

A SCIENTIFIC REVIEW ON ANATOMICAL AND PHYSIOLOGICAL ASPECT OF MOOTRAVAHA-STROTAS (URINARY SYSTEM) IN AYURVEDA

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ABSTRACT

The entire human body is made by various types of Srotas (Minute Channels). All the nutrients are canalized through these *srotas* along with Dosas, Dhatus and Mala. Disease developed due to vitiation of these *srotas*. Mootravaha *srotas* is an important *srotas* for the excretion of waste products from the body as urine. Mutravahasrotas is related with kidney, ureter, urinary bladder, urethra and penis. *Ayurvedic* concept regarding anatomy of *Mootravaha-srotas* (Urinary system) structures is quite limited and very much scattered. Physiology of this system is also not very clear in *Ayurvedic* texts. But still ancient science of *Ayurveda* gives the clue of thorough knowledge of Acharyas about human Body.

Keywords: *Mootravaha Srotas, Basti, Vrikka, Urinary System*

INTRODUCTION

Ayurveda is the oldest medical science and believed that, it is origin of the all source of medical science. This science is not confined within treatment only, but is a system of medicine deal with prevention of diseases and maintenance of health. In *Ayurveda*, Anatomy and the functioning of individual systems has also been described in a considerably detailed manner. Thorough structural scientific knowledge of the life was recommended by ancient *Acharyas*. Ancient works in the field of *Rachana Sharir* has been presented by *Acharya Susruta*, *Charaka* and other *Acharyas* as the documentation of profound scientific study. Ancient *Aachaarya* have described *Mootravaha Srotasa* in many aspects

which include the embryology, etymology, anatomy, physiology, etc. of urinary system.

However they are in the form of scattered references which are being described as follows. *Basti* (Urinary bladder), *Vrikka* (Kidney), *Gaveenee* (Ureter), *Mootrapraseka* (Urethra), *Mootravaha Srotasa* (Urinary system), *Mootravaha Naadi* (Ureter), *Mootravaha Dhamani*, (Renal arteries), *Mootravaha Siraa* (Renal veins).

BASTI (Urinary bladder): The organ act as receptacle or reservoir of urine is situated in the lower part of the *Nabhi* (Umbilicus).

Synonyms: *Mootraashaya, Mootraadhara, MootraBasti, Mootraputa,*

*Mootraputaka*¹

Definition: *Basti* can be defined as an organ which stores the *Mootra* (urine).

Embryological Development: During foetal life *Basti* is derived from the maternal contribution (*Maatrijabhaava*)² *Sushruta* has described the formation of the organ *Basti* during foetal development as follows during the *Paka* of essence of *Rakta* and *Kapha* with the help of *Pitta* the *Vata* enters in between and produces hollow organ like *Aantra*, *Guda* and *Basti*.³

Position: *Basti* has been included under the *Koshthaangas* and *Aashayas* by all the *Acharyas*.

Sushruta- *Basti* is surrounded by *Naabhi*, *Pristha*, *Kati*, *Mushka*, *Guda*, *Vanksha* and *Shepha*⁴

Charaka- *Basti* is surrounded by *Sthoolaguda*, *Mushka*, *Sevane*, *ShukravahaNaadee* and *Mootravaha Naadee*.⁵

Vaagbhata- The *Sthaana* of *Basti* is in *Kati Pradesha*⁶.

Bhaavamishra and **Shaarangadhara-** Mentioned that *Basti* is located below the *Pakvaashaya*⁷

According to modern anatomy, apex of the urinary bladder is related to umbilicus by the median umbilical ligament, the upper part of the base separated from the rectum by the rectovesical pouch and the lower part is related to the seminal vesicles and the terminal part of the vas deferens. In males the bladder rests on, and is in direct continuity with the base of the prostate.⁸

Structure

The *Basti* is *Alabu* (Bottle gourd) shaped and is fixed on all sides by *Sira* and *Snayu* according to *Sushruta*. *Snayus* are various true and false ligaments of bladder.⁹ He further adds that *Basti* is *adhomukha* i.e. its outlet is directed downwards and at lower end or the neck of which the

urethra is connected¹⁰. *Vagbhatta* has mentioned the shape of *Basti* as *Dhanurvakra* i.e. a curve like a bow with a downward opening.¹¹ *Basti* has been counted as one of the vital parts i.e. *Marmas* of the body. It is of the *Snayu Marmas* type with area of four fingers.¹²

Function: The karma of *mootraashaya* (urinary bladder) is *dhaarana* and *poshana*, which has been mentioned in relation of *mootranirmaana*. The *dhaarana* and *poshana* of *mootra* are regulated by *apaanavaayu*. The vitiation of *apaanavaayu* alters the functions of *basti* and leads to different disorders of *basti* or *mootravahasrotas*.¹³

2. Vrikka (Kidney)

It is derived from the root "*Vikkadane*" means to take. No direct reference of *Vrikka*'s relation to urine formation is found in either of the *Ayurvedic* classics. *Vrikka* are two in numbers and are situated in the lumbar regions on either side in the posterior abdominal wall in *Kostha*.¹⁴

Embryological Development: *Vrikka* is also a maternal contribution derived from essence of *Rakta* and *Meda*.¹⁵

Function: The *Vrikkas* have been told to be the root of *medovahasrotas*.¹⁶ *Sarangdhara* has considered the *Vrikka*'s as the nourishers of the abdominal fats. It can be explain as the suprarenal glands lie in close relationship to the upper pole of the corresponding kidney.¹⁷ Cortisol, which is secreted by the suprarenals promotes mobilization of the fatty acids from the adipose tissues. Also, excessive cortisol secretion is associated with a peculiar type of obesity, with excess deposition of fat in the chest and head regions of the body.¹⁸ The relation of *Vrikka* and *mutrashaya* has been mentioned while describing seven *Ashayas* and the organs related to the *Ashayas*.¹⁹

3. Gavini (Ureters)

A ureter is one of two uterine tubes that carry urine from the kidneys to the bladder. Each ureter is about ten to twelve inches long. Urine flows down partly by gravity, but mainly by waves of contractions, which pass several times per minute through the muscle layers of the urethral walls.²⁰ According to Ayurveda, it receiving *Mutra* from the *Antras* and sending it further to the *Mutrashaya*.

4. Mutrapraseka (Urethra)

Synonyms :-*Mutrapatha*, *Mutramarga*, *Mutrasrota*

It is one among the eight important organs, which are to be protected from any injury at the time of performing surgery for *Mutrashmari*.²¹ It is the outlet of the *Basti*, which are two *Angulas* in females and Twelve *Angulas* in males. In male it carries both *Mutra* and *Shukra*, while in female only *Mutra*.²² Urethra is the vessel through which urine passes after leaving the bladder. During urination, the smooth muscle lining the urethra relaxes in concert with bladder contractions to forcefully expel the urine in a pressurized stream. Following this, the urethra re-establishes muscle tone by contracting the smooth muscle layer, and the bladder returns to a relaxed.²³

5. MutravahaSrotas

According to *Charaka*, the definition of the word *Srotas* is '*Sravanat Srotamsi*' which means, where from something oozes out. On this way the channels which carry *Mutra* can be considered as *Mutravaha Srotas*. He says that *Mutravaha Srotas* has its origin from *Basti* and two *Vankshanas* (Lumbosacral Region), whereas *Sushruta* believes *Basti* and *Medhra* (Penis) as the roots of *Mutravaha Srotas*. Any trauma to this *Mutravaha Srotas* leads to acute retention of urine, distension of uri-

nary bladder and painful erection of the penis, ultimately leading to death of the patients.²⁴ The kidneys and the rest of the urinary tract may become injured in a number of ways. Examples include injuries due to a blunt force (most commonly motor vehicle crashes, falls, or sports injuries) or a penetrating force (most commonly gunshot or stab wounds), or surgery. Because the function of the kidneys is to continuously filter out metabolic wastes from the blood and remove them from the body through the urinary tract, injuries to the kidneys or urinary tract can lead to the inability to perform these functions (kidney failure). Other complications of injury include bleeding, leakage of urine from the urinary tract into surrounding tissues, and infection. Preventing permanent damage to the urinary tract and even death may depend on prompt diagnosis and treatment.²⁵

6. Mutravaha Nadis (channels)

Sushruta in chapter third *Nidanasthana* says that these are thousand in number and are situated in between *Pakvashaya* and *Basti* and their main function is to carry the *Mutra* from *Pakvashaya* to *Basti*, like the rivers fill the ocean with water.²⁶ According to *Dalhana* *Mutravahinadis* are two in number and have been told to divide in to tens of hundreds of thousands,²⁷ which come out to be one million. Each kidney contains about one million nephrons, The nephron carries out nearly all of the kidney's functions. Most of these functions concern the re-absorption and secretion of various solutes.²⁸

7. MutravahaDhamanis (Renal Arteries)

Sushruta while describing the *Dhamanis* has narrated one variety of *Dhamani*, termed as '*Adhogami Dhamani*' which are meant for *Sara-Kitta Vibhajana* and to transport *Mutra*, *Purisha Sukra*, *Artava*, *Apana Vata* etc., downwards. These same

Dhamanis taking part in the *Sarakitta vibhajana process*(urine dialysis), out of which two are said to be the *Mutravaha Dhaman* is going to the *Mutra Basti*, the functions of which stated are *Dharana* and *Yapan* (Provide nutrition) of *Mutra* and *Basti*. *Dalhan* further says that these are further divided into countless branches which can be correlated with nephrons in kidney which take part in urine dialysis *Sarakitta Vibhajana* process.²⁹

8. *Mutravaha Siras (Veins)*

There is no reference available with *Brihatrayee* about *Mutravaha Siras*. But *Sharangadhara* describes that the *Maladrava* of digested food i.e. *Mutra* is transported to *Basti* by *Siras*. *Adhamalla* in his commentary on *Sharangadhara* says that the *Siras* are concerned with *Aharajala* that have Relationship with *Vrikka* transported to *Basti* through *Mutravaha Siras* i.e. Vessels carrying liquid fraction of the refuse, resulting from the digestion of food.³⁰

According to the above mentioned materials, it can be concluded that above stated organs take an active part in the transportation of urine in one or the other way. So we find that *Mutravaha Nadi*, *Dhamani* and *Siras* have close relation with the urinary system.

DISCUSSION

The urinary or renal system is a group of organs in the body that filters out excess fluid and other substances from the bloodstream. The purpose of the urinary system is to eliminate wastes from the body, regulate blood volume and pressure, control levels of electrolytes and metabolites, and regulate blood p^H. The urinary system organs include the kidneys, ureters, bladder, and urethra. Metabolic wastes and excess ion are filtered out of the blood, combined with water, and leave the body in the form

of urine.³¹ In Ayurveda, concept of anatomy and physiology of urinary system is not much clear but disease of urinary system and pathogenesis is deeply explained. The concept of formation of urine according to Ayurveda is logically explained by *Acharyas*.

Mutranirmana Prakriya:

According to *Sushruta*, the general concept of *Mootra Nirmaana Prakriyaa* is that the ingested food after completion of digestive process converts into *Saara* (nutrients) and *Kitta* (excretory products) portion by the action of *Samana Vayu*. The *Sara* portion is absorbed and utilized for nourishment. The *Kitta Bhaga* contains some nutrients and precursor of *Mootra* and *Pureesha* (stool). Solid part of *Kitta* converts into *Pureesha* and *Drava* part converted to the *Mootra*. Thus formation of urine starts just along with digestion of food and passes through three stages 1) *Udaka* (general water pool)

2) *Kleda* (Metabolites added to the water pool)

3) *Mutra* (Real urine after filtration).

According to *Sushruta*, *Pakvaashaya* and *Aamaashaya* are the chief organs where *Mootra* is formed and then it comes into *Basti*; filled up with oozing of urine carried day and night by the channels from the region between *Aamaashaya* and *Pakvashaya*. Minute *Nadis* (specialized structures meant for transportation) arising from the large intestine, carry the urine continuously and contribute in the urine formation. This process is just similar to the manner in which many small tributaries and rivers contribute their water to the Sea. *Dalhana* commented that Urine is filtered and transported to *Basti* by *Upnsahan-Nyay* (percolation). *Sushruta* has stated the other example that as a new pitcher sunk into water up to its neck gets

filled up through the minute pores present in its walls similarly the *Basti* is filled with urine through these minute channels. The example of mud pot in the above explanation indicates the role of filtration played by the kidneys in the formation of urine.³²

Pathological conditions related with Mutravahastrots:

This can be classified into three types 1) Disease with predominant urinary manifestation, which are said to be originated from *Basti* or urinary tract such as *Mutrak-ruchha*, *Mutraghata*, *Ashmari*, *Prameha*. 2) Organ specific disease like *Vrikka Vidradhi*, *Asthila*, *Granthi*, *Basti-Shoth* etc. 3) Other disease associated with urinary alteration and urinary symptoms like *jwar*, *Atisara*, *Pandu*, *Kamla* etc.

CONCLUSION

As per *Acharya Charaka*, the detailed knowledge of normal human body is helpful to understand the factors influencing health and therefore such knowledge is widely appreciated by experts. The Ayurvedic literature reveals the ancient science was fully developed at time of *Samhitakala*. It is impossible to do surgeries and to treat diseases effectively without the deep knowledge of *Sharir Rachana* and *Sharir Kriya* but by the time it is fade up due to lack of research and references. *Mootravaha-strotas* (Urinary system) structures and physiology is quite limited and very much scattered. It is the need of time to research on anatomical and physiological aspects *Mootravaha-strotas* with the advancement of modern technology and its co relation of Ayurveda principles.

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