



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكرو فيلم

بسم الله الرحمن الرحيم



MONA MAGHRABY



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم



شبكة المعلومات الجامعية التوثيق الإلكتروني والميكروفيلم



MONA MAGHRABY



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات



يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار



MONA MAGHRABY



Fractional carbon dioxide laser, platelet – rich plasma and narrow band ultraviolet B in the treatment of Vitiligo (A prospective randomized comparative trial)

Thesis

*Submitted for Partial Fulfillment of Master Degree in
Dermatology, Venereology and Andrology*

Presented By
Mohamed Abdullah Eshafi
M.B. B.Ch.

Under Supervision of
Prof. Dr. Nehal Mohamed Zuelfakkar
*Professor of Dermatology, Venereology and Andrology
Faculty of Medicine - Ain Shams University*

Dr. Ahmed Abd Elfattah Afify
*Lecturer of Dermatology, Venereology and Andrology
Faculty of Medicine - Ain Shams University*

*Faculty of Medicine
Ain Shams University
2020*

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قالوا

سببنا أنك لا تعلم لنا
إلا ما علمتنا أنك أنت
العليم العظيم

صدق الله العظيم

سورة البقرة الآية: ٣٢

Acknowledgment

*First and foremost, I feel always indebted to **ALLAH**,
the Most Kind and Most Merciful.*

*I'd like to express my respectful thanks and profound
gratitude to **Prof. Dr. Nehal Mohamed Zuelfakkar**,
Professor of Dermatology, Venereology and Andrology
Faculty of Medicine - Ain Shams University for her keen
guidance, kind supervision, valuable advice and continuous
encouragement, which made possible the completion of this
work.*

*I am also delighted to express my deepest gratitude
and thanks to **Dr. Ahmed Abd Elfattah Afify**,
Lecturer of Dermatology, Venereology and Andrology
Faculty of Medicine - Ain Shams University, for his kind
care, continuous supervision, valuable instructions,
constant help and great assistance throughout this work.*

*Thanks for all staff members of dermatology,
venereology and andrology department, Ain shams
university for their support.*

Mohamed Eshafi

List of Contents

Title	Page No.
List of Abbreviations.....	i
List of Tables	iv
List of Figures	v
Introduction	1
Aim of the Work.....	3
Review of Literature	
Vitiligo.....	4
Fractional co2 Laser and its Role in Treatment of Vitiligo.....	42
PRP and Vitiligo	47
Patients and Methods.....	55
Results	65
Discussion	84
Conclusion	90
Recommendations	91
Summary	92
References	94
Arabic Summary	—

List of Abbreviations

Abb.	Full term
μ	Micro
μm	Micrometer
<i>AEs</i>	Adverse events
<i>AGEs</i>	Advanced glycation end-products
<i>AOPPs</i>	Advanced oxidation protein products
<i>bFGF</i>	basic fibroblast growth factor
<i>CAT</i>	Catalase
<i>CD</i>	Cluster of differentiation
<i>CDK4</i>	Cyclin Dependent Kinase-4
<i>CO2</i>	Carbon dioxide
<i>CTLA4</i>	Cytotoxic T Lymphocyte Antigen 4
<i>CXCL</i>	C-X-C motif
<i>CXCR</i>	C-X-C motif receptor
<i>DAMPs</i>	Damage-associated molecular patterns
<i>DCs</i>	Dendritic cells
<i>DHA</i>	Dihydroxyacetone
<i>EGF</i>	Epidermal Growth Factor
<i>ET-1</i>	Endotheline - 1
<i>FDA</i>	Food and Drug Administration
<i>FGF</i>	Fibroblast Growth Factor
<i>Fr:CO2</i>	Fractional carbon dioxide
<i>g/dl</i>	Grams Per Decilitre
<i>GFs</i>	Growth factors
<i>H2O2</i>	Hydrogen peroxide
<i>Hcy</i>	Homocysteine
<i>HGB</i>	Hemoglobine
<i>HGF</i>	Hepatocyte Growth Factor
<i>HIV</i>	Human immunodeficiency virus
<i>HLA</i>	Human Leukocyte Antigen
<i>IBD</i>	Inflammatory Bowel Disease
<i>IBS</i>	Irritable bowel syndrome
<i>ICAM-1</i>	Intra cytoplasmic adhesion molecule 1
<i>IFN</i>	Interferon
<i>IFN-γ</i>	Interferon gamma
<i>IFN-γR</i>	Interferon gamma receptor

List of Abbreviations Cont...

Abb.	Full term
<i>IgA</i>	Immunoglobulin A
<i>IgG</i>	Immunoglobulin G
<i>IgM</i>	Immunoglobulin M
<i>IL</i>	Interleukin
<i>IL1-α</i>	Interleukin 1 alpha
<i>JAK</i>	Janus kinase
<i>KP</i>	Koebner's phenomenon
<i>laser</i>	Fractional carbon dioxide laser
<i>MBEH</i>	Mono-benzyl ether of hydroquinone
<i>MCH</i>	Melanin concentrating hormone
<i>MCHR1</i>	Melanin concentrating hormone receptor 1
<i>mg</i>	Milligram
<i>MHC</i>	Major histocompatibility complex
<i>mL</i>	Milliliter
<i>mm</i>	Millimeter
<i>NALP1</i>	NACHT-LRR-PYD-containing protein 1
<i>NB-UVB</i>	Narrowband ultraviolet B
<i>NCES</i>	Non-cultured epidermal cell suspension
<i>NK</i>	Natural killer
<i>nm</i>	Nanometer
<i>NSAIDs</i>	Nonsteroidal anti-inflammatory drugs
<i>NSV</i>	Non segmental vitiligo
<i>PDGF</i>	Platelet-derived growth factor
<i>PG</i>	Punch Grafting
<i>PPP</i>	Platelet-poor plasma
<i>PRP</i>	Platelet-rich plasma
<i>PRRs</i>	Pattern recognition receptors (PRRs)
<i>PTPN22</i>	Protein Tyrosine Phosphatase Non Receptor Type 22
<i>PUVA</i>	Psoralen with ultraviolet A
<i>QoL</i>	Quality of life
<i>QSR</i>	Qswitched ruby
<i>ROS</i>	Reactive oxygen species
<i>SCF</i>	Stem cell factor
<i>SLE</i>	Systemic Lupus Erythematosus
<i>SOD</i>	Superoxide dismutase

List of Abbreviations Cont...

Abb.	Full term
<i>STAT</i>	Signal transducer and activator of transcription
<i>SV</i>	Segmental vitiligo
<i>TGF</i>	Transforming Growth Factor
<i>TNF</i>	Tumour necrosis factor
<i>TNF-α</i>	Tumour necrosis factor-alpha
<i>TNF-β</i>	Tumour necrosis factor-beta
<i>Tregs</i>	Regulatory T cells
<i>Tyk2</i>	Tyrosine kinase 2
<i>ul</i>	Microliters
<i>UV</i>	Ultraviolet
<i>UVA</i>	Ultraviolet A rays
<i>UVB</i>	Ultraviolet B rays
<i>VASI</i>	Vitiligo Area Scoring Index
<i>VEGF</i>	Vascular Endothelial Growth Factor
<i>VETF</i>	Vitiligo European Task Force
<i>VIDA</i>	Vitiligo Disease Activity Score
<i>WBCs</i>	White blood cells
<i>XE – Cl</i>	Xenon-Chlorine
<i>α-MSH</i>	α -melanocyte-stimulating hormone

List of Tables

Table No.	Title	Page No.
Table (1):	Classification of vitiligo	25
Table (2):	Contents of PRP: Growth factors and their actions	48
Table (3):	Demographic data of patients	66
Table (4):	Characteristics of vitiligo lesions in included patients	66
Table (5):	Distribution of VAS score between different groups	67
Table (6):	Comparison between surface area before and after treatment in each group	68
Table (7):	Comparison of mean values of surface area reduction with controls	69
Table (8):	Repigmentation grades' distribution in different treatment modalities	71
Table (9):	Correlation of repigmentation improvement with patients' age, duration of lesions and stability of vitiligo lesions	72
Table (10):	Distribution of pain and erythema between different groups	73
Table (11):	Distribution of itching and expansion between different groups.	74

List of Figures

Fig. No.	Title	Page No.
Figure (1):	Pathogenesis of vitiligo	8
Figure (2):	IFN- γ /CXCL10 signaling pathway in vitiligo	14
Figure (3):	Example of Koebner phenomenon (KP) subtype 2A (top) and type 2B (bottom) in a patient with extensive vitiligo	21
Figure (4):	Trichrome pattern on the neck and shoulders	22
Figure (5):	Inflammatory type of vitiligo with erythema and scale	23
Figure (6):	Mixed vitiligo in a 9-yr-old patient with (A) segmental and (B) non-segmental involvement	24
Figure (7):	Flow chart showing the stratified approach to management of vitiligo	41
Figure (8):	Flowchart illustrating preparation of "activated PRP"	53
Figure (9):	FIRE-XEL Fractional CO ₂ laser, Bison Medical, Korea	58
Figure (10):	Electronic centrifuge, (Scientific System, China)	59
Figure (11):	Waldman UV phototherapy lamp, Germany.	60
Figure (12):	Example of surface area calculation (A. Manual marking of lesions, B. Computer assisted calculation of lesions)	61
Figure (13):	Distribution of mean values of surface area reduction between groups	70

List of Figures Cont...

Fig. No.	Title	Page No.
Figure (14):	65 years old male patient, (duration of lesions = 52 years).	77
Figure (15):	45 years old female patient, (duration of lesions = 40 years).	80
Figure (16):	19 years old female patient, (duration of lesions = 5 years).	83

INTRODUCTION

Vitiligo is a chronic systemic acquired disease that has an unpredictable clinical course, characterized by the appearance of macules and achromic or hypochromic patches on the skin and mucous membranes due to the disappearance of melanocytes in the affected area (*Tarlé et al., 2014*).

The prevalence of vitiligo is less than 2% worldwide (*Ghafourian et al., 2014*). Vitiligo may develop at any age, but most people develop the disease before the age of 20 years (*Li et al., 2017*).

The cause of vitiligo is not fully understood. There are a few major hypotheses for the pathogenesis of vitiligo which include the genetic, neural, autoimmune, biochemical, and melanocytorrhagy theories (*Choi et al., 2014*).

The mode of re-pigmentation in vitiligo involves reactivation of the melanocytes located in the outer root sheath of the hair follicles or from the contiguous pigmented skin in which melanocytes migrate about 2–3 mm into the depigmented skin (*Anbar et al., 2006*).

Therapeutic strategies for vitiligo include nonsurgical and surgical methods. Nonsurgical options like psoralen and ultraviolet A (PUVA), narrow-band ultraviolet B (NB-UVB), corticosteroids, topical calcipotriol, and tacrolimus. Surgical

methods such as skin grafting, autologous cultured melanocyte, or epidermal suspension transplantations (*Mina et al., 2018*).

NB-UVB phototherapy is considered to be a very important modality in vitiligo treatment since it is use in 1997 (*Yuan et al., 2016*).

NB-UVB phototherapy utilizes ultraviolet radiation in the specific wavelength range of 311-312 nm and is an important treatment modality in a number of dermatological conditions (*Sokolova et al., 2015*).

Fractional CO₂ (Fr:CO₂) laser is a treatment modality that depends on thermal injury zones surrounded by normal skin. Fr: CO₂ laser proved effective in the treatment of refractory non-segmental vitiligo in combination with NB-UVB (*El-Zawahry et al., 2017*).

Platelet-rich plasma (PRP) is composed of high concentration of platelets with high concentration of growth factors (GFs). This may help in stimulation of the proliferation of melanocytes and repigmentation within vitiliginous patches (*Kadry et al., 2018*).