"COMPARITIVE EVALUATION OF STRESS ACTING ON CONNECTOR AND ABUTMENT TOOTH OF DIFFERENT DESIGNS OF ACID ETCHED RESIN BONDED FIXED PARTIAL DENTURES: A FINITE ELEMENT ANALYSIS"

By

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ABSTRACT

Introduction:

Resin bonded fixed partial dentures have been used as a conservative method of replacing missing tooth. Till now, they were used to replace missing anterior teeth. With a growing demand for conservative replacement options and advancements in luting resin cements, resin bonded fixed partial dentures are being used as an option to replace missing posterior teeth as well. Various preparation designs with better geometries are being used to restore missing posterior teeth but with little research on which design offers the highest chances of survival clinically. Finite element analysis is a useful method of predicting the stress concentration around abutment teeth and the restoration. This is a valuable method of predicting clinical longevity of the restoration. The purpose of the study was to determine which preparation design transmits least stress to the periodontium and surrounding bone.

Objective:

1)To analyze stress concentration on the connector area in four different designs of acid etched resin bonded fixed partial dentures.

2)To evaluate stress distribution on abutment teeth in four different designs of acid etched resin bonded fixed partial dentures.

Methodology:

Four three dimensional models of the four tooth preparation designs were prepared using ANSYS software. The first premolar and first molar were used as abutments to replace the missing second premolar. Model 1 included lingual wings and occlusal rests in the preparation. Model 2 included wings and proximal slices. Model 3

included wings, rests and grooves. Model 4 included wings, rests, grooves and occlusal coverage. The prepared models were restored with resin bonded fixed partial dentures. Young's modulus of elasticity and Poisson's ratio of the following elements were used in the case of stress analysis

1)TRABACULAR BONE

2)CORTICAL BONE

3)DENTIN

4)COBALT CHROMIUM ALLOY

A load of 100N was applied on the central groove of the pontic to simulate occlusal forces. The materials used in the models are considered to be isotropic, homogenous And linearly elastic. Finite element analysis will reveal stresses and deformation at every node in the model. Results were displayed as stress contours overlaid on the original model. This type of display permits the detection of maximal stresses and stress concentrations for the entire model.

Results : When vertical static loads were applied minimum stresses were seen in the connector region of design-3. Further, least amount of stresses were transferred from abutment teeth into the surrounding bone in design-3.

Conclusion : within the limitation of the present study , it can be concluded that design -3 was the ideal design to incorporate during tooth preparation to receive a posterior RBFPD.

Keywords : finite element analysis, resin bonded fixed prosthesis, von Mises stresses, grooves, wings, proximal slicing.