

Kidney stones

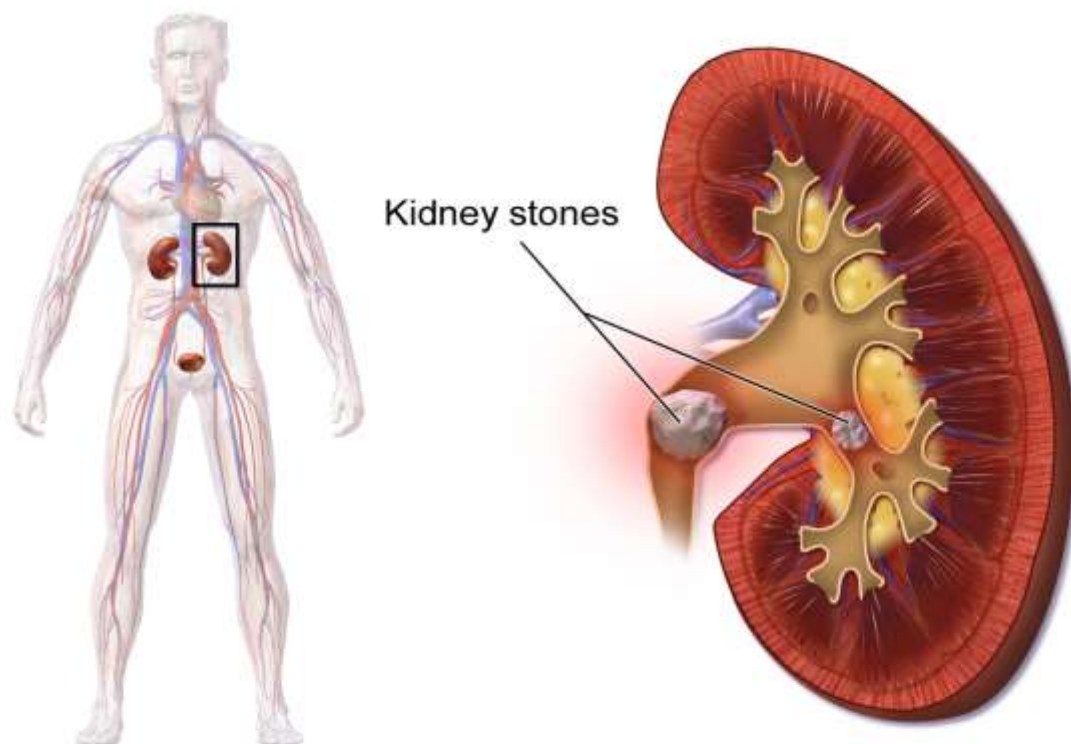
Definition

Kidney stones (renal lithiasis, nephrolithiasis) are small, hard mineral deposits that form inside your kidneys. The stones are made of mineral and acid salts.

Kidney stones have many causes and can affect any part of your urinary tract — from your kidneys to your bladder. Often, stones form when the urine becomes concentrated, allowing minerals to crystallize and stick together.

Passing kidney stones can be quite painful, but the stones usually cause no permanent damage. Depending on your situation, you may need nothing more than to take pain medication and drink lots of water to pass a kidney stone. In other instances — for example, if stones become lodged in the urinary tract or cause complications — surgery may be needed.

Your doctor may recommend preventive treatment to reduce your risk of recurrent kidney stones if you're at increased risk of developing them again.



Kidney Stones

Symptoms

A kidney stone may not cause symptoms until it moves around within your kidney or passes into your ureter — the tube connecting the kidney and bladder. At that point, you may experience these signs and symptoms:

- Severe pain in the side and back, below the ribs
- Pain that spreads to the lower abdomen and groin
- Pain that comes in waves and fluctuates in intensity
- Pain on urination
- Pink, red or brown urine
- Cloudy or foul-smelling urine
- Nausea and vomiting
- Persistent need to urinate
- Urinating more often than usual
- Fever and chills if an infection is present
- Urinating small amounts of urine

Pain caused by a kidney stone may change — for instance, shifting to a different location or increasing in intensity — as the stone moves through your urinary tract.

Causes

Kidney stones often have no definite, single cause, although several factors may increase your risk.

Kidney stones form when your urine contains more crystal-forming substances — such as calcium, oxalate and uric acid — than the fluid in your urine can dilute. At the same time, your urine may lack substances that prevent crystals from sticking together, creating an ideal environment for kidney stones to form.

Types of kidney stones

Knowing the type of kidney stone helps determine the cause and may give clues on how to reduce your risk of getting more kidney stones. Types of kidney stones include:

- **Calcium stones.** Most kidney stones are calcium stones, usually in the form of calcium oxalate. Oxalate is a naturally occurring substance found in food. Some fruits and vegetables, as well as nuts and chocolate, have high oxalate levels. Your liver also produces oxalate. Dietary factors, high doses of vitamin D, intestinal bypass surgery and several metabolic disorders can increase the concentration of

calcium or oxalate in urine. Calcium stones may also occur in the form of calcium phosphate.

- **Struvite stones.** Struvite stones form in response to an infection, such as a urinary tract infection. These stones can grow quickly and become quite large, sometimes with few symptoms or little warning.
- **Uric acid stones.** Uric acid stones can form in people who don't drink enough fluids or who lose too much fluid, those who eat a high-protein diet, and those who have gout. Certain genetic factors also may increase your risk of uric acid stones.
- **Cystine stones.** These stones form in people with a hereditary disorder that causes the kidneys to excrete too much of certain amino acids (cystinuria).
- **Other stones.** Other, rarer types of kidney stones also can occur.

Treatments and drugs

Small stones with minimal symptoms

Most kidney stones won't require invasive treatment. You may be able to pass a small stone by:

- **Drinking water.** Drinking as much as 2 to 3 quarts (1.9 to 2.8 liters) a day may help flush out your urinary system. Unless your doctor tells you otherwise, drink enough fluid — mostly water — to produce clear or nearly clear urine.
- **Pain relievers.** Passing a small stone can cause some discomfort. To relieve mild pain, your doctor may recommend pain relievers such as ibuprofen (Advil, Motrin IB, others), acetaminophen (Tylenol, others) or naproxen sodium (Aleve).
- **Medical therapy.** Your doctor may give you a medication to help pass your kidney stone. This type of medication, known as an alpha blocker, relaxes the muscles in your ureter, helping you pass the kidney stone more quickly and with less pain.

Large stones and those that cause symptoms

Kidney stones that can't be treated with conservative measures — either because they're too large to pass on their own or because they cause bleeding, kidney damage or ongoing urinary tract infections — may require more extensive treatment. Procedures may include:

- **Using sound waves to break up stones.** For certain kidney stones — depending on size and location — your doctor may recommend a procedure called extracorporeal shock wave lithotripsy (ESWL).

ESWL uses sound waves to create strong vibrations (shock waves) that break the stones into tiny pieces that can be passed in your urine. The procedure lasts about 45 to 60 minutes and can cause moderate pain, so you may be under sedation or light anesthesia to make you comfortable.

ESWL can cause blood in the urine, bruising on the back or abdomen, bleeding around the kidney and other adjacent organs, and discomfort as the stone fragments pass through the urinary tract.

- **Surgery to remove very large stones in the kidney.** A procedure called percutaneous nephrolithotomy (nef-row-lih-THOT-uh-me) involves surgically removing a kidney stone using small telescopes and instruments inserted through a small incision in your back.

You will receive general anesthesia during the surgery and be in the hospital for one to two days while you recover. Your doctor may recommend this surgery if ESWL was unsuccessful.

- **Using a scope to remove stones.** To remove a smaller stone in your ureter or kidney, your doctor may pass a thin lighted tube (ureteroscope) equipped with a camera through your urethra and bladder to your ureter.

Once the stone is located, special tools can snare the stone or break it into pieces that will pass in your urine. Your doctor may then place a small tube (stent) in the ureter to relieve swelling and promote healing. You may need general or local anesthesia during this procedure.

- **Parathyroid gland surgery.** Some calcium phosphate stones are caused by overactive parathyroid glands, which are located on the four corners of your thyroid gland, just below your Adam's apple. When these glands produce too much parathyroid hormone (hyperparathyroidism), your calcium levels can become too high and kidney stones may form as a result.

Hyperparathyroidism sometimes occurs when a small, benign tumor forms in one of your parathyroid glands or you develop another condition that leads these glands to produce more parathyroid hormone. Removing the growth from the gland stops the formation of kidney stones. Or your doctor may recommend treatment of the condition that's causing your parathyroid gland to overproduce the hormone.

Prevention

Prevention of kidney stones may include a combination of lifestyle changes and medications.

Lifestyle changes

You may reduce your risk of kidney stones if you:

- **Drink water throughout the day.** For people with a history of kidney stones, doctors usually recommend passing about 2.6 quarts (2.5 liters) of urine a day. Your doctor may ask that you measure your urine output to make sure that you're drinking enough water.

If you live in a hot, dry climate or you exercise frequently, you may need to drink even more water to produce enough urine. If your urine is light and clear, you're likely drinking enough water.

- **Eat fewer oxalate-rich foods.** If you tend to form calcium oxalate stones, your doctor may recommend restricting foods rich in oxalates. These include rhubarb, beets, okra, spinach, Swiss chard, sweet potatoes, nuts, tea, chocolate and soy products.
- **Choose a diet low in salt and animal protein.** Reduce the amount of salt you eat and choose nonanimal protein sources, such as legumes. Consider using a salt substitute.
- **Continue eating calcium-rich foods, but use caution with calcium supplements.** Calcium in food doesn't have an effect on your risk of kidney stones. Continue eating calcium-rich foods unless your doctor advises otherwise. Ask your doctor before taking calcium supplements, as these have been linked to increased risk of kidney stones. You may reduce the risk by taking supplements with meals. Diets low in calcium can increase kidney stone formation in some people.

Ask your doctor for a referral to a dietitian who can help you develop an eating plan that reduces your risk of kidney stones.

Medications

Medications can control the amount of minerals and acid in your urine and may be helpful in people who form certain kinds of stones. The type of medication your doctor prescribes will depend on the kind of kidney stones you have. Here are some examples:

- **Calcium stones.** To help prevent calcium stones from forming, your doctor may prescribe a thiazide diuretic or a phosphate-containing preparation.

- **Uric acid stones.** Your doctor may prescribe allopurinol (Zyloprim, Aloprim) to reduce uric acid levels in your blood and urine and a medicine to keep your urine alkaline. In some cases, allopurinol and an alkalizing agent may dissolve the uric acid stones.
- **Struvite stones.** To prevent struvite stones, your doctor may recommend strategies to keep your urine free of bacteria that cause infection. Long-term use of antibiotics in small doses may help achieve this goal. For instance, your doctor may recommend an antibiotic before and for a while after surgery to treat your kidney stones.
- **Cystine stones.** Cystine stones can be difficult to treat. Your doctor may recommend that you drink more fluids so that you produce a lot more urine. If that alone doesn't help, your doctor may also prescribe a medication that decreases the amount of cystine in your urine.