

## Patient information from the BMJ Group

# Kidney stones

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## Kidney stones

Having a kidney stone can be painful and distressing. But most stones pass out of the body without any treatment. And there are good treatments available for stones that don't.

We've brought together the best research about kidney stones and weighed up the evidence about how to treat them. You can use our information to talk to your doctor and decide which treatments are best for you.

## What are kidney stones?

Kidney stones are solid, stone-like lumps that can form in your kidneys. Small stones can stay in your kidney without any problems. They may also pass out of your body in your urine without you noticing. But larger stones can block the flow of urine from your kidney. Or they can pass out of your kidney into the tubes that carry urine towards your bladder. This can be extremely painful, as they may rub against these tubes or even get stuck. <sup>[1]</sup>

Your **kidneys** are two organs that are each about the size of your fist. They sit near the middle of your back, just below your rib cage. Their job is to filter waste products and extra water out of your blood. They send these waste products to your **bladder** as urine. <sup>[1]</sup>

A kidney stone is a lump of crystals made from waste chemicals in your urine. Urine contains chemicals to stop these crystals forming, but this doesn't always work. Crystals can then clump together and form stones in your kidneys. <sup>[2]</sup>

Kidney stones don't just affect your kidneys. You can also get them in other parts of your body that carry urine. The parts of your body that deal with urine are called your urinary tract.

Your urinary tract includes your **bladder** and **ureters**. The bladder is the pouch where urine is stored before you urinate. **Ureters** are tubes that carry urine from the kidneys to the bladder.

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You might hear 'kidney stone' used as a general term, to mean a stone anywhere in your urinary tract. Doctors sometimes use the terms **nephrolithiasis** or **urolithiasis** to describe kidney stones.



Kidney stones can be smooth or jagged.

Kidney stones come in many shapes and sizes. They can be as small as a grain of sand or as large as a golf ball. They can be smooth or jagged. They are usually yellow or brown. <sup>[1]</sup>

About two-thirds of all kidney stones go unnoticed. The rest cause pain on their way out of the body. <sup>[3]</sup>

### Types of kidney stones

There are four types of kidney stones. <sup>[1]</sup>

- Calcium stones (the most common type). These are usually caused by having too much calcium in your body. Calcium that is not needed elsewhere in your body goes to your kidneys as waste. Usually, unwanted calcium is flushed out in your urine. But calcium can build up in the urine. It can then join with other waste products to form a stone.
- Uric acid stones. Uric acid is a waste product produced after food is digested. If you have too much uric acid in your urine, it may not dissolve properly. It can then form stones. These kinds of stones are more common in men.
- Struvite stones. These stones develop when a urinary infection, such as **cystitis**, affects the balance of chemicals in the urine. They are rare, but they happen more often in women, because women have more urinary infections.
- Cystine stones. These are quite rare. They are made up of cystine, one of the building blocks of **protein**. Cystine does not dissolve well in urine. The stones are caused by a rare inherited condition called cystinuria.

It is important to know what kind of stone you have, as this will affect your treatment to prevent future stones. For example, a medicine that helps prevent calcium stones will not work if you have a struvite stone. And the changes in diet that can help prevent uric acid stones may have no effect on calcium stones. <sup>[1]</sup>

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## Kidney stones: why me?

Kidney stones form for three main reasons:<sup>[4]</sup>

- You have a lot of waste chemicals in your urine
- You don't have enough citrate in your urine. This is the main chemical that prevents crystals forming
- Your urine doesn't contain enough water to dissolve waste products.

Some things make you more likely to get stones. These are called risk factors. They include:<sup>[2] [5]</sup>

- A family history of kidney stones. If a close relative has had kidney stones, you are three times more likely to get them
- Having had a kidney stone before. If you've had a kidney stone, you have about a 1 in 2 chance of getting another one in the next few years
- High blood pressure. If you have **high blood pressure**, your kidneys have to work harder. This can increase your risk of kidney stones
- Gout. **Gout** is a medical condition where you have too much uric acid in your body. Uric acid is a chemical that is usually filtered out by the kidneys. Too much of it can make you more likely to get kidney stones
- Overactive parathyroid glands. If your body gets too much of the **hormone** made by the parathyroid glands, extra calcium is released into your blood. This can make you more likely to get kidney stones
- Having both ovaries removed, bringing on an early **menopause**
- Taking certain medicines, including some **diuretics** (water tablets) and some decongestants
- Problems inside your kidney, like cysts.

## What are the symptoms of kidney stones?

Very small stones can pass out of your body without you noticing. But if you do get symptoms, the most likely one is pain.

The pain might begin as a dull ache in your side while the stone is in your **kidney**. It won't become severe unless the stone leaves the kidney.<sup>[6]</sup>

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When a stone starts to move down one of the tubes ( **ureters** ) from the kidney towards your **bladder** , you can get a bad pain in your back or side. This will probably come on suddenly. <sup>[7]</sup>

This pain can be so intense that it feels like the worst you've ever had. It is called **renal colic**.

The pain comes from your muscles trying to squeeze the stone through the ureter and into the bladder. <sup>[8]</sup>

The pain is sharp and cramping. It tends to come and go as the stone moves. It will probably start in your back or side, and might spread down to your tummy or groin. It is the kind of pain that makes you move around a lot, rather than lying still, as you try to find a more comfortable position.

You might get other symptoms with the pain. You might:

- Feel sweaty or sick
- Be sick
- Find blood in your urine. This is caused by the stone rubbing against the walls of the ureter
- Need to urinate more often or feel a burning sensation when you urinate. This is more likely as the stone gets closer to the bladder. <sup>[8]</sup>

Your doctor is likely to suspect you have a kidney stone if you have sudden severe pain in your side and blood in your urine. <sup>[9]</sup>

Your doctor is likely to send you to a hospital outpatient or emergency department for one or more tests. These tests can:

- Confirm that you actually have a kidney stone
- Rule out other possible causes of the pain
- Show where the stone is stuck and how big it is.

You will probably have an **x-ray** . Most kidney stones show up on an x-ray. You might also have an **ultrasound scan** . But if these tests don't show a stone, the doctor will probably scan you using one of the following tests: <sup>[7]</sup> <sup>[8]</sup>

- A **CT scan** (computed tomography scan). This is a type of x-ray. It takes several detailed pictures of the inside of your body from different angles

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- An **IVP** (intravenous pyelogram).<sup>[7]</sup> <sup>[8]</sup> For this test, the doctor injects a dye into your bloodstream. The dye collects in your kidneys and helps any kidney stones to show up on the x-ray.

The results of these tests will also help your doctor to work out the best treatment for you.

Many people with kidney stones have no symptoms at all. They find out about them only if they have an x-ray for some other reason.<sup>[9]</sup> But, often, these stones go on to cause problems. About half of the small stones found in the kidneys start to produce symptoms within five years.<sup>[3]</sup>

### How common are kidney stones?

Kidney stones are quite common, especially in men.

For every two women who have kidney stones, around three men have them.<sup>[10]</sup>

Stones can happen at any age. But you're most likely to get them when you're 30 to 60 years old.<sup>[11]</sup>

White people are more likely to get kidney stones than Asian people, and Asian people are more likely to get them than black people.<sup>[6]</sup>

### What treatments work for kidney stones?

Most kidney stones are small enough to pass out of your body in your urine. You'll probably be able to stay at home while you wait for this to happen, with painkillers to help you feel comfortable. However, some people do need treatment in hospital.

If you have a larger kidney stone, you may need treatment to remove it, such as shock wave therapy or surgery.

### Key points about treating kidney stones

- If you're waiting for a stone to pass out in your urine, you'll need painkillers, and you should drink plenty of water to increase the flow of urine and make it easier for the stone to pass.
- Your doctor will probably ask you to strain your urine to catch any stones that pass. This is to find out what type of stone you have, so you can take steps to avoid getting another one.
- Get medical help urgently if you have a high temperature, you shiver or shake, or if the pain gets worse.

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- If a stone is too big to pass in your urine, there are several options. Shock wave treatment can help break up the stone. There's also a procedure where the doctor feeds a fine tube up your urethra to remove the stone. Or you can have a small operation where the doctor makes a small cut in your back and removes the stone.

We've looked separately at treatments to get rid of kidney stones and treatments to help with pain.

- [Treatments to help with pain from kidney stones](#)
- [Treatments to remove kidney stones](#)

### Treatment Group 1

#### What treatments work to help with pain from kidney stones?

Some kidney stones are so small they pass out in your urine without causing any problems. But larger kidney stones can be very painful. Your doctor will give you painkillers to make you more comfortable, possibly as injections. He or she will also advise you to drink plenty of fluids.

- Many people with kidney stones can be treated at home. But some people need treatment in hospital.
- Doctors often recommend anti-inflammatory painkillers like ibuprofen, indometacin, and diclofenac.
- If you're in a lot of pain, doctors may prescribe a stronger painkiller, like codeine.
- You may need to go to hospital if you're very ill, if painkillers don't help you, or if you're vomiting so much you can't drink enough fluids.

Which treatments work best? We've looked at the research and given a rating for each treatment according to how well it works.

#### Treatments to help with pain from kidney stones

##### Treatments that are likely to work

- [Painkillers called NSAIDs](#)
- [Stronger painkillers](#)

##### Treatments that need further study

- [Extra fluids](#)

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- [Antispasmodic drugs](#)

## Treatment Group 2

### What treatments work to remove kidney stones?

Most people with kidney stones don't need treatment. The stones pass out of the body on their own.

Kidney stones are often small enough to pass out of your body when you urinate. However, this can be painful. Your doctor can prescribe painkillers to help you feel more comfortable. He or she may also suggest you drink lots of fluids to help wash the stones out of your system. To read more, see [Treatments to help with pain from kidney stones](#)

Some kidney stones do need treatment. There are several options. What treatment you have will depend, in part, on how large your stone is and whether it is in your kidney, upper ureter, or lower ureter.

- If you have a smaller stone in your ureter, taking a drug called an **alpha-blocker** may help it pass out of your body more quickly.
- Breaking up stones with shock waves (**shock wave therapy**) is likely to work on smaller stones in the kidneys and lower down in the ureters.
- If you have a stone stuck in a ureter, a surgeon can thread a wire up from your bladder to get it out. This small operation is called an **ureteroscopy**. It causes more side effects than shock wave therapy.
- A small operation called **percutaneous nephrolithotomy (PCNL)** can help get rid of a stone in your kidney that is too big or difficult to reach with shock waves. The surgeon makes a cut in your back and uses a tube to remove the stone.

Which treatments work best? We've looked at the research and given a rating for each treatment according to how well it works.

### Treatments to remove kidney stones

#### Treatments that are likely to work

- [Alpha-blockers for stones in ureters](#)
- [Shock wave therapy](#)
- [Removing stones through a small cut in your back \(percutaneous nephrolithotomy\)](#)
- [Removing stones with a wire \(uteroscopy\)](#)

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## Treatments that need further study

- [Keyhole surgery](#)
- [Open surgery](#)

## What will happen to me?

Most kidney stones are small enough to work their way out of the body without needing treatment. But if your kidney stone is larger, you may need treatment to get rid of it.

Kidney stones usually vary in size from less than 2 millimetres across to more than 2 centimetres across. Most of them are less than 4 millimetres across, so they're small enough to pass out of people's bodies without treatment. <sup>[12]</sup>

If your stone shows up on an **x-ray**, your doctor might be able to tell you how big it is.

- If it's less than 5 millimetres across, you have about a 9 in 10 chance that it will leave your body without treatment. <sup>[5]</sup>
- If your stone is 5 millimetres to 10 millimetres across, you have about a 5 in 10 chance that it will leave your body without treatment. But you should be under the care of a kidney specialist (a urologist). <sup>[13]</sup>
- Stones bigger than 1 centimetre across rarely pass on their own. If you have a stone this size, you will need a procedure to remove it. <sup>[14]</sup>

## If you don't need a procedure to remove the stone

It can take two days to four weeks for a stone to pass through your body.

During this time, you will need to:

- Take strong painkillers to help you cope with the pain
- Drink plenty of water to increase the flow of urine and make it easier for the stone to pass. <sup>[14]</sup>

To read more, see [Treatments to help with pain from kidney stones](#) .

If you have a stone stuck in a **ureter**, your doctor might also recommend taking a medicine called an alpha-blocker. This type of drug is often used to treat **high blood pressure** or symptoms of an enlarged **prostate**, but studies show it can also help stones to pass through the ureters faster. To learn more, see [Treatments to remove kidney stones](#) .



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You'll probably be able to stay at home during this time, although you may need x-rays to check on the progress of the stone.

If the pain is very bad, or you're vomiting up fluids, you might have to be looked after in hospital. <sup>[14]</sup>

You should strain your urine in a tea strainer or something similar to catch any stones, or bits of stones, that pass. This is so that your doctor can find out what type of stone you have and advise you about what you can do to avoid getting another one. Your doctor will continue to keep an eye on you until an x-ray shows that the stone has gone. <sup>[13]</sup>

If you get more severe symptoms, this may mean your stone is blocking the flow of urine. This can be a serious problem. You should call your doctor straight away if you have: <sup>[15]</sup>

- Extreme pain in your back or side that will not go away
- Blood in your urine
- Fever and chills. This can mean you have an infection
- Vomiting
- Urine that smells bad or looks cloudy
- A burning feeling when you urinate.

You will need to see a urologist if you have a smaller stone that has not passed out of your body within four weeks. After that time, you are more likely to get problems like an infection. <sup>[13]</sup>

### If you do need a procedure to remove the stone

Before the 1990s, treatment for removing kidney stones involved a major operation. But now there are much simpler treatments. <sup>[16]</sup> You have a good chance of getting rid of your stone if you have one of these treatments.

They include:

- **Extracorporeal shock wave lithotripsy** (shock wave therapy). This is the most commonly used type of treatment. The doctor uses shock waves to break up the stone
- **Ureteroscopy**. The doctor feeds a fine tube up your urethra, through your bladder, and into your ureter to remove the stone

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- **Percutaneous nephrolithotomy (PCNL).** The doctor makes a small cut in your back and passes a needle and a very thin tube into your **kidney** to remove the stone.

What treatment you have will depend, in part, on how large your stone is and whether it is in your kidney, upper ureter, or lower ureter. To read more about these treatments, see [Treatments to remove kidney stones](#) .

You will probably need to go to hospital or a clinic for these treatments. You might be able to go home the same day, or you might need to stay in hospital for a few days.

### After the kidney stone has gone

Getting rid of your kidney stone is not the end of the story. You have about a 1 in 2 chance of getting another one within five to seven years. <sup>[5]</sup>

Your doctor may carry out some tests on your blood and urine to find out why you got a kidney stone. <sup>[17]</sup> Your doctor will also examine your stone to find out what type it is. <sup>[14]</sup> (To read about the types of stones, see [What are kidney stones?](#) )

### Preventing another kidney stone

Your doctor can prescribe medicines to help stop you getting some types of stones. The type of medicine you get depends on the type of stone that you've had. The medicines include: <sup>[17]</sup>

- Types of **diuretics** (water tablets) that reduce calcium in the urine
- A drug called allopurinol that reduces uric acid levels in the blood. The brand names are Caplenal, Cosuric, and Zyloric
- Drugs to make the urine less acidic
- Captopril or penicillamine to make cystine (one of the building blocks of **protein** ) less likely to cause stones. The brand names for captopril are Acepril, Capoten, Ecopace, and Kaplon. The brand name for penicillamine is Distamine.

We haven't looked at the research on these medicines in detail, so we can't say for certain whether they work.

### Changing your diet

Your risk of getting more stones is also affected by what you eat and drink. To reduce your risk, you can: <sup>[17]</sup>

- Drink lots of water. You can halve your risk of getting a second stone by drinking more than two litres of fluid a day

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- Eat a healthy diet, including calcium but not calcium supplements. People used to think that calcium in the diet made stones more likely. But now doctors think not eating enough calcium makes stones more likely. Foods rich in calcium include milk, cheese and other dairy products, peas and beans, leafy green vegetables, nuts, and bony fish like sardines and salmon
- Avoid using lots of salt
- Eat more vegetables. Vegetables make the urine less acidic.

If you've had a calcium oxalate stone (a type of calcium stone), you may need to reduce the amount of oxalate in your diet. This means cutting down on chocolate, nuts, rhubarb, strawberries, spinach, coffee, and tea.

But changes in diet don't work for everyone, and there is not a lot of evidence to show how well they work. So it's important to talk to your doctor before making big changes to what you eat.

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## Treatments:

### Painkillers called NSAIDs

In this section

Nonsteroidal anti-inflammatory drugs (NSAIDs) are a common type of painkiller. Ibuprofen is a well-known NSAID. You can buy some NSAIDs, including ibuprofen, over the counter from a pharmacy. You can also get stronger NSAIDs or higher doses of ibuprofen on prescription from your doctor.

Researchers have looked at NSAIDs called indometacin and diclofenac to see if they help with pain from kidney stones. These drugs can be given as tablets, injections, or suppositories (tablets you put inside your **rectum**).

In one study, people who took indometacin were less likely to need extra painkillers than people who took a dummy treatment (a **placebo**).<sup>[18]</sup>

- About 3 in 10 people taking a dummy treatment needed to take extra painkillers.
- But only 1 in 10 people taking indometacin needed more painkillers.

Another study found that people who took diclofenac were less likely to need to go to hospital because of the pain.<sup>[19]</sup>

- Nearly 7 in 10 people who took a dummy treatment had to go to hospital with pain.
- Only 1 in 10 people who took diclofenac needed to go to hospital.

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The studies we looked at didn't mention any side effects. We do know that NSAIDs can irritate your stomach, especially if you take them as tablets.

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### Stronger painkillers

In this section

If you get very bad pain, your doctor may suggest strong painkillers called opioids. There isn't any good research looking at how these drugs help people with kidney stones. But opioid painkillers are regularly used in this way, and doctors are sure that they work.

Doctors sometimes use a strong painkiller called pethidine to help with pain from kidney stones. It's given as tablets or as an injection. Other opioid painkillers include codeine, morphine, and diamorphine.

Opioid painkillers can have side effects.<sup>[20]</sup> They can make you feel sick or vomit. And they can make you constipated. You shouldn't take these drugs for too long. They can be addictive if you keep taking them.

Very rarely, breastfeeding babies can get serious problems if their mother is taking codeine.<sup>[21]</sup> There isn't a problem for most mothers, but a small minority of women absorb codeine much faster than normal. This means more of the drug gets into their breast milk, which can cause side effects for the baby. If your baby is sick, reluctant to feed, or sleeps more than usual, stop taking codeine and see your doctor straight away. If you become very sleepy yourself, it's also a good idea to talk to your doctor.

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### Extra fluids

In this section

If you're getting pain from a kidney stone, doctors usually suggest you drink plenty of fluids. The idea is that you'll make lots of urine, which will help flush out the kidney stone. Although this seems sensible, there isn't any research to tell us whether it helps or not.

If you're very ill and need treatment in hospital, your doctor may suggest fluids that are put into a vein through a tube (intravenous or IV fluids). For example, you may need IV fluids if you're vomiting and find it hard to drink. There's not enough good research to say if IV fluids can help with the pain from kidney stones. But, like drinking plenty of fluids, it may help to flush out the kidney stone.

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### Antispasmodic drugs

In this section

Researchers have tried drugs called antispasmodics to help with pain from a kidney stone. These drugs relax the muscles in your bowels. In one study, people took an antispasmodic drug called hyoscine (brand name Buscopan).<sup>[22]</sup> But it didn't work any better than a dummy treatment (a placebo). Another study found that an antispasmodic

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drug called papaverine may work as well as a strong painkiller. <sup>[23]</sup> But, overall, there's not enough evidence to be sure about these drugs.

The research didn't give much information about side effects. But it did say they weren't common.

Because antispasmodic drugs relax your bowels, they can make you constipated. <sup>[24]</sup> And they can make your heart beat slower or faster, but this only lasts a short time.

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### Alpha-blockers for stones in ureters

In this section

Alpha-blockers are often used to treat high blood pressure and the symptoms of an enlarged prostate. But people also sometimes take them if they have a smaller stone stuck in their ureter. Experts think alpha-blockers relax the muscles in the ureter so the stone can move through more easily. <sup>[12]</sup>

Most studies have looked at an alpha-blocker called tamsulosin (brand name Flomax). Other alpha-blockers include terazosin (Hytrin) and doxazosin (Cardura).

One summary of the research looked at 13 studies, including more than 1,000 people. <sup>[25]</sup> The summary said that:

- 78 in 100 people who took an alpha-blocker got rid of their stone within two to six weeks
- 46 in 100 people who took a dummy ( placebo ) drug got rid of their stone within two to six weeks.

You aren't likely to be given an alpha-blocker if your stone is large. Most of the studies have looked at people with stones smaller than 1 centimetre across. Also, in most studies, people's stones have been in their lower ureters. More studies need to explore which people are most likely to be helped by these drugs.

Alpha-blockers can cause side effects, but these are usually mild. Another review of studies found that 4 in 100 people taking alpha-blockers reported problems, including dizziness, headache, nausea and vomiting, and weakness. <sup>[26]</sup>

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### Shock wave therapy

In this section

Shock wave therapy is likely to work for removing stones.

Shock wave therapy breaks up stones so they get small enough to pass out of the body. Studies show that shock wave therapy doesn't work as well as an operation called

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[percutaneous nephrolithotomy \(PCNL\)](#) if you have a stone in one of your kidneys.<sup>[27]</sup> And it doesn't work as well as an operation called [ureteroscopy](#) if you have a stone in one of your ureters (the tubes that carry urine from your kidneys to your bladder).<sup>[28] [29] [30] [31]</sup>

But shock wave therapy is a simpler procedure than either of these other treatments, so it is used more often. It does not involve cutting into your body, and you should recover faster than you would with the other treatments. The disadvantage is that you might need several treatments to break up large or hard stones.<sup>[12]</sup>

In shock wave therapy, a machine sends shock waves through your body to the stone. Shock waves are created when energy is compressed and then suddenly released. The shock waves break the stone into smaller pieces, about the size of grains of sand. These pieces should then pass out of your body with your urine.<sup>[32]</sup>

There are two types of shock wave machines. With one, you sit in a tub of water. With the other, you lie on a table.<sup>[32]</sup> There's a loud noise when the shock waves are released, so you will probably wear ear muffs to protect your ears.

You'll need a [local anaesthetic](#) to numb the area that is being treated, but you probably won't need to stay in hospital overnight. You may have some pain and bruising from the shock waves. But you should be back to normal in a few days.<sup>[2]</sup>

One study compared shock wave therapy with a wait-and-see approach for people with stones in their ureters.<sup>[33]</sup> Shock wave therapy was better for getting rid of stones.

- About 7 in 10 people had got rid of their stones two days after shock wave therapy.
- But only 4 in 10 people who didn't have treatment had got rid of their stones.

Shock wave therapy causes fewer serious problems than treatment with [ureteroscopy](#), where doctors use a wire to remove stones.<sup>[30] [31] [34]</sup>

The side effects some people got from shock wave therapy included:<sup>[27] [30] [34]</sup>

- Bleeding during the treatment
- Blood in their urine after treatment
- Pain
- Pieces of the stone blocking their ureter
- Infection
- Blood clots

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- Being unable to urinate.

You may get some pain after shock wave therapy as the broken-up pieces of stone pass out of your body.<sup>[18]</sup> Your doctor can give you painkillers to help. To read more, see [Treatments to help with pain from kidney stones](#) .

Most doctors agree that shock wave therapy should be the treatment of choice for removing stones in the kidneys measuring less than 2 centimetres across.<sup>[35]</sup>

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### Removing stones through a small cut in your back

In this section

If you have a stone in one of your kidneys, a small operation where doctors make a cut in your back will probably be able to remove it. But there hasn't been much good-quality research.

This operation is called **percutaneous nephrolithotomy** (PCNL). It is often used when a stone is quite large or in a place that can't easily be reached with [shock wave therapy](#) .<sup>[2]</sup>

A review of the research found that PCNL worked more quickly than shock wave therapy to remove stones from the kidneys.<sup>[36]</sup> One good-quality study (a [randomised controlled trial](#) ) found that:<sup>[27]</sup>

- 95 out of 100 people who had PCNL had no stones three months after treatment
- 37 in 100 people who had shock wave therapy had no stones three months after treatment.

Altogether, 10 in 100 people who started out having shock wave therapy needed another procedure to get rid of their kidney stones.<sup>[27]</sup> Out of those who had PCNL, none needed another procedure.

Another study compared people who had PCNL with people who had [open surgery](#) .<sup>[37]</sup> Open surgery is where a surgeon makes a cut in your skin and removes the stone directly from your kidneys. The two operations worked about as well as each other. But PCNL had fewer side effects.

- About 16 in 100 people had side effects after PCNL.
- About 38 in 100 people had side effects after open surgery.

People also recovered faster after PCNL. They were able to go home three and a half days sooner, and go back to work one and a half weeks sooner.

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The side effects from PCNL can include: <sup>[27]</sup> <sup>[37]</sup>

- Blockage in the bowel
- Damage to the tissues around the kidney
- Blood clotting in the kidney
- Infection
- Blood in your urine.

If you have PCNL, you will be given either:

- A **local anaesthetic** to numb the spot where you're being treated plus a medicine to help you relax and stay still (a sedative)
- Or a **general anaesthetic** so you will sleep through the treatment.

A doctor will make a small cut in your back and pass a needle and a very thin tube into your kidney. The doctor will then put an instrument through the tube to remove the stone. <sup>[32]</sup>

You will probably have to stay in hospital for a few days after this operation. You should be able to go back to light activities after one to two weeks.

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## Removing stones with a wire (ureteroscopy)

In this section

If you have a stone stuck in a ureter, a procedure using a wire (a **ureteroscopy**) will probably be able to remove it. But this treatment can cause problems.

Ureteroscopy is a minor operation to remove stones. It works better than [shock wave therapy](#), but it can cause more side effects.

We found one review of the research (a **systematic review**) that included five good-quality studies ( **randomised controlled trials** ) comparing ureteroscopy with shock wave therapy. <sup>[31]</sup> After three months:

- 9 in 10 people who had ureteroscopy were stone-free
- 7 in 10 people who had shock wave therapy were stone-free.

But there were more problems with ureteroscopy, both during and after the treatment.



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In one of the studies in the review, 1 in 10 people treated with ureteroscopy had a ureter damaged or torn during treatment. <sup>[28]</sup>

Other side effects include: <sup>[31]</sup>

- Blood in the urine
- Urinary tract infection
- Kidney infection
- The ureter getting blocked
- Pain
- Being unable to urinate
- Fever
- Blood clotting.

If you have ureteroscopy, the doctor puts a long, thin wire into your **urethra** and passes it up through your bladder to reach the stone in the ureter. <sup>[32]</sup>

The doctor can then either remove the stone or break it up with shock waves. Afterwards, you may have a small tube left in the ureter for a few days to help it heal. <sup>[2]</sup>

You will probably have a **general anaesthetic** so that you sleep during the operation. You will most likely be able to go home later that day.

We can't say whether ureteroscopy works for stones that don't cause symptoms, for stones in the kidneys, or for stones in the upper part of the ureters. There hasn't been any good-quality research.

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## Open surgery

In this section

Open surgery can be used for stones that are too difficult to remove using other methods. It involves the doctor cutting through the skin and into the kidney or ureter to remove the stone. You have to stay in hospital for up to one week. You may need six weeks to recover afterwards.

We don't know how well open surgery works for kidney stones. There hasn't been enough research.

## Keyhole surgery

In this section

Keyhole surgery (or laparoscopic surgery) is a smaller operation than [open surgery](#) . Your surgeon removes the stone using small instruments that are put through a tiny cut in your skin.

We don't know how well keyhole surgery works for kidney stones. There hasn't been enough research.

The National Institute for Health and Care Excellence is the organisation that advises the government on NHS treatments. It says that keyhole surgery works well enough and is safe enough to be used in the NHS. But the operation should be done only by specialist surgeons. <sup>[38]</sup>

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## Further informations:

### Glossary:

#### kidney

Your kidneys are organs that filter your blood to make urine. You have two kidneys, on either side of your body. They are underneath your ribcage, near your back.

#### bladder

Your bladder is the hollow organ at the top of your pelvis that stores urine. It is similar to a balloon, only with stronger walls. It fills up with urine until you go to the toilet.

#### ureters

The ureters are tubes that carry urine from your kidneys to your bladder.

#### cystitis

Cystitis is inflammation of your bladder. It can make you feel as if you want to urinate all the time. The term is often used to describe a urinary tract infection that involves your lower urinary tract (your bladder and urethra) but not your kidneys. These infections are most often caused by bacteria.

#### proteins

A lot of your body's tissues are made out of proteins. Proteins can be made in your cells. Proteins are also part of the food you eat, particularly meat and dairy products. Your body breaks down the protein you eat into amino acids. Your cells then use these amino acids to build new proteins, which make up muscles, joints, hair and other parts of your body.

#### high blood pressure

Your blood pressure is considered to be high when it is above the accepted normal range. The usual limit for normal blood pressure is 140/90. If either the first (systolic) number is above 140 or the lower (diastolic) number is above 90, a person is considered to have high blood pressure. Doctors sometimes call high blood pressure 'hypertension'.

#### gout

This is a disease of the joints that is caused by a buildup of a chemical called uric acid. This chemical actually forms a crystal within the blood that gets stuck in the joints, causing swelling and pain. Gout attacks often occur in the big toe, but the disease can affect other joints in the body as well. Attacks are excruciatingly painful, but, fortunately, can be treated with a variety of medicines and a special diet.

#### hormones

Hormones are chemicals that are made in certain parts of the body. They travel through the bloodstream and have an effect on other parts of the body. For example, the female sex hormone oestrogen is made in a woman's ovaries. Oestrogen has many different effects on a woman's body. It makes the breasts grow at puberty and helps control periods. It is also needed to get pregnant.

#### menopause

When a woman stops having periods, it is called the menopause. This usually happens around the age of 50.

# Kidney stones

## **diuretics**

Diuretics are a type of medicine that reduce the amount of fluid in your body. The extra fluid is removed in your urine.

## **X-ray**

X-rays are pictures taken of the inside of your body. They are made by passing small amounts of radiation through your body and then onto film.

## **ultrasound**

Ultrasound is a tool doctors use to create images of the inside of your body. An ultrasound machine sends out high-frequency sound waves, which are directed at an area of your body. The waves reflect off parts of your body to create a picture. Ultrasound is often used to see a developing baby inside a woman's womb.

## **prostate**

The prostate is a small, solid gland that's about the size of a walnut. Only men have a prostate. The prostate makes the milky fluid that comes out of a man's penis when he has an orgasm. The fluid from the prostate helps keep sperm healthy and also helps them swim freely.

## **rectum**

The rectum is the last 15 to 20 centimetres (six to eight inches) of the large intestine, ending with the anus (where you empty your bowels from).

## **placebo**

A placebo is a 'pretend' or dummy treatment that contains no active substances. A placebo is often given to half the people taking part in medical research trials, for comparison with the 'real' treatment. It is made to look and taste identical to the drug treatment being tested, so that people in the studies do not know if they are getting the placebo or the 'real' treatment. Researchers often talk about the 'placebo effect'. This is where patients feel better after having a placebo treatment because they expect to feel better. Tests may indicate that they actually are better. In the same way, people can also get side effects after having a placebo treatment. Drug treatments can also have a 'placebo effect'. This is why, to get a true picture of how well a drug works, it is important to compare it against a placebo treatment.

## **local anaesthetic**

A local anaesthetic is a painkiller that's used to numb one part of your body. You usually get local anaesthetics as injections.

## **randomised controlled trials**

Randomised controlled trials are medical studies designed to test whether a treatment works. Patients are split into groups. One group is given the treatment being tested (for example, an antidepressant drug) while another group (called the comparison or control group) is given an alternative treatment. This could be a different type of drug or a dummy treatment (a placebo). Researchers then compare the effects of the different treatments.

## **general anaesthetic**

You may have a type of medicine called a general anaesthetic when you have surgery. It is given to make you unconscious so you don't feel pain when you have surgery.

## **systematic reviews**

A systematic review is a thorough look through published research on a particular topic. Only studies that have been carried out to a high standard are included. A systematic review may or may not include a meta-analysis, which is when the results from individual studies are put together.

## **urethra**

Your urethra is the tube that carries urine from your bladder out of your body. In a man, the urethra runs through the inside of the penis. In a woman, the urethra is shorter and opens onto the top of the vagina.

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