



PERCUTANEOUS NEPHROLITHOTOMY (KEYHOLE SURGERY for KIDNEY STONES)

Information about your procedure from
The British Association of Urological Surgeons (BAUS)

This leaflet contains evidence-based information about your proposed urological procedure. We have consulted specialist surgeons during its preparation, so that it represents best practice in UK urology. You should use it in addition to any advice already given to you.

To view this leaflet online, scan the QR code (above right) or type the short URL below it into your web browser.



<http://rb.gy/c3cyh>

Further general information about kidney stones can be found on the Patients' section of the BAUS website under "[I think I might have ... kidney stones](#)".

KEY POINTS

- The aim of this procedure is to fragment stones in the kidney telescopically using a "keyhole" approach to your kidney through a puncture in the skin of your back
- It is a major procedure and is usually reserved for larger stones or for patients with complex kidney anatomy
- We puncture the kidney with a needle, under ultrasound or X-ray guidance, and stretch up a "track" into the kidney through which we can pass a telescope
- The stone is broken up using a laser fibre, a lithoclast (small pneumatic drill) or an ultrasonic suction probe
- This procedure has largely eliminated the need for open surgery to remove kidney stones, because there is a similar stone clearance rate and recovery is much faster

What does this procedure involve?

This involves puncturing your kidney through the skin of your back or side with a needle (using X-ray or ultrasound to guide the puncture) and stretching up a track into the kidney through which a telescope can be passed. We may need to puncture the kidney at more than one site to reach all your stone(s).

We then fragment the stone(s) in your kidney using a laser, lithoclast (mechanical fragmenter) or ultrasound probe. We may leave a drainage tube in your kidney (nephrostomy) or an internal tube (ureteric stent) at the end of the procedure and we usually put a catheter in your bladder.

What are the alternatives?

- **Observation** – stones smaller than 5mm in diameter can pass by themselves but sometimes get “stuck” within the kidney; larger stones (greater than 7mm diameter) rarely pass
- **[Extracorporeal shockwave lithotripsy \(ESWL\)](#)** – by “firing” shockwaves, generated under water, through your skin to break the stone into fragments which you then pass yourself
- **[Flexible ureteroscopy](#)** – using a thin flexible telescope passed into your bladder, up through your ureter and into your kidney, where the stone is broken up using laser energy
- **Open/robotic stone removal** – although very unusual nowadays, if all the above techniques fail we may need to resort to open or roboticsurgery to remove your stone(s)

What happens on the day of the procedure?

Your urologist (or a member of their team) will briefly review your history and medications, and will discuss the surgery again with you to confirm your consent.

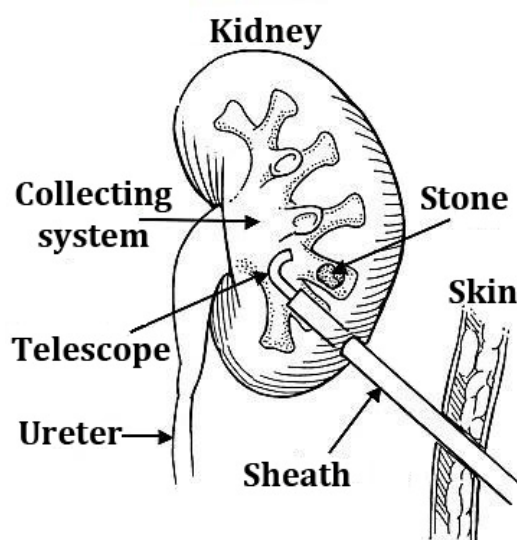
An anaesthetist will see you to discuss the options of a general anaesthetic or spinal anaesthetic. The anaesthetist will also discuss pain relief after the procedure with you.

We may provide you with a pair of TED stockings to wear, and we may give you a heparin injection to thin your blood. These help to prevent blood clots from developing and passing into your lungs. Your medical team will decide whether you need to continue these after you go home.

We may arrange an X-ray or CT scan for you on the day of the operation, or in the days leading up to it, to be sure that the stone has not changed in any way.

Details of the procedure

- we normally use a full general anaesthetic and you will be asleep throughout the procedure
- we usually give you an injection of antibiotics before the procedure, after you have been checked for any allergies
- we put a telescope into your bladder through the urethra (water pipe) and use it to put a fine tube (ureteric catheter) up to your kidney under X-ray control
- we put a catheter into your bladder through your urethra (waterpipe)
- we may need to turn you on to your face (in the prone position) and puncture the affected kidney with a needle using X-ray or ultrasound guidance; contrast medium (X-ray dye) can be injected through the ureteric catheter to help this process
- once the needle is correctly positioned in the kidney, we replace it with a guide wire over which dilators are threaded, or a special balloon is passed, to stretch up a “track” into the kidney
- the diameter of this track is determined by the size of telescope which we will use to see inside the kidney (normal, mini or ultra-mini)
- we pass the telescope (nephroscope) through a sheath, along the track, to see the stone(s) inside the kidney (pictured).
- the stones are broken up using a laser, a lithoclast or an ultrasound probe and the larger fragments are removed using grasping forceps or suction
- when smaller nephroscopes (mini or ultra-mini) are used, the stones are “dusted” to produce tiny fragments which can pass by themselves
- we may insert a temporary drainage tube (a nephrostomy tube) into the kidney at the end of the procedure



- in some patients, we place a temporary tube (a ureteric stent) between the kidney and the bladder, either instead of or as well as a nephrostomy
- the procedure takes 1-3 hours to complete, depending on the size of your stone(s)
- you can expect to be in hospital for one to three days but, in some patients, the operation may be done as a day-case procedure
- your bladder catheter may be removed at the end of the procedure or, more usually, the day after



Before you go home, we may carry out an X-ray or CT scan (which is more sensitive than plain X-ray) to see if all the stones have been cleared. Occasionally, we may X-ray your kidney using contrast medium (dye) put down the nephrostomy tube (a nephrostogram). If this is satisfactory, the nephrostomy tube will be removed.











You may get some leakage of urine from the nephrostomy site. This usually stops within 24 to 48 hours and can be managed with simple dressings.

Further information and a short [video of percutaneous kidney stone removal](#) are available on the BAUS website.

Are there any after-effects?

The possible after-effects and your risk of getting them are shown below. Some are self-limiting or reversible, but others are not. We have listed some very rare but important after-effects (occurring in less than 1 in 250 patients) individually. The impact of after-effects can vary a lot from patient to patient; you should ask your surgeon's advice about the risks and their impact on you as an individual:

After-effect	Risk
Mild bleeding from the kidney into your urine (into the nephrostomy tube and/or your bladder)	 All patients
Temporary insertion of a bladder catheter	 Most patients

Recurrent (new) stone formation over the next five to 10 years, requiring further surgery or other treatment		1 in 2 patients (50%)
Urinary infection requiring antibiotic treatment		Between 1 in 2 & 1 in 10 patients
Need for more than one puncture to clear your stones (depending on the site of the stones)		Between 1 in 2 & 1 in 10 patients
Residual stones requiring further surgery or other treatment		Between 1 in 5 & 1 in 20 patients
Sepsis (infection) requiring an unexpected intensive care admission		Between 1 in 10 & 1 in 100 patients
Moderately severe bleeding from the kidney requiring radiological intervention to block the blood supply to the damaged area (embolisation)		Between 1 in 50 & 1 in 100 patients
Failure to obtain satisfactory access to your kidney requiring further surgery or alternative treatment		Between 1 in 50 & 1 in 100 patients
Infection in the nephrostomy puncture wound in your back		1 in 100 patients (1%)
Accidental injury to organs near to the kidney (e.g. liver, spleen, lung, large bowel)		1 in 100 patients (1%)
Anaesthetic or cardiovascular problems possibly requiring intensive care (including chest infection, pulmonary embolus, stroke, deep vein thrombosis, heart attack and death)		Between 1 in 50 & 1 in 250 patients (your anaesthetist can estimate your individual risk)

Major damage to blood vessels in your kidney requiring emergency surgery to remove the kidney (nephrectomy)



Less than 1 in 1000 patients (less than 0.1%)

What is my risk of a hospital-acquired infection?

Your risk of getting an infection in hospital is between 4 & 6%; this includes getting *MRSA* or a *Clostridium difficile* bowel infection. This figure is higher if you are in a “high-risk” group of patients such as patients who have had:

- long-term drainage tubes (e.g. catheters);
- bladder removal;
- long hospital stays; or
- multiple hospital admissions.

What can I expect when I get home?

- you will be given advice about your recovery at home
- you will be given a copy of your discharge summary and a copy will also be sent to your GP
- any antibiotics or other tablets you may need will be arranged & dispensed from the hospital pharmacy
- you should drink twice as much fluid as you would normally for the first 24 to 48 hours, to flush your system through and reduce the risk of infection or blockage of your urine flow by blood clots
- it may take at two to four weeks to recover from percutaneous nephrolithotomy surgery
- you may return to work when you are comfortable enough or when your GP is satisfied with your progress; this is unlikely to be within 10 days, especially if your job is physically demanding
- if you develop a fever, pain in the area of the affected kidney, severe pain on passing urine, inability to pass urine or worsening bleeding, you should contact your urology unit or GP immediately

You can reduce your risk of further stone formation by altering your diet and fluid intake. Ask your urologist or specialist nurse for further details about this or download the BAUS leaflet [“Dietary advice for stone formers”](#).

General information about surgical procedures

Before your procedure

Please tell a member of the medical team if you have:

- an implanted foreign body (stent, joint replacement, pacemaker, heart valve, blood vessel graft);
- a regular prescription for a blood thinning agent (e.g. warfarin, aspirin, clopidogrel, prasugrel, ticagrelor, fondaparinux, apixobaxan, edobaxan, rivaroxaban, dabigatran);
- a present or previous MRSA infection; or
- a high risk of variant-CJD (e.g. if you have had a corneal transplant, a neurosurgical dural transplant or human growth hormone treatment).

Questions you may wish to ask

If you wish to learn more about what will happen, you can find a list of suggested questions called "[Having An Operation](#)" on the website of the Royal College of Surgeons of England. You may also wish to ask your surgeon for his/her personal results and experience with this procedure.

Before you go home

We will tell you how the procedure went and you should:

- make sure you understand what has been done;
- ask the surgeon if everything went as planned;
- let the staff know if you have any discomfort;
- ask what you can (and cannot) do at home;
- make sure you know what happens next; and
- ask when you can return to normal activities.

We will give you advice about what to look out for when you get home. Your surgeon or nurse will also give you details of who to contact, and how to contact them, in the event of problems.

Smoking and surgery

Ideally, we would prefer you to stop smoking before any procedure. Smoking can worsen some urological conditions and makes complications more likely after surgery. For advice on stopping, you can:

- contact your GP;
- access your local [NHS Smoking Help Online](#); or
- ring the Smoke-Free National Helpline on **0300 123 1044**.

Driving after surgery

It is your responsibility to make sure you are fit to drive after any surgical procedure. You only need to [contact the DVLA](#) if your ability to drive is

likely to be affected for more than three months. If it is, you should check with your insurance company before driving again.

What should I do with this information?

Thank you for taking the trouble to read this information. Please let your urologist (or specialist nurse) know if you would like to have a copy for your own records. If you wish, the medical or nursing staff can also arrange to file a copy in your hospital notes.

What sources have we used to prepare this leaflet?

This leaflet uses information from consensus panels and other evidence-based sources including:

- the [Department of Health \(England\)](#);
- the [Cochrane Collaboration](#); and
- the [National Institute for Health and Care Excellence \(NICE\)](#).

It also follows style guidelines from:

- the [Royal National Institute for Blind People \(RNIB\)](#);
- the [Information Standard](#);
- the [Patient Information Forum](#); and
- the [Plain English Campaign](#).

DISCLAIMER

Whilst we have made every effort to give accurate information, there may still be errors or omissions in this leaflet. BAUS cannot accept responsibility for any loss from action taken (or not taken) as a result of this information.

PLEASE NOTE: the staff at BAUS are not medically trained, and are unable to answer questions about the information provided in this leaflet. If you have any questions, you should contact your Urologist, Specialist Nurse or GP in the first instance.