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Marginal bone level evaluation for combined tooth-implant retained Kennedy Class I Partial denture versus implant retained partial denture using extracoronal attachments

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ABSTRACT

Aim: This study was conducted to evaluate and compare marginal bone level for Tooth-implant supported Kennedy class I partial denture compared to implant supported Kennedy class I partial denture using extracoronal attachments. **Subjects and Methods :** Ten male partially edentulous patients (Kennedy class I) with the canines are the last standing abutments were selected and all patients were rehabilitated with metallic partial denture supported by osseointegrated implants one on each side of the arch positioned in the premolar area and were randomly divided into two equal groups according to type of abutments, Group I; Patients were rehabilitated with Tooth Implant Retained partial denture with extra coronal attachment, Group II; Patients were rehabilitated with splinted Implant Retained partial denture with extra coronal attachment on each side. Evaluation by measuring marginal bone level for last main abutments was made at the time of insertion, after 6 month, after 12 month and last after 18 month using radiographic evaluation. **Results:** Partial dentures retained by two splinted implants showed better non-significant difference in marginal bone loss as compared with tooth implant retained Partial dentures. **Conclusion:** Using tooth implant retained partial dentures shows better effect on supporting structure as compared compared with tooth implant retained Partial dentures.

KEYWORDS

Partial edentulism, tooth and implant connection, combination fixed partial dentures, bridges, dental implants

INTRODUCTION

The mutual usage of teeth and implants as anchors for prosthetic restorations remains a debatable issue for the restoration of partial edentulism.[1]Implants become osseointegrated and consequently have an unyielding connection to supporting bone, teeth are supported by the periodontal ligament, permitting for physiologic mobility. Complications such as breakage of mechanical parts and a higher frequency of caries at the crown margin and tooth intrusion have been designated. The use of both rigid and non-rigid connectors of different designs has been suggested to diminish these effects.[2,3]

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A study confirms that the stress-breaking action of the non-rigid connector, clarifying decrease of stresses within the implant by a factor of 24 when the force is applied on the tooth side. There are numerous reasons support the joining of teeth and implants. When the implant segments are not self-sustained, either because of inadequate number, very short implants or inadequate bone, it might be essential to construct a mixed prosthesis. Additional causes include financial concerns for extra placement of implants and surgical augmentations in order to achieve completely implant-supported restorations. In addition, it is thought that the tooth will provide additional support for the restoration and increase the antirotational resistance of the screw joint. Finally, in periodontally compromised cases, the implants can provide stabilization of the teeth. [4,5]

Tooth-to-implant connection can be a rational treatment choice in certain clinical situations, but that rigid connection should be used with caution particularly when there are periodontal problems.[6] It has been stated that the usage of tooth-implant supported prosthesis significantly reduce mechanical problems hazard once compared to implant supported prosthesis. However these studies lack a long-term follow-up period. Excessive loading on implants and/or the supporting bone is risky. When implant components are exposed to excessive stress continuously, this phenomenon leads to affecting implant components or fracture of components due to metal fatigue ,The purpose of this article to investigate the connection of implants and teeth and recommend a design concept that can minimize biologic and technical complications

MATERIALS AND METHODS

Ten male partially edentulous patients (Kennedy class I) with the canines 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 arch positioned in the area of premolar area and were randomly divided into two equal groups according to type of abutments, Group I; Patients were rehabilitated with Tooth Implant Retained partial denture with extra coronal attachment, Group II; Patients were rehabilitated with splinted Implant Retained partial denture with extra coronal attachment on each side.

Surgical procedures for both groups

A. Pre-surgical preparation

Surgical stents were constructed (Fig.1)

A hole was drilled in the implant site corresponding to the premolar area in the preoperative Surgical stents

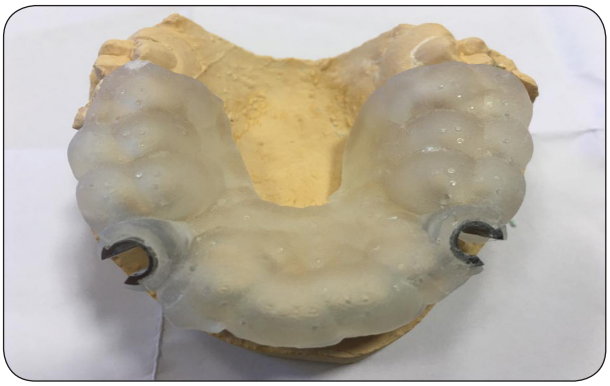

Fig. (1) Surgical stent

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 systemwere used. They are available in five diameters and five lengths ranging from 8 to 16 mms. The 10 mmlength and 3.75 mm diameter was used. . 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.

C. Surgical procedures for both groups

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. (Fig.2)

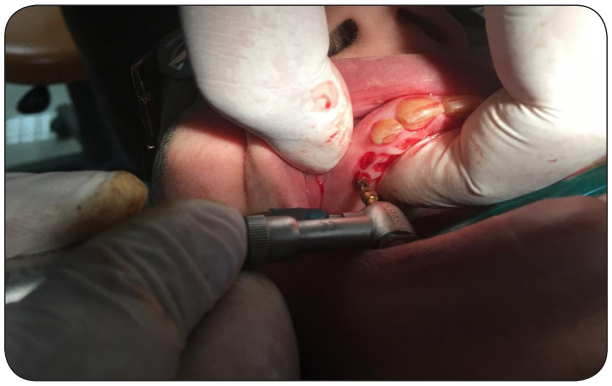

Fig. (2) Osteotomy with successive drills

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.(fig 3)

Fig. (3) Implant abutments in place

Prosthetic treatment

Preparation of the abutment teeth :

Primary impressions were made using alginate impression material in a suitable stock tray and poured in dental stone to obtain the primary casts on which individual trays were constructed on a 2mm spacer.

All teeth were prepared with a deep chamfer finishing line extend sub-gingivally (0.51mm) with sufficient occlusal (2-2.5mm) and circumferential reduction (1-1.5mm) to receive two full porcelain veneered crowns.

Gingival margin of the prepared abutments were retracted by retraction cord before impression making.

Putty impression was made. Dual impression was carried out in the conventional manner.The prepared abutments were protected by readymade temporary crowns which were cemented using temporary cement .The impression was then washed, inspection and poured in extra-hard dental stone

The obtained cast was sawed to obtain separate removable dies for the prepared abutments. The dies were indicated by ditching and the wax patterns of both crowns were built-up and the unilateral OT attachments was added to wax pattern . The dies were replaced on the cast which was placed on the table of the milling machine .The framework was waxed,sprued, flasked and processed into metallic framework

Centric occluding relation following the inter-occlusal wax wafer technique was made and a try in stage was made successfully.and final pickup impression were done fig 4,5

Fig. (4) Try in for framework

Fig. (5) Pickup impression

Radiographic evaluation

- Cone beam C.T. were developed and image processed.
- A line tangential to the apex and perpendicular to abutments long axes 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. (Fig. 6)
- 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.
- Data were collected for all patients at different follow-up intervals. Data were tabulated and statistically analyzed.

Fig. (6) Radiographic evaluation

RESULTS

Table (1)

Relation in marginal bone level between abutments in RPD with ***tooth implant retained*** RPD with ***splinted implan***t abutments retained RPD :

Treatment modality	RPD with ***tooth implant connection***		RPD with ***splinted implan***t abutments retention		**P-Value**
	(Group I)		(Group II)		
Time	**Mean**	**S.D.**	**Mean**0.37	**S.D.**	
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.

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. [11]

In this study the mean values for the amount of marginal bone loss around the abutments teeth in group I RPD with ***tooth implant connectio***n group was 1.94 mm while in group II RPD with ***total implan***t abutments retention group was 2.38 mm, twelve months after wearing the partial denture. 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 tooth implant abutments. 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 RPD with ***total implan***t abutments retention group which produce stresses on the crestal bone due to absence of periodontal ligament around implant fixture and load concentration in the crestal area [(11)]

Marginal bone loss around 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 two splinted implants 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 [(12)]

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 torqueing 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 periodontal ligament for group I in addition to saddle area. [(13)]

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. [(14)]

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**.** [(15)]

CONCLUSION

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

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مقارنة تقييم مستوي هامشي للعظام للاطقم الجزئيه كينيدي التصنيف الاول المدعمه بالزرعات مقابل المدعمه بالاسنان والزرعات معا

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الملخص :

الهدف: الغرض من الدراسة محاولة مقارنة تقييم مستوي هامشي للعظام للاطقم الجزئيه كينيدي 1 المدعمه بالزرعات مقابل المدعمه بالاسنان والزرعات معا.

المواد والاساليب: تم وضع غرسات في10 مرضي يعنون من فقد اسنان الخلفيه علي الجانبين حتي الناب ثم تم وضع غرسات لكل مريض في موضع الضواحك لتقييم معدل البقاء من وقت وضع الاستعاضة والمتابعة لمدة 6 اشهرو نسنه وسنه ونصف بعد وضع الغرسات.

النتائج: لايوجد فرق أحصائيا في مستوي العظام الهامشي باستخدام للاطقم الجزئيه كينيدي 1 المدعمه بالزرعات مقابل المدعمه بالاسنان والزرعات معا.الخلاصه: استخدام الغرسات السنيه يساعد فى دعم للاطقم الجزئيه كينيدي 1.

الكلمات المفتاحيه: طقم اسنان جزئى, اتصال بين السنه وزرعات السنيه, طقم اسنان جزئى مدعوم, كبارى مثبته