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OVERVIEW ANATOMY & PHYSIOLOGY OF TWACHA (SKIN) IN AYURVEDA & CONTEMPORARY SCIENCE

Dr. Trupti Gupta*[1], Dr. Arun Kumar Gupta[2] and Dr. Satej T. Banne[3]

[1]MD (Agadtantra), Assistant Professor Dept. of Agadtantra, Rajeev Gandhi Ayurveda College & Hospital Bhopal, M.P. India.

[2]MD (Panchakarma), Assistant Professor Dept. of Panchakarma, L.N. Ayurveda College & Hospital Bhopal, M.P. India.

[3]Ph.D. Scholar, Assistant Professor, Department of Dravyaguna Vigyana, Parul Institute of Ayurved, Parul University, Limda, Vadodara, Gujarat, India.

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***Corresponding Author**
Dr. Trupti Gupta
MD (Agadtantra), Assistant Professor Dept. of Agadtantra, Rajeev Gandhi Ayurveda College & Hospital Bhopal, M.P. India.

ABSTRACT

Ayurveda, which is the utmost ancient recognized science of life, contends upon the preclusion of the disease rather than adopting the therapeutic measures.[1] To fulfill these resolves, Ayurveda has revealed various fundamental principles in reference of SharirRachna, Sharirkriya, Chikitsa etc. Sharir is prepared up of doshas, dhatus, updhat and malas.[2] Twacha is measured as updhatu of mamsa dhatu.[3] Twacha is one among the five gyanendriyas.[4] It is a base of sparshanendriya. Twacha has several views and counterviews regarding twachauttapati, twachastara and concomitant skin disorders. Skin, the largest organ of human body[5], holds significant prominence in maintaining normal human physiological condition.

Twachapareeksha is also explained among eight tool of Ashtavidha pareeksha.[6] The knowledge of *Rachana Sharir* and *Kriya Sharir* is of pronounced importance as skin is the most important factor involved in the pathogenesis of any disease which is established in the skin. *Twacha*is the seat for various *twacharoga*s. Skin (*Twacha*) is one of the imperative presentable organof the body. It has a certain role in one's personality. So, disorders of skin (*twacha*) distress not only on somatic level but also on psychological level too. To get a suitable idea of disorder one must know the normal echo-texture. Hence standard condition of skin (*twacha*) is necessary. Hence the *twacha* rendering to *Rachana Sharir* and *Kriya Sharir*

has to be studied in depth. Skin is one of the sensory organs and thus supports in knowledge. It is in a method wrapper of the entire body not only outwardly but also internally.

KEYWORDS: Twacha, Skin.

1. INTRODUCTION

Ayurveda, which is the utmost ancient recognized science of life, contends upon the preclusion of the disease rather than adopting the therapeutic measures.[1] To fulfill these resolves, Ayurveda has revealed various fundamental principles in reference of SharirRachna, Sharirkriya, Chikitsa etc. Sharir is prepared up of doshas, dhatus, updhat and malas.[2] Twacha is measured as updhatu of mamsa dhatu.[3] Twacha is one among the five gyanendriyas.[4] It is a base of sparshanendriya. Twacha hasseveral views and counterviews regarding twachauttapati, twachastara and concomitant skin disorders. Skin, the largest organ of human body[5], holds significant prominence in maintaining normal human physiological condition. Twachapareeksha is also explained among eight tool of Ashtavidha pareeksha.[6] The knowledge of *RachanaSharir*and *KriyaSharir*is of pronounced importance as skin is the most important factor involved in the pathogenesis of any disease which is established in the skin. *Twacha*is the seat for various *twacharoga*s. Almost each*roga*has its one or many *lakshanas*having *vyaktisthan*as *twacha*. *Twacha*is a seat of *sparshanendriya*. To know the *vikruti*first one should know the *prakruti*. Skin is one of the supremeimportant body part and sensory organ. In modern times, the physicians are challenged with many novel diseases, as well as with novel forms of old diseases, that mark the medical practice more challengingand interesting too.

2. AIMS AND OBJECTIVES

- ✓ To study the perception of SharirRachanaand Sharirkriya of twacha.
- ✓ To assemble different views of twacha together as explained in different classical texts.
- ✓ To study the skin pronounced in modern science.

3. Embryology

The development of skin follows the fertilization of Shukra & Shonita. In the foetal stage of development of the Garbha, the different layers of the skin are formed & this formation is caused by all the three Doshas & particularly by Pitta. The formation of skin & its layers are just similar to the formation of layers, on the upper or outer surface of boiled milk. Just as the

Santaniaka forms in layers & gradually increase in thickness, all the layers formed in the developmental stage of the embryo of fetus join together to become the skin on the outer surface of the fully developed fetus (Su. Sha.4/3). According to AcharyaCharaka, the six layers of the Twaka are formed from the MamsaDhatu (Ch. Chi 15/17-18). Whereas, Vagabhata holds the opinion that the Twaka is formed from the Rakta. After the Paka of Rakta by its Dhatwagni, it gets dried up to form the skin, like the deposition of cream on the surface of boiling milk. (AH. Sha.3/8). Vagabhata opines that Vata is causative factor for the skin and its sensory function. He also added that Agni is a causative factor for Rupa, Varna and Pitta. (A.H.Sh.3/10-11). He also cited that the formation of Rupa and varna was completed in sixth month of pregnancy.(A.H.Sh.1/57) When Vagabhata described the properties of different Mahabhuta he opined the role of Agni in the formation of Shabda, Sparsha and Roopa. (A.H.Ni.14/137). While he discussed the organic constitution of different organ, he said that Vata caused Sparsh and Twaka and Agni caused Twaka, Pitta and Varna. (A.H.Sh.3/8). At the same place he ferther added that the seven layers of the skin areeformed from Rakta. Amongst six GarbhakaraBhava, skin is considered as MatrujaBhava. (A.H.Sh.3/24)

3. Stratum of skin

There are little conflicts in our intellect to understand the concept our Acharyas in regarding to layers of skin. Charaka Described six layer of skin while Vagabhata and Sushruta mentioned (Su.Sh.4/3)seven layer of skin. But if we look at the specialty of their discipline then we realized that inclusion of Mansadhara Kala as seventh layer may be appropriate.

Layers of skin

Charaka mentioned six layers as he was not belong to surgical discipline, he did not require such narration. Actually he has not mention the name of all six layers at same stanza; he mentioned only the name of first two layers of the skin. In contrast to Charaka, Vagabhata mentions only figure of the layers but not nomenclature them. (A.H.Sh.3/8). He is Arunadutta who nomenclature the seven layers in commentary of same. AcharyaBhela follows the pattern of Charaka for description of the layers of the skin. Sharangadhara, Arunadutta and rest worker follow the Sushruta's pattern for the description of layers of the skin.The modern histological study of the skin reveals that there are seven layers of the skin.

We can understand the trend by visualizing the following **table. 1**

Sushruta	**Charaka, Bhela**	**Vagabhata**	**Arundatta**	**Sharangadhara**
Avabhasini	Udakadhara	Udakadhara	Bhasini	Avabhasini
Lohita	Asrukdhara	Asrukdhara	Lohita	Lohita
Sweta	***3rd***	***3rd***	***Sweta***	***Sweta***
Tamra	***4th***	***4th***	***Tamra***	***Tamra***
Vedini	5th	5th	Vedini	Vedini
Rohini	6th	Pranadhara	Rohini	Rohini
Mamsadhara			Mamsadhara	Sthula

Nomenclature

It is true that the view of Charaka and Vagabhata are correct in accordance to the modern science. But the view of Sushruta is not without logic and practical usefulness. Sushruta is the only person who has given the specific names for each layer. Charaka and Vagabhata has named only first two layers and then given the numbers and referring them by the disease, which occurs in it. Avbhasini is the first later of the skin which is responsible for color reflection and hues of five Bhautika elements. Charaka has mentioned Udakadhara as a first layer of skin. It would appear that Avabhasini and Udakadhara are nearly identical on anatomical ground but not on the basis of their functions like color, absorption and metabolism.We can concord the different opinion of Charaka and Sushruta, regarding to the different layers of the skin, as below:

Modern	**LAYERS**		**THICKNESS**	**DISEASE**	
Implication	**Charaka**	**Sushruta**	**in mm (by Sushruta)**	**Charaka**	**Sushruta**
Epidermis	Udakadhara	Avabhasini	1/8 (0.05-0.06)		Sidhma, Padmakantaka
	Asrigadhra	Lohita	1/16(0.06-0.07)		Tilakalaka, nyachcha, Vyanga Charmadala, Ajagalli, Mashaka
	Tritiya	Shveta	1/12(0.07-0.08)	Sidhma, **Shvitra**	
	Chaturtha	Tamra	1/8 (0.12-0.15)	Dadru, Kushtha	**Kilasa**, Kushtha
DERMIS	Panchami	Vedini	1/5 (0.20-0.50)	Alaji, Vidradhi	Kushtha, Visarpaq
	Shashthi	Rohini	1 (1.0-1.10)	Arunshika	Granthi, Apachi, Shlipada, Galagand
		Mansadhara	2 (2.0-2.10)		Arsha, Bhagandar, Vidradhi

Opinion

The correlation of modern and Ayurvedic are never being a vis-à-vis phenomenon. Both are aimed to cure the body and the different pathway fused at some loci. The fourth layer is Tamra where Kilasa is seated, in other word it is responsible for the formation of melanin and melanin is situated in malpighian layer. So the description reveals that the Tamra may be

stratum basalis. Dermatology is one of the unique systems of the medicine, where a disease expresses itself over the skin, without any major diagnostic tool and major examination. It is a visual clinical specialty where there is simple morphology, history and histology reveals diagnosis. It is an essential part of general medicine since the skin is not foreign to the body. 20% of the patient who enter in the hospital are comes with skin manifestations. Skin is a part of integument system. It associates with very interesting figures like: it covers an area of about 22 sq. feet, it weighs about 5 kg etc. the skin composed of two layers. Upper epithelial part is known as Epidermis and underlying Dermis- connective tissue layer. They are connected with each other by dermal papillae. Beneath there is another subcutaneous layer known as hypodermis, subcutaneous layer of superficial fascia, attaches to tissues and organs. It composed of non vascular stratified epithelium. It contains four main types of cell layers. Its thickness is varies with 0.07nm-0.12nm. It is not uniform thickness throughout entire skin surface; it is highest in sole and palm (0.8nm-1.4nm). We can divide epidermis as below:

- Keratinizing system, also known as malpighian system. 90% of epidermal cell are keratinocytes. They also produced protein called keratine which is responsible for waterproof and protection of skin and interlaying tissue.
- Pigmentary system produced melanin which trancefer to keratinocytes through dendrities of melanocytes.
- Desmosome is a structure which anchors the keratinocytes to each other.
- Langerhanse cells are arising from bone merrow and migrate to epidermis.
- Markell cell are found in hairless epidermis and contect with nerve end known as markell disc.

There are four main layers of epidermis which have following microscopic characteristics.

(1) Stratum basale

CELL: Single row of cuboidal or columnar cell which contains stem cell and can produce eratinocytes and melanocytes.

Types: Four types of cells are germinated through these layers which are keratinocytes, melanocytes, langerhans cells and merkels cells. **Keratinocytes:** They are principle cells of the epidermis about 90% of total cell which produce the protein keratin. It is a tough, fibrous protein and it also helps to protect the skin and save their deeper tissue from heat, microbes and chemicals **Melanocytes**: They are the dendritic cells, synthesize and secrete melanin containing organelle called melanosomes. Melanin is a brown-black pigment which

contributes to skin color and absorbs damaging ultra-violate (UV) light. **Langerhanse cell**: They are originated from the bone marrow and migrate to the epidermis. Langerhans cells play a role in graft rejection and in immune reaction and allergic contact dermatitis. **Markel's cell**: They are originated in the ectoderm of the neural crest. Merkel's cells and tactile discs are functioning in the sensation of touch.

(2) Stratum spinosum

CellS: it consists of 5 to 12 layers of polyhedral keratinocytes connected to each other by intercellular bridges.

Desmosomes: they are bundles of intermediate filaments of the cystoskeleton. This arrangement provides both strength and flexibility to the skin. For holding the cells intercellular cement is also there.

(3) Stratum granulosum

Cell: It is 3 to 5 layers thick of flattened keratinocytes

Keratohylin: it contains darkly staining granules of a protein. It works as a water repellent sealant that retards loss of body fluid and entry of foreign materials. This layer is border mark in between the deeper – metabolically active strata and the dead cells of the more superficial strata.

(4) Stratum lucidum

Cell: It consists of 3 – 5 layers of clear, flat, dead keratinocytes that contains densely packed intermediated filaments and thickened plasma membrane. **Elidin**: they are refractive droplets in protein.

(5) Stratum conium: Cell: It contains anucleated, flattened, cornified, 25 – 30 layers of dead keratinocytes. **Keratin:** it is sulphur containing compound which is a byproduct of cellular protein. **Function**: It serves as an effective water-repellant barrier and also protects against injury and microbes.

(2) Structure of dermis: The dermis is 15 – 40 time thicker that the epidermis **Cell:** The dermis is composed mainly of non-cellular connective tissue containing collagen and elastic fibers. The other cells present in the dermis include fibroblasts macrophages and some adipocytes. **Other structure**: Nerves, blood vessels, lymphatic, muscles and pilosebaceous,

apocrine and eccrine sweat unit. The dermis can be dividing intoSuperficial – papillary region & Deeper – reticular region.

(1) Papillary layer

Cells: It consists of areolar connective tissue containing fine elastic fibers. Elastic fibers play a role in maintaining the elasticity of the skin. **Papilla**: The papillas are microscopic finger like process that projecting into epidermis. Finger prints are developed from ridge of this layer during 3rd and 4th month of foetal life. Thickness: It is about 1/5th thickness of the total dermis.

(2) Reticular region

Cells: It consists of dense, irregular connective tissue containing bundle of collagen and some coarse elastic fibers. **Function**: Collagen and elastic fibers provide strength, ability to stretch, elasticity to skin. **Other structures:** The space between fibers is occupied by adipose tissue, nerve, hair follicle, oil gland and duct of sweat gland.

(3) Hypodermis: It is also known as superficial fascia. It attached to under laying organ such as bone and muscles. It contains nerve ending called lammeleted or pacinian corpuscles which are sensitive to pressure and heat and cold.

Related structures

Dermoepidermal Junction (DEJ)

It represents a highly specialized attachment between the basal keratinocytes and papillary dermis. It helps in the attachment between the dermis to the epidermis, provides support and regulates the permeability across the epidermal – dermal interface. On electron microscopic study it consists of following layers –Plasma membrane of the basal keratinocytes, Lamina lucida – 30nm thick, Lamina densa– 40nm thick and Fibrous zone.

Immunology of Skin: The skin is an important immunological organ and normally contains all the elements of cellular immunity with the exception of B-Cells. Much of the original research into immunology was done under the skin as a model. The immunological component of skin can be divided into.

1. Structures
2. Cells
3. Functional systems

4. Immunogenetics.

(1) Structure

The epidermal barrier is an important example of innate immunity since most microorganisms that have contact with the skin don't penetrate it. Equally the generous blood and lymphatic supplies to the dermis are important channels through which immune cells can pass to or from their sites of action.

(2) Cell

Langerhans Cells: Thelangerhans cells of the epidermis are the guard of the cellular immune system. They are dendritic, bone - marrow derived cells characterized ultrastructurally by a unique cytoplasmic organelle known as the "Birbeck granule". Langerhans cells play an important role in antigen presentation.

T-Lymphocyte: T-Lymphocytes are now believed to circulate through normal skin where they are thought to mature. Different types of T-Cells are recognized as below:

1)	Helper:	Facilitate immune reaction
2)	Delayed hypersensitivity:	Specially sensitized.
3)	Cytotoxic suppressor:	Regulate other lymphocytes.

Mast Cell

These are normal residents of the dermis as are macrophages; both may be recruited to the site during inflammatory reactions.

Keratinocyte: They can produce pro-inflammatory cytokines (specially interteukin-1) and can express on their surface immune reactive molecules such as

Immunogenetics: The tissue type antigens of an individual are found in the Major Histo-compatibility Complex (MHC) located in man on the HLA gene cluster on chromosome 6.

The MHC Class-II antigens of which the commonest is HLA-DR are expressed on B-lymphocytes, Langerhans cells, sometimes T-cells, Macrophages, Epithelial cells and Keratinocytes. They are vital for immunological recognition but also are involved in transplant rejection.

4. PHYSIOLOGY OF SKIN

1) Maintains thermoregulation
2) Protects against mechanical injury

3) Prevents entry of noxious chemical & micro-organisms
4) Screens & reduces penetration of radiation
5) Prevents loss of body contents
6) Provides a frictional surface for grip
7) Discourages microbial growth.
8) Restricts electrical conductivity.
9) Serves as a outpost of sensory nervous system
10) Synthesizes vitamin D

5. CONCLUSION

Skin (*Twacha*) is one of the imperative presentable organof the body. It has a certain role in one's personality. So, disorders of skin (*twacha*) distress not only on somatic level but also on psychological level too. To get a suitable idea of disorder one must know the normal echo-texture. Hence standard condition of skin (*twacha*) is necessary. Hence the *twacha*rendering to *RachanaSharir*and *KriyaSharir*has to be studied in depth. Skin is one of the sensory organs and thus supports in knowledge. It is in a methodwrapper of the entire body not only outwardly but also internally.

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