Effect of Using Implant In Kennedy Class II Cases Rehabilitated With OT CAP Attachment Retained Partial Denture

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Introduction

Removable partial dentures remain an essential prosthetic consideration in manyi conditions of oral rehabilitation, especially when the edentulous spaces posterior to the remaining teeth are to be restored. Functional successful prosthetic rehabilitation requires careful attention and meticulous treatment planning. Rehabilitation of partially edentulous arch can be challenging when it is a distal extension situation classified under Kennedy's class I and class II because a natural tooth retained fixed prosthesis cannot be fabricated. Implant retained prosthesis is an option but this is sometimes impossible due to insufficient bone or economic reasons.[1]

Different treatment modalities have been proposed for the management of distal extension cases. However, controversy exists about the most suitable line of treatment that can satisfy the patient's needs. The challenge in unilateral distal extension cases is even more than the bilateral ones. This is because in most of the cases restored with a conventional partial denture, the patient is not satisfied when comparing it with the intact side.

Various design concepts were suggested to solve the problem of unilateral distal extension cases, attachments are successfully used for retention of removable partial denture in distal extension cases compared with conventional clasps[2]. Attachments provide superior retention; support and they also distribute occlusal forces better to the supporting structures.[3]

Precision attachment is a connector consisting of two or more parts. One part is connected to a root, tooth, or implant and the other part to the prosthesis providing a mechanical connection between the two. These attachments allowed prosthesis to combine the advantage of fixed and removable restorations. Attachment retained removable partial dentures is a viable treatment alternative through which a significant number of patients could be benefited. [4]

The OT cap unilateral castable attachment from **Rhein83**[5] is specifically intended for unilateral, bilateral or implant bar applications without additional support from milled bracing arms.

OT cap unilateral's exclusive design features a two-in-one combination of 1.8 mm horizontal and vertical spheres. OT cap functions as a stabilizing retentive connector. In addition, for treatment plans which require resiliency, OT cap provides a "Cushion Effect" similar to a shock absorber. This is achieved by the design of the sphere in conjunction with the elastic retentive caps the design of the sphere with a flat head in addition to the spherical inner surface of the elastic cap, permits vertical movement during mastication. Rhein [5] female caps are manufactured out of a special nylon material that remains stable and continues to function in the oral cavity over long periods of time.

The introduction of osseointegrated implants changes the conventional approached of prosthetic rehabilitation of partially edentulous patients and created treatment options deemed impossible to achieve in the past[6]. Using posterior implants for support and retention

has been suggested to be one of the prosthetic options for treatment of the distal extension cases. [7]

By introduction of implants and using attachments, as a partial denture retainers. The question remains which of the proposed designs may provide optimum stress distribution on both ridge and abutments to minimize the problem of support and decrease bone resorption.

Review of Literature

The free-end removable partial denture (RPD) was considered the best standard for restoring missing teeth. It used to achieve primary stability, prevent tooth migration and restore patient occlusion, their main limitation is gradual ridge resorption due to pressure areas between the tooth-fibro mucosa and support system.[8-10]

The continual resorption of the residual ridge negatively impacts the stability, retention and support of RPDs, thus placing patients in a loop of continual change towards inferior stability and discomfort. Furthermore, bone loss on the alveolar ridge also modifies the occlusal conditions most notably in the distal- extension of RPDs, thus further contributing to bone loss by causing premature contacts and uneven occlusal forces.[11]

Posterior free end edentulous areas are more prevalent among population. Absence of posterior abutments to support and retain partial dentures affects the prognosis of prosthesis. Problems of support, retention and stability are usually associated with distal extension removable partial dentures (RPD) [12,13], so it requires planning following biomechanical design principles to obtain adequate support, retention and stability from both the ridge and abutments without eliciting any harm to the supporting structure [13]. It is important to restore masticatory function as well as preserve abutment teeth and residual ridge. The influence of occlusal factors on masticatory performance and the stability of the denture base should be considered [14,15].

Kennedy class II removable partial denture

Distal extension removable partial denture is defined as; "removable partial denture that is supported and retained by natural teeth anterior to the denture base and in which a portion of the functional force vector of the base is carried by the residual ridge". According to Kennedy's classification of removable partial dentures, Kennedy class II is a unilateral edentulous area located posterior to the remaining natural teeth.

I- Problems of Kennedy class II removable partial denture

Problems could be attributed to the absence of the posterior abutment. Since, the difference in displacement between the mucosa and the periodontal ligament of last standing abutment was estimated to be up to 25 times. Consequently, when functional pressure is applied to the distal extension base removable partial denture, the resultant forces are extremely damaging to the abutment teeth.[16-18]

The lower motivation to wear the RPD by patients has been attributed to patient personality, poor denture fit and adaptive capability.[19] It was suggested that for many patients, the perceived benefits of RPD use were not sufficient to tolerate the presence of the denture in the mouth.[20]

The problems of unilateral distal extension free end saddle cases can be expressed into; support, retention, bracing and stability.

1. Support:

The main problem associated with unilateral distal extension base removable partial dentures is support. The problem of support is mainly due to the nature of supporting structures, which arises from visco-elastic behavior of the mucosa and periodontal ligaments. These support of distal extension removable partial denture depends on two completely different tissues. The teeth represent a relatively immovable support, while the soft tissues covering the edentulous ridge have a variable degree of displaceability. [21)]

In Kennedy class II, the teeth permit movement around 0.1 mm while the mucosal tissue is between 0.4 and 2 mm, highlighting the need for a tension direction system in the planning of free-ends, as these differences cause a lever-action where the tooth will tend to lean towards the prosthetic space, with the fulcrum situated at the apical limit of its root. This situation will determine the compression of the periodontal fibres and the stretching of others, tooth mobility, bone loss, periodontal pockets and even the loss of the tooth. [(22)]

Movement of the distal extension base is generated as a result of multidirectional forces transmitted vertically, laterally and anteroposteriorly. These movements create detrimental cantilever forces on the abutment teeth and trauma to the residual ridge followed by ridge resorption.[(23)]

Many factors influence the support; this depends on the quality of the residual ridge, extent of residual ridge coverage by the denture base, type and accuracy of the impression registration, accuracy of the denture base design of the partial denture framework and the total occlusal load applied.[(24)].

It was emphasized that the main problem facing the prosthodontics in treatment of distal extension cases is how to distribute the functional stresses between edentulous ridge and the abutment teeth. To enhance support in such a case supporting elements must be distributed as widely as possible between the teeth and the residual ridge aiming to decrease the stresses on the abutment teeth [25]. It was stated that in tooth-tissue supported partial denture rests serve in transferring a portion of the functional load to the teeth, while the remainder of the load is absorbed by the residual ridge. Therefore, a partial denture design with multiple abutments and rests would be more stable.[26]

2. Retention

Retention of a removable prosthesis is a unique concern when compared with other prostheses. that quality inherent in the dental prosthesis acting to resist the forces of dislodgment along the path of placement; In general, the forces acting to move prostheses toward and across the supporting teeth and/or tissue are the greatest in intensity. This is because most often they are forces of occlusion.[27]

Direct retention: Retention obtained in a removable partial denture by the use of clasps or attachments that resist removable from the abutment teeth.[28]

Indirect retention: The effect achieved by one or more indirect retainers of removable partial denture that reduce the tendency for denture base to move in an oclussal direction or in a rotational path about the fulcrum line.[28]