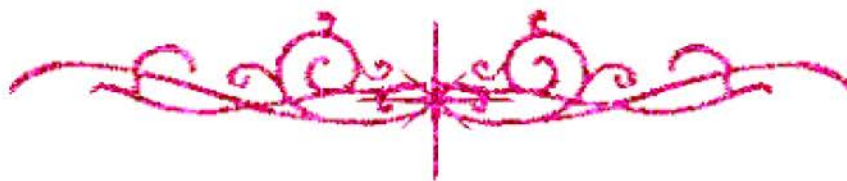


بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ





شبكة المعلومات الجامعية التوثيق الالكتروني والميكروفيلم



جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

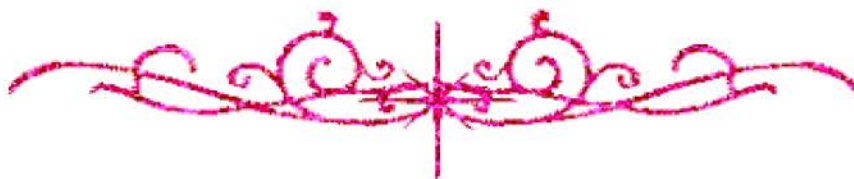
قسم

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



يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار





Efficacy of Fractional Carbon Dioxide Laser Alone and Combined with Platelet-Rich Plasma in the treatment of Male Androgenetic Alopecia

Thesis

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

By

Amira Nagy Mohamed Galal

M.B.B.Ch. Cairo University

Under supervision of

Prof. Dr. Mai Hussein El Samahy

*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*

Dr. Tarek Nabil Abd-allah

*Lecturer of Dermatology, Venereology and Andrology
Faculty of Medicine, Misr University for Science and Technology*

Faculty of Medicine - Ain Shams University

2021

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قالوا

لسببائك لا علم لنا
إلا ما علمتنا إنك أنت
العليم العظيم

صدقة 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. Mai Hussein El Samahy, 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.

I am deeply thankful to Dr. Tarek Nabil, Lecturer of Dermatology, Venereology and Andrology, Faculty of Medicine, Misr University for Science and Technology, for his great help, active participation and guidance.

I would like to express my hearty thanks to all my family for their support till this work was completed.

Last but not least my sincere thanks and appreciation to all patients participated in this study.

Amira Nagy Mohamed Galal

List of Contents

Title	Page No.
List of Tables	i
List of Figures.....	iii
List of Abbreviations.....	vii
Introduction.....	1
Aim of the Work.....	4
Review of Literature	
☞ Androgenetic Alopecia	5
☞ Platelets Rich Plasma.....	51
☞ Ablative Fractional Carbon Dioxide Laser	61
Patients and Methods.....	76
Results.....	84
Cases from The Present Study.....	98
Discussion.....	114
Summary	122
Conclusion.....	124
Recommendations.....	125
References	126
Arabic Summary.....	\

List of Tables

Table No.	Title	Page No.
Table (1):	Appropriate positioning of the area to be treated.....	72
Table (2):	Demographic data and clinical characteristics ..	84
Table (3):	Assessment of TH count response with fractional CO2 laser + PRP therapy	85
Table (4):	Assessment of VH count response with fractional CO2 Laser + PRP therapy.....	86
Table (5):	Assessment of hair thickness response with fractional CO2 Laser + PRP therapy.....	87
Table (6):	Assessment of TH count response with fractional CO2 laser monotherapy.....	88
Table (7):	Assessment of VH count response with Laser monotherapy	89
Table (8):	Assessment of hair diameter response with Laser monotherapy.....	90
Table (9):	Comparison of TH count improvement between fractional CO2 laser + PRP and laser monotherapy.....	91
Table (10):	Comparison of VH count improvement between fractional CO2 laser + PRP and fractional CO2 laser monotherapy	92
Table (11):	Comparison of hair thickness improvement between fractional CO2 laser + PRP and fractional CO2 laser monotherapy.....	93
Table (12):	Correlation of patients' age and duration of AGA with response to laser + PRP.....	94
Table (13):	Correlation of patients' age and duration of AGA with response to fractional CO2 laser monotherapy.....	95

List of Tables (Cont...)

Table No.	Title	Page No.
Table (14):	Patient's satisfaction after end of treatment	96
Table (15):	Side effects with laser therapy in included patients.....	97

List of Figures

Fig. No.	Title	Page No.
Figure (1):	Diagrammatic representation of hair anatomy showing the bulb, suprabulb, isthmus and infundibulum.....	8
Figure (2):	The different layers of hair follicle.....	10
Figure (3):	Key stages of the hair cycle.....	12
Figure (4):	Trichoscopic image of normal terminal hair from a 16-year-old male, frontal area.....	16
Figure (5):	Trichoscopic images showing the difference between vellus hairs and other hair shaft types x 50.....	16
Figure (6):	Diagrammatic image showing stepwise miniaturization of the hair follicle and shortening of the anagen growth phase, mediated by DHT.....	25
Figure (7):	<i>a and b:</i> Stelae or fibrous streamers (FSt) commonly seen in AGA.....	25
Figure (8):	Hamilton classification of male pattern hair loss.....	27
Figure (9):	Ludwig scale for female hair loss: stage I, stage II, and stage III.....	29
Figure (10):	Sinclair grades of female hair loss.....	29
Figure (11):	Hair shaft diameter variation.....	34
Figure (12):	Pearly white dots which represent hypertrophied sebaceous glands.....	34
Figure (13):	Peripilar sign characterized by brown halo around the emergent hair shaft, seen in early stage.....	35
Figure (14):	Scalp honeycomb pigmentation formed as hypomelanotic areas bordered by hyperchromic lines.....	35
Figure (15):	After centrifugation, the blood components (red blood cells, leukocytes and platelets) are separated from the plasma due to their different densities.....	55
Figure (16):	Microscopic ablation zone.....	63

List of Figures (Cont...)

Fig. No.	Title	Page No.
Figure (17):	The fractional CO ₂ laser (BISON Fire-Xel Fractional CO ₂ Laser) and the parameters used in the study.....	79
Figure (18):	800 D centrifuge used in the study.	80
Figure (19):	Clinical picture of one patient aged 27 years with grade III AGA: (A) before treatment (B) at 3 months after beginning of treatment.	98
Figure (20):	Trichoscopic assessment at the right frontal region: (A) before treatment (B) at 3 months after beginning of treatment.	99
Figure (21):	Trichoscopic assessment at the left frontal region: (A) before treatment (B) at 3 months after beginning of treatment.	99
Figure (22):	Trichoscopic assessment at the right frontotemporal region: (A) before treatment (B) at 3 months after beginning of treatment.	100
Figure (23):	Trichoscopic assessment at the left frontotemporal region: (A) before treatment (B) at 3 months after beginning of treatment.	100
Figure (24):	Trichoscopic assessment at the right vertex region: (A) before treatment (B) at 3 months after beginning of treatment.	101
Figure (25):	Trichoscopic assessment at the left vertex region: (A) before treatment (B) at 3 months after beginning of treatment.	101
Figure (26):	Clinical picture of one patient aged 24 years with grade III AGA: (A) before treatment (B) at 3 months after beginning of treatment.	102
Figure (27):	Trichoscopic assessment at the right frontal region: (A) before treatment (B) at 3 months after beginning of treatment.	103
Figure (28):	Trichoscopic assessment at the left frontal region: (A) before treatment (B) at 3 months after beginning of treatment.	103

List of Figures (Cont...)

Fig. No.	Title	Page No.
Figure (29):	Trichoscopic assessment at the right frontotemporal region: (A) before treatment (B) at 3 months after beginning of treatment.	104
Figure (30):	Trichoscopic assessment at the left frontotemporal region: (A) before treatment (B) at 3 months after beginning of treatment.	104
Figure (31):	Trichoscopic assessment at the right vertex region: (A) before treatment (B) at 3 months after beginning of treatment.	105
Figure (32):	Trichoscopic assessment at the left vertex region: (A) before treatment (B) at 3 months after beginning of treatment.	105
Figure (33):	Clinical picture of one patient aged 39 years with grade V AGA: (A) before treatment (B) at 3 months after beginning of treatment.	106
Figure (34):	Trichoscopic assessment at the right frontal region: (A) before treatment (B) at 3 months after beginning of treatment.	107
Figure (35):	Trichoscopic assessment at the left frontal region: (A) before treatment (B) at 3 months after beginning of treatment.	107
Figure (36):	Trichoscopic assessment at the right frontotemporal region: (A) before treatment (B) at 3 months after beginning of treatment.	108
Figure (37):	Trichoscopic assessment at the left frontotemporal region: (A) before treatment (B) at 3 months after beginning of treatment.	108
Figure (38):	Trichoscopic assessment at the right vertex region: (A) before treatment (B) at 3 months after beginning of treatment.	109
Figure (39):	Trichoscopic assessment at the left vertex region: (A) before treatment (B) at 3 months after beginning of treatment.	109

List of Figures (Cont...)

Fig. No.	Title	Page No.
Figure (40):	Clinical picture of one patient aged 27 years with grade III AGA: (A) before treatment (B) at 3 months after beginning of treatment.	110
Figure (41):	Trichoscopic assessment at the right frontal region: (A) before treatment (B) at 3 months after beginning of treatment.	111
Figure (42):	Trichoscopic assessment at the left frontal region: (A) before treatment (B) at 3 months after beginning of treatment.	111
Figure (43):	Trichoscopic assessment at the right frontotemporal region: (A) before treatment (B) at 3 months after beginning of treatment.	112
Figure (44):	Trichoscopic assessment at the left frontotemporal region: (A) before treatment (B) at 3 months after beginning of treatment.	112

List of Abbreviations

Abb.	Full term
<i>ACD-1</i>	<i>Anticoagulant citrate dextrose solution, solution-1</i>
<i>ADP</i>	<i>Adenosine triphosphate</i>
<i>AGA</i>	<i>Androgenetic alopecia</i>
<i>AR</i>	<i>Androgen receptor</i>
<i>ATP</i>	<i>Adenosine triphosphate</i>
<i>bFGF</i>	<i>Basic fibroblast growth factor</i>
<i>CACL2</i>	<i>Calcium chloride</i>
<i>CO2</i>	<i>Carbon dioxide</i>
<i>DHT</i>	<i>Dihydrotestosterone</i>
<i>DKK-1</i>	<i>Dickkopf-1</i>
<i>FDA</i>	<i>Food and drug administration</i>
<i>FGF</i>	<i>Fibroblast growth factor</i>
<i>FrCO2</i>	<i>Fractional CO2 laser</i>
<i>FSt</i>	<i>Fibrous streamers</i>
<i>FT</i>	<i>Frontotemporal</i>
<i>GF</i>	<i>Growth factor</i>
<i>HF</i>	<i>Hair follicle</i>
<i>HGF</i>	<i>Hepatocyte growth factor</i>
<i>HSV</i>	<i>Herpes simplex virus</i>
<i>IGF-1</i>	<i>Insulin-like growth factor</i>
<i>IL-1 α</i>	<i>Interleukin-1 α</i>
<i>IRS</i>	<i>Inner root sheath</i>
<i>KCZ</i>	<i>Ketoconazole</i>
<i>LAD</i>	<i>Laser-assisted drug delivery</i>
<i>LED</i>	<i>Light-emitting diode</i>
<i>LLLT</i>	<i>Low level laser therapy</i>
<i>MAA</i>	<i>Male androgenetic alopecia</i>
<i>MTZ</i>	<i>Microthermal treatment zone</i>

List of Abbreviations (cont...)

Abb.	Full term
<i>ORS</i>	<i>Outer root sheath</i>
<i>PDGF</i>	<i>Platelet-derived growth factor</i>
<i>PGD2</i>	<i>Prostaglandin D2</i>
<i>PGE2</i>	<i>Prostaglandin E2</i>
<i>PGF2</i>	<i>Prostaglandin F2</i>
<i>PIH</i>	<i>Postinflammatory hyperpigmentation</i>
<i>PRP</i>	<i>Platelet-rich plasma</i>
<i>RF</i>	<i>Radiofrequency</i>
<i>TE</i>	<i>Telogen effluvium</i>
<i>TGF-β</i>	<i>Transforming growth factor-β</i>
<i>TH</i>	<i>Terminal hair</i>
<i>TNF α</i>	<i>Tumor necrosis factor α</i>
<i>VEGF</i>	<i>Vascular endothelial growth factor</i>
<i>VH</i>	<i>Vellus hair</i>