SCANNING AND TRANSMISSION ELECTRON MICROSCOPY OF THE SCALY SCALP IN DIFFERENT DERMATOLOGICAL DISEASES

Thesis submitted for fulfillment of Master Degree in Dermatology and Venereology

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This Work is dedicated:

To My Parents, My Brothers, My Sister & My Fiancée

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(EGF)	Epidermal growth factor
(ECAF)	Endothelial cell stimulating angiogesis factor
(H&E)	Hematoxyllin and Eosin
(HLA)	Histocompatability leucocyte antigen
(ICAM)	Intercellular adhesion molecule
(ICS)	Intercellular cell space
$(INF-\alpha)$	Interferon alpha
$(INF-\beta)$	Interferon beta
$(INF-\gamma)$	Interferon gamma
(IGF)	Insulin growth factor
(IL)	Interleukin
(KGF)	Keratinocyte growth factor
(LFA)	Lymphocyte function associated antigen
(M.)	Microsporum
(MHC)	Major histocompatibility commplex
(P.)	Propiobacterium
(PDGF)	Platelet derived growth factor

(PA)	Pityriasis amiantacea
(PAS)	Periodic acid schiff
(PRP)	Pitryiasis rubra pilaris
(SD)	Seborrheic dermatitis
(SEM)	Scanning electron microscope or microscopy
(TCR)	T cell receptor
(TEM)	Transmission Electron microscope or microscopy
$(TGF-\alpha)$	Transforming growth factor alpha
$(TGF-\beta)$	Transforming Growth factor beta
(Th-1)	T helper 1
(Th-2)	T helper 2
$(TNF-\alpha)$	Tumor necrosis factor alpha
(VCAM)	Vascular cellular adhesion molecule
(VEGF)	Vascular endothelial growth factor

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ABSTRACT

Background and Objectives: The scales of some scalp disorders were examined by scanning electron microscope (SEM), and transmission electron microscope (TEM) with the purpose of revealing importance of stratum cornuem in the diagnosis of these disorders and studying possible correlation between morphological data and pathologic hypotheses in the dermatoses of the scalp. **Patients and methods:** 20 patients with various scaly scalp disorders are selected. From each patient, a skin surface biopsy for (SEM), and a punch skin biopsy for (TEM) were taken. They included 6 patients with psoriasis, 5 patients with seborrheic dermatitis (SD), 2 patients with dandruff, 2 patients with pityriasis amiantacea (PA), 2 patients with pityriasis rubra pilaris (PRP) and 2 patients with scaly tinea capitis. **Results:** SEM revealed specific surface patterns (print) of diseased cells which were: "hexagonal" in psoriasis, "heart-shaped" in SD, "polyhedral" in dandruff and PA, "rock-like" in PRP and fungal colonies obscuring the external morphological features in scaly tinea capitis. TEM revealed presence of remnants of nuclei and lipid droplets in all scaly scalp dermatoses. The characteristic findings for each disorder were: in psoriasis "retained intacellular lamellar bodies", in SD & dandruff "numerous lipid inclusions, intercellular lipids and wide intercellular space ", in PA "wide corneal separation with finger-like projections", in PRP "almost normal intercellular space" and in scaly tinea capitis "normal stratum corneum structure with massive fungal spores infiltration". **Conclusion**: Specific SEM and TEM findings for each scaly scalp disorder reflect the importance of the alteration of stratum corneum in hypotheses of these diseases and that there is a different underlying pathologic process of every disease.

Key words: scanning electron microscope- transmission electron microscope- psoriasis - seborrheic dermatitis - dandruff -pityriasis amiantacea.

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The Basic Structure of the Epidermis

The epidermis is the outermost layer of the skin. It is directly contiguous with the environment ***(Odom et al., 2000)***. The epidermis provides a physical barrier, for the sake of physiological homeostasis as well as exclusion of harmful organisms and external agents ***(Irene, 2003)***.

The normal epidermis is terminally differentiated stratified squamous epithelium. It is approximately 0.4 to 1.5 mm thickness, as compared to 1.5 to 4 mm full-thickness skin. It is composed of three basic cell types; keratinocytes, melanocytes, and Langerhans' cells, in addition to merkel cell ***(Odland, 1991)***.

The keratinocyte is an ectodermally-derived cell. It is the principal cell of epidermis making up at least 80% of epidermal cells. Keratinocytes are organized into distinct cellular layers; stratum basale, stratum spinosum, stratum granulousum and stratum corneum ***(Mc Grath et al., 2004)***. The characteristics of each epidermal layer reflect the mitotic and synthetic properties of the keratinocytes and their state of differentiation ***(Chu et al., 2003)*** (Fig. 1).

The stratum basale or the basal layer consists of a single layer of cuboidal shaped keratinocytes that attach to the basement membrane zone. These cells have relatively large nuclear cytoplasmic ratio and slightly basophilic cytoplasm. They often contain melanin pigment transferred from adjacent melanocytes, the extent and distribution of the pigment correlate with skin color. Most of the mitotic activity in normal epidermis occurs in the basal cell layer ***(Murphy, 1995)***.

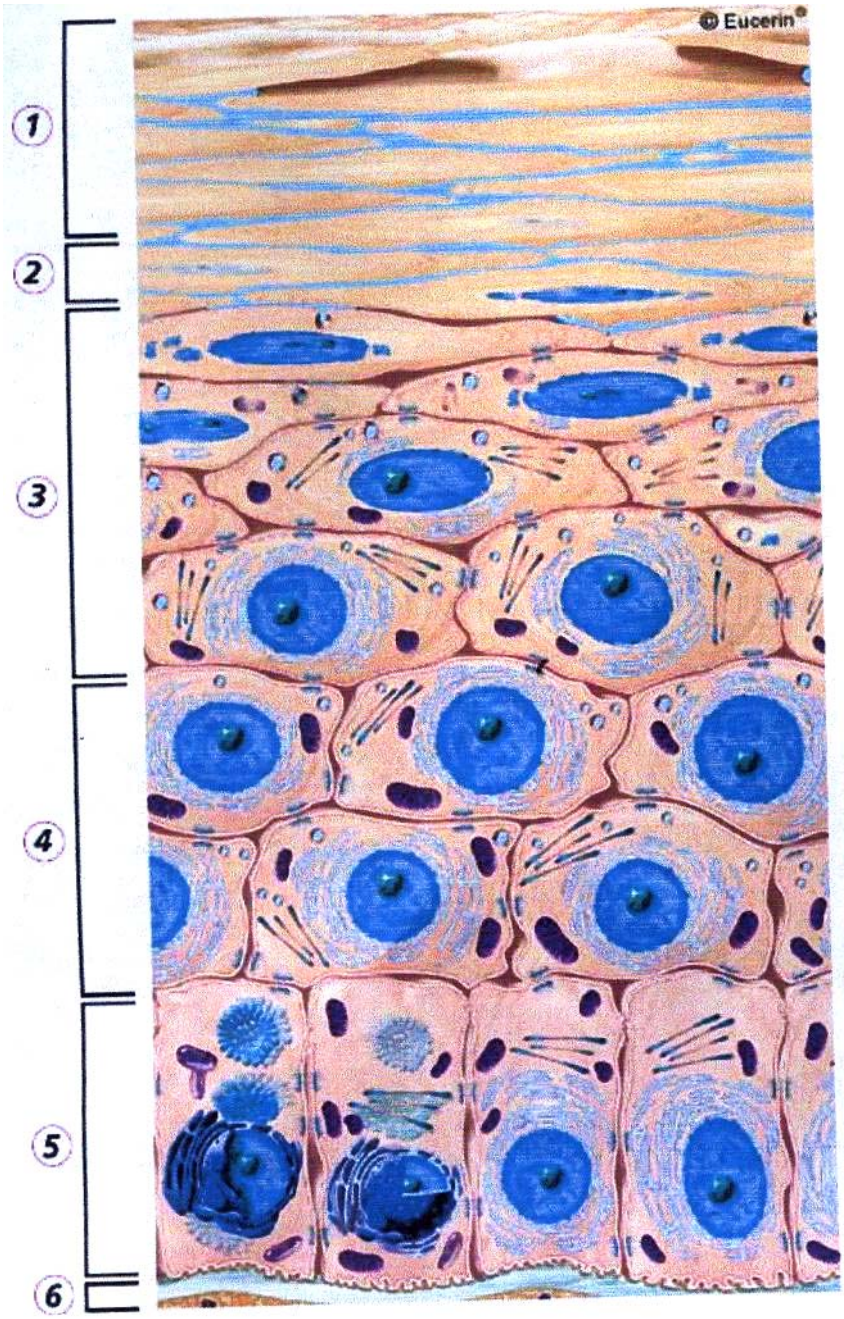

Fig. (1**):** Schematic diagram of the epidermis: the basal cells change, though differentiation, into flat horny skin cells that are without nuclei ***(Higazi, 2000)***.

1. Horny layer.
2. Clear layer.
3. Granular layer
4. Prickle cell layer.
5. Basal layer.
6. Basal membrane.