

A REVIEW ARTICLE ON AYURVEDIC CONCEPT ON ANATOMY AND PHYSIOLOGY OF SKIN AND ITS CO RELATION WITH MODERN MEDICAL CONCEPT

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ABSTRACT

Skin is also a reflection of mind and soul. Its mirror the health of the individual. It is also target organ for many infections. Skin is the largest organ in human being; it is not only an organ but also a sense organ. According to ayurveda *twacha* is one of *gyanedriyas* means sense organ. As *twacha* is *Upadhatu* of *mamsa*, ultimately it develops from *mamsa dhatu*. There is six layers of skin according to Charaka while seven layers according Shushruta. The present article is an attempt to highlighting on detail concept on skin anatomy and physiology by ayurvedic as well as modern science.

KEYWORDS – skin, *Twacha*, *Anatomy*, *physiology* *Ayurveda*

INTRODUCTION

Skin is the largest organ in human being, it is not only an organ but also a sense organ. *Maharshi Charak* said that, ‘the skin is one of the important sense organ in all of the five sense organs’. It is called as *Sparshendriya* which occupies whole body and *Maana* (mind) also ⁽¹⁾. Changes in the skin colour may indicate homeostatic imbalance in the body. Skin is the largest organ of the body. It is not uniformly thick. At some places, it is thick and in some places it is thin. The average thickness of the skin is about 1 to 2 mm. In the sole of the foot, palm of the hand and in the interscapular region, it is considerably thick, measuring about 5mm. In other areas of the body, the skin is thin. It is thinnest over eyelids and penis measuring about 0.5mm only. ⁽²⁾⁽³⁾

As *twacha* is *Upadhatu* of *mamsa*, ultimately it develops from *mamsa dhatu*.⁽⁴⁾ According to *Sushrut Acharya*, the product obtained from *dhatvagnipaka* of *shukra* and *shonita* is *twacha*. In later stages seven layers of the skin formed just like layer of cream after cooling of boiled milk.⁽⁵⁾ *Twacha* is formed by *Paka* of *Raktadhatu* by its *Dhatushma*. Seven layers of skin are formed just like deposition of cream over the cooled milk.⁽⁶⁾

Nirukti of Twacha

Ayurvedic Classics used the word “Twacha’ or “Charma” for skin.⁽⁷⁾ The word twacha is derived from ‘*twak savarane*’ along with ‘*tap pratyay*’ belongs to feminine gender, which means covering of the body.

Definition of Twacha:

The part of the body, which completely covers *meda*, *shonita* and other *dhatu* and gets spreading over, is called *Twacha*.⁽⁸⁾

Origin of the skin :

Among the *Shadbhava* of the *Garbha*, *Twacha* is first organ derived from *Matruja Bhava*.⁽⁹⁾ So it is *Mrudu*.

Layers of skin:

Acharya Charaka has described 6 layers of skin, while *Acharya Sushruta* has mentioned 7 layers of skin. In *Jalpakalpataru Tika* on Ch.Sha.7/3, *Acharya Gandhadhara* has clarified the difference of opinion between *Acharya Charaka* and *Acharya Sushruta*. He has written that the third layer of skin according to *Charakacharya* can be divided in two parts – superficial and deep. The superficial part is the third layer (*Sweta*), while the deep part is the fourth layer (*Tamra*) of *Sushruta*. *Vagbhatta* has only mentioned that the skin has seven layers but he has not described them in detail. *Vruddha Vagbhatta* has supported both of the views and described both 6 layers and 7 layers. *Sarangdhara* has mentioned seven layers of skin.⁽¹⁰⁾ first six layers same as *sushruta* but seventh layer is named as “*Sthula*” which is site of *vidradhi*.

Table no. 01 - Layers of the skin according to various acharyas

No.	Sushruta	Charaka, Bhela	Arundatta	Sharangadhara, Bhavaprakasha
1	Avabhasini	Udakadhara	Bhasini	Avabhasini
2	Lohita	Asrugdahra	Lohini	Lohita
3	Sweta	Trutiya	Sweta	Sweta

4	Tamra	Chaturtha	Tamra	Tamra
5	Vedini	Panchami	Vedini	Vedini
6	Rohini	Shashthi	Rohini	Rohini
7	Mamsadhara	-	Mamsadhara	Sthula

Dr. Bhaskar Govind Ghanekar, in his commentary on *Sushruta Sharira sthana Adhyaya 4 shloka 4*, has correlated the layers of skin with the latest modern anatomy of skin. It is as under:⁽¹¹⁾

Table no.2 -Comparison of Skin layers according to Ancient and Modern term:

Ancient term	Modern term	Types of skin
Avabhasini	Stratum corneum	Epidermis
Lohita	Stratum Lucidum	Epidermis
Sweta	Stratum Granulosum	Epidermis
Tamra	Malpighian layer	Epidermis
Vedini	Papillary layer	Dermis
Rohini	Reticular layer	Dermis
Mamsadhara	Subcutaneoustissue and Muscular layer	Dermis

Table no. 3 : Different opinion of Charaka and Sushruta regarding to the different layers of this skin can he has given in the table

EPIDERMIS

LAYERS		THICKNESS	DISEASE		
	<i>Charaka</i>	<i>Sushruta</i>	(In mm)	<i>Charaka</i>	<i>Sushruta</i>
Udakhara	Avubhasini	1/8 brihi (0.05– 0.06)	-----	Sidhama padmaKantaka	
Asrigdhara	Lohita	1/16 brihi (0.06 0.07)	-----	Tilkalak, Nyachand Masaka	
Tritiya	Sweta	1/12 brih(0.07– 0.08)	Charmadala, Ajagali, Masaka	Sidhma, Shvitra	
Chaturtha	Tamra	1/8 brihi (0.12– 0.15)	Kilasa, Kustha	Dadru Kustha	

DERMIS

Panchmi	Vedini	1/5brihi (0.20–0.50)	Kustha, Visarpa	Alsivradhi
Shashthi	Rohini	1 brihi (1)	Granthi, Apachi shlipada, Galagand	Arunsika

Mamsa dhara		2 brihi (2.0- 2.10)		Arsha, Bhagandrar, Vidradhi
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LAYERS OF SKIN (12,13)

Skin is made of two layers-

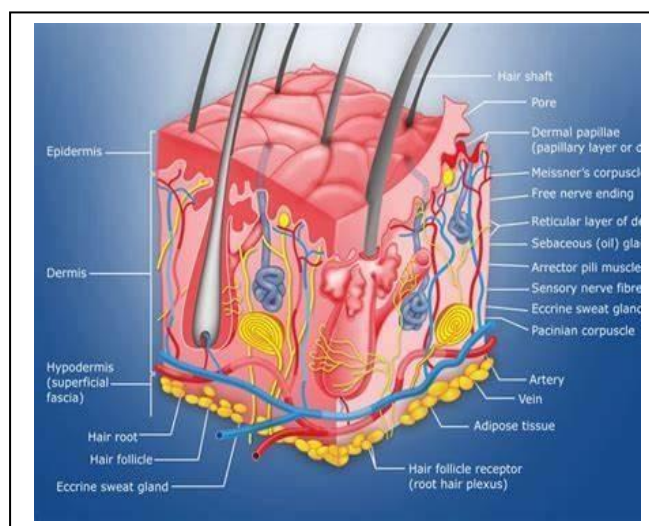
1) **Epidermis- Outer**

2) **Dermis- Inner.**

1) **Epidermis-**

The epidermis of the skin is formed by stratified epithelium, which consists of **5** layers.

- a) **Stratum corneum.**
- b) **Stratum lucidum.**
- c) **Stratum Granulosum.**
- d) **Stratum Spinosum.**
- e) **Stratum Germinativum.**



SKIN STRUCTURE

The important feature of epidermis is that, it does not have blood vessels. The nutrition is provided to epidermis by the capillaries of dermis.

- a) **STRATUM CORNEUM**-It is also Known as horny layer.It is the outer most layer and consists of dead cells, which are called coenocytes.The cytoplasm is flattened with fibrous protein known are keratin.Apart from this, these cells also contain phospholipids and glycogen.
- b) **STRATUM LUCIDUM**- It is made up flattened epithelial cells. As these cells exhibit shiny character, the layer looks like a homogeneous translucent zone so, this layer is called stratum lucidum (Lucid=clear).

- c) **STRATUM GRANULOSUM**-It is a thin layer with 2 to 5 rows of flattened rhomboid cells. The cytoplasm contains granules of a protein called keratohyaline. The keratohyaline is the precursor of keratin.

- d) **STRATUM SPINOSUM**- Stratum spinosum is also known as prickly cell layer because the cells of this layer possess some spine like protoplasmic projections. By these projections, the cells are connected to one another.

- e) **STRATUM GREMINATIVUM**- It is a thick layer made up of polygonal cells superficially and columnar or cuboidal epithelial cells in the deeper parts. Here, new cells are constantly formed by mitotic division. The newly formed cells move continuously towards the stratum corneum. The stem cells, which give rise to new cells, are known as keratinocytes. Another type of cells called melanocytes are scattered between the keratinocytes. The melanocytes produce the pigment called melanin. The color of the skin depends upon melanin.

2) **DERMIS**-

Dermis of the skin is a connective tissue layer made up of dense and stout collagen fibers, fibroblasts and histiocytes. The collagen fibers exhibit elastic property and are capable of storing or holding water. The collagen fibers contain the enzyme collagenase which is responsible for wound healing.

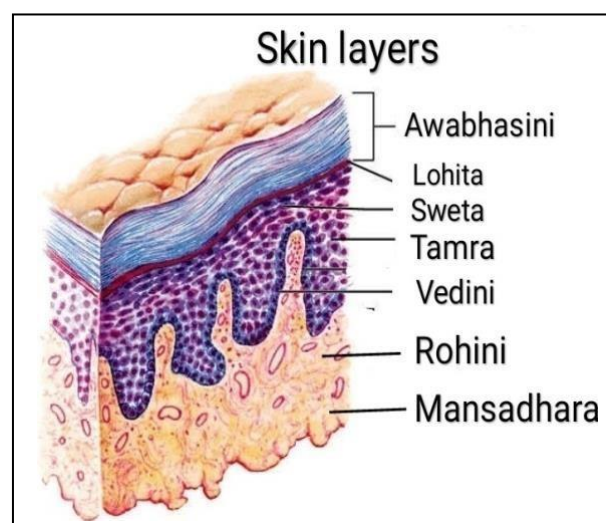
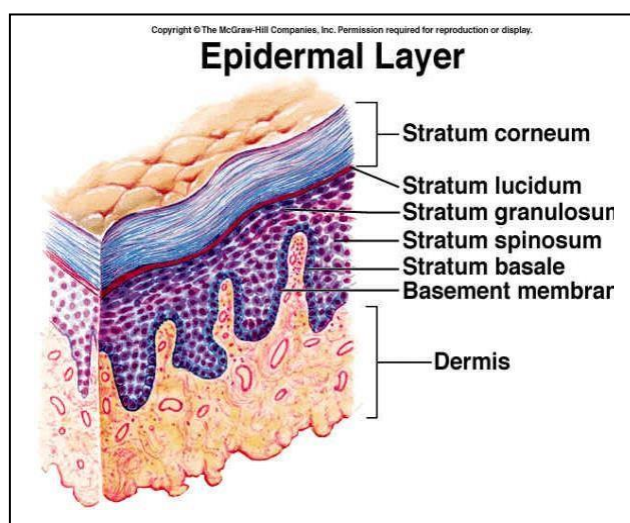
Dermis is made up of 2 layers-

- 1) Superficial papillary layer.
 - 2) Deep reticular layer.
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- 1) **SUPERFICIAL PAPILLARY LAYER**- This layer projects into the epidermis. It contains blood vessels, lymphatic and Nerve fibers. This layer also has some pigments containing cells known as chromatophores.

 - 2) **DEEP RETICULAR LAYER** - Reticular layer is made up of reticular and elastic fibers. These fibers are found around the hair bulbs, sweat glands and sebaceous glands

The reticular layer also contains mast cells, nerve endings, lymphatics, epidermal appendages and fibroblasts. Immediately below the dermis, subcutaneous tissue is present. It is a loose connective tissue, which connects the skin with the internal structure of the body. It serves as an insulator to protect the body from excessive heat and cold of the environment.

Skin layers according to modern its correlation with Ayurvedic skin layers



PANCHABHAUHIKTVA OF SKIN :

In this world all *Chetana* and *Achetana Dravya* are constituted from *Panchamahabhautia*. So, human body and its organ are *Panchabhautika*.⁽¹⁴⁾

Table no. 3 : Shows Panchabhautikatwa of skin

sr.no.	MAHABHUTA
1	PRUTHVI - Twacha is Parthiva Avayava.
4	JALA - Abha and Varna of skin is due to Tejas Mahabhuta
3	TEJA - Twacha is sparshanendriya adhithana which is vatadhithana.

- | | |
|---|---|
| 4 | VAYU - Twacha is sparshanendriya adhisthana which is vatadhisthana. |
| 5 | AKASHA - Swedavahi srotasa (micro channels of sweat glands) are indicative of Akasha Mahabhuta. |

COLOUR OF THE SKIN ACCORDING TO AYURVEDA :

ACHARYA CHARAK :

- *Goura Varna -- Tejas + Aap + Akash*
- *Krishna Varna --Tejas + Pruthvi + Vayu*
- *Shyama Varna -Tejas+ Pruthvi + Akasha + Aap + Vayu*
- *Charakacharya has mentioned Prakruta Varna and Vikruta Varna of skin.*
- **The Prakruta Varna – Krushna, Shyama, Shyamavadata, Avadata.**
- **The Vaikruta Varna – Neela, Shyava, Tamra, Harita, Shukla.**

ACHARYA SUSHRUTA:

Tejas Mahabhuta is responsible for manifestation of all types of colors of skin.⁽¹⁵⁾

- *Goura Varna -- Tejas + Aap*
- *Krushna Varna -- Tejas + Pruthvi*
- *Krushna Shyama -- Tejas+ Pruthvi +Akasha*
- *Goura -- Tejas+ Akasha + Aap*

It means the color of the skin in the body depends upon the color of the food that had consumed during pregnancy.

VRUDDHA VAGBHATTA:

According to *Vrudhdha Vagbhatta*, *Varna* of *Shukra*, *Matura Ahara – Vihara*, *Desha*, *Kula* and *Teja Dhatu* are responsible for *Varna* of skin.

Tabale 5: varna of skin according to dhatu and matru Ahar-vihara

<i>Varna of Shukra</i>	<i>Matura-Ahara Vihar</i>	<i>Dhatu</i>	<i>Varna of Garbha</i>
<i>Shukla or Grutamandabha</i>	<i>Kshiradi Madhuara Ahara, Udaka Vihara</i>	<i>Teja + Udaka + Akasha</i>	<i>Gaura</i>
<i>Tailabha</i>	<i>Tiladi Vidahi Ahara</i>	<i>Teja + Bhū + Vayu</i>	<i>Krushna</i>
<i>Madhvabha</i>	<i>Mishra Ahara</i>	<i>Sarvadhātu Samya</i>	<i>Shyama</i>

SKIN COLOR

Melanin, Hemoglobin, and Carotene are three pigments that impart for colour to skin.

◆ **Melanin** –the amount of melanin causes the skin’s color to vary from pale yellow to red to tan to black. Dark skinned individual have large amounts of melanin in the epidermis.

◆ **Hemoglobin** – the skin color ranges from pink to red depending on the amount and oxygen content of blood moving through capillaries in the dermis. The red color is due to hemoglobin, the oxygen-carrying pigment in red blood cells.

◆ **Carotene** – is a yellow – orange pigment that gives egg and carrots their color. This precursor of vitamin A, which is used to synthesize pigments needed for vision, accumulates in the stratum corneum and fatty areas of the dermis and subcutaneous layer in response to excessive dietary intake.

PHYSIOLOGY OF SKIN :-

(1) TWACHA AND DOSHA:

Twacha has been mentioned as one of the sites of *Vata* and *Pitta*.

VATA:- Among five *Gyanendriya*, *Vayu* is situated in *Sparshanendriya* and *Sparshanendriya* is situated in *Twacha*.⁽¹⁶⁾ Secretion of sweat etc. is a function of *Vyana Vayu*. If *Vyan Vayu* is disturbed, the diseases like *kushtha*, *visarpa* and *sarvanga gata vyadhi* etc. will occur.⁽¹⁷⁾⁽¹⁸⁾ The color of the skin is one of the function of *Udana vayu*.⁽¹⁹⁾ *Samana Vayu* is also situated in *Swedavahi Srotasa*.⁽²⁰⁾

PITTA :-The skin is also the site of *Pitta dosha*. *prabha* and *tanumardava* of skin are functions of *Pitta*. Due to increased *Pitta*, the skin becomes *Pita*. Due to decrease in *Pitta*, skin lost its *Prabha*. It presents relationship between *Pitta* and color of skin.⁽²¹⁾ *Bhrajaka Pitta* is situated in *Twacha*. *Bhrajana* means *Prakashana* or *Deepana* i.e. imparting luster to skin. In *Charaka Samhita* according to *Acharya Marichi*, *Pitta* is responsible for *Prakruta* and *Vikruta Varna* means *Pitta* is responsible for all type of manifestation of color of skin. In commentary of above sentence *Chakrapani* has told *Bhrajaka Pitta* is responsible for difference in color of skin.⁽²²⁾

KAPHA:- *Mrudutva*, *snigdhatva* etc qualities of skin are attributed by *Kapha dosha*. *Ropan karma* is also a function of *kapha dosha*.⁽²³⁾

(2) TWACHA AND DHATU:

a. Rasa dhatu: While describing *trayo rogamarga*, *Acharya Charaka* has mentioned skin and *Rakta* etc *dhatu* are *bahya rogamarga*. *Chakrapani* has mentioned in his commentary that here *twacha* is considered as *Rasa Dhatu*.⁽²⁴⁾

b. Rakta Dhatu: *Varna prasada* i.e. Imparts color to skin is mentioned as function of *Rakta Dhatu* by *Acharya Sushruta*. When *rakta dhatu* decreases, the skin becomes dry.⁽²⁵⁾⁽²⁶⁾ *Kandu*, *Arunshi*, *Kotha*, *pidaka*, *Kushtha*, *Charmadala* etc. are the diseases arising from the morbidity in the Blood, and are called Blood born diseases.⁽²⁷⁾ As *Vicharchika* is a type of *Kshudra Kushtha*, it is also a blood born disease.

c. Mamsa Dhatu:- As *twacha* is *upadhatu* of *mamsa*, ultimately it developed from *mamsa dhatu*.⁽²⁸⁾

(3) TWACHA AND MALA:

a. Sweda:- *Sweda* is the mala of *Meda Dhatu* The function of *Sweda* is *kleda* and *twak soukumaryakrut*.⁽²⁹⁾

b. Kesh & Loma:- The *Mala* of *Asthi Dhatu* are *Kesha* and *Loma*, which are related with *Swedavaha Srotasa*.⁽³⁰⁾

c. Twakgata Sneha- *Twakgata sneha* is the *mala* of *Majja dhatu*.⁽³¹⁾

d. Twacha And Strotomulam : *Twacha* is the *mula* of *mamsavaha srotasa* and the *lomakupa* are the *mula* of *swedavaha srota*⁽³²⁾

ACCESSORY STRUCTURES OF THE SKIN

Hair, skin glands and nails develop from embryonic ectoderm.

1) **Hair** – hairs or pili are present on most skin surfaces except the palms, palmar surfaces of the fingers, the soles, and the plantar surfaces of the feet. In adults, hair usually is most heavily distributed across the scalp, in the eyebrows in the axillae (armpits), and around the external genitalia. Genetic and hormonal influences largely determine the thickness and the pattern of distribution of hairs. Although the protection it offers is limited, hair on the head guards the scalp from injury and the sun's rays. It also decreases heat loss from the scalp. Eyebrows & eyelashes protect the eyes from foreign particles, as hair do in the nostrils and in the external ear canal. Touch receptors (hair root plexuses) associated with hair follicles are activated whenever a hair is moved slightly. Thus, hairs also function in sensing light touch.

2) **Skin glands** – several kinds of exocrine glands are associated with the skin: sebaceous glands, ceruminous glands, mammary glands.

- a) **Sebaceous glands** (seba- = greasy) or Oil glands:
- b) **Sudoriferous glands** (sudori- = sweat; -ferous = bearing):
- c) **Eccrine sweat glands** (eccrine = secreting outwardly)
- d) **Apocrine sweat glands:**
- e) **Mammary glands:**
- f) **Ceruminous glands** (cer- = wax)

3) **Nails:** are plates of tightly packed, hard, dead, and keratinized epidermal cells that form a clear, solid covering over the dorsal surfaces of the distal portions of the digits. Each nail consists of a nail body, a free edge and a nail root. Functionally, nails help us grasp and manipulate small objects in various ways, provide protection against trauma to the ends of the digits, and allow us to scratch various parts of body.

FUNCTION OF THE SKIN-

- 1) **Protective function-** Skin protects Bacteria, Mechanical blow, Ultraviolet rays.
- 2) **Sensory function-** Eg. Touch, pain, pressure or temperature.

- 3) **Storage function**-Skin store fat,water,chloride and sugar.
- 4) **Synthetic function**- Vit D3 is synthesized in skin by the action of ultraviolet rays on cholesterol.
- 5) **Excretory function**- Skin can excrete small quantities of water materials like urea,salts and fatty substances.
- 6) **Absorptive function**-Skin can absorb the fat soluble substances and some ointments.
- 7) **Secretary function**-Skin secretes sweat through sweat gland and sebum through sebaceous gland.

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