

Laboratory Diagnosis Of Kidney Diseases And Frequency Of Meeting.

Tashkent medical academy

Z.A. Sayfutdinova, M.D. Xidoyatova, G.B. Abdullayeva, A.A. Jienbayeva.

Abstract: Kidney stones are a common disorder, with an annual incidence of eight cases per 1,000 adults. During an episode of renal colic, the first priority is to rule out conditions requiring immediate referral to an emergency department, then to alleviate pain, preferably with a nonsteroidal anti-inflammatory drug. The diagnostic workup consists of urinalysis, urine culture, and imaging to confirm the diagnosis and assess for conditions requiring active stone removal, such as urinary infection or a stone larger than 10 mm. Conservative management consists of pain control, medical expulsive therapy with an alpha blocker, and follow-up imaging within 14 days to monitor stone position and assess for hydronephrosis. Asymptomatic kidney stones should be followed with serial imaging, and should be removed in case of growth, symptoms, urinary obstruction, recurrent infections, or lack of access to health care. All patients with kidney stones should be screened for risk of stone recurrence with medical history, basic laboratory evaluation, and imaging. Lifestyle modifications such as increased fluid intake should be recommended for all patients, and thiazide diuretics, allopurinol, or citrates should be prescribed for patients with recurrent calcium stones. Patients at high risk of stone recurrence should be referred for additional metabolic assessment, which can serve as a basis for tailored preventive measures.

Keywords : Kidney stones

Kidney stones are a common disorder, with an annual incidence of eight cases per 1,000 adults. During an episode of renal colic, the first priority is to rule out conditions requiring immediate referral to an emergency department, then to alleviate pain, preferably with a nonsteroidal anti-inflammatory drug. The diagnostic workup consists of urinalysis, urine culture, and imaging to confirm the diagnosis and assess for conditions requiring active stone removal, such as urinary infection or a stone larger than 10 mm. Conservative management consists of pain control, medical expulsive therapy with an alpha blocker, and follow-up imaging within 14 days to monitor stone position and assess for hydronephrosis. Asymptomatic kidney stones should be followed with serial imaging, and should be removed in case of growth, symptoms, urinary obstruction, recurrent infections, or lack of access to health care. All patients with kidney stones should be screened for risk of stone recurrence with medical history, basic laboratory evaluation, and imaging. Lifestyle modifications such as increased fluid intake should be recommended for all patients, and thiazide diuretics, allopurinol, or citrates should be prescribed for patients with recurrent calcium stones. Patients at high risk of stone recurrence should be referred for additional metabolic assessment, which can serve as a basis for tailored preventive measures.

Table 1 lists the incidence of different types of kidney stones among children and adults in developed countries.³⁻⁸ Most are of noninfectious etiology and are associated with low fluid intake, hot climate, and certain comorbidities and risk factors (e.g., hypertension; gout; obesity; nonalcoholic fatty liver disease; excessive intake of protein, carbohydrates, and sodium). Increasing exposure to these risk factors may explain the rising incidence of kidney stones and their prevalence in men, non-Hispanic whites, and persons with low socioeconomic status. The annual incidence of kidney stones is about eight cases per 1,000 adults and peaks around midlife in developed countries

CLINICAL PRESENTATION

Acute renal colic presents as cramping and intermittent abdominal and flank pain as kidney stones travel down the ureter from the kidney to the bladder.² Pain is often accompanied by nausea, vomiting, and malaise; fever and chills may also be present.² Similarity with a previous episode should increase confidence in the diagnosis,

although the value of personal or family history during an episode of renal colic is not known. The physical examination should be directed toward excluding differential diagnoses (e.g., urinary tract infection, musculoskeletal inflammation or spasm, ectopic pregnancy, testicular torsion, malignancy; Table 2).^{2,12-14} The initial workup of a patient with suspected kidney stones in the primary care setting should include point-of-care urinalysis to detect blood, because hematuria helps confirm the diagnosis.

TABLE 1

Composition of Kidney Stones in Developed Countries		
Stone type	Children (%)	Adults (%)
Calcium oxalate	60–90	32–46
Calcium phosphate	10–20	3–5
Both	29	40
Cystine	1 - 5	1
Struvite (magnesium ammonium phosphate)	1 - 18	2 - 15
Uric acid	1–10	3–16

TABLE 2

Differential Diagnosis of Kidney Stones	
Clinical clues	Suggested diagnoses
Dysuria	Interstitial cystitis (pelvic pain syndrome), prostatitis, urinary tract infection, vaginitis
Fever, chills	Nonspecific response to infection or inflammation (e.g., pyelonephritis)
Hematuria	Benign prostatic hyperplasia, renal glomerular disease, urinary tract infection, uroepithelial or prostatic tumor
Nausea, vomiting	Gastrointestinal disease, intestinal or urinary obstruction, nonspecific response to pain .
Pain and tenderness	
Abdominal	Acute mesenteric ischemia, cholecystitis, gastrointestinal disease, leaking abdominal aortic aneurysm .
Groin or pelvis	Ectopic pregnancy, hernia, ovarian pathology, pelvic inflammatory disease, pelvic pain syndrome, prostatitis, testicular mass, testicular torsion, urethritis, vaginitis
Suprapubic	Interstitial cystitis, peritonitis, prostatitis, urinary calculi, urinary tract infection .

Urinary frequency	Benign prostatic hyperplasia, bladder spasms, high fluid intake, hyperglycemia, urinary tract infection
-------------------	---

ACUTE MANAGEMENT

Pain relief is the priority in the acute management of renal colic. Nonsteroidal anti-inflammatory drugs (e.g., ketorolac, 30 to 60 mg intramuscularly) are more effective and have fewer adverse effects than opioids. If an opioid is used, meperidine (Demerol) should be avoided because of the significant risk of nausea and vomiting. Neither scopolamine nor increased fluid intake alleviates renal colic. Immediate referral to a urologist or emergency department is warranted when medical analgesia is insufficient; when sepsis is suspected; when anuria, bilateral obstruction, urinary tract infection with renal obstruction, or obstruction of the sole functioning kidney are present; in women who are pregnant or have delayed menstruation (because of the risk of ectopic pregnancy); and in patients who have potential comorbidities or are older than 60 years, especially those with arteriopathy (because of the risk of leaking abdominal aortic aneurysm).

DIAGNOSTIC WORKUP

When immediate referral is not indicated, urine culture and urinalysis (if not already done) should be ordered to rule out infection, as well as imaging to confirm the diagnosis of kidney stones and assess for hydronephrosis and stone size and position. Although non-contrast-enhanced computed tomography (CT) of the abdomen and pelvis has superior sensitivity and specificity and is commonly performed in the emergency department, first-line ultrasonography has acceptable performance and is more cost-effective. Intravenous urography with plain radiography has limited accuracy and is no longer the preferred diagnostic imaging modality for kidney stones.⁵ There is no direct evidence for the optimal timing of diagnostic workup for acute renal colic in the primary care setting.

FOLLOW-UP

Conservative management is indicated if referral is not necessary. Patients should receive pain medication as needed, and follow-up imaging (ultrasonography and possibly plain radiography) should be obtained once within 14 days to monitor evolving stone position and assess for hydronephrosis. Complete urinary obstruction causes irreversible loss of kidney function, but patients with well-controlled pain and no significant degree of hydronephrosis have only partial obstruction and can be followed for about four to six weeks. If the stone does not pass spontaneously, the patient should be referred to a urologist for active stone removal. Approximately 86% of kidney stones pass spontaneously; this proportion is lower for stones larger than 6 mm (59% vs. 90% for smaller stones). Although stones larger than 6 mm in diameter are often removed by urologists, these are the stones that have greatest benefit from medical expulsive therapy. Medical expulsive therapy with alpha blockers, 0.4 mg per day; doxazosin, 4 mg per day) hastens and increases the likelihood of stone passage, reduces pain, and prevents surgical interventions and hospital admissions. These medications should be offered to patients with distal ureteral stones 5 to 10 mm in diameter. Tamsulosin is the most studied medication, but other alpha blockers seem equally effective. Calcium channel blockers (e.g., nifedipine) are less effective and may be no more effective than placebo. Coadministration of oral corticosteroids or increasing fluid intake does not hasten stone passage or alleviate renal colic.

Further Evaluation in the Subacute Setting

Patients with newly diagnosed kidney stones should receive a basic evaluation consisting of a detailed medical history, serum chemistry, and urinalysis/urine culture. Patients at risk of stone recurrence should be referred for additional metabolic testing (e.g., 24-hour urine collection for total volume, pH, and calcium oxalate, uric acid, citrate, sodium, potassium, and creatinine levels) and individualized preventive measures. The medical history should review the stone history (including family history of kidney stones), diet, current medications, and conditions associated with an increased risk of kidney stones. The patient should be instructed to strain his or her urine to catch the stone, then send the stone in a urine specimen cup or a clean, dry container for analysis; non-calcium oxalate stones require additional metabolic testing. Recurrent stones should also be considered for analysis because their composition may differ from the initial stone. When stone analysis is not

available, ultrasonography should be ordered to look for renal abnormalities if it was not performed before the stone was passed. Non-contrast-enhanced CT should be considered if residual stone is suspected; this modality may help identify stone composition.³¹ Basic laboratory evaluations include creatinine (for renal function), ionized calcium (for hyperparathyroidism), and uric acid (for hyperuricemia); parathyroid hormone should be measured only if the serum calcium level is high.^{15,31} If a stone was not retrieved for analysis, additional tests should be considered: urine pH (for nephrocalcinosis and other metabolic abnormalities), microscopy of sediment from morning urine (for urine crystals that may suggest stone composition), and a test for cystinuria (especially in children because it is an inherited metabolic disorder).

Prevention

Measures to prevent recurrence of kidney stones include lifestyle modifications, citrate supplementation, and medications.^{2,15,31,38,39} Lifestyle modifications are the cornerstone of prevention after a first kidney stone in patients with low risk of recurrence, whereas citrate supplementation and medications are reserved for patients with recurrent stones.^{15,31,38,39} Patients at high risk of stone recurrence should receive preventive measures tailored to the results of the metabolic assessment.

References

1. Scales CD Jr., Smith AC, Hanley JM, Saigal CS; Urologic Diseases in America Project. Prevalence of kidney stones in the United States. *Eur Urol.* 2012;62(1):160-165.
2. Frassetto L, Kohlstadt I. Treatment and prevention of kidney stones: an update. *Am Fam Physician.* 2011;84(11):1234-1242.
3. Alatab S, Pourmand G, El Howairis Mel F, et al. National profiles of urinary calculi: a comparison between developing and developed worlds. *Iran J Kidney Dis.* 2016;10(2):51-61.
4. López M, Hoppe B. History, epidemiology and regional diversities of urolithiasis. *Pediatr Nephrol.* 2010;25(1):49-59.
5. Türk C, Petřík A, Sarica K, et al. EAU guidelines on diagnosis and conservative management of urolithiasis. *Eur Urol.* 2016;69(3):468-474.
6. Sharma AP, Filler G. Epidemiology of pediatric urolithiasis. *Indian J Urol.* 2010;26(4):516-522.
7. Gabrielsen JS, Laciak RJ, Frank EL, et al. Pediatric urinary stone composition in the United States. *J Urol.* 2012;187(6):2182-2187.
8. Alelign T, Petros B. Kidney stone disease: an update on current con
9. Roudakova K, Monga M. The evolving epidemiology of stone disease. *Indian J Urol.* 2014;30(1):44-48.
10. Aune D, Mahamat-Saleh Y, Norat T, Riboli E. Body fatness, diabetes, physical activity and risk of kidney stones: a systematic review and meta-analysis of cohort studies. *Eur J Epidemiol.* 2018;33(11):1033-1047.
11. Wijarnpreecha K, Lou S, Panjawatnan P, et al. Nonalcoholic fatty liver disease and urolithiasis. A systematic review and meta-analysis. *J Gastrointest Liver Dis.* 2018;27(4):427-432.
12. Pietrow PK, Karellas ME. Medical management of common urinary calculi. *Am Fam Physician.* 2006;74(1):86-94.
13. Wright PJ, English PJ, Hungin AP, Marsden SN. Managing acute renal colic across the primary-secondary care interface: a pathway of care based on evidence and consensus [published correction appears in *BMJ.* 2003;326(7379):18]. *BMJ.* 2002;325(7377):1408-1412.
14. Bultitude M, Rees J. Management of renal colic. *BMJ.* 2012;345:e5499.
15. Pearle MS, Goldfarb DS, Assimos DG, et al. Medical management of kidney stones: AUA guideline. *J Urol.* 2014;192(2):316-324.
16. Afshar K, Jafari S, Marks AJ, Eftekhari A, MacNeily AE. Nonsteroidal anti-inflammatory drugs (NSAIDs) and non-opioids for acute renal colic. *Cochrane Database Syst Rev.* 2015;(6):CD006027.
17. Holdgate A, Pollock T. Systematic review of the relative efficacy of non-steroidal anti-inflammatory drugs and opioids in the treatment of acute renal colic [published correction appears in *BMJ.* 2004;329(7473): 1019]. *BMJ.* 2004;328(7453):1401.
18. Pathan SA, Mitra B, Cameron PA. A systematic review and meta-analysis comparing the efficacy of nonsteroidal anti-inflammatory drugs, opioids, and paracetamol in the treatment of acute renal colic. *Eur Urol.* 2018;73(4):583-595.

19. Worster AS, Bhanich Supapol W. Fluids and diuretics for acute ureteric colic. *Cochrane Database Syst Rev.* 2012;(2):CD004926.
20. Smith-Bindman R, Aubin C, Bailitz J, et al. Ultrasonography versus computed tomography for suspected nephrolithiasis. *N Engl J Med.* 2014; 371(12):1100-1110.
21. Niemann T, Kollmann T, Bongartz G. Diagnostic performance of lowdose CT for the detection of urolithiasis: a meta-analysis. *AJR Am J Roentgenol.* 2008;191(2):396-401.
22. Rodger F, Roditi G, Aboumarzouk OM. Diagnostic accuracy of low and ultra-low dose CT for identification of urinary tract stones: a systematic review. *Urol Int.* 2018;100(4):375-385.
23. Fulgham PF, Assimos DG, Pearle MS, Preminger GM. Clinical effectiveness protocols for imaging in the management of ureteral calculous disease: AUA technology assessment. *J Urol.* 2013;189(4):1203-1213.
24. Tcheu DU, Ha YS, Kim WT, Yun SJ, Lee SC, Kim WJ. Expectant management of ureter stones: outcome and clinical factors of spontaneous passage in a single institution's experience. *Korean J Urol.* 2011;52(12):847-851.
25. Ahmed AF, Gabr AH, Emara AA, Ali M, Abdel-Aziz AS, Alshahrani S. Factors predicting the spontaneous passage of a ureteric calculus of ≤ 10 mm. *Arab J Urol.* 2015;13(2):84-90.
26. Coll DM, Varanelli MJ, Smith RC. Relationship of spontaneous passage of ureteral calculi to stone size and location as revealed by unenhanced helical CT. *AJR Am J Roentgenol.* 2002;178(1):101-103.
27. Hollingsworth JM, Canales BK, Rogers MA, et al. Alpha blockers for treatment of ureteric stones: systematic review and meta-analysis. *BMJ.* 2016;355:i6112.
28. Wang H, Man LB, Huang GL, Li GZ, Wang JW. Comparative efficacy of tamsulosin versus nifedipine for distal ureteral calculi: a meta-analysis. *Drug Des Devel Ther.* 2016;10:1257-1265.
29. Pickard R, Starr K, MacLennan G, et al. Medical expulsive therapy in adults with ureteric colic: a multicentre, randomised, placebo-controlled trial. *Lancet.* 2015;386(9991):341-349.
30. Chua ME, Park JH, Castillo JC, Morales ML Jr. Terpene compound drug as medical expulsive therapy for ureterolithiasis: a meta-analysis. *Urolithiasis.* 2013;41(2):143-151.
31. Skolarikos A, Straub M, Knoll T, et al. Metabolic evaluation and recurrence prevention for urinary stone patients: EAU guidelines. *Eur Urol.* 2015;67(4):750-763.
32. Daudon M, Frochot V, Bazin D, Jungers P. Drug-induced kidney stones and crystalline nephropathy: pathophysiology, prevention and treatment. *Drugs.* 2018;78(2):163-201.
33. Bjelakovic G, Gluud LL, Nikolova D, et al. Vitamin D supplementation for prevention of mortality in adults. *Cochrane Database Syst Rev.* 2014;(1): CD007470.
34. Izzedine H, Lescure FX, Bonnet F. HIV medication-based urolithiasis. *Clin Kidney J.* 2014;7(2):121-126.
35. Kahwati LC, Weber RP, Pan H, et al. Vitamin D, calcium, or combined supplementation for the primary prevention of fractures in communitydwelling adults: evidence report and systematic review for the US Preventive Services Task Force. *JAMA.* 2018;319(15):1600-1612.
36. Streeper NM. Asymptomatic renal stones—to treat or not to treat. *Curr Urol Rep.* 2018;19(5):29.
37. Semins MJ, Matlaga BR. Management of urolithiasis in pregnancy. *Int J Womens Health.* 2013;5:599-604.
38. Qaseem A, Dallas P, Forciea MA, Starkey M, Denberg TD. Dietary and pharmacologic management to prevent recurrent nephrolithiasis in adults: a clinical practice guideline from the American College of Physicians. *Ann Intern Med.* 2014;161(9):659-667.
39. Fink HA, Wilt TJ, Eidman KE, et al. Medical management to prevent recurrent nephrolithiasis in adults: a systematic review for an American College of Physicians clinical guideline [published correction appears in *Ann Intern Med.* 2013;159(3):230-232]. *Ann Intern Med.* 2013;158(7): 535-543.
40. Fink HA, Akornor JW, Garimella PS, et al. Diet, fluid, or supplements for secondary prevention of nephrolithiasis: a systematic review and meta-analysis of randomized trials. *Eur Urol.* 2009;56(1):72-80.
41. Phillips R, Hanchanale VS, Myatt A, Somani B, Nabi G, Biyani CS. Citrate salts for preventing and treating calcium containing kidney stones in adults. *Cochrane Database Syst Rev.* 2015;(10):CD010057.
42. Prezioso D, Strazzullo P, Lotti T, et al. Dietary treatment of urinary risk factors for renal stone formation. A review of CLU Working Group [published correction appears in *Arch Ital Urol Androl.* 2016;88(1):76]. *Arch Ital Urol Androl.* 2015;87(2):105-120.
43. McDowell SE, Thomas SK, Coleman JJ, Aronson JK, Ferner RE. A practical guide to monitoring for adverse drug reactions during antihypertensive drug therapy [published correction appears in *J R Soc Med.*

2013; 106(4):119]. J R Soc Med. 2013;106(3):87-95.

44. Goldfarb DS, Coe RL. Prevention of recurrent nephrolithiasis. Am Fam Physician. 1999;60(8):2269-2276.

45. Portis AJ, Sundaram CP. Diagnosis and initial management of kidney stones. Am Fam Physician. 2001;63(7):1329-1339.