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Review on *Shukradhara Kalaa* and its applied aspect

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ABSTRACT

According to *Sushruta* the *Kalaa* has been defined as interior receptacles for *Dhatus* and act as a separator for *Dhatus* from their *Ashaya*. They are inner most lining limit between *Dhatu* and *Ashaya* which are seven in number. In the series of *Sapta Kalaa*, *Shukradhara Kalaa* is seventh in number. Before we go for the applied anatomy of the *Shukradhara Kalaa* it becomes important to know where the *Kalaa* is situated or spreaded and so that we can understand the clinical importance of *Kalaa*. In classics it is been said that *Shukradhara Kalaa* is spreaded in entire body of the living being. For the applied aspect point of view for the understanding of *Shukradhara Kalaa* we should have knowledge of *Shukravaha Srotas*. So here we have to understand what are the structures involved in the formation of *Shukravahava Srotas* and its *Moolasthan* and *Shukradhara Kalaa* and their Anatomy, Pathophysiological changes in their respective structures and its management. So the collection and comprehensive review information regarding *Shukradhara Kalaa* is very significant.

Key words: *Kalaa*, *Shukradhara Kalaa*, *Shukra*, *Shukravaha Srotas*.

INTRODUCTION

Ayurveda is not only the medical science but it is one of the unique and excellent sciences which not only gives healthy but even prosperous life for the living beings. *Acharya Sushruta* pioner in the field of Ayurveda has explained many topics in *Rachana Shareera* one among of them is *Kalaa Shareera* or clinical anatomy of *Kalaa Shareera* which is explained in *Shareera Sthana* and even all other Acharyas have given their opinion but it is limited.

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Etymology of *Kalaa*

The word *Kalaa* is derived from following roots;

Kalyatata Itat Kalaa; Kal Gatao Sankhyayam ||

The one which moves and counts and is known as *Kalaa*.

This is functional phenomena as well as structural constitution of the body.^[1]

Definition of *Kalaa*

Kalaa is defined as internal lining structure (layer) between *Dhatu* and *Ashaya*, they are seven in number. The essence part of *Dhatu* remains in small part as layers, these structures are called as *Kalaa*.^[2]

The commentator *Dalhana* explained in "*Dhatwashayantara Maryada*" internal limiting layer present between particular *Dhatu* and its locating place i.e. *Ashaya* is referred as *Kalaa*. *Kalaa* is *Pratyanga* of the body which separates the *Dhatu* and *Ashaya*.

Sushrutas explanations is based on dissection of the cadaver, he observed and said that, as in the wooden

block there appears a layers in cross sectioned of timber, in the same way we can observe *Kalaa* after dissecting the *Mamsadi Dhatus* of the body.^[3]

Development of Kalaa

According to *Vagbhata* the *Kleda* which is present in between *Dhatu* and *Ashaya* gets converted or becomes *Pakwa* by its action of *Ushnatwa* (i.e. *Agni*) of the particular *Dhatu* and get covered in the form of *Snayu*, *Sleshma* and *Jarayu* like *Sara* of plants *Kalaa* is formed. It is formed from very little quantity of *Rasa* and essence of *Dhatu*.^[4]

Structures of Kalaa

Acharya Sushruta said that *Kalaa* is a structure or covering which is formed by *Snayu* (ligament), *Jarayu* (fetal covering), and *Sleshma* (coated with *Kapha*). In Ayurvedic classics *Kalaa* resembles for the most part of the protective or epithelial tissues. In mainly therefore the outlook of *Kalaa* is in general the same as that of epithelial tissues. The semipermeable membrane through which material pass to and form in the course of secretory and excretory activities of the body.

- Thus according to modern interpretation *Kalaa* is protective, secreting, excreting, and absorbing tissues, comparable to epithelial tissues and membranes composed by them.^[5]
- The epithelial tissue described in modern biology on the other, still the description of them and their functions appears to be nearly identical. It may be recalled that, (a) epithelial tissue, (b) endothelial tissue or endothelium, (c) the term epithelium may be used in an elementary sense to cover all these tissue. These have a bearing on the study of *Kalaa*.^[6]

There are seven *Kalaa* in the body. *Mamsadhara*, *Raktadhara*, *Medodhara*, *Shleshmadhara*, *Pureeshadhara*, *Pittadhara*, *Shukradhara Kalaa*. Now we shall deal about this;

Shukradhara Kalaa and its applied aspect

Shukradhara Kalaa is said to support the *Shukra Dhatu* (the male reproductive system). The

Shukradhara Kalaa is the seventh *Kalaa* in the sequence of *Kalaa Shareera*, it is present in the entire body of the human beings as explained by our *Acharya Sushruta*.^[7] The *Shukra* is found all over the body of a human being just like *Ghrta* present in milk or *Guda* in sugarcane.^[8] The *Shukra* comes out through the urinary passage of male, from the distance of two *Angula* inferior to the orifice of urinary bladder on the right side.^[9] The *Shukra* (semen) which prevades all over the body of man gets ejaculated, during intercourse with a women and at orgasm while pleasurable sensation (*Prasanna Manas*).^[10] Here we can take the importance of *Shukravaha Srotas* as our *Acharyas* said that *Moola Sthanas* of this as *Vrushana* (2 testis) and *Shepha* along with the *Sthana*. There are two *Shukravaha Srotas* their roots are penis and testis.^[11] If injury to their *Srotas* leads to *Klaibya*, *Rakta Shukrata*, delay in discharge of semen.^[12] Due to vitiation of *Shukravaha Srotas* some diseases are manifested such as *Vrushana Vruddhi*, *Nirudha Prakarsha*, *Dwaja Bhaga*, *Vandhyatwa*.

Role of Panchakarma

Here an attempt is made to know the role of *Shukara Dhara Kalaa* (membrane) when the treatment is given to treat the disease pertaining to this *Kalaa*.

As *Panchakarma* is unique procedure in our science in that *Anuvasana* and *Uttarabasti* etc. helps to treat the diseases affecting the *Shukradhara Kalaa* or *Shukra* such as *Shukra Dusthi* etc. by the administration of medicated drugs through urethral passage or the anal passage. Thus medicine comes in contact with the internal lining of the urethra or urinary bladder before the drug get observe or travels.

Uttarabasti treatment serves beneficial in case of obstructive pathologies of male infertility. It as well strengthens muscles of urinary tract and reproductive system, and it enhances the immunity and keeps the organ clean, healthy and sterile.

The structure which are to be considered under the *Shukravaha Srotas* and *Shukradhara Kalaa* is according the modern anatomy are been listed and the applied anatomy of that structure is taken for the

study. According to Acharya Charaka, Moola Sthana of Shukravaha Srotas is Shepha and Vrushana.

Moolasthana of Shukravaha Srotas	Modern Correlation	Applied Anatomy (Acc. to Classics)	Applied Anatomy (Acc. to Modern)
Shepha	Penis	Klaibya Dwaja Bhaga	Erectile dysfunction
Vrushana	Testis, Epididymis, Vas deferens, Seminal vesicles.	Vrushana Vridhi Vandhya Raktashukrta Shukragatavata	Impotency Infertility Blood with semen Epididymitis

Shukradhara Kalaa is correlated with lining of reproductive passage. So here testes, seminiferous tubules and its cells, epididymis, vas deference and seminal vesicles are consider as Kalaa because they helpful in support, nourishment, protection and secretion, absorption and excretion.

Structure	Internal lining membrane (Kalaa)	Function	Applied Anatomy
Testes	Tunica Albuginea (dense irregular connective tissues).	Nourishment for the spermatogenic cells	Cryptorchidism (undescended testis)
	Tunica Vasculosa (loose connective tissues).	Secretes the inhibin, prostaglandin and testosterone	Testicular varicocele
Epididymis	Pseudo stratified columnar epithelium	Phagocytosis of defective sperms. Concentration	Epididymitis

		n of semen by water absorption from it. It secretes glycoprotein.	
Vas Deferens	Pseudo stratified columnar epithelium Adventitial layer	Secretory and absorptive in function. Protective and supportive in function.	Vas deference obstruction
Seminal Vesicles	Epithelium lining the mucosa Muscular layer Adventitia	Secrete a semisolid, viscous fluid called semen. Ejaculation of semen Protective and supportive in function	Blood with semen

There is no much difference between the Shukravaha Srotas and Shukradhara Kalaa; if any deformity occurs to Shukravaha Srotas leads to infertility, impotency, and blood with semen; so the condition can be consider under the applied aspect of Shukradhara Kalaa.

- Undescended testicles (cryptorchidism): Failure of embryonic descent of testis leads to sterility in men is known as cryptorchidism.
- Testicular varicocele: a varicocele is a dilated or varicose vein and it occurs in the scrotum.
- A bag of skin hanging below penis is scrotum: the medical condition can also cause scrotum swelling due to increase of fluid which is called hydrocele.
- Inflammation of epididymis i.e. epididymitis.
- Ejaculatory duct: semen is not possible to travel due to obstruction of one or both of ejaculatory ducts.

- Ductus deferens: the course of ductus deferens increases the risk of the structure been damaged during inguinal or lower urethral surgeries ex. Hernia repair, varicocele, bilateral calcification ductus deferens and in diabetes, TB and syphilis, gonorrhoea etc. also effect the ductus deferens that in turn will affect the membranous structure present in testis in scrotum or in ejaculatory duct and in ductus deferens which can be taken into the consideration of the clinical anatomy of *Shukradhara Kalaa*.
- The mucosa of organs is composed of one or more layers of epithelial cells that secrete mucus and an underlying lamina propria of loose connective tissue.
- Mucosa lining the bladder protects the underlying tissue from urine.

DISCUSSION

In Ayurvedic Anatomy, the word *Kalaa* has been used in the structural entity by our *Acharyas* like *Sushruta*, *Vagbhata* etc. to denote only one kind of *Pratyanga*. *Acharya Sushruta* has opined that, *Kalaa* are the structures in the form of linings for limitation between *Dhatuwashaya* i.e. *Dhatvasyaantar Maryada* we have to understand that what is in between the *Dhatu* and *Ashaya* i.e. to know the limitations of *Kalaa*. In *Srotas* we can see the function of *Kalaa* i.e.; formation of *Dhatu*. *Sushruta's* explanation is based on dissection of the cadaver, he observed and said that, as in the wooden block there appears a layers in cross sectioned of timber, in the same way we can observe *Kalaa* after dissecting the *Mamsadi Dhatus* of the body.

Thus, we have in *Kalaa*, protective, secreting, excreting and absorbing tissues, comparable to epithelial tissues and membranes composed by them.

According to *Acharya Sushruta* the *Shukradhara Kalaa* is the seventh *Kalaa* in the sequence of *Kalaa Shareera*, it is present in the entire body of the human beings.

When we go through the explanation of *Shukradhara Kalaa* so it becomes need that we should take into the

consideration of anatomical structure of *Shukravaha Srotas* because ultimately *Shukradhara Kalaa* is going to be situated in the *Shukravaha Srotas* along with the *Mutamarga* because ultimately it is facilitating to help for the proper ejaculation of semen.

When we come across the modern review it can be understood that to some extent we can compare male reproductive system like testis, epididymis, vas deferens, seminiferous tubules etc. so in which whatever layer like structure spreaded and the structure from where the *Shukra* travels, this can be consider as *Shukradhara Kalaa*.

Testis: It is having connective tissue framework (from external to internal) i.e. tunica vaginalis and tunica albuginea. In this tunica vaginalis is serous (peritoneum) that accompanied the testis embryologically in its retroperitoneal descent from the abdomen to the scrotum.

Tunica albuginea is a layer of dense connective tissue beneath the tunica vaginalis, encapsulating the seminiferous tubules.

In the testis there are seminiferous convoluted tubules the walls of each tubules is made up of a fibrous tissue which also contains muscles like cells, the contraction of these cells probably help to move spermatozoa around the tubules.

The space between seminiferous tubules is filled by loose areolar connective tissue containing blood vessels and modified epithelial cells called interstitial cells of Leydig. These produce a male sex hormones called testosterone, which are essential for the appearance of secondary sexual character in males.

Epididymis: the ducts in the epididymis are lined by pseudo stratified columnar epithelium and head is lined by ciliated columnar epithelium.

Vas deference: it connects epididymis to the prostatic urethra. It has inner mucous membrane, middle muscularis layer, outer adventitial layer. The mucous membrane: it is lined by pseudo stratified columnar epithelium, similar to the epididymis, cells have long stereocilia. The lamina propria is unusually rich in elastic fibers.

Seminal vesicles: Epithelium lining the mucosa is secretory in function and they secrete semisolid, viscous fluid called semen. Semen is an alkaline fluid rich in glucosaminoglycans and fructose, which nourishes the spermatozoas. Muscular layer helps in ejaculation of semen into ejaculatory duct. And adventitia is protective and supportive in function.

As per *Sushruta* injury to the *Srotas*, *Klaibya*, delay in discharge of semen, appearance of blood in semen, *Vandhyatwa*.

Uttarabasti etc. treatments are said which are helpful in diseases related to *Shukra* or *Shukradhara Kalaa*. *Uttarabasti* helps to strengthen muscle and treat the structure of urinary tract and reproductive system etc. Thus in diseases or in treatment explained according to Ayurveda and modern, we can take into the consideration of applied anatomy of *Shukradhara Kalaa*.

CONCLUSION

Kalaa can be taken as a membranous structure present in between tissue. *Shukradhara Kalaa* can be considered as a membranous lining limit of the reproductive system generally and particularly in the testis, epididymis, seminal vesicles, ductus deferens etc. Injuries or deformities or pathophysiological changes of *Shukravaha Srotas* will be affecting the *Shukradhara Kalaa* to be consider as clinical Anatomy. In the treatment point of view *Anuvasana Basti* and *Uttarabasti* acts on diseases pertaining to *Shukra* and its *Kalaa*. Thus *Uttarabasti* is a gift of Ayurveda for those who are suffering from infertility or impotency. It also strengthens the reproductive organs etc. thus can be considering as clinical anatomy. *Kalaa Shareera* plays a very important role in the applied aspect which has to be evaluated in further research, will be helpful for medical scholars etc.

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