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RESEARCH ARTICLE

CLINICAL APPROACH TO URINARY CALCULI AND LIFESTYLE MODIFICATIONS TO PREVENT IT

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ABSTRACT

Urinary calculi are common problems in primary care practice and usually affect people between 30-60 yrs of age. They affect men more than women. In India, 12% of the population is expected to have urinary stones out of which 50% may end up loss of kidneys or renal damage. Location & quality of pain are related to position of the stone within the tract. Patient may present with the classic symptoms of renal colic & hematuria along with nausea, vomiting, difficulty in urinating, penile pain, testicular pain etc. Helical CT scan of abdomen is the Gold standard method for diagnosis of urinary calculi. Management of urinary calculi is based on stone composition, stone location & size & upper tract anatomy. Lifestyle modifications play very important role to prevent the occurrence and recurrence of urinary calculi. Dietary changes like increase in consumption of water, low salt diet, increase intake of fruits containing citrates along with limit intake of foods containing oxalates in large extent are the things which can combinely help to prevent recurrency of urinary calculi. These all factors will be discussed in detail in present study.

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INTRODUCTION

Urinary calculi are the most painful and most common disorders of the urinary tract. Urinary calculi are solid crystals that form from dissolved minerals in urine. It can be caused by both environmental & metabolic problems. Calcium oxalate and phosphate account for almost 70% of all renal stones. Urinary calculi may have various compositions which include in order of decreasing frequency as - Calcium oxalate, Uric acid, Struvite, Calcium phosphate & Cystine. Xanthine & drug related stones are less common types of stone. Calculi are typically composed of urinary chemicals which are usually soluble but occur in amounts too high to stay undissolved in urine. As a result of changes in supersaturation some of the solutes tend to precipitate and aggregate to form crystalline concentrations or stones.It is seen that most calculi originate in Kidney and proceed distally..

AIM: Study of clinical approach to urinary calculi & lifestyle modifications to prevent it.

OBJECTIVES

- To study the clinical aspect of urinary calculi from Modern point of view.
- To study the clinical aspect of *Ashmari* according to *Ayurvedic* point of view.
- To describe the lifestyle modifications to prevent urinary calculi.

MATERIALS AND METHODS

1. *Ayurvedic* literaure like *Sushruta Samhita.*
2.Modern science book like Textbook of Surgery.
3.Related Research papers on Urinary Calculi.
4.Conceptual study of Urinary calculi is done from the above literatures to explain the clinical approach to urinary calculi and lifestyle modifications to prevent it

DISCUSSION

Anatomical positions of formation of urinary calculi

Most calculi originate in Kidney and proceed distally. Uteropelvic junction, pelvic brim, upper, middle & distal ureter , ureterovesical junction & urinary bladder are the different anatomical positions where the calculus becomes lodged. Urinary calculi usually get anchored at the end of collecting ducts & then slowly increase in size over the time.

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This anchoring is thought to occur at the sites of epithelial cell injury perhaps induced by the crystals themselves. Calcium phosphate crystals may form in the interstitum (tissue surrounding the loop of Henle in renal medulla) and eventually get extruded at the renal papilla forming the classic Randall's plaque i.e subepithelial calcifications of the renal papilla which are < 2mm in their greatest dimensions. They act as a anchor for Calcium oxalate crystals and are considered to be predisposing factor for stone formation. Calcium oxalate and Calcium phosphate crystals may then deposit on the top of this nidus, remaining attached to the papilla.

TYPES OF URINARY CALCULI

Calcium oxalate: This type of calculus is usually single and is extremely hard. It is dark in colour due to staining with altered blood precipitated on its surface. It is spiky that means it is covered with sharp projections, which cause bleeding due to injury to the adjacent tissues. It is popularly known as "Mulburry stone" . Primary hyperoxaluria is the factor responsible for the precipitation of oxalate crystals. Due to its high calcium content it is radio-opaque. It is mostly occurring type of calculi & seen in 80% of cases.

Phosphate Stone: Majority of such stones are made up of calcium phosphate & a few are made up of mixture of calcium phosphate & triple phosphate. It is dirty white in colour. It is smooth, soft & friable. It enlarges rapidly and gradually fills up pelvis and renal calyces to take up the shape of "Staghorn calculus". They are usually radio-opaque. Tends to grow in alkaline urine especially when proteus bacteria are present. It is seen in 5-10% of cases.

Uric acid: These are the by-products of protein metabolism.Pure uric acid calculi are rare and are radio-opaque. The majority contain urates and enough calcium oxalate to render such calculi radio-opaque. They usually occur in multiple & so are typically faceted. The stones are of moderate hardness. Their colour varies from yellow to dark brown. Their surfaces are smooth & on section show wavy concentric markings. They are commonly seen in Gout & may result from certain genetic factors & disorders of blood producing tissues. Fructose also elevates uric acid crystals. It is seen in 5-10% of cases.

Cystine: Representing only very small percentage of urinary stones, these are the result of cystiuria a heredietary disorder that causes kidneys to excrete massive amounts of certain amino acids. Pure cystine calculi are not radio-opaque , but as they contain sulphur they are usually radio-opaque. They occur in multiples. These calculi are soft and yellow or pink in colour. When these are exposed outside the colour gradually changes to green. It is seen in 1-2% of cases.

Struvite: Found more often in women. These are almost the result of urinary tract infection. It is seen in 10-15% of cases.

OTHER FACTORS RESPONSIBLE FOR CALCULI:

Urinary calculi can be symptom of other systemic disorders like:

- Diabetes
- Hypertension
- Hyperparathyroid disease
- Osteoporosis
- Obesity

DIAGNOSIS OF URINARY CALCULI:

Diagnosis can be done by:-

- **USG abdomen & pelvis**
- **Plain abdominal radiograph (KUB)**
- **Intravenous Pylogram (IVP).**

OPTIONS FOR STONE INTERVENTION

Oral stone dissolution : It is done when stone is sufficiently small in size. Chemical dissolution of renal stones requires indwelling ureteral catheters for constant through & through irrigation with G solution or with Renacidin .Sometimes stone fragments get occluded in the ureteral catheters & cause obstruction.

Extracorporeal shock wave lithotripy (ESWL): In this technique the stone can be removed with shock wave and instrumental penetration of the body is not needed.The stone in the kidney is fragmented by repeated shock waves which are focused towards the renal stone. They are fragmented so small that they get automatically passed through the urine.

Ureteroscopy: In performing ureteroscopy preliminary cystoscopy in the lithotomy position is carried out and a guidewire is passed to the appropriate ureter. The ureteric orifice is then dilated with co-axial dilator. Following the dilation the bladder is emptied and the ureteroscope is passed through ureteric orifice guided by the presence of a previously placed guidewire. The ureteroscope is passed to the stone, which can either be snared in a basket and removed intact or fragmented using USL, EHL,LL or PL.

Percutaneous nephrolithotomy (PCNL): PCNL is a technique which allows safely and reliably the removal of stones from the pelvicalyceal system and upper ureter. In it if the stone is small is extracted through nephroscope. If it is quite large it is broken with an ultrasonic lithotriptor and 20-22 Fr. nephrostomy tube is inserted to drain the kidney and allow the passage of any residual fragment or clot.

Open or laproscopic lithotomy: Performed in 2% of the cases. Operative procedures are done only when stone cannot be naturally eliminated and causes obstruction and renal damage. Following are their types:

- Pylolithotomy
- Nephrolithotomy
- Partial nephrectomy
- Nephrectomy
- Nephrostomy

CONCEPT OF *MUTRASHMARI* ACCORDING TO *AYURVEDA:*

SAMPRAPTI (PATHOGENESIS)

According to *Acharya Sushruta*(*Su.Ni*.3/4) causes of *Mutrashmari* are improper purification of the body & following *Nitya Apathyasevan* . Along with this he stated that

Divaswap, Samashan, *Adhyashan , Shit-Snigdha-Guru-Madhur* diet consumption regularly. *Ayurveda s*tates that the factors aggrevating *Kapha Dosha* are responsible for *Mutrashmari.* Also *Sushruta(Su.Ni.3/24)* said that *Vata-Pitta-Kapha Dosha* enters into the *Basti* like how *Mutra* enters into *Basti* from *Pakwashaya* & with "*Upsneha Nyaya" Ashmari* is formed in the *Basti*. *Basti* is considered as the total Excretory system in *Ayurveda.*

When clear water is placed in a new mud pot, after sometime some particles get precipitated into the water. Similarly,in the *Basti Ashmari* develops.(Su.Ni.3/25). *Sushruta (Su.Ni.3/26)* explains the crystallization process when dry air along with the Static electricity in the clouds form the crystals of water present in the cloud, similarly *Ashmari* develops.

TYPES

Following are the types of *Ashmari* described by *Sushruta* in *Nidan Sthaan*:

Vataja Ashmari

- *Vata* & *Kapha Dosha* combinely form the *Vataja Ashmari* which is *Shyava*, hard, irregular and rough. It contains thorny structures like *Kadamba Pushpa.*
- It produces symptoms like obstruction of urine, severe abdominal pain, biting of teeth,sqeezes the umbical region, pressing external genitals, anus and has to forcefully pass the urine.
- It can be correlated with Calcium oxalate stones.

Pittaja Ashmari

- *Kapha Dosha* along with *Pitta Dosha* attends compactness to form *Pittaj Ashmari* which is red, yellow,dark in colour and appears like seeds of *Bhallataka*.
- It produces symptoms like obstruction of urine, burning sensation in the *Basti ,Medhra*, feeling of hot air coming out of bladder.
- It can be correlated with Uric acid calculi.

Kaphaja Ashmari

- *Kapha Dosha* attends compactness & increases in size and produces *Kaphaja Ashmari* which is pale white in colour, slimy to touch, large in size. It appears like hen's egg.
- It produces symptoms like obstruction of urine, tearing type of pain in bladder, heaviness in the bladder & feeling of cold.
- It can be correlated with Phosphate stone.

Shukrashmari

- It is caused by *Shukravegadharan* or excessive coitus. The vitiated *Vata* causes *Vimargagaman* of *Shukra* into *Medhra* or *Vrushana* and after drying it forms *Shukrashmari*.
- It produces symptoms like obstruction of urine, dysuria, pain in bladder & external genitals, oedema in legs.

FOODS THAT SHOULD BE CONSUMED

- Fruits and vegetables have high alkalizing effect on the urine.
- Drinking fruit juices like lemon, orange, apple appears to decrease oxalate and increase citrate level in the urine.
- Plant proteins should be consumed instead of animal protein as organic phosphorus from plant protein has lower absorption than phosphorus from animal protein ranging from 40-50%.
- A wide variety of high fibre plant foods contain a compound called phytate which decreases the risk of formation of Calcium oxalate calculi. The average intake of fibre should be 18gm/day. The foods containing high fibres are : wholemeal bread, porridge, baked beans, pear, dry apricot, brown rice etc.
- Drink Lemon juice containing water or plane water 1 glass/hourly i.e 2-3 litres daily. Carry refillable water bottle everywhere – walking, shopping, driving etc
- Include liquid foods like soups, stews, jellies in your diet.

Changes in Daily Habits

- Control weight gain : For good health the body mass index i.e B.M.I should be between 19-25/m^2. Higher BMI is linked to high uric acid levels in urine. Urine pH tends to be acidic in overweight people & there is an increased risk of most stone types.

LIFESTYLE MODIFICATIONS TO PREVENT URINARY CALCULI

(A) DIETARY CHANGES

Sr. no	Type of calculus	Causative factors which should be avoided	Daily requirement not more than
1.	Calcium oxalate	1.Foods containing higher percentage of Calcium like milk & milk products.	Calcium:1200mg/day
		2. Oxalate containing foods like spinach, tomato, cabbage, cauliflower, strawberries, beets, dark green vegetables, black tea, chocholate, rhubarb etc	Sodium: 1500mg/day (Salt intake:6gm/day)
		3. Excessive intake of Sodium from salted snacks ,prepared salad dressings , mustard ketchup, soy sause, pickled foods, canned foods, olives, sweet potatoes& soy products etc.	Protein :0.8 gm/body wt
		4. Animal proteins like meat, poultry, fish and eggs contain higher percentage of Calcium and Oxalate.	
2.	Uric acid	Foods containing purines like all meats, all sea foods, other sources like yeast and extracts, beer, asparagus, cauliflower, mushrooms, beans, peas, spinach	Protein :0.8 gm/body wt
3.	Phosphate	Milk and milk products. Animal products like meat , poultry fish. Plant sources are cereals.	Phosphate: 1200mg/day
		Other sources are beverages like cola etc	Protein : 0.8 gm/body wt

- Regular exercises: Regular exercises should be done for proper health. Patients who have sedentary lifestyle are at higher risk of the disease than the patients who daily perform exercise.
- Avoid control of urge of urination for long time.

Conclusion

Urinary calculi is very commonly seen urinary disorder and can be very painful. It can be managed medicinally or by various different ways. But rather it is better to prevent its occurence and reccurence by making lifestyle modifications. Family history, high protein diet, low fluid intake, obesity and sedentary lifestyle are the major factors play important role in development of renal calculi. Dietary changes like increase in consumption of water, low salt diet, low protein diet, increase intake vegetarian diet, increase intake of fruits containing citrates along with limit intake of foods containing oxalates in large extent are the things which can combinely help to prevent urinary calculi. Along with this daily exercises and avoidance of sedentary lifestyle definitely prevent recurrency of urinary calculi.

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