HISTOLOGICAL AND IMMUNOHISTOCHEMICAL STUDY OF SKIN CHANGES IN PHOTOAGING AND CHRONOLOGICAL AGING

Thesis
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دراسة هستولوجية و هستوكيميائية مناعية للتغيرات التي تحدث في الجلد نتيجة التسنن الزمني و التسنن الضوئي

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٢٠٠٧

b

(وَقُلِ اعْمَلُواْ فَسَيَرَى اللّهُ عَمَلَكُمْ وَرَسُولُهُ وَالْمُؤْمِنُونَ .)

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Dedication

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List of abbreviations:

AHAs ……alpha hydroxyl acids
CS ……..condroitin sulphate
DS ……..dermatan sulfate
ER ……..estrogen receptor
GAGs ……glycosaminoglycans
HA ……..hyaluronic acid
hpf ……..high power field
IGF-I ……..inculin-like growth factor-I
IL …….interlukin
MMP ……...matrix metalloproteinase
PBS ……..phosphate buffered saline
ROS …….reactive oxygen species
TEM …….transmition electron microscopy
TNF ……..tumor necrosis factor
TUNEL ……..terminal deoxynucleotidyl transferase-mediated deoxyuridine triphosphate nick end labeling reaction
UV ……ultraviolet

Introduction

Aging of the skin has become an issue of great social significance and concern due to the cosmetic disfigurement it produces and its psychological impact, especially on women **(Katsambas and Katoulis 1999).**

Human skin, like all other organs, undergoes chronological (intrinsic) aging which depends on the passage of time per se. However, unlike other organs, skin is in direct contact with the environment and therefore undergoes additional changes as a consequence of environmental damage. The primary environmental factor that causes human skin aging is ultraviolet (UV) irradiation from the sun. This sun-induced skin aging (photoaging), like chronological aging, is a cumulative process. Understanding the basis of chronological aging and photoaging provides exciting new opportunities for the development of new anti-aging therapies **(Fisher et al., 2002)**.

Jackson (2001) mentioned that skin changes due to aging can be distinguished from those due to sun damage, which results in telangiectasia of blood vessels. However, **Toyoda et al., (2001)** found that photodamaged

microvascular system in facial skin is characterized by coexistence of regressive changes and angiogenesis. On the other hand, **Chung et al., (2002)** observed reduction of cutaneous vessel size in both photoaged and chronologically aged skin, in addition to reduction of the number of dermal vessels in photoaged skin.

Most of the studies that described the histological changes in the photoaged skin used in-comparable anatomical sites such as buttocks and forearm skin. Therefore, data obtained was not always accurate because of the regional differences in the structure of the skin that influence the morphologic photoaging at any given site **(Toyoda et al., 2001).**

Little is known about the regional variability in the mottled skin appearance on the sun-exposed parts of the body in the elderly. The relationship between these features and the skin atrophy related to aging is also an area ripe for study **(Petit et al., 2003).**

Aim of the work

The aim of this study is to investigate the structural changes in aged skin with special concern to changes in the vascularity and also to compare between sun-exposed and sun protected areas.

Review of Literature

Intrinsic (Chronological) aging

As the population aged, common skin disorders of the elderly demanded greater attention. Moreover, there were many clinical, histological and physiological changes that characterized old skin and were increasingly implicated in its vulnerability to environmental injury and certain diseases, thus it was important to study the basic process of aging in the skin and the separable process of photoaging which itself is a major clinical problem. Studies at the cellular level had demonstrated major functional losses, particularly in the proliferative capacity between infancy and adulthood and as a result of chronic sun exposure. Continued, careful, quantitative assessment of changes in aged and photoaged human skin -both in vivo and in vitro- would be critical for better understanding of these processes and particularly to their successful therapeutic modification **(Gilchrest, 1989)**.

On studying the skin thickness changes in normal aging skin, **Branchet et al., (1990)** found that the epidermal thickness decreased with aging. This decrease was somewhat slower in women (5.7% of the original value / decade) than

in men (7.2%). They also found that the total dermal thickness decreased at about the same rate in women and in men (6% / decade). They noticed that the superficial layer of the dermis showed a decrease in it's thickness with age but this change was not significantly different between women and men because of the large individual variations and possibly because of the absence of well demarcation between the two layers of the dermis.

Functions of the skin such as protection, excretions, secretion absorption, thermoregulation, pigmentogenesis, sensory perception and regulation of immunological processes were found to be affected by the structural changes in the skin with aging. After middle age, most functions were reduced by as much as 50- 60%. The physiological changes associated with these reductions included impairment of the barrier function, decreased turnover of epidermal cells, reduced number of keratinocytes, Langerhans cells and fibroblasts, and reduced vascular network particularly around hair bulbs and glands. These changes resulted in fibrosis and atrophy, and decreased hair and nail growth and vitamin D synthesis. Moreover, there was a decrease in functions of Meissner's and Pacinian corpuscles **(Cerimele et al., 1990)**.