

# KIDNEY STONES

(Nephrolithiasis)

Kidney stones (calculi) are jagged mineral deposits that form in the kidney and drop into the collecting system. Stones often get stuck and block the flow of urine and cause severe pain and blood in the urine. The kidney's function is to filter the salts and minerals in the blood and produce the byproduct- urine. Stones form when crystals coalesce. 3% of all adults will suffer from kidney stones in their life. People who live or move to hot and humid environments increase their chance of developing a kidney stone due to dehydration. This is why 2 to 3 liters of water each day is the best way to prevent stones.

## **Preventing Kidney Stones:**

Like many problems, making stones is an inherited trait. In addition, the greatest risk to having a second stone was having the first one. You can do several things to decrease your risk of making your first stone or making additional stones.

How to prevent ever making a stone: Always drink 2-3 liters of **water** a day. Caffeinated and sugared drinks act as diuretics and create a negative fluid balance. Never add salt to your food and limit salty foods. Decrease consumption of chocolate, tea, coffee and nuts. Even though most stones contain calcium, restricting calcium intake is NOT recommended.

How to reduce the risk of making more stones: Have your stone analyzed for composition. This will dictate what additional tests are needed to help prevent future stone formation. Continue drinking at least 2-3 liters of **water** a day.

*Uric Acid Stones:* Limit consumption of foods containing purines. This includes red meat and nuts. Your doctor may prescribe allopurinol to block the production of uric acid in addition to medicine to alkalinize the urine such as bicarbonate or PolyCitra.

*Calcium Stones:* Do NOT limit consumption of calcium foods. Limit the consumption of high oxalate foods such as tea, coffee, cola, chocolate, nuts and green leafy vegetables such as spinach. After a thorough work-up, medications are tailored to the problem discovered. The most common sources include:

1. *Renal Leak Hypercalciuria*.. This is when the kidneys spill excess calcium in the urine. Treatments include water, a stone dissolver such as UroCit-K and possibly hydrochlorothizide to reabsorb the calcium.
2. *Absorptive Hypercalcemia*: Excess calcium is discovered in the blood from the intestines absorbing more than enough calcium. Limiting oxalate containing foods and regular water drinking can treat this.
3. *Resorptive Hypercalcemia*: Excess calcium is discovered in the blood from resorbing the calcium in the bones. This is from an abnormality of the hormone PTH and needs be treated surgically.

### **Symptoms of Kidney Stones:**

Kidney stone pain is described as one of the worst pains a healthy person can endure. Many women describe kidney stone pain as being worse than labor! The pain typically is on the side of the stone localizing to the back or flank. Many people suffering with a stone see no other alternative than going to the emergency room for relief of their anxiety and pain. As the stone travels toward the bladder, the location of the pain changes toward the current location of the stone. Often, the stone will irritate the kidney and cause blood to be seen in the urine (hematuria). Some stones will block the flow of urine and cause symptoms of nausea and vomiting.

Classic stone symptoms:

- Flank or back pain
- Nausea and vomiting
- Blood in the urine
- Frequent urination

### **Diagnosis of Kidney Stones:**

The diagnosis of a kidney stone can be made by symptoms alone. The ER team or urologist will likely confirm the presence of stone by checking your blood for kidney function (creatinine), check the urine for blood, and order a CT scan or X-ray to see how big and where the stone is. Once the diagnosis is made a decision of whether to treat the stone or let it pass will be made based on the stone's size, location and your level of pain.

### **Types of Kidney Stones:**

There are several varieties of Kidney stones. The most common type is calcium oxalate. Other types include uric acid, struvite and phosphorous. After your stone has been treated or passed, your doctor will check your urine for 24 hours and do blood tests. The results of these may show if excess of certain types of minerals are being spilled into your urine or are circulating in your blood. .

### **Calcium Stones:**

This is the most common type of stone. These stones cannot be dissolved with medicine. The only treatment is letting the small ones pass and treating the larger ones with ESWL or surgery. After the stones have been passed or removed, then preventing further formation is the priority. In addition to increasing fluid intake, citrate in the form of lemonade or citrate pills (UroCit-K, K-dur) should be added. Findings from the 24-hour urine collection or blood work may indicate additional medications to prevent further stone formation.

### **Uric Acid Stones:**

This type of stone forms in patients with a metabolic purine abnormality such as gout. This stone does not show up on regular X-Rays and therefore, CT or ultrasound is needed to find them. Fortunately, uric acid stones can sometimes be dissolved with bicarbonate. If dissolving the stone is unsuccessful, then ESWL or surgery may be necessary.

### **Struvite Stones:**

This type of stone is also called an infection stone. They form large stones in the kidney that typically need multiple surgical treatments.

### **Treatments:**

Treatment of kidney stones depends on their size and location. Stones under 4mm have a 90% chance of passing without surgery. Stones bigger than 6mm only pass on their own 20%. Stones typically get stuck at the narrow points of the ureter. The first spot is the junction of the ureter with kidney (UPJ). The next hold up spot is midway toward the bladder where the blood vessels to the legs cross the ureter. The narrowest spot is at the junction of the bladder with the ureter (UVJ). When stones get stuck here the symptoms of urinary frequency and burning are often experienced.

### **Medical Treatment:**

Medical or a conservative treatment may be decided upon if the stone is not blocking the kidney and pain is minimal. The most important medicines are water and time. 2-3 liters a day is a must. Medications to help with pain are often used such as hydrocodone and ibuprofen. Some people get relief by sitting in warm water such as a Jacuzzi or hot bath. Your doctor may give you Flomax™ to help decrease ureteral colic. A follow-up CT or X-ray will show if any progress has been made.

### **Surgical Treatment:**

1. ESWL (extra-corporeal shock wave lithotripsy). This a minimally invasive treatment typically performed as an outpatient. Only IV sedation is needed to undergo ESWL. The stone is visualized on X-ray and shocked up to 3000 times over about a 30-minute session. This approach is ideal for Calcium stones up to 2 cm.
2. Ureterscopy with Lasertripsy. If the stone is lodged in the ureter or ESWL was unsuccessful, this is highly successful approach. This minor surgery requires general anesthesia for about 2 hours. A fine fiber-optic scope is guided directly to the stone and a laser fiber is used to break the stone. A stent is usually placed in the ureter afterwards and will be removed in one week in the office.
3. Percutaneous Nephrostolithotomy (PCNL). This is a major but closed operation requiring one or two days admission to the hospital. This approach is best for large stones measuring more than 2 cm. A small tube is placed directly in the kidney to remove large amounts of stone.
4. Open Surgery. Open surgery is rarely performed for stones any more. Only if there is severe kidney damage or anatomic abnormalities should open surgery be offered.