"A CRITICAL REVIEW ON THE PATHOLOGY OF CKD IN THE LIGHT OF AYURVEDA"

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Abstract

CKD encompasses a spectrum of pathophysiologic processes associated with abnormal kidney function and a progressive decline in the glomerular filtration rate (GFR). As the definition of healthy person according to Ayurveda is, the one who has balanced Doshas, balanced Agni, properly formed Dhatu, proper elimination of Malas1. Well functioning of bodily processes & whose mind, soul, senses are full of bliss. So elimination of Malas from the body is also a inductive of good health. There are totally three Malas explained by the Samhitas namely Purisha, Mutra & Sweda2.

In Chronic Kidney Disease (CKD) where there is a less formation of Mutra, the Karma of Mutra is removing Kleda(waste products) from the body3. So the Kleda which resides in the body causes Pratiloma gati of Vata leading to different variety of diseases which involves Dusti of Rakta4. Therefore use of Mutrala & Raktashodhaka Dravyas may be helpful in the subjects of CKD. There is no availability of direct description of CKD in Ayurvedic science, so we can study the disease with Ayurvedic concepts on the basis of general signs & symptoms.

Key words – Vrikka roga, Kleda, Mutra, Rakta, GFR,ESRD, CKD.

INTRODUCTION

A condition in which hampering of normal kidney functions is called as CKD. Hemodialysis is most common form of the treatment in the conventional medicine. Renal replacement is another option which may offer endurance of some years in patients with ESRD5. Though both these treatments are effective, they
are not affordable and approachable, hence not acceptable by Indian population. Etiology of CKD in India is diabetic nephropathy(31.2%), undetermined (16.4%), chronic glomerulonephritis(13.8%), hypertension(12.8%), tubulointestinal disease(7%), obstructive uropathy(3.4%), autosomal dominant polycystic kidney disease(2.5%), renovascular diseases(0.8%), kidney transplant graft loss(0.3%), others(11.7%). Mostly diabetes mellitus and hypertension together account for most of the patients being treated for ESRD. Clinical manifestation of CKD include fluid, electrolyte and acid base disorders, distributed potassium homeostasis, metabolic acidosis, disorders of calcium and phosphate metabolism, cardiovascular abnormality include ischemic heart diseases, heart failure, hypertension, left ventricular failure & pericardial diseases. Hematological abnormalities include anemia, neuromuscular abnormalities, GIT & nutritional abnormalities, endocrine and metabolic disturbances etc. CKD stage 0: GFR is above 90ml/min per 1.73m², with risk factors for CKD. CKD stage 1: GFR is above or equal to 90ml/min per 1.73m². With demonstrated kidney damage (eg. Persistent proteinuria, abnormal urine sedimentation, abnormal blood & urine chemistry, abnormal imaging study) CKD stage 2: GFR is 60-89ml/min per 1.73m². CKD stage 3: GFR is 30-59ml/min per 1.73m². CKD stage 4: GFR is 15-29ml/min per 1.73m². CKD stage 5: GFR is less than 15ml/min per 1.73m². According to Ashtanga Hridayakara, there are 2 types of pathology for Mutra Rogas i.e. Mutra Apravuttijannya and Mutra Atipravuttijannya Vikaras. By seeing all the symptoms of CKD, we can incorporate it into Mutra Apravuttijannya Vikara. 8 types of Mutrakrichra, 13 types of Mutraghata, 4 types of Ashmari are also included under the same. In both Mutrakrichra & Mutraghata, Krichrata & Mutra-Vibandhata are simultaneously present. But 20 types of Prameha are included under Mutra.
Atipravruttijannya Vikara due to its Prattyatma Lakshana “Prabhuta Avila Mutrata”.

EMBRYOLOGICAL DEVELOPMENT OF KIDNEY

In embryo, nephrogenesis (nephron development) occurs through several stages involving classical epithelial/mesenchyme type of interactions. Nephrogenesis continues into the late fetal period (GA week 34-35) and while the fetal kidney does produce urine, not until after birth does the glomerular filtration rate (GFR) increases rapidly due to a postnatal drop in the kidney vascular resistance and an increase in renal blood flow. The urinary system is developmentally and anatomically associated with genital development, often described as the “Urogenital System”. Nephron development involves 3 pairs appearing in sequence within intermediate mesoderm during development namely Pronephros, Mesonephros and Metanephros.

ANATOMY OF URINARY SYSTEM IN AYURVEDA:

The following is the description of Mutravaha Samasthan (Urinary system) given in ancient classics:

<table>
<thead>
<tr>
<th>Basti (Urinary bladder)</th>
<th>Mutravaha Srotansi (Nephrons)</th>
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</thead>
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<tr>
<td>Vrikkia (Kidney)</td>
<td>Mutravaha Nadies (Nerves of urinary system)</td>
</tr>
<tr>
<td>Gavini (Ureters)</td>
<td>Mutravaha Dhamanis (Arteries of urinary system)</td>
</tr>
<tr>
<td>Mutrapraseka (Urethra)</td>
<td>Mutravaha Sira (Veins of urinary system)</td>
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1. **Basti (Urinary Bladder):**

The description about Basti (Bladder) is present in most of the Ayurvedic texts. There is no doubt that structure of Basti (Bladder) and urinary bladder is one and the same. According to Shabdakosha, the root "Vas" is used as "Vas Acchadane". Its different meanings are, to cover, base, store house and reservoir.

In Ayurvedic texts though no clear cut definition of Basti (Bladder) has been given, but from the grammatical derivations, it can be defined as a store house which acts a reservoir of urine.

2. **Vrikkia (Kidney):**

It is derived from the root "Vrikkadane" means to take. The position, development and its functions are well described all over but no direct reference of Vrikkia's
(Kidney's) relation to urine formation or blood purification is found in either of the Ayurvedic classics. Vrikka (Kidney) are two in numbers and are situated in the lumbar regions on either side in the posterior abdominal wall in Koshta (Abdominal cavity)\(^\text{11}\). The Ayurvedic scholars in 20th century described Vrikka (Kidney) which closely resembles with kidney, but from references available in Samhita and their commentaries it cannot be interpreted that Vrikka is kidney.

3. **GAVINI** (URETERS): They are two in number, situated one on each side of Basti (Bladder), receiving Mutra (Urine) from the Antras (Alimentary canal) and sending it further to the Mutrashaya (Urinary bladder)\(^\text{12}\).

4. **MUTRAPRASEKA** (URETHRA): Mutrapraseka are to be protected from any injury at the time of performing surgery for Mutrashmari (Bladder calculus)\(^\text{13}\). It is the outlet of the Basti (Bladder), Which is two Angulas (Almost width of 2 fingers) in females and Twelve Angulas in males\(^\text{14}\). In male it carries both Shukra (Semen), and Mutra (Urine), while in female only Mutra (Urine)\(^\text{15}\).

5. **MUTRAVAHA SROTAS** (NEPHRONS): According to Charaka, meaning of the word Srotas (Body channels) is 'Sravanat Srotamsi'\(^\text{16}\). which means, where there is a continuous circulation takes place. So this way the channels which carry Mutra (Urine) can be considered as Mutravaha Srotas (Nephrons). He says that Mutravaha Srotas (Nephrons) has its origin from Basti (Bladder) and two Vankshananas (Inguinal region)\(^\text{17}\). Whereas Susruta believes Basti (Bladder) and Medhra (Penis) as the roots of Mutravaha Srotas (Nephrons)\(^\text{18}\).

6. **MUTRAVAHA NADIS** (NERVES OF URINARY SYSTEM): Mutravaha Nadis are lakhs together in number and are situated in between Pakvashaya (Large intestine) and Basti (Bladder)\(^\text{19}\). The functions of these Nadis (Nerves) are Mutra Nishyandana (Filtration of urine) during the state of awakening or sleep, and carrying the Mutra (Urine) from Pakvashaya (Large intestine) to Basti (Bladder), like the rivers fill the ocean with water\(^\text{20}\).
7. MUTRAVAHA DHAMANIS (ARTERIES OF URINARY SYSTEM):
Susruta while describing the Dhamanis (Arteries) has narrated one variety of Dhamani, termed as 'Adhogami Dhamani (Arteries which move downwards)' which are meant for Sara-Kitta Vibhajana (Division between essence and fecal matter of food) and to transport Mutra (Urine), Purisha (Feaces), Shukra (Semen), Artava (Ova/Menses), Apana Vata (Flatulence) etc. downwards21. Adhogami Dhamani (ten in numbers) are further subdivided into three parts, thus total number becomes 3022. These same Dhamanis (Arteries) taking part in the Sara-Kitta Vibhajana (Division between essence and fecal matter of food) process, out of which two are said to be the Mutravaha Dhamanis (Arteries of urinary system) going to the Mutrabasti (Urinary bladder), the functions of which stated are Dharana (Holding) and Yapan (Nourishing) of Mutra (Urine) and Basti (Bladder)23. Dalhan further says that these are further divided into countless branches24.

8. MUTRAVAHA SIRAS (VEINS OF URINARY SYSTEM):
In Charaka and Susruta Samhita, description about Mutravaha Sira (Veins of urinary system) is not available. Ashtanga Hridaya has first time described concept of Mutravaha Sira25. Mutravaha Sira’s are regarded as minute channels carrying Mutra (Urine) to Basti (Bladder). This Mutravahi Sira opens in the lateral side of Basti (Bladder) and fills the Basti (Bladder) with Mutra (Urine) continuously by the process of Nishyandana (Filtration)26. Sarangdhara describes that the Maladrava (Liquid part of stool) of digested food i.e. Mutra (Urine) is transported to Basti (Bladder) by Siras (Veins)27. Adhamalla in his commentary on Sarangdhara says that the Siras (Veins) are concerned with Aharajala (Liquid part of food) transported to Basti (Bladder) through Mutravaha Siras (Veins of urinary system)28. So we find that Nadis (Nerves), Dhamani (Arteries) and Siras (Veins) of Mutravaha have close relation with the urinary system.

PHYSIOLOGY OF MUTROTPATTI (URINE FORMATION) INAYURVEDA
First description about formation of urine is present in ‘Atharvaveda’. In Atharvaveda it is clearly mentioned that, Mutra Nirman (Urine formation) takes place in Antras (Alimentary canal) and it is transferred through Gavini (Ureters) and reaches Basti (Bladder)\(^{29}\). Formation of urine in Ayurveda is related to ‘Ahara (Food)’. When food gets completely digested liquid portion enters into Pakvashaya (Large intestine). Liquid portion absorbed from Pakvashaya (Large intestine) is transported to Basti (Bladder) by help of two Nadi’s (Nerves)\(^{30}\). Considering all the facts about anatomy and physiology of urine formation we can summarize the process of urine formation as follows-

**URINE FORMATION ACCORDING TO SUSHRUTA IN AYURVEDA**

Urine is produced in Pakwashaya and fill the urinary bladder like the river drains into the ocean. Mutravaha Nadies are very minute and they are not visible to our naked eyes. This process takes place continuously day and night. Arrangement for conveying urine from intestine to urinary bladder is made by two vessels called Gavini. By reviewing literatures of Ayurveda it is clear that urine is formed from intestines not from kidneys\(^{31}\).

**PATHOLOGY OF CHRONIC KIDNEY DISEASE IN THE LIGHT OF AYURVEDA**

In Ayurveda CKD can be included under Mutravaha Srotus. All the Tridoshas, Saptadhatus, & Mutra are involved in the disease. In Srotus, morbid changes due to accumulation of Doshas in them leading to the blockage, which can be responsible for the reduced kidney functions like filtration, reabsorption & secretion depending on the involvement of Glomerular apparatus & renal tubules. By the analysis of the clinical picture of
CKD involvement of the Dushyas can be understood. In CKD, Dushti of Rasavaha Srotus can be understood as fluid & electrolyte imbalance. Cardiovascular complications, reduced immunity, anemia & other serological impairments are caused by Rakta Dushti. Mayopathy torches on Mamsa Dushti. Dislipidaemia due to Medas dushti. Osteodystrophy due to involvement of Asti Dushti. Neuropathy will make us to keep a note on Majja Dushti. Sexual dysfunction & LOL indicates the Dushti of Shukra. Overall Mutra & Rakta are the most commonly affected Dushyas in the CKD. Mutravaha Srotodushti is indicated by oliguria, decreased GFR & proteinuria. Raktavaha Srotodushti is indicated by increased serum creatinine, blood urea, serum uric acid. Decreased GFR & oliguria are suggestive of vitiation of vata & increased levels of serum creatinine which is a waste product of body indicates Malasanchaya Ama. So, conclusion of involvement of Doshas, Dhatus & Malas as per the symptoms are
DOSHA - Vata Kapha Pradhana Tridosha
DUSHYA - Saptadhatu

AGNI - Jatharagni Mandyata & Dhatvagnimandyata
UDBHAVASTHANA - Pakvashayajanya
SANCHARASTHANA- Rakta & Mutra
VYAKTASTHANA- Vikka, Rakta.
SROTUS - Raktavaha & Mutravaha
SROTODUSHTI KARANA - Sangha & Vimargagamana
MALA - Mutra
SWABHAVA- Chirakari
SADHYASADHYATA - Krichrasadya

CONCLUSION
In CKD, we come across reduced formation of Urine (Mutra), because of which the excessive Kleda is not evacuated out and resides in Basti causing Pratiloma Gati of Vata and leading to the Dushti of Rakta. If we look into the renal function test, serum creatinine & urea amount is markedly raised in CKD. Serum creatinine & urea can be taken as Malaroopi Kleda which is causing damage to Rakta and other Dhatus.

In Vrika Roga Prakarana (~Kidney disorders) of Bhaishajya Ratnavali while explaining about Chikitsa, patient is advised to undergo Virechana, Swedana & drugs which are having Mutrala properties & Raktashodhaka properties.32
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