

Effect of Three Different Clasp Designs on the Abutment Tooth Supporting Structures

Khalid Ahmad Omar Arafa

Associate Professor of Prosthodontics, Dean, Faculty of Applied Medical Sciences, Albaha University, P.O. Box: 1988 Al-Baha, Saudi Arabia
drkhalidarafa@yahoo.com

Abstract: Three different designs of clasp (RPI clasp, wrought wire clasp and RPL clasp) designed for distal-extension removable partial dentures (RPDs) were evaluated in Kennedy category I patients' mouths. The assessment enclosed the gingival index, quality and epithelial attachment loss of the abutments once loaded on a free-end RPD occlusal surface. The abutment movement of the 3 styles of retainers was all among the 'mobile ability area' except the molded wire clasp. The best tooth movement was determined with the molded wire clasps, followed by RPL clasp. From the analysis the following was concluded that, the different clasps do influence the occlusal load distribution.

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1. Introduction:

Removable partial dentures (RPD) for partially edentulous patients is for restoration of oral function, preservation of remaining oral structures, and prevention of many oral diseases to the greatest extent possible. However, after treatment with RPD, functional stresses transmitted from the artificial teeth to the abutment teeth and their supporting structures sometimes exceed the threshold of the physiological movements of the abutment teeth, then it is possible to speculate an increase in tooth mobility.(1-2) In other word, if the difference in displaceability of the supporting abutment teeth and soft tissues covering the residual ridge permit rotational movement when the force is directed especially on the distal extension denture base, which results as a harmful stress on the abutment tooth and the residual ridge. Several factors such as denture design, fit of the denture base and framework(3), occlusal considerations(4) and the morphology of the residual ridges(5-6) are known to be related to the efficiency of the RPD. In this study, the effect of three types of clasps on the abutment teeth movement and supporting structures were studied using mandibular bilateral distal extension RPD.

2. Materials and methods:

Selection of patients: 60 patients were selected according to the following criteria: 1- all patients were free from any systemic diseases. 2- All patients were class I Kennedy classification. 3- all patients had enough inter-arch space. Then were classified into three groups according to the clasp design. Group I: received RPI clasp design including mesial

rest - point of rotation which exerts a mesial force on the tooth, proximal plate - superior edge at bottom of guide plane to disengage during loading. Slightly lingual for reciprocation I Bar - 2.5 mm from gingival margin, crosses at right angles in a.01" undercut at the greatest M-D prominence to permit it to disengage during function. Group II: received wrought wire clasp, stainless steel wire and attached to the partial denture as the foundation of the clasp is soldered to the metal base of the saddle and so cowl the solder joint with the acrylate resin of the saddle. Group III: received RPL clasp composed from mesial rest, a proximal plate and L-par. The lower Bicuspid teeth (abutment teeth) in patients in the three groups were evaluated clinically according to the following indices, after 6 months of denture insertion and then after 12,17,24,30 and 36 months : 1- Gingival index (G.I.). 2- Epithelial attachment level. 3- Tooth mobility. Statistical analysis were performed to evaluate and compare the results of the different clasps and tabulated and included in this study.

3. Results:

Tables (I) and fig(1) showed the means and standard deviations of clinical evaluation scores and measurements, regarding the Gingival Index, for the three groups, after 6,12,18,24,30 and 36 months. The statistical analysis of the results showed a significant between the different groups after 6,12,18 months the RPL group lower than the anther groups. After 24,30,36 months the RPI firth group the lower significant different than the other two groups. changes in all parameters used to evaluate the supporting structures in the first 6 months.

Table (I): the means and standard deviations of the Gingival Index.

Groups	After 6 months		After 12 months		After 18 months		After 24 months		After 30 months		After 36 months	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Group I	0.62	0.32	0.83	0.41	0.90	0.58	1.22	0.79	1.24	0.80	1.50	0.85
Group II	0.44	0.21	0.63	0.56	0.93	0.65	1.46*	0.35	1.55*	0.65	1.74*	0.70
Group III	0.34	0.12	0.56	0.22	0.65	0.29	1.43*	0.64	1.64*	0.68	1.83*	0.72

*= Significant.

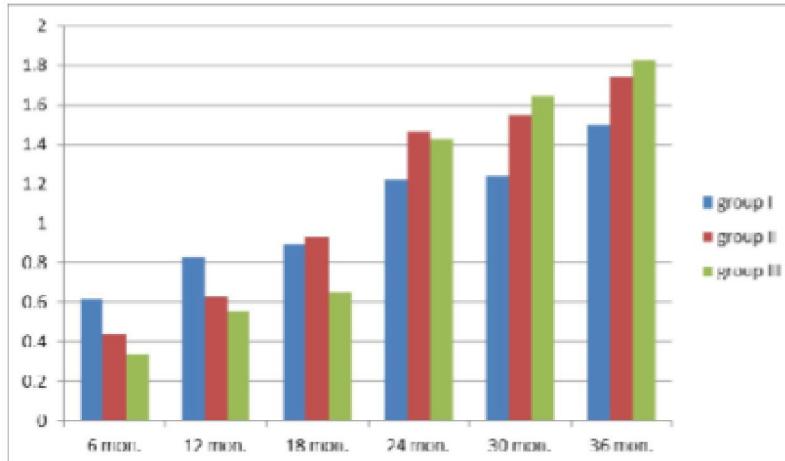
**Fig(1): the means value of the three clasp designs on the gingival index.**

Table (2) and fig(2) showed the means and standard deviations of clinical evaluation scores and measurements, regarding the epithelial attachment loss, for the three groups, after 6,12,18,24,30 and 36 months. The statistical analysis of the results

showed significant changes between the different groups after 6,,12,18 months, the RPI group lower than the other groups. After 24,30,36 months Group II showed the higher significant difference than the other two groups.

Table (II): the means and standard deviations of the attachment loss (mm).

Groups	After 6 months		After 12 months		After 18 months		After 24 months		After 30 months		After 36 months	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Group I	0.21	0.05	0.27	0.09	0.36	0.18	0.53	0.25	0.64	0.36	0.76	0.40
Group II	0.26	0.17	0.37	0.10	0.40	0.31	0.73	0.57	1.20	0.84	2.01*	0.99
Group III	0.24	0.13	0.36	0.08	0.40	0.31	0.62	0.47	0.82	0.66	1.03	0.78

*= Significant.

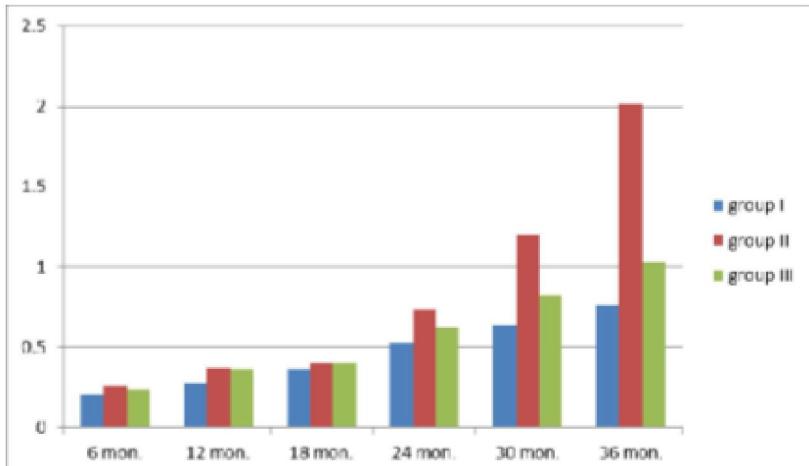
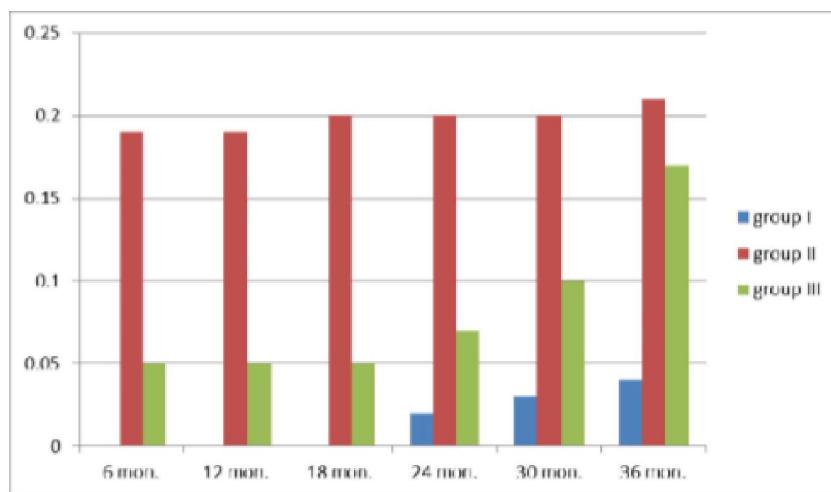
**Fig(2): the means value of the three clasp designs on the attachment loss.**

Table (3) and fig(3) showed the means and standard deviations of clinical evaluation scores and measurements, regarding abutment tooth mobility for the three groups, after 6,12,18,24,30 and 36 months.

The statistical analysis of the results showed that group II clasp had the most harmful effect on the abutment teeth and the RPI clasp had the least and minimum effect on the abutment teeth.

Table (III): the means and standard deviations of the tooth mobility scores.

Groups	After 6 months		After 12 months		After 18 months		After 24 months		After 30 months		After 36 months	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Group I	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.09	0.03	0.10	0.04	0.11
Group II	0.19	0.32	0.19	0.32	0.20	0.33	0.20	0.33	0.20	0.33	0.21	0.34
Group III	0.05	0.10	0.05	0.10	0.05	0.10	0.07	0.15	0.10	0.20	0.17	0.27



Fig(3): the means value of the three clasp designs on the abutment tooth mobility.

4. Discussion:

A lot of investigators (7,8,9,10,11,12) have been aimed at determining which design is most suitable for a clasp on the abutment tooth in RPD with the least mobility of the abutment tooth. However, the results were in conclusive and sometimes contradictory. Nally (8) demonstrated in his laboratory study that the mesial connection was always preferable if all displacements were taken into account. On the contrary, several studies (10,13) revealed that clasp assemblies had no significant influence of the movement of the abutment tooth. Thompson et al.(13) described that RPD resulted in distal torque of the abutment tooth regardless of clasp designs and that the magnitude was smaller at mesial rest than distal rest. Feingold et al. (10) reported conflicting results in their study concerning the direction and magnitude of the abutment tooth using the clasp designs with different occlusal rest positions. They concluded that the directional movement of the abutment tooth was not related to the occlusal rest position and the design of the clasp affected the magnitude of the movement of the saddle and the abutment tooth. Browning (14) revealed that,

there was no significant difference in the movement of the abutment tooth with three different clasp assemblies and that the abutment tooth moved buccally under the buccal loading and moved lingually under the lingual loading.

Conclusion:

From this study, we concluded that, the wrought wire clasp had the most damaging effect on the supporting structures of the abutment teeth followed by RPL clasp and the best design was the RPI clasp. This support the opinion that the simplicity of RPD clasp design and minimizing gingival coverage. The Gingival Index showed a significant gingival inflammation in the second and third groups after 24, 30 and 36 months. While there was no significant change in gingival index in the first group until the end of the study. There was no significant attachment loss in the first and third groups but there was a significant attachment loss in the second group after 36 months.

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