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Critical understanding of the journey of Urinary Calculi from Inception till Cure

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ABSTRACT

Acharya Sushruta "the Father of Surgery" has mentioned both medical as well as surgical emergencies in the field of *Ayurveda*. Among them his skill of managing *Ashmari Chikitsa* shows an important limelight into the field of surgery. Each and every step mentioned by *Acharya* in the management requires critical analysis with respect to contemporary practice. The analysis has been carried out through the literary review of *Sushruta Samhitha*, modern text and other supporting scientific data. Even though the field of surgery has advanced by leaps and bounds today; many techniques practiced today have still been derived from the practices of *Acharya Sushruta*.

Key words: Urinary Calculi, Ashmari, Mutrashmari

INTRODUCTION

Ashmari is one of the most common and distressing disease among the group of urinary disorders. Renal stone disease is common, affecting people of all countries and ethnic groups. It affects all age groups and both gender but the peak incidence is observed in 2nd to 3rd decades of life with a male-female ratio of 2:1.^[1] Among all the urinary problems described in *Ayurvedic* texts, there is one variety where both medical and surgical treatments are advised and agreed upon by all *Acharyas* and this entity is the *Mutrashmari*. In some regions, the risk is higher, most

notably in countries such as Saudi Arabia, where the lifetime risk of developing a renal stone in men aged 60–70 is just over 20%.^[1]

Kidney stone disease is prevalent, with an expectancy of 12% in a total population reported to be prone to urinary stones. Of this 12%. 50 % are severely affected by renal damage, and leads to loss of kidney function. Frequency of prevalence and recurrence rate of renal stone is high in areas like- Maharashtra, Gujarat, Rajasthan, Punjab, Haryana, Delhi, Madhya Pradesh, Bihar and West Bengal.^[2]

The documentation about *Ashmari Roga* can be found i.e., in *Atharvaveda*. The reference of *Ashmari* with detailed description is available only in *Ayurvedic* texts. *Acharya Sushruta* (800-1000 B.C.) has given elaborate description of *Ashmari* in his treatise.

Nirukti^[3]

अश्मानं राति इति अश्मरि ।

The condition which is associated with presence of the stone in the body is known as *Ashmari*. *Ashmari* comprises of two words, i.e., 'Ashma' and 'Ari'. Where *Ashma* means a stone and *Ari* means enemy.

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Ashmari as a Mahagada^[4]

वातव्याधिः प्रमेहश्च कुष्ठमर्शो भगन्दरम् |

अश्मरी मूढगर्भश्च तथैवोदरमष्टमम् |

अष्टावैते प्रकृत्यैव दुश्चिकित्स्या महागदाः ||

It is included as one among the *Ashtamahagada* because it is *Tridoshaja Pradhana Vyadhi*, *Basti* is the *Sthana*, *Marma* is the *Ashraya* and it is a *Sastrasadhya Vyadhi*.

Nidana of Ashmari^[5]

तत्रासंशोधनशीलस्यापथ्यकारिणः प्रकुपितः श्लेष्मा मूत्रसम्पृक्तोऽनुप्रविश्य बस्तिमश्मरीं जनयति ||

Asamshodana Sheela - one who is not making the *Shuddi* of the body through *Panchakarma* procedures and also do *Mutravegadharana* and in *Apathyakarina-Sleshma Prakopa* will occur. This *Prakupita Sleshma* along with *Mutra* reaches *Basti* and lead to the formation of *Ashmari*. *Mutrasamprukta* means *Mutrena Sahita* means it won't be expelled out along with *Mutra*. Instead of that it will reaches the *Basti* and forms *Kadora Rupa*.

Etiology of Urinary Calculi^[6]

- Hyperexcretion of relatively insoluble urinary constituents
- Physical changes in urine
- Urinary Crystalloids and Colloids - an increase in the crystalloid level or a fall in the colloid level, urinary stones may be formed
- Decreased urinary output of citrate - Presence of citrate in the urine keeps relatively insoluble calcium phosphate and carbonate in solution.
- Urinary infection - (a) Infection disturbs the colloid content of the urine, so there is more chance of stone formation; (b) Infection also causes abnormality in the colloids which may cause the crystalloid to be precipitated, (c) Infection also changes urinary pH which helps in stone formation.
- Urinary stasis - (a) Urinary stasis provides a fertile field for bacterial growth, (b) It also causes a shift of the pH of the urine to the alkaline side, (c) Stasis

also predisposes urinary infection, (d) It allows the crystalloids to precipitate. i.e., secondary stones especially triple phosphate stone.

- Hyperparathyroidism - Due to overproduction of parathormone the bones become decalcified and calcium concentration in the urine is increased. This extracalcium may be deposited in the renal tubules or in the pelvis to form renal calculus. Peculiarly enough renal calculi are more likely to develop when hyperparathyroidism is mild and prolonged without much skeletal lesion.
- Vitamin A Deficiency - Deficiency of Vitamin A causes desquamation of the epithelium which inturn act as nidus for stone formation. This is more applicable to bladder stones.

Samprapti of Ashmari^[5]

Due to *Nidana Sevana* there will be *Kapha Prakopa*. This *Prakupita Kapha* mixes with *Mutra* reaches *Basti Pradesha* leading to the formation of *Mutrashmari*.

Samprapti Ghataka^[7]

Dosha	<i>Tridosha</i>
Dushya	<i>Mutra</i>
Agni	<i>Jataragnimandya</i>
Ama	<i>Jataragnimandyajanyaama</i>
Srotas	<i>Muthravaha Srotas</i>
Udbhava Sthana	<i>Amashaya and Pakvashaya</i>
Sanchara Sthana	<i>Siras, Amashayapakvashayagatha Muthravahasrotas</i>
Adhistana	<i>Muthravaha Srotas and Basthi</i>
Vyaktha Sthana	<i>Basthi</i>
Dustiprakara	<i>Sanga</i>
Rogamarga	<i>Madhyama</i>
Vyadhi Swabhava	<i>Chirakari</i>
Sadhyasadhyatha	<i>Kruchrasadhya, Sasthrasadhya</i>

Pathogenesis of Urinary Calculi^[8,9]

Randalls plaque theory/ nidus - Randall postulated that when the overlying mucosa is ulcerated, the calcification acts as a nidus on to which insoluble crystals deposit to form stones. Even blood clot, clumps of epithelial cells, bacteria or even pus cells may form nidus. Necrotic ischemic tissue and foreign bodies may form Nidus and encourage stone formation. Such tissues may be caused by Neoplasms, necrotic papillae or ulcerated mucous membrane from infection.

Purvarupa of Ashmari^[10]

तासां पूर्वरूपाणि - ज्वरो बस्तिपीडारोचकौ मूत्रकृच्छ्रं
बस्तिशिरोमुष्कशेफसां वेदना कृच्छ्रावसादो बस्तगन्धित्वं
मूत्रस्येति ॥

There will be *Jwara*, *Bastipeeda*, *Arochaka*, *Mutrakruchra*, *Vedana* in head of bladder, scrotum and penis and *Mutra* becomes *Bastagandha*.

Samanya Lakshana of Ashmari^[11]

- Pain during micturition in one of the following parts i.e., *Nabhi*, *Basti*, *Sevani*, *Mehana*
- *Mutraddharasanga*
- *Sarudhira Mutrata*
- *Mutravikiranam*
- *Gomeda Prakasha*, *Ati Avila*, *Sasikata*
- Pain during *Dhavana*, *Langhana*, *Plavana*, *Prustayana*, *Ushna Gamana* and *Adhwagamana*

Signs and symptoms of Urinary Calculi**A] Renal calculus^[12]****Symptoms**

- **Quiescent calculus** - i.e., inactive, A few stones, particularly the phosphate stones, may be discovered accidentally in X-ray performed for some other reason such as renal failure, uraemia or due to symptoms of urinary infection.
- **Pain** - Pain is the leading symptom of renal calculus in majority of cases (80%). Fixed renal pain - If the stone is free and obstructs a calyx or

ureteropelvic junction, there will be dull flank pain due to capsular and parenchymal distension. Dull aching or boring type of pain is also experienced in case of big phosphate calculus. The pain is situated in the renal angle posteriorly and in the corresponding hypochondrium anteriorly. This pain characteristically gets worse on movement particularly walking up the stairs and during jolting.

- **Hydronephrosis** - patient complains of a lump in the loin and a dull ache, which are due to hydronephrosis caused by renal stone.
- **Haematuria** - Occasionally haematuria is the leading and only symptom. Haematuria usually occurs in small amount to make the urine dirty or smoky during or after an attack of pain. Infection of the kidney may occur due to stone which is relatively symptomless. Patient presents with pus in the urine in varying amounts or opalescent urine.

Signs

- **Tenderness** - This is mostly present at the 'renal angle' posteriorly. Anteriorly such tenderness may be elicited about an inch below and medial to the tip of the 9th costal cartilage, which is known as the renal point'. Tenderness is more a constant feature when renal calculus is associated with infection.
- **Muscle rigidity** - few cases. Rebound tenderness anteriorly can also be elicited, particularly if acute infection is associated with.
- **Swelling** - When there is hydronephrosis or pyonephrosis associated with renal calculus, a swelling may be felt in the flank.

B] Ureteric Calculi^[13]**Symptoms**

- **Pain** - There are two types of pain :- (i) Ureteric colic - When a stone enters the ureter and descends along it there is an attack of ureteric colic due to hyperperistalsis of smooth muscles of the ureter, pelvis and calyces. It is repeated at longer or shorter intervals till the stone is ejected into the bladder or becomes impacted in the ureter and

becomes severe when the stone becomes arrested at the anatomical narrowing's of the ureter. (i) Fixed pain - When the ureteric calculus gets impacted, ureteric colic passes off and is replaced by a dull ache. The position of this dull ache depends on the position of impaction of the ureteric impacted in the pelvic part of the ureter - pain is at the iliac fossa. This may lead to loss of function and complete atrophy of the kidney later on.

- **Haematuria** - usually occurs after an attack of ureteric colic.
- **Urgency and frequency** - Even in the absence of infection symptoms of urgency and frequency of urination may be complained of when the stone is very near the bladder.
- **Gastrointestinal symptoms** - Nausea and vomiting are often complained of. These symptoms may sometimes overshadow the renal and ureteric pain. and may mimic peptic ulcer, cholelithiasis or acute appendicitis

Signs

- Patient is usually in agony, pacing the floor rather than lying quietly in bed
- The skin is cold and clammy and there may be other signs of mild shock.
- Marked tenderness in the Costo vertebral angle and flank
- The abdomen is distended and quiet on auscultation
- Hyeraesthetic scrotal skin

C] Vesical calculus^[14]

Males are more often affected in the ratio of 8:1. Clinically three types of bladder stones are noticed 1. Usual type, which gives rise to symptoms, 2. Silent type, which is asymptomatic and 3. Masked type. A vesical calculus usually remains free in the bladder and moves about according to the position of the patient. It gravitates to the most dependent part which is the

neck of the bladder in erect posture and behind the interureteric ridge in recumbent posture.

Symptoms

1. Usual type - The symptoms which are usually complained by patients with vesical calculus are as follows:

(i) Frequency - Increased frequency is the earliest and commonest symptom of vesical calculus. Frequency is mostly noticed by day. The most characteristic feature is that the patient does not feel satisfied after complete voiding and he feels to come back again for urination

(ii) Pain - Pain and discomfort is particularly complained of at the end of micturition. Such pain is referred to the tip of the penis or to the labia majora at the end of micturition. Such pain is due to the presence of vesical calculus on the trigone of the bladder. Pain or discomfort is also complained of in the suprapubic region and this is aggravated by running and jolting. Pain passes off as the patient lies down.

(iii) Haematuria - Terminal haematuria is a quite frequent symptom of vesical calculus due to its spiky surface which abrades the sensitive mucus membrane of the trigone and causes bleeding.

(iv) Dysuria - Sudden interruption in the flow of urine by the vesical calculus blocking the internal urethral meatus is sometimes complained of. The patient may restart the flow of urine by change of posture.

(v) Acute retention of urine is extremely rare from vesical calculus

2. Silent type - When the vesical calculus lies in a diverticulum of the bladder or in the postprostatic pouch, it remains symptomless for quite a long time. These stones are usually discovered either by straight X-ray of the abdomen or by cystoscopy which is performed for some other purpose.

3. Masked type - In a few cases of vesical calculus the symptoms of cystitis dominate, so that the patients are treated in that line and the stone is masked. It should be remembered that a patient who frequently comes with the complaint of cystitis should be investigated thoroughly to exclude presence of vesical calculus.

Signs

- Abdominal examination is usually negative except in some cases where tenderness in the suprapubic region may be elicited.
- Rectal or vaginal examination should be performed in all cases of vesical calculus.
- One may be able to palpate the vesical calculus by this examination if the stone is of moderate size.

4] Urethral calculus^[15]**In males**

- Patient may experience a sudden stoppage of urine while urination and thereby unable to empty the bladder.
- Pain due to the stone in urethra may be rather severe and may radiate to the glans penis.
- Dribbling also occurs.
- Strangury

In females

- The symptoms of urethral diverticulum with or without calculus are those of infection of lower urinary tract including
- Frequency
- Dysuria
- Nocturia
- Pyuria
- In rare haematuria

Pain in Calculi^[16]

- Renal pain fibers are primarily preganglionic sympathetic nerves that reach spinal cord levels T-11 to L-2 through the dorsal nerve roots.
- Aortorenal, celiac, and inferior mesenteric ganglia are also involved.
- Spinal transmission of renal pain signals occurs primarily through the ascending spinothalamic tracts.
- In the lower ureter, pain signals are also distributed through the Genito femoral and Ilioinguinal nerves.

- The nervi erigentes, which innervates the intramural ureter and bladder, is responsible for some of the bladder symptoms that often accompany an intramural ureteral calculus

Ashmari Bheda^[17]

चतस्रोऽश्मर्यो भवन्ति; श्लेष्माधिष्ठानाः; तद्यथा- श्लेष्मणा, वातेन, पित्तेन, शुक्रेण चेति ॥

Four types- *Sleshmaja Ashmari, Vataja Ashmari, Pittaja Ashmari, Sukra Ashmari.*

Types Of Urinary Calculi^[18,12]

Criteria	Types
Based on Pathogenesis	Primary stones Secondary stones
Based on Composition	Calcium Oxalate Phosphate Calculi Uric Acid or Urate Calculi Cystine Calculi Xanthine Calculus
Based on Location	Renal calculi Ureteric calculi Vesicle calculi Urethral calculi

Site	Types	Incidence
Renal Calculi	Oxalate Stones	75%
	Phosphate Stones	10-15%
	Uric Acid and Urate Stones	5 %
	Cystine Stones	2%
	Xanthine, Indigo and Struvite Stones	Rare
Ureteric Calculi	Triple Phosphate	15-20%

	Cystine Calculi	1-15%
Vesical Calculi	Xanthine Calculi	rare

Sleshmaja Ashmari^[19]**Vedhana**

त्रप्रतिघाताद्दाल्यते भिद्यते निस्तुद्यत इव च

Ashmari

श्वेता स्निग्धा महती कुक्कुटाण्डप्रतीकाशा मधूकपुष्पवर्णा

Sleshmaja Ashmari can be correlated with Cystine Calculus

Cystine calculus^[20] - These uncommon stones appear in the urinary tract of patient with a congenital error of metabolism that lead to cystinuria. Hexagonal, translucent, white crystals of cystine appear only in acid urine. They are often multiple and may grow to form a cast of the collecting system. Pink or yellow when first removed, they change to a greenish colour when exposed to air. Cystine stones are radio-opaque because they contain sulphur and they are very hard

Vataja Ashmari^[21]**Vedhana**

दन्तान् खादति, नाभिं पीडयति, मेढ्रं प्रमृद्वाति, पायुं स्पृशति, विशर्धते, विदहति, वातमूत्रपुरीषाणि कृच्छ्रेण चास्य मेहतो निःसरन्ति

Ashmari

अश्मरी चात्र श्यावा परुषा विषमा खरा कदम्बपुष्पवत्कण्टकाचिता

Vataja Ashmari can be correlated with oxalate calculus and triple phosphate calculus.

Oxalate calculus^[20] - These are irregular in shape and covered with sharp projections which tends to cause bleeding. The surface of the calculus discolors by altered blood. It is hard and radio dense.

Triple Phosphate Calculus^[22] - Large stag horn calculi induced by urinary tract infection with urea splitting organisms

Pittaja Ashmari^[23]**Vedhana**

मूत्रप्रतीघातादूष्यते चूष्यते दह्यते पच्यत इव बस्तिरुष्णवातश्च

Ashmari

अश्मरी चात्र सरक्ता पीतावभासा कृष्णा भल्लातकास्थिप्रतिमा मधुवर्णा

Pittaja Ashmari can be correlated with phosphate calculus.

Phosphate calculus^[22] - (Calcium phosphate obtained with ammonium magnesium phosphate) is smooth and dirty white. It tends to grow in alkaline urine. Especially when urea splitting proteus organism are present. As a result, the calculus may enlarge to most of the collecting system, forming a stag horn calculus even a very large stag horn calculus may be clinically silent for years until it signs its presence by haematuria, urinary infections or renal failure. Because they are large, phosphate calculi are usually easy to see on radiographic films.

Sukra Ashmari^[24]

महतां तु शुक्राश्मरी शुक्रनिमित्ता भवति ॥

Due to *Nidanas* like *Maithuna Vighata* and *Atimaithuna* there will be *Vimargagamana* of *Sukra*. *Samharana* and *Upashoshana* of *Sukra* by *Vata* between *Vrushna* and *Medra* and causes *Avrana* of *Mutramargha* leading to the formation of *Sukrashmari*.

Lakshanas

मूत्रकृच्छ्रं, बस्तिवेदनां, वृषणयोश्च श्वयथुमापादयति, पीडितमात्रे च तस्मिन्नेव प्रदेशे प्रविलयमापद्यते

Sukra Ashmari can be correlated with seminal calculi

Seminal Calculi - Seminal vesicle calculi are uncommon with just over 100 cases being reported in the literature. The suggested pathogenesis for their formation includes: seminal vesiculitis, anatomical abnormalities of the seminal vesicle predisposing to stasis and urinary reflux into the ejaculatory ducts.

Upadrava of Ashmari^[25]

There will be दौर्बल्यं, सदनं, काश्यं, कुक्षिशूलम, अरोचक, पाण्डुत्व, उष्णवातं, तृष्णां, हृत्पीडनं, वमिम्. These can be taken as important symptoms in an obstructed calculus. When obstructed during its coming out of the urinary passage, it gives rise to secondary diseases. *Sarkara, Sikata Meha* and *Bhasmakya* are secondary diseases of *Ashmari*.

Complications of Urinary Calculi**A] Renal calculus^[22]**

- **Obstruction:** Partial obstruction leads to hydro nephrosis. Complete obstruction may lead to destruction of kidney.
- **Infection:** Infection leads to Pyelitis, Pyonephritis, Pyonephric abscess etc.
- **Parenchymal ischemia** may be caused by local pressure due to stone.
- **Epithelioma (Malignancy of epidermoid):** due to presence in the lining epithelium of the renal pelvis.

B] Ureteric calculus^[26]

- **Obstruction** - Partial or complete as we discussed earlier. The stones can lodge at different places through its journey down.
- **Ulceration** - may leads to bleeding, pain, acts as foci for infection and nidus formation.
- **Diverticulum in the wall of the Ureter** - due to the injury to wall of ureter and bladder, which inturn might leads to temporary relief of symptoms later can cause rupture or fistulae.

Investigations**A] Renal calculus^[27]****Blood examination**

This is to be done for urea, creatinine, uric acid, total count of blood, serum calcium and phosphate.

Urine analysis

- Physical examination

- Chemical examination
- Microscopic examination
- Bacteriological examination
- Renal function test

Imaging studies

- **Straight x-ray** - at least 90% of renal stones are radio-opaque and are easily branched renal calculus in right kidney. Visible in a plane film of KUB region unless they are very small or overlie bones.
- **Excretory urogram** - If the stone is non-opaque, excretory urography will show filling defect or negative shadow. Retrograde urogram may be needed if excretory urography fails to show the kidney due to poor function.
- **Ultrasonography** - This is useful to distinguish between opaque and non-opaque stones. This is cheap, painless procedure. The size, shape and number of the stones in kidney, thickness of the cortex of the kidney, presence of cysts can be estimated any obstruction in the hydronephrosis. Helps in locating stones for extracorporeal shock wave lithotripsy.
- **CT** - helpful in the diagnosis of non-opaque stones. This is particularly useful in the diagnosis of non-opaque stones. It also reveals about any fluid collections, demonstration of pelvicalyceal system and ureter, any renal masses, cyst and to control of needle procedures.
- **Renal scan** - if excretory urogram shows poor renal function, isotope studies may indicate further about renal function. Such findings by different isotope may indicate the need of nephrectomy rather than nephrolithotomy.
- **Cystoscopy** - Cystoscopy is useful in diagnosis of the ureteral stricture. It can also be used for diagnosis of obstruction due to stone formation.

Examination of stone: If the stone has passed previously, crystallographic examination is required in

establishing the type of stone and cause of stone formation.

B] Ureteric calculus^[28]

- Blood investigation
- Urinalysis
- Straight x-ray
- Intravenous urography
- Cystoscopy
- Retrograde pyelography- When a shadow is suspected to be of ureteric calculus on straight X-ray. But excretory urography shows no excretion of dye. (b) To display the presence of a non-opaque ureteric calculus (this is more required when excretion of dye is minimum in excretory urography).

C] Vesical calculus^[29]

- **Urine examination** - may reveal R.B.C. pus cells and crystals of stone.
- **Straight X-ray** - usually reveals vesical calculus in about 95% of cases. X-ray of KUB region (Kidney, Ureters and Bladder) should be done to exclude any associated calculus in the kidney or in ureter.
- **Excretory urography** - should always be performed to know the functional status of the kidneys. It will also reveal a filling defect in cystography when the stone is not opaque.
- **Cystoscopy** - This is essential to know the type of stone and to exclude any other pathology e.g. diverticulum, tumours of the bladder, enlarged prostate etc. associated with the calculus. This examination also detects stones which are non-opaque to X-ray.

Ashmari Chikitsa

Ashmari is a *Daruna Vyadhi*. In *Taruna Avastha* it is *Oushada Sadhya*. In *Pravrudha Avastha* it is *Chedhya Vyadhi*. In *Purvaroop* – *Snehadikrama* will help in curing the *Vyadimoola*.^[31]

Acharya Susruta told that *Kshara, Yavagu, Yusha, Kashaya, Payas, Bhojana* prepared of the mixture of

Ushakadi, Varanadi and Kushadi has to be given respectively to *Vata, Pitta and Kapha Doshas*.^[32]

Sastrakarma in Ashmari^[33]

Shastra Karma is indicated when the calculi not curable to treatment with *Ghrita, Kshara*, decoctions, milk preparations and *Uttarbasti*.

अक्रियायां ध्रुवो मृत्युः क्रियायां संशयो भवेत् ।

तस्मादापृच्छ्य कर्तव्यमीश्वरं साधुकारिणा ।।

Poorvakarma

The patient [*Roganvitha*] subjected to mild *Snehana* and *Swedana* followed by *Panchakarma* and made to *Ishatkarshana*. If patient is *Atikarshita* it will help in *Karmakshamata*. If patient is not made *Karshita*, due to *Alpabastikayatwa* it will cause difficulty in doing surgery. OT is kept ready as per *Agropaharaniya* and the confidence of patient to be attained. On the day of surgery, he is made to offer and perform auspicious rites as per his belief, after *Snehana* and *Swedana* patient is taken in to appropriate position. Here *Acharya* explains about the lithotomy position. Patient is made to sit on a *Janusama Phalaka*, with the help of attenders he is made to lie on the table with his face up, and *Unnatha Katika* i.e. waist raised. Then he bent his knees and elbow and both tied cloth or ropes and also held by attenders [thus preventing any movement of the body parts.

Pradhankarma

Next the abdomen below the umbilicus is anointed with oil, massaged and manipulated, such that the stone comes down. Then the surgeon should insert the *Pradeshini* and *Madhyama Anguli* of *Vamahasta* [index and middle finger of his left hand] their nails closely pared and lubricated with *Sneha* is inserted into the anus along the urethroccocygeal raphae and bring the stone to the space between the *Payu* and *Medra* [anus and penis.]

By digital manipulation, the stone is made to project outwards through perineum, so as to make the stone assume the shape of a tumour. In women *Garbhashaya* is situated by the side of the urinary bladder, hence in them sharp instruments should be moved from below

upwards. And it should not be too deep. Otherwise a *Mutra Sravi Vrana* will develop there.

Even in men, if the urinary orifice is injured then also urine exudes from the wounds.

मूत्रप्रसेको नाम मूत्रं येन बस्तिमुखाश्रयेण स्रोतसा क्षरति, तस्य छेदनादित्यर्थः।

Vasovagal shock symptoms

While fixing the stone if the patient develops symptoms like *Vivrutakasha* [wide open eyes], *Vichetana* [loss of consciousness] *Hatavallamba Seersha* [head drooping down], with loss of all activities like a *Mritupama*- in such conditions stone should not be pulled out, if pulled out he will die. Removal has to be done if these symptoms are not present.

Then, an incision of about the size of the stone should be made one *Yava* width away from the perineal raphe on the left side. Precautions should be taken so that the stone does not get broken or crushed. Even if a small particle is left behind it again increases in size, hence it, should be removed completely by the *Agravakra* (curved forceps) *Shastra*. When the wound is made for the removal of the stone, an injury to the urinary bladder is not likely to heal. Patients with calculi, whose bladder has been torn in two, never get well. An incision in the bladder, made at one place only for the removal of a stone.

Paschatkarma

After *Shalyanirharana* the patient should be given fomentation by immersing him in a bathtub filled with lukewarm water, so that the blood does not accumulate in the bladder. If accumulation takes place, then decoction of *Ksira Vrksha* should be introduced into the bladder through the *Pushpanetra*. To purify *Mutramargha*, the patient should be given *Guda*. Next, he should be taken out from the tub, *Madhu* and *Ghritha* applied to the wound and *Mutravishodhana Dravya Siddha Yavagu* with *Ghritha* should be administered twice daily for 3 nights.

After 3 nights milk with *Jaggery* and small quantities of well-cooked rice should be eaten for 10 nights. After 10

night's *Phalaamla* and *Jangala Rasa* should be given. Thereafter for 10 nights patients should carefully be given *Swedana* either by *Sneha* or by *Drava*. Then his wound should be washed by the *Ksheeravruksha Kashaya*.

The pastes of *Rodhra*, *Madhuka*, *Manjishtha* and *Prapaundarika* should be applied to the wound also. *Taila* or *Ghritha* from the same substance along with *Haridra* should be anointed over the wound. In case of formation of *Sharkara* or *Sukrashmari*, it should be removed and if not possible it should be removed with the help of a *Badisa*.

Treatment of Renal Calculi

Revolution in the treatment of stone

- The technological revolution over the last decade has enabled as an outpatient procedure or with minimal hospital stay.
- Extracorporeal shock wave lithotripsy.
- Surgical intervention (PCNL, URS etc)
- Flush out therapy

A] Conservative measures^[34]

- Flush therapy - mainly used for lower ureteric stones.
- IV fluids
- Inj Frusemide 60-80mg IV
- Anti-inflammatory and antispasmodic agents are given to relieve pain

B] Percutaneous methods^[34]

The development of extracorporeal shock wave lithotripsy (ESWL), percutaneous nephrolithotomy (PCNL) and ureteroscopy (URS) have changed the treatment of stones to the extent that open surgery is now required in less than 1% to 2% of cases.

C] Surgical methods

Open surgery - Conventional Open Surgery Is Now Performed in Less Than 2% Of All Stone Cases.

- Pyelolithotomy
- Nephrolithotomy

- Pyelonephrolithotomy
- Partial Nephrectomy
- Nephrectomy
- Nephrostomy

After the wound is healed, should avoid *Maithuna*, *Plavana*, riding horse, elephants climbing mountains and chariots swimming and food which are hard for digestion etc for an year and should avoid *Guru Ahara*.

Treatment of Vesical Calculi^[35]

In majority of cases surgery is required to remove the stone unless the stone is very small which may pass out spontaneously with the urine or may be removed by means of an evacuator after passing the largest size cannula through the urethra. The vesical calculus is removed by either of the two methods - suprapubic lithotomy or litholapaxy.

Pathya Apathya^[36]

Pathya - *Shashtika Shali*, *Rakta Shali*, *Yava*, *Kulatha*, *Purana Kushmanda Phala*, *Ardra*, *Gokshura*, *Pashanabheda*, *Yavashooka*, *Shyamaka*, *Varuna*, *Krounchamamsa Rasa*, *Vaari*

Apathya - *Shushka*, *Rooksha Pistanna Sevana*, *Viruddha Bhojana*, *Karjura*, *Shaluka*, *Kapitta*, *Jambu*, *Divaswapna*, *Vegadharana*, *Ativyayama*, *Atimaituna*.

DISCUSSION

Acharya Susruta was well aware about the anatomical relations. He mentioned a different procedure in females because *Garbhashaya* is there next to the *Basti*. This proves that *Acharya* was well aware of the anatomical relations.

“स्त्रीणां तु बस्तिपार्श्वगतो गर्भाशयः सन्निकृष्टः तस्मात्तासामुत्सङ्गवल्छस्त्रं पातयेत्”^[37]

Ashmari is considered as *Maharoga*. *Basti* is the *Ashraya* of this *Vyadhi*, which is one among *Sadyopranahara Marma*. *Acharya Sushruta* has explained regarding the severity of the disease. Due to the bad prognosis *Acharya* also mentioned to take consent of higher authorities before treating such cases.

Acharya has mentioned to follow Nil per oral before surgery in certain diseases and *Ashmari* is one among them. This shows that *Acharya* is well known about the importance of Nil per oral before surgery. अभुक्तवतः कर्म कुर्यात्^[38]

Acharya Sushruta explains the sites where pain is felt in *Purvarooopa* as well as in *Rupa*. (बस्तिशिरो मुष्क शेफसां वेदना.). Upper ureter and renal pelvis calculi tends to radiate to the flank and lumbar areas.

Middle ureter calculi cause pain that radiates anteriorly and caudally. Distal ureter calculi tends to pain radiate to the groin or testicle in male and labia majora in female because pain is referred from ilioinguinal or genitofemoral nerve.

Acharya Sushruta has mentioned *Ashmari* among the indications of *Paneeeya Kshara* in *Ksharapakavidhi Adhyaya*. [“क्षरणात् क्षणनात् वा क्षारः...”] As in the disease *Ashmari*, main involved *Dosha* is *Kapha*, the drug pacifies the aggravated *Kapha* by its above mentioned properties. *Vata Shamana* property of *Kshara* pacifies *Apana Vata*. The *Kshara* having the property of *Ksharana* (Corrosive) might act mechanically on the calculi to disintegrate its molecules thereby resulting into lithotriptic action and may help in dislodging the calculi. *Kshara* is having *Katu*, *Tikta*, *Lavana Rasa*, *Ushna Virya* and *Kapha Vata Shamaka*.^[39]

Sushruta Samhita is the earliest treatise where in reference of perineal lithotomy is mentioned.

First recorded details of perineal lithotomy were those of *Cornelius celsus* (25 BC-40AD) and were in practice in ancient period.

In the context of explaining *Nadiyantra*, *Acharya* has explained a type which is used for *Mutravisravana*. This can be correlated to the Catheters which is used for draining urine in acute retention of urine. Nephroscope, Ureterscope etc which are used for the surgical intervention in treating calculi can be correlated to the advanced form of *Nadiyantra* which serves the purpose of रोगदर्शन and शल्योद्धारण.^[40]

Kidney stone analysis is a test done on a kidney stone to see what chemicals are in it. The test is

done on a kidney stone that has been passed in the urine or removed from the urinary tract during surgery.

So, that patient can avoid the food which contains that particular component. Morphological changes like trabeculations to be monitored to prevent recurrence of calculi.

CONCLUSION

Field of urology and the science of urinary calculi was a well-developed field in ancient India. The treatment for urinary calculi was specific to the nature of stone and customized to the patient. Limitations of medical therapy were clearly understood and surgical interventions were also highlighted. Management included diagnostic, therapeutic, and preventive aspects. More researches are required in understanding ancient varieties of stone in today's light. There is much more scope for researches at the level of organisations, multicentre levels, central research bodies such as CCRAS & CSIR, which could help the practitioners in the understanding and help the society in prevention of formation of stones. We as *Ayurveda* surgeons, belonging to family of Lord *Dhanwantari* and *Acharya Sushruta* (Father of Surgery) should also get an opportunity to practice surgical intervention explained by *Acharya Sushruta* and to bring it to lime light. An attention is also required towards the prevention of secondary reoccurrence of the stones after primary cure by various medical and surgical management. Hence, *Susrutha Acharya* was not only an excellent plastic surgeon, a renowned urologist too.

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