

Percutaneous Nephrolithotomy

Prior to Surgery

Surgery Scheduling

You will be contacted in the near future by one of the department's surgery schedulers with the date of the procedure. An appointment will also be made for you at the Preoperative Medicine Clinic (PMC). Shortly thereafter you will receive by mail an informational packet with instructions on where to go for your PMC visit and surgery. Three days prior to surgery you will be contacted by one of OHSU's OR schedulers with the final surgery time and when to check in the morning of surgery.

Preoperative Testing

During your PMC visit the items listed below will be ordered as deemed necessary based upon your age and medical history. You will have an opportunity to speak with the anesthesia staff regarding the risks of a general anesthetic.

- EKG (electrocardiogram)
- CBC (complete blood count)
- PT / PTT (blood coagulation profile)
- Comprehensive Metabolic Panel (blood chemistry profile)
- Urinalysis

Medications to Discontinue

Unfortunately it is not safe to perform the procedure while taking anti-coagulation (blood thinning) medications. A list of medications that decrease your body's ability to clot are listed below. ***All blood thinning medications need to be discontinued at least 5 days prior to surgery to prevent serious bleeding from the kidney and/or nearby organs following the procedure.***

Do not stop any of these medications without contacting your prescribing doctor for approval. If your prescribing doctor does not feel it is safe for you to discontinue one of these medications please contact the urology office to let us know. We will discuss with you alternative treatment options such as ureteroscopic lithotripsy, which can be performed while taking bleeding thinning medications.

- Vitamin E
- Aspirin
- Aspirin / dipyridamole (Aggrenox)
- Ibuprofen (Advil, Motrin)
- Naproxen (Aleve)
- Diclofenac (Voltaren)
- Celecoxi (Celebrex)
- Rofecoxib (Vioxx)
- Clopidogrel (Plavix)
- Ticlopidine (Ticlid)
- Warfarin (Coumadin)
- Enoxaparin (Lovenox)

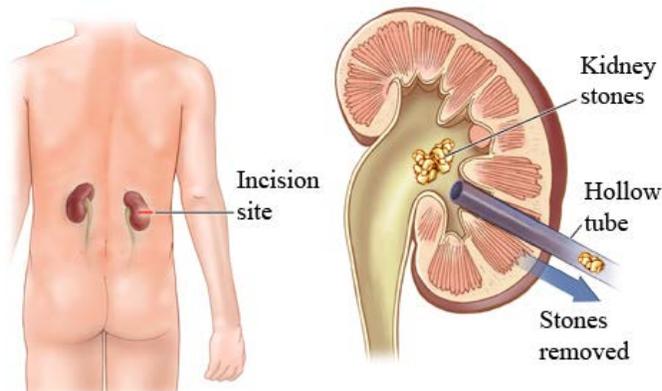
Diet Day Before Surgery

You may eat a regular diet until midnight the night before surgery. After midnight please do not eat or drink anything. If instructed to do so, you may take your prescription medications with a sip of water.

Surgery

Procedure Description

Once asleep a catheter will be placed in your bladder (Foley catheter). You will then be placed on your stomach and a small incision will be made in your back (about 1 inch in length). Through the incision a tube (access sheath) will be placed into the hollow part of your kidney containing the stone(s). An instrument is passed through the sheath into the kidney, which breaks the stone up and sucks out the pieces.

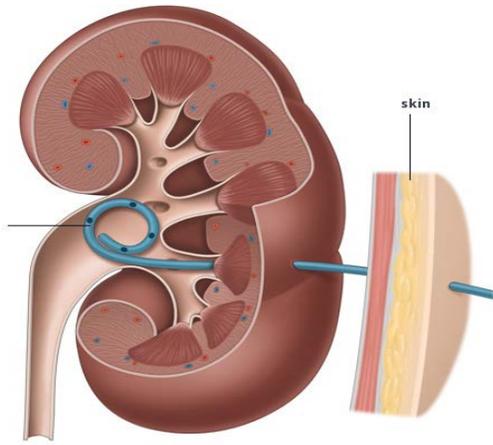


Once the stone has been removed a ureteral stent will be placed. A ureteral stent is a piece of surgical plastic that goes from the kidney to the bladder through the ureter (tube that transports urine from the kidney to the bladder). The stent keeps the ureter open following surgery. If a stent is not placed the ureter may temporarily swell shut or become occluded by blood clots or stone debris resulting in kidney pain following surgery or leakage of urine out of the incision site in your back.



The majority of time a nephrostomy tube will also be placed at the end of the procedure. A nephrostomy tube is a drain that rests within the hollow part of the kidney and comes out through the previously made skin incision. Like the ureteral stent, the nephrostomy tube helps ensure that the kidney does not become blocked with blood clots following the procedure. The

tube also minimizes bleeding from the kidney following surgery. Occasionally, a nephrostomy tube will not be placed at the end of the procedure. This depends on a number of factors during surgery.



Hospitalization and Drain Removal

Most patients spend a single night in the hospital and are discharged the afternoon following surgery. Unless there is concern for ongoing bleeding or infection (fevers after surgery) the drainage tubes will usually be removed in the following order.

Nephrostomy Tube Present

- Nephrostomy tube: the day after surgery while in the hospital
- Bladder Catheter: two days after surgery, either in clinic or at home
- Ureteral Stent: one week after surgery in clinic

No Nephrostomy Tube

- Bladder Catheter: the day after surgery while in the hospital
- Ureteral Stent: one week after surgery in clinic

Potential Risks and Complications

Although uncommon, percutaneous stone removal is an invasive surgery with the potential for major complications. Potential risks include, but are not limited to the following:

Residual Stones within the Kidney or Ureter

The risk of having residual stone following the procedure depends upon the number, size and complexity of the stone(s) being treated. A review of the medical literature published by the American Urological Association found that nearly 25% of patients being treated for large, complex stones had residual fragments following surgery. One study (Raman et al. J Urol 2009; 181: 1163) found that within 3 years of surgery 43% of patients with residual fragments had stone-related symptoms and 26% required another procedure.

Urinary Tract Infection

Intravenous antibiotics will be given to you immediately before surgery. If you have a history of infected kidney stones or recurrent urinary tract infections you may be placed on oral antibiotics the week prior to surgery. In rare instances you may be admitted to the hospital a day or two prior to surgery to receive intravenous antibiotics.

Despite preoperative antibiotics it is always possible to develop a bladder infection (burning with urination, urinary frequency and urgency) or a kidney infection (back pain, fevers, nausea, fatigue) after surgery. The likelihood of a serious infection following the procedure is less than 1%. However, the risk may be slightly higher if you have a history of recurrent infections or an infection that was treated prior to surgery.

Bleeding

The procedure involves making a hole in the kidney to remove the stones. As a result, significant bleeding can occur. The risk of losing enough blood to require a transfusion is roughly 3%. This risk may be higher if your blood count prior to surgery is low.

Approximately 1% of patients will experience delayed bleeding. This typically occurs 5 to 7 days after surgery and is due to abnormal healing of blood vessels in the kidney. Patients will typically experience the rapid onset of kidney pain with a marked increase in the amount of blood in the urine. An angiogram of the kidney is performed by an Interventional Radiologist, which locates the bleeding vessel. The vessel is then plugged from the inside.

Pleural Effusion

The surgical incision will occasionally have to be made above the ribs to access the stone(s), which risks developing a pleural effusion (accumulating fluid around the lung). Incisions above the 12th rib carry a risk of about 5% and incisions above the 11th rib a risk of nearly 30%. Fortunately, it is very rare to have to go above the 11th rib to get into the kidney unless abnormalities of the spine are present. Small effusions do not require treatment. However, if a large amount of fluid has accumulated around the lung then a separate drainage tube will need to be placed, which usually gets removed a day or two after surgery.

Collecting System Injury

Tearing a hole in the hollow part of the kidney occurs roughly 5% of the time. Small perforations (holes) do not need to be treated. Large perforations require the procedure to be stopped and increase the risk of developing an abscess (collection of infected fluid) around the kidney. Most large perforations heal with no further treatment other than prolonged kidney drainage (leaving the nephrostomy tube, bladder catheter, and stent in longer than usual).

Failure to Gain Access

The first part of the procedure is establishing a connection between the skin and the hollow part of the kidney with a plastic tube (sheath). Approximately 1 to 3% of the time this is not successful and the surgery is stopped. Most instances involve patients who are very obese or have abnormal kidney anatomy. Future treatment options include attempting the procedure at a later date after the kidney has recovered, having the tube placed under CT or ultrasound

guidance at an earlier date, or treating the stone(s) in a different way (ureteroscopic or shock wave lithotripsy).

Injury to Nearby Organs

Injuring structures near the kidney such as the colon, small intestines, liver or spleen has been reported (0.3% of procedures). Loss of the kidney has also been noted but also occurs less than 1% of the time.

Following Surgery

Postoperative Symptoms

The vast majority of patients do well after the procedure and are able to go home the day after surgery. The following symptoms can be expected.

Pain

Most patients experience mild to moderate pain at the surgery site, especially if a nephrostomy (kidney) drain is present. The pain improves significantly following removal of the nephrostomy tube. Nevertheless, it can take several weeks for the pain to resolve. Burning with urination typically lasting 24 hours is also common.

These symptoms are usually well controlled with oral narcotic pain medication. If not provided prior to surgery, you will be sent home with a prescription for either Percocet or Vicodin. These medications can impair judgment and reaction time. As a result, ***you must not drive or operate dangerous equipment while on these medications.*** You should transition to Acetaminophen (Tylenol) and/or Ibuprofen within a day or two of surgery if possible.

Hematuria

Hematuria (blood in the urine) will always be present following the procedure and usually lasts until a few days after the ureteral stent is removed. The amount of blood in the urine is typically heaviest over the first one to two days. It is common for the blood in the urine to go completely away and then come back intermittently while the stent remains in place. This is nothing to worry about and is usually due to the stent rubbing up against the inner lining of the kidney, ureter and bladder. As previously mentioned, if you notice a sudden increase in the amount of blood in your urine with worsening kidney pain please contact the urology office or go to the Emergency Department.

Stent Related Symptoms

Nearly all patients will experience symptoms related to the ureteral stent. It is common to feel like you have to urinate more frequently and urgently due to the stent irritating the bladder. You may also feel a dull ache in your kidney when you urinate due to urine backing up the stent into the kidney. Lastly, you may also experience some discomfort in the urethra or tip of the

penis at the end of urination. These symptoms are usually mild and can be controlled with oral medications. A small number of patients will have severe symptoms related entirely to the stent, which resolve following removal.

Constipation

Narcotic pain medications such as Percocet and Vicodin cause constipation. Over the counter stool softeners such as Colace and Senna are invaluable while taking narcotic pain medications. Laxatives such as Miralax may also be used if you have not had a bowel movement in several days. Drinking plenty of fluids and transitioning to over the counter pain medications will help minimize constipation.

Postoperative Instructions

Dressing

It is common to leak fluid from the incision site for a day or two after removal of the nephrostomy tube. If this occurs it is best to keep the site covered with clean gauze. The gauze should be changed on a daily basis and more frequently if needed. Once the incision has stopped draining it may be left uncovered.

Foley Catheter Care

If you are sent home the day after surgery you will more than likely be discharged with a Foley (bladder) catheter. The nursing staff will teach you how to care for the catheter and provide you with necessary supplies.

Showering and Baths

You may shower immediately after discharge, even if you have a Foley catheter in place, but please no baths for two weeks from the time of surgery to allow the incision site to heal.

Activity

- Driving: you may begin driving once the Foley catheter has been removed and you are off narcotic pain medications.

- Lifting / Exercise: There are no lifting or exercise restrictions. However, if you notice an increase in your pain, urinary symptoms, or blood in the urine following an activity, then it is best to limit this activity until your symptoms resolve.

- Intercourse: You may resume sexual activity as tolerated.

Diet

You may resume a regular diet after leaving the hospital.

Returning to Work

Most patients take two weeks off of work to recover. Occasionally patients may need to take more time off. Our office can provide you with documentation as needed.

Postoperative Appointment

Please call the clinic the day after discharge to arrange a postoperative visit (503-346-1500). The timing of that visit will be told to you prior to discharge and will be included in your discharge paperwork. Usually you will follow-up the week after surgery for ureteral stent removal.

Stent Removal

If you are sent home with a ureteral stent, it must be removed. Failure to remove the stent will result in stone formation on the stent with eventual obstruction and infection, which over time can damage the kidney and make removal very difficult.

Preparation

Unless you have abnormal kidney function or an allergy to Ibuprofen, ***please take 600 mg of Ibuprofen 1 hour before stent removal.*** Ibuprofen helps prevent ureteral spasms after stent removal. Nevertheless, it is not uncommon to have some pain in the kidney following stent removal. This is usually mild and lasts only a few hours. If you develop pain that is not controlled with oral medications or a fever greater than 101.5 degrees then please contact the clinic or go to the emergency department.

Technique

A small scope (cystoscope) will be inserted through the urethra into the bladder. The stent will be grasped with a small instrument and removed. The procedure usually takes about a minute and is very well tolerated. You may drive home following the procedure.

Things to Watch For After Surgery

Although uncommon, there are a number of things to watch out for after discharge. These include...

- Pain that is not controlled by oral pain medications
- Sudden onset of kidney pain with worsening blood in the urine
- Severe nausea with the inability to keep any fluids or medications down
- Fever greater than 101.5 degrees Fahrenheit

If you develop any of these conditions during normal business hours (Monday through Friday from 8 am to 5 pm) please call the clinic (503-346-1500) to speak with one of the nurses. If after hours, then go to the OHSU emergency department if you live locally or the nearest ER if you live further away.