

COMPARATIVE STUDY BETWEEN TWO TYPES OF ATTACHMENTS USED FOR ROOT-SUPPORTED OVERDENTURE

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ABSTRACT

INTRODUCTION: The incorporation of attachments in overdentures into everyday dental practice will open up another dimension in dental treatment planning and patient satisfaction. Teeth that might be considered for extraction may be considered as long or short term alternatives to implant or total edentulousness. Some teeth are maintained to support and/or retain the prosthesis and therefore, maximizing prosthesis stability, besides preserving proprioception of the periodontal ligament and reducing bone loss. Tooth-supported overdentures can be retained with attachments and can improve both retention and stability while simultaneously reducing alveolar bone resorption. They may also be more cost-effective and maintain more dental proprioception than implant-supported overdentures.

OBJECTIVES: To compare clinically and radiographically between flex pivot (precision attachment with flexible male sphere) and castable pivot (semiprecision attachment) used for root-supported overdenture.

MATERIALS AND METHOD: This randomized parallel controlled clinical study was conducted on twelve patients having bilateral mandibular single rooted teeth; canines or first premolars. Those were divided into two groups of six subjects. **Group A** (study group) each of six patients received flex pivots (precision attachment with flexible male sphere) bilaterally as test group. **Group B** (control group) six patients received castable pivots (semiprecision attachment) bilaterally as control group.

RESULTS: When the data of changes in the clinical and radiographic parameters of periodontal status over a 6 months period were compared at immediate post-treatment, 1, 3, and 6 months intervals relative to type of attachment, the findings revealed there were no significant differences among precision attachment group in most of the mean values, while the opposite was shown in semiprecision attachment.

CONCLUSIONS: Precision attachment with flex pivot was associated with more superior clinical periodontal parameters than precision attachment, and it is more biocompatible, hygienic, and maintaining healthy, stable periodontal soft tissue and crestal alveolar bone level.

KEY WORDS: root, overdenture, precision, semiprecision, attachment.

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INTRODUCTION

The loss of teeth is generally associated with esthetic, functional, psychological and social impairment of the individual's life which may have a high impact of the patient's self-esteem and health (1,2).

In addition to the rehabilitation alternatives of partially or completely edentulous patients such as the use of dental implants, fixed prosthesis, removable partial or complete dentures, the overdenture offers a viable and simple alternative and has been demonstrated to be efficient in these clinical situations (3,4). The literatures reported that the use of selected teeth in strategic positions can greatly improve the final treatment result in terms of overdenture stability and retention (5, 6).

The preservation of roots is an effective way to improve prosthesis support, and it also preserves proprioception of the periodontal ligament and reduces bone loss (7-9). The utilized root can or can't be associated with retention systems (10, 11).

These alternatives offer the patient a more comfortable prosthesis, especially in the mandibular arch rehabilitation where achievement of functional requirements of the complete dentures with respect to retention, support and stability are limited (12).

One of the most important requirements to the success of overdentures is the patient's awareness of their need to

improve oral hygiene of the remaining roots used for support and/or retention (13, 14).

Another important factor is the retention system chosen. Usually, the choice of the retention system is determined according to number, distribution and location of the remaining natural teeth or according to some clinical individual experience (15, 16).

Jayasree et al (10) reported the use of resilient stud attachments to retain maxillary and mandibular overlay complete dentures. these stud attachments (Rhein 83, Bologna, Italy) consist of patrix (a sphere with a flat head) available in preformed plastic patterns which cast to copings on abutments, and matrix (Elastic rubbers) made of nylon and Teflon available in different colours corresponding to different retention degrees, both in normal and micro sizes.

Rhein's stud attachments were commonly used due to their simplicity in design, ease in maintenance and minimum leverage. The supra-radicular attachments (self-locating design) allow patients to seat their overdenture easily without the need for accurate alignment of the attachment components. The technical work required is minimal and can be carried out at chairside, thus making it cost effective (8, 17).

The current study was aimed to compare clinically and radiographically between flex pivot (precision attachment with flexible male sphere) and castable pivot

(semiprecision attachment) used for root-supported overdenture.

MATERIALS AND METHOD

This study was performed after the approval of research ethics committee, Faculty of Dentistry, Alexandria University, and informed consent form was signed from each patient after discussing oral and written explanation of the treatment plan.

This randomized parallel controlled clinical study was conducted on twelve patients having bilateral mandibular single rooted teeth; canines or first premolars who were selected from the diagnostic clinic of Prosthodontic Department, Faculty of Dentistry, Alexandria University.

The participants were selected to be physically healthy enough to clean their own retained teeth, with adequate bone support for the abutments not less than two thirds of the root length, and without gingival inflammation. Also, patient should attain and maintain good oral hygiene with adequate interarch space to allow overdenture placement on the abutments. But, patients with systemic diseases or disorders affecting bone quality, and patient having bad oral

hygiene, or having oral habits were excluded from the study.

Prior to any treatment approach, every patient was thoroughly assessed regarding both dental and medical status. For that, all the following were done for all patients: Medical and Dental history, thorough intraoral and extraoral clinical examination, and radiographic examination using intraoral periapical radiograph and Orthopantomograph (panoramic radiograph) to evaluate bone support surrounding the abutment teeth.

Those Selected 12 patients were equally divided into two groups of six subjects, and two types of attachment were applied:

Group A (study group) each of six patients received mandibular root supported overdenture with bilateral flex pivot (precision attachment with flexible male sphere) (Rhein 83, Bologna, Italy). (Figure 1 a)

Group B (control group) six patients were assigned to receive mandibular root supported overdenture with bilateral castable pivot (semiprecision attachment) (Rhein 83, Bologna, Italy). (Figure 1 b)

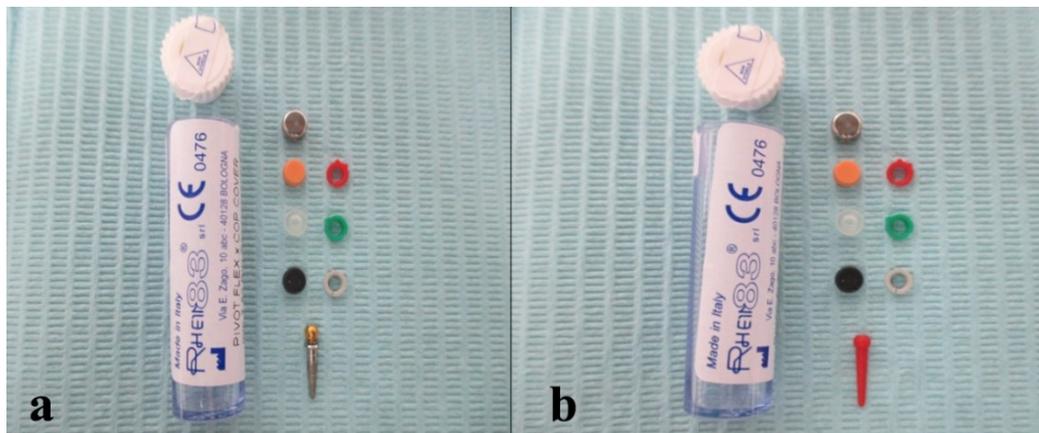


Figure (1): Rhein's overdenture attachment system including pivot post, OT Caps, and directional rings. (a for group A with titanium flex pivot post, and b for group B with Castable Acrylic posts).

The Patients participating in this study were within a range from 48 to 87 years of age, and were treated with maxillary complete denture opposed by a mandibular root supported overdenture.

Preprosthetic phase was conducted for every patient by performing a thorough oral prophylaxis including scaling and root planning with oral hygiene instructions and motivation for plaque control. Preliminary impressions of maxillary and mandibular arches were made using irreversible hydrocolloid impression material (Cavex, Netherlands). Then the primary (study) casts were obtained from pouring the impression and were used to get self-cure acrylic resin (custom) special trays.

The abutment teeth were prepared by doing intentional root canal treatment. Then clinical crown portions of future overdenture abutment teeth were reduced approximately to the level of adjacent gingival margin or 1.5 to 2.0 mm coronal to it.

Abutment teeth were treated with topical fluoride gel application (Ionite APF gels, DHARMA, USA).

Prosthetic phase was started by making border molding for all trays of both arches with low fusing green stick compound (Tracing Sticks, Pyrax Dental Mart.in, Uttarakhand,India). For the maxillary arch, the final

impression was made with ZOE impression paste (Cavex, Netherlands).

Preparation for the post space was performed inside each root abutment by removal of some of the gutta-percha, and flaring up root walls was done by low speed peso reamers drills (MANI Peeso Reamers, JAPAN). For group A, a mooser bur (Rhein 83, Bologna, Italy) was used to prepare the canal for the calibrated optimum length and diameter of the ready-made titanium post. Preparation for the post was done at length about 2/3 of the root length. (Figure 2 a &b)

For castable semiprecision attachment (group B), a ready-made resin post with ball head (patrix) was inserted in the prepared root canal to be adjusted within the root canal for castable attachment impression. (Figure 3) The final pick up impression was made with putty and light body wash addition Silicone (Zetaplus and Oranwash L, Zhermack, Italy), and the cast was poured in Type IV extra hard dental stone.

Other resin post was adjusted with duralay inlay pattern resin (Reliance Dental Mfg Co., IL, USA) to fit prepared root canal on the cast. The related copings were waxed up with dome shape to cover the exposed part of the root and the extra pattern resin was trimmed off. (Figure 4 a)

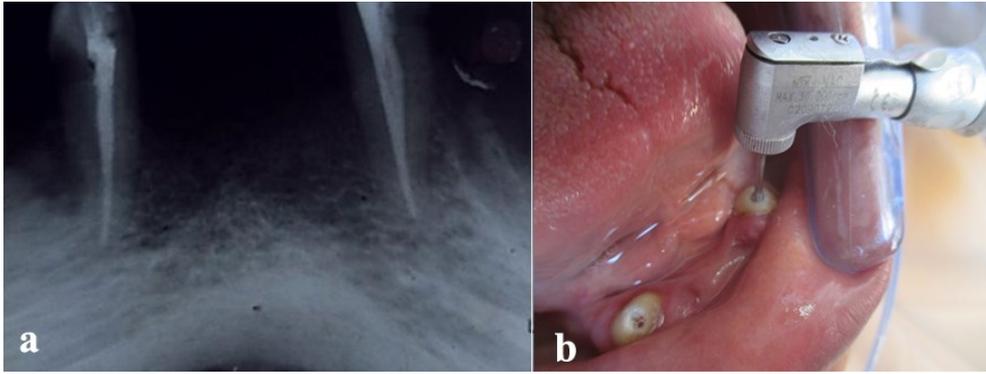


Figure (2): a. Radiograph showing endodontically treated mandibular cuspids. b. Gutta-percha removal and post space preparation using drill provided by the manufacturer for intra-radicular drilling conforming to the size of the attachment post.

The Wax patterns of coping, post and the attached sphere (patrix) were casted in cobalt chromium alloy (Wironit Co-Cr Alloy (BPD), Bego, Germany) by conventional burn out technique.

The fabricated post coping and patrix were tried in the patients' mouth in each abutment, and finally cemented with self cure bonding resin cement (se T, SDI, Australia). The thickness of the copings should not be more than 1 mm. (Figure 4 b)

After post space preparation, in group A, the prefabricated titanium flex pivot posts of precision attachment (Rhein 83, Bologna, Italy) were selected according to the appropriate size, then placed and checked. The selected Titanium posts were directly cemented with self cure bonding resin cement (se T, SDI, Australia) within the patient mouth. The lack of parallelism in the abutments was circumvented by using Rhein 83 directional rings. (Rhein 83, Bologna, Italy). (Figure 5)

Mandibular final impressions for both groups were made with regular body elastomer (Thixoflex M, Zhermack, Italy). Master casts were prepared by pouring the impressions in Type IV extra hard dental stone (Zhermack, Italy)

For both groups, trial denture bases were fabricated on the master casts with relief blockout around the attachment, and wax occlusal rims.

Maxillomandibular relations were recorded and transferred to the adjustable articulator (Whip Mix Model 8500, Louisville, KY, USA) following the face bow transfer of the maxillary record bases.

After acrylic teeth selection and arrangement, the trial dentures were evaluated in the patient's mouth for phonetics, and esthetics. The trial dentures were flaked, packed, cured, finished and polished following the

conventional technique to get the final maxillary and mandibular dentures

To incorporate the attachments into the denture base, spacers were used to prevent excess acrylic resin from engaging any undercut. Then, the matrix component retention caps for each type were placed over their related posts over the abutments. Each denture was inserted over matrix components and rechecked for any interference. The prosthesis was relieved until there was no interference and there was proper occlusion with even tissue contact.

Small amount of an autopolymerizing cure resin (Acrostone, Egypt) was luted in relieved area related to the attachment at the denture base, and the dentures were seated in the mouth and were allowed to set chairside. The patients were asked to bite gently on the denture to confirm the correct seating.



Figure (3): Ready-made acrylic resin posts in position for Indirect final pick up mandibular impression after tooth preparation for castable attachment fabrication (Group B)

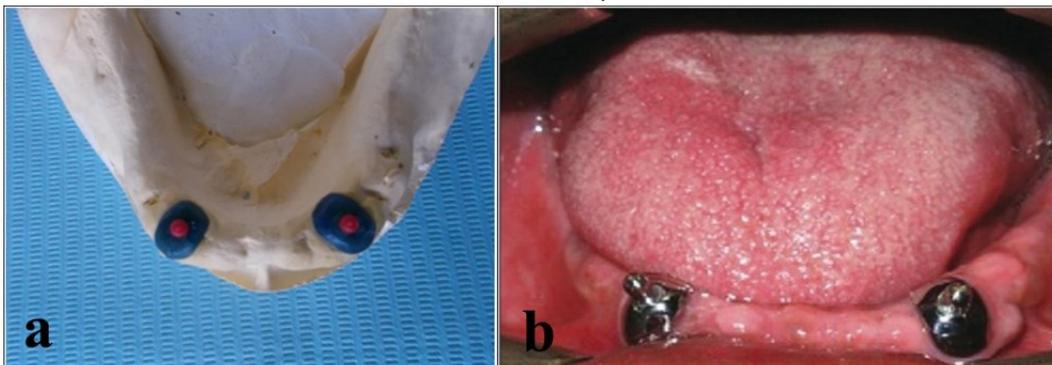


Figure (4): a. Wax patterns were prepared on the cast for castable attachments fabrication. b. Semiprecision Attachments with coping s were tried and checked for fit, and then finally cemented on patient abutments teeth.



Figure (5): Directional rings were placed to correct and accommodate the divergent angles of the roots.

After the resin was set, the denture base was removed, and the tissue surface was observed to evaluate the successful transfer of the matrix attachment process. The excess material from the access openings was removed, and the surface was then finished and polished. Rubber spacer was removed. The fitting surface of the denture was always relieved around the marginal gingiva. Finally, the dentures were delivered.

Post insertion instruction and oral health motivation were given to the patients.

Appropriate maintenance care was performed for the dentures, abutments, and soft tissues during frequent recall appointments.

Follow-up and evaluation : Participants were evaluated clinically at time of post immediate denture insertion to establish standardized baseline measurements, then after 1, 3 months, and 6months intervals, and radiographically immediately after denture insertion and six months later. Both clinical and radiographic parameters were measured and assessed as follows:

- 1. Plaque index (PI)** as developed by *silness* and *l e* (18) assesses the thickness of plaque at the cervical margin of the tooth. Four areas were examined; distal, labial, mesial, and lingual.

Four different scores are possible:

0= No plaque present in the gingival margin and adjacent area of the tooth.

1= Presence of a film of plaque adhering to the free gingival margin and adjacent area of the tooth.

2= Moderate accumulation of plaque or soft deposits in the gingival pocket or on the tooth surface which could be seen by the naked eye.

3= Abundant plaque or soft material within the pocket or on the tooth surface.

- 2. Clinical attachment level (CAL)** (19) Clinical attachment level refers to the distance from the cement-enamel junction CEJ to the apical extent of the probe penetration. It was measured by a periodontal prober on the six sites of tooth surfaces; distolabial, labial, mesiolabial, mesiolingual, lingual, and distolingual. Same way of measurements as pocket depth, 1mm or less was recorded as 1mm, measurements exceeding 1mm but less than 2mm were recorded as 2 mm, etc...

It is important to note that the measurements were taken from the coping margins as a reference point rather than the cemento enamel junction (CEJ), due to the fact that the canines were covered by the permanently cemented primary copings, concealing the CEJ, or sides by **measuring** the distance from the coronal part of abutment tooth as references points in cases without coping as in group A.

- 3. Radiographic evaluation**

Standardized radiographs were made using cone beam computed tomography (CBCT) (Veraviewepocs 3D R100, **J. Morita**, California, **USA**) to evaluate the abutments bony support (20). The levels of alveolar bone around each abutment were assessed at both mesial and distal sides by **measuring** the distance from the highest coronal level of bone tooth contact to the coping abutment interface for group B, or to the most occlusal part of abutment as references points in cases without coping as in group A. Measurements were made immediately at time of overdenture insertion as initial record and six months later as final record to estimate the amount of bone loss. (Figure 6 a,b)

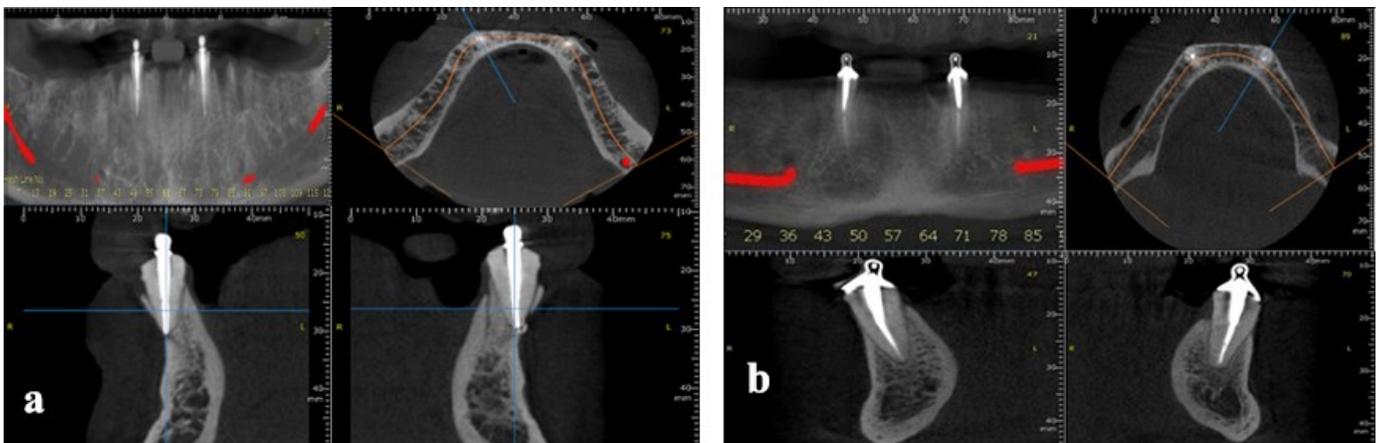


Figure (6): CBCT radiograph. a for group A, and b for group f B.

RESULTS

Table (1) showed a comparison of the mean values of plaque index scores of the abutment teeth among the two studied groups at all the follow up periods.

The abutment teeth of study group with precision attachment (group A) showed statistically significant increase of plaque index after 3 month and 6 months, but after one month of denture use, there was no statistical significant difference with p values of 0.023, 0.001 and 1.00 respectively.

The same observations of the significant increase of plaque index scores by root supported overdenture using semiprecision (group B) especially after one month, 3, 6 months of denture use with p values of 0.004, 0.001, and 0.001 respectively.

By comparing the mean values of plaque index scores of control group (group B) were slightly higher than those of study group (group A), and however, the score 1 remained as maximum limit.

There were statistically significant differences of plaque indices between the two groups after 1 month, 3months, and 6 months periods of denture use with the p-values of 0.002*, 0.004*, <0.001* respectively. It was noted that, in spite of statistical significance increase of plaque index at most of the follow up periods, all the mean values were less than score (1). Which indicated healthy parameters.

Table (1): Comparison of plaque index between the two studied groups at all follow-up periods

Plaque Index	Baseline at immediate post insertion	After			F _p
		1Month	3 Months	6 Months	
Precision (n=12) Group A					
Min. – Max.	0.0 – 0.0	0.0 – 0.0	0.0 – 0.50	0.25 – 0.75	<0.001*
Mean ± SD	0.0 ± 0.0	0.0 ± 0.0	0.21 ± 0.23	0.48 ± 0.13	
Median	0.0	0.0	0.13	0.50	
P _{Baseline}		1.000	0.023*	0.001*	
Sig. bet. Periods		p ₁ =0.023*, p ₂ =0.001*, p ₃ =0.010*			
Semi Precision(n=12) Group B					
Min. – Max.	0.0 – 0.0	0.0 – 0.25	0.25 – 0.75	0.75 – 1.0	<0.001*
Mean ± SD	0.0 ± 0.0	0.15 ± 0.13	0.50 ± 0.15	0.85 ± 0.13	
Median	0.0	0.25	0.50	0.75	
P _{Baseline}		0.008*	0.002*	0.002*	
Sig. bet. Periods		p ₁ =0.004*, p ₂ =0.001*, p ₃ =0.001*			
P _t	1.000	0.002*	0.004*	<0.001*	

Sig. bet. periods was done using Wilcoxon signed ranks test
 F_p: p value for Friedman test for comparing between different studied periods in each group
 P_{Baseline}: p value for comparing between Baseline at immediate post insertion and each period
 p₁: p value for comparing between after 1 month and 3 months
 p₂: p value for comparing between after 1 month and 6 months
 p₃: p value for comparing between after 3 month and 6 months
 p_t: p value for Mann Whitney test for comparing between each two groups
 *: Statistically significant at p ≤ 0.05

The mean values of clinical attachment level (CAL) of periodontal tissues of studied abutments in (mm) at all follow up periods during six months of denture wearing were shown in table (2)

Generally, there was very slight increase in the mean values of clinical attachment level from baseline to the end of all follow up periods but this increase was insignificant when comparing the baseline at immediate post insertion and each period with p values = 0.339, 0.051, 0.132 respectively.

Likewise, The abutment teeth of study group with precision attachment (group A) showed statistically significant difference of clinical attachment level when comparing between after 1 month and 3 months with p₁=

0.047*, however, there was statistical insignificance when comparing between after 1 month and 6 months, and after 3 month and 6 months periods of denture use with p value: p₂= 0.119, p₃= 0.339 respectively,

Meanwhile, the abutment teeth of the control group (group B) with semiprecision attachment showed statistically significant increase in the mean values of clinical attachment level from baseline at immediate post insertion throughout all periods of follow up. Therefore, the mean values of CAL increased from 1.13 ± 0.13 at baseline to 1.51 ± 0.08 after 1 month, to 1.54 ± 0.05 after 3 months, and to 1.64 ± 0.09 with p values= <0.001* .

However, The abutment teeth of study group with precision attachment showed statistically insignificant difference of clinical attachment level when comparing between after 1 month and 3 months at p₁=0.104, whereas, there was statistical significance when comparing between after 1 month and 6 months, after 3 month and 6 months periods of denture use with p value: p₂= 0.001* , p₃= 0.001* respectively.

Table (2): Comparison of the clinical attachment level between the two studied groups at all the follow up periods

Clinical attachment loss	Baseline at immediate post insertion	After			F _p
		1Month	3 Months	6 Months	
Precision (n=12) Group A					
Min. – Max.	1.0 – 1.33	1.0 – 1.33	1.0 – 1.50	1.0 – 1.50	0.023*
Mean ± SD	1.10 ± 0.13	1.09 ± 0.13	1.18 ± 0.20	1.16 ± 0.21	
Median	1.0	1.0	1.08	1.0	
P _{Baseline}		0.339	0.051	0.132	
Sig. bet. Periods		p ₁ =0.047*, p ₂ =0.119, p ₃ =0.339			
Semi Precision(n=12) Group B					
Min. – Max.	1.0 – 1.30	1.30 – 1.60	1.50 – 1.60	1.60 – 1.83	<0.001*
Mean ± SD	1.13 ± 0.13	1.51 ± 0.08	1.54 ± 0.05	1.64 ± 0.09	
Median	1.16	1.50	1.50	1.60	
P _{Baseline}		<0.001*	<0.001*	<0.001*	
Sig. bet. Periods		p ₁ =0.104, p ₂ =0.001*, p ₃ =0.001*			
P _t	0.530	<0.001*	<0.001*	<0.001*	

Sig. bet. periods was done using Post Hoc Test (LSD) for ANOVA with repeated measures
 F_p: p value for (ANOVA) with repeated measures for comparing between different studied periods in each group
 P_{Baseline}: p value for comparing between Baseline at immediate post insertion and each period
 p₁: p value for comparing between after 1 month and 3 months
 p₂: p value for comparing between after 1 month and 6 months
 p₃: p value for comparing between after 3 month and 6 months
 p_t: p value for Student t-test for comparing between each two groups
 *: Statistically significant at p ≤ 0.05

The comparison of the mean values of clinical attachment level between study group with precision attachment and control group with semiprecision attachment showed that there was statistically insignificant difference in CAL values of both groups at immediate post insertion baseline, moreover, there was statistically significant increase in CAL values of semiprecision attachment group throughout other study follow up periods at (P value<0.001*). p ≤ 0.05.

Radiological evaluation of the the level of alveolar bone height around each abutment tooth was recorded immediately after overdenture insertion, and six months later (table 3). There was mild change in the level of alveolar bone height has occurred during this period of denture use for both groups, but it was higher around the abutments with semiprecision attachments (group B) where the mean values changed from 2.62 ± 0.31 immediately at denture insertion to 2.94 ± 0.42 after six months period of follow up, and there was statistically significant difference at p value = <0.001* . However, for

the precision attachment, the mean values of alveolar bone level change very slightly with the same standard deviation, and therefore, there was no statistical difference between the mean values of base line at denture insertion and after six months period of denture use for the abutment teeth with precision attachments.

Table (3): Comparison of alveolar bone height level between the two studied groups.

Level of alveolar bone height ABH	Precision (n=12)	Semi Precision (n=12)	p
Baseline at immediate post insertion			
Min. – Max.	2.29 – 2.90	2.31 – 3.12	0.504
Mean ± SD	2.69 ± 0.17	2.62 ± 0.31	
Median	2.68	2.52	
After 6 Months			
Min. – Max.	2.31 – 2.91	2.62 – 3.62	0.073
Mean ± SD	2.69 ± 0.17	2.94 ± 0.42	
Median	2.68	2.75	
p	0.723	<0.001*	

p: p value for Student t-test for comparing between the two studied group

p: p value for Paired t-test for comparing between Baseline at immediate post insertion and After 6 Months

*: Statistically significant at $p \leq 0.05$

DISCUSSION

It is well known that the retention of the natural teeth, even of doubtful prognosis, or roots can reduce the rate of alveolar bone loss (21).

With the preservation of the teeth, there is also preservation of sufficient periodontal proprioceptive receptors impulses to provide better occlusal awareness, biting forces and neuromuscular control. A major premise of tooth supported overdenture treatment is to transfer occlusal forces along the long axis of the supporting tooth, to minimize the horizontal torque and to allow for a more optimum situation for periodontal ligaments (22).

The purpose of this study was to compare clinically and radiographically between flex pivot (precision attachment with flexible male sphere) and castable pivot (semiprecision attachment) used for root-supported overdenture.

The conditions of abutments were evaluated clinically through absence of mobility in all directions, and absence of any signs of pain or gingival inflammation. Preoperative panoramic and periapical radiographs were made for all patients to show the height and the amount of bone support in the areas of prospective abutment, crestal bone height, the width of periodontal ligament space, continuity of the lamina dura, the presence of periapical lesions, crown/root ratio and root length and form and any clinically undetectable pathology or bone abnormality. Bone level was not less than two thirds of the root length, to provide good support for the prosthesis (23).

To conduct this study, the anterior mandibular alveolar ridge with bilateral cuspids or bicuspid was selected for root supported overdenture construction because it appears to be most vulnerable to time-dependent occlusal stresses. Cuspids and/or bicuspid are regarded as the best overdenture abutments as supported by clinical experience which recommend at least one tooth per quadrant, and an even distribution of abutments in each quadrant of the arch is preferable for better stress distribution, and for increased retention and stability of the prosthesis (24).

The canines were selected for this study as it is considered that canines are most often retained, due to the fact that the size, shape, and length of their roots, and their strategic position at the corners of the dental arch which made them appropriate teeth for support. They have a relatively large root surface, with great periodontal attachment and also a wider attached epithelium (25).

In the majority of cases, they are the last remaining teeth in the lower jaw, and because they are single rooted, successful endodontic treatment easily performed. Moreover, canine was considered the most sensitive of all oral structures and the most important proprioceptive organ (26).

First premolars were suggested as alternative to canines, because they were single rooted also, and their position is next to canines, so they can be considered in strategic position (27).

The abutment teeth were endodontically treated as the root canal therapy is a necessary phase of preparation for the selected teeth; single rooted or double rooted teeth with readily accessible canals are preferred. The remaining crowns of endodontically treated abutment teeth were flashed with the gum margin or 2 mm above it, and the roots were prepared to 2/3 of its length that to accommodate extraradicular attachments with intraradicular posts without future interference with suprastructures construction as recommended by previous studies (28).

In study conducted by Arafa in 2016 (29), the findings showed that there were significant increases in attachment loss over time in non-vital teeth as compared to vital teeth.

The patients were examined for the following clinical periodontal parameters; Plaque index (PI), and Clinical attachment loss (CAL) at time of overdenture insertion, and on interval of 1, 3, 6 months, to indicate the mucosal and periodontal health around the abutment teeth. The level of alveolar bone around each abutment was evaluated immediately at time of overdenture insertion and 6 months later, using cone beam computed tomography (CBCT).

The current study was conducted using plaque index in order to assess the gingival status around the abutment throughout the follow up period of study. This plaque index was selected to be as the consensus of researchers of several longitudinal studies indicates that periodontal disease is a continuing problem with patients who wear overdentures and that only effective plaque control can maintain the health of the overdenture abutments (30).

It was noted that, in spite of statistical significance increase of plaque index at most of follow up period, all the mean values of the plaque (PI) indices scores of abutment teeth in both groups were less than score (1) after the prosthesis has been delivered and during all follow up periods, which were considered to be clinically insignificant and accepted.

However, there were no statistically significant differences between study and control groups. However, the means of indices were slightly higher around precision attachment. Semiprecision attachments are often used in overdenture construction by either connecting the attachments to cast abutment copings or connecting into the prepared post space of the abutment teeth. Protective abutment coverage with copings is recommended. In the control group, abutments were covered with protective

cobalt chromium copings. Cobalt chromium alloy is biocompatible and hygienic metals (31).

It was concluded that the precision attachment has lower affinity for plaque adherence, so it was more hygienic. Such results would be attributed to the proper inclusion and exclusion criteria for patient selection and the stringent oral hygiene regimen implemented throughout follow-up period of the study in conjunction with meticulous oral examination.

Regarding clinical attachment loss, the measurement of the attachment level may be assessed with acceptable accuracy on millimeter scale by probing, provided that all measurements are related to a fixed reference point as recommended by Toolson, and Smith (32).

Clinical attachment loss was measured from the most occlusal part of the abutment as found by Ramfjord (33), and Budtz J and Thylstrup (34). In the current analysis, result showed statistically insignificant change in CAL around abutment teeth in study group with precision attachment. While, there was statistically significant difference between the scores of different follow up periods in control group with semiprecision attachment. The comparison of the results between the two groups showed statistically significant difference in favor of precision attachment slightly due to higher scores of CAL were found around abutment teeth with semiprecision attachment and coping. The results indicated that the precision attachment with titanium flex pivot maintained a very stable and healthy soft tissue around the teeth. This could be explained by better biocompatibility and better clinical hygienic behavior of precision attachment. These results may be due to the meticulous daily plaque control program that was performed by all patients.

These findings were in agreement with Graser and Caton (35), and Toolson and Smith (32), who concluded from their work on a bare root overdentures that there were no significant change of pocket depth or the width of attached gingiva after 1 and 5 years, respectively.

Furthermore, Ettinger, and Qian (36) in the 42 months of the study, found that pattern of attachment loss did not change over 3 consecutive recalls for 53 persons, who returned, after baseline measurement, at 6 to 18 months, 19 to 30 months, and 31 to 42 months. They confirmed that the attachment loss may be reduced by more frequent recalls, denture maintenance to reduce movement, and better home oral hygiene care.

In the current investigation, measurements of mesial and distal bone height were made on abutments using CBCT at the time of denture insertion and after 6 months.

This imaging modality had many advantages including lower radiation doses than traditional CT and the possibility of individualized, standardized, and overlap free reconstructions. CBCT has also shown an absence of distortion and the dimensions it presents are compatible with the actual size for dental and periodontal structures (20).

When comparing study group and control group, radiographic interpretation showed that there was statistically insignificant difference of mean alveolar bone level around abutment teeth at the end of follow up period in control group. Several articles have speculated on the proprioceptive role of the periodontal ligaments in the patient treated with overdentures (37). It may be hypothesized that proprioceptive feedback mechanism for

the sensory input from the periodontal ligaments of the teeth under an overdenture acts as guidance to signal against a physiologic overload of the system and thus prevents bone resorption as found by Pacer and Bowman (38) who studied occlusal force discrimination by denture patients.

These findings can be related to that overdenture with precision attachment transmitted loads evenly along the long axis of the tooth. Consequently, contributed to elimination of the most stresses induced by overdenture, and aided in preservation of more alveolar bone around the natural teeth under overdenture than in semiprecision attachment. Resilient attachments permit vertical movement during mastication reducing stress transfer to the abutments (stress breaking function) and direct the forces to the residual ridge acting as stress redirectors (17).

Meanwhile, there was statistically significant difference in the levels of alveolar bone heights in case of semiprecision attachment. The observed findings were consistent with current knowledge of acceptable clinical values for post treatment bone loss as reported previously that there were no significant differences between the initial alveolar bone levels surrounding the preserved roots and the levels after different longitudinal periods of observation (39).

From all analyses of both groups, it could be concluded that using precision attachment with flex pivot support denture, as demonstrated in the current study, is a viable method that is suitable for implementation in dental practice.

CONCLUSION

Within the limitation of this study, and based on the results of the present study, it was concluded that Precision attachment with flex pivot is associated with more superior clinical periodontal parameters than precision attachment. It also has lower plaque adherence affinity, and it is more biocompatible and maintaining healthy, stable periodontal soft tissue and crestal alveolar bone level.

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

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