Penn Medicine

CLINICAL BRIEFING™

Division of Urology

Multimodal Treatment of Kidney Stone Disease

Urologists at Penn Medicine are managing kidney stones with a range of interventions that reflects the variable characteristics and effects of stone disease, and an approach to diagnosis that encompasses accuracy of stone identification and patient safety.

Kidney stones (renal calculi) form as solid concretions or crystals; about 80% are composed of calcium, with the remainder comprised of ammonium magnesium phosphate (struvite), uric acid and cystine. The incidence and prevalence of kidney stone disease has been rising for more than two decades in the United States. Men are predominantly affected, but stone disease is no longer uncommon in women, peaking in both sexes between the ages of 40 and 60.

CT scans are an invaluable guide for stone disease treatment planning, providing information relevant to stone location, size and composition. At Penn, low-dose noncontrast helical CT (providing <50% the radiation dose of a standard CT scan) is the standard of diagnosis for kidney stone disease.

This approach limits radiation exposure for patients who may require repeated serial scans while providing most of the information necessary for treatment planning.

At Penn, treatment of kidney stone disease emphasizes noninvasive therapies and minimally invasive surgery and is determined by stone size, location in the urinary tract and intensity on CT (an artifact linked to stone composition).

Stones small enough to pass out of the body (<5mm) may require no more treatment than pain management and careful monitoring. Larger calculi may be amenable to noninvasive shock wave lithotripsy, a treatment that uses ultrasound energy to break stones into small fragments. Stones that are refractory to lithotripsy or too large to split may be treated by minimally invasive ureteroscopy, a procedure that permits direct visualization and retrieval of the stone.

Individuals with large stones lodged in the kidney are candidates for percutaneous lithotomy. This procedure involves making a small tract into the kidney from the back to gain access and break the stones. In some cases, laparoscopic (key hole surgery) or robotic procedures may be necessary to clear all of the stones. These procedures are generally more invasive and reserved only for select patients.

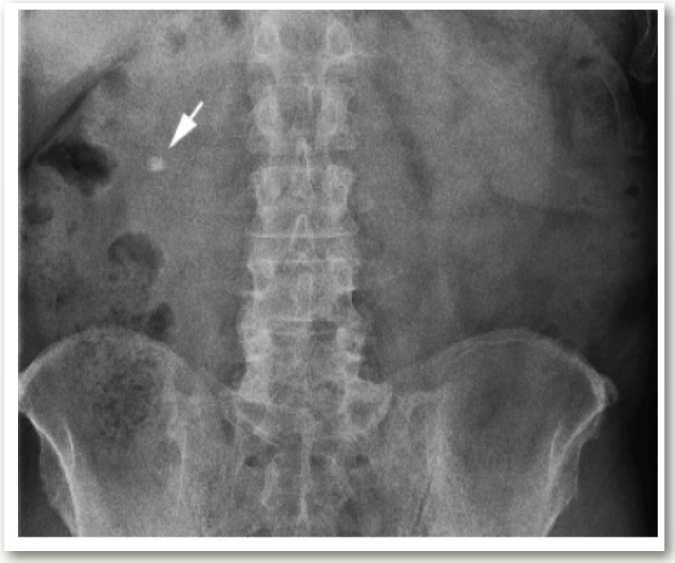

Figure 1: Kidney, ureter and bladder (KUB) x-ray demonstrating 0.9 cm renal calculi in the mid-right kidney.

Case Study

Mr. D, a 47-year-old male, was referred to Penn Urology by his primary care provider for treatment of a renal calculus. Two weeks prior to his visit, he experienced the acute onset of severe right flank and abdominal pain accompanied by hematuria and vomiting. Mr. D was treated in a Penn emergency room where he underwent a low dose CT scan. This revealed an uncomplicated semi-opaque calculi approximately 0.9 cm in diameter in the middle portion of his right kidney (Figure 1) and a 5 mm stone in the distal right ureter, which he subsequently passed.

The passed stone was sent for analysis and found to be a calcium oxalate stone. Fearing another episode of pain, Mr. D inquired about treatment options for the stone in his kidney. The size and location were appropriate for shock wave lithotripsy but other stone parameters on the CT scan predicted a lower chance of success compared to ureteroscopy.

Because it is noninvasive, and despite a lower chance of success, Mr. D decided to undergo shock wave lithotripsy. When a single session failed to fracture the stone, however, Mr. D asked to have it removed. A ureteroscopic procedure was then performed under general anesthesia to retrieve and remove the stone via basket extraction. Mr. D went home the same day. Two years after his procedure, and with a few dietary modifications, he reports no further issues with stone disease.

Faculty Team

Penn Urology offers the latest in techniques to critically evaluate and manage all types of urologic disease, including urethral obstruction, enlarged prostate, bladder tumors, urinary stones and cancer. As leaders in minimally invasive and noninvasive procedures, Penn urologists collaborate with specialists in radiology, pathology, medical oncology and radiation oncology to offer high quality personalized care.

Penn Urology is a leader, as well, in innovative approaches to therapy, including robotic surgery and endourologic techniques to visualize and treat disorders from kidney to bladder.

Treating Stone Disease at Penn Medicine

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