

# UNDERSTANDING KIDNEY STONES

## A PATIENT'S GUIDE



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## WHAT ARE KIDNEY STONES?

Kidney stones are small, hard crystals or deposits that form inside your kidneys when salts and other minerals in your urine bond together. Stones often vary in shape and size, with some growing to be quite large. Kidney stones can be as small as a grain of rice and others can grow to be as large as a golf ball.

Some stones stay in the kidneys causing little to no symptoms, and others may pass through the urinary tract, causing painful symptoms as they move down the ureter (the thin tube that leads to the bladder). Some people are able to pass the stone without surgical intervention, but in some cases, surgery to remove the stone may be necessary.

The urologists at Chesapeake Urology are experienced in treating kidney stones that affect both men and women, providing the specialized diagnosis, treatment and follow-up care needed with a focus on your long-term health.

## A FOCUS ON THE OVERALL HEALTH PICTURE

Our urologists understand that focusing on the whole patient, and not solely the kidney stone, is important to developing a long term plan of care. This includes:

- Identifying the factors that made the stone form in the first place.
- Surgically removing the stone utilizing the most advanced techniques for optimal outcomes, if it cannot be passed naturally or treated through non-surgical methods.
- Studying the stone and its composition to help in the development of a long term prevention plan that may include changes in diet.
- Providing metabolic medical management for long term care.
- Maintaining a schedule of follow-up care.

## ARE YOU AT RISK FOR DEVELOPING KIDNEY STONES?

Anyone can produce kidney stones, but certain people are more prone to developing stones than others. Causes and risk factors for kidney stones include:

- A family history of stone disease, especially in first degree relatives.
- Dehydration - Lack of fluids can cause salts and other minerals in the urine to stick together to cause kidney stones.
- Certain diets - Diets high in protein, salt, oxalates (such as spinach, chocolate, nuts), excess vitamin C or D can increase your risk of developing kidney stones.
- Certain medical conditions such as inflammatory bowel disease, Crohn's disease and chronic diarrhea affect the way your body absorbs water and calcium, which increases levels of stone-forming substances in your urine.
- Metabolic diseases (such as hyperparathyroidism or gout).
- Obesity has been linked to higher incidences of stone formation. Certain types of gastric bypass also have an increased incidence of stone formation.

## SYMPTOMS OF KIDNEY STONES

Symptoms of kidney stones vary by patient depending on the size and location of the stone.

In some cases, a very small kidney stone may cause no symptoms at all while larger stones can be very painful. Very small stones may pass on their own or only cause mild discomfort. In these cases, increasing water intake will help flush the small stone out of the urinary system and only over-the-counter pain medication may be needed to help pass the stone.

In cases of larger kidney stones and those stones that pass into the ureter, the pain experienced is related to the passing of the stone from the kidney to the bladder through the ureter. Your urologist can provide supportive care at this time to ease the discomfort. It's important to note that large stones in the kidney may not cause pain when they are not actively passing into the ureter. Symptoms of a kidney stone may include:

- Severe pain, usually located in the side or the back; pain may spread to the abdomen and the groin area.
- Urinary symptoms such as painful urination, urinary urge, and frequent need to urinate.
- Blood in the urine and/or foul smelling urine.
- Nausea and/or vomiting.
- Fever, if the stone has caused an infection.

Very large stones or staghorn kidney stones (a stone that fills the kidney) may not cause severe symptoms, but can pose a serious health risk and usually require surgery to remove.

*When performed by a highly skilled surgeon with experience in the complex technique, the PCNL procedure has a high post-procedure stone-free rate.*

## DIAGNOSING A KIDNEY STONE

Patients who present with symptoms of a kidney stone either in their urologist's office or in the emergency department (due to extreme pain from a large stone) will have one of several diagnostic tests performed to confirm the diagnosis. For large kidney stones, tests most commonly performed include:

- CT scan
- Ultrasound
- X-Ray
- Urinalysis
- Blood work to look for excessive calcium or uric acid

## PASSING A SMALL KIDNEY STONE

Patients with smaller stones (typically around 2 to 5 mm in size) are usually able to pass the stones through the urinary tract with the aid of the following:

- **Pain relievers** - Your doctor may recommend over the counter pain relievers such as acetaminophen to relieve some discomfort of passing a small stone.
- **Medication** - Alpha blockers can help relax the muscles in the ureter, which will help you pass a small stone with less pain.
- **Increased fluid intake** - Drinking an increased amount of water (up to three quarts per day) may be recommended to help flush out the stone from the urinary tract.

Your urologist may ask you to use a special strainer that will be provided to you to "catch" the kidney stone or its fragments as it is passed through your urine. The stone will then be analyzed by your doctor to determine the type of stone your body formed. This helps manage your kidney stone disease for the future, helping your urologist develop a stone disease management plan to help keep you stone free.

## TYPES OF KIDNEY STONES

Kidney stones come in all shapes and sizes, ranging from a grain of sand to a golf ball. Anyone who has experienced a large kidney stone knows the discomfort that can come along with one, but did you know there are over one dozen types of stones?



Following are some of the most common types of kidney stones:

- **Calcium-oxalate stones** - These are the most common type of kidney stones - and are typically caused by foods high in salt and/or oxalate-rich food (e.g. greens such as spinach and kale, strawberries, chocolate, tea, nuts), certain medications and even your genetics.
- **Struvite stones** - These stones can grow to be very large and are typically associated with a kidney infection. Surgical removal of these stones is nearly always indicated.
- **Uric acid stones** - These stones are made of uric acid, a waste product that is passed out of the body through the urine. They may be caused by eating too much animal protein such as red meat and are more common in people with conditions such as gout and inflammatory bowel disease.
- **Cystine stones** - These are very rare, caused by a genetic kidney disease called cystinuria.

*Certain people are more at risk for developing kidney stones than others. Potential risk factors include family history, dehydration, diets high in salt, and certain medical conditions can lead to stone formation in some individuals.*

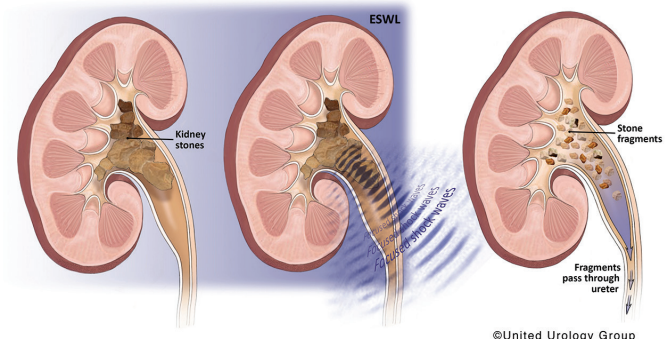
## TREATMENT OPTIONS FOR LARGER KIDNEY STONES

Some kidney stones are too large to pass through the urinary system, cause more severe symptoms and may require immediate attention by your doctor. Stones that are greater than 5 mm may require surgical intervention. Depending on the size, location and type of kidney stone you have, one of the following minimally invasive treatment options may be recommended:

### SHOCK WAVE LITHOTRIPSY (SWL)

Shock wave lithotripsy (SWL) is a non-invasive option if you have smaller stones that are too large to pass on their own. SWL is not indicated for very large kidney stones; this treatment is typically prescribed for:

- Small to medium-sized stones.
- Stones that are not dense or very hard.
- Stones that are not located in the lower pole of the kidney.





## HOW SHOCK WAVE LITHOTRIPSY WORKS

- X-ray or ultrasound are utilized to locate the stone(s) within the kidney.
- High energy shock waves are then delivered through the body to the stone.
- These shock waves break up the stone(s) into very small particles that can then be passed through the urinary system.

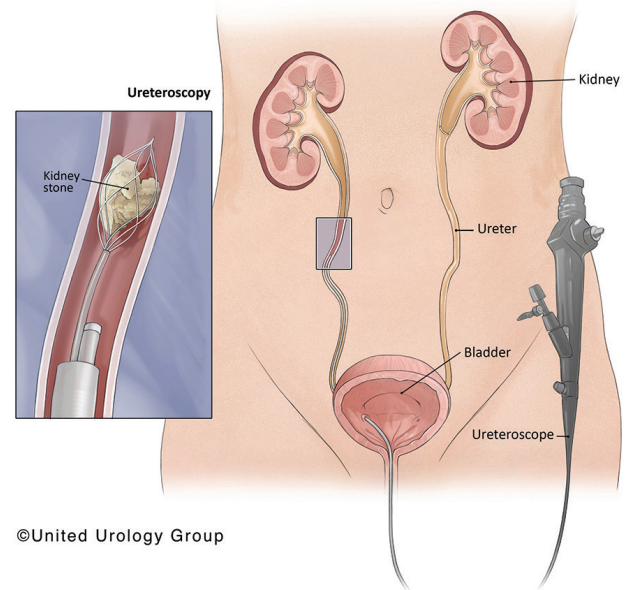
SWL is an outpatient procedure and typically takes about one hour to perform. You may receive local anesthesia or a sedative for your comfort during the procedure. In some cases where the stone is blocking the ureter, you may have a stent placed to open up the urinary tract to allow for the stone fragments and urine to pass through following SWL. Your urologist will determine if a stent is necessary after viewing the X-ray images.

## URETEROSCOPY/RENOSCOPY

Ureteroscopy is a minimally invasive procedure (no incision is made and it is usually performed as an outpatient procedure) that utilizes a small scope that is passed into the urinary tract to locate and remove stones (renoscopy refers to passing the scope into the kidney).

## HOW URETEROSCOPY WORKS

- Utilizing the tiny scope to visualize the kidney stone, a special laser breaks up the stone into tiny pieces that can be easily passed through the urinary system. This is sometimes referred to as “stone dusting” or breaking the stone into minute fragments that resemble grains of sand. A special laser and training is required to perform stone dusting.
- In some cases, your urologist will use a tiny wire “basket” that is passed via the scope through the bladder and into the ureter and/or kidney to grab and clear any remaining stone fragments.
- Ureteroscopy is appropriate for nearly all stones; however, larger stones may require repeat procedures to completely clear the stone from the body.



### Shock Wave Lithotripsy (SWL)

SWL is a good option for:

- Small to medium-sized kidney stones.
- Stones that are not dense or very hard.
- Stones that are not located in the lower pole of the kidney.

### Ureteroscopy (URS)

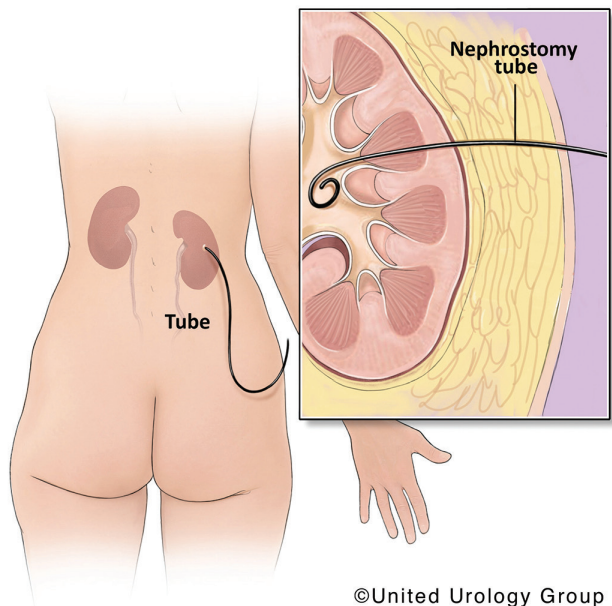
- Ureteroscopy is an option for treating any stone, any size and in any location of the kidney, although very large, complex stones may require PCNL surgery for total removal.
- URS is a viable option for small to medium-sized kidney stones, and may be considered for larger stones.

## PERCUTANEOUS NEPHROLITHOTOMY (PCNL) FOR LARGE, COMPLEX KIDNEY STONES

Percutaneous nephrolithotomy (PCNL) is one of the most innovative surgical treatments for patients who have large kidney stones (larger than 2cm in diameter) that cannot be treated successfully using SWL (shock wave therapy) or ureteroscopy. PCNL has become the standard surgical treatment for large kidney stones including staghorn stones (stones that fill the kidney).

Percutaneous refers to a minimally invasive surgical technique performed via a very small incision through the skin, rather than an open, more invasive procedure. Your urologist will determine whether you are an appropriate candidate for this surgery to treat your kidney stone(s).

Standard PCNL (with nephrostomy tube)



## PCNL – UNDERSTANDING THE MINIMALLY INVASIVE SURGICAL TECHNIQUE

PCNL surgery may be performed in the hospital with most patients staying at least one day. In some cases, the surgery will be performed in an Ambulatory Surgery Center (ASC) which is specially-equipped for PCNL surgery. The decision to have the procedure performed on an outpatient basis is based on the complexity of your kidney stones and your overall health, and will be determined by your surgeon.

*More than 1 million Americans will get a kidney stone and the number is rising. In 1980, about 3 in every 100 people got a stone at some point in their life. In 1994, that number rose to about 5 in every 100 people. By 2010, almost 9 in 100 people were expected to get a stone in their lifetime. Source: Urology Care Foundation.*

## HOW PCNL SURGERY IS PERFORMED

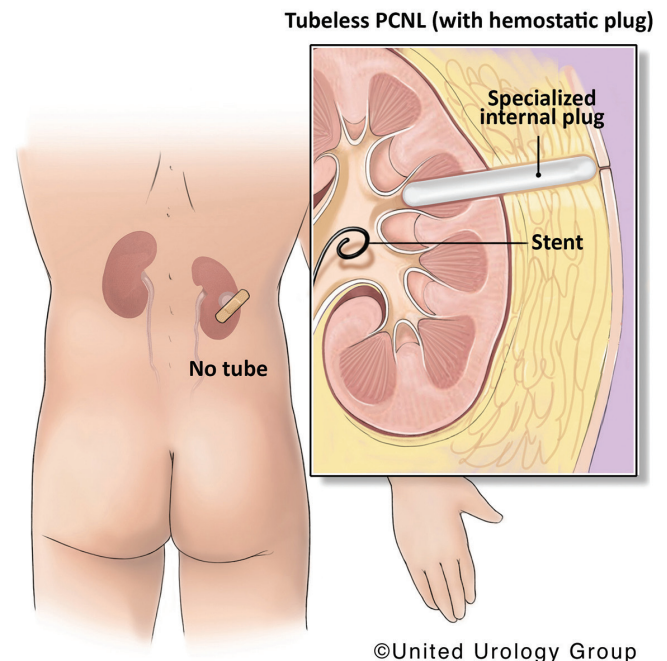
- Depending on your urologist and your individual stone properties, you may need an appointment with an interventional radiologist prior to your surgery (your urologist will provide you with the referral). The interventional radiologist uses X-ray imaging called fluoroscopy to help guide the precise placement of the renal access tube (nephrostomy tube) into the kidney. This tube is placed through your back and into your kidney near the stone. This procedure is usually done one to two days before the PCNL surgery. The tube is utilized by your surgeon to gain access into the kidney to remove the stone.
- On the day of your PCNL procedure, your surgeon utilizes special imaging to map out the kidney to ensure a more complete removal of the stone(s).

- Through the placed renal access tube, a thin wire is passed into the kidney and a balloon is used to dilate a tract.
- A tube is placed over the balloon and a scope is inserted into the tract to look into the kidney.
- Special instrumentation is placed through the tube to break up the stone(s) into tiny pieces that can be removed or passed through the urinary system. The goal is to clear all stones and fragments from the kidney.
- Once the stones are removed, it is not uncommon to have a small tube, called a ureteral stent, placed through the ureter and into the bladder to allow the kidney to drain better while it heals from the procedure.
- In some cases, the nephrostomy tube will remain in the kidney following surgery for drainage of urine and blood. The tube is removed in your surgeon's office. The timing of the tube removal will be determined by your surgeon.
- Stones will be sent for analysis to aid in developing a program to prevent further stone formation.

*In many cases, doctors try to allow a kidney stone to pass without surgery. But, if a stone is too large, blocks the flow of urine, or leads to infection, surgical removal using new and innovative techniques such as PCNL is often highly successful.*

## TUBELESS PCNL – A NEW STANDARD OF CARE

The tubeless PCNL procedure is performed as a standard PCNL surgery; however, patients do not have a nephrostomy tube placed by an interventional radiologist prior to surgery as they do with standard PCNL. Your surgeon will create his or her own renal access tract during the surgery. The need for the nephrostomy tube, which exits the surgical site through the skin and is used to drain excess fluid from the kidney post-operatively, is eliminated.



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## IF NO TUBE, THEN WHAT?

In tubeless PCNL surgery, rather than leaving the drainage tube in the kidney following extraction of the stone(s), the renal access tract leading from the outside of the body (the skin, or percutaneous) to the kidney is sealed using a specially designed plug.

In place of an external drainage tube, patients typically receive a urinary stent that dilates the urinary tract and maximizes the drainage of the kidney. This gives the kidney time to heal from the procedure and also allows small stone fragments to easily pass through the urinary system without causing a blockage. The stent is usually removed in your physician's office within a week following surgery.

Typically, a CT scan will be performed post-operatively to ensure all stone fragments have been removed and the access tract into the kidney is completely sealed with the special plug. This plug is naturally absorbed by the body over time and does not require removal.

## WHO IS A CANDIDATE FOR TUBELESS PCNL?

Your surgeon will determine if you are a good candidate for tubeless PCNL by assessing your overall health as well as the size and location of the stone in the kidney. In certain cases, the tubeless PCNL procedure may be performed in a specially-equipped Ambulatory Surgery Center rather than in a hospital operating suite. Again, your surgeon will make this determination and discuss the best options with you for optimal outcomes.



## MINI PCNL – SURGERY THROUGH AN EVEN SMALLER INCISION

Mini PCNL is similar to a standard PCNL procedure; however, the surgery is performed with an even smaller incision with a renal access sheath that is about half the size of a standard sized tract. While the incision is half the size, the decrease in tissue trauma is even more dramatic. Patients experience about one quarter of the tissue trauma typically seen with a standard PCNL procedure.

This may lead to a faster recovery and further decreases potential risks associated with PCNL surgery. All Mini PCNL procedures are performed tubeless and most are performed in an ASC with same-day discharge. Mini PCNL is an option for many large or complex kidney stones. Your surgeon will determine if this is an appropriate option for you.



## METABOLIC MEDICAL MANAGEMENT – AN IMPORTANT PART OF YOUR KIDNEY STONE CARE

Once all kidney stones have passed or have been surgically removed, your urologist may refer you for a metabolic evaluation, an important component for the overall management of kidney stone disease. Metabolic evaluation helps determine exactly why your body is producing kidney stones and aids your physician in developing a treatment plan that will help manage your stone disease for the long term.

### MANAGING YOUR STONE DISEASE INVOLVES:

- Regular testing and evaluation for kidney stones.
- Annual exams.
- Changes to your diet that can help prevent kidney stones from forming in the future.



## WHAT IS A METABOLIC EVALUATION?

Metabolic evaluations are a vital component to a well-designed kidney stone prevention plan. This series of diagnostic tests helps determine causes of your stone disease. The metabolic work-up includes several key components:

- A 24-hour urine test. Patients urinate in a collection jug for a full 24 hours. This test is an important diagnostic tool that provides your doctor with the most information on why you're forming stones. The urine is then analyzed for levels of calcium, oxalate, uric acid, protein, urinary sodium and other indicators of kidney stones.
- Blood work can show increased levels of minerals such as uric acid and calcium that lead to kidney stones formation.
- Crystal analysis (when a kidney stone or fragment of the stone is available) helps your urologist determine the type of stone your body formed which can aid in the development of a prevention plan including changes to diet.

Results of your evaluation often yield a diagnosis such as dehydration, low urinary citrate, or elevated levels of urinary sodium or protein. Understanding the factors that caused your body to produce kidney stones ultimately helps your urologist map out a comprehensive treatment and prevention plan.

***Staying stone free for the long-term requires a combination of medical and/or surgical intervention, comprehensive medical management, and patient education and prevention methods. Understanding the factors that cause your body to produce stones will guide your physician in mapping out a comprehensive treatment plan.***

## STEPS YOU CAN TAKE NOW TO HELP PREVENT KIDNEY STONES IN THE FUTURE

In addition to the metabolic management and close monitoring, our urologists recommend following these important tips and lifestyle/diet changes to help prevent kidney stones from returning:

- Stay well hydrated. The single most important thing you can do if you are forming kidney stones is to increase your fluid intake.
- Limit the amount of sodium in your diet to 2,000 to 2,500 mg/day.
- Moderate calcium intake to about 800 to 1,200 mg/day. Do not completely eliminate calcium.
- Limit the protein. High protein diets can increase the rate of kidney stone formation.
- Avoid heavy intake of oxalate rich foods such as spinach, kale, collard greens and strawberries, rhubarb, chocolate, nuts and tea.
- Add more citrate to your diet through citrus foods such as lemons, oranges and grapefruits.



## CLINICAL TRIALS AT CHESAPEAKE UROLOGY RESEARCH ASSOCIATES

A clinical trial is a carefully designed research study that investigates the effectiveness of a specific treatment for a particular group of people. Well designed clinical trials are the fastest way to find treatments that work. Clinical investigators bring extensive experience and knowledge to all clinical trials and to your treatment. Talk to your urologist about available kidney stone research trials that may be right for you.

### Benefits of Clinical Trials

Participating in a clinical trial has many potential benefits. These include:

- Access to the latest treatments before they are widely available.
- Possible compensation for your time and reimbursement for extra services.
- Closer monitoring of your condition by expert medical professionals.
- Improved medical knowledge that can benefit others.