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Treatment of Kidney and Ureteral Stones

The underlined terms are listed in the glossary.

You have been diagnosed with a kidney or ureteral stone. This leaflet describes the different treatment options which you can discuss with your doctor. Together you can decide which approach is right for you.

Factors that influence the decision include:

- Your symptoms
- Stone characteristics
- Your medical history
- The kind of treatment available at your hospital and the expertise of your doctor
- Your personal preferences and values

Not all stones require treatment. You need treatment if your stone causes discomfort and does not pass naturally with urine. Your doctor may also advise treatment if you have pre-existing medical conditions.

There are different treatment methods for emergency and non-emergency situations.

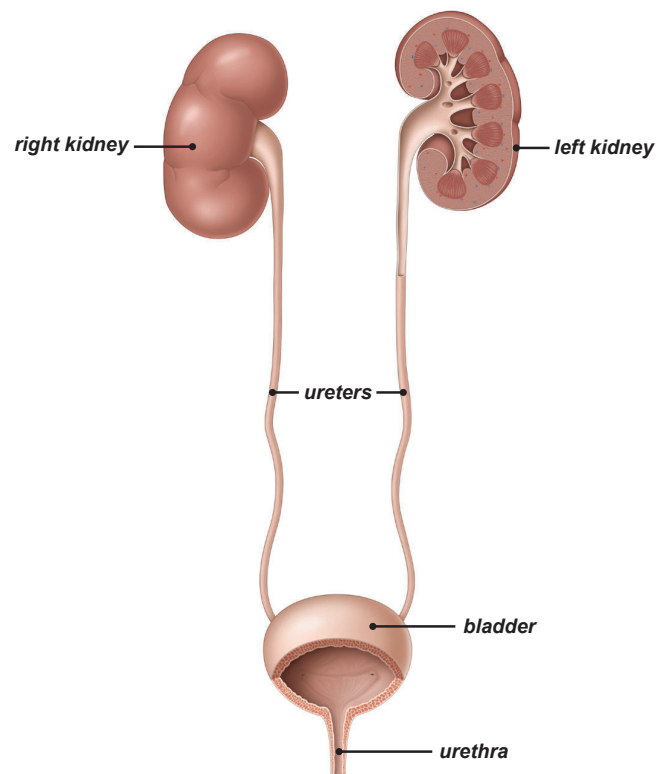


Fig. 1: The urinary tract.

Treatment of emergency situations

Acute renal colic

Renal colic is an acute, painful situation caused by a stone that blocks the ureter. Go to the family doctor or the nearest emergency room as soon as possible to relieve the pain.

Pain is usually relieved with NSAIDs (non-steroidal anti-inflammatory drugs), which you can take as a tablet or a suppository. If this first step of treatment does not help, you will get stronger painkillers called opioids. Usually, they are injected directly into the vein. The disadvantage of opioids is that they can make you nauseous.

On a rare occasion, drugs do not work. In this case the doctor may need to drain urine from your kidney. This is called decompression.

There are two methods of decompression:

- By placing a ureteral JJ-stent in your ureter through your urethra (**Fig. 2**)
- By inserting a percutaneous nephrostomy tube into your kidney directly through the skin (**Fig. 3a and 3b**)

Both methods are equally effective.

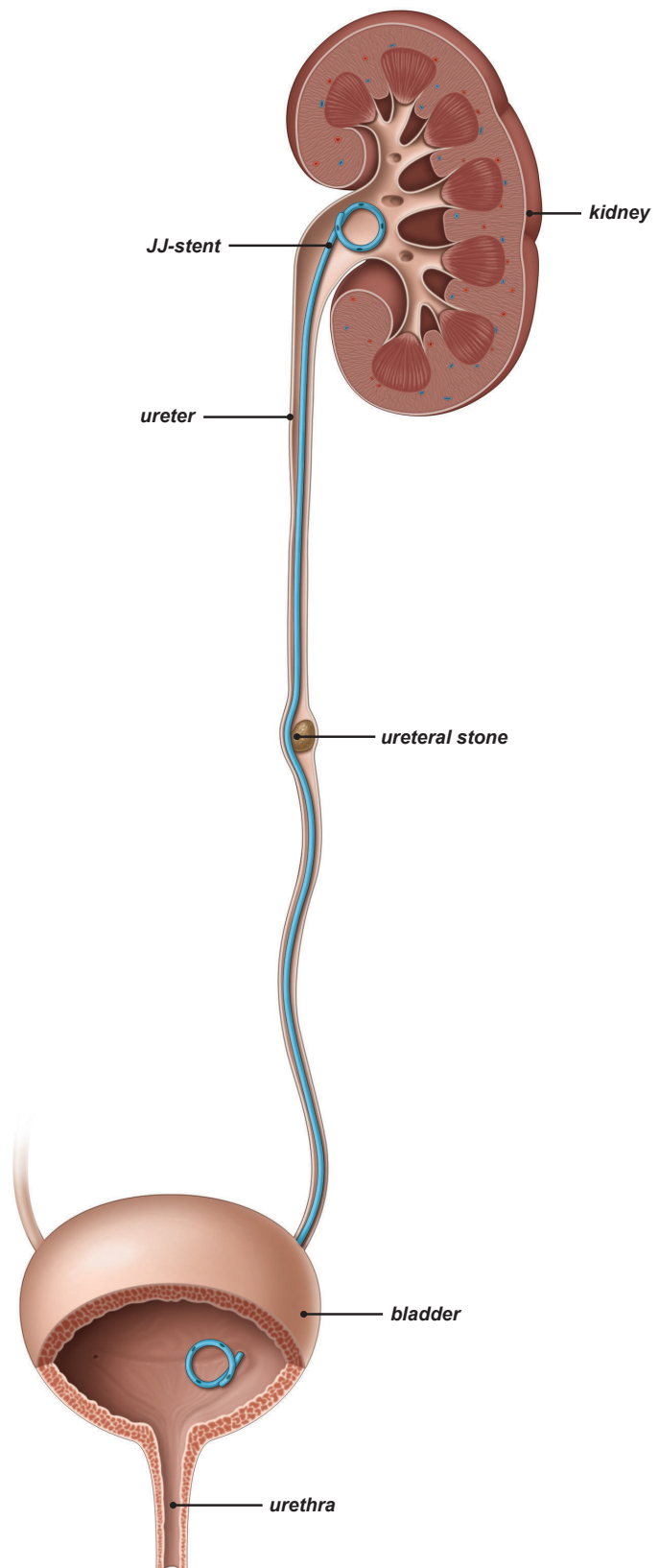


Fig.2: A JJ-stent is inserted to make sure urine can flow through the urinary tract.

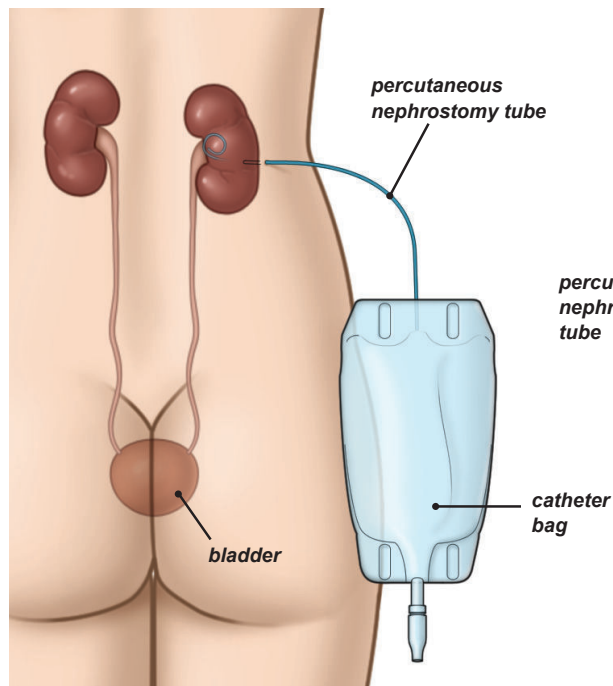


Fig. 3a: A percutaneous nephrostomy tube is used to drain urine directly from the kidney into the catheter bag.

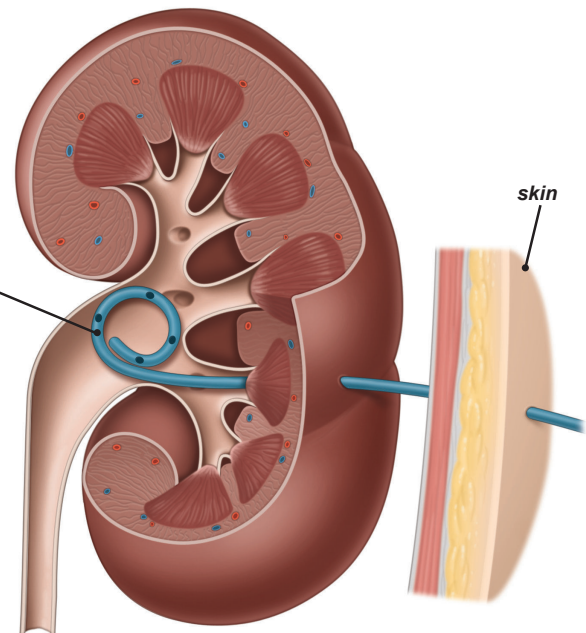


Fig. 3b: A percutaneous nephrostomy tube inside the kidney.

Obstructed and infected kidney

If you have renal colic together with a fever or if you feel unusually tired, you should go to the closest urological department at once. You will get blood and urine tests to check if you have an infected, obstructed kidney. If you do, you need immediate decompression to relieve the pressure in your kidney.

After the decompression you will get antibiotics to clear the infection. You can only be treated to have your stone removed after the infection is gone.

Treatment of non-emergency situations

If you have a kidney or ureteral stone which does not cause discomfort, you will generally not receive treatment. Your doctor will give you a time schedule for regular control visits to make sure your condition does not get worse.

If your stone is likely to pass with urine, your doctor can prescribe drugs to ease the process. This is called conservative treatment.

If your stone continues to grow or causes frequent and severe pain, you will get active treatment.

Conservative stone treatment

Most kidney or ureteral stones will leave your body while you urinate. However, depending on the size and location of the stone, it will take you some time to pass the stone. You may suffer from renal colic when the stone moves. If you have a very small stone there is a 95% chance of passing this stone within 6 weeks.

In general you can keep this in mind:

- The closer the stone is to the bladder, the higher the chance of passing it
- The bigger the stone, the smaller the chance of passing it

Medical Expulsive Therapy

Your doctor may prescribe drugs (so called alpha-blockers or nifedipine) to help you pass the stone faster and to limit pain while it moves. This is called Medical Expulsive Therapy (MET) and it is most effective for ureteral stones.

Alpha-blockers are not registered as drugs for stone removal but they can be helpful when passing stones. If you want MET, your doctor will discuss the possible side-effects of the drugs with you.

During MET you should see your doctor regularly - how often depends on his or her recommendation. The doctor needs to check if the stone keeps moving and if your kidneys continue to function well.

If you are in a lot of pain, if you have an infection, or if your kidneys do not function well, MET is not an option. Your practitioner will discuss other treatment options with you.

Dissolving your stone

If you suffer from uric acid stones, it may be possible to dissolve your stone. This is done by increasing the pH-value of your urine to make it alkaline rather than acidic. Oral medication like alkaline citrate or sodium bicarbonate is generally prescribed. At a pH-level of 7.0-7.2, the stone will decrease in size and may even dissolve completely. You can easily check the pH-value of your urine at home by using a dipstick test.

Active stone treatment

Kidney or ureteral stones should be treated if they cause symptoms. If you don't have symptoms you may still get treatment in case:

- The stone continues to grow
- You are at high risk of forming another stone (See *Metabolic Evaluation for Kidney and Ureteral Stones*)
- You have an infection
- Your stone is very large
- You prefer active treatment

Your doctor will recommend to remove a stone in the ureter if:

- It seems too big to pass with urine
- You continue to suffer from pain while you take medication
- Your kidneys have stopped or may stop to function properly

There are three common ways to remove stones: shock-wave lithotripsy (SWL), ureteroscopy (URS), and percutaneous nephrolithotomy (PNL). Each of these procedures has advantages and disadvantages. It is important to talk about your symptoms and test results with your doctor to find the most efficient treatment option for you.

Shock-wave lithotripsy (SWL)

SWL is done with a machine that can break stones from outside the body. To break the stone, focused shock waves (short pulses of high energy sound waves) are transmitted to the stone through the skin. The stone absorbs the energy of the shock waves and this breaks it into smaller pieces. The fragments then pass with urine (**Fig. 4**).

SWL is suitable for over 90% of all patients. However, its success depends on several factors like stone characteristics and your physical condition.

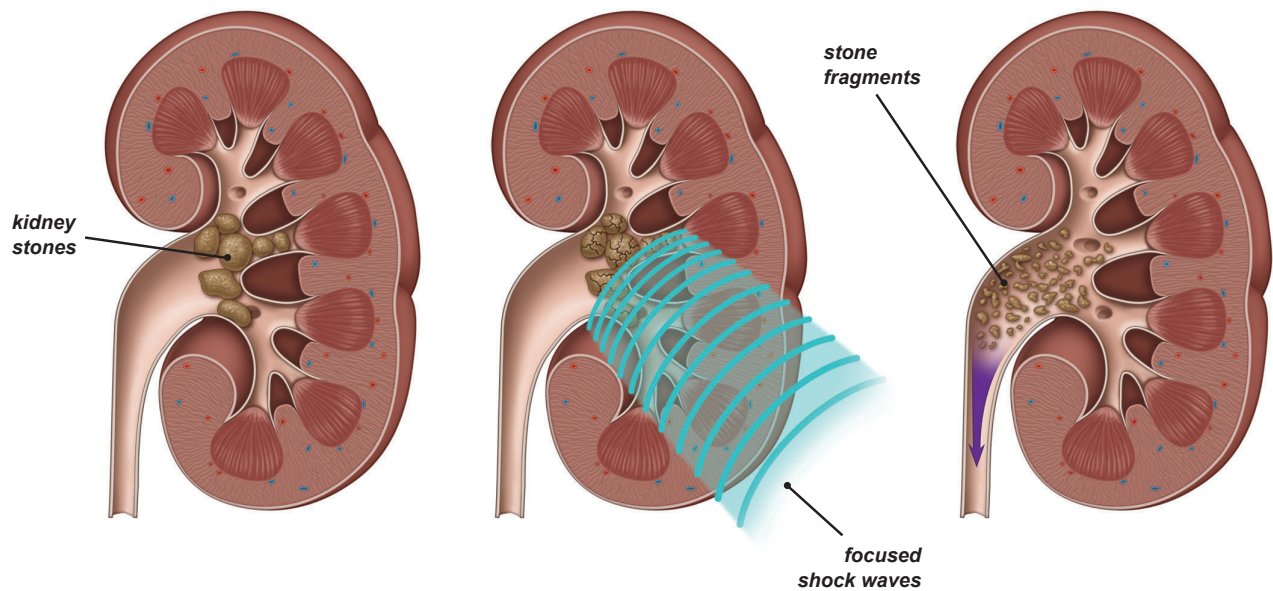


Fig. 4: Focused shock waves break the stones into fragments.



Interesting Fact

SWL was first used to treat stones in 1980 and within a few years it became the standard treatment option.



Go Online

Watch how SWL is performed in this YouTube video by BUPA:
<http://youtu.be/ODL3eEZY8M>

How is SWL performed?

You are placed on an operating table with your flank positioned towards the shock-wave generator (**Fig. 5**). The exact location of your stone is determined by ultrasound or x-ray.

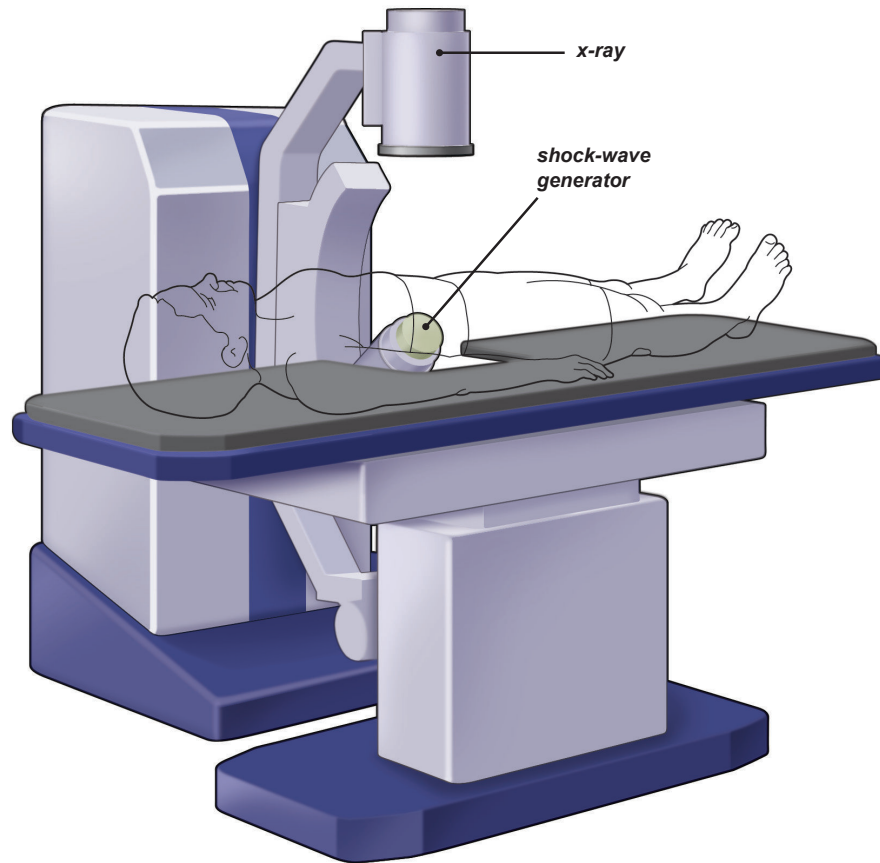


Fig. 5: A common type of SWL machine.

During the procedure you will be able to hear the making of the shock waves; this sounds like little bangs. Your doctor will start at low intensity levels and slowly increase the power of the waves. There is no need for anaesthesia, but you will receive pain medication to comfort you during the procedure. SWL lasts about 45 minutes.

If you have a large stone it is quite common that you need multiple sessions to completely break it.

When is SWL not recommended?

There are several contraindications for SWL that either have to do with your physical condition or with the characteristics of the stone.

SWL is not recommended if:

- You are pregnant
- You have high risk of severe bleeding
- You have any uncontrolled infections
- You have uncontrolled high blood pressure
- Your physique makes it difficult to reach the stone
- You have an aneurysm
- You have an anatomical obstruction in the urinary tract, below the stone or in the bladder
- Your stone is very hard (for instance cystine stones)

Will I be stone free directly after treatment?

No. SWL breaks your stone into small pieces. These fragments will pass with urine in the days or weeks after SWL. You can get MET to help pass the stone fragments.

How do I prepare for the procedure?

Your doctor will advise you in detail about how to prepare for the procedure. If you take any medication to prevent clotting of blood, discuss with your doctor if you need to stop taking it before the procedure. Do not eat anything 4 hours before the treatment.

How long will it take me to get back to my normal daily activities?

In general you can go back to your regular activities right after treatment. However, make sure to get some rest on the day of the procedure. If you have received medication against the pain or to calm you down, do not drive a car or operate any other motorized vehicle within the first 24 hours after SWL.

If you don't have any pain, it is important that you drink more than usual to flush out stone fragments. Try to drink more than 2 litres every day. If you have renal colic, ask your doctor how much you should drink. Do not drink any alcohol in the first 24 hours after the procedure.

You should filter your urine to catch stone fragments for stone analysis.

Your doctor will give you a time schedule for regular control visits in the first weeks after SWL.

You need to go back to the hospital right away if you:

- Develop a fever
- Feel pain in your kidney or flank
- Still have blood in your urine more than 2 days after the treatment

Advantages of SWL

- Low risk of complications
- No need for anaesthesia

Disadvantages of SWL

- Does not remove your stone. Instead, fragments of the stone will pass in the following days or weeks, which may cause renal colic
- You may need multiple sessions for larger stones

Ureteroscopy (URS)

URS is a type of treatment which is done with a small-calibre endoscope. Stones can be located, disintegrated, and removed in a single procedure. URS is common, success rates are high, and the risk of complications is low.

How is URS performed?

For URS you will receive general, spinal, or intravenous anaesthesia. Once you are under anaesthesia, the doctor enters your bladder with the endoscope through the urethra without making an incision in your body. Depending on the location of the stone, a rigid or a flexible ureteroscope is used. A flexible ureteroscope allows your doctor to reach virtually every point within the kidney (Fig. 6).

When the stone is identified, it can be pulled out using a special “basket” (Fig. 7). If the stone is too big to be removed completely, it can be fragmented using laser, ultrasound, or a pneumatic lithotripter (which works like a little jackhammer). At this point all stone fragments are removed.

Based on how the operation goes, your doctor may need to place a JJ-stent in the ureter to make sure urine can flow through the urinary system (Fig. 2). The stent will be removed when your urine flow is back to normal. This can take anywhere between several days and a few weeks.

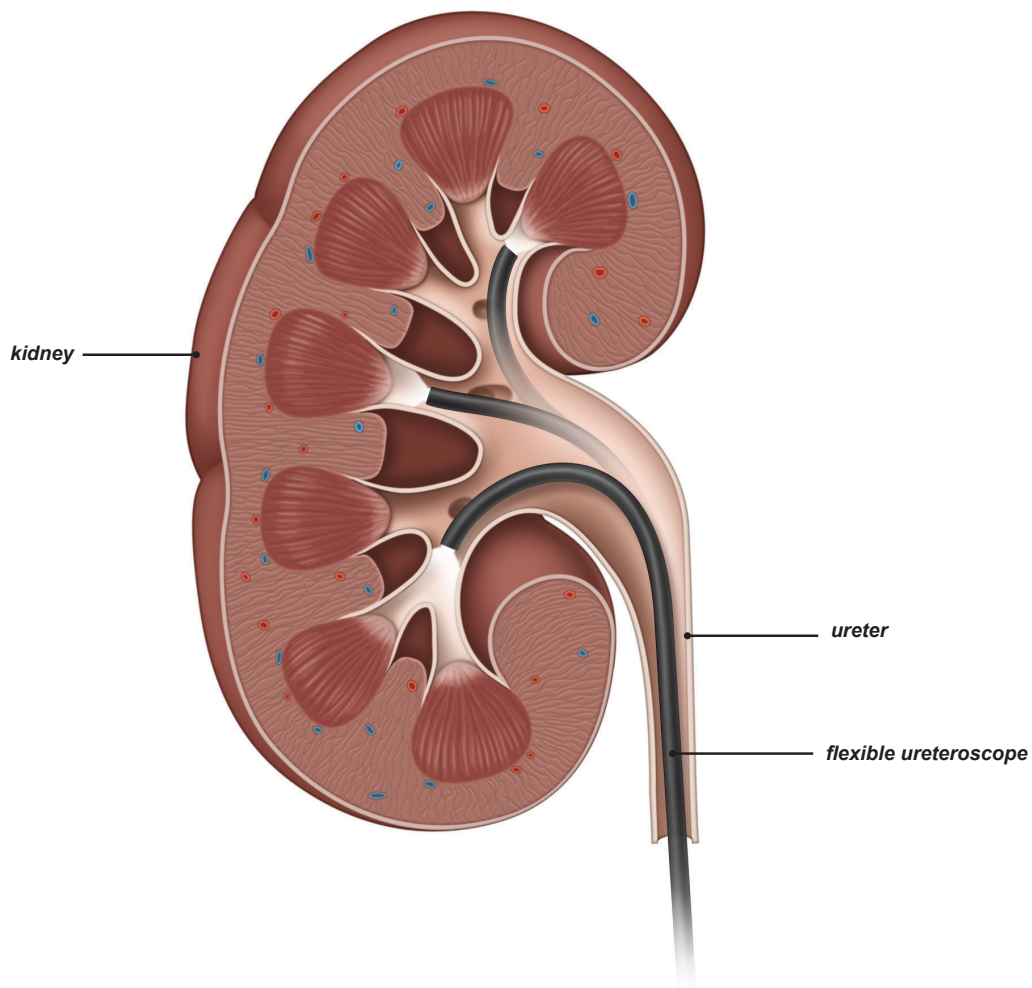


Fig. 6: A flexible ureterscope allows your doctor to reach virtually every point within the kidney.

When should I consider URS?

If your stone is not large (generally under 2 centimetres), URS is an alternative to SWL. Although URS is more invasive than SWL and requires anaesthesia, it is a safe and effective treatment option for kidney and ureteral stones. Because the stone fragments are removed during the procedure, you don't have to pass them afterwards. You have a high chance of being stone-free with a single operation. Your doctor will discuss the differences between SWL and URS in your individual situation.

When is URS not recommended?

There are few contraindications for URS. In general it can be performed in almost every patient, as long as your condition allows anaesthesia and you do not have an untreated urinary tract infection. URS can even be done without stopping medication for blood clotting. However, it is always important to discuss your individual situation with the doctor.

How do I prepare for the procedure?

Your doctor will advise you in detail how to prepare for the operation. You must not eat, drink, or smoke for 6-8 hours before the procedure to prepare for the anaesthesia.

How long will it take me to get back to my normal daily activities?

Usually you can leave the hospital 2 days after the procedure and return to your normal daily activities. Your urine can contain some blood for a couple of days. If a JJ-stent was placed during the procedure, your doctor will take it out when your urine flow is back to normal.

You need to go back to the hospital right away if you:

- Develop a fever
- Feel pain in your kidney or flank

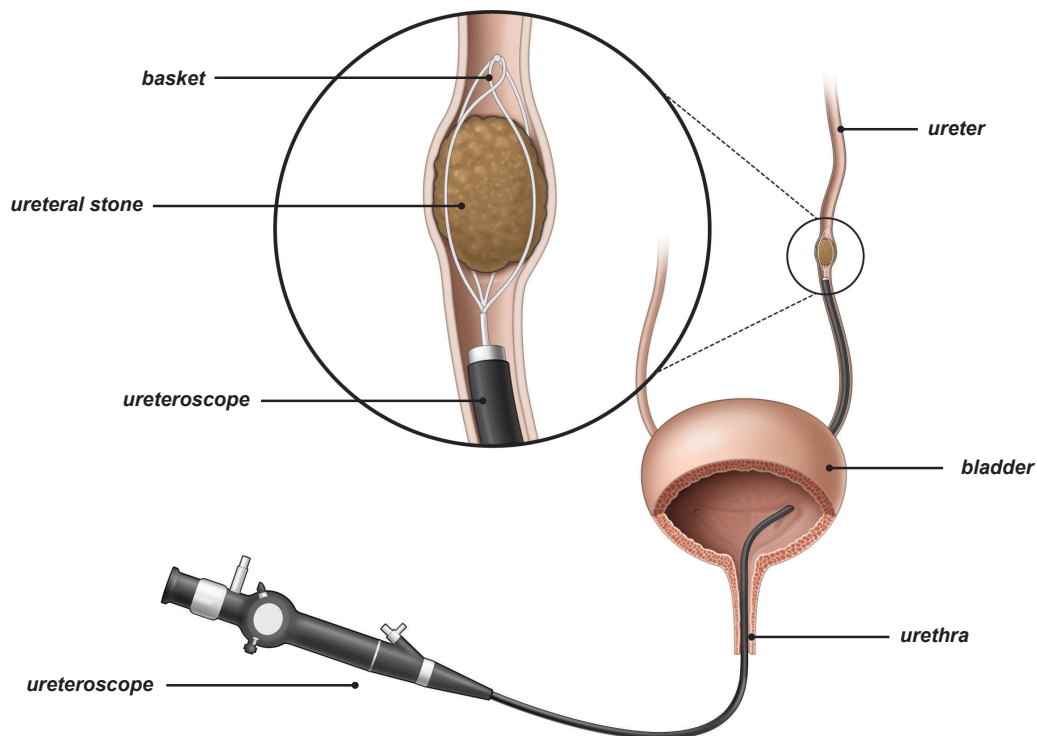
Advantages of URS

- Immediate stone removal
- Low risk of complications

Disadvantages of URS

- Requires anaesthesia
- There is a small risk of injuring the ureter

Fig. 7: A stone is pulled from the ureter using a basket.



Percutaneous Nephrolithotomy (PNL)

PNL is a surgery to remove large stones directly from the kidney. The advantage is that even very large stones are removed in a single operation (**Fig. 8a and 8b**). However, compared to SWL and URS it is more invasive and there is a higher risk of complications. The most common complications of PNL are bleeding and fever.

How is PNL performed?

PNL is carried out under general anaesthesia. While you are under anaesthesia, the doctor punctures the kidney with a needle through your skin. The doctor makes the puncture channel large enough to insert the nephroscope. Depending on the size of the stone, it is either removed completely or it is broken into smaller pieces first. Fragmentation of the stone is done with laser, ultrasound, or a pneumatic lithotripter

(which works like a little jackhammer). At this point all stone fragments are removed. Sometimes a JJ-stent (**Fig. 2**) or a percutaneous nephrostomy tube (**Fig. 3**) is placed to make sure that urine can leave your kidney.

When should I consider PNL?

PNL should be considered when your stone is very large (bigger than 2 centimetres) and has not moved to the ureter. Your doctor may also discuss PNL as a treatment option if:

- You have more than one stone
- Your stone is very hard

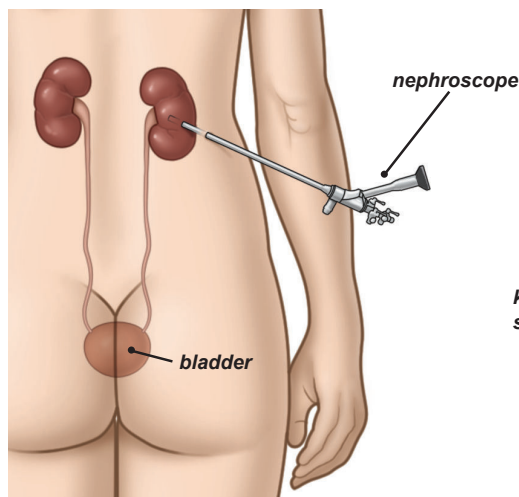


Fig. 8a: A nephroscope is used to remove stones directly from the kidney.

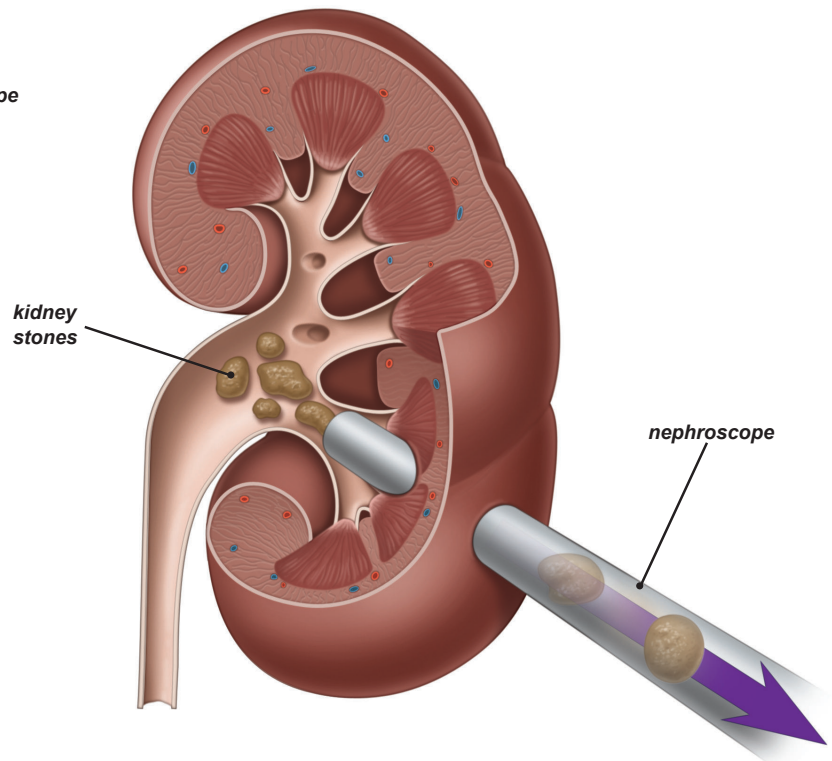


Fig. 8b: Stone fragments are removed in a single procedure with a nephroscope.

When is PNL not recommended?

PNL is a safe and effective procedure but there are some contraindications because the stone is accessed directly through the skin. If you take medication to prevent blood clotting you should stop taking it before the procedure. However, it is always important to discuss your individual situation with the doctor. In addition, PNL is not recommended if you are pregnant or if your physique makes it difficult to access the kidney.

How do I prepare for the procedure?

Your doctor will advise you in detail about how to prepare for the operation. You must not eat, drink, or smoke for 6-8 hours before the procedure to prepare for general anaesthesia.

How long will it take me to get back to my normal daily activities?

After PNL you will stay in the hospital for some days. In the case that you have a percutaneous nephrostomy tube, you will be discharged when the doctor or nurse can remove it. Your urine might be a little bloody for the first couple of days. Do not plan physical exercise the first two weeks after the procedure.

You need to go back to the hospital right away if you:

- Develop a fever
- Feel pain in your kidney or flank
- Still have blood in your urine a week after the surgery

Advantages of PNL

- Even very big stones can be removed completely during one single operation

Disadvantages of PNL

- Requires general anaesthesia
- Will leave a scar
- Longer hospital stay

This information was last updated in June 2012.

This leaflet is part of a series of EAU Patient Information on Kidney and Ureteral Stones. It contains general information about stone disease. If you have any specific questions about your individual medical situation you should consult your doctor or other professional healthcare provider.

This information was produced by the European Association of Urology (EAU) in collaboration with the EAU Section of Urolithiasis (EULIS), the Urolithiasis Section of the EAU Young Academic Urologists Group, and the European Association of Urology Nurses (EAUN).

The content of this leaflet is in line with the EAU Guidelines.

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