

Evaluation of Silica – Calcium Phosphate Composite on Jaw Bone Healing in Diabetic Patients

Thesis

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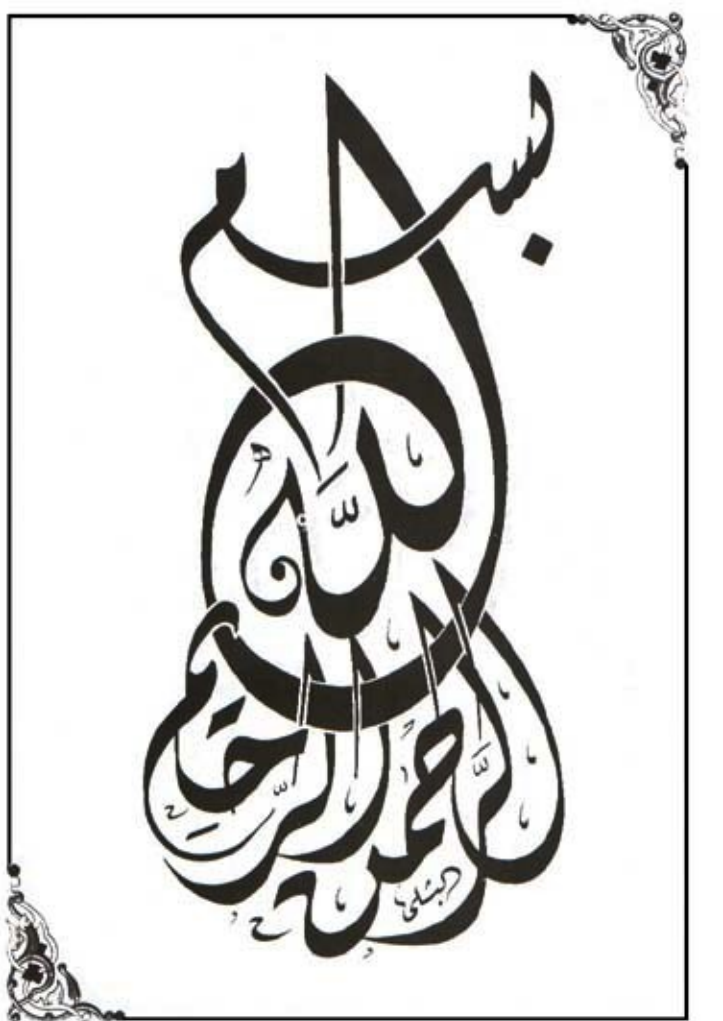
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Degree in Oral and Maxillofacial Surgery**

By

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



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LIST OF CONTENTS

TOPIC	PAGE
INTRODUCTION	1
REVIEW OF LITTERATURE	3
AIM OF THE STUDY	25
MATERIALS AND METHODS	26
RESULTS	39
DISCUSSION	58
SUMMARY	64
CONCLUSIONS	65
REFERENCES	66
ARABIC SUMMARY	

LIST OF TABLES

Table No	Title	Page No
1	Showing the clinical profile of patients in group A	27
2	Showing the clinical profile of patients in group B.	28
3	Showing the clinical profile of patients in group C	28
4	Showing comparison of bone density within the socket between the three groups	47
5	Showing the changes by time in mean bone density of each group	49
6	Showing Comparison between percentage changes in bone density of the three group	50
7	Showing the means, standard deviation (SD) values and results of paired t-test for the comparison between Line A and Line B in each group	52
8	Showing comparison between bone height of the three groups	54
9	Showing comparison between bone height Changes by time in each group	55
10	Showing comparison between percentage changes in bone height of the three groups	57

LIST OF FIGURES

Figure No	Title	Page No
1	A photograph showing film holder mounted on the cast and attached to RWT ring	29
2	A photograph showing the components of radiographic stent	30
3	A photograph showing the surgical tray	31
4	A photograph showing extraction socket of lower second molar before placement of SCPC	32
5	A photograph showing Silica-Calcium Phosphate vial	32
6	A photograph showing implantation of SCPC into the extraction socket	33
7	A photograph showing SCPC bone graft up to crestal bone	33
8	A photograph showing gelatamp over the SCPC bone graft within the extraction socket	34
9	A photograph showing cross mattress suture stabilizing gelatamp in the extraction socket	34
10	Diagram showing cross mattress suture	35
11	Showing linear density measurement within the socket using Digora unit	36
12	Showing linear measurement of alveolar bone height by a line drawn from a radiopaque marker perpendicular on the tangent of the highest level of alveolar crest.	37
13	Showing linear density measurements along the outer aspect of the socket using Digora unit	38

14	Photograph showing healing of extraction socket two weeks post operatively of case no 5 in group A	39
15	Photograph showing healing of extraction socket three months postoperatively of case no 5 in group A	40
16	Photograph showing healing of extraction socket Six months post operatively of case no 5 in group A	40
17	Photograph showing healing of extraction sockets two weeks post operatively of case no 3 in group C	41
18	Photograph showing healing of extraction sockets three months post operatively of case no 3 in group C	41
19	Photograph showing healing of extraction sockets six months post operatively of case no 3 in group C	42
20	Photograph showing healing of extraction sockets two weeks post operatively of case no 3 in group B	42
21	Photograph showing healing of extraction sockets three months post operatively of case no 2 in group B	43
22	Photograph showing healing of extraction socket six months post operatively of case no 2 in group B	43
23	Showing immediate posoperative image of extraction socket of case no 3 in group A	44
24	Showing six months posoperative image of extraction socket of case no 3 in group A	44
25	Showing immediate posoperative image of extraction socket of case no 2 in group B	45
26	Showing six months posoperative image of extraction socket of case no 2 in group B	45

27	Showing immediate posoperative image of extraction socket of case no 3 in group C	46
28	Showing six months posoperative image of extraction socket of case no 3 in group C	46
29	Histogram showing comparison of bone density within the socket_between the three groups	48
30	Line chart showing the changes by time in mean bone density of each group	49
31	Histogram showing percentage changes in bone density of the three groups	51
32	Histogram showing comparison between Line A and Line B in each group	53
33	Histogram showing comparison between bone height of the three groups group	54
34	Histogram showing comparison between bone height changes by time in each group	56
35	Histogram showing comparison between percentage changes in bone height of the three groups	57

LIST OF ABBREVIATIONS

AGE-2	Glyceraldehyde-derived Advanced Glycated End Products
AGE-3	Glycolaldehyde- derived Advanced Glycated End Products
AGEs	Advanced Glycated End Products
ALP	Alkaline Phosphatase
ANOVA	Analysis of Variance
BALP	Bone Alkaline Phosphatase
BB	Bio Breeding wistar rat
BG	Bioactive Glass
Ca/P	Calcium to Phosphorous ratio
Ca-P	Calcium Phosphate layer
CCD	Charged Coupled Device
DM	Diabetes Mellitus
DO	Distraction Osteogenesis gap
D-PTFE	Diabetic associated to polytetrafluorethylene
ECM	Extra Cellular Matrix
GDM	Gestational Diabetes Mellitus
Group A	Diabetic Grafted Group
Group B	Diabetic non Grafted Group
Group C	Non Diabetic Grafted Group
HA	Hydroxy Apatite
HbA _{1c}	Glycated Hemoglobin
HDDM	Homogenous Demineralized Dentin Matrix
IDDM	Insulin Dependent Diabetes Mellitus

IGF	Insulin like growth factor
IGFBP-1	Insulin like growth factor binding protein-1
IRs	Insulin Receptors
KV	Kilo Voltage
mRNA	Messenger Ribonucleic acid
MSCs	Undifferentiated Mesenchymal Stem cells
NIDDM	Non Insulin Dependent Diabetes Mellitus
NRCO	Neonatal Rat Calvaria Osteoblast
OC	Osteocalcin
P27	Protein-27 (Cyclin-Dependent Kinase Inhibitor)
PICP	Carboxy-terminal extension peptide of procollagen
PSP	Phosphor Storage Plate
PTFe	Polytetrafluoroethylene
PTH	Para Thyroid Hormone
rhBMP-2	Recombinant human Bone Morphogenetic Protein-2
SBF	Simulated Body Fluid
SCPC	Silica Calcium Phosphate Composite
SD	Standerd of Deviation
SDT	Spontaneously Diabetic Torii rat
Si	Silicon
Si-OH	Silanol group
SPSS	Statistical Package for Scientific Studies
T1DM	Type 1 Diabetes Mellitus
T2DM	Type 2 Diabetes Mellitus
TCP	Tricalcium Phosphate
ZDF	Zucker Diabetic Fatty rat

INTRODUCTION

Diabetes mellitus (DM) is one of the most frequent metabolic diseases, affecting over 246 million individual across the world. More than four million of these patients live in Egypt which is currently one of the top ten countries with the highest number of diabetic patients and will remain so as 7.5 million Egyptians will have the disease by 2025.¹⁻³

Analysis of the previous epidemiological data indicates that all dentists will encounter patients with diabetes mellitus and those clinicians who perform intra-oral surgery, should have a thorough knowledge of this disease.⁴

One of the complications which may face the dentist during treating the diabetic patients is impaired bone formation and delayed tooth socket healing. Investigative efforts have found a generalized reduction in height of the alveolar ridge, reduced osteogenesis, and decreased synthesis of collagen at implanted sites. All of these represent a great problem for the diabetic patients who need oral rehabilitation with either conventional denture or implant supported over denture.⁵⁻⁹

Although there are multiple studies for using bone graft to enhance healing of bone defects in diabetic animals,¹⁰⁻¹⁵ the literature shows no clinical studies evaluating bone graft in diabetic patients.

Resorbable porous Silica-Calcium Phosphate nanocomposite (SCPC) has been successfully used in animal and human studies.¹⁶⁻¹⁸ This successful use in non diabetic humans suggest that SCPC may be a viable material for enhancing bone formation in extraction socket and alveolar ridge augmentation in diabetic patients.

In the present study, the effect of SCPC as adjunct mean in enhancing extraction socket healing of type 2 diabetic patients was evaluated, which is according to our knowledge has not been evaluated before.