**Kidney Stones**

**Introduction**

The kidneys are two bean-shaped organs that help in the removal of wastes from the body.

As the kidneys filter blood of impurities, minerals and acid salts can accumulate and harden over time. These solid crystalline deposits are called kidney stones, and can form in one or both kidneys. The stones can travel down the urinary tract and block the flow of urine, causing pain and bleeding.

Kidney stone formation is a common urinary system disorder that can form in any individual. However, men, and overweight people are at a higher risk of developing them.

**Incidence**

Stones affect about three in twenty men and one in twenty women in the UK.  They most commonly occur between the ages of 20 and 50, but can occur at any age.  Once someone has had a stone there is a 50% chance they will form a further stone within five-ten years.

**Causes**

Kidney stones form when certain salts and minerals in the urine become highly concentrated and build up. This can happen due to

* Insufficient water intake
* Treatments for Kidney diseases and cancer
* Certain medications
* Family history
* Intestinal disease such as Crohn’s disease
* Single functional kidney

**Signs and Symptoms**

Symptoms of kidney stone formation may not manifest until the stone moves around the kidney or down into the urinary tract. Symptoms may include:

* Severe pain below the ribs, back, sides, lower abdomen, groin and during urination
* Pain that fluctuates in intensity
* Frequent urge to urinate
* Pink, brown or red urine that is cloudy or foul smelling

You should call your doctor if you find it difficult to pass urine, or the pain increases and is accompanied with fever, chills, vomiting and nausea.

**Diagnosis:**

When kidney stones are suspected, your doctor may order blood, urine and imaging tests (X-ray, CT scans) to diagnose the condition. This could be arranged on the same day of your consultation.

You may also be asked to urinate through a sieve to collect and test the kidney stones that pass in the lab. The results will help your doctor to determine the cause and formulate an appropriate plan for treatment.

**Conservative treatment:**

Treatment depends on the type of stone and its underlying cause. Small kidney stones can be flushed out by drinking plenty of water. Additionally, your doctor may prescribe medication to relieve pain.

**Surgical treatments:**

For larger stones that are unlikely to pass by itself or is causing too many problems then intervention may be required.

Most patients who have treatment will have planned surgery for stones and have a full explanation of the treatments given to them by their consultant at their clinic appointment. In summary surgical removal can be achieved by the following;

**Extracorporeal Shock Wave Lithotripsy (ESWL)**

ESWL is a non-invasive procedure. It involves treating a stone in the kidney or ureter without the need for a general anaesthetic.  The patient lies on a bed then water filled cushion is then pressed up against the kidney and a shock wave is fired directed at the stone.  The location of the stones is determined with the help of ultrasound or X-rays. Using a device called a lithotripter, high-energy sound waves are passed over the area to be treated from outside the body. The shock waves will vibrate and break the stones down without harming the rest of the body. This fragments the stone allowing the patient to pass the fragments.

This is done without the need for general anaesthetic as an outpatient procedure.  However, the stone fragments need to pass down the ureter pipe and may cause renal colic as they come down.  The success rate from lithotripsy is also slightly lower than ureteroscopy and laser to the stone.

**Ureteroscopy**

Ureteroscopy involves the insertion of a very small telescope up through the water pipe (urethra) to the bladder and then up the ureter.  This is performed under general anaesthetic.  A straight or semi-rigid telescope is normally used for stones in the ureter.  A flexible telescope with a movable tip is used to access stones in the kidney.  A laser fibre can be inserted down the middle of the telescope to allow the stone to be broken.  A tiny wire basket may then be used to remove the stone fragments.  Very small fragments may be left to pass out on their own.

Ureteroscopy is the most successful way of treating stones of 10 mm or less, but does require a general anaesthetic.

**Percutaneous Nephrolithotomy (PCNL)**

PCNL is the surgical removal of stones from the kidney.  This is reserved for larger stones or stones that cannot be treated with either ureteroscopy or shock wave lithotripsy.  A general anaesthetic is required and a small (1cm) incision is made in the skin overlying the kidney.  A telescope is then introduced through this incision into the kidney.  The stone is broken and removed.  At the end of the procedure a small tube is left in the kidney, which drains out through the skin.  This is normally removed after 24 hours.

**Prevention:**

Kidney stones can be prevented by making some lifestyle changes like drinking more water and reducing the intake of excess salt and animal proteins.

Stones are more likely to form when the urine is concentrated.  It is therefore advisable to try and drink plenty of water to avoid stone formation.  It is advised that you try and pass 2½ - 3 litres of urine per day.  This should keep the urine clear rather than golden.    
  
Even though most stones are made of calcium, patients are not advised to reduce the amount of calcium in their diet. It has been shown that low calcium diets are associated with higher rates of stone formation and therefore dairy products, e.g. milk, cheese and yoghurt, which are rich in calcium, should be taken normally.    
  
A high salt intake may be associated with stone formation.  It is therefore advisable not to add salt to your food excessively.  A diet low in animal protein (meat) and rich in fibre may also prevent stone formation.   
  
Finally, a chemical called citrate naturally prevents stone formation in the urine. You can increase the amount of citrate in the urine by having a glass of fresh orange juice or freshly squeezed lemon juice each day.

**Recurrent stone formers:**

Most patients if they have a single stone episode only require a simple blood test to check the calcium and urate in the blood.  However, if the stones have come back, there is more than one stone, there is a family history of stone formation or an underlying medical condition that predisposes to stone formation, then a more extensive investigation called a 24 hour metabolic stone screen will be arranged.  This involves collecting urine over a 24 hour period and then the chemicals within the urine can be measured to see if there is an underlying cause for the stone formation.