the periodontal ligaments of abutment teeth and its surrounding tissues from repeated removal forces of prosthesis retained by telescopic crowns. In agreement with Gungor et al. this strain concentrated on the bone and the tensile stresses on the periodontal tissues might cause resorption around the cervical region which is same situation as group II OT unilateral attachment which produce stresses on the periodontal ligaments due to its design which gives

more retentive means of the attachment to the abutment through the two balls in two planes and additional bracing arm. [18]

Marginal bone loss around Posterior implants due to stresses upon them and most of the occlusal stresses dissipated along the saddle area lead to insignificantly marginal bone loss compared to group II retained by OT unilateral attachment with additional retentive means to the abutments and that also reflects posteriorly on marginal bone loss around posterior implants leading to insignificant marginal bone loss compared to Group I.

The ledge was prepared on the lingual surface of the second premolar wax pattern to receive a lingual bracing arm to provide bracing of the RPD as a modification for the type of the attachment used (OT unilateral). [19]

Rigid precision attachments are designed to mechanically engage the abutment teeth so as to prevent muscular and gravitational forces from dislodging the denture during function. Unfortunately, rigid connectors apply lateral forces to the abutment teeth that are ultimately destructive through their torquing action. These attachments may be no less harmful to the abutment teeth than conventional clasps. The effect of this forces on the alveolar ridge bone dissipated through the saddle due to proper support from posterior supporting implant. [20]

By contrast, the passive, free-moving attachment dissipates destructive lateral forces, preventing their infliction on the abutment teeth. Although the partial cannot be dislodged during function, it can move in a vertical direction slightly to release the forces instead of passing along these forces to the abutment teeth. The result is physiologic stimulation of the abutment teeth and the edentulous ridges. Clinical experience has shown that this physiologic stimulation results in increased longevity of the abutment teeth, even when a few teeth are required to carry the load of an entire arch. The stimulation of the edentulous ridge also prevents the bone resorption that typically reduces tissue support for the partial denture. The tissue under a well-fitting precision attachment partial is typically pink, healthy and firm. [21]

With the introduction of unilateral attachment, it was possible to restore distal extension areas without the need of cross arch extension. The support of RPD and its connection with fixed prosthesis generates cross arch stability throughout masticatory activity and permits function similar to that of fixed prosthesis. Use of stress attachment system minimizes the metal display which improves esthetics. [22]

CONCLUSION

Within the limitation of the results of this study, it could be concluded that using tooth implant supported partial overdentures retained by extracoronal OT unilateral attachments showed the same clinical effect on marginal bone loss when compared with tooth implant supported partial overdentures retained with telescopic crown retainers.

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