“The effect of different impression techniques on the supporting structures of the lower Kennedy class I removable partial denture”

(In vivo study)

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بسم الله الرحمن الرحيم
إنا فتحنا لك فتحا مبينا
ليغفر لك الله ما تقدم من ذنبك
وما تأخر ويتم نعمته عليك ويهديك صراطا
مستقيما • وينصرك الله نصرا عزيزا •
صدق الله العظيم

Dedication and acknowledgement

To **Allah**, the Ever-Thankful, for His help and bless.

To **the soul of my Great father** .

To **my mother**; her unconditional love and prayers

encourage me to complete this thesis.

Deepest thanks go to all my beloved family for their

endless love and support.

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Introduction

Kennedy class I cases are characterized by bilateral edentulous areas posterior to the abutment teeth. The absence of the posterior abutment and the difference in the compressibility between the abutment and the mucosa of these cases make the management so challenging.

The problems in kennedy class I cases occur mostly in the mandibular arch rather than the maxillary as the main support of the upper arch comes from the hard palate. On the other hand the support in the lower arch comes from the resilient mucosa which does not have the advantage of the total tooth support.

The difference of the displacibility between the abutment and the mucosa causes the removable partial denture to rotate around the fulcrum line that passes through the two main occlusal rests.

Hence, the occlusal load should be evenly distributed between the abutment and the basal seat area otherwise torque of the abutment will occur which leads to anteroposterior rotation around the abutment which acts as a pivot.

When the occlusal forces act on free end saddle removable partial denture they are transmitted first to the abutment and the distal end does not contributed to the support because the force pass through the abutment and absorbed before transmission of the forces to the residual ridge so the tissue in this case not contributed to support. This actually occurs when a single impression record of the teeth and the soft tissue is

taken in the anatomic form. So the residual ridge should contribute in retention, support and stability on the removable partial denture and an indirect retainer should be used to prevent the rotation of the denture base and the occlusal forces should be equally distributed on the teeth and the ridge thus a single impression should be avoided and a dual impression technique is done by capturing the teeth in the anatomic form and the ridge in the functional form.

The objective of a functional impression technique is based on acquiring more support from the residual ridge and the overlying mucosa as well as maintaining the occlusal contact between the teeth and decreasing the movement of the denture base to avoid the torque on the abutments.

The altered cast technique was introduced to measure the support obtained from the residual ridge and to equalize the stresses between the abutment teeth and the ridge.

While the functional reline technique is another type of the functional impression in which the support of the distal extension area and the functional form of the residual ridge and the underlying mucosa are recorded by relining the under surface of the denture base.

Review of literature

Partial edentulism:-

A Partially edentulous arch has one or more missing teeth but not all natural teeth.[1,2] The loss of teeth has a major effect on the psychological condition, level of oral health and quality of life.[3-5] Partial edentulism may be attributed to caries, periodontal problems, traumatic injuries, impactions, supernumerary teeth, neoplastic and cystic lesions. However **Bruce**[6] observed that the main reason of tooth loss across all ages was dental caries (83%) followed by periodontal diseases (17%).

Improvement in oral health and preventive measures lead by time to a decrease of the number of partially edentulous patients.[7,8] The recent trends in dental health care favor preservation of dentition.[9] A study showed that Kennedy class III is the most prevalent pattern in maxillary and mandibular arches and class IV is the least dominant pattern while there is an increase in Kennedy class I and II and a decrease in class III and IV with increase in age.[10]

The drawbacks of partial edentulism include clinical challenges and compromised life style. Loss of teeth leads to tilting and drifting of adjacent teeth, supraeruption of opposing teeth, changes in facial appearance, altered speech and tempromandibular joint disorders.[1,11,12] It also causes loss and degradation of alveolar bone and supporting structures which causes difficulties in the restoration of partially edentulous arches.[13] Moreover, it leads to changes in life style by restriction in dietary options

and weight loss in addition to lack of confidence and decrease in social activities so it adversely affects the quality of life and leads to psychological problems.[1]

Classification of partially edentulous arches:

Partially edentulous arches were classified by different methods and the aim was to facilitate the communication between dental practitioners, students and lab technicians about combination of missing teeth to edentulous ridges.[1,2,14,15]

There are various methods of classifications which include Kennedy, Applegate, Avant, Neurohar, Eichar and American college of prosthodontics which developed a classification system for partially edentulous patients based on diagnostic findings.[11,13,16,17] This classification has guidelines made to help practitioners make appropriate treatment plans for their patients. Four categories for partially edentulism are defined class I to class IV where class I represents uncomplicated clinical situations and class IV represents complex clinical situations. The benefits of this system include improvement in professional communication, standardization, criteria of outcome assessment, enhancement of diagnostic consistency and simplification of patient referrals.[13]

Although all these various methods of classification are present, Kennedy's classification is still the most common and the most accepted one because it offers an immediate assessment of the removable partial denture design and recognition of the prosthesis support. [11,14,16]

A study showed that there is no correlation between gender and partially edentulism and that it's more common in the mandibular arch than the maxillary arch. Younger adults more commonly have class III and IV removable partial dentures while older adults have more class I and II distal extension removable partial dentures.[18]

Problems of bilateral distal extension cases:-

Many problems are associated with free end saddle removable partial dentures which include:-

A-Problems in support:

In bounded cases, the support totally comes from the occlusal rests that lie on the occlusal surfaces of the abutment teeth while in distal extension cases there is an occlusal rest on one side while the other side is supported by the soft tissues of residual ridge.[19,20]

There is a major difference in resiliency between the periodontal ligament of the abutment tooth and the soft tissues covering the residual ridge. Resiliency of the residual ridge is around 500mm and the periodontal ligament of teeth is 20mm which causes undue forces on the abutment teeth.[21]

The problem in support is more prevalent in the mandible than the maxilla because in the maxilla there is great support coming from the hard palate through the major connector.[19]

It is very essential that the load applied should be within the physiologic limits of the supporting structures of the removable partial

denture. Support could be enhanced by a well designed removable partial denture through decreasing the buccolingual width of teeth, increasing sharpness and effectiveness of teeth to decrease pressure applied during chewing of food but without increasing the slopes of the cusps which create highly destructive horizontal forces. The design should allow wide distribution of load by maximum tissue coverage.[19,22]

B-Problems in retention:

Retention of removable partial dentures is gained by using the clasps which engage undercuts of abutment teeth in addition to neuromuscular adaptation around the polished surface of the denture that tends to seal the denture borders. Retention can also be gained by physical means that can be achieved by maximum coverage of the ridge and intimate contact between the base and the tissues.[23]

Sticky food, gravity and muscles action create forces that cause rotation of the partial denture around the retentive fulcrum line that passes through the retentive tips of the clasps of the main abutments due to lack of posterior abutments which causes movement of the denture away from the tissues.[23]

Clasps should be effective to determine the amount of indirect retention needed for resistance of displacement of removable partial dentures in an occlusal direction.[24,25] Stress releasing action is also recommended and forces should be distributed bilaterally as much as possible.[26]