

# KIDNEY STONES

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## Kidney Stones

### What is a kidney stone?

A kidney stone is a solid mass formed from substances in the urine. These substances are normally found in the urine, but become highly concentrated when there are not enough liquids to flush them out of the body in the urine. These stone-forming substances are:

- Calcium
- Oxalate
- Urate
- Cysteine
- Xanthine
- Phosphate

These and other chemicals are the “waste products” that must exit the body.

Kidney stones usually range in size from as small as a grain of sand to a pearl. Although rare, some stones can be as large as golf balls. Smaller stones can pass through the urinary tract on their own without any pain or notice. Larger stones can get trapped in the kidney or lodged in the ureters. When this happens, the stones keep urine from exiting the body. Blocking the flow of urine causes severe pain or bleeding. Stones that can't pass on their own are treated with medications or surgery. The decision is based on stone size/shape, location, type, and number of stones.

### What are the risk factors for developing kidney stones?

Risks for developing kidney stones include:

- Not drinking enough liquids
- Repeat urinary tract infections
- Blockage in the urinary tract
- Family history of kidney stones
- Health conditions that affect the levels of the substances in the urine that can cause stones to form:
  1. Hypercalciuria, which is high calcium levels in the urine
  2. High blood pressure
  3. Diabetes
  4. Obesity
  5. Osteoporosis
  6. Gout
  7. Kidney cysts
  8. Cystic fibrosis
  9. Parathyroid disease
  10. Inflammatory bowel disease
  11. Chronic diarrhea
  12. Some surgical procedures, including weight loss surgery or other stomach/intestine surgeries.
- Medications:
  1. Diuretics (“water pills”)
  2. Calcium-based antacids
  3. Crixivan® (used to treat HIV infections)
  4. Topamax® and Dilantin (used to treat seizures)
  5. Cipro® (ciprofloxacin)
  6. Ceftriaxone (antibiotics)
- Certain foods and flavor enhancers including:
  1. Animal proteins (meat and poultry)
  2. Diets high in salt (sodium)
  3. Sugars (fructose, sucrose, and corn syrup)
  4. Foods specific to the type of kidney stone formed

## What are the signs and symptoms of kidney stones?

Signs and symptoms include:

- Pain in the lower back or side of body. Pain can start as a dull ache that may come and go. Pain can become severe and result in a trip to the emergency room.
- Nausea and/or vomiting with the pain
- Blood in the urine
- Pain when urinating
- Unable to urinate
- Feeling the need to urinate more often
- Fever/chills
- Urine that smells bad or looks cloudy

Smaller kidney stones may not cause pain or other symptoms and are able to pass on their own.

## How are kidney stones diagnosed?

Diagnosis starts with a physical exam and review of your medical history. Other tests include:

- **Blood test:** to measure how well your kidneys are functioning, to look for signs of infection, and to look for biochemical problems that lead to forming kidney stones.
- **Urine sample test:** to look for signs of an infection and to examine the levels of the stone-forming substances – calcium, oxalate, urate, cystine, xanthine, and phosphate.
- **Imaging tests:** to see the size, shape, and location of the stones; determine the most suitable treatment, and sometimes to review the result of treatment. Types of imaging tests used are X-rays, CT scan, and ultrasound. Both X-ray tests and CT scans use a small amount of radiation to create their images.

Two types of X-rays are used: a standard X-ray of the urinary tract or a special type of X-ray called an intravenous pyelogram (IVP). If an IVP is ordered, you receive an injection of a dye in your vein before the X-ray is taken. The dye is used to get a sharper image of problems in the kidneys, ureters, and bladder resulting from urine being blocked.

A CT scan of the abdomen is an imaging test that creates a three-dimensional view of the organs within the abdominal cavity. It is used with or without the injection of a dye in your vein. This test shows the stone size and location and conditions that may have caused the stone to form. In addition, the other organs within this area of the body can be evaluated.

An ultrasound of the urinary tract uses sound waves to detect kidney stones and indirect signs of kidney stones, such as changes in the kidney's size and shape.

## How are kidney stones treated?

Treatment options include:

- **No treatment:** Allow stones to pass on their own.
- **Medications:** To relax the ureter to allow stones to pass.
- **Minimally-invasive procedures:** Procedure carried out by entering the body through a small incision in the skin or through the body's natural openings.
- **Surgery.**

**No treatment:** Depending on the size and location of the kidney stone, sometimes stones can pass through urine on their own. Drinking plenty of liquids helps the kidney stones travel through the urinary tract. Passing the stone may take up to three weeks.

**Medications:** Severe pain, requiring an emergency room visit, can be managed with IV narcotics, IV anti-inflammatory drugs, and IV drugs to manage nausea/vomiting. Stones causing less pain can be managed with an anti-inflammatory drug such as ibuprofen. (Caution: Ask your doctor before taking ibuprofen. This drug can increase the risk of kidney failure if taken while having an acute attack of kidney stones – especially in those who have a history of kidney disease and associated illnesses such as diabetes, hypertension, and obesity.) Other medications may be given to relax the ureter such as tamsulosin (Flomax®) or nifedipine (Adamant®, Procardia®) so that the stones can pass on their own.

**Procedures:** There are three types of minimally invasive surgery – ureteroscopy, shock wave lithotripsy, and percutaneous nephrolithotomy:

- **Ureteroscopy:** To perform this procedure, a small instrument, called a ureteroscope, is inserted in the urethra, through the bladder, and into the ureter. This instrument allows stones to be seen and then retrieved in a surgical “basket” or broken apart using a laser. These smaller pieces of kidney stones are then more easily able to exit the body through the urinary tract.
- **Shock wave lithotripsy:** In this procedure, the patient is placed on a special type of surgical table or tub. High-energy shock waves are sent through water to the stone(s) location. The shock waves break apart the stones, which are then more easily able exit the body through the urinary tract.
- **Percutaneous nephrolithotomy:** When kidney stones can't be treated by the other procedures – either because there are too many stones, the stones are too large or heavy, or because of their location – percutaneous nephrolithotomy is considered.

In this procedure, a tube is inserted directly into the kidney through a small incision made in your back. If the stones are large, an ultrasound probe and/or laser are inserted and deliver shock waves to the stones to break them apart. Fragments of stones are either suctioned out (so you do not have to pass them through your urine) or removed through a tube (called a nephrostomy) that has been inserted through the skin and into the kidney. This tube drains urine, as well as any small pieces of stone, into a urine collection bag. This procedure requires a short hospital stay (2 to 3 days).

**Open stone surgery.** Open stone surgery, a major surgical procedure, is rarely performed. It is currently only done in 0.3 to 0.7% of cases.

## How can kidney stones be prevented?

Ways to decrease your risk of kidney stones include:

- Drink more fluids, especially water. Drink at least 64 ounces of liquids per day. Liquids help you stay hydrated. Staying more hydrated helps you urinate more often, which helps “flush away” the buildup of the substances that cause kidney stones. If you sweat a lot from your activities, be sure to drink more water.
- Limit the amount of salt (sodium) in your diet.
- Lose weight if you are overweight.
- Limit the types of foods and drinks that led to the development of your specific type of kidney stone. You may be asked to collect your urine over a 24-hour period. Stone fragments and minerals in the urine can help identify what may have caused your kidney stone. Based on the stone’s content, another health care professional, a dietitian, can suggest changes in your diet to help decrease your risk of developing more stones.
- Take medication prescribed by your doctor to help prevent kidney stones based on your specific stone type and any health problems that make you more likely to form a stone.

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