Introduction to Dermatology Part 1&2
(Skin Structure & Dermatological Language)

Course Objectives :

Below is a summary of the key objectives of the course.

- To understand the basics of skin anatomy.
- To be familiar with the language of dermatology by learning the primary and secondary skin lesions and to be able to describe various skin conditions.
- To enable medical students to recognize the most common skin diseases and to manage them.
- To be familiar with the diagnostic laboratory tests pertinent to dermatology.
- To help students to formulate decent differential diagnoses of skin diseases.
- To gain an overview of the skin manifestations of systemic diseases.
- To be able to deal very appropriately with different emergencies in dermatologic diseases

Sources: doctor's slides and notes + FITZPATRICK color atlas +433 team male and female + 434 team

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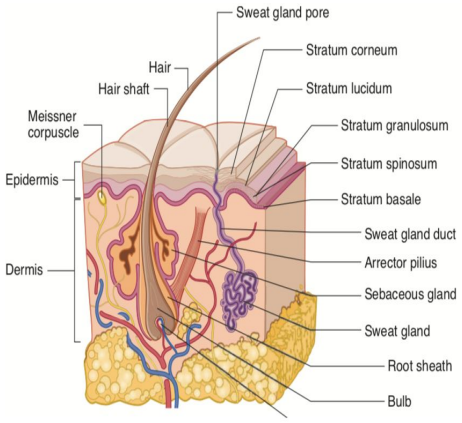
[Color index : Important | Notes | Extra]

The Skin:

- The **human skin** is the outer covering of the body.The skin is a complex, dynamic organ and is **the largest** organ of the body. It has a body surface area of 1.5 – 2 m2 and it contributes to 1/6 to 1/7 of body weight.

Skin function :



- Barrier to harmful exogenous substance & pathogens.
- Prevents loss of water & proteins. (metabolic & endocrine function)
- Sensory organ protects against physical injury.
- Regulates body temperature (Thermal regulation through the sweat glands, constriction or dilation of blood vessels)
- Important component of the immune system.
- Vit.D production by absorbing UVB.
- Has psychological and cosmetic importance such as hair, nails. Studies have found that the psychological trauma that is produced on them is equal to the trauma that is produced on patients with CVS disease, DM or HTN!

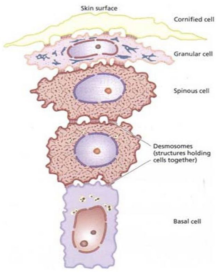
The Skin structure consists of:

1. Epidermis
2. Basement membrane
3. Dermis
4. Subcutaneous tissue
5. Skin appendage

1) The epidermis:

Is the **outermost** layer of the skin. **The main cell types which make up the epidermis are:**

1-Keratinocytes (90% of epidermis + produce keratin) the main cell type in the skin
2-Melanocytes (produce melanin responsible for skin color).
3-Merkel cells (They are abundant in highly sensitive skin areas like that of the fingertips and is essential for light touch).(Merkel cell carcinoma is an aggressive malignant tumor).
4-Langerhans cells (are antigen presenting cells). Considered as part of the adaptive immune system. They are located in the spinous layer.



Cornification (keratinization):

- It is the cytoplasmic events that occur in the cytoplasm of epidermal keratinocytes during their terminal differentiation into dead horny cell (corneocyte). The total process takes approximately 2 months
- It involves the formation of keratin polypeptides.
- Abnormalities in this process lead to roughness and scaling of the skin like PSORIASIS (In psoriasis it takes 3 days which will result in a lot of scales)

The Epidermal zones :	1) **Stratum corneum (cornified layer horny cell layer):** is the outermost layer of the epidermis (dead cells with no organelles, The cells in this layer have No nucleus = corneocytes). Its 25 cell layer. The cells have a thick envelope that helps it resist external

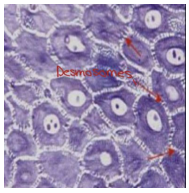
chemicals. In psoriasis, you see a nucleus in the stratum corneum, this is NOT normal!**(Parakeratosis)**

2) **Stratum lucidum** (wasn't mentioned in the slides) very thin absent in areas with thin skin (back) it is only found in palms and soles, present under the stratum corneum.

3) **Stratum granulosum (granular cell layer) (flat cells containing keratohyaline organelles):**

- Diamond shaped cells
- Cytoplasm is filled with keratohyalin organelles (the protein Keratohyalin forms dense cytoplasmic granules that promote dehydration of the cells well as aggregation and cross-linking of the keratin fibers. The nuclei and other organelles then disintegrate, and the cells die)
- The thickness of this layer is proportional to that of the stratum corneum thicker in palms and soles than in the face because the stratum corneum is thicker there.
- In thin skin its 1-3 cell layers and 10 cell layers in thick (fingertips, hand and soles)

4) Stratum spinosum (spinous cell layer, larger nucleus, **polyhedral cells attached by desmosomes):**



- In the spinous layer they are connected to each other by desmosomes and gap junctions which appear as spines thus called spinous layer. Desmosome is a complex modification of the cell membrane. When there is a problem with desmosomes, the patient develops "blistering diseases" > the connection between keratinocytes is no longer there due to autoimmune antibodies or other causes.
- Bone marrow derived **Langerhans cells** which are antigen presenting cells (MHC II) are found in this layer.(skin immune function/adaptive immunity) And they can be identified through birbeck granules. Abnormal proliferation of these cells is seen in Langerhans cell histiocytosis

5) Stratum basale (basal cell layer) (columnar or cuboidal dividing cells): stem cells

- This layer Rests on (above) the basement membrane
- **Divides continuously and moves upwards.**
- It takes 28 days to transmit cells from this layer to stratum corneum
- Melanocytes are dendritic cells lying between basal cells in a ratio of **1:10** for every 10 keratinocytes, there is ONE melanocyte. Melanocytes are scattered among the keratinocytes. They produce and store melanin + transfer pigment granules (melanosomes) into keratinocytes "Melanosomes are transferred to adjacent cells by means of dendrites thus forming **The epidermal melanin unit** ". Melanosomes serve as the packaging of melanin pigment. The **size of melanosomes** and packaging differentiate white from dark skin. The number of melanocytes are **equal** in white and dark skin what differs is the SIZE of the melanosomes. Melanocytes are cells responsible for skin pigment and provide protection from UV light. They are mainly seen in this layer. Melanocytes can also be found in the hair bulb, eye and brain.

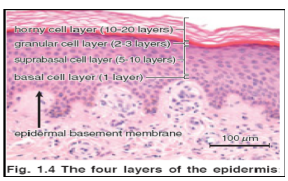
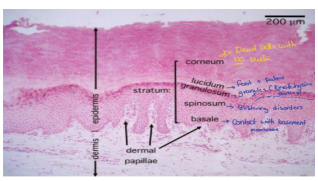
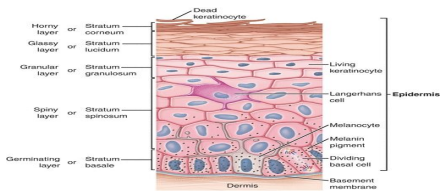


Fig. 1.4 The four layers of the epidermis

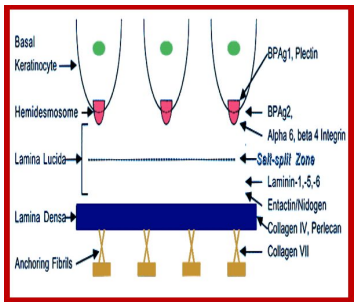




2) Basement Membrane:

Between epidermis and dermis and Consists of two layers:

- Lamina Lucida (thin clear amorphous space) (above) (superficial)
- Lamia dense (an electron dense area) (below)(deep)



Contains important proteins and proteinous structures which are important in bullous
and autoimmune diseases:

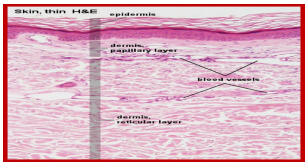
- **Laminin**
- **Desmosomes**: adheres keratinocytes to the basement membrane
- **Anchoring filaments**: connects lamina lucida to lamina densa
- Anchoring fibrils: connects lamina densa to papillary dermis

It's the site of attack injury in blistering diseases. Types of blisters :
Autoantibodies directed against the antigens/proteins forming the basement membrane 1-Intraepidermal blisters (within the spinosum layer) (like pemphigus vulgaris). 2-subepidermal : between dermis and epidermis like(bullous pemphigoid)

- The basement membrane is thickened in some diseases: connective tissue diseases, when we take a punch biopsy from these pts and see it under the microscope we see that the bm appears very thickened.
- Keratinocytes stick to basement membrane through the "Hemidesmosomes".
- There is an antigen called alpha 6 beta 4, mutated in pts with epidermolysis > split in the basement membrane and the basal layer. الدكتورة قرأت الصورة، لاتسوون سكيب

3) Dermis:

- Upper layer is called papillary dermis
- The lower part is called reticular dermis. "Bigger part"



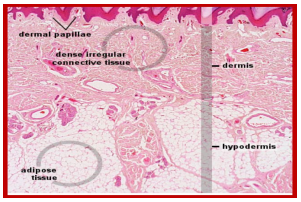
Consists of:

1. Collagen fibers (strength) 70-80%
   Thin fibers in papillary dermis but thick and coarse in the reticular dermis.
2. Elastic fibers (elasticity) 1-3%. Pts with systemic sclerosis: 1&2 affected. Protects against shearing forces
3. Ground substance (softness) binds water and maintains skin turgor. proteoglycans
4. Fibroblasts (produce collagen)
5. Blood vessels(It provides nourishment to the epidermis and interact with it during wound repair, nerves, lymphatics and muscles)
   So the function of dermis is to give the skin its strength and elasticity and to provide the epidermis with nourishment .When we get older we will have less ground substance , collagen fibers and elastic fibers so we will get wrinkles and dry skin.

The cells in the dermis include: macrophages, fibroblasts, dermal dendritic cells and mast cells (immune functions)

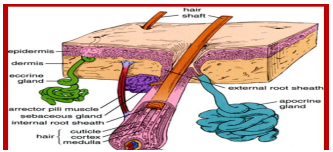
4) Subcutaneous fat:

- Lies below the dermis. Composed of **Lipocytes**. What is the fundamental unit of Subcutaneous fat? lipocytes.
- Attach the skin to underlying boneand muscle as well as supplying it with blood vessels and nerves.The main cell types are fibroblasts macrophages and adipocytes
- Inflammation of the subcutaneous fat is called **panniculitis**

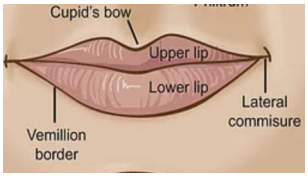
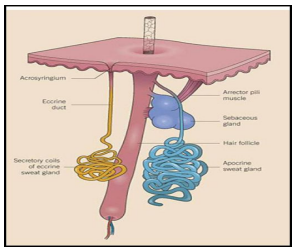
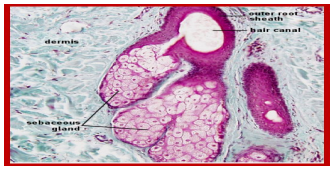
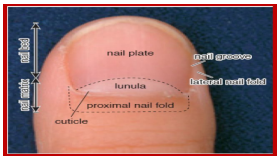
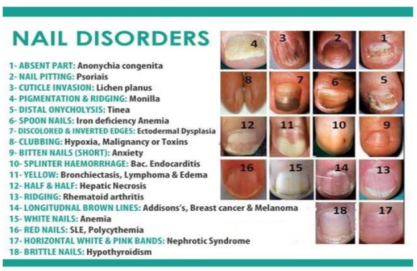


5) Skin appendage:

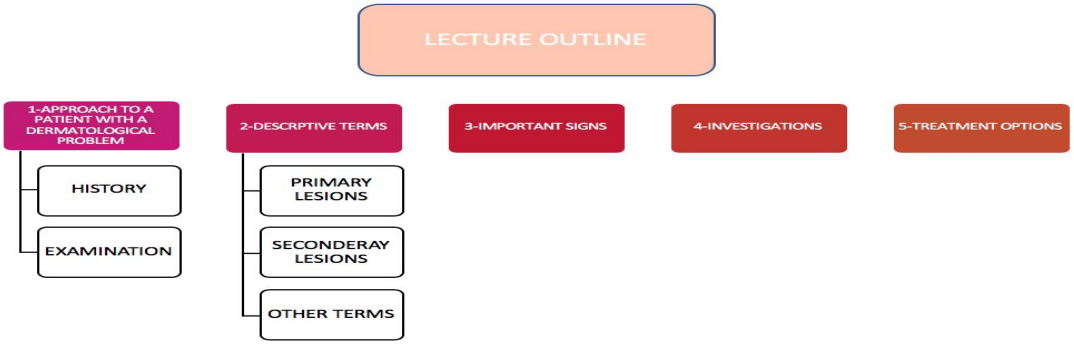
are skin-associated structures that serve a particular function It includes :
1-Eccrine/apocrine glands
2-Hair follicles



3-Sebaceous glands
4-Nail

Eccrine glands:	• Tubular structures open freely on the skin , **not attached to hair follicles.** While apocrine is attached to hair follicles. • Under the influence of **cholinergic stimuli**. parasympathetic • Present everywhere except: - The vermilion border. - Nailbeds. - glans penis. - Labia minora. • Abundant in palms and soles.  
Apocrine:	• Secrete viscous material that gives musky odor when acted upon by Bacteria. • Present in: The axillae, Anogenital area, Modified glands in the external ear canal, The eyelids (moll's glands) and areolae. Please don't forget this: eyes sebaceous glands (meibomian glands), eyes sweat glands are called **(moll's glands)**! • Under **adrenergic** stimuli.Periglandular acetylcholine is the major stimulant of sweat secretion.
Sebaceous glands :	Attached to hair follicles or open freely. If attached, it's called pilosebaceous unit. • Present in the scalp, forehead, face and upper chest **except palms and soles.** • Secrete sebum to moisturize the skin. • Sebaceous glands are under the control of **androgens** • SG in the areola are called **montgomery tubercles**, in the eye they are called meibomian glands.  Ectopic glands in the mucous membrane are called → fordyce spots. تصير غالباً بعد فيلر الشفاه
Hair follicles:	• Hair follicle has the hair shaft, hair bulb and the bulge. • Pilosebaceous unit include: hair follicle, sebaceous gland ,arrector pili Muscle.
nails:	• The nail plate is formed of hard keratin. Proximal nail fold morphology can be altered in connective tissue disease. • The lunula is the visible part of the matrix. • The matrix covers the mid-portion of the distal Phalanx. • Fingernails grow 3mm/month. Toenails grow 1mm/month. • Nails can be affected in systemic and skin diseases.  

Part 2 (Dermatological Language)



◆ Approach to a dermatology patient:

- **There are two distinct clinical situations regarding the nature of skin changes:**
  A/The skin changes are incidental Findings in well and ill individuals noted during the routine general physical examination ((should be able to recognize these lesions to differentiate them from asymptomatic but important, e.g., malignant, lesions))
  B/The skin changes are the chief complaint of the patient: e.g., localized itchy rash.

1) First start with basics: **" Don't forget the basics''** Start with the patient:
   1. Age
   2. Race
   3. Sex
   4. Occupation and marital status

2) History:
   - **How long** have skin lesions been present. Acute, subacute, chronic.
   - **Where** did the problem first appeared. (does it change sites ?)
   - **Progression** of the problem. (constant or increasing in size)
   - Aggravating relieving factors (Heat, cold, sun)
   - Any other symptoms like pruritus. (is it itchy)
   - **Treatment** history. (some medications might cause autoimmune reactions ex penicillin thiazide lithium)
   - General relevant medical history. (chronic diseases)
   - **Occupational** and recreational history. (Jobs like painting)
   - **Travel** and **Family** and **household** contact history (pets)
   - Drug Hx and allergy Hx are VERY IMPORTANT in dermatology

3) Examination: Don't forget the patient vital signs you need a good light in order to examine. It is very important to examine the mucus membranes, mucus membranes examination is part of the dermatological examination

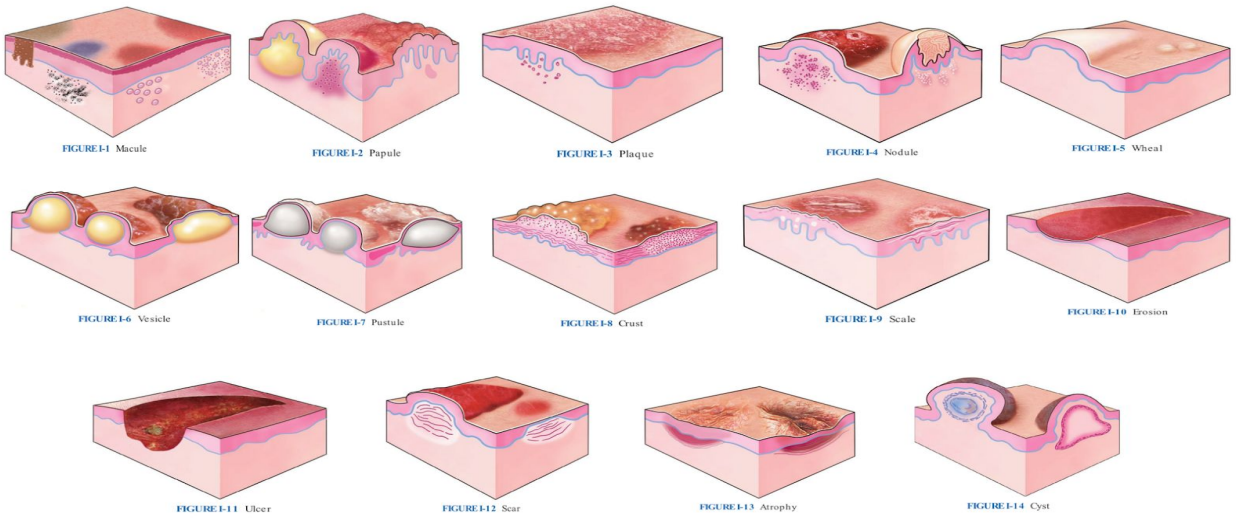
- Full skin examination should be carried out to determine the full extent of the problem and possible unrelated conditions.
- The examination should be done in a good light, better natural sunlight. Look at web spaces where scabies start

- Skin, nails, hair, mucous membranes should all be examined. Never forget: mucus membranes, hair and nails.
- **Describe the General appearance of the patient.**
- **Look for distribution of lesion its color size shape type arrangements**

- **Palpate for consistency mobility depth and tenderness.**
- Lymph node exams in selected diseases like mycosis fungoides and skin cancers.
- Wood's lamp, dermoscope, photography and other office based test like KOH preparation could help in diagnosis and follow up.
- Lesion distribution could be **generalized** or **localized :** certain diseases present with certain distribution

Generalized	Localized
◆ All over the body ◆ Symmetrical: either universal or bilateral In the same regions, the left side is affected in a similar way to the right side. ◆ Asymmetrical: either diffuse or unilateral Wholly or predominantly on one side of the affected region	◆ Acral (peripheral body parts "limbs/head: ears and nose") ◆ Dermatomal (following the dermatomes, ex: herpes zoster which follow the nerve roots distribution (sacral, trigeminal)) ◆ Malar (malar bone (cheeks)) ◆ Sun exposed areas ◆ Trauma sites ◆ Extensors ex: extensor surfaces of the UL ◆ Flexures ◆ Specific part

◆ Terms Used in Dermatology:

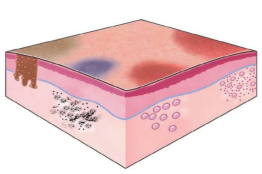
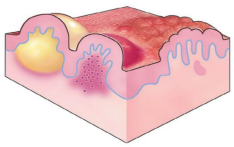
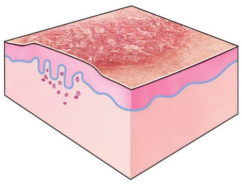
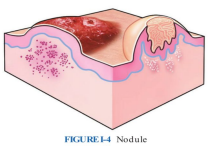
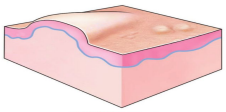


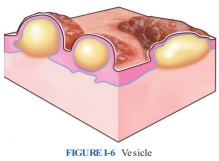
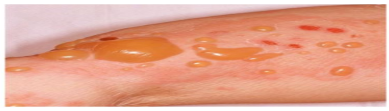
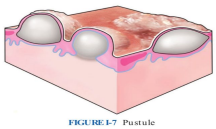
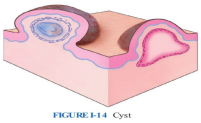
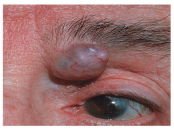
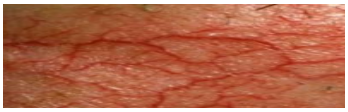
◆ Skin lesions: skin lesions are divided into primary & secondary lesions

1) Primary lesions= basic lesions:

- Macule/patch
- Papule/plaque
- Nodule
- Cyst
- Wheal
- Vesicle/bulla
- Pustule
- Purpura

- Telangiectasia
- Tumor

Primary skin lesion	Description	Picture
1) Macule	a flat circumscribed area of altered skin color **less than 1 cm** in size. It **Lacks** surface elevation or depression. (not palpable) e.g freckle, vitiligo. Less than 5 mm patch or macule معناته elevation أي شي تحطي يدك ومافيه Change in color only, what differentiates between macule or patch is the SIZE. it is no longer patch or macule أي شي طالع أو نازل	 FIGURE I-1 Macule 
2) Patch	Flat circumscribed skin discoloration; More than 1 cm it **Lacks** surface elevation or depression). e.g Vitiligo, melasma. More than 5 mm	
3) Papule	A papule is a superficial, elevated, solid lesion, generally considered <0.5 cm in diameter.	 FIGURE I-2 Papule 
4) Plaque	A flat topped palpable lesion more than 1 cm in size. Confluence (group) of papules leads to the development of larger, usually flat-topped, circumscribed, plateau-like elevations known as plaques **lacks a deep component** ALSO A PATCH WITH ELEVATION is considered plaque	 FIGURE I-3 Plaque 
5) Nodule	A **solid**, circumscribed elevation whose greater part lies beneath the skin surface. > 0.5 cm in diameter; **with deep component. (elevation+depth)**	 FIGURE I-4 Nodule 
6) Wheal	A transient, edematous slightly raised lesion, characteristically with a pale center and a pink margin. Commonly seen in urticaria Pts with atopy have WHITE wheals	 FIGURE I-5 Wheal 

7) Vesicle	Elevation that contains **clear** fluid < 0.5cm in diameter e.g. Dermatitis Herpetiformis. Vesicle is a smaller bulla	 
8) Bulla	Localized fluid collection. >0.5cm in diameter (bulla is a **large vesicle**).e.g. Bullous Pemphigoid. It could be tense or flaccid depending on the split level. Once you see a tense blister, you should know that the split level is deep, either at the basement membrane or at the lower epidermal layer but NOT the upper.	
9) Pustule	A small less than 5 mm in diameter circumscribed **Pus** containing elevation. Pustule is a purulent vesicle It does not necessarily mean that there is infection	 
10) Purpura	Extravasation of red blood cells giving non-blanchable erythema.e.g. Vacuities Small spots called petechiae while large ones called ecchymosis	
11) Cyst	A Closed sac-like lesion that contains **liquid or semi-solid** substance its Usually soft and has depth.	 
12) Telangiectasia	"not in the slides". Dilated capillaries visible on the skin surface. e.g. Rosacea.	
13) Tumor	"not in the slides". Solid elevation of the skin more than 2 cm in diameter and has depth. Like large nodule.	

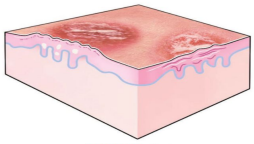
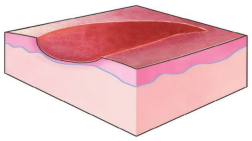
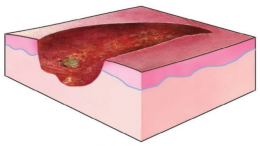
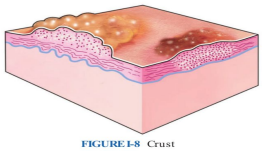
2) Secondary skin lesions:

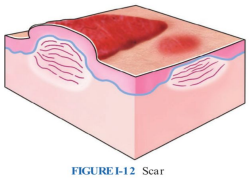
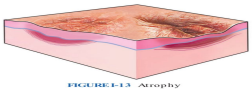
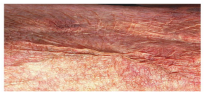
Lesions that Develop during the evolution of skin disease or created by scratching or infection

- Scale
- Excoriations
- Fissure
- Erosion

- Ulcer
- Scar
- Lichenification

- Crust
- Atrophy
- Poikiloderma

Secondary skin lesion	Description	Picture
1) Scale	Thickened, loose, EASILY detached fragments of stratum corneum. e.g. Psoriasis	 FIGURE 1-9 Scale 
2) Excoriations	Linear erosion induced by **scratching**.	
3) Fissure	Vertical loss of epidermis and dermis with sharply defined walls, (crack in skin).	
4) Erosion	A partial focal loss of epidermis that **heals without scarring**. a moist, circumscribed, usually depressed lesion that results from loss of all or a portion of the epidermis. (433TEAM)	 FIGURE 1-10 Erosion 
5) Ulcer	A full thickness focal loss of epidermis and dermis; **heals with scarring**	 FIGURE 1-11 Ulcer 
6) Crust	A collection of cellular debris, dried serum and blood . Antecedent primary lesion usually a vesicle, bulla, or pustule.	 FIGURE 1-8 Crust 

7) Scar	A collection of new connective tissue that May be Hypertrophic or Atrophic. Which Implies dermo-epidermal damage. A permanent lesion that results from the process of repair by replacement with fibrous tissue. Ex: Surgical scar.	 FIGURE I-12 Scar 
8) Lichenification	Increased skin markings secondary to scratching. Patches of increased epidermal thickening with accentuation of skin markings and pigmentation.e.g. Lichen simplex chronicus. Seen in Eczema	
9) Poikiloderma	not in the slides. A morphologic descriptive term, refer to the combination of atrophy, telangiectasia, and pigmentary changes (hypo or hyperpigmentation) e.g. Dermatomyositis.	
10) Atrophy	not in the slides	 FIGURE I-13 Atrophy 

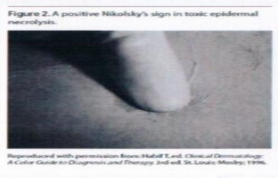
Other descriptive terms:

Photodistribution:

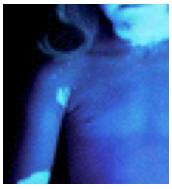
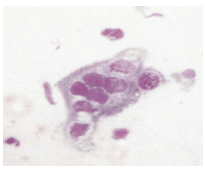
- Lesions occurring over sun exposed skin.
- Protected areas remain free of lesions.

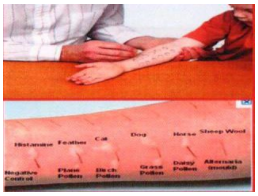
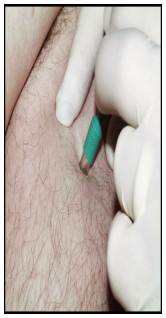
- **Linear:** Forms a line.
- **Dermatomal**: Occurring within the distribution of nerve.
- **Annular**: Ring like.
- **Herpetiform/Grouped:** Lesions grouped in a manner similar to herpes simplex lesions.
- **Reticular:** Net like. Could be physiological or pathological
- **Verrucous, warty, papillomatous:** Surface consisting of finger like projections (in papilloma).
- **Nummular/discoid:** Coin like lesions **(Dermatomyositis).**
- **Guttate:** Drop-like, “en gouttes” (guttate psoriasis).
- **Targetoid:** Round-lesions with concentric border anda dark center (erythema multiforme).
  - Iris like.
- **Umbilication:** Round depression in the center (molluscum contagiosum).

Important Signs:

Nikolsky Sign	Rubbing of apparently normal skin induce blistering. Seen only in pemphigus vulgaris and toxic epidermal necrolysis (TEN). Video 
Auspitz Sign	forceful removal of scale on top of a red papule produces bleeding points Seen in psoriasis. video 
Koebner's phenomenon	Trauma to the skin reproduce certain diseases like Psoriasis, Vitiligo, Lichen planus and Warts these diseases are prone to koebnerization. Video مثلاً لو تعرضوا لجرح أو خبطة، يصيرون معرضين لإن المرض اللي عندهم يمتد لمكان الجرح أو الخبطة. عشان كذا المرضى المصابين بالبهاق (Vitiligo) ماتنصحهم يسوون fractional laser لأن ممكن يطلع لهم بهاق في الوجه بعد الليزر (بينما كانت المنطقة سليمة قبل الليزر). المصابين بأحد الأمراض أعلاه نحرص على إننا ننبههم على إمكانية امتداد المرض للمنطقة المصابة في حال تعرضهم لأي جرح، خصوصاً لو بيسوون عمليات. 
Dermatographism:	Firm stroking of the skin produces erythema and **wheal**.Seen in physical urticaria. In patient with atopy, stroking produces white dermatographism rather than red. 

Investigations:

1-Wood's lamp:	Produces long wave UVL (360 nm) Useful in: • Tinea Versicolor Versicolor-yellowish green fluorescence. • Tinea Capitis yellow green fluorescence in M.canis, M. andouini. • Vitiligo (milky white) زي الصورة • Erythrasma coral red fluorescence • Melasma becomes more intensified. 
2-KOH preparation	For fungus (used for scaly lesions not vesicular)  
3- Tzanck smear:	(used in vesicular lesions to diagnose): • Herpes simplex or VZV **(multinucleated giant cells)** • Pemphigus Vulgaris **(acantholytic cells).** • Stain with Giemsa stain. ⟶ Examine under microscope  

4-Prick test:	● Put a drop of allergen containing solutio ● A non bleeding prick is made through the drop. ● After 15-20 min the antigen is washed and the reaction is recorded. ● Positive test shows : ❖ urticarial reaction at site of prick. ❖ Detects immediate-type IgE mediated reaction. (type 1 hypersensitivity reaction). +angioedema ● Emergency therapeutic measures should be available in case of anaphylaxis.
5- Patch skin test	● Important in Allergic contact dermatitis. (Type 4 cellular immunity) ● Select the most probable substance causing dermatitis. ● Apply the test material over the back. ● Read after 48 & 72 hr. Look for (erythema, edema, vesiculation) ● Positive shows edema and erythema, in severe cases vesicles could present 
6-Skin punch biopsy	● Clean skin with alcohol. ● Infiltrate with 1-2% xylocaine with adrenaline. ● Rotate 2-6 mm diameter. ● punch into the lesions. ● Lift specimen and cut at base of lesion. ● Fix in 10% formalin ● For Immunofluorescence →Put in normal saline. (to keep the tissue fresh). ● Suture if 5 mm is used.(if less the 4 mm we do not need to suture it but if more the 4 mm we need to suture) if the pt is on a blood thinner > suture 
7-Direct immunofluorescence:	● Used to diagnose autoimmune diseases e.g. ➢ Pemphigus Vulgaris ➢ Bullous pemphigoid ● Detects immunoglobulin and complement deposits in skin. ● The deposits will give a green fluorescence ● Fluorescence will be noted if immunoglobulin deposits are found intercellular between the epidermal cells as in pemphigus vulgaris, while found the Basement membrane zone as in bullous pemphigoid.
8- Indirect ImmunoFluorescence :	Detect autoantibodies in the serum. It is used: ➢ To confirm a diagnosis, to differentiate between bullous diseases, to monitor disease activity.

◆ **Topical treatment:** A wide variety of topical agents are available. Delivers the drug to target site.

★ **(Golden rule):**

• IF the lesion is dry -wet it → How to wet it? Creams, ointments

• IF wet -dry it →How to dry it? Using compressors (cloth of water) will cause it to evaporate

★ **Topical drugs consist of:**

1- Active substance: →like steroids, antimicrobial agents.

2- Vehicle: → Is the base in which the active ingredient is dispersed.

Topical steroids side effects:

1) Atrophy and striae.
2) Telangiectasia and purpura.
3) Masking the initial lesion.
4) Perioral dermatitis and rosacea or acne.
5) Systemic absorption.
6) Tachyphylaxis (sudden loss of response).

Guidelines regarding steroid use:

- Avoid use for extended periods of time.
- Avoid high potency steroid on flexures and face
- Avoid high potency steroid in children.

Examples :

- Creams : are mixture of oils and water in which the active substance is
- dispersed. white in color useful in folds.and are applied to wet lesions.
- Ointments are primarily grease ,useful in dry lesions and Are translucent.
- Gels are mixtures of propylene glycol and water. Sometimes they contain Alcohol. They are translucent and are best used in wet disorders and hairy regions.

★ **Fingertip unit:** The amount of cream/ointment expressed from 5mm nozzle.It weighs 0.5g →It covers 2 hand units.

Other therapeutic modalities:

1. Phototherapymachine/NBUVB.
2. Hand and feet narrow band UVB.
3. Liquid nitrogen gun (Cryotherapy) Used to treat warts. * 1

& 2 are used to treat: vitiligo, psoriasis, lichen planus and atopic dermatitis.