SDM
College of Dental Sciences & Hospital
Dhavalnagar, Sattur, Dharwad - 580009, Karnataka, INDIA
Recognised by Dental Council of India, New Delhi

A Constituent Unit of
SHRI
DHARMASTHALA
MANJUNATHESHWARA
UNIVERSITY

Orthodontic Retainers and their debonding forces: A Finite Element Analysis

By

DR. SHIVANI GUPTA

Dissertation Submitted to the

SHRI DHARMASTHALA MANJUNATHESHWARA UNIVERSITY,
Dharwad, Karnataka

In Partial Fulfilment of the Requirement for the Degree of

MASTER OF DENTAL SURGERY (M.D.S)

in

ORTHODONTICS AND DENTOFACIAL ORTHOPEDICS

Under the Guidance of

DR. SHRINIVAS M. BASAVARADDI

PROFESSOR,

Department of Orthodontics and Dentofacial Orthopedics

S.D.M College of Dental Sciences and Hospital

Dharwad, Karnataka.

May 2024

TABLE OF CONTENTS

ABSTRACT

BACKGROUND- Orthodontic retention is defined as maintaining teeth in optimal aesthetic and functional position after treatment. Fixed retainers were introduced in 1970s to prevent the relapse from happening. They are of different cross-sections i.e., multistranded, circular and flat. Multistranded NiTi wires are most frequently used.

OBJECTIVE- To evaluate the force required to debond different lingual retainers in laboratory settings and to assess the amount of wire deformation after debonding.

MATERIALS AND METHODS- We tested 24 samples each of 0.027"x0.016" wire, 0.027"x0.011" wire, 0.0162" wire and 0.0195" wire giving a total sample size of 96. Extracted teeth were mounted in acrylic. A 10mm section of lingual retainer wire is bonded on the lingual surface of extracted teeth. 3-D model scanning was done to generate 3-D models. Finite element analysis was performed to check the debonding strength of lingual retainers.

RESULTS- the group A(0.0195inch) showed the maximum amount of debonding force required as compared to other groups. when wire deflection was check it was noted that the group A(0.0195inch) has the least amount of wire deflection from its original path.

DISCUSSION- Debonding strength of various orthodontic materials have been tested for a long time. To achieved good retention and stability for orthodontic treatment, lingual retainers play a crucial role in maintaining it. From our study we concluded that rectangular braided wires proved better in retention and strength when compared to circular braided and circular twisted wires.

CONCLUSION- Compared to the other groups, Group A was better retained on the teeth due to its higher bond strength and thus having the least wire deflection also.

Key words- lingual retainers, bond strength, deflection, finite element analysis