



Renal Resource Centre

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Kidney Stones

What are kidney stones?

Kidney stones, also called renal calculi, are one of the most common disorders of the urinary tract. They are hard rock-like crystals (of varying sizes and shapes) which form when certain chemicals in the urine aggregate and then gradually increase in size. Normal urine contains chemicals called stone inhibitors which reduce this crystal formation.

There are four major types of stones:

- Stones formed from calcium combined with oxalate or phosphate - the most common types
- Uric acid stones
- Stones caused by urine infection - (struvite stones)
- Cystine stones which are rare and hereditary

What causes kidney stones?

A number of different factors can contribute to stone formation:

- Excess calcium, phosphate, oxalate and uric acid in the urine
- Insufficient amounts of stone inhibitors in the urine
- Low fluid intake resulting in concentrated urine and a higher probability of crystal formation
- Recurrent urine infections:
- Rare inherited conditions

The most common calcium containing stones usually occur due to:

- Higher than normal bowel absorption of calcium or oxalate
- Higher than normal escape of calcium phosphate or oxalate into the urine
- Overactivity of the parathyroid neck glands. This results in calcium and phosphate being shifted from bones into the blood stream and then to the kidney filtering system

About 10% of kidney stones are associated with a problem of general metabolism that affects the entire body (eg gout, parathyroid gland overactivity), or a structural or metabolic problem of the kidney itself. In some cases the cause of stones is difficult to determine.

Who is affected by kidney stones?

About 4-8% of the Australian population have kidney stones at any one time.

The lifetime risk of developing kidney stones is 1 in 10 for Australian men and 1 in 35 for Australian women. The likelihood of developing a stone generally increases with age and if there is a family history of stone formation. Urinary tract stones tend to be more common in children in developing countries and amongst Aboriginal Australians.

After having a kidney stone, the risk of getting a second stone is about 5-10% each year. 30-50% of people with a first kidney stone will get a second one within five years and then the risk declines. Some people keep on getting stones their whole lives.

What problems do kidney stones cause?

Not all kidney stones cause discomfort, but pain is usually the first symptom. Blood is frequently seen in the urine or found to be present on testing. Kidney stones can cause blockage to the flow of urine which can damage and sometimes cause failure of the blocked kidney. Stones increase the chance of urinary and kidney infection and can result in the serious condition of septicaemia when germs spread into the blood stream.

What are the symptoms of kidney stones?

The first symptom of kidney stones is often severe pain, which begins when a stone moves from where it has formed into the urinary tract. This pain, known as renal colic, is a gripping pain in the back (just below the ribs) and may radiate around to the front of the body and sometimes towards the groin. Other symptoms include:

- Blood in the urine
- Nausea and vomiting
- Shivers, sweating and fever if there is accompanying infection

How are kidney stones detected and what tests might be done?

Many stones are discovered by chance during examinations (such as ultrasounds and CT scans) for other conditions. Further diagnostic tests may include ultrasound, X-rays (which may include an intravenous pyelogram where dye is injected into the bloodstream before the x-rays are taken) or CT scans. Detecting the location of stones in the urinary tract assists in determining the right course of treatment. Urine and blood tests will assist in determining the cause of stone formation. If you pass a stone, collect it and take it to your doctor for analysis. Analysis of a stone is very useful.

How are kidney stones treated?

Most stones can be treated without surgery - 90% of stones causing symptoms will pass by themselves within 3 to 6 weeks. In these circumstances the only immediate treatment required is pain relief. Pain can be so severe that hospital admission and narcotics (pethidine or morphine) may be required. However, if a stone doesn't pass, is too large to pass, blocks the urine flow or causes bleeding or infection, it may need to be removed. New surgical techniques have reduced hospital stay time to as short as 48 hours.

Treatment methods to remove stones include:

- Extracorporeal Shock-Wave Lithotripsy (ESWL): for stones less than 2cm in size. A machine aims ultrasound waves at the kidney stone, breaking it into smaller pieces which can pass out with the urine.

- Percutaneous nephrolithotomy: A small cut is made in the back and a tunnel through the skin to the stone in the kidney is made. An instrument is then passed through the tunnel and removes the stone
- Endoscopic removal: An instrument is inserted into the urethra, passing into the bladder and to the ureter and kidney

Preventing recurrence of kidney stones

If you have had one stone already, you can assist in preventing further kidney stones:

- Consult your doctor to determine the cause of previous stones
- Avoid dehydration and drink enough water to keep your urine volume at or above two litres a day. This can halve your risk of getting a second stone by diluting stone-forming substances. Excessive tea or high calcium milk should be avoided, but citrus juices, particularly orange, grapefruit and cranberry, reduce the risk of developing some stones. Mineral water cannot cause kidney stones because it contains only trace amounts of minerals.
- Get prompt treatment of urinary tract infections
- Adopt dietary changes recommended by your specialist. Reducing dietary calcium is only necessary in some cases where absorption of calcium from the bowel is high. Reducing salt intake often reduces the risk of calcium containing stones.
- People with calcium containing stones may be at greater risk of developing weak bones and osteoporosis. Discuss this risk with your doctor

Treatment with Drugs

- Certain drugs (thiazide diuretics and probably indapamide) can reduce the likelihood of calcium stone recurrence. However it is not known whether these drugs are more effective than simply drinking more water, and they can have side-effects. They are best used with potassium citrate or citrus juices.
- In people who form stones and who have a high level of uric acid in their urine or who make uric acid stones, the drug allopurinol can reduce the rate of recurrence of stones.
- Drugs being tested - but as yet not generally available for people with renal stones:
potassium phosphate, potassium-magnesium citrate and bisphosphonates
- If stones are associated with infection, complete clearance of both the stones and the infection is required if recurrence is to be avoided.

Disclaimer

Any material or information provided does not constitute medical advice and is intended for information purposes only. Please consult a health care professional for specific treatment recommendations.