KIDNEY STONE CLINIC
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www.kidneystoneclinic.com.au

**Kidney Stone Clinic**
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Complex Kidney Stones

# General Information about **Kidney Stones**

## Why do kidney stones form?

Kidney stones form from minerals and salts in the urine that clump together when the urine becomes highly concentrated. Normally these stones are only small and pass through the urinary tract without causing problems. Factors that favour stones to form include having a highly concentrated urine, a poor diet that is high in animal proteins, and also having a high salt diet.

## What are the different types of kidney stones?

Kidney stones come in many different types and colours. There are four main types of stones:

Calcium stones

These are the most common types of stones produce in Australia. When calcium combines with another mineral within the kidney, insoluble crystals form which are commonly either calcium oxalate or calcium phosphate in composition. These stones can typically be seen on a plain x-ray. Usually, no specific cause is found on why these stones develop, however they can occur in certain medical conditions such as morbid obesity, having an overactive parathyroid gland, certain types of weight loss surgery, and in several types of kidney disorders.

Uric acid stones

Typically, these stones form in acidic urine (pH 5-6) and are characteristically not visible on plain x-ray. Acidic urine may come about from being overweight, having chronic diarrhoea, type 2 diabetes, gout, or a diet that is high in animal protein and low in fruit and vegetables. These stones are becoming more common in the Australian community due in part from having an unbalanced diet and having a busier lifestyle. Uric acid crystals can act as a starter crystal for other types of kidney stones to form and is therefore important to recognize in undertaking any stone prevention strategies.

Struvite /Infection stones

These stones are related to chronic urinary tract infections (UTIs). They are less common in the general Australian community but can be found more commonly in the newer migrant groups. These stones are important to recognize as they can grow to a very large size in a short period of time. They damage the kidney from squeezing it from within and obstruct the function of the kidney. Surprisingly, these stones can have very little in the way of pain. If left untreated, they can cause persistent urinary tract infections, can destroy the kidney from the inside, and may result in death.

Cystine stones

Cystine is an amino acid that occurs in certain foods and is one of the building blocks in protein production. They are rare stones occurring in 1% of the Australian kidney stone population. It is a genetically inherited abnormality from both parents and results in cystine crystals to accumulate within the drainage system of the kidney. An excess of these cystine crystals will clump together to form larger kidney stones that can result in symptoms. Patients who are affected tend to be diagnosed at a young age and develop recurrent kidney stones throughout life. Treatment tends to be a lifelong commitment with a trusted team of medical specialists and supervised by a urologist with a special interest. Long term management involves close surveillance, education, dietary changes, fluids, and if required oral medications to prevent these stones from recurring.

## How are kidney stones diagnosed?

Kidney stones can present either with symptoms, or detected as part of an investigation of another condition.

The typical presentation is severe excruciating flank pain on the side of the affected kidney, and the pain radiating towards the groin. Sometimes, it also results in the urge to urinate 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 kidney failure. If the latter two problems occur, it is a surgical emergency requiring immediate treatment.

The most common presentation without any specific symptoms is as an incidental finding for work up of another complaint. This may result in further specific investigations to be carried out.

The definitive diagnosis of a stone is made by imaging tests, and the best available is a low radiation dose CT KUB (kidneys, ureter, and bladder) scan. This can also rule out other causes of severe abdominal pain which require an alternate course in management.

## How are kidney stones treated?

Treatment of your kidney stone depends on the type of stone you have, how bad it is and the length of time you have had symptoms. There are different treatments to choose from and it is important to talk with your Urological Surgeon as to what is best for you.

What about waitng for the stone to pass out by itself?

You can simply wait for the stone to pass. Smaller stones are more likely to pass out spontaneously compared with larger stones. A great majority of stones less than 4mm will pass out without the need for intervention. Usually this stage is best supervised by an urologist as they can intervene acutely if this management approach is not working.

What about medications to help pass the stone?

This is called medical stone expulsion therapy. It remains controversial regarding its effectiveness. In certain situations, a tablet called tamsulosin (Flomaxtra$^{TM}$) may be beneficial in helping relax the ureter to aid in the ureteric stone to pass. It works best for small stones that are lower down in the ureter. Pain relieving medications may also be required to help during this time.

When is surgery required?

Surgery may be needed to remove a stone from the ureter or kidney if:

- The stone fails to pass after a period of waiting
- The stone is too big to pass spontaneously
- The pain is too great in waiting for the stone to pass
- The stone is affecting your kidney function
- The stone is affecting your employment eg. airline pilot, truck driver, self-employed people, or working in isolated communities
- You are motivated to having the stone treated eg. frequent traveller
- You are considering getting pregnant
- You are troubled by the uncertainty of having a kidney stone

**When is having a kidney stone dangerous to my health?**

If you have a kidney stone resulting in pain, and develop fevers, chills or rigors (“shivers or shakes”), urgent urological treatment should be sought immediately at the nearest hospital

Emergency Department. This can develop quickly into a life threatening emergency and you need to go immediately to seek help!

## How can I prevent stones from recurring?

The type of stone you have will determine your stone management. There is no "one-size-fits-all" prescription for preventing kidney stones. Everyone is different and attitude plays a big role. However, without changes being made you have a 50% chance of developing another stone episode within 5 years. General measures in kidney stone prevention revolve around being well motivated to not having another stone, maintaining a healthy lifestyle and normal weight range, keeping up fluid intake, reducing animal protein intake and decreasing salt in the diet.

Lifestyle Change

There is evidence that having a busy lifestyle and not being able to maintain a work life balance can result in kidney stones forming in our Australian community. Having a lack of physical activity and no time for exercise may result in weight gain in susceptible individuals. Added in the mix of having an unbalanced diet, kidney stones are becoming more widespread. Simply recognizing these factors can be the start of change in becoming a well-motivated patient.

Maintain Calcium Intake

You need to maintain normal calcium intake!
Restricting calcium intake can actually produce kidney stones.
Unless there is a specific abnormality detected through blood tests, calcium stones are not normally due a calcium excess in the body.
Calcium is important in maintaining bone health and especially guarding against osteoporosis as you get older.

**You are encouraged to consume two servings of dairy (but no more than two); or another source of calcium-rich food such as cheese each and every day**.

Increase Fluid Intake

The best method in preventing stones is to drink more water which dilutes your urine.
**Fluid intake needs to be increased to 10 standard cups (250mL) in a 24-hour period which gives a total of 2.5L**. Ideal fluid choices 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 and sip from it throughout the day.
Even more drinks need to be consumed on hotter days due to sweating.
A good measure of success is the colour of the urine should be clear or a very pale yellow.
The fluid should ideally be low in sugar and calories.

Reducing Protein Intake

Excessive protein intake can result in an acidic urine and form uric acid stones. An important goal is to stay within a healthy weight range for your height. A Body Mass Index range of 19 to 25 is considered healthy. **As a general recommendation, limit your daily protein 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 (Sodium) Intake

Your goal is to reduce added salt in your diet. These may come from fast foods, packaged or canned foods, and salty snacks.
**You should consume less than 2000 mg/ day of sodium. This is equivalent to one teaspoon of salt per day**.
The human body carefully regulates its salt levels. When excess salt in the urine, calcium is also produced. In other words, the more salt your kidneys filter, the more calcium you form in the urine. Excess calcium in the urine can lead to new stone formation by binding with other minerals.

How do I prevent uric acid stones from forming?

Uric acid stones are formed by a diet high in animal proteins, or from excessive uric acid production from within the body. Most of these stones can be prevented from making the urine less acidic which results in the uric acid being in a dissolved state.
This can be achieved in the majority of patients by alkalinizing the urine using oral bicarbonate preparations (main ingredient of baking soda), and drinking plenty of oral fluids to keep the urine dilute.

In some circumstances an oral prescription medication called allopurinol maybe used to prevent excessive internal production of uric acid within the body.

Your doctor will advise you about your specific circumstances and tailor the treatment accordingly.

How do I prevent infection or struvite stones from recurring?

Your choice of urological surgeon and their skillset in treating complex stones is the most important factor here. Infection stones require complete stone clearance by minimally invasive surgical means. The prevention of these stones from recurring is best achieved by being vigilant against developing further urinary tract infections. Drinking plenty of fluids is helpful in this regard.

How do I prevent cystine stones from recurring?

This is best carried out in a multidisciplinary environment within a stone clinic having a special interest in this condition. It requires a coordinated team approach consisting ideally of an urological surgeon, renal physician and dietician. Stone episodes typically start during early-adulthood and are recurrent throughout life. Regular minimally invasive stone treatments (retrograde intrarenal surgery and laser treatment, percutaneous nephrolithotomy) maybe required periodically to keep on top of the situation before the stone burden become too large. Drinking plenty of fluids, typically over 3L of fluids each day is needed in most patients. Diligent alkalinisation of urine with taking potassium citrate or bicarbonates are mandatory and need regular monitoring using pH test strips. A low methionine diet with the aid of a dietician is helpful. Medical therapy (d-penicillamine or captopril) is best instituted as a last line of treatment by a renal physician with regular blood count monitoring.

Other measures- recap!

Become well motivated
Eat a balanced diet including fruit and vegetables
Everything in moderation
Use commonsense
Seek a dietician if you wish for a more tailored approach