THE ANTI-INFLAMMATORY POTENCY OF VITAMIN E AND COCONUT OILS ON LIGATURE-INDUCED PERIODONTITIS IN ALBINO RATS

Histological and Immunohistochemical Study

Thesis

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By

Hoda Omar Mohamed Helmy Desouky

B.D.S. Faculty of Dentistry, Misr International University, 2011
Demonstrator in the Oral Biology Department
Faculty of Dentistry - Misr International University

Supervised by

Prof. Dr. Ahmad Mahmoud Halawa

Head of Oral Biology Department
Faculty of Dentistry – Ain Shams University

Ass. Prof. Dr. Mohamed Ahmed Zayed

Assistant Professor of Oral Biology
Faculty of Dentistry – Misr International University

Dr. Dina Hazem Hassan Gomaa

Lecturer of Oral Histology
Faculty of Dentistry - Ain Shams University

Faculty of Dentistry
Ain Shams University
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Dedication

I would like to dedicate this work to my parents, my siblings, my husband, and my lovely daughter Hana.

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LIST OF ABBREVIATIONS

µm	Micrometers
Ab	antibody
ANOVA	Analysis of variance
BANA	benzoyl-DL-arginine-naphthylamide
CD	cluster of differentiation
CSF-1	Colony stimulating factor-1
DNA	deoxyribonucleic acid
DPX	distyrene, a plasticizer, and xylene
EASPA	ethyl acetate soluble proanthocyanidins
ECM	extracellular matrix
EGF	Epidermal growth factor
g	grams
H&E	hematoxylin and eosin
I/V	Intravenous
IHC	Immunohistochemistry
IL-1	interleukin-1
IL-1Ra	interleukin-1 receptor antagonist
IL2R	interleukin -2 receptor
kg	kilograms
LDL	low density lipoprotein
mg	milligrams
ml	milliliters
MMP-1	Matrix metalloproteinase-1
MMP-9	Matrix metallopeptidase 9
MRC	Medical Research Center
MTC	Masson's trichrome
ORG	organoleptic breath assessment
PBS	Phosphate buffer saline
PDL	periodontal ligament
PMNL	polymorphonuclear leukocytes
RANKL	receptor activator of nuclear factor kappa-B ligand
RBCs	red blood cells
ROS	reactive oxygen species
SD	Standard deviation
SOD	Superoxide Dismutase
TIMPs	tissue inhibitors of matrix metalloproteinases
TNF α	tumor necrosis factor alpha
TRAP	Tartrate-Resistant Acid Phosphatase

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ABSTRACT

Overview: Plaque induced periodontitis is the second most common oral disease worldwide after dental caries. Adjunctive methods such as mouthwashes have been developed as an aid to routine scaling for treating periodontal inflammation. **Aim:** The aim of this study was to evaluate the anti-inflammatory potency of vitamin E and coconut oils when used for oil gum massage therapy in periodontitis and compare them to the conventionally used chlorhexidine. **Methods:** 105 adult male albino rats were divided into 5 groups of 21 rats each: The negative control group (group 1) that received no intervention, the positive control group (group 2) that received ligature induced periodontitis without any treatment, the chlorhexidine experimental group (group 3) that received ligature induced periodontitis and chlorhexidine for 10 days, the vitamin E experimental group (group 4) that received ligature induced periodontitis and vitamin E for 10 days. And the coconut oil group (group 5) that received ligature induced periodontitis and coconut oil for 10 days. Groups 2-5 were further divided into subgroups A,B, and C according to day of termination (day 3, 7, &10). After rats were terminated, maxillary molar regions were excised and stained with H&E and Masson's trichrome stain. Specimens were also examined immunohistochemically for the expression of MMP-1 antigen. **Results:** Histological and immunohistochemical examination showed an inflammatory reaction with ligature induced periodontitis that decreased gradually from day 3 until day 10. Statistical analysis regarding the immunohistochemical expression of MMP-1 inflammatory marker showed that it gradually decreased over the course of the treatment in all experimental groups with chlorhexidine showing the greatest decrease in inflammation while there was no significant difference between vitamin E and coconut oil. **Conclusion:** Vitamin E and coconut oil are effective in reducing periodontal inflammation in rats but less effective than chlorhexidine.

INTRODUCTION

Plaque induced periodontitis is the second most common oral disease worldwide after dental caries **(Petersen 2003)**. Mechanical removal of plaque via routine scaling is critical to maintain the health of the periodontal tissues **(Sharma et al., 2004)**.

However, since most people do not consistently control plaque accumulation adequately, adjunctive methods such as antimicrobial mouthwashes and dentifrices have been developed for treating periodontal inflammation **(Nadkerny et al., 2015)**.

Among these adjunctive methods, chlorhexidine has long been considered the "gold standard" for treating gingival inflammation, owing to its broad spectrum action on plaque-causing bacteria **(Indurkar et al., 2016)**.

Since it has been found that most tissue destruction in periodontal disease is dependent more on the host's response to the plaque-causing microorganism rather than the microorganism itself **(Lamster & Novak, 1992; Dahiya et al., 2013)**, the use of antioxidant rich oils for oil pulling and oil gum massage can be seen as a potential alternative to chlorhexidine. Vitamin E oil and coconut oil are two natural products that are currently gaining popularity for their powerful antioxidant properties, enabling them to oxidize free radicals and reactive oxygen species generated during periodontal inflammation **(Atalay et al., 2000; Singla et al., 2014)**.