Force Delivery and Force Decay
Of
Coil Springs Vs Elastomeric chains

A Thesis

Submitted to the Faculty of Dentistry

Ain Shams University

In Partial Fulfillment of the Requirements

For

Master's Degree in Orthodontics

By

Lamia Ihab El Shammaa
B.D.S (1994)

Faculty of Dentistry
Ain-Shams University
2010

Supervisors

Dr. Khaled M. Fawzy

Professor of Orthodontics

Head of Orthodontic and Pediatric Dentistry Department

Faculty of Dentistry,

Ain shams University

Dr. Noha E. Sabet

Professor of Orthodontics

Faculty of Dentistry,

Ain shams University

Dedication

To my beloved mother, thank you for your endless sacrifice, patience, care, and constant support. Without you nothing would have been possible.

To my sister, thank you for your constant support and continuous encouragement.

To my wonderful friends thank you for your help.

Acknowledgement

I would like to express my most sincere grateful appreciation to **Professor. Dr. Khaled M. Fawzy,** Professor of Orthodontics, and head of Orthodontic and Pediatric Dentistry Department, Faculty of Dentistry, Ain shams University. His endless encouragement, great help, extreme patience, valuable guidance and immeasurable support, will always be sincerely remembered.

I wish to express my deepest thanks and sincere gratitude as well as appreciation to **Dr. Noha E. Sabet,** Professor of Orthodontics, Faculty of Dentistry, Ain shams University. Her valuable advice, devoted effort, and unique cooperation, will always be deeply remembered.

I would also like to express my great appreciation and sincere gratitude to my professors, colleagues and staff members of Orthodontic Department, Faculty of Dentistry; Ain shams University, for their valuable time, impressive advice, great support, encouragement and cooperation.

<u>Table of Contents</u>

List of figures

List of tables

Introduction

Different systems have been proposed to close spaces in orthodontics. Although current knowledge on the various properties of the space closure system is extensive, the search for the ideal device still goes on. The ideal space closure system should have mechanical properties that provide a continuous light force, preserve periodontal integrity, and close the space within a minimum time. [1]

The force generated by space closing systems depends not only on the device itself, but also on the force applied by clinicians. Since sliding mechanics have been widely employed to close residual extraction spaces, it is important to compare the force exerted by different space closing systems to help orthodontists in choosing between commercially available devices.[2]

Theoretically, there is no doubt that light continuous forces produce the most efficient tooth movement. Therefore, the optimum force level for orthodontic tooth movement should be just high enough to stimulate cellular activity and frontal resorption, without completely occluding the blood vessels in the periodontal ligament and causing necrosis.[3]

This force level also aids in decreasing the discomfort of the patient and reducing the overall treatment time, because the lag phase or delay that occurs during undermining resorption is avoided[3].

Many techniques have been proposed such as arch-wire closing loops, stainless-steel ties, coil-springs, latex elastics, and synthetic elastomers. However, the most commonly used are coil springs and elastomeric chains.[4]

Coil springs recently became widely used specially the nickel-titanium which has the property of being super elastic producing light continuous force over a long period of time. It is corrosion resistant, but has the disadvantage of being more expensive than other materials. Advantages of synthetic elastomeric chains are that they are easily manipulated, inexpensive; require little or no patient co-operation, hygienic, easily applied, and biocompatible with the oral mucosa.[4, 5]

On the other hand, they have disadvantages such as absorbing saliva, staining, having rapid loss of applied force due to stress relaxation and this might result in gradual loss of effectiveness to conduct required tooth movement as the force level is not maintained for enough time to have significant effects on the position of the teeth.[4, 5]

Apart from the physical properties of the materials used and their ability to maintain the applied force, the complex factors found in the oral cavity, such as the fluctuations of temperature and pH, add to the challenge of trying to control the force system. It is therefore an advantage to have knowledge of the behaviour of the different materials in this environment to be able to deliver the desired force and achieve physiologic tooth movement. Thus there was a strong need for comparing different activation techniques and different materials within various media.