Comparison of Layers of Twak and Layers of Skin

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Abstract

'Twak' as per Ayurvedic science means which encloses the whole body. Joseph Listre said, 'Skin is best dressing'. Twak is updhatu of Mamsa which forms the outer covering of the body and protects the body from external factors such as heat & cold. It is an important organ of integumentary system which envelops underlying tissues & organs. Ayurveda mentions twak as sparshanaindriya and different layers of twak are mentioned by Acharyas. Understanding each layer is still unclear with reference to layers of skin mentioned by contemporary science. There is a need to understand the different layers of twak & skin, their structural, functional and developmental interpretation and to correlate between them.

Keywords: Twak, Sparshanaindriya, Updhatu

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Introduction

In Ayurveda the word Twak is used for Skin. Twak is called because it covers the body. Acharya Sushruta described the process of formation of Twak in developing foetus. After fusion of Shukra and Artava, twak develops just as layer of Santanika (Scum) appears in the boiling milk which gradually increases in thickness, in similar manner the seven layers of skin are formed over surface of foetus of body.[1] During the formation of Garbha, differentiation of the layers of the skin takes place and is produced by all the three doshas, particularly by the Pitta dosha. Charaka described twak as the Matruja Bhava (maternal factor) which is one of the six bhava essential in the development of foetus. Whereas Vagbhatta opinei Twak derived from Rakta by action of rakta dhatwagni, it gets dried up to form the skin, like the deposition of cream on the surface of boiling milk. Acharya Charaka mentioned six layers of twak. Only first two layers are named such as Udakadhara and Asrugdhara.[2]

Acharya Sushruta has described seven layers of Twak. He mentioned the thickness of each layer along with the conditions affecting those layers.[3] Acharya Vagbhata has mentioned seven layers of twak similar to Sushruta. He has not given any description regarding it, commentator Arunadatta and Hemadri have named them as per Sushruta.[4]
test arteriovenous fistula puncture pain level among patients undergoing heamodialysis with their selected demographic variables.

Sharangadhara has mentioned seven layers of twak along with diseases affecting them.

The first six layers are same as that of Sushruta, but a seventh layer is named as Sthula which is site of Vidradhi.[5] There is different opinion regarding the number of layers of twak. The layers of twak explained by different Acharyas have been tabulated (Table 1).

Table 1: Layer of Twak as per different Acharyas

Layers	Charaka[6]	Sushruta[7]	Vagbhata[8]	Arunadatta[8]	Sharangadhara[9]	Bhavaprakasha[10]
Prathama	Udhakadhara	Avabhasini	1st	Bhasini	Avabhasini	Avabhasini
Dwitiya	Asrugdhara	Lohita	2nd	Lohita	Lohita	Lohita
Tritiya	Sidhma, Kilasasambhava adhistana	Shwetha	3rd	Shwetha	Shwetha	Shwetha
Chaturtha	Alaji, Vidradhisambhav aadhistana	Tamra	4th	Tamra	Tamra	Tamra
Panchami	Dadru, Kushtasambhava adhistana	Vedini	5th	Vedini	Vedini	Vedini
Shashthi	If this layer is injuired, leads to Andhatwa and Tama pravesha	Rohini	6th	Rohini	Rohini	Rohini
Sapthami		Mamsadhara	7th	Mamsadhara	Sthula	Sthula

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The skin is the largest organ of the body with a total area of 20 sq feet and weighs 4.5 – 5 kg and about 7 % of total body wt. Skin is known as 'The First line of Defence' as it protects us from microbes and other invading elements. It is part of integumentary system that contributes to homeostasis by protecting the body and helping to regulate body temperature. It allows us to sense pleasurable, painful and other stimuli in the external environment. Skin and its components are entirely derived from ectoderm & mesoderm. Skin is composed of three layers outer Epidermis, Dermis & Hypodermis.[6,7] (Table 2)

Discussion

Acharya Sushruta, Vagbhata, Bhavprakasha & Sharangadhara had mentioned seven layers of twak. While Acharya Charaka, Bhela & Astanga Sangraha mentioned six layers of twak. There is difference in opinion regarding layers of twak due to prospective vision of surgeon & physician.

Table 2: Layers of Skin and thickness

Layer of Skin	Sub-layers	Thickness
Epidermis	Stratum corneum	10-30mm
Thin skin –4 layers, 0.1mm	Stratum lucidum	100 mm
Thick skin – 5 layers 1-2mm	Stratum granulosum	100mm
	Stratum spinosum & S. basale	100mm
Dermis	Papillary layer	100 mm
	Reticular layer	

Prathama Avabhasini

Acharya Sushruta called outermost layer of Twak as Avabhasini with thickness 18/20th of vreehi and is seat of diseases like Sidhma & Padmakantaka. Dalhana mentioned first layer is responsible for exhibition of Gaura, Shyamadhi Varna & fives types of Prabha (glory) & Chaya (shades) of body with help

of Bhrajaka Pitta. Acharya Charaka & Vrddha Vagbhatta named outer layer as Udakadhara. As the name suggest it holds Udakadhatu. Indu depicts that this layer carries Udakadhatu & prevents outflow & maintain ardratabhava i.e moisture content of twak on its surface. Vagbhatta stated that 1st layer as Bhasini which is similar feature as explained by Astanga Sangraha & Charaka. As the layers superficial to Malpighi are opaque, exhibition of complexion is done by Stratum corneum, hence Avabhasini may be correlated with Stratum corneum. The corneal layer is made up of scale like flattened epithelium which consist of keratin filaments this make it highly resistant to permeation by water. So as the result it prevents the water loss from body and due to this reason Acharya Charaka called it Udakadhara.

Dwitiya Lohita

Sushruta named second layer of twak as Lohita having thickness 16/20th of Vreehi, and is adhistana of Tilakalaka, Nyaccha & Vyanga. Charaka & Vriddha Vagbhatta called the second layer as Asrugdhara. Indu explains this layer as Rudhantva Asram i.e it holds the blood and prevents outflow of Raktadhatu from the body. Hemadiri describes this layer as Lohini. Stratum lucidum layer consists of homogenous distributed cell layers with indistinct cell boundary which give it clear/lucid appearance. The change in amount of Hb%, bilirubin is reflected through this layer as the pallor or icteric look of skin. So Acharya has opinion as Lohita and / or Asrgdhara for this layer.

Tritiya Shweta

Sushruta called third layer as Shweta, it is having thickness of 12/20th of Vreehi and is adhisthana for Charmadala, Ajagalika and Mashaka. Charaka & Vrdhha Vagbhata mentioned third layer is seat of Sidhma & Kilasa. Astanga Hrudaya describes the third layer as site of Sidhma & Shwitra. Underneath the Stratum lucidum is Stratum granulosum, it is made up of 2-5 layers of flattened cells containing the granules in their cytoplasm. The kerato-hyaline granules are numerous in this layer which binds the keratin filaments in thick layer.

Chaturthi Tamra

Sushruta mentions the fourth layer of twak as Tamra. It lies beneath the Shweta and has thickness 8/20th of Vreehi. It is the seat of Kusta and Kilasa. Charaka mentioned the fourth layer as Dadrukushta adhistana. Astanga Sangraha & Hrudaya stated the fourth layer as adhistana of Sarvakushta. Sarangadhara and Bhavaprakasha stated Tamra as site for Kilasakushta. The chaturthi layer we can take both Stratum spinosum and Stratum basale because below the Shweta (S. granulosum) is Stratum spinosum. Melanin pigment released by melanocytes which lies in Stratum basale & scattered in Stratum spinosum which determines the complexion of an individual. So, Acharya opines 5th layer as Tamra with Stratum spinosum & Stratum basale.

Panchami Vedini

Sushruta mentions fifth layer as Vedini. As the name suggests, it is concerned with perception of touch, pain, heat and cold. It is about 5/20th of Vreehi in thickness. It is adhistana for Kusta & Visarpa. Charaka & Vagbhata describes the 5th layer as adhistana for Alaji & Vidradhi. Hemadiri stated this layer as Twagvedini as well as Rogakarini. Sharangadhara & Bhavaprakasha describe these layers as site for Sarvakushta & Visarpa. This layer is responsible for perception exterior-ceptive information, since it is incorporated with many receptors such as Meissner's corpuscles, Pacinian corpuscle, Ruffinis corpuscles, free nerve ending etc. Kushta and Visarpa affecting this layer also produce in organization of papillary layer of dermis. So, the Acharya opines this layer as Vedini which corresponds to papillary layer of dermis.

Shasthi Rohini: Sushruta states the 6th layer of Twak as Rohini which is equal to 1 Vreehi in thickness. It is adhistana for Granthi, Apachi, Galaganda, Arbuda & Shleepada. Charaka mentioned this layer as Arumshiadhistana. Chakrapani described that sudden injuiry to this layer leads to Tamayathi andhaevaie feeling of darkness in front of eye due to sudden loss of consciousness. AcharyaVagbhata stated 6th layer as Pranadhara. Indu stated that any injuiry to this layer leads to life threatening condition Tama Praveshaie feeling of blindness for short period, it is prime location of Arumshiie small boils, blackish red in appearance commonly found in small joints and very difficult to treat. Rohini name suggest, that is responsible for wound healing process i.e Vrana Ropana Karma, this layer plays major role in formation of granulation tissue, fibrous tissue during the wound healing. Due to this Acharya opines this layer as Rohini corresponds to Reticular layer of dermis in contemporary science.

Sapatami Mamsadhara

Acharya Sushruta mentions 7th layer as Mamsadhara. It is thickest layer measuring about 2 Vreehi. It is adhistana for Bhagandhara, Vidradhi, Arsas. Sarangadhara & Bhavaprakasha describes the 7th layer as Sthula, having thickness of two vreehi, it is site of Vidradhi. Adhamalla mentioned Sthula, it is site for Vidradhi, Bhagandhara and Arshas. Mamsadhara Twak explained by Sushruta can be correlated with hypodermis as it comprises of blood vessels, lymphatics and adipose tissue. It is the superficial fascia which envelopes the underlying muscle and does the dharana of the muscle, so called Mamsadhara.

Formation of Twak:

Twak is the Upadhatu of Mamsa.[12] Sushruta described that after fertilsiation of Sukra & Shonita. Twak develops just as Santanika which forms in layer wise and gradually increase in thickness, in the similar way seven layers of the Twak are formed and deposited rapidly in the same manner as the layers of Scum are formed and accumulates on the surface of the boiling milk.[13] Vagbhata opinion that the twak is formed from the Rakta. After the Paaka of Rakta by its Dhatwagni, it gets dried up to form the skin, like deposition of scum on the surface of boiling milk.

Out of two layers of skin, the epidermis is a superficial epithelial tissue derived from surface ectoderm & dermis is a deeper layer composed of dense irregularly arranged connective tissue derived from mesenchyme. Skin structures vary from one part of the body to another. The embryonic skin at 4-5 weeks consists of a single layer of surface ectoderm overlying the mesoderm. During the first & second trimesters of pregnancy there is an increment in epidermal thickness. The cells of surface ectoderm proliferate and form a layer of squamous epithelium, the periderm and basal layer. The cells of the eperiderm continually undergo keratinization and desquamation and are replaced by cells arising from the basal layer. Replacement of peridermal cells continues till the 21st week, thereafter, the periderm disappears and the Stratum corneum forms. Proliferation of cells in the Stratum germinative also forms epidermal ridges, which extend into the developing dermis. The transformation of the surface ectoderm into a multi-layered epidermis result in the formation of different layers of epidermis. Skin is classified as thick or thin based on the thickness of the epidermis.[15] (Table 3)

Melanoblasts are derived from neural crest & migrate in Stratum basale; Lanerhans cells are derived from the bone marrow and migrate into the epidermis. Merkel cells are of uncertain origin and is associated with free nerve endings.[16]

The dermis mostly develops from mesenchyme which arises from the somatopleuric layer of lateral mesoderm

plate; however, some of it is derived from the dermatomes of the somites. By the 11th week, the mesenchymal cells produce collagenous and elastic fibres. As the epidermal ridges form, the dermis projects into epidermis, forming dermal ridges that interdigitate with the epidermal ridges. Sensory nerve ending, tactile receptors and vascular element develops in the ridges.[17]

Table 3: Layers of Skin as per Ayurveda and possible modern correlation

Layers	Twak layer	Subdivision of layer of Skin	Skin layer
Prathama	Avabhasini	Stratum corneum	Epidermis
Dwitiya	Lohita	Stratum lucidum	
Tritiya	Shweta	Stratum granulosum	
Chaturthi	Tamra	Malpighian layer	
Panchami	Vedini	Papillary layer	Dermis
Shasthi	Rohini	Reticular layer	
Saptami	Mamsadhara	Subcutaneous tissue and Muscular layer	Hypo-dermis

The layer of skin derived gradually in layer wise during intrauterine life of foetus. These develop two types of skins in foetus body, thick skin covers the palms & soles; it consists of 5 layers in epidermis, it lacks hair follicle, arrector muscles of hairs and sebaceous glands, but it has sweat glands. & thin skin covers most of the rest of the body; it lacks the Stratum lucidum layer in epidermis; it contains hair follicles, arrector muscles of hair, sebaceous glands & sweat glands.

Measurement of layer of Twak:

Dalhana describes the total thickness of Twak as Angustha Udara Pramana which is equal to Shad YavaPramanaie thickness of six barley grains together. The parameter for thickness is applicable for fleshy area not for bony are like Sukshma Anguli and Lalaata (forehead). The motive behind describing thickness of each layer of twak is for performing various surgical interventions such as abdominal tapping should be done in Angusta Udara Pramana by Vrihimukha Yantra in Jaludhara.

The classical description regarding the pramana of each layer of Twak, on adding the pramana of each layer we get 6 yava. But to match with contemporary science is difficult. Also, diseases which has its seat in different layer is difficult to correlate with contemporary science. So, it can be a subject further study.[18]

Conclusion

Based on comparative study, the seven layer of Twak namely, Avabhasini, Lohita, Sweta, Tamra, Vedini, Rohini & Mamsadhara respectively can be correlated with Stratum corneum, Stratum lucidum, Stratum granulosum, Stratum malpighan, Papillary layer of Dermis, Reticular layer of dermis & Hypodermis based on simile of their structure functional and applied aspect. Regarding the formation of the Twak all layers of Twak does not appear at once rather they appear layer by layer during intrauterine life of the foetus which is similar to appearance of cream in the boiling milk as mentioned by the Acharyas.

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