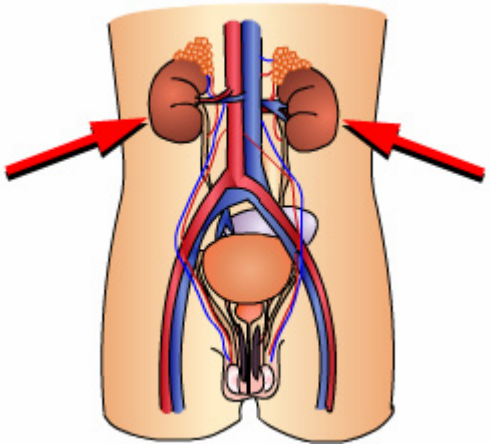
# *X-Plain™*
# *Kidney Stones*
# Reference Summary

## Introduction

Kidney stones are fairly common. Although they can be very painful, they are treatable, and in many cases preventable. This reference summary will help you understand better the treatment and prevention options for kidney stones.

## Anatomy



The majority of people are born with two kidneys.

Kidneys are bean shaped organs located in the mid to lower back on both sides of the spine.

The kidneys form urine, which then flows through tubes called ureters to be stored in the bladder.

Their main function is to filter the blood from harmful chemicals known as toxins. These toxins are secreted into the urine.

When the bladder is full, people feel the urge to urinate. The urine is emptied through the urethra.

## Kidney Stones

Kidney stones vary in size and shape. They can range from the size of sand particles to golf ball size.

Some stones, known as staghorn stones, can fill the entire kidney; these are usually caused by infections.

Kidney stones can be smooth or jagged. They are formed when crystals in the urine stick together and become large enough to form a stone. Crystals are solid forms of chemical compounds in the urine.

Most stones are formed of calcium, a very common chemical in dairy products. Other chemicals such as oxalate, uric acid, and cystine can also cause stones.

Kidney and urine infections may also lead to the formation of stones.

## Symptoms

The most common symptom of kidney stones is pain in the flank area. The pain is usually excruciating. It comes in spasms and may radiate to the inguinal area.

This pain occurs when a small stone gets stuck in one of the ureters on its way to the bladder.

A kidney stone in the ureter causes the urine flow through the ureter to slow. The urine may back up in the ureter and cause the ureter and kidney to dilate.

This can cause further pain and possible long-term kidney damage if not treated promptly. Infections may also occur. This may result in fever, burning during urination, nausea, and vomiting. Blood in the urine is another symptom of kidney stones.

## Diagnosing Kidney Stones

After taking a detailed medical history, the physician is able to confirm the presence of kidney stones and pinpoint their locations using various tests and x-rays.

A simple x-ray of the abdomen, known as a KUB or Kidney, Ureters, and Bladder, can help detect the stone.

An IVP may also be done. This is a test where dye is injected in a vein and x-rays are then taken of the abdomen to see how quickly the kidneys excrete the dye into the urine.

This test also shows the shapes of the kidneys, ureters and bladder and can pinpoint the exact location of kidney stones. CAT scans and ultrasounds of the abdomen may also be needed. Blood work and urine samples may be needed to check for the presence of infection, blood in the urine, and abnormally high levels of chemicals that may cause kidney stones.

## Treatment Options

Depending on the patient's symptoms, as well as the size and location of the stone, the physician may just wait and see if the patient can pass the stone on his or her own.

Patients are usually given enough medication to help with the severe pain. They are also asked to drink a lot of fluid, approximately 12 eight-ounce glasses, to help "flush out" the kidney.

This is known as expectant therapy.

If the symptoms are not very severe, medication can be given in some cases to change the composition of the urine and help dissolve the stone.

This takes a long time and is not a good option in cases of severe pain or urinary obstruction.

If pain persists and the patient has not been able to pass the stone, further treatment may be needed.

The doctor may perform an ESWL, or Extracorporeal Shock Wave Lithotripsy. During this procedure the patient is either placed in a tub filled with water or more recently asked to lie down on a soft mattress.

A machine then targets shock waves at the stone. This causes the stone to crumble and become smaller. It then becomes easier to pass in the urine. The ESWL may need to be repeated. ESWL is usually an outpatient procedure, that is, the patient goes home the same day after the procedure.

Patients are asked to strain their urine during expectant therapy or after lithotripsy to see if the stone or sand has passed. The stone or sand should be given to the physician to help determine the exact composition of the stone.

After determining the stone's composition, the doctor will be able to advise the patient about necessary dietary changes to help prevent further kidney stones from developing.

A study published in 2006 showed that patients who undergo ESWL are more likely to develop hypertension and diabetes than patients who have not.

Some stones are very hard and are not affected by the shock waves. If ESWL is not successful or if the doctor does not suggest it, other procedures can be performed to take the stones out. The physician can go through the urethra and bladder, and into the ureter using a scope. He or she can then find the stone and take it out. This is known as ureteroscopic stone removal and is usually an outpatient procedure, that is the patient goes home the same day after the procedure.

Sometimes the stone is too big to remove and is therefore broken into smaller pieces, using either a mechanical instrument or a small laser introduced through the urethra into the bladder then into the ureter.

If ureteroscopic stone removal is not possible, the kidney itself can be opened up surgically through the flank to take the stones out.

This is an inpatient operation, which means the patient may have to stay in the hospital after the procedure.

**Prevention**

People can prevent kidney stones by making simple changes in their diets. The next section discusses the most important suggestions. Drinking lots of fluid, approximately 12 eight-ounce glasses of water a day, helps keep the urine flowing and decreases the chances of stones forming. Some liquids cause people to get dehydrated and should be limited. These include beverages that contain alcohol and caffeine. For patients who have been diagnosed with kidney stones, dietary changes can be helpful in decreasing the chances of stone formation.

Patients with calcium stones should limit their intake of dairy products such as milk and cheeses.

Patients with oxalate stones should limit their intake of colas, chocolate, and peanuts.

Patients with uric stones should limit their intake of meat, chicken, and anchovies. Patients with cystine stones should limit their intake of fish.

Depending on the kind of stones, some medications may be given to decrease the specific stone forming compounds in the urine, or to decrease the ability of the urine to form stones.

These medications should be taken as prescribed by the doctor. Patients should schedule regular follow-up visits with their physicians.

## Summary

Kidney stones can be very painful. Fortunately, they are treatable and preventable. Treatment options include medication, shock wave therapy, endoscopy, and surgery. Some simple changes in diet may decrease a patient's chance of developing kidney stones.