Mount Sinai

The Milton and Carroll Petrie

Department of Urology

Kidney Stone Center at Mount Sinai

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- Active Surveillance
- Non-Invasive Treatment
- Minimally Invasive Treatment
- Narcotic-Free URS
- Staghorn Calculi

Mantu Gupta, MD, FRCS (Glasg.)
Site Chair, Urology, Mount Sinai West, Mount Sinai St. Luke's
Professor of Urology, Department of Urology at the Icahn School of Medicine at Mount Sinai

Overview

The Kidney Stone Center at Mount Sinai, led by Mantu Gupta, MD, FRCS (Glasg.), provides a comprehensive approach to the treatment of kidney stones, including minimally invasive and non-invasive techniques for stone removal as well as stone prevention. A unique feature of our program is our multidisciplinary approach, wherein you will be evaluated by a team of experienced medical professionals dedicated to stone disease treatment and prevention, and provided with a management plan tailored to *you*.

The treatment of acute stone disease ranges from medication and monitoring to highly specialized, minimally invasive procedures such as laser lithotripsy and percutaneous nephrolithotomy (PCNL). Prevention of kidney stones can range from changes in diet and lifestyle to supplementation with vitamins and minerals to medical intervention. Your treatment and prevention plan is based on a comprehensive evaluation of you, the patient, taking into consideration the size and type of your kidney stone, your medical history and lifestyle, and your comfort level with intervention. Our team also places emphasis on patient education, understanding and empowerment.

Dr. Gupta serves as the director and visionary of this program and is regarded as a world leader in the research and treatment of urinary stone disease. He has pioneered many of the current techniques used world-wide for the surgical treatment of kidney stones and has performed more than 10,000 major endourologic procedures (minimally invasive procedures through the use of cameras and small instruments) throughout the world. He has brought to the Mount Sinai Department of Urology the latest technological advances for the treatment of kidney stones, including state-of-the-art lasers, best-in-class shock wave lithotripsy machines, and flexible miniature endoscopes that improve patient comfort and outcomes. The Kidney Stone Center is involved in cutting-edge research and technological development with the goal of offering our patients access to the latest advances in care.

About Dr. Gupta

Mantu Gupta, MD, FRCS, (Glasg.) is a Professor of Urology, Icahn School of Medicine at Mount Sinai, Chair of Urology at Mount Sinai West and Mount Sinai St. Luke's Hospitals, and Director of Endourology and Stone Disease for the Mount Sinai Health System.

Dr. Gupta is recognized as a world leader in the research and treatment of urinary stone disease, ureteropelvic junction obstruction, urinary tract obstruction, and upper tract urothelial malignancies, having pioneered many of the techniques in current use. He is recognized as one of the leading endoscopic, percutaneous, and minimally invasive surgeons in the world, having performed more than 10,000 major endourological procedures. Dr. Gupta is unique in that he employs a nurturing, compassionate, and holistic approach to the management of stone disease, utilizing alternative medical, nutritional, and preventive strategies.

Prior to joining Mount Sinai, Dr. Gupta served as Associate Professor, Director of Endourology and Director of the Kidney Stone Center at Columbia University Medical Center for 18 years.

The recipient of numerous honors and awards, Dr. Gupta was given a Presidential Gold Medal by President Ronald Reagan for his academic achievements and has served as a visiting professor both within the United States and internationally. He is a frequent lecturer and moderator at national and international meetings and has published extensively in major peer-reviewed journals and authored numerous book chapters. Additionally, Dr. Gupta teaches various surgical skills courses throughout the world and has served as editor and guest editor for numerous publications including the *Journal of Endourology,* the *Journal of Urology*, the *Indian Journal of Urology,* and *Urology*.

Dr. Gupta was a member of the prestigious Honors Program in Medical Education at Northwestern University where he earned a combined BS-MD degree with distinction and was elected to the Alpha Omega Alpha Honor Society. He subsequently did his urology residency at the top ranked University of California at San Francisco and completed a fellowship in endourology at Long Island Jewish Medical Center under the tutelage of Arthur Smith, MD, the founding father of endourology.

Kidney Stone Prevention

Approximately two-thirds of patients who have had one kidney stone are at risk for developing another in the future. Because of this high rate of recurrence, Mount Sinai physicians recommend a metabolic evaluation, which includes stone analysis, blood testing, and urinary testing. We also perform bone density measurements when needed. This comprehensive evaluation can identify the source of the problem in more than 90 percent of patients and can help us determine how you might be able to prevent future kidney stones.

While there is no guaranteed way to prevent stones from forming (heredity does play a role), you can reduce your risk by modifying your diet. Here are some steps that you can take:

Dr. Gupta recommends increasing your fluid intake to 2-3 liters per day. Certain mineral water may decrease kidney stones.

- **Increase fluid intake to about two to three liters per day,** depending on your activity level and rate of perspiration. Water is best, though citrus drinks such as lemonade and orange juice have also been shown to help prevent kidney stones.
- **Limit salt/sodium intake** to no more than 2,300 milligrams a day. Sodium causes the kidneys to excrete more calcium, which increases the chance of developing kidney stones. You can monitor sodium intake by reading food labels.

Eating more vegetables and less meat is part of a kidney healthy diet.
Photo by Scott Liddell from FreeImages

- **Adjust calcium supplementation,** which can affect formation of calcium oxalate stones. Calcium from food does not increase stones, but some studies have shown that supplements can affect formation of certain stones, if not taken with meals. Your doctor can advise you on the most appropriate calcium levels, if you have a history of forming calcium oxalate stones.
- **Reduce animal protein** to no more than six ounces a day. Meats and other animal protein, like eggs and fish, can encourage formation of uric acid stones because they contain purines. Reducing meat consumption can decrease the risk of uric acid stones, especially if you have already had them.
- **Avoid foods high in oxalate**. People who are more likely to form calcium oxalate stones should avoid foods high in oxalate such as beets, spinach, many types of berries, sweet potatoes, soy, nuts, chocolate, brewed tea, and colas.
- **Consult our wellness expert, Jillian L Capodice, MS, LAC,** for more individualized diet advice. If you are prone to developing kidney stones, her expertise in kidney stone prevention may help you identify foods to limit or avoid. We will develop an individualized treatment plan, depending on the type of stones you have had.

Treatment of Kidney Stones

Active surveillance

If your kidney stone is small (generally less than 6mm), located in your kidney, and not causing any blockage of urine flow or any pain, you may be advised to just observe your kidney stone. Stones of this size are rarely dangerous although when they are 6mm and above, they are often unlikely to pass on their own. You may be advised to come back to the office every 3-6 months to observe your kidney stone via an ultrasound or X-ray; this is performed personally by our team during your appointment to make sure that it has not grown in size and to ensure that you do not develop a blockage.

If your stone is under 5mm and located in the ureter, meaning it is already passing, you may be advised to start a regimen of Medical Expulsive Therapy (MET). This consists of a medication that will widen the ureter by relaxation to help your stone pass more quickly and easily. Most stones under 5mm will pass with MET, however even with MET it can take up to 6 weeks for a stone to pass into the bladder, and this can be quite uncomfortable. You will be monitored frequently by our team to assess whether the MET is working, or whether further intervention is required.

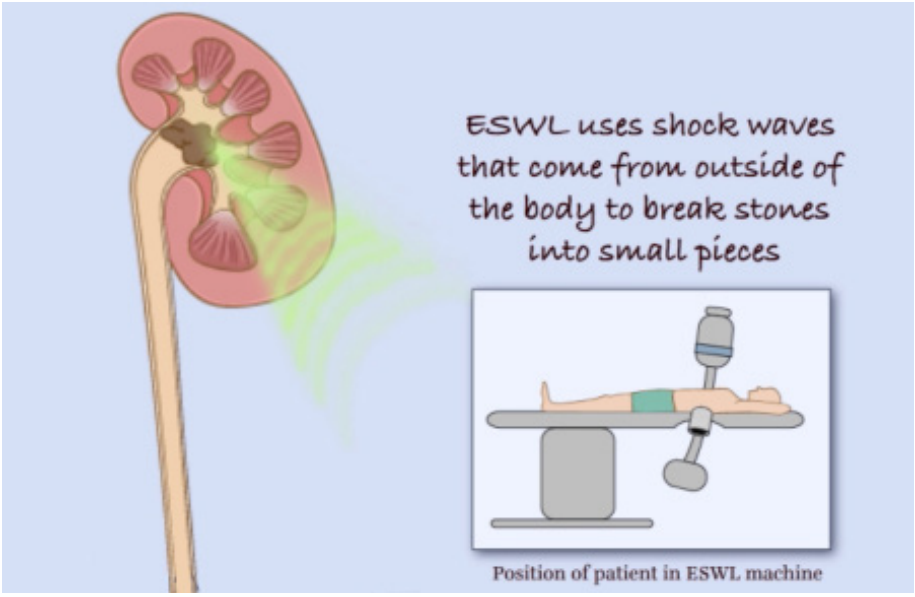
Non-Invasive Treatment: Extracorporeal Shockwave Lithotripsy (ESWL)

ESWL is a completely non-invasive treatment performed both in our office and operating room. We use this procedure to treat average-size stones (4-9mm) in the kidney and sometimes in the ureter. Several factors must be favorable to consider performing ESWL, such as a short distance from the skin to the stone and the stone must not be too hard. The size and location of the stone also play important roles.

You will lie on your back on a table and a water-filled cushion will be placed under the side of your back where your affected kidney is located. A mild, general anesthetic is given for this procedure because shock waves can be painful. After locating the stone using an X-ray machine or ultrasound we then direct pressure waves, or shock waves, at the stone to break it into tiny pieces. Once the stone is broken, the procedure is complete and you will wake up from anesthesia. The entire procedure takes 40-60 minutes and you will go home the same day.

Over the next several days, you will pass the stone fragments through the urinary tract. Sometimes, these will be so small that you won't even feel them, but sometimes you will have some discomfort and will be able to see the small stones as they pass.

Because X-rays and shock waves are used in ESWL, this is not an appropriate treatment for patients who are pregnant, have bleeding disorders, infections, severe skeletal abnormalities, or are very obese. If you are taking aspirin or another blood thinner, you may need to stop these before the procedure.



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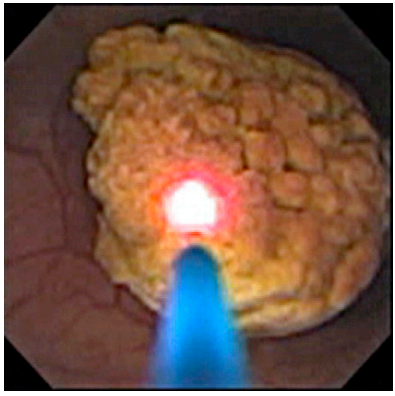
Minimally Invasive Treatment: Ureteroscopy with Laser Lithotripsy



Laser beam breaks the stone into smaller pieces.

Calcium oxalate stones are broken into pieces.

Stones are retrieved via a sheath.

Ureteroscopy with laser lithotripsy is a procedure used to treat stones in the kidneys and ureters – it requires anesthesia, however there are no cuts or incisions. Instead, a small tube-like instrument with a camera on the end, called a ureteroscope, is passed through the urethra and into the bladder. The ureteroscope is then advanced into either the left or right ureter where your stone is located. Through the ureteroscope we can locate your stone under direct vision and, if small enough, we may remove it whole. If your stone is too large, however, we use a laser beam to break the stone into small pieces.

Once the stone is small enough to remove, we pass a basket through the scope to grab the stones and remove them. After all of your stones are removed, sometimes it is necessary to leave a small plastic tube in the ureter called a stent. This tube goes from the kidney to the bladder to keep the ureter open so you are not obstructed by inflammatory changes after your procedure.

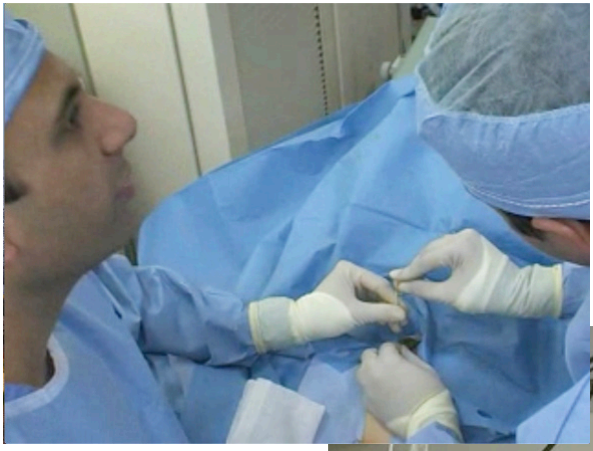
The entire procedure takes anywhere from 30 minutes to 2 hours, depending on the size and location of your stones. You will go home the same day. If you have a stent, it will be removed in the office after 7-10 days. In the office we use a local anesthetic to numb the urethra, then pass a camera into the bladder, grab the stent and pull to remove it. The procedure to remove the stent takes approximately one minute.

Minimally Invasive Treatment: Percutaneous Endo Laparoscopic Cystolithotomy

A percutaneous endo laparoscopic cystolithotomy is an outpatient bladder surgery to remove large bladder stones. Dr. Gupta invented this minimally invasive procedure utilizing the assistance of a surgical plastic bag to trap the stones prior to breaking them.

A one-centimeter incision is made side to side in the middle of your stomach between your navel and pubic bone. A flexible cystoscope is inserted into the urethra to visualize the placement of a plastic small tube and bag into the bladder. Stones are then trapped inside the bag where they can be crushed and vacuumed. The bag ensures pieces are not left behind or need to be chased. This decreases the overall surgery time while eliminating the chance of not removing all fragments.

You will have a tube (urinary catheter) in your bladder for 1-2 nights. These tubes will drain the bladder to ensure the incision heals appropriately. You will be started on a prostate medication before the surgery and continue for several days to ensure effective urination and bladder emptying after the surgery. The procedure takes 30-90 minutes depending on the size of your stone(s).



Minimally Invasive Treatment: Percutaneous Nephrolithotomy (PCNL)

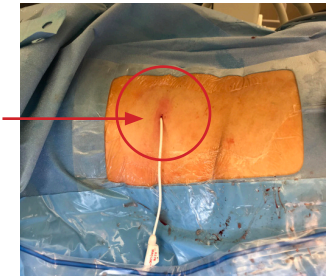
A percutaneous nephrolithotomy (PCNL) is a kidney surgery for large or multiple stones. Though a minimally invasive procedure, it is more invasive than a ureteroscopy because it requires a small incision in the flank. The procedure requires general anesthesia and an overnight stay in the hospital. We make a small cut measuring less than one centimeter in your back on the side of the affected kidney and insert a protective sleeve called a sheath. This is called “obtaining access.”

At other institutions, patients must undergo two procedures – one to obtain “access” and place a tube in the kidney by an interventional radiologist using fluoroscopy, and another procedure by the urologist to remove the stone. At our Center, both procedures are done at the same time by Dr. Gupta. We will typically utilize ultrasound to obtain access which has zero radiation. Once “access” has been achieved, a small incision is made in your back. Dr. Gupta uses a 20 percent smaller incision than other urologists to perform the surgery. At times, an even smaller incision (called mini-PCNL) is performed – it is 50 percent smaller than normal. This decreases bleeding and promotes faster healing afterword.

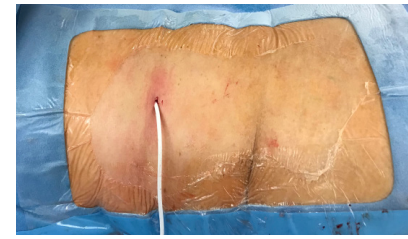
Next, a tube-like instrument with a camera on the end, called a nephroscope, is then passed through a plastic sheath to locate and crush your stone(s). We use a device that both crushes and vacuums the stone simultaneously to ensure all stones are completely removed. A tube called a urinary catheter will be left in your bladder overnight. This tube will drain urine produced by the kidney during the night and will be removed the next morning before you are discharged. The procedure takes 2-3 hours depending on the size of your stone(s). Rarely, we may leave a tube called a nephrostomy tube in the kidney coming out of a one centimeter incision in the back overnight to ensure proper drainage.

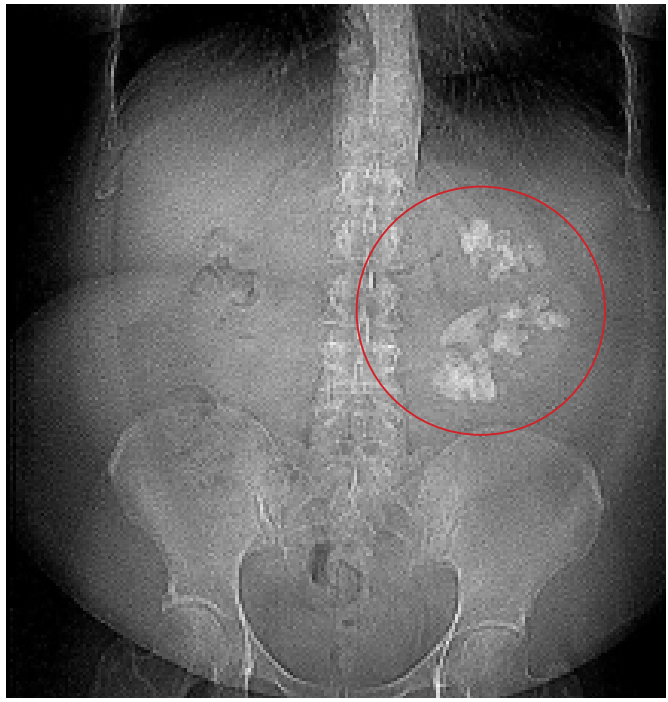
In addition to the nephrostomy tube and urinary catheter, you may require a ureteral stent (a tube that runs from the kidney to the bladder) after your procedure to promote healing and reduce the chance of urinary blockage due to inflammation. Whether you need this stent will be determined during your procedure. If you do need one, this will be removed after 10-14 days in our office. We use a local anesthetic to numb the urethra, then pass a camera into the bladder, grab the stent, and pull to remove it. The procedure to remove the stent takes about one minute.

A small cut measuring less than one centimeter in the back is made on the side of the affected kidney, and a protective sleeve is inserted called a sheath.



Close up of small incision, less than 1 cm.





Staghorn Calculi

Named after the shape of deer antlers, staghorn calculi are large stones that fill part or all of the branched kidney collecting system. While they may or may not be obstructing kidney drainage, their negative effects on kidney functioning requires immediate intervention. The gold standard for staghorn removal is through the minimally invasive, percutaneous nephrolithotomy (PCNL).

Dr. Gupta has removed thousands of staghorn stones and utilizes state-of-the-art imaging and surgical methods to ensure that a patient's surgery is as minimally invasive as possible. His expertise and experience limits post-operative pain and the likelihood of complication, while facilitating a quick recovery and improved kidney functioning.

Research Team and Current Projects

Dr. Gupta is a world leader in kidney stone research, and the Kidney Stone Center has a robust research team dedicated to improving patient care through enhanced research. In addition to investigating and innovating surgical techniques, Dr. Gupta's research focuses on the primary causes of kidney stones so that they can be prevented in the future.

Specifically, Dr. Gupta is conducting research projects investigating the specific proteins and genes responsible for kidney stone formation in certain types of patients. Often times, kidney stones tend to run in families or in people with common diseases. If specific proteins and genes can be implicated in the formation of urinary stones, targeted therapies could prevent them from forming or even slow down the rate of their formation.

Dr. Gupta's team includes William Atallah, MD, MPH, who is a clinical and research expert in endourology and stone disease and also does general urological procedures and treatments such as circumcision and hydrocele.

Some examples of research studies Dr. Gupta is currently conducting are:

- Examining the effect of magnesium with vitamin B6 and a low oxalate diet on urinary oxalate levels.
- Analyzing the matrix proteins found within kidney stones to identify proteins implicated in the formation of stones
- Genetic analysis of patients with kidney stones to identify common genetic causes of certain types of kidney stones
- The effect of modifying patient positioning during ureteroscopy on surgical parameters and stone free rates (See images below.)

Flat Position.

Reverse Trendelenburg Position

The effects of modified patient positioning are being studied by Dr. Gupta's research team.

Narcotic-Free Ureteroscopy

Research indicates that approximately 90 percent of patients undergoing minimally invasive orthopedic, gynecologic, or urologic procedures are prescribed opioids, yet patients on average consume roughly 25 percent of their prescription. In an attempt to address the rising non-medical use of prescription opioids, Dr. Gupta's research group is investigating the necessity of opioids after ureteroscopy, in addition to analyzing the efficacy of how pre-operative pain counseling may reduce the quantity of opioids required after surgery. Our hope is to demonstrate that for minimally invasive procedures such as a ureteroscopy, an equivalent level of patient satisfaction can be achieved with the use of patient-physician counseling and non-narcotic alternatives.

Other Program Centers in Urology Department at Mount Sinai

The Department of Urology's surgeons and scientists have pioneered the adop-tion of novel diagnostic techniques and minimally invasive treatments for a wide range of other urologic disorders. The program centers and procedures include:

Prostate Cancer Program:

Dr. Ashutosh (Ash) K. Tewari, MBBS, MCh, FRCS (Hon.), System Chair of the Department of Urology leads our prostate cancer program. Dr. Tewari has performed more than 7,000 robotic prostatectomies (surgery to remove the entire prostate). He is also highly skilled in procedures such as active surveil-lance, genomic marker analysis, immunotherapy, and MRI fusion targeted biopsy.

Comprehensive Kidney Cancer Center and Reconstructive Surgery Program:

Dr. Ketan K. Badani, MD, system Vice Chair of Urology, leads the Comprehensive Kidney Cancer Center and Robotic Kidney Surgery Program. Dr. Badani has the most experience performing robotic kidney surgery of any surgeon in the United States. He is also highly skilled in complex urinary tract reconstructive surgery. The Comprehensive Kidney Cancer Center at Mount Sinai offers all treatment modalities for kidney cancer including radical and partial nephrectomy, ablation, and active surveillance.

Bladder Cancer Program:

Dr. Peter Wiklund MD, PhD, a world renowned physician-scientist, is the director of our bladder cancer program. His innovations include the entirely robotic removal of a bladder and creation of a new bladder and he has performed the highest number of these surgeries worldwide. Along with Dr. Mehrazin and Dr. Sfakianos, he has expanded the scope of robotic surgery, immunotherapy and research to provide a patient centered, personalized treatment approach to bladder cancer.

Minimally Invasive Surgery and Advanced Procedures:

Dr. Michael A. Palese, Chair of Mount Sinai Downtown and Beth Israel Hospital leads the Minimally Invasive Surgery team for the Mount Sinai System. Dr. Palese and his group develop and perform the newest cutting edge minimally invasive techniques for robotic, laparoscopic and endoscopic procedures. The MIS team specializes in performing advanced procedures for complex conditions involving the kidney, pros-tate, bladder, ureter and adrenal gland.

Our Team

The Kidney Stone Center at Mount Sinai focuses on the comprehensive management of your stones. Our primary approach focuses on prevention and non-invasive or medical management of kidney stones instead of surgery.

Our team includes a certified physician associate, nurse practitioner, and medical assistants. Our executive assistant, secretaries, and surgery scheduler are dedicated to making your experience scheduling office visits and procedures easy and stress free.

Unlike many other centers, we can do in-house diagnosis and treatment in many cases. We have a procedure suite in our office where we have the capability to treat your kidney stones with shockwave lithotripsy, place and remove stents, and perform an ureteroscopy. Our state-of-the-art imaging technology, including ultrasonography and X-ray, allows us to monitor existing stones or find new ones, preventing a painful kidney stone attack.

Please feel free to call our office with any questions that you have. We can be contacted at 212-241-1272. For more information about Dr. Gupta and the services of the Kidney Stone Center, visit https://www.mountsinai.org/care/urology/services/kidney-stones.

Frequently Asked Questions

Q. How do kidneys work?

The kidneys are paired, kidney bean-shaped organs that are deep within the abdomen below the diaphragm toward the flanks (sides) and partially protected by the rib cage. The purpose of the kidneys is to act like a strainer for the blood stream by clearing the body of waste products and excess minerals and salts. These waste products are then excreted from the body within urine. Damage to the kidneys from high blood pressure (hypertension), kidney stones, infections, kidney diseases such as glomerulonephritis, or urinary tract obstruction can result in renal failure. When you have renal failure, the kidneys are no longer capable of eliminating waste products. These toxic substances can build up in the blood stream and in the body, causing organ malfunction and even death. Alternative methods of eliminating the waste products, such as dialysis or a kidney transplant, must be implemented to avert a fatal outcome.

Q: What are kidney stones and how do they form?

Kidney stones are solid masses composed of minerals and proteins that form within the kidneys of susceptible individuals. When an excessive amount of minerals or salts such as calcium, oxalate, phosphorous, or uric acid are present in the urine, a phenomenon called supersaturation can occur. The resulting crystallization of the excess component (e.g. uric acid), or the combining of a negative ion (anion) such as oxalate with a positive ion (cation) such as calcium, will form an insoluble crystal. These crystals can aggregate to form a nidus, with subsequent addition of crystals to the existing lattice structure resulting in the formation of a kidney stone (also known as a renal calculus).

Q: What are the most common types of kidney stones?

The most common type of kidney stone, found in approximately 90 percent of people who develop stones, is composed of calcium oxalate, of which there are two types: calcium oxalate monohydrate (COM) and calcium oxalate dihydrate (COD). The second most common type of kidney stone is composed of uric acid (found in approximately 6 percent of people). Sometimes a stone is composed of both calcium oxalate and uric acid. This can occur because the crystal lattice structures of calcium oxalate and of uric acid are similar enough that the crystal of one type can join the lattice of the other type, a phenomenon called epitaxy. Of course the formation of kidney stones is a much more complex process than the simple supersaturation and subsequent crystallization of excess minerals. Numerous other factors such as the role of crystallization and aggregation inhibitors such as citrate are only now finally being understood. In addition, we now recognize the importance of matrix and of epithelial cells in mediating and facilitating crystal-crystal interactions.

Other stone types have different etiologies. Cystine stones, for example, occur in patients who have a defective gene that allows the excess absorption and excretion of the amino acids cystine, ornithine, lysine, and arginine due to defective transport proteins located in the intestinal tract as well as renal tubules. This is most often an inherited genetic disorder that can cause severe and rapid kidney stone formation.

Struvite stones are stones composed of magnesium ammonium phosphate and are caused by infection of the urinary tract by particular groups of bacteria that have a special ability to split urea, a common waste product in the urine, to form ammonia. These stones can be dangerous to treat since bacteria are often trapped in the center of the stones and can be released into the urine and into the blood stream during treatment – sometimes resulting in severe sickness and potentially death.

Q: Do all kidney stones need to be treated?

No. Stones that are small (less than 4 millimeters) and not causing any pain or obstruction of the urinary tract can usually be observed for spontaneous passage. These small stones may sit in the kidney for months or even years without causing any pain, and may not pose any danger to the individual. Paradoxically, some kidney stones are large but do not cause any pain whatsoever. These stones, however, can be very dangerous. Numerous studies have demonstrated that these large stones, sometimes referred to as staghorn stones, can silently cause kidney failure. Stones that are medium size should usually be treated even if they are not causing pain because of their potential in the future to pass into the ureter and cause obstruction and severe pain.

Q: Can my kidney stones be dissolved?

Unfortunately, the vast majority of kidney stones cannot be dissolved by any oral medication or herbal therapy. Because they are composed of calcium, like the bones of the body, any medicine that could dissolve them would also dissolve the bones of the body. Certain subtypes of stones, including uric acid and cystine stones, can be dissolved. Both of these stone types are formed in an acidic environment, and become soluble if the urine pH (alkalinity) can be raised. Using a combination of dietary modification and medications, partial or sometimes even complete dissolution can be achieved. In addition, calcium phosphate stones that are associated with an endocrine disorder called hyperparathyroidism may dissipate when the disorder is corrected. Even though most kidney stones cannot be dissolved, they can be prevented from increasing in number and in size by appropriate changes in diet, and with medications and other herbal and holistic remedies.

Q: What non-invasive or natural remedies are available?

A current focus of research at the Kidney Stone Center at Mount Sinai is the role of holistic therapy and herbal or natural medications to achieve cessation of metabolically active urinary stone disease. We have had tremendous success in the non-invasive treatment of kidney stones by initiating nutritional changes, and by supplementing the diet with the proper balance of vitamins and minerals that can aid in stone dissolution.

For example, we have successfully dissolved uric acid stones by supplementing patients' diets with fresh squeezed lemon juice. Some patients have a deficiency of citrate and by supplementing the diet with 4 ounces of fresh squeezed lemon juice (which has a naturally high concentration of citrate) each day, their kidney stones can be dissolved.

Another example is the common misunderstanding that patients with kidney stones should avoid calcium in their diet. Many patients shun dairy products. This puts them at an increased risk for osteoporosis and bone fractures. The vast majority of patients, even those with calcium oxalate stones, need more calcium in their diet to stop their kidney stones from forming and growing. This paradox can be explained by the recent discovery that in calcium oxalate stone formers, the oxalate is usually the more metabolically active component. Not having enough calcium and magnesium in the diet allows free, unbound oxalate in the intestinal tract to be absorbed unhindered. Increased oxalate absorption translates to increased oxalate excretion in the urine and subsequent kidney stone formation.

This finding is especially true in patients who have had bowel surgery, ulcerative colitis, Crohn's disease, intestinal problems, diarrhea, lactose intolerance, celiac sprue, and malabsorption syndromes. In many of these cases, continued formation of kidney stones can be arrested by dietary supplementation with calcium or magnesium.

Q: What can be done to find out why I am making kidney stones?

At the Kidney Stone Center, patients with significant urinary stone disease get a full evaluation including a dietary questionnaire, comprehensive metabolic panel (to rule out systemic metabolic conditions such as hyperuricemia or hyperparathyroidism), and a 24-hour urine collection. The most important step in determining appropriate dietary modifications and/or medications that may be necessary to prevent stone disease progression, and in some cases effect dissolution, is the urine collection.

The causes for stone disease are myriad, and often the solutions are just as complex, sometimes incorporating a combination of vitamin supplementation, natural or herbal supplements, dietary avoidance of certain products, and medications.

Q: How can my kidney stones be treated?

Not all stones need treatment. If treatment is necessary or desirable and the stones are determined to be the type that cannot be dissolved, a host of minimally invasive treatments are now available that would have been unthinkable just 20 years ago.

First and foremost, extracorporeal shock wave lithotripsy (ESWL) is a completely non-invasive treatment that allows fragmentation of urinary tract stones without the need for incisions or endoscopy. In this process, which can be performed with minimal anesthesia, shock waves are generated by a machine called a lithotripter and are sent through the surface of the skin to focus on the stone. The kidney stone then vibrates and self-fragments into small pieces, sometimes no bigger than sand particles, that are then flushed through the urinary tract. This procedure is performed on an outpatient basis. A car service can sometimes be provided to bring patients to the hospital and take them back home to minimize inconvenience to family members and patients.

Stones that cannot be treated with ESWL (because of size, location, composition, or patient contraindications) can most often be managed by a minimally invasive technique called ureteroscopic laser lithotripsy. In this process, a tiny fiberoptic camera is passed into the urinary tract without any incisions and the stone is directly visualized, whether in the bladder, kidney or ureter. A state of the art device, the Holmium-YAG laser, is used to fragment and vaporize the stone into thousands of miniscule pieces, which are then flushed out of the body naturally. Some anesthesia is required but this outpatient procedure allows very quick recovery and return to normal activities within hours to days.

Stones that are very large or that are recalcitrant to other methods may require percutaneous lithotripsy, also known as percutaneous nephrolithotomy. In this procedure a tiny incision (1 cm.) is made in the flank and a camera is passed into the kidney through the flank. The stones are visualized and fragmented with a ultrasonic lithotripsy or laser lithotripsy and extracted. A drain is often necessary for 1 or 2 days, so a short hospital stay (1-2 nights) is usually required.