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## Kidney Stones

By Robert S. Hollabaugh, Jr. MD

### Introduction

Unfortunately for many, kidney stones are a common and often painful problem. Medical textbooks describe kidney stone pain as the worst pain known to man, even worse than childbirth (although some women in the midst of labor will disagree). Mid-Southerners live in the heart of the 'kidney stone belt,' a dubious distinction for the region due to the higher incidence urinary stones than other regions, related primarily to the heat and humidity of the southeast US. Kidney stones can affect both men and women, and can occur at any age. Stone pain usually comes on suddenly, with the hallmark being "colic," which is pain plus nausea. The pain usually begins in the

flank on the side where the stone is located and migrates to the groin area as the stone moves. The pain is often accompanied by severe nausea and vomiting. When passing a stone, remember to urinate thru a strainer so that you can capture the stone and we can be certain that it has passed. Never just assume the stone is gone because the pain has stopped. If there is any question, make sure to follow up with your doctor, because it can be dangerous to leave a stone blocking off the kidney.

Kidney stones form when the concentration of calcium salts and various other urinary chemicals get too high. Crystals form in the kidney making stones. While usually a slow process taking months or even years, stones can sometimes form in just a few weeks. Urinary stones become symptomatic when they cause bleeding or obstruction to the flow of urine. Small stones in the kidney are frequently asymptomatic. When they just sit in the kidney with no movement or blockage they are pain free, and may be so for years. However, when the stones significantly increase in size or pass out of the kidney into the tube (ureter) carrying urine to the bladder, the stone may block the flow of urine which causes distension of the kidney and pain. As stones move and approach the bladder, they may cause frequent urges to urinate as well as burning with urination. Many small stones will spontaneously pass. However, as the size of the stone increases, the likelihood of stone passage decreases. Predicting the likelihood of passage requires knowing the exact size and specific location of the stone. X-rays,

CT scans, and ultrasounds are commonly used to get this important information.

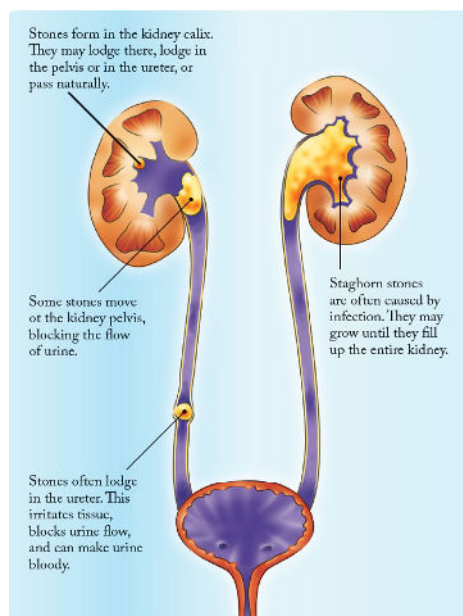
### Diagnosis

Kidney stones can be diagnosed easily and quickly if the right tests are available. CT Scan has become the gold standard in the evaluation of kidney stone disease. Most urologists schedule CT scans through a hospital facility, but the Conrad Pearson Clinic has its own CT scanner right in the office. This allows for immediate evaluation for suffering patients who suspect kidney stones. Other tests may include IVP (intravenous pyelogram). For this test, contrast dye is given intravenously which circulates thru the kidney system. Plain x-rays are taken sequentially, which give a roadmap of the urinary drainage system. Such information can help decide the size, location, and blockage associated with stones or other kidney abnormalities. Urinalysis can detect if there is any blood in the urine, as stones in the kidney system will usually scratch the lining causing some bleeding. While not definitive, urinalysis can help confirm the diagnosis.

### Risks

Certain diseases may be associated with stone formation, although many times stones form in otherwise healthy individuals. **Gout**, which usually causes a painful joint, may also be associated with stone formation. **Parathyroid Gland** disease can cause high blood levels of calcium which can lead to stones. Polycystic kidney disease, a genetic disorder, is associated with kidney stones. **Chronic diarrhea** or

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intestinal malabsorption syndromes can lead to stones, as can major weight loss. While there is some controversy regarding pregnancy, many feel that the metabolic changes of pregnancy may favor stone formation in patients predisposed to stones. Chronic urinary tract infections may be caused by, or may lead to, stone formation. Some medications, such as Topamax, can lead to urinary stone formation.

## Treatment Options

Once a stone has been diagnosed, the urologist and patient have several options for addressing the problem. Factors that determine which method of treatment is best for a given situation include stone size, stone location, and the presence of any infection or anatomical abnormalities of the urinary tract.

**Trial of Passage:** Patients that have small stones (usually less than 5 mm) whose symptoms are well controlled with oral pain medications are frequently treated with a period of observation to allow the stone to pass. Commonly, we will suggest giving 3-5 days to see if it will pass, sometimes even longer if pain is well controlled. Larger stones or stones accompanied by severe symptoms usually require intervention. Medications, like Flomax, can be used temporarily to help dilate the system so stones may pass more easily. Pain medications and nausea meds are commonly needed while trying to pass the stone.

**Lithotripsy:** The first choice of treatment for most stones in the kidney is shock wave lithotripsy. This treatment utilizes a special machine (lithotripter) to generate a shock wave that has its energy focused on the stone. The shock waves pass easily thru the body and fragment the stone. Smaller pieces, often dust, are then much more easily passed in the upcoming days. Short acting anesthesia in the ambulatory surgery center makes this minimally invasive treatment virtually painless. The Conrad Pearson Clinic has one of the latest generation lithotriptors and the entire process usually takes less than an hour. Lithotripsy is the most common form of therapy, but some stones are not good candidates for lithotripsy.

In addition, you must be off any blood thinners for lithotripsy to be safe.

**Ureteroscopic Stone Extraction:** Stone extraction involves using a delicate scope to look into the urinary system. With the patient under anesthesia, a scope is guided into the opening of the urethra and gently up thru the urinary tract. When the stone is seen, a fine basket is used to grasp it and extract it. If needed, a high-tech laser can be used to break it into smaller pieces. Scope extraction is generally recommended when the stones are small and relatively low in the urinary tract. This procedure is performed in an outpatient surgery center or hospital under anesthesia.

**Percutaneous Stone Extraction (PERC):** In cases where the stone is particularly large (over 20 mm) or is unsuccessfully managed by other treatments, percutaneous stone extraction may be recommended. This is done in the hospital and often requires an overnight hospital stay. At the hospital, a needle and wire are placed thru the skin of the back into the kidney system. This gains access to the kidney. In the operating room, that access tract is stretched so that instruments can be placed into the kidney to break the stone. The stone pieces can then be extracted thru the access tract

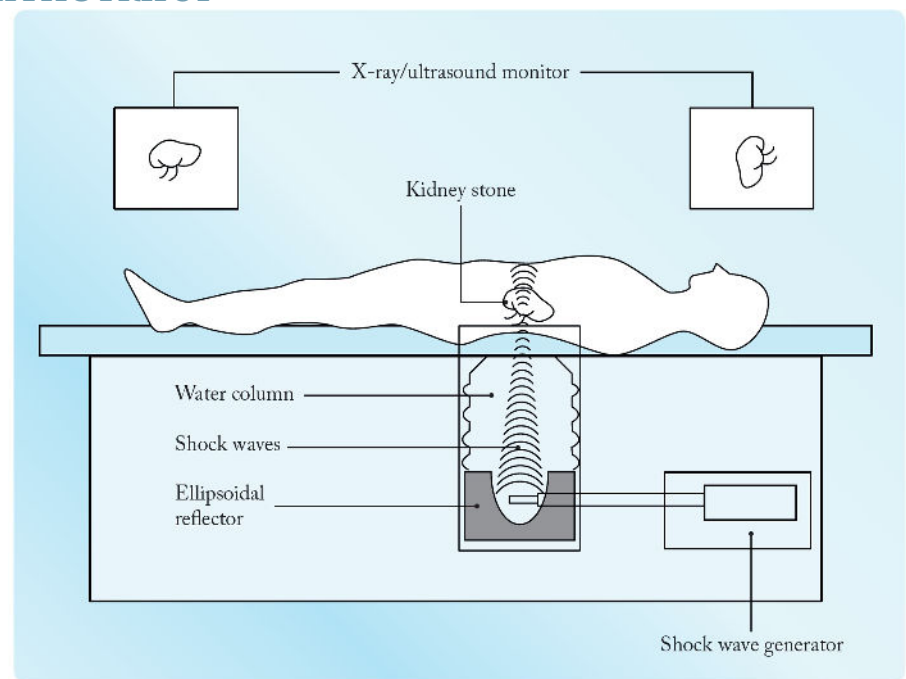
in the skin. A drainage tube may left in place overnight, which is removed before going home. Such PERC removals are rarely needed as most stones will respond to either lithotripsy or ureteroscopy.

**Open Stone Surgery:** In very rare circumstances, open surgical exploration or laparoscopic surgery is needed. Sometimes this is warranted if other problems exist with the kidney that need to be corrected in addition to the stone. If laparoscopic and robotic options are ruled out, the stone may need to be removed thru an old-fashioned surgical incision made in the flank. These patients recover in the hospital for several days, and have restricted activity in recovery of 3-4 weeks.

## Stents

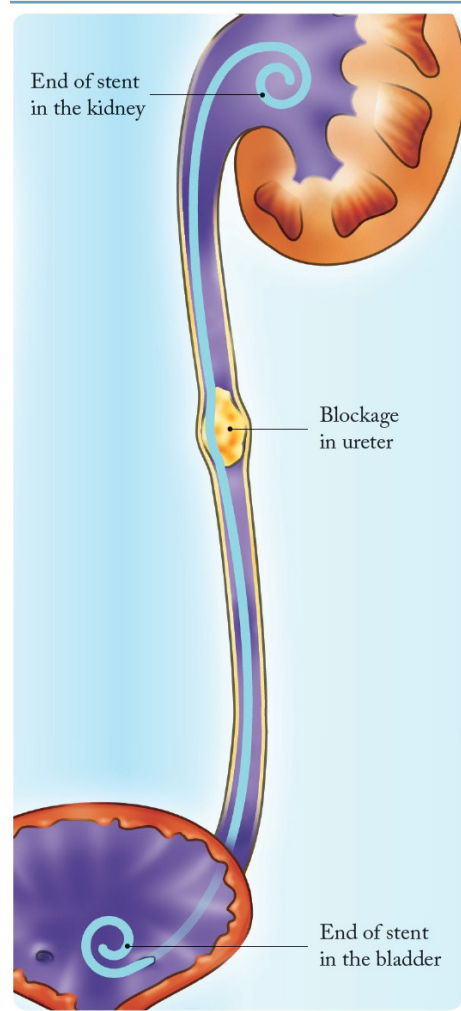
Sometimes in the course of managing a stone, the doctor will decide that a stent is necessary. The stent is a plastic tube that is inserted inside the urinary tract to relieve blockage. The stent spans the ureter from the kidney to the bladder. It is roughly the diameter of a spaghetti noodle and is about 12 inches in length. It is flexible and hollow like a straw. Many different circumstances may necessitate a stent. In some cases a stent is put in as a first step in treating the stone. The stent can gradually dilate the ureter over 5-7

## LITHOTRIPSY



days and make more room for the stone to pass or for a scope to be used later. Stone manipulation after stenting is much more reliable and effective. In other situations, the narrow natural anatomy will just not accommodate the ureteroscope to reach the stone. To force the scope up a narrow ureter is dangerous and can permanently damage the ureter. In these cases, the urologist will place a stent and come back a week later to more safely reach the stone. When there is infection in the urinary system, it is dangerous to manipulate stones as it may precipitate sepsis; therefore, when infection is present, a stent is placed to relieve the blockage and antibiotics are given for a week before further attempts are made at removing the stone. Finally, in many cases the ureter has become so irritated by the stone, that even though the stone is extracted, the ureter needs a stent for 4-7 days to assure proper healing. If

## KIDNEY WITH STENT



the ureter is severely irritated upon removal of the stone, it will spasm and swell shut in the hours after the stone is removed and hurt just as bad as a stone. The stent is less aggravating than that would be.

When in place, the stent itself does irritate the kidney and bladder. Because it is plastic, the stent will rub the lining of the bladder and often causes blood in the urine. This amount of blood, while easily visible, is only a minor concern. Remember, a single drop of blood will turn the entire toilet bowl red. The stent might also cause spasms of the bladder and a constant urge to urinate. There are medications that can be taken to control spasms if needed. Once the stent is removed, everything returns to normal in 24-48 hours.

## Special Circumstances

**Stones and Sepsis:** If a stone is infected and the patient is having fever and chills, special emergency precautions must be taken to avoid sepsis (overwhelming, life-threatening spread of the infection). Infection might develop at any time while managing a stone. Because infection can easily be aggravated in the urinary tract, attempting removal of an infected stone is not recommended. Instead, patients are usually hospitalized and either a stent or a nephrostomy tube is placed. A nephrostomy is a tube placed thru the skin of the back directly into the kidney by interventional radiologists in the hospital. The infected urine can then drain out of the kidney thru the tube. At a later date, once the infection is resolved, the stone can be safely treated and the stent or nephrostomy removed.

**Stones and Pregnancy:** During pregnancy, because of the developing fetus, x-rays (radiation) are avoided. This makes diagnosing and managing a kidney stone more difficult. All types of x-rays are avoided in the first trimester if possible; low dose CT scans can be safely used in the 2<sup>nd</sup> and 3<sup>rd</sup> Trimesters. In most cases, conservative recommendations allow the stone to have a chance to pass. It is safe to take short-term pain medication and antibiotics during pregnancy. In cases where the pain cannot be controlled or where infection complicates matters, a stent or a nephrostomy tube is needed. These options usually will control the situation

until after delivery. Once the baby is delivered and the uterus returns to a near normal size, lithotripsy or ureteroscopic extraction can be used to safely manage the stone. Stone manipulation during pregnancy is avoided and lithotripsy during pregnancy is never used.

## Prevention of Stones

While quick management of a painful stone is everyone's first concern, it is not the end of the story. As the old saying goes, "An ounce of prevention is worth a pound of cure." A critical consideration involves trying to prevent future stones, as prevention of stone formation is preferable to treatment of recurrent stone attacks. Numerous manageable medical conditions, like parathyroid disease, gout and digestive disorders can contribute to stone formation. Metabolism changes, as seen with major weight loss, can also cause stones to form. The most common factor, however, is dehydration. Anything that leads to dehydration can lead to stones. Thus, the most common recommendation for stone prevention is to "drink more water." Hydration, as well as managing underlying medical conditions, will help prevent recurrent stones.

Most urinary stones are made of calcium oxalate. Contrary to popular belief, consuming too much calcium or dairy products is not usually the cause of these stones. However, if you make lots of stones and are taking lots of dairy, calcium supplements, calcium-vitamins, or TUMS, they may be implicated. Similarly, some foods have lots of oxalate composition which can trigger stones, most notably tea, beer, nuts, and peanut butter. Identifying stone composition and then assessing urine concentrations can often identify the cause. Once studied, your doctor will decide if medications might help decrease the risk of new stone formation. Above all, a complete evaluation is critical in the long-term care plan for kidney stone patients.

## Kidney Stone Prevention Tips:

1. Hydrate. Don't underestimate your sweating. Saunas, hot yoga and heavy exercise may be good for your health, but they also may lead to kidney stones. The





common link is dehydration. The more you sweat, the less urine you produce, which allows stone-causing minerals to concentrate.

**Recommend:** Your best bet to avoid kidney stones is to drink plenty of water. A simple way to assess hydration is to look at your urine. If it is dark yellow or amber, you are likely dehydrated; if it is almost clear like water, you are well hydrated. Stay hydrated to lessen stone formation.

**2. Understand Stone Chemicals.** Most stones are made of calcium-oxalate. Dietary calcium is not necessarily the enemy, although it tends to get a bad rap! While calcium intake is certainly involved, a bigger factor in calcium excretion is sodium (salt) intake. Too much salt triggers calcium release into the urine. Regarding dietary calcium, too much or too little can precipitate stones, but more importantly cut your salt. Oxalate is dietary, and is naturally found in many foods, including peanut butter, iced tea, nuts and seeds, grains, legumes, sweet potatoes, and even chocolate. Urine studies can tell if oxalate levels are driving stone formation. If so, controlling oxalate intake will be critical. Remember, calcium and oxalate will bind together, either in the gut or in the urine.

**Recommend:** If you love calcium and oxalate foods, eat and drink them together during a meal. In doing so, oxalate and calcium are more likely to bind to one another in the gut before the kidneys ever

begin processing them, making it less likely that calcium finds oxalate in the urine to make a stone.

**3. It's Not One and Done.** Passing a kidney stone is often described as one of the most painful experiences a person can have, but unfortunately, it's not always a one-time event. Having that first stone greatly increases your chances of having another. Research shows, sadly enough, that stone patients do not always heed preventive medical advice. About 15% of kidney stone patients don't take prescribed medications and 41% do not follow the nutritional advice that would keep stones from recurring.

**Recommend:** Take action! Without the right medications and diet adjustments, stones will almost certainly come back.

**4. When Life Hands You a lemon, make Lemonade.** Next time you drive past a lemonade stand, consider your kidneys. Citrate, from citrus fruits like lemons, is a stone preventative. While it may seem easier to just take a citrate pill, some home remedies, like lemonade, may be just as beneficial.

**Recommend:** Studies have shown that limeade, lemonade and other fruits and juices high in natural citrate offer stone-preventing benefits. Beware of the sugar, though, because high levels can also increase kidney stone risk. Instead, buy sugar-free lemonade, or make your own by mixing lime or lemon juice with water and using a sugar substitute if needed. Citrus lowers stone risk.

**5. Not All Stones are Created Equal.** In addition to calcium oxalate stones, another less common type of kidney stones is uric acid stones. Red meat, organ meats, and shellfish have high concentrations of a natural chemical compound known as purines (a type of protein). Protein with high purine content leads to a higher production of uric acid which can cause uric acid stones. Acidic urine favors

crystallization of this uric acid into urinary stones.

**Recommend:** To prevent uric acid stones, cut down on high-purine foods and follow a healthy diet that contains mostly vegetables and fruits, whole grains, and low fat dairy products. Limit sugar-sweetened foods and drinks, especially those that contain high fructose corn syrup. Limit alcohol because it can increase uric acid levels in the blood, and avoid crash diets for the same reason. Eating less animal-based protein and eating more fruits and vegetables will help decrease urine acidity and this will help reduce the chance for stone formation if you are a uric acid stone former.



**6. Did I mention Salt?** Urine calcium follows urine sodium like a shadow, so restrict your salt. The current FDA recommendations are a sodium intake below 2300 mg. per day. For stone formers, 1,500 mg should be the limit. Remember, it's not just the white stuff in the shaker... There is red salt, that is called ketchup. There is yellow salt; called Mustard. There is green salt, called Pickles. There is Brown salt, called gravy. There is black salt, called soy sauce. In addition, stone formers should strictly limit salty snacks, like chips, crackers, and salted nuts. Fast food is full of salt; that's why we love it!

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