



Current Management of Renal Colic

The emergency physician is often faced with the patient in severe pain who has suspected renal colic. The lecturer will present information on current diagnostic and imaging modalities used to evaluate the patient with suspected renal colic. Pain management and admission criteria will be reviewed.

- Discuss the various diagnostic and imaging modalities available in the evaluation of patients with renal colic.
- Describe the pain management in these patients.
- Discuss the criteria for admission.

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FACULTY

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Current Management of Renal Colic
WE-176
Instructor: David F. M. Brown, MD, FACEP

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WE-178

1 Hour

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CURRENT MANAGEMENT OF RENAL COLIC

I. Introduction

A. Definitions

1. urolithiasis – stone disease in the urinary tract – is characterized by the precipitation of crystals in the renal collecting systems and subsequent growth into macroscopic stones.
2. Calcium-containing stones >80%

B. Incidence/Prevalence

1. ~12% of US population will form a stone during their lifetime
2. Men:women = 3:1
3. Incidence in men who have never had a stone is 3/1000/year.

C. Etiology

1. multifactorial
2. calcium-containing and uric acid stones derive from a combination of environmental factors and genetic predisposition
3. cystine stones are due to autosomal recessive genetic abnormality
4. struvite stones form in the presence of urease-producing bacteria

D. Prognosis

1. stones <5mm tend to pass spontaneously
2. stones >10mm usually require urological intervention
3. 5 year recurrence for untreated calcium stone formers is 30-50%

II. Clinical Presentation/Differential Diagnosis

A. symptoms are determined by stone location

1. ureteral: abrupt severe pain in the back, flank, groin associated with nausea, vomiting, and diaphoresis is classic
2. kidney: dull flank/back pain, +/- n/v
3. bladder: dysuria or urinary retention
4. atypical presentations may occur – abdominal pain in the affected upper quadrant

B. Physical examination

1. vital signs – hypertension/tachycardia common, check temperature
2. abdomen usually benign
3. genitalia normal
4. CVA tenderness

C. differential includes

1. abdominal aortic aneurysm rupture – must be considered in ALL PATIENTS with suspected renal colic, may cause GU symptoms and/or microscopic hematuria
2. appendicitis - can cause microscopic hematuria but time course usually different
3. aortic dissection, especially involving a renal artery
4. pyelonephritis
5. renal artery embolus

6. testicular/ovarian torsion
7. ectopic pregnancy
8. musculoskeletal back pain/spasms
9. biliary colic
10. urethritis
11. lower lobe pneumonia

III. Emergency Physician's Responsibilities in Suspected Renal Colic

- A. relieve pain rapidly
- B. exclude the dangerous diagnoses
- C. provide appropriate disposition and follow-up care
- D. you do not have to make a definitive diagnosis in every patient

IV. Analgesia

- A. before diagnostic tests
- B. evidence from multiple randomized controlled trials show that NSAID's are as effective as narcotics in relieving pain of renal colic
 1. no clinically important differences in terms of onset of action
 2. no clinically important differences in terms of magnitude of pain relief
 3. variety of medications, dosages, routes of administration tested without a clearly superior approach
 4. NSAIDs block prostaglandin E2 synthesis
- C. most studies used narcotics as the "rescue medication" for refractory pain
- D. advantages of NSAIDs
 1. non-sedating
 2. little/no effect on hemodynamics
 3. will not cause ureteral spasm
- E. less common treatments
 1. acupuncture as effective as NSAIDs in one RCT (N=38) with a more rapid onset of action and no observed side effects
 2. glucagon intravenously may be effective in causing ureteral relaxation
- F. suggested regimen
 1. parenteral or rectal NSAID's as first line agent
 - a. ketorolac
 - b. naproxen
 - c. indomethacin
 - d. ibuprofen
 2. parenteral narcotics for refractory pain
 3. anti-emetics for vomiting

V. Diagnosis

- A. Urinalysis
 1. hematuria in ~90% of patients with urolithiasis
 2. pyuria –may indicate infected stone or simple pyelonephritis
- B. Bedside EP-performed ultrasound
 1. identify unilateral hydronephrosis

2. assess size of abdominal aorta (r/o AAA)
 3. look for perinephric fluid –sign of ruptured calyx
 4. usually cannot identify stones unless intrarenal
 5. rapidly performed, cheap, immediately available, no contrast or radiation
- C. Formal radiographic studies
1. None
 - a. young, otherwise healthy patients
 - b. classic history AND hematuria
 - c. no h/o IVDU (at risk for renal embolus)
 - d. readily available prompt follow-up
 - e. other diagnoses considered and excluded in reasonable manner
 - f. h/o previously recovered stone is very helpful
 2. plain radiographs (KUB)
 - a. 80% of stones are contain calcium (doesn't mean you'll see 80% of stones on KUB)
 - b. helpful in patients with documented stones who re-present to the ED
 - c. otherwise of limited utility
 - d. charge: \$100-150
 3. helical CT scanning
 - a. advantages
 - ii. rapidly performed
 - iii. highly accurate
 - iv. identifies stone anywhere along GU tract
 - v. accurately sizes the stone
 - vi. gives information about other intra-abdominal structures
 - vii. no contrast
 - b. disadvantages
 - i. less information about degree of obstruction than IVP
 - ii. radiation exposure similar to IVP
 - iii. not widely available
 - iv. charge: ~\$600
 4. intravenous pyelogram (IVP)
 - a. advantages
 - i. detailed anatomic and functional information, including degree of obstruction
 - ii. widely available
 - b. disadvantages
 - i. may not directly visualize stone on scout film and, even if identified, inaccurately sized c/w CT
 - ii. time-consuming
 - iii. no information about other intra-abdominal structures
 - iv. contrast administration
 - v. radiation exposure
 - vi. charge: \$500-700 depending on type of contrast
 5. formal ultrasonography
 - a. advantages

- i. non-invasive
 - ii. accuracy approaches IVP, esp. when combined with KUB
 - iii. provides excellent anatomic detail
 - iv. provides information about other abdominal and pelvic structures
 - v. no radiation or contrast
 - vi. relative cost advantage (charge \$300-\$400), unless KUB performed as well
 - b. disadvantages
 - i. does not assess renal function
 - ii. operator-dependant
 - iii. difficult to visualize the actual calculus
 - iv. images often obscured by bowel gas or body habitus
6. suggested approach for a patient who requires a formal imaging study
 - a. helical CT as the first choice if available
 - b. IVP as second choice
 - c. formal renal US for pregnant patient and, in centers where helical CT not available, for those with diabetes, renal insufficiency, or a history of contrast allergy

VI. Disposition

- A. Most patients will be discharged
 1. with analgesia (NSAID vs. narcotic)
 2. with a urine strainer – stone analysis is critical in determining further treatment and should be stressed to the patient
 3. with a prompt follow-up appointment with a urologist or the PCP
 4. with clear instructions on when/why to return to the ED
- B. Indications for admission
 1. intractable pain
 2. persistent vomiting/dehydration
 3. fever/pyuria – requires immediate urological intervention
 4. high grade obstruction or stones >8mm are likely to require intervention and generally are criteria for admission
 5. patients with a solitary kidney or underlying intrinsic renal disease
 6. social reasons

REFERENCES

1. Erwin BC, et al: Renal Colic: The Role of Ultrasound in Initial Evaluation. *Radiology* 1984;152(1):147.
2. Hill MC, Rich JI, Maridat JG, Finder CA. Sonography vs. Excretory Urography in Acute Flank Pain. *Am J Roentgenology* 1985;144:1235.
3. Laing FC, et al: Ultrasound versus Excretory Urography in Evaluating Acute Flank Pain. *Radiology* 1985;154(3):613.
4. Platt JF, Rubin JM, Ellis JH. Acute Renal Obstruction: Evaluation with Intrarenal Duplex Doppler and Conventional US. *Radiology* 1993;186:685.
5. Sommer FG, Jeffrey RB, Rubin GD, et. al. Detection of Ureteral Calculi in Patients with Suspected Renal Colic: Value of Reformatted Noncontrast Helical CT. *Am J Roentgenology* 1995;164(6):1375-1380.
6. Smith RC, Rosenfield AT, Choe KA, et al. Acute Flank Pain: Comparison of Non-Contrast-enhanced CT and Intravenous Urography. *Radiology* 1995;194(3):789.
7. Smith RC, Verga M, McCarthy S, et al. Diagnosis of Acute Flank Pain: Value of Unenhanced Helical CT. *Am J Roentgenology* 1996;166:97.
8. Katz DS, Lane MJ, Sommer FG. Unenhanced Helical CT of Ureteral Stones: Incidence of Associated Urinary Tract Findings. *Am J Roentgenology* 1996; 166:1319.
9. Levine JA, Neitlich JD, et al: Identification of Ureteral Calculi on Plain Radiographs in Patients with Flank Pain: Correlation with Helical CT. *Radiology* 1997; 204:27.
10. Dalrymple NC, Verga M, et al: The Value of Unenhanced Helical CT In The Management of Acute Flank Pain. *J Urol* 1998;159:735.
11. Press SM, Smith AD: Incidence of Negative Hematuria in Patients with Acute Urinary Lithiasis Presenting to the Emergency Room with Flank Pain. *Urology* 1995; 45:753.
12. Rubin GD, Silverman SG: Helical (Spiral) CT of the Retroperitoneum. *Rad Clin N Am* 1995;33(5):903.
13. Zangerle KF, et al: Usefulness of Abdominal Flat Plate Radiographs in Patients with Suspected Ureteral Colic. *Ann Em Med* 1985;14(4):316.
14. Roth CS, et al: Utility of the Plain Abdominal Radiograph for Diagnosing Ureteral Calculi. *Ann Emerg Med* 1985;14(4):311.
15. Dalla Palma L, Stacul F, et al: Ultrasonography and Plain Film versus Intravenous Urography in Ureteral Colic. *Clin Radiol* 1993;47:333.
16. Sinclair D, et al: The Evaluation of Suspected Renal Colic: Ultrasound Scan Versus Excretory Urography. *Ann Em Med* 1989;18(5):556.
17. Brown DFM, Rosen CL, Wolfe RE. Renal ultrasonography. *Emerg Med Clin North Am* 1997;15:877.
18. Rosen CL, Brown DFM, Sagarin MJ, et al: Ultrasonography by emergency physicians in patients with suspected ureteral colic. *J Emerg Med* 1998;16:865.
19. Henderson SO, Hoffner RJ, Aragona JL, et al: Bedside emergency department ultrasonography plus radiology of the kidneys, ureters, and bladder vs. intravenous pyelography in the evaluation of suspected ureteral colic. *Acad Emerg Med* 1998;5:666.

20. Brown DFM, Rosen CL, Chang YC, Sagarin MJ, Wolfe RE: Efficacy of a clinical pathway for suspected ureteral colic in reducing IV pyelogram utilization (abstract). *Acad Emerg Med* 1996;3:482.
21. Khalifa MS, et al: Treatment of Pain Owing to Acute Ureteral Obstruction with Prostaglandin-Synthetase Inhibitor: A Prospective Randomized Study. *J Urol* 1986;136(2):393.
22. Lundstam SO: Prostaglandin-Synthetase Inhibition with Diclofenac Sodium in Treatment of Renal Colic: Comparison with use of Narcotic Analgesic. *Lancet* 1982;8281(1):1096.
23. Sjodin JG, et al: Indomethacin by Intravenous Infusion in Ureteral Colic. *J Urol Nephrol* 1982;16(3):221.
24. Hedenbro JL, et al: Metoclopramide and Ureteric Colic. *Acta Shir Scand* 1988;154:439.
25. Nepper-Rasmussen J, et al: Glucagon and Ureteric Colic. *Urol Res* 1984;12(1):23.
26. Labrecque M, Dostaler L-P, Rouselle R, Nguyen, T, Poirier S. Efficacy of nonsteroidal anti-inflammatory drugs in the treatment of acute renal colic: a meta-analysis. *Arch Int Med*. 1994;154:1381-1387.
27. Cohen E, Hafner R, Rotenberg Z, Fadilla M, Garty M. Comparison of ketorolac and diclofenac in the treatment of renal colic. *Eur J Clin Pharmacol*. 1998;54:455-458.
28. Muriel C, Ortiz P. Efficacy of two different intramuscular doses of dipyron in acute renal colic. *Meth Find Exp Clin Pharmacol*. 1993;15:465-469.
29. Supervia A, Pedro-Botet J, Nogues X, et al. Piroxicam fast-dissolving dosage form vs. diclofenac sodium in the treatment of acute renal colic; a double-blind controlled study. *Br J Urol*. 1998;81:27-30.
30. Stein A, Ben Dov D, et al: Single dose intramuscular ketorolac versus diclofenac for pain management in renal colic. *Am J Emerg Med*. 1996;14:385-387.
31. Muriel-Villoria C, Zungri-Telo E, Diaz-Curiel, M, et al. Comparison of the onset and duration of the analgesic effect of dipyron, 1 or 2 g, by the intramuscular or intravenous route, in actual renal colic. *Eur J Clin Pharmacol*. 1995;48:103-107.
32. Cordell W, Wright S, Wolfson A, et al. Comparison of intravenous ketorolac, meperidine, and both (balanced analgesia) for renal colic. *Ann Emerg Med*. 1996;28:151-158.
33. Curry C, Kelly A. Intravenous tenoxicam for the treatment of renal colic. *NZ Med J*. 1995;108:229-230.
34. Cordell W, Larson T, et al. Indomethacin suppositories versus intravenously titrated morphine for the treatment of ureteral colic. *Ann Emerg Med*. 1994;23:262-269.
35. Stankov G, Schmieder G, Zerle G, Schinzel S, Brune K. Double blind study with dipyron versus tramadol and butylscopolamine in acute renal colic pain. *World J Urol*. 1994;12:155-161.
36. Sandhu D, Iacovou J, Fletcher M, Kaisary A, Philip N, Arkell D. A comparison of intramuscular ketorolac and pethidine in the alleviation of renal colic. *Br J Urol*. 1994;74:690-693.
37. Jasani N, O'Connor R, Bouzoukis J. Comparison of hydromorphone and meperidine for ureteral colic. *Acad Emerg Med*. 1994;1:539-543.
38. Lee Y-H, Lee W-C, Chen M-T, Huang J-K, Chung C, Chang L. Acupuncture in the treatment of renal colic. *J Urol*. 1992;147:16.