Assessment Of The Effect Of Er,Cr:YSGG LASER Biomodulation On Bone Surrounding All-On-4 Implants Supporting Hybrid Immediately Loaded Prostheses

Thesis

Submitted to Faculty of Dentistry Ain Shams University, in partial fulfillment of the requirements of Doctorate Degree in Oral and Maxillofacial Removable Prosthodontics

By

Dina Essam Bahig Rafla

B.D.S., 2008

M.S., 2014

Ain Shams University

Faculty of Dentistry

Ain Shams University

2018

<u>Under Supervision of</u>

Prof.Dr. Hany Ibrahim Eid

Professor of Removable Prosthodontics

Oral and Maxillofacial Removable Prosthodontics Department

Faculty of Dentistry

Ain Shams University

Prof.Dr. Rami Maher Ghali

Professor of Removable Prosthodontics

Oral and Maxillofacial Removable Prosthodontics Department

Vice dean for Community & Environmental affairs

Faculty of Dentistry

Ain Shams University

Acknowledgement

First of all, I would like to express my sincere thanks to God for helping me to complete this work.

I wish to express my great thanks and feeling of gratitude to Prof. Dr. Hany Eid, Professor of Prosthodontics, Faculty of Dentistry, Ain Shams University, for his valuable advice, great effort in planning and revising this study, his meticulous supervision, constructive comments, endless understanding and patience.

I am extremely grateful to Prof. Dr. Rami Maher Ghali, Professor of Prosthodontics, Faculty of Dentistry, Ain Shams University, for his valuable suggestions, encouragement, scientific supervision, real support and continuous follow up from the beginning to the end of this thesis.

I would also like to express my appreciation and thanks to all professors and staff members of the Prosthodontic department, Faculty of Dentistry, Ain Shams University, for their encouragement and support.

Words can never express my sincere thanks and appreciation for the great effort and support my family gives me every day.

My great thanks go to all my dear friends Noha, Meriam and Mona and all those who offered me any kind of encouragement. I wish them all the best.

I would like to thank my great support team Dr. May Hussain dental photography for capturing every step and Dr. Rami Gamil at 3Dvision imaging for their work from patient scanning to the production of the stents and models used in this study. I would like to thank Dr. Mohamed Shady for helping me out with the statistics.

Last but not least, I would like to thank all my patients and all those who contributed to the accomplishment of this work.

Dedication

This work is dedicated to my wonderful husband, my two boys Sherif and Youssef and my parents. I would never have accomplished this work without your love and support.

List of Contents

List of Figures

List of Tables

Introduction

Most patients are able to function effectively and comfortably with conventional maxillary complete dentures. They are quite satisfied with the outcomes. An exception to this situation is the patient with mandibular natural dentition opposing an edentulous maxilla. (1)

The dentist rehabilitating patients with this clinical pattern is confronted by many difficulties. Mal-posed, tipped or super-erupted teeth in the lower arch make it difficult to achieve harmonious balanced occlusion. Unfavorable occlusal relationships tend to displace the maxillary denture causing soreness, mucosal changes and ultimately ridge resorption if the occlusion of the denture is not properly balanced.(2)

The esthetic and phonetic placement of the maxillary teeth is difficult without introducing occlusal interferences in eccentric functional movements due to the fixed position of the mandibular teeth. (2)

To place implants in the maxilla complex procedures like grafting are required to fabricate a totally supported prosthesis .In order to help the problem the All-on-4 concept was developed. The tilting of distal implants makes it possible to use longer implants, gives better implant distance, helps in reduction of cantilever and bone anchorage is improved. “Paulo Malo” developed the All-on-4 treatment concept to provide the patient

with an immediately loaded fixed prosthesis on only four implants by the use of straight and angled multiunit abutments.[3]

The angled posterior implants help to avoid anatomical structures, allow longer implants anchored in better quality bone, reduce posterior cantilever and eliminate bone grafts in the edentulous maxilla and mandible in majority of cases.[4]

The All-on-4 is accompanied with high success rates because implants are well-spaced, have good biomechanics and are easier to clean. Immediate function and aesthetics can be obtained. Final restoration can be fixed or removable. The cost is reduced due to less number of implants and grafting in the majority of cases is avoided. [4]

Erbium Chromium Doped Yttrium Scandium Gallium Garnet (Er,Cr:YSGG) LASER has a wavelength of 2780nm, in the infrared spectrum. Its use has been investigated in bone ablation for implant bed preparation. Er,Cr:YSGG LASER is absorbed by water so it allows bone cutting. Advantages of Er,Cr:YSGG include absence of bone dust and vibration, enhanced visualisation of the surgical field due to hemostasis and improved patient comfort with less postoperative pain and edema. When ablating bone it has a bactericidal effect. Er,Cr:YSGG LASER provides straight, clean and precise bone ablation and causes minimal thermal damage to the adjacent tissue. [5-12]

The availability of cone beam computed tomography (CBCT) is also expanding the use of additional diagnostic and treatment

software applications. CBCT allows more than diagnosis; it facilitates image-guided surgery. Diagnostic and planning software assist in implant planning to fabricate surgical models to facilitate virtual implant placement and to create diagnostic or surgical implant guidance stents. (13)

Implant success can be effectively evaluated by the appearance of natural bone around it with bone apposition on the surface of the implant. Implant mobility correlates with the appearance of a thin radiolucent line around the implant outline. It predicts failure to osseointegrate. (14)

So this study was conducted to correlate the effect of Er,Cr:YSGG LASER versus conventional drilling alone on the marginal bone loss around the immediately loaded All-On-4 implants.