AGEING OF THE SKIN

Thesis

SUBMITTED FOR PARTIAL FULFILMENT

OF MASTER DEGREE IN

(DERMATOLOGY & VENEREOLOGY)

By

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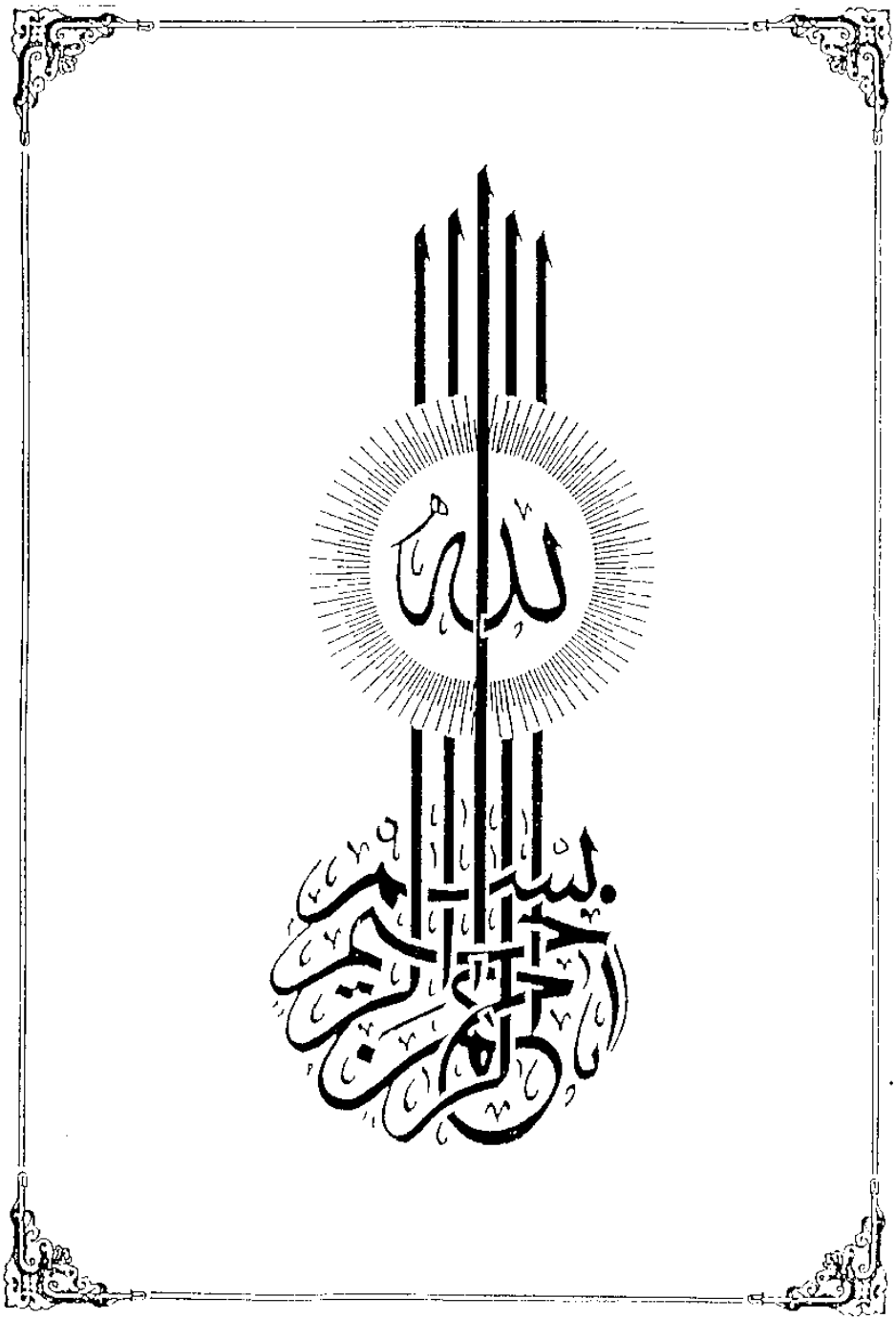

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INTRODUCTION

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The skin arises by the juxtaposition of two major embryological elements, the prospective epiderms which originates from a surface area of the early gastrula, and prospective mesoderm which is brought into contact with the inner surface of the epidermis during gastrulation.

Epidermis : in about the third week of fetal life, the epidermis consists of a single layer of undifferentiated glycogen-filled cells. In a 4 - 6 weeks old fetus, two layers of cells can be distinguished, the periderm and a stratum germinativum. Between 8 and 11 weeks a middle layer starts to form. Glycogen is abundant in all layers, and a few microvillous projections occur at the surface of the periderm. By 12 to 16 weeks there are one or more intermediate layers. These cells contain mitochondria, Golgi complexes and a few tonofilaments. Microvilli become much more numerous. From this stage onwards dome-shaped blebs start to project from the centres of the periderm cells. They remain connected to the basal part of the cell by one or more pedicles of cytoplasm. Between 16 and 26 weeks the intermediate layers increase in number. By 26 weeks the periderm cells start to separate from the embryo. The significane of the glycogen in embryonic epiderms is uncertain . It is undoubtedly formed in situ

from glucose. It is also found in the developing hair follicle. In contrast, only small amounts of glycogen occur in adult epidermis, though it appears after injury and in skin grafts.

The periderm may be no more than a protective investment for the fetus before keratinization of the epidermis, and may be concerned with the uptake of carbohydrate from the amniotic fluid (Holbrook and odland, 1975).

Hair follicles and apocrine glands: the earliest development of the hair rudiments occur at about 9 weeks in the regions of the eye brow, upper lip and chin. The first sign of a hair follicle is a crowding of nuclei in the basal layer of the epiderms, the so-called pre-germ stage which passes rapidly into the hair-germ stage, the basal cells become high, the nuclei become elongated and the structure starts to grow downward into the dermis. At the same time mesenchymal cells and fibroblasts increase in number to from the rudiment of the hair papilla beneath the hair germ. At this stage it is known as the hair peg. At the hair peg stage two epithelial swellings appear on the posterior wall of the follicle. The upper one is the rudiment of the sebaceous gland. In many follicles a third bud later appears above the sebaceous gland; this is the rudiment of the apocrine gland. Such rudiments develop in a large number of the follicles, including some on the scalp, face, chest, abdomen, back and legs, as well as in the axilla, mons pubis, external auditory meatus, eyelids, region of the breast, and scrotum, where they survive in the adult.

Eccrine glands: eccrine glands derived from a specialized down-growth of the epidermis at about the fourth month of intrauterine life. No glands develop after birth. They are distributed over the whole skin surface but not on mucous membranes.

Nails: the nail is formed from an invagination of epidermis situated on the dorsum of the distal phalanx of each digit. The invagination is first visible in the 9-week embryo and the nail plate is almost completely formed by the 20th week.

Melanocytes:- Melanocyte arises from the neural crest and migrates to dermis (by 8th week of gestation it starts to migrates to basal cells of epidermis) and hair follicles. By 20th week it disappears from dermis. Dendritic melanocytes have been identified in the negro foetus at the 10th week. Dermal melanocytes normally disappear after 20th week. It is generally accepted that melanocytes in the skin and hair continue to reproduce themselves by cell division.

Innervation of the skin: sensory innervation of skin is very different at different stages of development. In the foetus of 8 to 14 weeks menstrual age there is a cutaneous plexus which is already functional. As this stage of development there is no sign of any encapsulated ending in any part of the skin. During third month of gestation stratification of the epidermis begins, and immediately it is invaded by branches from the cutaneous plexus. Later, as the epidermis differentiates further, its nerve fibre population gradually withdraws, and by the

time of birth is greatly reduced. During this period the organized corpuscles appear, first being the pacinian corpuscle , which is recognizable about the fourth or fifth month of foetal life. The characteristic form of the meissner corpuscle does not appear until after birth. As the differentiated receptors appear , the cutaneous plexuses cease to act as receptors and become preterminal.

Dermis: most of the dermis is formed by mesenchymal cells migrating from mesodermal areas. These mesenchyme cells give rise to the whole range of blood and connective tissue cells, including the fibroblasts and mast cells of the dermis and the fat cells of the subcutis.

Age-associated Anatomical Changes in Normal Skin.

AGE-ASSOCIATED ANATOMICAL CHANGES IN NORMAL SKIN

1. Epidermis:

Hill and Montgomery, (1940) and (Montagna and Carlisle, 1979) found that with aging of human skin flattening of the dermo-epidermal junction with effacement of both the dermal papillae and epidermal rete pegs and this results in a much smaller contiguous surface between the two compartments, less nutrient transfer and less resistance to shearing forces.

Thorne (1981) stated that with advancing years the epidermis may become flattened but there is no reduction of cell layers, although there is an increasing variation in the size and shape of basal cells.

Leyden et al., (1978) showed an age-associated decrease in the epidermal turn over of approximately 50 percent between the the third and seventh decades of life.

Maize and Foster, (1979) demonstrated a progressive reduction in the number of melanocytes with age and rarely observed in persons beyond age 80.

Nagy and Janner, (1970) showed that the ultra microscopic changes in the epidermis in exposed skin in old age are very similar to those seen in xeroderma pigmentosum: shrinkage of keratinocytes and their nuclei and abnormalities of nuclear morphology, melanocytes are abnormal with polymorphic melanosomes and there may be giant pigment granules in melanocytes or keratinocytes.

2. Dermis:

Montagna and Carlisle, (1979) found loss of dermal thickness in the elderly individual and the remaining dermis is relatively acellular and avascular.

Giacometti (1965) demonstrated that with age the collagens become stiffer and less elastic resulting in decrease elasticity of the skin.

Murray (1961) stated that the actual concentration of total collagen per unit weight of skin increases from birth to adult hood, when it remains stationary.

Sams and Smith, (1965) found the concentration of insoluble collagen in the skin increases from infant to adult.

Shuster and Bottoms , (1963) showed that from early adult hood onwards gradual decrease in the absolute amount of Collagen per unit area of skin and this correlates with the clinical appearance of the skin during ageing and this occurs more rapidly in women than in men.

Ridge and Wright, (1965) reported that the age changes in the dermis are directly responsible for many of the most striking gross external manifestations of ageing.

Thorne (1981) stated that with advancing years the dermis showed striking changes: the collagen becomes less elastic and stiffer with a definite decrease in the ratio of mucopolysacchoride to collagen, this causes the baggy appearance of the skin with its small initial resistance to stretching.

Ryan (1973) showed that changes in skin blood vessels occurring with age are mainly a consequence of changes in the supporting tissues. Thus, diminished vasculature and fragility may be due to degenerative changes in collagen.

Ryan (1966) demonstrated that the main feature of old age is loss of vasculature. There are many fewer papillary vessels and thinning of the skin is associated with a generally decreased total vasculature.

Ryan (1973) stated that a second feature of old age is the great variety of dystrophic forms. The venules are commonly dilated.

Kocsard et al., (1970) showed that the macroscopic lesions are gross local dilatation of venules, particularly on the lips and under the tongue.