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Different Runways for Edentulous Areas

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Abstract: The success of a removable partial denture depends on the careful evaluation of patient, proper treatment plan and an organised design sequence. Designing a removable partial denture is often a daunting task for a clinician. The two main difficulties encountered are 1) to obtain suitable retention and 2) stability of denture to horizontal and vertical displacement.[1] The completed design serves as a blueprint for removable partial denture construction. Therefore utmost care must be taken while designing a prosthesis.[2] The mechanical characteristics of removable partial denture must be considered. Components must be neatly drawn and accurately positioned.

Keywords: removable partial denture, Kennedy`s classification, designing.

INTRODUCTION

Any prosthesis that replaces some teeth in a partially dentate arch. It can be removed from the mouth and replaced at will.[3] Removable partial dentures are removable prosthesis and hence not connected to the teeth or tissues rigidly. The design of a removable partial denture should incorporate not only easy removal and placement but also stability when subjected to functional loads such as mastication. Therefore when a removable partial prosthesis is considered for restoration of the missing teeth, the design of RPD is a problem. This is due to the quite difference in the displacements between the periodontal soft tissues of abutments and residual ridge mucosa.[4] Proper designing is therefore essential to prevent any deleterious effect on the supporting structure.[1]

DISCUSSION

The correct design should be based on the mechanical and biological principles. The basic principles given by dr. A.H. Schimdt includes:

1. Thorough knowledge of mechanical and biological principles.
2. Treatment plan based on complete examination and diagnosis.
3. Correlation of factors and proper plan of the treatment.
4. Restore form and function without injury to the oral tissues.
5. It is a form of treatment not cure.[2]

Mechanical Principles:

The control of potentially damaging forces is the primary goal of a removable partial denture design. When subjected to intraoral forces, a removable partial denture can perform the action of 2 simple machines: the Lever and Inclined plane.[2]

Lever: A lever is a rigid bar supported somewhere along its length. The support point of the lever is called the fulcrum, and the lever can move around the fulcrum.[5]
Levers can be of three types namely:

1st - order levers
IInd - order levers
IIIrd - order levers [5]

1st - order levers: In this lever the fulcrum is in the center, resistance is at one end and effort (force) is at the other. These levers are more efficient and easily controlled. This type of lever can occur in patients with distal extension partial dentures.[2] The direct retainer will be the fulcrum, effort end lies on the point where the denture takes up the occlusal load (area where the artificial teeth are located) the load is the region of the anterior end of the major connector .

IInd - order levers: In this lever, the fulcrum is at one end, effort is at the opposite end and resistance or load is the center. This type of lever action occurs in indirect retention of a removable partial denture. When a displacing force tends to lift a denture from one end (effort), the anterior most point of the major connector will act as the axis of rotation (fulcrum), the intermediate zone of the denture, which is lifted by the force, will form the resistance (load) of the lever.

IIIrd - order levers: In this lever, the fulcrum is at one end, resistance is at the opposite end and effort is at the center e.g. tweezers. This type of lever action does not occur in partial dentures.

Inclined plane: Inclined plane is nothing but two inclined surfaces in close alignment to one another. When a force is applied against an inclined plane it may produce two actions:

- Deflection of object, which is applying the force (Denture).
- Movement of the inclined plane itself (tooth).

During the rest seat preparation, the floor of the seat must be inclined slightly towards the centre of the tooth. The enclosed angle formed by a line dropped down the proximal surface of the tooth parallel to the long axis of the tooth and the floor of the rest seat must be less than 90 degrees so that the transmitted occlusal forces can be directed along the vertical axis of the tooth. An angle greater than 90 degree will not yield the desired axial loading and will produce an inclined plane effect. This in turn will produce slippage of the prosthesis away from the abutment teeth. In addition, it can cause orthodontic movement of the abutment tooth and concurrent pain and bone loss.[2]

PHILOSOPHY OF DESIGN

There are three basic, underlying approaches to distributing the forces acting on a partial denture between the soft tissue and the teeth.

1. Stress equalization: The resiliency of the tooth secured by the periodontal ligament in an apical direction is not comparable to the greater resiliency and displace ability of the mucosa covering the edentulous ridge. Because of this great disparity, forces are transmitted to the abutment teeth as the denture bases are displaced in function. A rigid connection between the denture bases and the direct retainer on the abutment teeth is damaging and that some type of stress director or stress equalizer is essential to protect the vulnerable abutment teeth.[2]

2. Physiologic basing: This philosophy of design denies the necessity of using stress directors to equalize the disparity of vertical movement between the tooth and mucosa. The belief is that the equalization can best and most simply be accomplished by some form of physiologic basing, or lining, of the denture base.
The physiologic basing is produced either by displacing or depressing the ridge mucosa during the impression making procedure or by relining the denture base after it has been constructed. [2]

3. Broad stress distribution : Advocates of this school of partial denture design believe that excessive trauma to the remaining teeth and residual ridge can be prevented by distributing the forces of occlusion over as many teeth and as much of the available soft tissue area as possible. This is accomplished by the use of additional rests, indirect retainers, clasps, and broad coverage denture bases. [2]
Different design options: Table

CONCLUSION

A properly designed RPD in combination with a well planned comprehensive treatment will contribute to the preservation of the remaining teeth, bone and gingival by maintaining the gingival, tooth position and occlusion. It will also improve mastication and speech and enhance appearance. The emphasis is on design as it is one of the major weak link in the process of total care. The results of a detailed clinical and radiographic examination should dictate the ultimate design of the prosthesis.

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LEGENDS:

Fig.1 Anteroposterior palatal strap

Fig.2 Lingual plate

Fig.3 I-bar

Fig. 4 Embrasure clasp

Kennedy`s classification	Major Connector	Direct Retainer	Indirect retainer
Class 1 and 2	1. Anteroposterior palatal strap (fig.1) 2. Complete palate 3. Lingual plate (fig.2) 4. Double lingual bar	1. Reverse circlet clasp 2. I bar (fig.3)	1. Lingual plating (fig.2) 2. Embrasure clasp (fig.4)
Class 3	1. Palatal strap 2. Anteroposterior palatal bar 3. Anteroposterior palatal strap	1. Circlet clasp 2. Reverse circlet clasp 3. I bar	Embrasure clasp
Class 4	1. Horseshoe 2. closed horseshoe 3. Complete palate 4. Lingual bar 5. Labial bar	1. Reverse circlet clasp 2. I bar	Embrasure clasp