Effect of Different Designs of Bilateral Distal Extension Removable Partial Dentures Retained by Telescope Crowns on the Supporting Structures

Thesis
Submitted to the Faculty of Dentistry
Ain Shams University
In partial fulfillment of the requirements for the
Doctor Degree in Oral and Maxillofacial Prosthodontics

By

Rehab Helmy Abd El Fattah Ibrahim
B.D.S., Cairo University (1997)
M.D.S., Ain Shams University (2005)
Assoc. Lecturer, Prosthodontic Department
Faculty of Dentistry- Misr International University
Faculty of Dentistry
Ain Shams University

2011

Supervisors

Prof. Hany I. Eid
Professor of Prosthodontics
Faculty of Dentistry,
Ain Shams University

Prof. Fatma El-Zahraa A. Sayed
Professor of Prosthodontics
Faculty of Dentistry,
Ain Shams University

To

My gorgeous family,

My beloved husband,

My precious kids, Hana and Mohammed

Acknowledgement

First and foremost, thanks are due to Allah, the Beneficient and Merciful, by the grace of whom this work was possible.

I would like to express my deepest appreciation to Prof. Dr. Hany I. Eid, Professor of Prosthodontics, Faculty of Dentistry, Ain Shams University, who very kindly and generously gave much of his time and precious experience. Words stand short when expressing my gratefulness for his unlimited help, valuable guidance and instructions from the very beginning and throughout the whole work.

My great appreciation and thanks to Prof. Dr. Fatma El Zahraa A. Sayed, Professor of Prosthodontics, Faculty of Dentistry, Ain Shams University, for her kind supervision, faithful guidance and generous co-operation that made this work accomplished.

Last, but not least, I am very grateful to all the members of Prosthodontic Department, Misr International University for their kind co-operation and sincere help.

Contents

List of Figures

List of Tables

List of abbreviations

RPD **Removable partial denture**

DEB **Distal extension base**

TCs **Telescopic crowns**

PD **Pocket depth**

GI **Gingival index**

Introduction

Preservation of supporting structures is of prime concern when restoring partially edentulous arches. Removable partial dentures (RPDs) should provide functional stability, good retention, an esthetic appearance and patient's comfort. [1]

The difference in anatomy and physiology of natural teeth as well as their associated periodontal tissues and the residual ridges with their resilient mucoperiosteal covering makes it difficult to design tooth tissue supported partial dentures. This is due to the difference in response of the supporting tissues to wearing distal extension partial dentures. [2]

Studies proved that RPD design strongly affects the distribution of force between abutment teeth and the residual ridge. [3, 4]

Lack of posterior retention in bilateral distal extension bases (DEBs) subjects the distal end of these bases to movement and rotation in an occlusal direction. This tends to move the denture out of ridge contact. Movement of DEBs should thus be prevented by designing direct retainers and indirect retainers. [5]

Many clinical studies were carried out on the effectiveness of RPD design. However, they were mainly focused on direct retainers and their effect on load transmission to the abutment teeth. [6-8]

The selection of retainers suitable for distal extension RPDs and the concept of connecting the denture with the

remaining teeth are key factors in the preservation of abutment teeth and the long term success of RPDs. [9] [10]

Retainers are selected according to several factors including number, alignment and periodontal status of the remaining teeth. Also, the esthetic demands and financial limitations of the patient are considerable factors. [9]

Forces that produce torque on abutment teeth should be controlled and minimized when designing RPDs. Various stress controlling clasp designs have been designed for retaining DEBs. [11-13] Although clasp retained partial dentures are commonly used in dental practice, the attachment retained and telescopic partial dentures are increasingly used as acceptable treatment modalities. [12-15]

Telescopic crowns (TCs) were reported as effective retainers for DEBs as they provide support, controlled retention and splinting action. They also transfer forces along the long axes of abutment teeth. [16-18] It was also reported that TCs provide indirect retention. It is thus apparent to assess whether telescopic dentures need an addition of an indirect retainer or to comply with a simpler design depending on indirect retention provided by the TCs.

To weigh the merits of various RPD designs several lines of treatment must be studied to evaluate their effect on supporting structures. [11] Hence, this study was proposed to assess the effect of different telescopic denture .designs on the RPD supporting structures.

Review of Literature

Distal Extension Removable Partial Dentures

Distal extension partial dentures are defined as "Removable partial dentures supported and retained by natural teeth at one end of the denture base and in which portion of the functional load is carried by the residual ridge." [19]

Bilateral DEBs are the most common clinical condition among partially edentulous patients, hence, they were classified by Kennedy as class I cases. DEBs occur more frequently in the lower jaw compared to the upper jaw. [20]

Several problems are usually encountered in designing DEBs. These problems are mainly related to the support and retention of the dentures.

The current perio-prosthodontic literature indicates that the greatest potential for destructive forces on the teeth and their periodontal supporting apparatus as well as on the residual ridges occurs when the patient is treated with distal extension RPDs. [2]

The forces transmitted to a removable prosthesis can be widely distributed, directed and minimized by selection of the design and location of components of the RPD and by development of harmonious occlusion. [21]

I-Designing support for distal extension bases

Distal extension partial denture depends on the residual ridge for portion of its support due to lack of posterior teeth support. Maintaining support from the residual ridge is required as the distance from the last abutment increases. [21]

Residual ridge tissues are 20-25 times more resilient compared to the periodontal attachment apparatus of abutment teeth. Hence, under vertical load RPD tends to rotate around a fulcrum line that coincides with its most distal occlusal rest. This results in bone resorption and torque on the abutment teeth. Torque effect increases if the clasp tip is placed mesial to the axis of rotation comparable to class I lever. [22, 10]

In an invitro study, it was proved that placing the retentive component on the side of the fulcrum line away from the extension base causes movement of the abutment tooth in an undesirable occlusal direction. [23]

The influence of wearing dentures on the residual ridge was investigated. The results indicated that wearing dentures reduced the height of the residual ridge due to a slow progressive process of bone resorption. [24]

The edentulous ridge of free end saddle cases usually bears part of the masticatory load; hence, ridge resorption is likely to occur. At the same time the abutment tooth is subjected to torque in both antero-posterior and buccolingual directions

resulting in premature breakdown of the supporting bony tissues. [20]

Adequate support for DEBs could be achieved by:

Load reduction

Reduction of the size of occlusal table of artificial teeth reduces forces and stresses on the abutment teeth and supporting tissues. [20]

Reduction of the functional load can be achieved by broad base coverage resulting in less load per unit area and better support. [21]

Splinting abutment teeth can also enhance support by distribution of functional load to teeth adjacent to abutments. This also reduces destructive stresses within the periodontium of abutments. [25]

Load distribution

Distributing stresses to as many remaining teeth as possible is achieved by placement of rests and clasping teeth. However, opponents to this concept mentioned that during function the denture rotates around the fulcrum line and the anteriorly placed components are disengaged reducing their effectiveness. Also, additional coverage of remaining teeth would be conductive to caries. [26]