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 strotas. 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-strotas (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 confided 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 Aacharya shave 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

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).

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.

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

Sushruta- Basti is surrounded by Naabhi, Prista, Kati, Mushka, Guda, Vanksa a and Shepha.

Charaka- Basti is surrounded by Sthoolaguda, Mushka, Sevaneey, ShukravahaNaadee and Mootravaha Naadee.

Vagbhatta- The Sthaaana of Basti is in Kati Pradesha.

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

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.

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. 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 connected. Vagbhatta has mentioned the shape of Basti as Dhanurvakra i.e. a curve like a bow with a downward opening.

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.

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 aapanaavaayu. The vitiation of aapannavaayu alters the functions of basti and leads to different disorders of basti or mootravahasrotas.

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.

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

Function: The Vrikkas have been told to be the root of medovahasrotas. 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. 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.

The relation of Vrikka and mutrashaya has been mentioned while describing seven Ashayas and the organs related to the Ashayas.
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. 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*. 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*. 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.

5. **Mutravaha Srotas**
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, distention of urinary bladder and painful erection of the penis, ultimately leading to death of the patients. 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.

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. According to Dalhana *Mutravahinadis* are two in number and have been told to divide in to tens of hundreds of thousands, 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.

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.  

8. Mutravaha Siras (Veins)

There is no reference available with Brihattrayee about Mutravaha Siras. But Sharangadhara describes that the Maladraya 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.

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 pH. 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. 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 Moostra 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 Moostra and Pureesha (stool). Solid part of Kitta converts into Pureesha and Drava part converted to the Moostra. 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 Moostra 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 Upnsnahan-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.  

**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 *Mutrakruchha, Mutraghata, Ashmar, 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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