

Ascorbic Acid versus Diode Laser in the Treatment of Gingival Hyperpigmentation: Histological and Clinical Randomized Study

Thesis Submitted to the Faculty of Dentistry, Ain-Shams University in partial fulfillment of the requirement for Master Degree in Oral Medicine, Periodontology and Oral Diagnosis

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Dedication

This work is dedicated to

My dear parents

The light that leads my way

My beloved husband and son

For their encouragement and support

Acknowledgment

*Words could not express my deepest gratitude and appreciation to **Prof .Dr. Nevine Kheir El Din**, Professor of Oral medicine, Periodontology, Oral Diagnosis and Radiology, Faculty of Dentistry, Ain Shams University for her wise supervision, guidance and valuable advice.*

*I would like to express my special deep thanks and gratitude to **Dr. Ola Ezzatt** Lecturer of Oral medicine, Periodontology, Oral Diagnosis and Radiology, Faculty of Dentistry, Ain Shams University for her support, continuous inspiration and unlimited willingness for help to accomplish this work,*

*I would like to express my grateful thanks to **Prof. Dr. Houry Baghdadi** Professor and head of Oral Pathology Department, Faculty of Dentistry, Ain Shams University For her great help and supervision.*

*Many thanks to **Dr. Ahmed Sobhy** and **Dr. Basma Abd El Rahman** for their valuable help.*

Finally, My sincere thanks and appreciation to all the staff members and colleagues of Oral medicine, Periodontology, Oral Diagnosis and Radiology Department for their cooperation, continuous support and encouragement.

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List of abbreviations:

ACTH	Adrenocorticotropin Hormone
Al	Aluminium
AP-1	Activator Protein-1
Ar	Arsenide
bFGF	Basic Fibroblast Growth Factor
cAMP	Cyclic Adenosine Monophosphate
CO₂	Carbon dioxide
DHI	5,6-Dihydroxyindole
DHICA	5,6-Dihydroxyindole-2-Carboxylic Acid
DOPA	Dihydroxyphenylalanine
DOPI	Dummet Oral Pigmentation Index
Er:YAG	Erbium-doped Yttrium-Aluminum-Garnet
Ga	Gallium
GPCR	G-Protein-Coupled Receptor
H & E	Hematoxylin and Eosin

HGF	Hepatocyte Growth Factor
IL1	Interleukin 1
IL6	Interleukin 6
IL8	Interleukin 8
In	Indium
LAA	L-Ascorbic Acid
LASER	Light Amplification by Stimulated Emission of Radiation
MAF	Mean of Area Fraction
MART-1	Melanoma Antigen Recognizable by T lymphocytes
MC1R	Melanocortin Receptor 1
MITF	Microphthalmia-Associated Transcription Factor
MMP	Matrix Metalloprotenase
mRNA	Messenger Ribonucleic Acid
Nd:YAG	Neodymium-doped Yttrium-Aluminum-Garnet
NFkβ	Nuclear Factor Kappa-Beta
PAR-2	Protease Receptor 2
ROS	Reactive Oxygen Species

SCF	Stem Cell Factor
TNF-α	Tumor necrosis factor alfa
TRP-1	Tyrosinase-Related Proteins-1
TRP-2	Tyrosinase-Related Proteins-2
TYR	Tyosinase
UV	Ultra Violet
VEGF	Vascular Endothelial Growth Factor
Vit. C	Vitamin C
Vit. E	Vitamin E
α-MSH	Alfa-Melanocyte Stimulating Hormone

Review of literature

Cosmetic dentistry is usually centered on aesthetic restorative procedures but it may also involve the appearance of the gingiva, especially when it is located in the anterior labial region. Oral pigmentation may be physiological or pathological in nature (*Cicek et al., 2003, Karydis et al., 2012*).

Physiologic gingival hyperpigmentation affects numerous people of different ethnic backgrounds, (*Dummett et al., 1971*) and occurs in all races of man (*Perlmutter et al., 1986, Tamizi et al., 1996*). In addition, no difference in oral pigmentation was observed between males and females (*Steigmann et al., 2000*).

In darker skinned people oral pigmentation increases, although there is no difference in the number of melanocytes between fair skinned and dark skinned individuals. Oral pigmentation may appear in young children or become clinically visible only after puberty. The intensity and distribution of racial pigmentation of the oral mucosa is variable, not only between races, but also between different individuals of the same race and within different areas of the same mouth (*Prinz 1932, Amir et al., 1991, Özbayrak et al., 2000, Steigmann et al., 2000, Chatterjee, 2011*).

Colour variation may not be uniform and may exist as unilateral, bilateral mottled, macular or blotched and may involve

gingival papillae alone or extend throughout the gingiva or to other soft tissues (**Dummet, 1971**). The prevalence of gingival pigmentation is higher on the labial part of the gingiva than on the palatal / lingual parts of the arches. The highest rate is observed in the area of the incisors and decreases considerably in the posterior areas (**Patsakas et al., 1981**).

Physiologic pigmentation caused by excessive melanin deposition by melanocytes mainly located in the basal and suprabasal cell layers of the epithelium. The most common location of the melanocytes is the attached gingiva (27.5%) followed in decreasing order by the papillary gingiva, the marginal gingiva, and the alveolar mucosa. The total number of melanophores in the attached gingiva is approximately 16 times greater than that in the free gingiva (**Gorsky et al., 1984, Mobio et al., 2008 Karydis et al., 2012**).

The colour of healthy gingiva is variable ranging from a pale pink to a deep bluish purple hue (**Shafer et al., 1984**). Between these limits, there are large number of pigmentation mosaics which depend primarily upon the intensity of melanogenesis, depth of epithelial cornification and arrangement of gingival vascularity (**Chatterjee, 2011**).