

**Comparison Evaluation of the Effect of
Resilient Attachments Versus Rigid
Attachments on Muscle Activity in
Mandibular Implant Retained
Overdentures Cases**

Thesis

**Submitted to the Faculty of Dentistry Ain Shams
University, For the Partial Fulfillment of the Doctoral
Degree In oral and maxillofacial Prosthodontics**

By

Amr Abd El Bary Mahdy Emarah

B.D.S Cairo University (2002)

M.D.S Cairo University (2011)

**Faculty of Dentistry
Ain Shams University
2016**

Supervisors

DR. Hany I. Eid

Emeritus Professor of Prosthodontics

Faculty of Dentistry

Ain Shams University

Dr. Fardos Nabel Fathy Rizk

Assistant professor and Head of Prosthodontic

Department

Faculty of Dentistry

British University

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

((قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا
مَا عَلَّمْتَنَا إِنَّكَ أَنْتَ الْعَلِيمُ
الْحَكِيمُ))

صدق الله العظيم
البقرة الآية (٣٢)

ACKNOWLEDGMENT

First and foremost, I am greatly thankful to ALLAH for granting me the perseverance to accomplish this work.

I was fortunate to conduct this work under the supervision of **Dr. Hany Ibrahim Eid** *Professor of Prosthodontics*, Faculty of Dentistry, Ain Shams University; I am in a deep gratitude for his faithful supervision and guidance, as well as beneficial advice throughout the whole work. He treated me like a son rather than a student.

I am deeply grateful to **Dr. Fardos Nabel Fathy Rizk**, Ass. *Professor of Prosthodontics*, Chairman of Prosthodontic Department, Faculty of Dentistry, British University, for her unlimited patience, remarkable effort, considerable help and for all the valuable time she has generously given me.

A special gratitude and thanks are owed to **Dr. Elsayed Hassan Mahdy**, *Lecturer of electronics and Control engineering at Egyptian Atomic Energy Authority*, for his valuable advises devoted efforts and co-operations.

A special thanks are expressed to **Mr. Ayman Mahmoud Ammar**, *Dental technician*, for his efficient help and effort throughout the clinical part of the study.

DEDICATION

To My Dear Parents

*For their sincere pray to Allah
for me*

*To My wife, My two sisters and
my brother*

Amr Emarah

List of Contents

	Page
Introduction	1
Review Of Literature	3
1. Complete Edentulism	3
2. Problems of Complete Denture	4
3. Dental Implants in Edentulous Mandibular Cases	4
3.1. Classification of root form implant	5
3.1.1. Classification according to design	5
3.1.2. Classification according to implant surface treatment, microstructure, or surface topography	5
3.1.3. Classification according to the insertion technique	5
3.1.4. Classification of implants according to the surgical technique	6
3.1.5. Classification according to time of prosthetic loading	7
4. Prosthetic options of implants retained prosthesis in mandibular edentulous cases	7
4.1. Removable overdenture versus fixed restorations	8
4.1.1 Advantages of overdenture over fixed restoration	8
4.1.2 Drawbacks of overdentures when compared to fixed restorations	10
5. Implant retained overdentures	11
5.1 Advantages over conventional complete dentures	11
5.2. Support in implant retained overdentures	14
6. Attachments	16
6.1. Classification of implant attachments	17

6.1.1.	Classification according to mode of fabrication	17
6.1.2.	Classification according to amount of movement allowed by attachment	17
6.2.	Types of attachments	18
6.2.1.	Stud attachments	18
6.2.1.1.	Classification of stud attachments	18
6.2.2.	Telescopic attachment	23
6.2.3.	Bar attachment	24
6.2.4.	Magnet attachment	26
7.	Evaluation of dental implants	27
7.1.	Clinical evaluation	27
7.1.1.	Mobility	28
7.1.2.	Percussion	28
7.1.3.	Pocket depth	28
7.2.	Radiographic evaluation	29
8.	Mastication and Muscles of mastication	30
9.	Electromyography	35
9.1.	The concept of electromyography	36
9.2.	Value of electromyography in dentistry	36
9.3.	Types of electromyography	37
9.4.	Components of electromyographic system	37
9.5.	Correlation between EMG activity and muscle force	39
9.6.	Correlation between EMG signals and muscle fatigue	40
9.7.	Factors affecting the reliability of surface EMG	40
9.8.	Factors affecting electromyographic activity of the masticatory muscles	41
9.8.1.	Patient related factors	42
9.8.2.	Prosthesis related factors	48
9.8.3.	Procedure related factors	50
9.9.	Computerized electromyography (Computer based system)	51
9.10.	Limitations of the electromyography	52
	Aim of The Study	54

Materials And Methods	55
1. Patient Selection	57
2. Patient Examination	57
2.1. Medical History	57
2.2. Dental History	57
2.3. Extra-oral examination	57
2.4. Intra-oral examination	57
2.4.1. Visual assessment	57
2.4.2. Digital assessment	58
2.5. Diagnostic cast evaluation and fabrication of radiographic stent	58
2.6. Radiographic examination	58
3. Steps of complete denture construction	61
4. Surgical stent construction	65
5. Surgical procedure	66
6. Grouping the study	74
7. Recording the electromyographic activities	85
7.1. Maximum Voluntary Teeth Clenching (MCV)	87
7.2. Chewing data collection	87
7.3. Data Analysis- EMG Power Spectrum	87
8. Clinical evaluation (Pocket depth evaluation)	88
Results	90
1. Comparison between muscle activity of right and left sides of masseter and temporalis muscles	91
2. Comparison between the effect of time on the EMG record of the masseter and temporalis muscles	96
3. Comparison between the effect of function: on the overall EMG activity of masseter and temporalis muscles.	102
4. Comparison between both groups in different periods on overall EMG activity of masseter and temporalis muscles	105
5. Effect of time on pocket depth	107
6. Effect of different retention modalities Ball and Socket in group I and Telescopic in group II on pocket depth	109

Discussion	111
Summary	122
Conclusion	124
References	125
Arabic Summary	

List of Figures

	Page
Figure 1 Intra-oral preoperative view	56
Figure 2 Diagnostic mounted casts used to evaluate interarch distance	59
Figure 3 Radiographic stent with radiopaque marker ...	60
Figure 4 Cone beam Computerized Tomography.....	60
Figure 5 Upper and lower final impressions.....	62
Figure 6 Upper and lower casts mounted on the articulator.....	62
Figure 7 The finished upper and lower dentures in the patients' mouth.....	64
Figure 8 Surgical stent	65
Figure 9 Marking the implant sites.	67
Figure 10 Semilunar flap	68
Figure 11 Drilling of the site	68
Figure 12 Drilling of the site	69
Figure 13 Implant was carried manually to the prepared surgical site.....	69
Figure 14 Implant was carried manually to the prepared surgical site	70
Figure 15 Ratchet was used to completely seat the implant.....	70
Figure 16 Ratchet was used to completely seat the implant.....	71