PROCEDURE

Lithotripsy

Lithotripsy breaks kidney or ureter stones into smaller pieces using shock waves or instruments.

PURPOSE
Break urinary stones into pieces for passage or removal

PROCEDURE TYPE
Therapeutic; minimally invasive, using shock waves or an endoscope

WHERE IT IS DONE
Outpatient clinic or operating theatre

ANAESTHESIA
Moderate sedation or general, based on technique

HOW LONG IT TAKES
30 minutes to three hours, based on technique

PREPARATION
Fasting and blood-thinner planning; urine testing may be needed

RECOVERY
Same day usually; no driving after sedation or anaesthesia

MAIN RISKS
Bleeding, infection, ureter blockage, incomplete stone clearance

RESULTS
Fragmentation known immediately; clearance assessed over following weeks

Overview

Lithotripsy breaks stones in the urinary system into smaller pieces. It is most often used for stones in a kidney or ureter, the tube carrying urine from a kidney to the bladder.

There are several forms of lithotripsy. Extracorporeal shock-wave lithotripsy, or ESWL, sends focused pressure waves through the skin toward the stone. The pieces are then expected to pass in your urine.

During laser lithotripsy, a surgeon passes a thin viewing instrument called a ureteroscope through the urethra and bladder into the ureter or kidney. A laser breaks the stone, and some fragments may be removed with a small basket.

Large or complex kidney stones may be broken during percutaneous nephrolithotomy. This

involves passing instruments into the kidney through a small opening in the back.

The best method is influenced by the stone's size, location, hardness and number, as well as your health and urinary anatomy.

Why the procedure is performed

Lithotripsy may be offered when a stone is unlikely to pass on its own or is causing ongoing problems. These may include pain, bleeding in the urine, blockage of urine flow or repeated urinary infections.

Treatment may also be considered when a stone is growing, threatens kidney function or could create a problem for someone who cannot easily reach urgent medical care.

The aim is to clear the stone while limiting injury to the kidney and surrounding tissue. One treatment does not always remove every fragment. Some people need another lithotripsy session or a different procedure.

Who should and should not have it

Lithotripsy may be suitable if imaging confirms a stone that needs treatment and the chosen technique can safely reach or target it. Shock-wave treatment often works best for selected kidney and upper ureter stones. Ureteroscopy can reach stones in many parts of the urinary tract and allows fragments to be removed directly.

Small stones that are likely to pass may not need a procedure. Monitoring, pain relief and other supportive treatment may be reasonable if there is no infection, serious blockage or threat to kidney function.

Shock-wave lithotripsy is not used during pregnancy because the effects of shock waves could harm the pregnancy. It may also be unsuitable when a stone cannot be targeted clearly, urine cannot drain beyond the stone, or bleeding risk cannot be managed safely.

Lithotripsy is usually delayed if you have an untreated urinary infection. An infected, blocked kidney often needs urgent drainage with a stent or kidney drainage tube before the stone itself is treated.

Blood-clotting disorders and medicines that reduce clotting can increase bleeding risk. Do not stop a prescribed blood thinner like warfarin or apixaban on your own. Your urology and prescribing teams should make a plan based on the medicine and your reason for taking it.

How to prepare

Your treating facility's own instructions take priority because preparation differs between shock-wave and endoscopic procedures.

You may have urine and blood tests to check for infection, kidney function and clotting problems. Imaging helps the team confirm the stone's position and choose the treatment approach.

Preparation may include:

Tell the team if you could be pregnant, have a heart device or implanted medical equipment, or have previously reacted to anaesthesia, contrast dye or antibiotics.

- Following specific instructions about when to stop eating and drinking
- Arranging changes to blood thinners or diabetes medicines
- Taking prescribed antibiotics like amoxicillin or doxycycline if your team identifies an infection risk
- Arranging for an adult to take you home after sedation or anaesthesia
- Removing jewellery and bringing an up-to-date medicine list

What happens during the procedure

For shock-wave lithotripsy, you lie on a treatment table while imaging is used to locate the stone. A water-filled cushion or treatment head is placed against your skin. The machine sends repeated pressure waves toward the stone. You may hear tapping sounds and feel a snapping or pulsing sensation.

Pain medicine and sedation are commonly used. Some facilities use general anaesthesia, meaning you are fully unconscious. The team monitors your breathing, heart rate and blood pressure.

For laser lithotripsy, you are usually under general anaesthesia. The surgeon passes a ureteroscope through the natural urinary opening, so there is normally no skin incision. Laser energy breaks the stone into dust or small fragments. Pieces may be collected for analysis.

A temporary ureteric stent may be left between the kidney and bladder. This thin tube keeps urine flowing while swelling settles and fragments pass. It can cause urinary urgency, bladder discomfort or aching in the kidney area, especially when you urinate. Your team should tell you how and when it will be removed.

Recovery and what to expect afterward

Mild soreness in the side or back is common after shock-wave treatment. Passing fragments can cause cramping similar to stone pain. After ureteroscopy, burning during urination and discomfort from a stent are common for a short time. Use only the pain medicine recommended for you.

You can usually drink and eat once you are awake and not feeling sick. Fluids may help you stay hydrated, but follow any fluid limits given for a heart or kidney condition.

Gentle walking is usually encouraged. Avoid strenuous exercise and heavy lifting for the period specified by your team. You may be asked to pass urine through a strainer so fragments can be collected for testing.

Do not drive home after sedation or general anaesthesia. Avoid driving until the anaesthetic effects have passed, you are no longer taking medicine that impairs alertness, and pain does not limit safe movement.

Many people return to desk-based work within a few days. A physically demanding job, ongoing stone pain or a stent may require more time away.

Risks and possible complications

Some blood in the urine is expected for a short period. Bruising or tenderness can occur where shock waves entered the body.

Possible complications include:

A line of fragments can collect in the ureter after shock-wave treatment. This is sometimes called a "stone street." It may settle as pieces pass, but blockage, severe pain or infection can require another procedure.

Anaesthesia also has risks, including nausea, allergic reactions and breathing or heart problems. Your anaesthesia team can explain risks that apply to your health.

- A urinary infection, which can sometimes become serious
- Bleeding around the kidney or elsewhere in the urinary tract
- Stone fragments blocking the ureter
- Fragments remaining and requiring another treatment
- Injury or narrowing of the ureter after an endoscopic procedure

- Stent pain, urinary urgency or movement of the stent

Results and follow up

Your surgeon can usually tell whether the stone broke during the procedure. This does not always mean every piece has left the urinary system.

Fragments may pass over days or weeks after shock-wave lithotripsy. Follow-up imaging may be arranged to check for remaining stones and make sure urine is draining properly.

If a fragment was collected, laboratory analysis can identify what the stone is made from. You may also be offered blood or urine testing to look for factors that encourage stones to form.

Routine follow-up should confirm any stent-removal plan, review imaging and discuss ways to reduce future stone risk. Prevention advice is based on the stone type and your test results rather than a single diet for everyone.

Alternatives

The realistic alternatives depend on the stone and whether it is causing blockage, infection or uncontrolled pain.

Waiting is not a safe alternative when an infected kidney is blocked. In that situation, urgent drainage may be needed before definitive stone treatment.

- Observation: Avoids a procedure, but passage can take time and may not occur
- Medicines to support stone passage: May help selected ureter stones, but cannot reliably clear every stone
- Ureteroscopy: Often clears more stone directly, but requires instruments in the urinary tract and usually anaesthesia
- Percutaneous nephrolithotomy: Can remove a larger stone burden, but involves an opening into the kidney and a longer recovery
- Stone-dissolving treatment: Can treat certain uric acid stones, but does not dissolve most calcium stones and works gradually
- Open or keyhole surgery: Rarely needed, but may be considered when less invasive methods are unsuitable or unsuccessful

When to call your healthcare team

Contact your healthcare team during routine hours if pain or urinary symptoms are not gradually improving, you are unsure about stent removal, or you have not received a follow-up plan.

Seek urgent medical assessment if you develop:

Call emergency services if you collapse, become confused, have severe difficulty breathing or cannot be awakened normally. These are emergency symptoms rather than routine recovery effects.

- Fever or shaking chills
- Inability to pass urine
- Worsening pain that is not controlled by prescribed medicine
- Persistent vomiting or inability to keep fluids down
- Heavy bleeding, large clots or bleeding that is increasing
- A stent that comes out unexpectedly

Common questions

Will I be asleep?

For laser lithotripsy, you will usually have general anaesthesia and be asleep. Shock-wave treatment may use pain medicine with sedation or general anaesthesia, depending on the equipment and facility.

Can I drive myself home?

No if you received sedation or general anaesthesia. Arrange for an adult to take you home and follow the facility's instructions about supervision afterward.

How painful is lithotripsy?

Anaesthesia or sedation limits pain during treatment. Afterward, soreness and cramping can occur as swelling settles and fragments pass. A ureteric stent may cause aching, urgency or burning.

When will I know if it worked?

The surgeon can often see whether the stone fragmented during treatment. Follow-up imaging over the following weeks shows whether fragments have cleared.

Will I need a stent?

Not everyone does. A stent may be used after ureteroscopy or when swelling and fragments could block urine flow. It must be removed or exchanged according to your team's plan.

Can the stone come back?

Lithotripsy treats the current stone but does not remove the reason it formed. Stone analysis and blood or urine tests can help guide prevention.

Sources

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