

# A Comprehensive Review Article on Conceptual Study and Aetiopathological Study on Urinary Tract Infection

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**Abstract**—Pittaj Mutrakrucha is well described in Ayurveda. which can be easily correlated with Mutraghata and Mutrakrichha separately described by Acharya Sushruta in Uttar-tantra. In urinary tract infections it is described as dukkhen or kruchenmutrapravuti. i.e., very painful micturition. The methodology was clinical study of Mutavahasrotodushti Mutrakrichha, the prakupita Pitta Dosha and Vata (Apana Vayu) on reaching Basti (bladder) affects the Mutravaha Srotas giving rise to Pittaj Mutrakrucha. Difficulty in micturition along with symptoms like Peeta mutrata, Sarakta mutrata, Sadaha mutrata, Saruja mutrata and Muhurmuhur mutrata are common clinical features. All these symptoms resemble closely with UTI (urinary tract infections) mainly cystitis. Therefore, in present article attempt has been made to define Mutrakrichha on scientific grounds vis-a-vis urinary tract infection. Mutrakricchra is also found as a lakshana in many diseases such as ashmari, Mutraghata, Mutraja vridhi, arsha and Gulma etc. The present study was done to assess the etiopathology of mutrakricchra according to various classical texts and to find out interrelation between Pittaj mutrakricchra and Drug induced Cystitis. In this review etiopathogenesis of the mutrakricchra has been illustrated in accordance with ayurvedic classics, and research papers collected from indexed journals accessed physically and through the internet. Nidanas of mutrakricchra are divided in to two types i.e., samanya and vishishta nidana. It can be classified according to the doshas i.e., vataja, pittaja and kaphaja nidana. Various research articles have suggested that Excessive exercise, Medications, Alcohol, Regular intercourse, Regular riding, Sea foods, Heavy food intake & Indigestion, Salt & astringent materials, urge suppression and Fecolith are the main etiological factors of mutrakricchra w.s.r. to Urinary tract infection. Most western countries have voluntary systems in place to report adverse effects of drugs is evidence of under-reporting of cystitis associated with drugs. Apana vata is responsible for normal evacuation of urine. Sushruta has mentioned that the pratiloma gati of vata is responsible for the mutra rogas. So, it is concluded that any abnormalities in vyana vayu, samana vayu, pachaka

pitta, ranjaka pitta and apana vayu due to dietary, habitual, deficiency, injury, Medicines and bacterial factors resulting in mutrakricchra.

**Index Terms**—Urine, Mutrakricchra, Urinary tract infection, Apana vata

## I. INTRODUCTION

As per Ayurveda, Sharir is made from doshas, dhatu and mala. It means they help in maintaining the structural and functional integrity of the body. Among these Mala are specifically means for elimination of waste product out of the body. Also known as kledvahan. Due to vitiation by initiated doshas they in turn vitiate their marga or srotas which is known as Mutravasrotodushti. Patient of pittaj mutrakrucha complains as shulyukta, dahayukt and muhurmuhur mutraprvuti. Pittaj mutrakrucha is equivalent to UTI where dysuria, burning micturition and increase frequency of micturition. In our classical texts the urinary disorders are described in the form of 8 types of Mutrakrichha, 13 types of Mutraghata and 4 types of Mutrashmari.

All the classical texts have explained its silent feature is “dukhen mutra pravritti”. Any type of „Dukha” (Discomfort) during micturition is included under Mutrakricchra. Mutrakricchra is a broad term which covers the conditions described in modern medical infection. Urinary tract infection (UTI) is an infection that affects part of the urinary tract. When it affects the lower urinary tract, it is known as a simple cystitis or bladder infection and when it affects the upper urinary tract it is known as pyelonephritis or kidney infection. So urinary tract infection (UTI) is also known as acute cystitis or bladderinfection.

However, Drug-induced cystitis (DIC) is an under-reported and poorly recognized condition. Although

there is widespread awareness of the role of cyclophosphamide as a cause of DIC there is a much lower level of awareness for other drugs. Henley et al., in a survey found that 27% of those responding were unaware of the possibility of cystitis associated with tiaprofenic acid or other NSAIDs. Most western countries have voluntary systems in place to report adverse effects of drugs; however, there is evidence of under-reporting of cystitis associated with drugs. DIC usually presents with frequency, urgency, dysuria and bladder pain. Some patients also have penile pain, voiding difficulties or even episodic urinary retention.

## II. METHODS

In present article, literary aspects regarding Pittaj Mutrakrichha and UTI i.e., Drug induced Cystitis are compared discussed with the help of available Ayurveda and Modern literature.

## III. CONCEPTUAL REVIEW

Ayurvedic Perspective:

As per Ayurveda, Sharir is made from doshas, dhatu and mala. It means they help in Muta is an outcome product digestion of food and metabolism in the body it is passes through urethra. In both Mutraghata and Mutrakrichha, Kruchata (dysuria) and Muta-vibandhta are simultaneously present but in Mutrakrichha there is predominance of Kruchata (dysuria).

Definition of Muta Krichha

The painful voiding of urine is known as Mutrakrichha. In this disease patient has urge to micturate, but he passes urine with pain.

Nidana

Vyayama, ruksha seven, adhyashan, yana gamana are causative factors for vata prakopa. Tikshna, amla sevana causes pitta prakop and Anupa mamsa sevana, vyayama, adhyashan causes kapha prakopa. So, these Nidanas cause vitiation of Doshas alongwith Strotodushti of Mutrvaha strotas. Stroto-dusti will cause kha-vaigunya in Mutravaha strotas. These factor leads to Mutrakriccha.

Partantra Nidana ♦ Kaphaja arsha(11) ♦ Ajirna(12) ♦ Vasti vidradhi(13) ♦ Gulma(14) ♦ Udavarta(15)

LAKSHANA

Many symptoms are mentioned in the classics for various types of Mutrakrichchra. The symptoms like krichchrata (hesitancy), muhurmuhr mutra pravritti (increased frequency of micturition) and shula (dysuria) are present in almost all types of Mutrakrichchra as explained in the classics. Hence these symptoms can be considered as important clinical features of Mutrakrichchra.

The most presenting features Shula and muhurmuhr mutrata are due to aggravation of vata dosha, peeta mutrata and daha are due to aggravated pitta dosha and picchila mutra (turbid urine), shweta mutra (presence of leukocytes in urine) are due to aggravated kapha dosha. Among all these symptoms most agonizing and predominant symptom of Mutrakrichchra (LUTI) is burning micturition which suggests pitta dusti in manifestation of this disease.

SAMPRAPTI

Ayurvedic concept of samprapti lies in understanding the dosha and dushya involved in the manifestation of the disease. Causative factors like atimaitihuna, ativyayama, mutravigadharana, and nityadrutaprastayana leads to aggravation of vata dosha specially apana vata. Excessive intake of madya, tikshna aushadh, matsya and katu amla lavana rasa causes aggravation of pitta dosha i.e. pachaka pitta. Intake of anupamamsa, adhyashana and ajirna bhojana aggravates kapha dosha which in turn leads to reduced state of agni (digestive power). Hence all the tridoshas get vitiated.

The vitiated tridoshas along with the state of agnimandhya (reduced digestive capacity) invariably produce ama. Ama mixes with the doshas forming sama doshas. These sama dosha produces symptoms such as peeta mutra (yellowish urine), sadaha mutra pravritti (burning micturition), basti and mutrendriya gurutwa (inflammation of bladder), shweta, snigdha and picchila mutra (turbid urine with the presence of leucocytes).

It is an important factor to understand the process of manifestation of the disease. In the context of Mutrakricchra, only Acharya Charaka has described the pathogenesis. When the doshas have been vitiated by the specific etiological factors, then three doshas either individually or jointly get aggravated in the basti

or afflict the urinary passage, then give rise to Mutrakricchra

#### IV. APPLICATION OF SHATA KRIYAKALA IN SAMPRAPTI OF MUTRAKRICCHRA

The development of the disease according to Shata kriya kala is following in first kriyakala Sanchaya, in the context of mutra vikara, the organ which is responsible for formation of Toya (former part of mutra) is a pakvashaya and for formation of ama is amashaya. Pakvashaya is the vishesha sthana of vata and Amashaya of pitta. Stabdhapurna koshta, Pitavabhasata and Alasya are the symptoms of vata, pitta and kapha chaya respectively arises due to disturbance of agni.

In second kriyakala Prakopa, when etiological factors are not controlled and continue to act for long, the doshas continue to increase further and accumulate in excess till they reach the prakopa stage. In third kriyakala prasara, vitiated pitta spreads to other regions of the body in to general circulation with the help of vyana vayu or rasa. The prakupita doshas are propelled from koshta to basti and to other parts of the body. Pittaja and vataja factors help doshas to move out from the koshta. It leads to dhatvagnimandhya. As a result, kleda (mala of all dhatus) is formed in excess. Excess kleda affects the quantity of mutra and disturbs the concentration of urine. Natural colour of urine is due to ranjaka pitta but here vitiated pitta results in haridra mutra.

In fourth kriyakala Sthana samshraya, due to kha vaigunya in mutravaha srotas, the excited dosha having extended to other parts of body becomes localized to basti and mutra marga. As a basti is the seat of apana vayu, vitiated pitta with the influence of apana vayu obstruct the urinary pathway due to pratiloma gati of vayu. Vitiated pitta with its ushna and tikshna guna causes irritation of urinary pathway. As a result, mild symptoms are produced.

Acharya Susruta has clearly mentioned that when there is localization of the doshas in the basti, the resultant effect is any disease which affects the mutra such as mutra dosha, mutraghata or prameha. This is the purvarupa stage of the disease and the clinical features that are manifested in the stage are not attributable to any particular dosha but to the disease. In fifth kriyakala Vyakti, the pathogenesis of the disease is completed fully in this stage. In this stage

micturition process is affected due to obstruction of mutra marga. Further differentiation according to the doshas will take place and the respective type of Mutrakricchra will manifest.

In sixth kriyakala Bheda, if the disease is not checked by proper measures, then the condition will deteriorate and complications like karshya (Weakness), arti (Discomfort), trishna (Thirst), shula (Pain) will be developed.

#### V. MODERN PERSPECTIVE

##### DEFINITION

Infection of Urinary tract is termed as Urinary tract infection (UTI). Infection of the lower urinary tract is known as bladder infection (cystitis) or lower urinary tract infections. Infection of upper urinary tract is known as kidney infection (pyelonephritis).

##### AETIOLOGY

The most common cause of UTI is Bacterial infection with E. coli being the most frequent pathogen, causing 75.90% of UTIs. Other bacteria include Klebsiella, Proteus, Enterococcus species, Staphylococcus, saprophyticus. Fungi (Candida species) is also causative organism for UTIs commonly after catheterization or surgery. Likewise drug induced cystitis is a rare cause and it may be precipitated into haemorrhagic cystitis.

##### DISCUSSION

Mutrakricchra is compared with LUTI. Acute infections of the urinary tract can be subdivided into two general anatomic categories i.e., lower urinary tract infection (urethritis and cystitis) and upper urinary tract infection (acute pyelonephritis, prostatitis, intrarenal and perinephric abscesses). Infections of the urethra and bladder are often considered superficial or mucosal infections, while prostatitis, pyelonephritis, and renal suppuration signify tissue invasion. Infections confined to lower urinary tract commonly cause dysuria, frequency and urgency. Pyelonephritis is a clinical syndrome characterized by chills, fever, flank pain and constitutional symptoms caused by bacterial invasion of the kidney.

If a person complains frequency, urgency, hesitancy, burning micturition, painful micturition and red-yellow-orange urine etc. is diagnosed as a

Mutrakricchra. These are the symptoms which are similar to lower urinary tract problem. In lower urinary tract infection, patient suffers from urgency, frequency, suprapubic pain, discomfort etc. associated with the presence of microorganisms in the urinary tract. Some patients can also have symptoms of infection with very low or none of the bacterial count in urine. It is included under acute urethral syndrome. Intestinal cystitis is a condition that results in recurring discomfort or pain in the bladder and surrounding pelvic region. Some of the symptoms of intestinal cystitis resemble those of bacterial infection, but medical tests reveal no organism in the urine of patients with intestinal cystitis. Furthermore, patient with intestinal cystitis do not respond to antibiotic therapy. So, we can compare the Mutrakricchra with LUTI (Lower urinary tractinfection).

Aharaja nidana (Ati ushna, lavana, katu, amla rasa, Anupa mamsa, madya, Tikshana aushadha) acts like irritants (Urinary metabolites), then Mutravaha srotas dushti resulting in Mutrakricchra (Vataja, Pittaja, kaphaja, ashmarija), and due to Viharaja nidana (Ativyavaya, ativayama, Vegadharana, bharadharana, Nityadrutaprushthayana, abhigata) trauma (mutravaha srotobheda) occurred resulting in Mutrakricchra (Abhigataja, Shukraja, Shakritaja, Ashmarija, Pittaja). Analysis of textual references regarding etiology of mutrakricchra discloses the fact that pittakara nidana and vatacara nidana play a significant role in manifestation of mutrakricchra.

Consideration of the eight types of Mutrakricchra has also shown up interesting facts. UTI is common in patient with calculi and other obstructions. Ashmari (Lithiasis) and sharkara (Lithiasis) has been implicated as a cause of Mutrakricchra even in ayurvedic texts. Burning micturition is one of the common complaints of an infected patient. Daha (Burning sensation) is also the common finding explained in texts when pitta dosha is aggravated. This feeling of burning is one of the lakshana of pittaja mutrakricchra. Sannipataja mutrakricchra have daha when pitta is predominant in all three types. Another, ashmarija and sharkaraja mutrakricchra have similar features like vataja, pittaja, kaphaja and sannipataja but they are diagnosed by the patient's clinical history. Abhigataja mutrakricchra occurs when a person suffered from trauma in urethra, vagina, bladder and during coitus or surgical instrumentation. Its main

feature is bloody micturition with severe pain. Purishaja mutrakricchra have complaints of flatulence, distention of abdomen with pain and retention of urine. The pratyatma lakshana of Mutrakricchra is „dukhen mutra pravritti” means discomfort during micturition. This dukha is also a synonym for Roga. So, difficulty may also be due to various diseases other than Mutrakricchra as a disease. This point is validated as we find that Mutrakricchra occurs as a clinical symptom in pakvashayastha vata. It also occurs as a purvarupa inashmari.

From an ayurvedic point of view, even in agantuja nidana, dosha prakopa is the main cause for the vyadhi though pain occurs first. Kha vaigunya in the srotas decides whether there will be sthana samshraya of the doshas or not. Apana vayu is responsible for normal evacuation of urine. Acharya Sushruta has said that the pratiloma gati of vata is responsible for mutra rogas. Vesico ureteral reflux and neurogenic bladder dysfunction are two major causes for UTI. Vesico ureteric reflux is more common in patients with urinary tract infection. It causes infection of peripheral papillae and consequent scars at the poles of kidney. So, we can say that the normal gati of apana vata is reversed in these two conditions.

The modern theories of pathogenesis suggest that the bacteria gain access to the bladder via the urethra. There is first an increase in the intestinal flora and the bacteria colonize the vaginal introits in females and distal urethra in both males and females. Cystitis like UTI is more common in females than in males because of shortens of urethra which is liable to fecal contamination and due to mechanical trauma during sexual intercourse. Local immunity factors are said to decide whether infection occurs or not.

Detailed analysis of the pathogenesis of the disease suggests that there is increase in ruksha and chala guna of vata giving rise to impairment in the flow of urine through its channels. The ushna and tikshna gunas of pitta increase and thereby produce burning micturition. The guru and picchila guna of kapha gets vitiated, giving rise to shotha i.e., colonization of bacteria leading to inflammation of the urinary tract. Excessive exercise, medications, alcohol, regular intercourse, regular riding, meat (Sea foods), heavy food intake & Indigestion, Salt & astringent materials, urge suppression and Fecalith are the main etiological factors of mutrakricchra.

#### Tikshna aushadha [Medication]

Intake of drugs with strong potency aggravates pitta dosha. This increases the urine concentration, thereby urine volume decreases and results in change of pH value. This creates an environment susceptible for infections. Studies have revealed that certain medications, particularly the chemotherapy drugs like Cyclophosphamide and Ifosfamide can cause inflammation of bladder which is termed as drug induced cystitis. People who have compromised immune systems due to illness or medication use may be more prone to urinary tract infections than others.

### VI. DRUG INDUCED CYSTITIS

A wide variety of agents including chemotherapeutic drugs are implicated in the development of hemorrhagic cystitis. The most important among these are the oxazaphosphorine compounds such as cyclophosphamide and ifosfamide (synthetic analogues) that are used in many chemotherapeutic protocols for cancers like solid tumors and lymphomas. Cyclophosphamide is also used in certain immuno-inflammatory conditions such as Wegener's granulomatosis and rheumatoid arthritis. The dose-limiting toxicity with these agents is usually urinary tract toxicity. Urinary tract symptoms include storage lower urinary tract symptoms such as frequency, urgency, nocturia and dysuria.

#### DRUGS CAUSES HEMORRHAGIC CYSTITIS

1. Ifosfamide
2. Cyclophosphamide
3. Busulphan
4. Thiotepa
5. Temozolomide
6. 9-nitrocarnitrothecin
7. Penicillin and its derivatives like methicillin, carbenicillin, ticarcillin, piperacillin
8. Danazol
9. Tiaprofenic acid
10. Allopurinol
11. Methaqualone
12. Methenamine mandelate
13. Gentian violet
14. Acetic acid

Other systemic chemotherapeutic agents less commonly cause hemorrhagic cystitis. Busulphan, an alkyl sulfonate compound used in the treatment of

chronic granulocytic leukemia, has been reported to cause hemorrhagic cystitis in about 16% of patients. Alkylating agents like thiotepa, temozolomide, and 9-nitrocarnitrothecin (a topoisomerase I inhibitor) have also been implicated to cause hemorrhagic cystitis. Certain medications like penicillins and its synthetic derivatives like methicillin, carbenicillin, ticarcillin, piperacillin and penicillin G, on rare occasions, cause hemorrhagic cystitis through an immunological mechanism. Symptoms can take two weeks to develop after the medication is started. Urinalysis frequently reveals sterile pyuria, hematuria and eosinophiluria.[28] Danazol, a semi synthetic anabolic steroid, has caused hemorrhagic cystitis in 19% of patients with hereditary angioedema. Hematuria occurs after a long interval of symptom free period and is unrelated to dose. Tiaprofenic acid, a non-steroidal anti-inflammatory agent, is reported to cause hemorrhagic cystitis. The symptoms can occur within days of starting the medication or years later. The etiology may be due to direct toxicity to the bladder urothelium or due to immune mediated hypersensitivity reaction. The main treatment in these cases is stopping the drug and control of lower urinary tract storage symptoms and the hematuria in these patients resolves in a few days.

Other medications that have been implicated in the development of hemorrhagic cystitis include allopurinol,[31] methaqualone,[32] methenamine mandelate, gentian violet and intravesical instillation of acetic acid.

### VII. CONCLUSION

Pittaj Mutrakricha when viewed under the conventional medicine can be correlated with Cystitis (UTI). Both diseases having equal signs and symptoms.

In both Ayurveda and modern management, primary prevention (Nidan pravara-nam) strategy has been given priority.

Intake of drugs like NSAIDs with strong potency aggravates pitta dosha. This increases the urine concentration and induces cystitis

It is concluded that any abnormalities in vyana vayu, samana vayu, pachaka pitta, ranjaka pitta and apana vayu due to dietary, medicinal, habitual, deficiency, injury and bacterial factors resulting in mutrakrichra.

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