



Produced by Dr. David Voss, Specialist Renal Physician
in the interest of public health education.

www.kidney.net.nz

Urinary Tract Stones Information Sheet

What is a urinary tract stone (calculus)?

Waste products (from the food we eat, and our normal body metabolism) that usually dissolve in water are removed from the human body in the urine. If there is a lack of solvent (urine) for these waste products to stay dissolved in solution or an excess of solute (the waste product the kidney stone is made of, e.g. calcium, oxalate, uric acid), then a supersaturated solution occurs. In a super saturated solution the solute can settle (crystallises) out of the solution, in the kidney and forms a solid (stone).

Urine normally has chemicals that inhibit stones forming. In some people with kidney stones, these inhibitors seem not to work properly. Carbonated drinks can effect these inhibitors.

The medical term for kidney stones is nephrolithiasis; and a stones anywhere in the urinary system is referred to as urolithiasis.

Kidney stones have nothing to do with gall bladder stones (cholelithiasis).

Who gets stones?

Stones are more common in men. The first stone usually occurs in the 20 to 40 year old group. Once someone has had a stone, she / he is more likely to have a subsequent stone in the future, making prevention very important. 60% of men and 40% of women will have a second stone within 10 years. Recurrent stones are more frequent in people with underlying metabolic causes or inadequate fluid intake (preferably water) and without dietary manipulation (reducing foods that may contain stone making compounds) in their diet.

Stones are also more common in hot/tropic regions where either excessive sweating or a lack of good water availability (and therefore intake) leads to an inadequate urine output.

Some metabolic conditions can be associated with stones: hyperparathyroidism; hyperoxalaturia; hyperuricosuria. Some inherited conditions can be associated with stones: renal tubular acidosis; hyperoxalosis; cystinosis; familial hypercalciuria.

Excessive intake of calcium or vitamin D can cause stones.

Diuretics, and corticosteroids (prednisone) to treat other medical conditions may be associated with urinary stones.

What are the symptoms of stones?

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Pain (colic). The pain is usually severe, and of a gripping feeling, and comes and goes in waves. The movement of the stone causes irritation, and/or blockage to the drainage of urine, and resultantly the pain. Typically the pain of a kidney is felt in the back and side of the abdomen, and travel down to the groin (“loin to groin” pain).

Blood in the urine may be seen when passing urine.

Other symptoms include an urge to pass urine, or discomfort passing urine. Nausea, vomiting may also occur. Fever may suggest infection in the urine. Occasionally there are no symptoms, and a stone is found coincidentally in the [kidney](#), imbedded in the kidney tissue on investigations for other conditions; or may be found in the [bladder](#) or lodged in the [ureter](#).

How are the stones diagnosed?

Either an ultrasound of the urinary tract or one of several radiography tests. A radiograph (X-ray) without contrast (“dye”); or with contrast to show the kidneys and bladder more clearly (IVU); or a CT scan is performed to identify a urinary tract stone.

What are the types of kidney stones?

Most stones are made of calcium and oxalate or phosphate; or uric acid. Hereditary stones are made of cystine. Struvite stones are kidney stones that are associated with urinary infections.

How are the stones treated?

Pain relief is very effective. The pain relief medication is administered by mouth or injection into the muscle or vein, pain relief is usually achieved with anti-inflammatories (e.g. diclofenac, ibuprofen and naproxen). Pethidine is also frequently used usually in hospital.

Most stones pass through the urinary system, to the toilet. Straining the urine passed through a fine sieve (e.g. a handkerchief) to collect the stone, taking it to your doctor, and the stone being analysed at the laboratory can be useful in planning therapy and prevention.

Some types of stones (e.g. uric acid stones) can be dissolved. Stone can be dissolved by either taking medications by mouth; or a tube being placed through the skin into the kidney and a solution being injected.

Most stones do not require surgery.

If the stone is too large to pass, or the stone is associated with a urinary tract infection, or the stone blocks the drainage of urine flow, or is growing on serial monitoring either surgery or lithotripsy will be needed.

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What is the difference between surgery and lithotripsy?

Extracorporeal Shockwave Lithotripsy (ESWL) - or lithotripsy for short - uses sound waves transmitted through the skin to break up the stone into pieces that can be passed out in the urine. The procedure can be painful. Pain relief is usually given before the procedure.

Usually the fragments of stone following ESWL are passed in urine normally and so there can be further blood and pain noticed.

Sometimes the stone is too large to break up with ESWL, or not suitable for ESWL, and so surgery is required. Several weeks are usually required to fully recover from major stone surgery.

What can I do to prevent kidney stones?

1. Increasing fluid intake is very important. Most stone formers do not drink enough fluid. A **urine output volume of at least 2 litres per day** is important to reduce new stones forming. Water is best. In people who make oxalate containing stones, drinks with oxalate (e.g. black tea) may need to be reduced.
2. The intake of oxalate containing foods may need to be reduced and the commonly high oxalate foods include: beets, spinach, rhubarb, nuts, chocolate, wheat bran, strawberries and dried beans. Green and lima beans are not high in oxalate.
3. Uric acid stones may respond to reducing the amount of acid producing foods (meats (especially lamb, beef and pork); offal (brain, kidney and liver); mushrooms, asparagus, beans, peas and cauliflower; alcohol; seafood (particularly scallops, sardines and anchovies) and poultry in the diet.
4. People on medications for other conditions that may increase the risk of stones may need to have the medication dose changed.
5. Medications to prevent future stones may be used. These may be used to alkalinise (reduce the amount of acid) the urine; or reduce the amount of calcium in the urine (e.g. bendrofluazide); reduce the amount of uric acid produced (e.g. febuxostat); or bind the cystine in the urine (penicillamine) in people with the rare inherited disorder of cystinuria.
6. Infected stones need surgery to remove the stone, and antibiotics maybe used to keep the urine free from bacteria that may lead to stone regrowth.

In most cases, a high fluid intake is the most important
preventative of kidney stones. Water is best.

Diet and stones

Fluid. Increasing fluid intake is very important. Most stone formers do not drink enough fluid. **A urine output volume of 2 litres per day is paramount.** It is the output of urine that is important.

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Drinking more in the hot summer months, or when working and sweating is important. It is important to measure your urine volume to get an understanding of how much 2 litres is at initial diagnosis. Measuring urine volume may need to be repeated in the future should stones recur to make sure you are still achieving this high urine output.

Salt. A high salt intake leads to a lot of salt in the urine, which leads to more calcium and cystine excreted in the urine. A lower salt intake may be appropriate management in calcium and cystine stone makers.

Calcium stones. These are the most common types of stones. Reducing the amount of the calcium in the diet is not recommended before there has been an assessment by a dietitian, and some laboratory (blood and urine) tests performed. Even then, as calcium is very important for teeth and bone strength, often no change is made to the dietary calcium intake. Dairy products (milk, cheese, yoghurt), oysters, tofu, are all high in calcium. Sometimes dietary oxalate intake can be reduced to manage calcium oxalate stones. People on calcium supplements who develop calcium containing stones should not cease these supplements and seek both specialist advice (from their general practitioner or renal physical) and dietitian.

Oxalate stones. Oxalate is usually bound to calcium. Often it is appropriate to reduce the oxalate intake in someone who makes oxalate containing stones. Again medical advice and tests should be sought prior to such a diet change. Spinach, rhubarb, strawberries, nuts, beetroot and the drink tea are high in oxalate. A diet adequate in calcium to reduce oxalate stones. Taking calcium supplements may be appropriate particularly when taken with food to bind the oxalate and reduce its chance of being absorbed.

Vitamin supplements. B vitamins do not cause stones. High intakes of calcium containing vitamins, vitamin C, vitamin D, and fish liver oil all increase kidney stone formation in some people.

Bottled water. Some bottled waters are mineral waters, and have calcium, or other chemicals within, that increase the risk of stones. Get advice first!

Most other stones (cystine, struvite, uric acid stones) require medication to treat and prevent; and the dietary advice is beyond the scope of this information sheet – but do (again!) keep up that high fluid intake. Water is best.

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