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All you need to know about Urinary stone disease

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Urinary stone disease is a very common problem nowadays. Urinary stone prevalence is estimated at 3% in all individuals, and it affects up to 12% of the population during their lifetime. Urinary stone recurrence rates approach 50% at 10 years and white males have the highest incidence in the U.S. In India It has significantly increased over the past few years. Unless treated properly with adequate counter measures to prevent further stones this can be a continuous problem which can even lead to renal failure.

Formation of kidney stones –

Kidney stones can form when substances in the urine—such as calcium, oxalate, phosphorus, and uric acid etc.—become highly concentrated. Stones are solutes that occur in amounts too high to stay dissolved in urine. The body uses food for energy and tissue repair. After the body uses what it needs, waste products in the bloodstream are carried to the kidneys and excreted as urine. These substances get accumulated in the kidney as small crystals initially at the urine secreting sites of the kidney. When they are not washed off due to decreased water intake or due to certain factors causing adherence the crystals accumulate and enlarge to form stones of different sizes. Diet is one of several factors that can promote or inhibit kidney stone formation. Certain foods may promote stone formation in people who are susceptible, but scientists do not believe that eating any specific food causes stones to form in people who are not susceptible. Other factors that affect kidney stone formation include genes, environment, body weight, and fluid intake.

Types of kidney stones –

Four major types of kidney stones can form

Calcium stones are the most common type of kidney stone and occur in two major forms: calcium oxalate and calcium phosphate. Calcium oxalate stones are more common. Calcium oxalate stone formation may be caused by high calcium and high oxalate excretion. Calcium phosphate stones are caused by the combination of high urine calcium and alkaline urine, meaning the urine has a high pH. **Uric acid** stones form when the urine is persistently acidic. A diet rich in purines—substances found in animal protein such as meats, fish, and shellfish—may increase uric acid in urine. If uric acid becomes concentrated in the urine, it can settle and form a stone by itself or along with calcium. **Struvite stones** result from kidney infections. The most common pathogen being Proteus mirabilis. Less common pathogens include Klebsiella, Enterobacter, or Pseudomonas. Eliminating infected stones from the urinary tract and staying infection-free can prevent more struvite stones. **Cystine** stones result from a genetic disorder that causes cystine to leak through the kidneys and into the urine, forming crystals that tend to accumulate into stones. There are other less common stones, including xanthine and drug-related stones as well.

Clinical symptoms

The classic presentation of a renal stone is acute, colicky flank pain radiating to the groin or scrotum. As the stone descends in the ureter, pain may localize to the abdomen overlying the stone. Renal and ureteral colic are often considered among the most severe pain experienced by patients. As the stone approaches the urinary bladder, lower abdominal pain, urinary urgency, frequency, and dysuria are common. Haematuria, Nausea and vomiting can also be present. Features of recurrent urinary infection with fever can also be present. Some large stones fixed in the kidneys may not cause any of these symptoms and are diagnosed incidentally on diagnostic evaluation.

Diagnostic tests

Blood tests to check infection, Uric acid and Renal function. A basic ultrasound of the abdomen and X-ray kub can be done. Plain CT KUB is the ideal confirmatory investigation of choice. All Types of stones can be seen, the exact size and location identified and the degree of obstruction to the kidneys can be made out. Ultrasound may miss lower ureteric calculi and some stones are not visible on the xray. If a person can catch a kidney stone as it passes, it can be sent to a lab for analysis. Blood and urine can also be tested for unusual levels of chemicals such as calcium, oxalate, and sodium to help determine what type of kidney stone a person may have had.

Management-

Prevention - An important step in preventing kidney stones is to understand what is causing the stones to form. This information helps suggest diet changes to prevent future kidney stones. For example, limiting oxalate in the diet may help prevent calcium oxalate stones but will do nothing to prevent uric acid stones. Some dietary recommendations may apply to more than one type of stone. Most notably, drinking enough fluids helps prevent all kinds of kidney stones by keeping urine diluted and flushing away materials that might form stones. People can help prevent kidney stones by making changes in fluid intake and, depending on the type of kidney stone, changes in consumption of sodium, animal protein, calcium, and oxalate. Drinking enough fluids each day is the best way to help prevent most types of kidney stones. We recommend that a person drink 2.5 - 3 litres of fluid a day. People with cystine stones may need to drink even more. Though water is best, other fluids may also help prevent kidney stones, such as citrus drinks. People who have had a kidney stone should drink enough water and other fluids to produce at least 1.5 litres of urine a day. Citrus drinks like lemonade and orange juice protect against kidney stones because they contain citrate, which stops crystals from growing into stones. The risk of kidney stones increases with increased daily sodium consumption. The U.S. recommended dietary allowance (RDA) of sodium is 2,300 milligrams (mg). Meats and other animal protein—such as eggs and fish—contain purines, which break down into uric acid in the urine. Foods especially rich in purines include organ meats, such as liver. People who form uric acid stones should limit their meat consumption to 6 ounces each day. Animal protein may also raise the risk of calcium stones by increasing the excretion of calcium. A diet chart is usually available with every urologist for stone prevention.

Medical management – This is possible only in small stones usually less than 6mm in size.. The ureter which transports urine from the kidney to bladder is only 5-6 mm diameter in size. The stones move from the kidney to the ureter and get blocked. The stones are tried to be flushed out with medicines. The medicines dilate the ureter and promote stone expulsion. However, a ureteral stone that has not passed within 1-2 months is unlikely to pass spontaneously with further observation or medicines. Potassium magnesium citrate, soda bicarbonate etc are few medicines for stone dissolution.

Surgical management –

Ureteric stones - stones in the ureter upto 2 cm are usually treated by (URS). In this procedure a small scope is placed through the natural orifice into the ureter and the stone is broken with laser. The Laser breaks the stone into a fine powder and it is cleared completely. A stent is placed for 3 weeks. It's a single day procedure under anaesthesia. Stones more than 2 cm is usually cleared by laparoscopy (key hole) where the ureter is opened and the whole stone is removed in toto.

Kidney stones- Small stones above 6mm upto 1.5 cm can be broken with ESWL (shock wave) lithotripsy. Here the stone is focused with a shockwave under ultrasound guidance and broken in one to three sittings. It is done in a procedure room without anaesthesia. Each sitting takes about half hour and the patient can go home the same day. The stone fragments pass down naturally via the ureter and is expelled in the urine. But the clearance rate of the stones is less with this method.

RIRS (The Latest in Kidney stone management) is a procedure in which a flexibleureteroscope is placed via the natural orifice into the kidney and with the help of laser, stones of any size upto 3cm ,multiple or single can be fragmented completely. complete stone clearance can be achieved in a single sitting.

PCNL – This is a procedure for large kidney stones where a small 1cm incision is made on the abdomen side through which instruments are placed to reach the kidney stone under x ray guidance, The stone is completely broken and the fragments are removed through this small incision and we can achieve complete clearance of the stones.

3D Laparoscopy (keyhole) – This is keyhole surgery for very large and multiple stones involving the whole of kidney. Here the kidney is bivalved and opened up , All the stones are removed completely. Then the 2 halfs of the kidney is closed with sutures and the kidney again functions as a normal kidney

Pulse 100H Holmium laser has significantly improved the management of stones, providing a less invasive and more effective treatment. It performs faster fragmentation and superior dusting of stone due to its technological advancements. The high frequency applied in dusting minimizes retropulsion. Holmium lasers and associated fibers effectively fragment stones of any composition or size throughout the urinary tract. Holmium lasers are used in urology procedures such as percutaneous nephrolithotomy (PCNL) and ureteroscopy. Patients benefits from the shorter treatment time, no bleeding & reduced cost due to less number of re-treatments.

Patients who get treated for kidney stones by whatever means have 50% chance of recurrence of stones. Hence they need to be on long term medication for stone prevention and adequate and follow up with an urologist is required for a safe and healthy kidney!!

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