



Kidney Pebbles

New approaches to the treatment of kidney and urinary stones

by Dr Gerald Tan

URINE IS PRODUCED by the two kidneys situated high in the abdominal cavity, and comprises water associated with waste products of the body. It passes down narrow tubes called the ureters into the bladder, which stores urine until a convenient time for it to be excreted.

Patients with stones in the kidneys and urinary tract are common in Singapore and Southeast Asia. Kidney stones usually occur in patients aged above 40 years. They affect men more often than women, and form as a result of urine with a high concentration of certain chemicals (such as calcium, oxalate, phosphate, uric acid and others) and a low concentration of substances that stop stone formation (urinary inhibitors such as citrate and magnesium). Most urinary stones are made up of calcium oxalate or calcium phosphate; whilst struvite, uric acid and cysteine stones are less commonly encountered. Risk factors for urinary stone formation include urinary tract infections, cystic kidney disease, and various metabolic disorders such as gout.¹

How are kidney stones diagnosed?

Kidney stones are often asymptomatic. They are usually detected when they cause severe cramping pain in the flanks, which may spread down to the lower abdomen. Nausea, vomiting, and blood in the urine may be accompanying symptoms. Fever, chills and painful urination suggest that the stone may be associated with a urinary infection. Urine analysis, X-rays of the abdomen and pelvis and ultrasonography of the kidneys are usually the first tests to confirm the diagnosis (Figure 1). Computer tomography of the urinary tract, popularly known as a CT urogram, gives the most accurate information of the position of the stones and the associated anatomy of the kidneys, which may be swollen from the stone causing obstruction to passage of urine down the ureters.

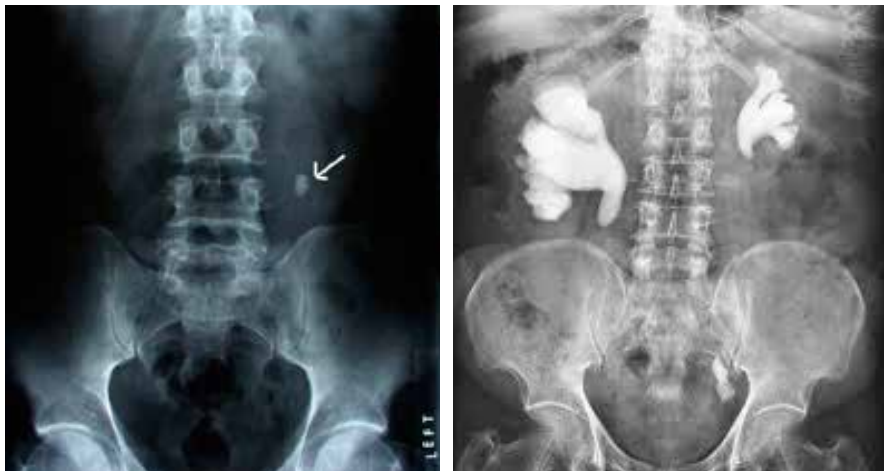


Figure 1. Abdominal X-rays showing (a) stone in the left upper ureter; (b) staghorn stones in both kidneys

What treatments are available for urinary stones?

Most urinary stones are small (less than 5mm), and will pass out of the body spontaneously without need for surgery. For larger or impacted stones, treatment objectives are to eradicate the stone and relieve obstruction to promote recovery of kidney function. In recent years, new approaches and technologies have been developed to eradicate such stones.

Medical Expulsive Treatment of Ureteric Stones

In the past decade, medical expulsive therapy (MET) for ureteric stones has become increasingly popular. Various medications, such as calcium channel blockers (nifedipine and verapamil), α -blockers (tamsulosin, alfuzosin, doxazosin, and terazosin), and corticosteroids have been investigated. Based on several published meta-analyses, tamsulosin appears to be the most effective in facilitating spontaneous stone expulsion. It is suitable as first-line treatment in

patients with ureteric stones less than 10mm, which are not causing upper tract obstruction or significant distress. Failure of stones to pass out after four to six weeks of medical treatment will necessitate intervention to remove these stones.¹⁻³

Extracorporeal Shock Wave Lithotripsy

Extracorporeal Shock Wave Lithotripsy (ESWL) is a popular treatment for stones less than 2cm in size in the kidneys and upper ureter. It is performed as an outpatient procedure, and involves the patient lying on a specially constructed

Most urinary stones are small (less than 5mm), and will pass out of the body spontaneously without need for surgery. For larger or impacted stones, treatment objectives are to eradicate the stone and relieve obstruction to promote recovery of kidney function.

treatment platform. Shock waves of varying intensities are created outside the body and transmitted through the skin and body tissues to converge on these stones. The stones are then shattered into smaller particles that pass easily through the urinary tract in the urine (Figure 2). Recovery time is relatively short, and most people can resume normal activities in a few days. Side effects of ESWL treatment include bruising and pain around the treated kidney, downstream blockage of stone fragments in the lower ureter, and incomplete stone clearance requiring multiple treatment sessions.

Ureterorenoscopy

For stones in the lower ureter less than 2cm, specially constructed small-calibre endoscopes are passed up the ureter to the stone's location with the aid of guide-wires under X-ray guidance. The stones may then be shattered using a Holmium laser probe under direct vision, and the fragments retrieved out of the ureter using special stone baskets. If the ureter or kidney is swollen from stone obstruction, a temporary plastic stent is left in the ureter to facilitate healing, and is subsequently removed using a cystoscope four to six weeks after the initial procedure. Ureterorenoscopy (URS) is usually performed as an outpatient procedure under general

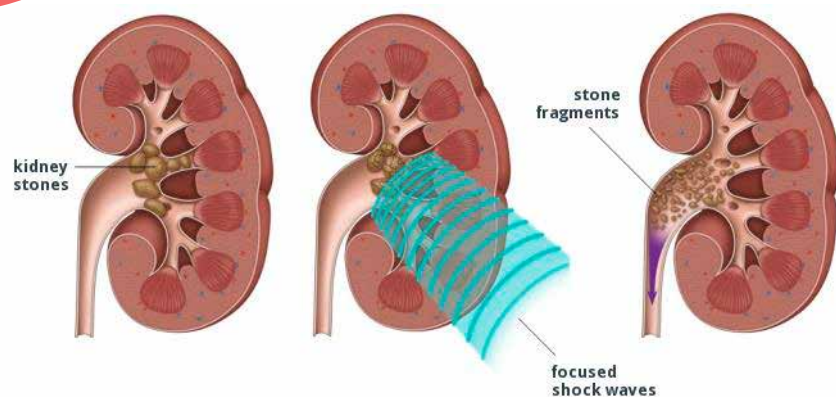


Figure 2. Extracorporeal shockwave lithotripsy, in which shockwaves are focused onto kidney stones to cause fragmentation

anaesthesia. Pain after URS usually resolves after two to three days, although blood in the urine will take slightly longer to clear up.

In recent years, advances in endoscope technology have enabled urologists to use small-calibre flexible ureterorenoscopes to steer all the way up the upper ureter into the kidney, and remove kidney stones using Holmium lasers and stone baskets (Figure 3). This has proved most successful for definitive clearance of stones located in the lower chambers of the kidney, for which ESWL has poor stone clearance rates.⁴

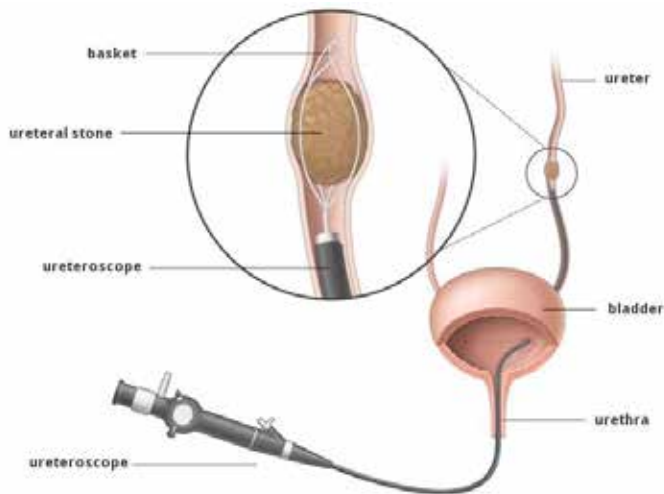


Figure 3. A flexible ureterorenoscope passed through the bladder up into the ureter to reach the stone, which may then be fragmented using a Holmium laser fibre and basket to retrieve the stone fragments.

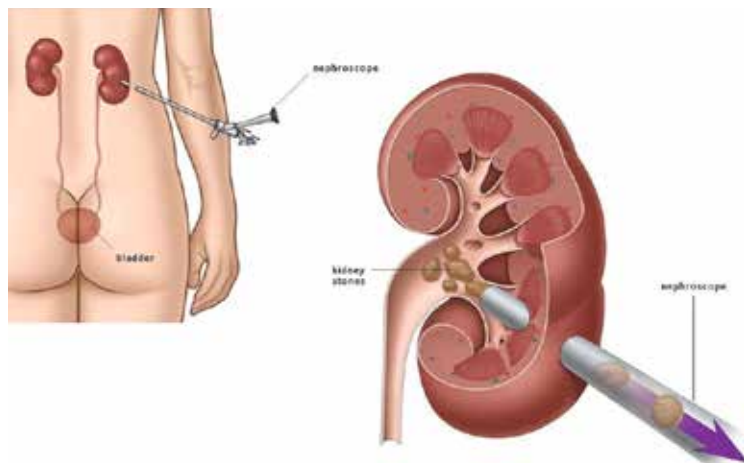


Figure 4. Percutaneous nephrolithotomy, in which a nephroscope is passed through a small incision in the skin to access stones in the kidney

Percutaneous Nephrolithotomy

For kidney stones more than 2cm in size or occupying a significant part of the kidney (known as staghorn stones), percutaneous nephrolithotomy PCNL is the treatment of choice for definitive stone clearance. This procedure is performed under general anaesthesia, usually with the patient lying prone on the surgical table. Under X-ray or ultrasound guidance, the urologist makes a tiny incision in the back and creates a tunnel directly into the relevant chamber of the kidney.

Rigid and flexible nephroscopes are used to locate the stones, which are then shattered and removed using various devices (Figure 4). A small nephrostomy tube is left in the kidney for a few days till residual bleeding clears up.

Which treatment is best for me?

Urinary stones are a common cause of visits to the emergency department. Patients are usually referred to the urologist, who will then advise on the most appropriate treatment approach based on the stone's size, characteristics of the urinary tract anatomy, and clinical condition. Advances in medical therapy and surgical technologies now allow stones to be eradicated successfully with minimal scars, less pain and swift recovery. eh

REFERENCES:

1. C Turk, T Knoll, A Petrik et al. EAU guidelines on urolithiasis 2013. http://www.uroweb.org/gls/pdf/21_Urolithiasis_LR.pdf
2. Bader MJ, Eisner B, Porpiglia F, Preminger GM, Tiselius HG. Contemporary management of ureteral stones. *European Urology* 2012; 61(4): 764-772.
3. Seitz C, Liatsikos E, Porpiglia F, Tiselius HG, Zwergel U. Medical therapy to facilitate the passage of stones: what is the evidence? *European Urology*. 2009; 56:455-471.
4. S Rajamahanty, M Grasso. Flexible ureteroscopy update: indications, instrumentation and technical advances. *Indian Journal of Urology* 2008; 24(4): 532-537.



Dr Tan Yau Min, Gerald is a consultant urologist at Mt Elizabeth Hospital with over 17 years of clinical experience. He is internationally renowned for his expertise in minimally invasive and robotic surgery for prostate, kidney and bladder diseases. He may be contacted via email at enquiries@drgeraldtan.com.sg.