



## PERCUTANEOUS NEPHROLITHOTOMY [PCNL]

### A patient's guide

#### What is PCNL?

PCNL is a minimally invasive or “keyhole” surgical technique for treating kidney stones. It tends to be reserved for larger stones and those stones that have failed to respond to extra-corporeal shock wave lithotripsy (ESWL - the common outpatient stone treatment that focuses shock waves on stones without the need for a general anaesthetic or hospital admission).

#### Pre-operative investigations

Before proceeding with a PCNL a CT scan is required to image the precise position of the stone in relation to the internal architecture of the collecting system of the kidney (the pelvi-calyceal system – PCS). This allows to plan the track that will be used to gain access to the stone. Sometimes a renogram will be arranged as well to determine the functional contribution made by the kidney containing the stone, for if it functions very poorly it is sometimes more sensible to simply remove the kidney with the stone rather than removing the stone from the kidney. Both these tests are performed as an outpatient. Those patients submitted for PCNL after these investigations will need to attend the hospital a week or two before the procedure for a “pre-operative assessment (POAC)”.

#### Hospital stay

Patients undergoing PCNL are admitted to Southmead Hospital as an inpatient and can typically expect to be in hospital for about 3 nights. The procedure is performed by a combined team of Urological Surgeons, Radiologists and Anaesthetists. The procedure involves key hole access into the kidney drainage system, fragmentation and extraction of stone(s).

#### The procedure

The procedure is performed under general anaesthetic (GA). A thin telescope is passed into the bladder to allow a fine plastic tube (catheter) to be passed up the ureter (the drainpipe from the kidney above to the bladder below). The patient is then turned over (while still asleep under GA) and laid on their front.

The Radiologist passes a fine hollow needle through the skin into the PCS of the kidney, guided by ultrasound or contrast that has been passed up the ureteric catheter which shows up under X-ray screening. A guidewire is passed down the needle and the needle is removed. Plastic tubes of increasing diameter are passed over the guidewire until a track has been made through the skin into the kidney that is large enough to accept metal dilators of increasing diameter. Alternatively, a special balloon catheter maybe used that incorporates a high-pressure balloon which can be inflated to long sausage shape, so enlarging the track to permit an operating tube to be placed over the balloon.

The surgeon passes a telescope down the operating tube to find the stone. A selection of devices are available that can be passed down the telescope or operating tube to allow fragmentation of the stone and removal of the fragments.

Occasionally several tracks need to be made in order to deal fully with a larger or more complex stone.

When all (or as much as possible) of the stone has been removed a plastic tube (nephrostomy) is passed down the operating tube, and the latter is removed. A catheter tube is left in the bladder, but the ureteric catheter is removed, and the patient is woken up and returned to the ward via the theatre recovery area.

## Post-operative care

Following the procedure patients usually have at least three temporary tubes in them:

A nephrostomy, which drains to a bag.

A urinary catheter in the bladder, which drains to a bag.

An intravenous fluid infusion or “drip”

There is often a syringe driver attached to the same line as the drip which allows patients to administer their own pain-relief if and when they need it (patient-controlled analgesia – PCA).

Patients may usually eat and drink as soon as they feel they wish to. The urinary catheter is removed the next day. The nephrostomy tube is clamped the next day.

An Xray KUB or USS of the kidneys maybe performed a day or two after the procedure to assess the kidneys. This involves a trip down to the X-ray department. Provided patients are comfortable they can usually be discharged following removal of the nephrostomy.

## What can go wrong?

There is no such thing as a perfect surgical procedure that never has any complications. In advising a patient to undergo surgery surgeons must balance the risks, benefits and imponderables of all the options available in order to recommend the best solution for their patient. The following are recognised complications of PCNL that will have been considered by your surgeon. None of them are “common” but you must be informed of any complication that occurs in 1% or more of cases, or is so significant that any reasonable person would wish to have been informed of it before consenting to undergo the procedure.

**Failure:** Occasionally it proves impossible to gain adequate access to the PCS to allow the procedure to go ahead safely, in which case it is aborted. Sometimes, when access is obtained it proves impossible to find the stone, or if it can be found it can occasionally prove impossible to completely destroy it. This may be due to difficult access within the PCS, technical equipment failure, bleeding obscuring vision or very hard stones. In this situation we have to “think again” and review the options for another occasion.

**Bleeding:** The initial track is established in a semi-blind manner – the blood vessels do not show up on X-ray screening – so it is possible to cause bleeding in establishing access. Likewise, bleeding can occur once inside the kidney, especially if the access track was difficult to establish and there is angulation with respect to the internal architecture which makes instrumentation harder and internal damage more likely. Occasionally a blood transfusion is required.

**Kidney loss:** Major vascular damage (*i.e.* significant damage to a major blood vessel) is very rare, but well recognised, and may require major corrective surgery or even removal of the kidney. Likewise, substantial damage to the kidney itself requiring it's removal or leading to “functional” loss is very rare, but recognised.

**Sepsis:** All large renal stones contain bacteria, which may be released, as the stone is shattered. They then have easy access to the bloodstream and may be washed into it by the irrigation that is a necessary component of the telescope procedure causing “uro-sepsis”. Likewise they may give rise to urinary infection. Antibiotics are given routinely before and after the procedure to reduce the risks of serious infection.

**Pain:** The procedure is performed “asleep” under GA and most anaesthetists will set up a patient-controlled analgesia system for the immediate post-operative period. If this proves inadequate there is an acute pain team who can be called upon to ensure that patients are comfortable. Rarely patients can experience persistent pain related to the surgical track, which occasionally requires referral to a pain specialist.

**Pneumonia:** The procedure can be quite long (several hours) with the patient lying face down with the weight of their body compressing their chest. Post-operative chest infections are therefore more common with PCNL than with more routine surgery.

**Pneumothorax:** If the access track needs to be made from the top of the kidney it is possible for it to pass through the lower limit of the pleural cavity (the space that contains the lung) allowing air to enter the cavity and so collapse the lung. Theoretically it would also be possible for this space to fill up with irrigation fluid. Should this occur, a “chest drain” can be placed into the pleural cavity, which allows the lungs to re-expand. This would remain in place for a few days post-operatively.

**Bowel injury:** If the access track “went too far” it could theoretically enter the peritoneal cavity (the space containing the bowels/guts) and so allow damage to the bowels.

**General Anaesthesia:** Modern general anaesthetics are remarkably safe, indeed, the emphasis throughout any interventional procedure is always centred on patient safety. However, all GAs carry risks, the nature and magnitude of which vary according to the age, general health and body habitus of the patient. These risks, although very rare, include death, heart attack, stroke, deep vein thrombosis, pulmonary embolus and pneumonia. All patients are assessed by an anaesthetist before undergoing a general anaesthetic. They will answer any questions or concerns voiced by patients.