
KIDNEY STONE SURGERY

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OVERVIEW

Kidney stones come in a variety of sizes and locations within the urinary tract. Choosing the appropriate management for your stone is very important. Stones that can pass on their own should be left alone to do that. Options for treatment included anything from an observation protocol and monitoring for smaller stones up to large incisions and removal of kidney for the most extreme and uncommon cases. Stones that are too large to pass or possibly causing infection, severe pain, or hospitalization need to be treated with surgical removal, most often a ureteroscopy.

Listed below are the options available for treating stones in 2024.

1. Conservative (passing a stone on your own): Small stones will often pass on their own. Drink lots of fluids, take pain medication as needed. Time and pain tolerance are the critical factors in allowing a stone to pass on its own.
2. Stenting or Percutaneous Nephrostomy: Sometimes a drain needs to be placed to drain the kidneys on a temporary basis. These are not permanent tubes, but rather a way to make sure a kidney has adequate drainage to protect it, or in cases of infection to allow an infection to drain. A stent is placed in the ureter. It is entirely internal, spanning from the kidney to the bladder. A percutaneous nephrostomy is placed through the skin directly into the kidney through the back and drains to a bag.
3. ESWL: Some stones can be broken up by passing shock waves through the skin focused on the stone. The fragmented stone particles will then pass on their own.
4. Ureteroscopy: This is the most common procedure that is performed. Here a small scope is passed into the bladder through the urethra and up the ureter to the kidney where the stone be caught and removed intact or broken up into small pieces most commonly with a laser. A broken stone can be removed through basket extraction, irrigated from the kidney, or broken up into small enough particles the stone fragments will pass without notice down through the ureter.
5. Percutaneous Nephrolithotomy: For the largest of stone a small incision is made in the back and a tract to the kidney is dilated a scope can be passed into the kidney. Through the scope instrumentation can break up a large stone to allow it to be removed in pieces.
6. Open or Laparoscopic Surgery: Rarely do kidney stones do enough damage to require kidney removal or to make a larger incision necessary. Most often an open procedure is used to remove a kidney damaged by infection and very large stones.

Your physician will help you make the appropriate choice for your individual stone.

Good luck on your journey,

Dr Brandt

A COMMENT ABOUT WHEN TO SEEK HELP AFTER YOUR PROCEDURE

Most people are aware of the risks and benefits of any surgery or procedure. We all intrinsically understand with any procedure comes risks such as bleeding, infection, pain, anesthetic complications as well as unintended injury to the structures on which we are operating or to structures near to the structure we are working on.

Risks of the individual procedures are listed in the handout for the procedure, but I want to address the question of, “when is what I am experiencing too much?” When is the amount of pain, bleeding, signs of not feeling well after surgery a cause for concern? When should I seek medical attention?

The answer to the question is two-fold.

1. If you are experiencing severe symptoms (see below), please go to an emergency room. The emergency room can diagnose and treat the acute symptom far more quickly than we can with a clinic visit or over the phone. If you had a surgical procedure at a hospital, it is best to return to that hospital’s emergency room. You can then be assured the clinical record is available to the emergency room physicians and the surgeon who treated you or her partners will be able to continue your care.

Here is a short list of problems for which we would suggest you go to an emergency room: **Fevers (greater than 101F), inability to urinate, vomiting repeatedly and abdominal bloating such that you are unable to eat or drink, chest pain or shortness of breath, heart palpitations, severe and painful leg swelling (especially in the lower leg or calf), severe pain not controlled by the medications provided to you.**

2. If you are simply worried or wondering, please contact our office. We would rather have you contact our office and be reassured than to not call and miss the opportunity to diagnose and treat a complication early in its course.

Symptoms such as pain, bleeding, burning to urinate, urinary frequency, mild redness around an incision, general fatigue, temperatures elevation up to 100F, cramping and slow bowels, mild nausea, bloating, and constipation are all common symptoms postoperatively. Please expect to experience some of these symptoms, but also expect that the symptoms should be tolerable.

We understand and are empathetic to the reality that tolerance of postoperative concerns varies from patient to patient. Be reassured we get many calls for symptoms related to bleeding and pain concerns. Most minor complaints can be managed by reassurance, a change in medications handled over the phone, or a simple evaluation for infection by the laboratory or clinical staff.

Please also be aware that postoperative healing for all of us works on its own schedule. For most of us, healing just takes time. A phone call doesn’t take the pain, bleeding, or infection away, but it does allow us to determine the next steps.

During normal business hours you should call our main office line at (651) 999-6800. During nights, weekends, or holidays (for urgent questions), our physician answering service is the same number 651-999-6800. and ask for the physician on call. A physician or PA-C is available by phone when the clinic is not open. Please respect that if you are calling after hours or the middle of the night the available provider may not be immediately available if attending to another emergency.

CONSERVATIVE TREATMENT, AKA WAITING FOR A STONE TO PASS

Conservative options help facilitate the natural passage of stones through the urinary tract without the need for surgical intervention. These options are typically recommended for smaller kidney stones that are likely to pass on their own. Here are some conservative approaches:

Drink plenty of water. This is crucial for kidney stone passage. Increased fluid intake helps dilute urine and flush out small stones or debris from the urinary tract. It also helps your body stay hydrated at times when you may feel unable to eat or drink or have vomiting from pain. Aim to drink at least 2-3 liters of water per day, or as advised by your healthcare provider, while passing a stone. Water consumption and dilute urine also helps prevent future kidney stone.

Control your pain. Kidney stones can cause significant pain as they move through the urinary tract. Over-the-counter pain medications such as ibuprofen (Advil, Motrin) or acetaminophen (Tylenol) can help alleviate discomfort. Your doctor may prescribe stronger pain medications if needed.

You can obtain good pain relief by taking acetaminophen (Tylenol) every 4-6 hours as needed. Do not exceed 4000 mg acetaminophen per day.

If you can take ibuprofen (Ex. Motrin, Advil) you may also take this. We recommend taking 600 mg of ibuprofen every 6 hours as needed.

You may take acetaminophen and ibuprofen together - these medications do not interact and are safe to take at the same time or you can alternate the two medications every 3 hours.

Occasionally, you may require a prescription for narcotic medications to help with this pain. If you feel like your pain is severe, or unrelieved by your current regimen please contact your prescribing provider.

If you are prescribed a narcotic medication, you may be given a prescription for a stool softener to prevent constipation. Stool softeners may also be purchased over the counter at the pharmacy (Ex. Colace, Milk of Magnesia, Miralax). You may take these as directed to prevent constipation. You should stop these medications if you have any diarrhea or loose bowel movements.

Consider a hot pack or a hot bath. You may use a heating pad over the kidney (back) or bladder (lower pelvis) to assist in pain relief/discomfort. Some patients find soaking in a hot bath helpful for discomfort.

Ask your doctor about Tamsulosin. Certain medications can help relax the muscles in the ureter, making it easier for kidney stones to pass. Alpha-blockers such as tamsulosin (Flomax) are commonly prescribed for this purpose. Your healthcare provider will determine if these medications are appropriate for you.

Stay as active as possible. Light physical activity, such as walking or gentle exercise, may help facilitate the movement of kidney stones through the urinary tract. Heavy activity is not harmful if you are feeling well enough to perform, but obviously avoid strenuous activities that could exacerbate pain or discomfort. Also please avoid operating heavy machinery and situations where a lack of pain control may put you in harm's way, e.g. working on a ladder or roof.

It's important to note that conservative management may not be suitable for all kidney stones, particularly larger stones or stones that are causing complications such as severe pain, urinary obstruction, or kidney damage. In such cases, additional interventions such as lithotripsy, ureteroscopy, or surgery may be necessary. Always consult with your healthcare provider to determine the most appropriate treatment approach for your specific situation.

CYSTOSCOPY AND URETERAL STENT

Cystoscopy is a medical procedure used to examine the inside of the bladder and urethra. It involves inserting a thin, flexible tube with a camera and light at the tip, called a cystoscope, into the urethra and advancing it into the bladder. This allows the doctor to visualize the interior of the bladder and urethra on a monitor.

Cystoscopy may be performed for various reasons, including investigating urinary tract problems such as recurrent urinary tract infections, blood in the urine, urinary incontinence, or bladder stones. It can also be used to diagnose or monitor conditions like bladder cancer, urinary tract strictures, or enlarged prostate.

During a cystoscopy, the doctor may also perform additional procedures if needed, such as taking tissue samples (biopsies), removing bladder stones, or treating certain bladder conditions.

A ureteral stent is a thin, flexible tube placed in the ureter to help urine drain from the kidney to the bladder. It is typically used in situations where there is a blockage or obstruction in the ureter, such as from a kidney stone or after certain surgical procedures.

The stent is inserted through the urethra and bladder into the ureter using a cystoscope or other specialized instruments. Once in place, the stent helps maintain the patency of the ureter, allowing urine to flow freely from the kidney to the bladder.

Ureteral stents can cause discomfort or urinary symptoms such as urinary urgency, frequency, or discomfort during urination. They are usually temporary and removed once the underlying issue, such as a kidney stone, has been addressed or resolved.

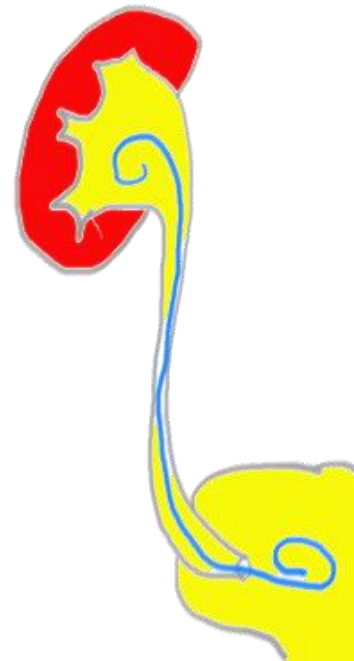
Both cystoscopy and ureteral stenting are common procedures used to diagnose and treat various urinary tract conditions, and they are typically performed by urologists or other trained healthcare providers.

A ureteral stent is placed after a ureteroscopy or percutaneous nephrolithotomy, but stenting may be required to drain infection from the kidney. A stent also allows dilation of the ureter if the ureter itself is too narrow to allow a scope to pass or if a stone is impacted within the ureter.

While the stent is in place, you may have back or side pain, bladder pressure or pain, frequent urination, urgency to get to the bathroom and blood or blood clots in your urine. These symptoms may worsen during urination. You may also have blood in your urine, small blood clots, or debris. This is common after this procedure and not a cause for concern. These symptoms typically improve after the first 48 hours but may persist the entire time your stent is in place. Many patients do not notice their stent at all.

Patients do have pain from the stent when it is placed. Here are strategies for pain relief.

A ureteral stent ensures drainage from the kidney to the bladder. Most all ureteral stents have a coil at each end that keeps the stent in position until it is removed.



- Acetaminophen (Tylenol) every 4-6 hours as needed. Do not exceed 4000 mg acetaminophen per day.
- Ibuprofen (Ex. Motrin, Advil) taking 600 mg of ibuprofen every 6 hours as needed.
- You may take acetaminophen and ibuprofen together - these medications do not interact and are safe to take at the same time or alternating every 3 hours.
- You may require a prescription for narcotic medications to help. If you feel like your pain is severe, or unrelieved by your current regimen please contact your prescribing provider.
- If you are prescribed a narcotic medication, you may be given a prescription for a stool softener to prevent constipation. Stool softeners may also be purchased over the counter at the pharmacy (Ex. Colace, Milk of Magnesia, Miralax). You may take these as directed to prevent constipation. You should stop these medications if you have any diarrhea or loose bowel movements.
- You may be given a prescription for Oxybutynin or Tamsulosin. These medications help relax the urinary system and ease the discomfort from the stent.
- You may use a heating pad over the kidney (back) or bladder (lower pelvis) to assist in pain relief/discomfort.

Stents are temporary must be either removed or replaced within 3 months. Your stent will either be removed in clinic, or in some cases, at home by the patient.

If your stent is to be removed in the office this will be done at your follow up visit. It involves placing a small camera scope through the urethra into the bladder to visualize the stent, grasp it, and then remove the stent.

If your doctor left your stent on a “dangler” you will see a small string coming out of your urethra with a tab at the end. You will be instructed on when to remove the stent at home, typically within a few days after surgery. To remove the stent, grasp the string and gently pull the string until the entire stent is removed. The stent will have a curl at each end (this is normal).

You have no dietary restrictions. We encourage you to increase your fluid and water intake until your stent is removed which will help with your urinary symptoms.

You should take it easy for 24 hours immediately after the procedure and increase your activity as tolerated. You may shower or bathe normally after your procedure. You may return to work immediately the day after your procedure unless otherwise instructed by your doctor.

Risks of stent placement include pain, infection, bleeding, poor drainage from the stent either from poor positioning or from dislodgement of the stent, stent plugging or injury to ureter or kidney from stent placement.

NEPHROSTOMY TUBE PLACEMENT

A nephrostomy tube is required when the kidney stones has become very large and requires percutaneous access to remove the stone or in more extreme cases where a stone is infected, or the ureter is damaged in some way.

Most often the tube is placed in conjunction with an interventional radiologist, a specialized radiologist who perform procedures using radiologic tools such as fluoroscopy or kidney ultrasound.

A nephrostomy tube is not permanent and must be changed periodically or removed when it's no longer needed.

The nephrostomy drains to an external bag. A nephrostomy tube usually does not need special care other than maintenance of the bags connected to the tube.

A nephrostomy tube can be uncomfortable and requires pain management, usually from over-the-counter medication such as acetaminophen and ibuprofen.

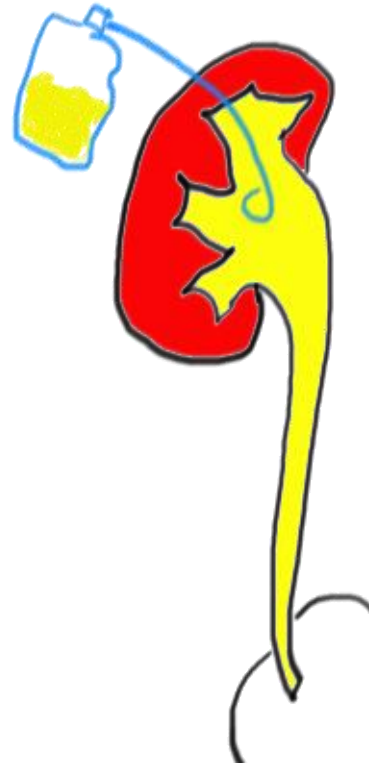
- Acetaminophen (Tylenol) every 4-6 hours as needed. Do not exceed 4000 mg acetaminophen per day.
- Ibuprofen (Ex. Motrin, Advil) taking 600 mg of ibuprofen every 6 hours as needed.
- You may take acetaminophen and ibuprofen together - these medications do not interact and are safe to take at the same time or alternating every 3 hours.
- You may require a prescription for narcotic medications to help. If you feel like your pain is severe, or unrelieved by your current regimen please contact your prescribing provider.
- If you are prescribed a narcotic medication, you may be given a prescription for a stool softener to prevent constipation. Stool softeners may also be purchased over the counter at the pharmacy (Ex. Colace, Milk of Magnesia, Miralax). You may take these as directed to prevent constipation. You should stop these medications if you have any diarrhea or loose bowel movements.
- You may use a heating pad over the kidney (back) or bladder (lower pelvis) to assist in pain relief/discomfort.

A nephrostomy tube is managed by the interventional radiologist with removal, replacement, and troubleshooting being managed by the radiology team.

Risks of nephrostomy tube placement include bleeding, pain, infection, poor positioning, or displacement of the nephrostomy tube and poor or no drainage from the tube after placement.

You have no dietary restrictions. You should take it easy for 24-48 hours immediately after the procedure and increase your activity as tolerated. You may shower or bathe normally after your procedure. You may return to work immediately the day after your procedure unless otherwise instructed by your doctor.

A nephrostomy tube drains to an external bag. The drain is placed through the skin.



URETEROSCOPY

Ureteroscopy is a procedure used to diagnose and treat kidney stones. It involves passing a thin, flexible scope called a ureteroscope through the urethra and bladder, then up into the ureter and sometimes into the kidney itself. This allows the doctor to directly visualize the urinary tract and locate any kidney stones.

During the procedure, if a stone is found, various techniques can be used to remove it or break it into smaller pieces that can pass more easily. These techniques may include laser lithotripsy, which uses a laser to break up the stone, or basket retrieval, where a small basket-like device is used to grab and remove the stone.

Ureteroscopy is often preferred for treating smaller stones or stones located in the lower part of the ureter or kidney. It is less invasive than some other procedures, such as percutaneous nephrolithotomy (PCNL), which involves making a small incision in the back to access the kidney. Ureteroscopy is typically performed under general anesthesia or sedation and is considered safe and effective for the treatment of kidney stones.

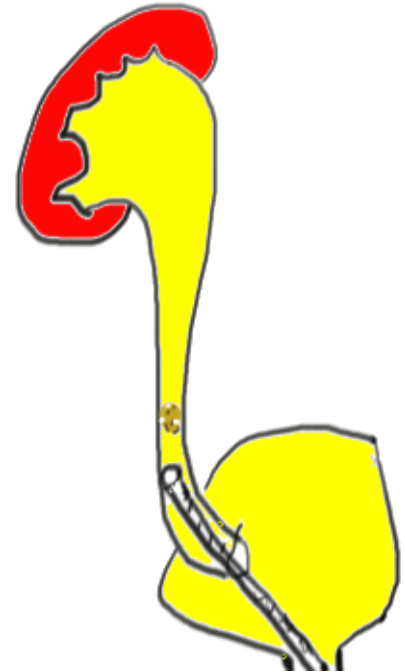
A stent is typically placed after a ureteroscopy to ensure drainage from the kidney after the procedure. Please refer to the cystoscopy/stent placement page earlier in this handout for a discussion of how to manage stent discomfort and expectations for bleeding.

A ureteroscopy is often complemented by laser lithotripsy of the stone to break the stone into smaller pieces to allow removal of the stone or to allow spontaneous passage of the stone. The laser technology that is currently most common is the Holmium laser. A technology that is developing is also the Thulium laser. The two lasers are similar in the ability to break up stone. Minor differences exist that you surgeon will be aware of (the thulium laser generates more heat while breaking up the stone). Both lasers are safe and very effective.

There are times when a ureteroscope cannot be placed up to the level of the stone during an initial attempt. That is because the ureter can be small enough that it won't allow the scope to pass. In that case most often placement of a ureteral stent and a subsequent return to the operating room allows for successful passage of the scope and removal of the kidney stone.

Risks of ureteroscopy include bleeding, infection, pain after surgery from the manipulation and, often, placement of a ureteral stent. A risk of not being able to pass the ureteroscope or complete the procedure on the first attempt was discussed earlier. The biggest risk for long term for a patient is tearing the ureter. Most tears in the ureter are small and will heal spontaneously after placement of a ureteral stent. A complete tear (called an avulsion) of the ureter is a very rare, very serious event that requires surgical repair.

A ureteroscopy places a scope into the ureter usually to the point of an obstructing stone in the ureter. Small laser fibers or other instruments pass through the scope to remove the stone.



EXTRACORPOREAL SHOCK WAVE LITHOTRIPSY

Extracorporeal Shock Wave Lithotripsy (ESWL) is a non-invasive medical procedure used to treat kidney stones and stones in other parts of the urinary tract, such as the ureter. Instead of surgery, ESWL uses shock waves generated outside the body to break kidney stones into smaller pieces that pass easier through the urinary tract.

During the procedure, the patient lies on a special treatment table or a water-filled cushion. An ultrasound or X-ray imaging device is used to precisely locate the kidney stone. Then, shock waves are generated and focused onto the stone using a machine called a lithotripter. The shock waves travel through the body and break the stone into smaller fragments.

ESWL is generally considered safe and effective for treating small to medium-sized kidney stones, particularly those located in the kidney or upper ureter. However, it may not be suitable for all types of kidney stones, and some patients may require multiple treatment sessions to completely clear the stones.

After the surgery you will be allowed to go home when you have recovered from your anesthetic. You will typically go home with pain medicine and an antibiotic. You will begin passing stones in your urine shortly after the procedure. You will need to strain your urine with a strainer that will be provided for you at the time of surgical facility. You should collect your fragments so that the minerals can be analyzed for their composition. Most patients are typically seen back in the office 2-4 weeks after the procedure with an x-ray to ensure that the stone is gone.

If the stone is large, or in an unfavorable position that may be causing pain, your doctor may advise you to have a stent placed. Please refer to cystoscopy and stent placement page in this handout.

Risks of the ESWL are pain, bleeding, failure to break up the stone, inability to pass the broken fragments, injury to nearby structures such as liver (right kidney) and spleen (left kidney), heart arrhythmia during the procedure due to the shock pulses from the lithotripter, bruising on the skin of the back, and failure to begin or complete the procedure due to poor visualization of the stone on Xray or ultrasound during the procedure.

An ESWL sends shock waves through the body to break up the kidney stone. The patient then passes smaller fragments easier through the ureter to the bladder.



PERCUTANEOUS NEPHROLITHOTOMY

Percutaneous nephrolithotomy (PCNL) is a minimally invasive surgical procedure used to remove large kidney stones, usually those that are too large to be treated effectively with other methods such as shock wave lithotripsy or ureteroscopy.

During a PCNL procedure, the surgeon or interventional radiologist makes a small incision in the patient's back and inserts a hollow tube to create a direct tract into the kidney usually guided by imaging techniques such as fluoroscopy or ultrasound. The surgeon then passes a scope called a nephroscope directly into the kidney. The nephroscope allows the surgeon to directly visualize the stone within the renal collecting system. Some stones can be removed through the dilated tract intact, but most will need fragmentation (lithotripsy) using ultrasonic or pneumatic lithotripsy, laser lithotripsy, or mechanical fragmentation.

After the stone has been fragmented, the smaller pieces are either removed with specialized retrieval tools or flushed out of the kidney using irrigation fluid.

Once the stone is removed most often a ureteral stent is placed which will allow drainage from the kidney and allow the dilated tract to heal.

In some cases, a temporary drainage tube called a nephrostomy tube may be left in place to allow the kidney to drain and heal properly. Sometimes we remove this tube prior to discharge and sometimes this catheter may be left in place for subsequent surgery or to remove additional stone burden. The catheter exits the back and is secured to an external bag on the leg. This allows for a safe way to return to the kidney collecting system to remove additional stone. If you are discharged home with your nephrostomy tube your nurse will teach you how to manage and empty the bag.

If your nephrostomy tube is removed before you go home: ***You are likely to experience leakage of fluid from where your nephrostomy tube was in your back. This fluid may be clear, pink, or blood tinged. You may leak a lot of fluid and require multiple dressing changes per day - this is normal, do not be alarmed. The leakage of fluid will resolve on its own as your incision heals, typically within 24 -72 hours. You may change your dressing as needed. We do not put stitches in that incision, it will heal on its own.***

PCNL is typically performed under general anesthesia and may require a short, usually overnight only, hospital stay for recovery. It is considered an effective and safe treatment option for large kidney stones, with high success rates for stone clearance and low rates of complications when performed by experienced surgeons.

Risks of percutaneous nephrolithotomy include bleeding, pain, kidney injury, failure to remove all the stones, injury to nearby structures, and delayed bleeding from the kidney as it heals from surgery. One of the more serious uncommon complications is an injury to the lung or a collection of urine, blood, or fluid in the space around the lung on the side of the procedure. The fluid collection or lung injury may require placement of a tube called a chest tube to help drain the fluid if severe.

Percutaneous Nephrolithotomy requires access to the collecting system through the back to remove a larger stone.



OPEN OR LAPAROSCOPIC SURGERY

Open surgery for kidney stones, also known as open stone surgery or open nephrolithotomy, is a traditional surgical approach used to remove large kidney stones or stones that cannot be effectively treated with less invasive methods such as shock wave lithotripsy or ureteroscopy. We rarely need to perform these types of procedures.

During open stone surgery, the surgeon makes an incision in the patient's back or abdominal cavity to access the kidney directly. The surgeon then removes the kidney stone manually or with the help of specialized instruments. In some cases, if the stone is too large to remove in one piece, it may need to be broken into smaller pieces before removal. After the stone has been removed, the incisions are closed, and the patient stays in the hospital.

Open stone surgery is effective for removing large kidney stones or stones that are difficult to access with other methods. However, it is a more invasive procedure compared to less invasive techniques such as ureteroscopy or shock wave lithotripsy. As such, it typically requires a longer recovery time and carries a higher risk of complications, including bleeding, infection, and damage to surrounding tissues.