

# EM CASE OF THE WEEK.

BROWARD HEALTH MEDICAL CENTER  
DEPARTMENT OF EMERGENCY MEDICINE



Care Warriors

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October 2020 | Vol 3 | Issue 1

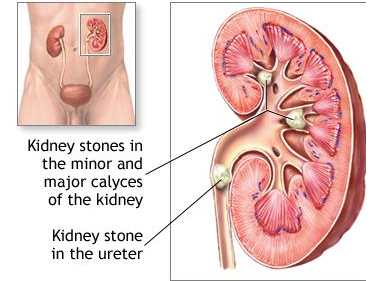
## Nephrolithiasis

A 32-year-old female with no past medical history presents to the ED with sudden onset right flank pain persisting for the past 12 hours. She has never experienced these symptoms prior to this episode. She reports dysuria, hematuria, urinary frequency, and radiating pain from her back towards her groin region. She denies fever, chills, shortness of breath, chest pain, vaginal discharge. Patient is afebrile and vitals are within normal limits.

On physical exam, patient has right CVA tenderness, tenderness in the right lower quadrant and suprapubic region to palpation. Remainder of physical exam is within normal limits.

Which of the following is the most appropriate initial treatment for this patient's condition?

- A. Increased oral hydration **PLUS** Computed Tomography (CT) abdomen/pelvis without contrast **PLUS** Indomethacin 50 mg three times per day.
- B. Intravenous hydration **PLUS** shock wave lithotripsy (SWL)
- C. Strain urine with every void **PLUS** Prednisone 10mg once daily **PLUS** Oxycodone 10 mg once daily
- D. Nitrofurantoin 100 mg two times daily **PLUS** Prednisone 10 mg once daily



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Nephrolithiasis, also called renal calculi or kidney stones, is defined as an accumulation of substances in the kidney; most commonly, calcium oxalate (80%), calcium phosphate, uric acid, cysteine, or struvite.

As depicted in the photograph above, a kidney stone can lodge in a variety of locations including the ureter, minor calyx, or major calyx.

*EM Case of the Week is a weekly "pop quiz" for ED staff.*

The goal is to educate all ED personnel by sharing common pearls and pitfalls involving the care of ED patients. We intend on providing better patient care through better education for our nurses and staff.

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The correct answer is A. Patients should increase oral fluid hydration, use an NSAID, such as Indomethacin for pain management, and undergo abdomen/pelvis CT without contrast for confirmation of the diagnosis.

Renal colic describes the symptoms suggestive of nephrolithiasis. The most common kidney stone is composed of calcium oxalate (80%), followed by calcium phosphate. Kidney stones are caused by altered urine composition, based on patient behaviors and certain conditions. Some include, low calcium intake, high oxalate intake, high animal-protein intake, low potassium intake, high sodium intake, low fluid intake, hypertension, gout, obesity, and diabetes.<sup>1</sup>

## Discussion

Nephrolithiasis occurs when a collection of substances form a stone in the kidneys. Hence, nephrolithiasis is also termed “kidney stone”. Substances that form a kidney stone include calcium, uric acid, struvite, and cysteine. Patients with kidney stones typically present with hematuria and flank pain, elicited as costovertebral angle tenderness on physical exam. Pain may radiate, usually to lower abdominal or genitourinary regions, and often comes in paroxysmal waves. Other symptoms include nausea, vomiting, dysuria, and urinary urgency.

In terms of prevalence by race and gender, stone disease is more common among white men. The annual incidence is 140.6 per 100,000 population for men and 65.8 per 100,000 population for women.

Risk factors for developing a calcium stone include personal or family history of nephrolithiasis, dehydration, high sodium intake, low calcium intake, low potassium intake, high vitamin C intake, and other concomitant conditions such as gout, obesity, type 2 diabetes, hypertension and malabsorption as seen after bariatric surgery.

Diagnosis is suspected based on patient presentation. However, bladder, kidney, and ureter imaging should be obtained to confirm suspicion. Ideally, abdomen and pelvis CT without contrast should be conducted. If unavailable, renal and bladder ultrasound should be conducted, occasionally with radiography. Differential diagnoses for nephrolithiasis include pyelonephritis, renal cell carcinoma, ectopic pregnancy, ovarian cyst, appendicitis, among others.

Sequelae of nephrolithiasis include permanent kidney damage. Damaged kidneys are at increased risk of infection and sepsis, recurrent kidney stones, and hydronephrosis.<sup>1,2,3</sup>

## Treatment

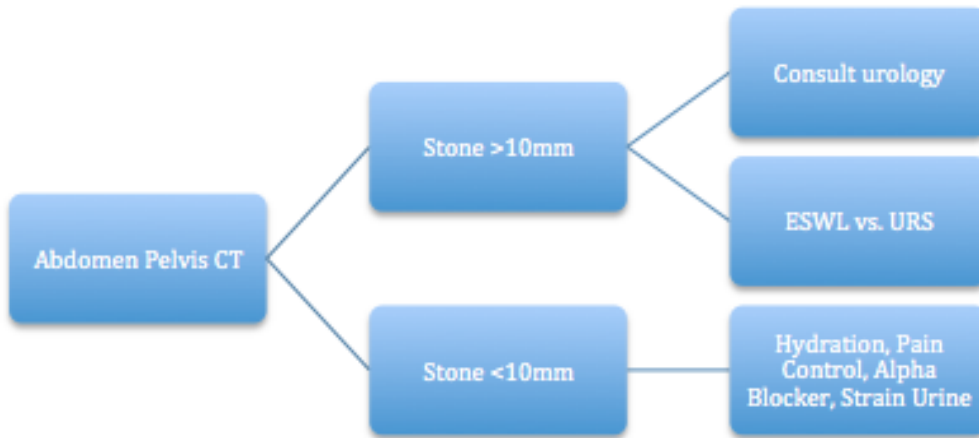
Conservative management, including pain control, hydration, and straining urine, is appropriate for most patients with a stone confirmed less than 10mm in size. Pharmacologic pain management with NSAID and opioids has demonstrated equal effectiveness. To facilitate stone passage, oral hydration and alpha-blocker medications (i.e. tamsulosin 0.4mg once daily) are utilized.

Nephrolithiasis requires urology consultation if larger than 10mm diameter, located in a complex renal or ureteral location, conservative management failed, the patient presents with symptoms of urosepsis, acute kidney injury, anuria, or is unable to tolerate oral hydration due to nausea or vomiting.

After straining or retrieval, the stone should be evaluated to determine its chemical composition. Based on results, future stone prevention techniques can be customized. For example, individuals with calcium oxalate stones should be advised to avoid foods high in protein and oxalate such as dark leafy vegetables, chocolate, and vitamin C supplements. Uric acid stones may be prevented with xanthine oxidase inhibitor medications. Prevention of cystine stones may be considered by increasing urine pH. And, prevention of struvite stones may be attempted with antibiotic treatment specific of bacteria producing urease.<sup>1,2,3</sup>

For a list of educational lectures, grand rounds, workshops, and didactics please visit [BrowardER.com](http://BrowardER.com) and click on the “Conference” link.

*All are welcome to attend!*



## ABOUT THE AUTHOR

This month's case was written by Mihir Nakrani. Mihir is a 4<sup>th</sup> year medical student from NSU-COM. She did her emergency medicine rotation at BHMC in September 2020. Mihir plans on pursuing a career in Physical Medicine & Rehabilitation after graduation.

Initial management of nephrolithiasis is based greatly upon the size of the renal calculus. Therefore, imaging is essential to precisely evaluate the size of the stone. Stones greater than 10 millimeters require urologic intervention by a urologist for stone clearance, such as extracorporeal shock wave lithotripsy (ESWL) or ureteroscopy (URS) lithotripsy.

## Take Home Points

- There are many types of renal calculi. They most commonly occur in men and are typically composed of calcium oxalate.
- The diagnosis of nephrolithiasis is made initially with clinical presentation, usually flank pain and hematuria.
- Nephrolithiasis is confirmed with CT abdomen pelvis without contrast. If CT is unavailable, ultrasound is the second line imaging option.
- Stones smaller than 10mm are managed conservatively. Stones larger than 10mm are managed procedurally in conjunction with urology.
- If stone composition is identified, customized prevention techniques can be implemented.

## REFERENCES

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