KIDNEY STONE CLINIC
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www.stoneclinic.com.au

Kidney Stone Clinic
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Kidney Stones

Formation

Kidney stones result from crystals in the urine aggregating together when the urine becomes highly concentrated. Normally these crystals pass through the urinary tract without problems. Occasionally, if these stones become large enough, they cause obstruction of the kidney drainage system which may result in severe pain, bleeding, infection or kidney failure. The common sites of obstruction from a stone in the upper urinary tract are located at the:

- Junction where the kidney meets the upper ureter,
- Midportion of the ureter, or
- Lower ureter at its entry into the bladder

Factors that exacerbate stone formation include having persistently concentrated urine, high urinary acidity, and/or lack of inhibitory substances in the urine such as citrate.

Stone Types

Calcium stones

When calcium combines with another mineral, insoluble crystals form which are commonly either calcium oxalate or calcium phosphate in composition. These stones can typically be seen on plain x-ray. Usually, no specific cause is found on why these stones develop, however they can occur in certain medical conditions such as hyperparathyroidism, certain types of weight reduction surgery, and in several types of kidney disorders.

Uric acid stones

These form crystals in the urine, either alone or with other stone types. They are commonly due to an excessively high protein diet, obesity, or in patients who suffer with gout. Typically, these stones form in acidic urine (pH 5-6) and are not visible on plain x-ray.

Cystine stones

These are rare stones occurring in 1% of stone patients, due to an inherited defect in amino acid transport within the kidney. An excess of cystine crystals are found in the urine of affected patients which clump together to form stones. Patients who are affected tend to be young and develop recurrent kidney stones throughout life. Long term treatment involves close surveillance, education, dietary changes, fluids, and sometimes medications to prevent the stones from recurring. **0**

Struvite (Infection stones)

These stones can grow very rapidly to form a complete stone cast within the drainage system of the kidney. They are usually associated with urinary tract infections, which change the urinary environment to permit rapid stone growth. Consequently, the stone formed can become very large in size. If left untreated they can cause chronic infection, destroy the kidney, and may result in death.

Diagnosis

Kidney stones can present either with or without symptoms. The most common asymptomatic presentation is an incidental finding on imaging for investigation of another condition. The typical symptomatic presentation is severe excruciating flank pain on the side of the stone and radiating towards the groin. Sometimes, it also results in urinary frequency and urgency if the stone is near the bladder. Nausea and vomiting at the time of pain can also be a feature. The condition may be associated with visible blood in the urine, infection and/or kidney failure. If the latter two problems occur, it is a surgical emergency requiring immediate treatment. The definitive diagnosis of a stone is made by imaging tests, and the best available is a non-contrast CT scan of the abdomen (kidneys, ureter, and bladder) in combination with a plain abdominal x-ray. This can also rule out other causes of severe abdominal pain which require an alternate course in management.

Treatment

If the stone is symptomatic, you may need hospital admission for pain relief, anti-nausea medications, and sometimes intravenous fluids. In certain situations, a tablet called tamsulosin (Flomaxtra) may be beneficial in helping pass a kidney stone which is obstructing the ureter. If an underlying infection is suspected (fevers, chills, or high temperatures), urgent medical treatment should be sought immediately at the nearest hospital Emergency Department.

A great majority of stones are small (less than 4mm) and pass spontaneously. Surgical treatment may be warranted in specific circumstances to treat those stones causing persistent symptoms, or if it results in potential kidney damage or infection. If surgery is deemed necessary, the vast majority can be treated with keyhole surgery allowing quicker recovery. Occasionally, a temporary hollow tube called a stent will be required to assist in keeping the urinary tract unobstructed either before or after definitive stone surgery has been carried out. Asymptomatic kidney stones may also require treatment if they are large in size, at risk of causing future symptoms, or associated with specific circumstances necessitating their removal ie. planning for future pregnancy or in certain occupations groups where having a stone can present significant problems (airline pilots, working in isolated areas, or frequent travellers).

Prevention

Without changes being made, a recurrent stone episode will occur in 50% of patients within 10 years. General measures in kidney stone prevention revolve around maintaining a healthy lifestyle and normal weight, keeping up fluid intake, reducing animal protein intake and decreasing salt in the diet.

Calcium Intake

There is no evidence restricting calcium intake reduces kidney stones from developing. Unless there is a specific abnormality detected through blood tests, calcium stones are not normally due a calcium excess. Calcium is important in maintaining bone health and especially guarding against osteoporosis in the older age groups. Sometimes restricting dietary calcium can actually increase the risk of developing calcium stones in the kidney as it allows other stone forming minerals to be preferentially absorbed into the body from the gut. The recommended daily requirement of calcium is 1000 mg, and two-thirds is consumed in dairy containing products. You are encouraged to consume two servings of dairy (but no more than two) or other calcium-rich food per day to maintain normal bone stores of calcium.

Increase Urine Volume

The best method to prevent stone formation is to drink more fluids, thereby diluting your urine. Fluid intake needs to be increased to 8 to 10 glasses (2.5L) in a 24 hour period. Ideal fluids include water, citrus juices and carbonated mineral water beverages. This needs to be spaced evenly throughout the day, and a practical measure is to carry a drink bottle at all times. Even more oral fluids need to be consumed on hotter days due to insensible losses from perspiration (sweating). A good measure of success is the colour of the urine should be clear or a very pale yellow.

Reducing Protein Intake

Excessive protein intake can result in uric acid stones. An important goal is to stay within a healthy weight range. As a general recommendation, limit your daily intake to 350 grams per day in total of beef, poultry, fish and pork. This will easily provide enough protein for the body's daily requirements. An easy rule of thumb for estimating portion size is 100 grams of meat is roughly the size to cover the palm on your hand.

Decrease Salt Intake

The human body carefully regulates its sodium levels. When excess sodium is excreted in the urine, calcium is also excreted proportionally. In other words, the more sodium you take in and excrete, the more calcium you waste in the urine. Excess calcium in the urine can lead to new stone formation. Try to reduce dietary sources of sodium, including fast foods, packaged or canned foods, and salty snacks. Your goal should be to consume less than 2000 mg/ day of sodium. This is equivalent to one teaspoon of salt per day.

If stones are due to uric acid crystal formation, prevention can be achieved by making the urine less acidic (pH>7) or decreasing uric acid production. This can be achieved by alkalinizing the urine using oral bicarbonate preparations (over the counter medication), and/or oral prescription medication (allopurinol) to prevent excessive uric acid production. Infection stones require complete stone removal and ongoing prevention against further urinary tract infections.

Cystine stones require lifelong close medical surveillance and an individualised treatment programme.