



# Renal Stone Disease: Genesis, Evolution And Iatric Treatment

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## Abstract:

The purpose of the current review is to provide updates on the most common risk factors or medical conditions associated with kidney stone formation, current available methods of metabolic investigations, dietary recommendations and treatment. Laboratory tests for hypercalciuria, hyperuricosuria, hyperoxaluria, cystinuria, hypocitraturia, renal tubular acidosis, urinary tract infections and decreased urine volume are based on the results of 24-hour urine and urine collection and urine collection. and pH. Blood tests for creatinine, calcium and uric acid should be obtained. Bone mass should be determined primarily between hypercalciuria and primary hyperparathyroidism to be ruled out. Current information does not support calcium channel recommendations as it may lead to the treatment of hyperoxaluria and osteoporosis. Reduction of animal protein and salt intake, high liquid consumption and potassium consumption should be done. Medications include the use of thiazide, allopurinol, potassium citrate or other drugs according to the disorder. Correction of these abnormalities in the body is a basic tool to prevent or reduce the formation of recurrent stones.

**Keyword:** Kidney stones; Nephrolithiasis; Hypercalciuria; Osteopenia, Calcium; Oxalate

## Introduction

The formation of kidney stone is also known as renal calculi or crystal. It is a serious but life-threatening disease worldwide. In medical terms the calorie content of urine content is called nephrolithiasis and urolithiasis where the root word "Lith" means "stone." Kidney stones formed by one or both kidneys can grow on one or both kidneys. The medical name for kidney stones is nephrolithiasis. When stones cause severe pain, this is known as renal colic. Kidney stone is a solid mass made of crystals that separate urine from the urinary tract. Generally, urine contains chemicals that inhibit or prevent crystals from forming. These inhibitors do not seem to work for everyone, however, so some people form stones. If the

crystals remain small enough, they will pass through the urinary tract and then pass through the urinary tract unknowingly. Kidney stones can contain a combination of different chemicals. The most common type of stone contains calcium in combination with oxalate or phosphate. These chemicals are part of the normal human diet and make important parts of the body, such as bones and muscles. A rare type of stone is caused by an infection in the urinary tract. This type of stone is called struvite or infection stone. Other types of stones, uric acid stones, are rare, and cystine stones are rare.

## Overview of Kidney Stones

Kidney stones are mostly implanted in the kidneys. Mankind has suffered from urinary stones since the centuries beginning 4000 BC and is the most

common disease of the urinary tract. Prevention of kidney stones remains a major problem in human health. The prevention of the recurrence of stones requires a better understanding of the mechanisms involved in stone construction. Kidney stones are associated with an increased risk of chronic kidney disease, renal failure, cardiovascular disease, diabetes and high blood pressure. It has been suggested that kidney stone may be a systemic disease associated with metabolic syndrome. Nephrolithiasis accounts for 2 to 3% of renal end-of-cases cases when associated with procalcitonin. Symptoms of kidney stones are related to their location, whether in the kidneys, ureter, or bladder. At first, the formation of stones does not cause symptoms. Later, the signs and symptoms of this stone disease include renal colic (severe cramping pain), side pain (back pain), hematuria (bloody urine), uropathy (urinary tract disease), urinary tract infections, obstruction of urine flow, and hydronephrosis (enlargement of the kidneys). These conditions can cause nausea and vomiting with the discomfort associated with the stone event. Therefore, treatment and lost time at work involves significant costs that affect the quality of life and the country's economy.

### Genesis:

Doctors do not always know what causes a stone to be built. Although certain foods can promote the formation of stones in affected people, scientists do not believe that eating any particular food causes the formation of stones in unaffected people. Someone with a family history of kidney stones may have stones. Urinary tract infections, kidney diseases such as cystic kidney disease, and certain metabolic disorders such as hyperparathyroidism are also linked to stone formation. In addition, more than 70 percent of people with rare genetic disease called renal tubular acidosis develop stones. kidneys. Hyperoxaluria is two other rare diseases, found in the metabolism that often cause kidney stones. In cystinuria, the excess amino acid cystine, which does not dissolve in urine, is inactive, leading to the formation of cystine stones. In patients with hyperoxaluria, the body produces too much oxalate, salt. When urine contains more oxalate than can be dissolved, crystals settle to the ground to form stones. Hypercalciuria is inherited, and it can be the cause of stones in more than half of patients. Calcium is absorbed from excess food and lost in the urine. This high level of calcium in the urine causes crystals of calcium oxalate or calcium phosphate to build up in the kidneys or elsewhere in the urine blood. Other causes of

kidney stones are hyperuricosuria, which is a disorder of uric acid metabolism; disease; overeating vitamin D; urinary tract infections; and obstruction of the urinary tract. Certain diuretics, called water pills, and calcium-based antacids can increase the risk of kidney stones by increasing the amount of calcium in the urine. Bowel transplantation, or ostomy surgery. As mentioned earlier, struvite stones can build up in people who have had a urinary tract infection. People taking the protease inhibitor indinavir, a drug used to treat HIV infection, may be at greater risk of developing kidney stones. Oxalate Food & Drink. People who are accustomed to building calcium oxalate stones may be asked by their doctor to reduce or avoid certain marmalade in their diet if their urine contains excess oxalate.

### High oxalate foods - high to low

Rhubarb, spinach, beets, swisschard, wheatgerm, soybean crackers, peanuts, okra, chocolate, black Indian tea, sweet potatoes

Foods with a moderate amount of oxalate can be eaten in moderation.

**Medium foods** - high to low grits, grapes, legumes, greenpepper, red raspberries, fruit cake, strawberries, marmalade, liver.

### Types of kidney stones include:

#### Calcium stones

Most kidney stones are calcium stones, usually in the form of calcium oxalate. Oxalate is something that is made daily by your liver or absorbed by your diet. Certain fruits and vegetables, as well as nuts and chocolates, have a high oxalate content. Dietary factors, high levels of vitamin D, gastrointestinal surgery and several disorders can increase calcium or oxalate in the urine. Calcium stones can also occur in the form of calcium phosphate. This type of stone is very common in metabolic conditions, such as renal tubular acidosis. It can also be associated with certain medications used to treat migraines or seizures, such as topiramate (Topamax, Trokendi XR, Qudexy XR).

**Struvite stone:-** Struvite stones form a response to urinary tract infections. These stones can grow very fast and become very large, sometimes with a few marks or a little warning. Struvite stones are also called three phosphate stones, or stones of infection. They form in the presence of high urinary tract infections by bacteria that produce urease.

**Uric acid stones-** Uric acid stones can build up in people who lose a lot of fluids due to chronic diarrhea or malabsorption, those who eat a high-protein diet, and those who have diabetes or metabolic syndrome. Certain genetic factors may also increase the risk of uric acid stones, which are common in people with hyperuricosuria. About 15-20% of patients with uric acid stones have a history of gout. An animal-rich diet, due to its high purine content, which produces uric acid in its catabolism, can increase the risk of uric acid formation. At a pH of urine below 5.5, uric acid does not dissolve well, but the solubility increases with a pH greater than 6.5.

### Physical examination:

The main purpose of physical examination is to prevent the formation of repeated stones in high-risk stone manufacturers, as well as to prevent the continued growth of any existing stones. In a patient with recurrent stones, in addition to a baseline study, a 24-hour urine sample should be made of urine volume with calcium, oxalate, uric acid, citrate, urine sodium and creatinine excretion. Urine creatinine is measured to determine the accuracy of urine collection. This is not done during the intensive handling of the stone, but rather afterwards to try to add edible liquid and food preparation to prevent recurring stones from forming. Many authors suggest that a person should wait at least 1 month after the transfer or removal of a stone, allowing the patient to return to his or her normal routine, otherwise a physical examination may reveal important details. Basic metabolic testing begins with a complete history and physical examination, (similar previous conditions or family history). Stone Analysis: In patients with unusual stone formation - cystine, pure struvite, and pure uric acid - treatment can begin immediately. Patients with calcium phosphate stones are known to be at high risk from renal tubular acidosis and primary hyperparathyroidism, while patients with calcium oxalate stones have a combination of physical diagnoses. Serum chemistry contains a basic metabolic panel (e.g., sodium, potassium, chloride, carbon dioxide, urea nitrogen in the blood, creatinine) and calcium and uric acid. Hypercalcemia can indicate hyperparathyroidism and may allow further testing with parathyroid hormone testing. The presence of hypokalemia and hyper-chloremia strongly suggests metabolic acidosis. Beneficial properties of the drug Klebsiella, Proteus, Pseudomonas, or other substances that differentiate urea may indicate the presence of struvite stone. , a pH above 7.5 associated with urinary tract infection and a pH

below 5.5 describe a diagnosis of gouty diathesis. 24-hour urine collection to measure: total volume, pH, calcium, phosphorus, oxalate, citrate, sodium, magnesium, potassium, uric acid, and sulfate. It is our custom for a patient to collect 24 h of urine samples on two separate days (either consecutively or separately) with the patient in a "normal" state (normal diet, liquid diet, medication, exercise, etc.).

### Who is the Natural Stone Exploration?

1. A stone patient who needs a physical examination
2. One stone with dangerous features: a. Family history b. Intestinal disease c. Chronic diarrhea d. UTI e. Gouty f. Osteoporosis g. Bone fractures
3. Repeating stone cutters
4. Children
5. Controversy: uric acid / struvite / cystine stones

### Signs and Symbols:

#### When symptoms appear, they usually include:

**1. Pain in the groin, side of the abdomen, or both** - You will feel pain in the side and back, under your ribs. It can clear your stomach and groin as the stone travels through your urinary tract. Larger stones may be more painful than smaller ones, but the severity of the pain is not related to the size of the stone. Even a small stone can be painful as it moves or causes obstruction.

**2. Blood in the urine** - Blood in the urine is a common symptom in people with urinary incontinence. This symptom is also called hematuria. Blood can be red, pink or brown. Sometimes blood cells are too small to be seen without a microscope (called microscopic hematuria), but your doctor may examine this symptom.

**3. Cleaning and vomiting-** It is common for people with kidney stones to get nauseous and These symptoms occur due to a shared nerve connection between the kidneys and the GI tract. Kidney stones can cause nerves in the GI tract, setting up a painful stomach. Nausea and vomiting can also be your body's way of responding to severe pain.

**4. fever and chills, if there is an infection** - Fever and cold are signs that you have kidney disease or another part of your urinary tract. This can be a major problem for kidney stones. It can also be a sign of other serious problems besides kidney stones. Any painful fever needs urgent treatment. Infectious fever is usually above 100.4°F (38°C) or

higher. Colds or colds often occur along with the flu.

**5. Increased need for urination-** Wanting to go to the toilet more frequently or more often than usual is another sign that the stone has entered the lower part of your urinary tract. You may find yourself running to the bathroom, or you may need to walk day and night.

#### Risk factors:

#### Factors that increase the risk of developing kidney stones include:

**Family or Personal History** - If someone in your family has kidney stones, you may also be building stones. If you already have one or more kidney stones, you are at greater risk of developing another.

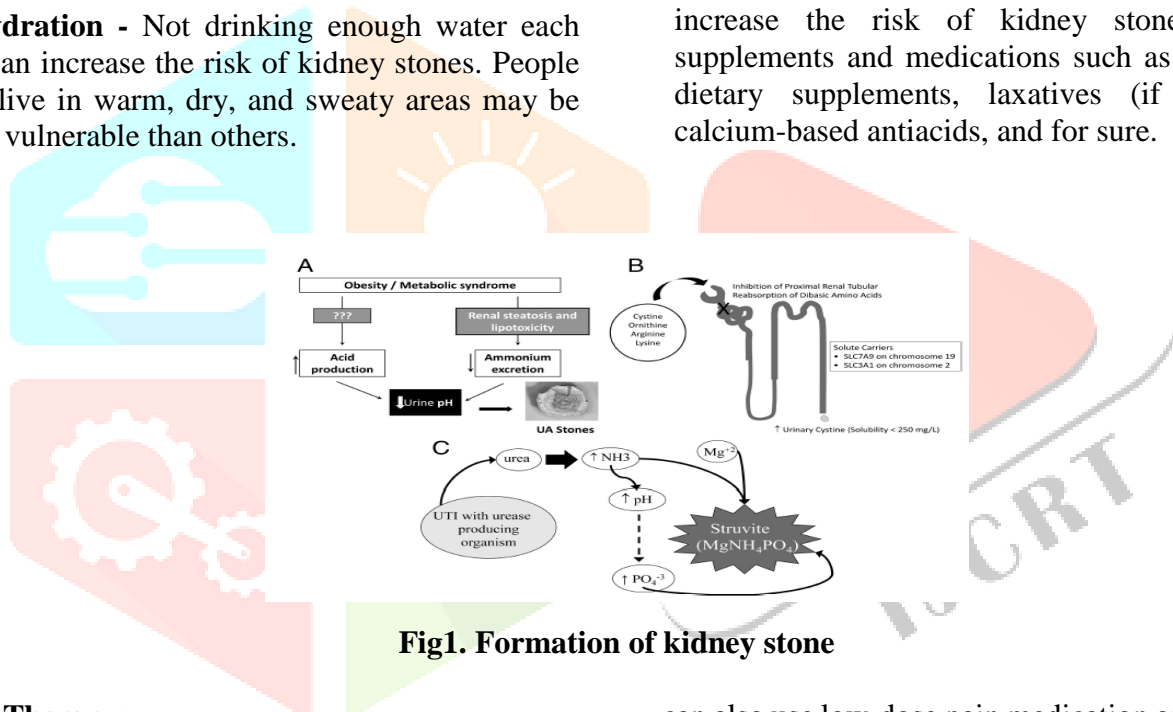
**Dehydration** - Not drinking enough water each day can increase the risk of kidney stones. People who live in warm, dry, and sweaty areas may be more vulnerable than others.

**Diet-** Eating foods high in protein, sodium (salt) and sugar can increase the risk of certain kidney stones. This is especially true of high sodium diets. Too much salt in your diet increases the amount of calcium your kidneys need to filter and greatly increases the risk of kidney stones.

**Obesity** - High body mass index (BMI), large waist size and weight gain have been linked to an increased risk of kidney stones.

**Digestive Diseases and Surgery** - Surgery, gastrointestinal surgery or chronic diarrhea can cause changes in the digestive system that affect your absorption of calcium and water, increasing the amount of stones in your urine.

**Other medical conditions** - such as renal tubular acidosis, cystinuria, hyperparathyroidism and recurrence of urinary tract infections can also increase the risk of kidney stones. Certain supplements and medications such as vitamin C, dietary supplements, laxatives (if overused), calcium-based antacids, and for sure.



**Fig1. Formation of kidney stone**

#### Iatric Therapy:

#### Pain Management

Pain management usually requires intravenous administration of NSAIDs or opioids. NSAIDs appear to be better than opioids or paracetamols in those with normal kidney function. Oral medications often work with side effects. The use of antispasmodics has no other advantage.

#### Dismissal from treatment

The use of drugs to accelerate the automatic passage of stones into the ureter is called medical expulsion. Many agents, including alpha adrenergic blockers (such as tamsulosin) and calcium channel blockers (such as nifedipine), may be effective. blockers can lead to more people removing their stones, and they can pass their stones in less time. People taking alpha-blockers

can also use low-dose pain medication and may not need to visit a hospital. Alpha-blockers appear to work better on larger rocks (over 5 mm in size) than on smaller stones. However, the use of alpha-blockers may be associated with a slight increase in side effects, side effects from this drug. The combination of tamsulosin and corticosteroid may be better than tamsulosin alone. These therapies also appear to be more effective than lithotripsy.

#### Lithotripsy

A lithotripter with a mobile fluoroscopic system ("C-arm") is visible in the operating room; other devices that appear in the background include anesthesia. Extracorporeal shock wave lithotripsy (ESWL) is an invalid method of removing kidney stones. Most ESWLs are performed when the stone is close to the kidney skin. ESWL involves the use of a lithotripter machine to deliver externally

concentrated, concentrated, powerful ultrasonic powders to create stone disintegration within 30-60 minutes. Following its launch in the United States in February 1984, the ESWL was quickly and widely accepted as an alternative to rehydration and urinary stone treatment. It is currently used in the treatment of low kidney stones and upper extremities, as long as the combined stone load (stone size and number) is less than 20 mm (0.8 in) and the affected kidney structure is normal. Stone more than 10 millimeters (0.39 in), ESWL may not help to break the stone with a single treatment; instead two or three methods may be needed. Some 80-85% of stones can be successfully treated with ESWL. There are many factors that can affect its function, including the chemical composition of the stone, the presence of abnormal renal anatomy and the location of the stone within the kidneys, the presence of hydronephrosis, body index, and the distance to the target area. Such as injuries to the shock control area, and damage to the blood vessels of the kidneys. In fact, the vast majority of people who are treated with the usual dose of shock waves using currently approved medical treatments are at greater risk of developing serious kidney damage. ESWL-induced kidney damage depends on volume (the total number of shock waves provided by the lithotripter electric current) and can be severe, including internal bleeding and low hematomas. In rare cases, such conditions may require a blood transfusion and lead to severe kidney failure. Hematoma values may be related to the type of lithotripter used; hematoma levels of less than 1% to 13% have been reported with separate lithotripter machines. Recent studies show a decrease in severe tissue injury when the treatment process involves a short break after starting treatment, and both improved stone layers and a decrease in injury when ESWL was performed with a rapid rate of shock. Injuries, animal studies suggest that these serious injuries can lead to scarring, leading to loss of functional kidney volume. Recent research also suggests that older people are at greater risk of developing high blood pressure following the ESWL. In addition, a recent retrospective study published by researchers from the Mayo Clinic in 2006 found an increased risk of developing diabetes and high blood pressure in people with ESWL, compared to people of age and gender associated with unnecessary treatment. That severe trauma persists with long-term consequences probably depends on a number of factors including the frequency of the atmosphere (i.e., the number of shock waves brought in, the rate of delivery, power setting, acoustic features of a particular lithotripter, and the American Urological Association established the Skyck

Wave Lithotripsy Task Force to provide expert opinion on the value and safety of ESWL benefits. The team of publishers published a white paper outlining their conclusions in 2009. They concluded that the risk of profit Rate is high for most people. We are not upset, the fact that it is easier to treat high urine treatment, and that, at least, well, at a very low dose for most people. 60 pulses per minute to reduce the risk of kidney damage and increase the risk of fractures. Alpha-blockers are sometimes discontinued after lithotripsy shocks help my fragments. Burn and leave the human body y. By relaxing the muscles and helping to keep the blood vessels open, alpha blockers can release the ureter muscles to allow kidney stones to pass through. Compared with conventional care or placebo treatment, alpha blockers can lead to faster stone removal, reduced need for additional treatment and fewer side effects. They can also clear kidney stones in adults than the normal lithotripsy procedure. Unnecessary side effects associated with an alpha blocker emergency hospital visit and return to hospital for stone-related problems, but these side effects were more common in adults who did not receive alpha-blockers as part of their treatment.

### Surgery

Reconstructed third-degree CT scan of the left ureter (shown with yellow arrow), kidney stone below (red arrow above) and another in the ureter near the stent (lower red arrow) A kidney stone at the end of the ultrasonic separation most less than 5 mm (0.2 in) pass automatically. Immediate surgery may be required for people with a single active kidney, double obstruction, urinary tract infection, and, therefore, presumably, infected kidneys, or chronic pain. Beginning in the mid-1980's, minimally invasive non-invasive treatments such as extracorporeal shock wave lithotripsy, ureteroscopy, and short-term proliothotomy began to replace open surgery as a popular treatment for urolithiasis.

### Ureteroscopic surgery

Ureteroscopy has become very popular as flexible and strong fiberoptic ureteroscopes become commonplace. One ureteroscopic procedure involves the placement of a ureteral stent (a small tube that extends from the bladder, enlarges the ureter and goes to the kidneys) to provide immediate relief for the affected kidneys. Strong placement can help save the kidneys from the risk of severe kidney failure after the disease due to increased hydrostatic pressure, inflammation and infection (pyelonephritis and pyonephrosis) caused by the stone band. Ureteral stents vary in length

from 24 to 30 cm (9.4 to 11.8 in) and most have a shape usually called "double-J" or "double pigtail", due to the folds in them both sides. They are designed to allow urine to flow through the ureter. They can be kept in the ureter for days or weeks when the disease resolves and as the stones dissolve or are separated by ESWL or other therapies. The stents open the ureters, which can facilitate the use of instruments, and provide a clear line to help identify the ureters and any associated stones in radiographic examination. The presence of permanent ureteral stents can cause moderate discomfort, general or sudden abnormalities, and infections, which often resolve with removal. Most ureteral stents can be removed cystoscopically during office visits under topical anesthesia after resolution of urolithiasis. Studies currently do not confirm that placement of a temporary stent during ureteroscopy leads to different outcomes than leaving a stent depending on the number of hospital visits for postoperative complications, short-term or long-term pain, need for narcotic pain medications, UTI risk, need repeated procedure or reduction of ureter injury - Clear ureteroscopic methods of removing stones (rather than simply blocking the block) include basket removal and ultrasound ureterolithotripsy. Laser lithotripsy is another procedure, which involves the use of holmium: yttrium aluminum garnet (Ho: YAG) laser to fragment stones in the bladder, ureters, and kidney. A success rate of 93-100% using Ho: YAG laser lithotripsy. Recent experience shows that ureteroscopic techniques offer various benefits in treating high ureteral stones. Specifically, the overall success rate is high, less frequent recurrences and post-surgical visits are required, and treatment costs are lower after ureteroscopic treatment compared to ESWL. These benefits are particularly evident in stones larger than 10 mm (0.4 in) in diameter. However, because ureteroscopy of the upper ureter is a greater challenge than ESWL, many urologists still prefer to use ESWL as a first-line treatment with stones less than 10 mm, and ureteroscopy for those larger than 10 mm wide. Ureteroscopy is the preferred treatment option for pregnant and obese people, as well as those with a bleeding problem.

**Conclusion:** The increasing episodes in kidney stones contribute to the serious illness and economic loss of the world. Advances in technology have helped to diagnose and treat people early. However, the frequent combination of metabolic stones with metabolic disorders such as hypertension, diabetes, and obesity emphasizes the importance of eating habits when they occur and are recurrent. High fluid intake and adopting a

healthy lifestyle are some of the least expensive ways to prevent kidney stones.

## **DRUG TREATMENT**

### **Thiazide diuretics**

Thiazide lowers calcium in urine leading to the collapse of calcium oxalate and calcium phosphate supersaturation. Reduction of calciuria is caused by improved calcium retardation in renal distal convolute tubule but the most recent and compelling data show that improved  $\text{Ca}^{2+}$  + improvement in the near tubule than  $\text{Ca}^{2+}$  + movement in distal convolution explains hypocalciuria (65) produced by thiazide. Doses of chlorthalidone or hydrochlorothiazide should not exceed 25 mg / day to avoid side effects. Indapamide, a thiazide-like agent, is also effective.

### **Allopurinol**

Allopurinol inhibits uric acid production, reducing nucleation unlike calcium oxalate by uric acid and monosodium urate. In addition, marketing of common macromolecular inhibitors of calcium oxalate crystallization by uric acid or monosodium urate may be avoided when using this drug. However, Allopurinol (100 to 300 mg / day) is indicated only when hyperuricosuria is the only abnormality in the body. On the other hand, alkaline treatment with potassium citrate may also be helpful, as increasing the pH of urine will help reduce uric acid converting it into potassium urate.

### **Potassium citrate**

Potassium citrate reduces the concentration of calcium salts by mixing calcium and reducing the concentration of ionic calcium. Due to its alkalinizing effect, it also increases uric acid separation, reduces the amount of uric acid which does not dissolve, reducing the ability to form uric acid stones. Decreases in urine calcium during initial treatment indicate an additional benefit of the drug. Thus, potassium citrate appears to be effective in cases of hypocitraturia, hypercalciuria, or hyperuricosuria and in remote RTA patients, due to the need for alkalinization in the end. Potassium citrate prefers sodium citrate to prevent urolithiasis, at doses ranging from 30 to 60 mEq / day. However, side effects of intestinal origin including epigastric pain, abdominal pain or diarrhea are common. Promising results from the use of other citrate salts such as potassium-magnesium, which have not yet been approved by the Food and Drug Administration, have also been demonstrated.

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frequent combination of metabolic stones with metabolic disorders such as hypertension, diabetes, and obesity emphasizes the importance of eating habits when they occur and are recurrent. High fluid intake and adopting a healthy lifestyle are some of the least expensive ways to prevent kidney stones.

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