Tikrit University

College of Nursing

Basic Nursing Sciences

Second Year - 2023-2024

Adult Nursing

Urinary Disorders

Prepared by:

Nariman Mohammed Ahmed

Kidney Stones

What is Urolithiasis?

- **Urolithiasis** refers to stones (calculi) in the urinary tract.
- Stones are formed in the urinary tract when the urinary concentration of substances such as calcium oxalate, calcium phosphate, and uric acid increases.
- Stones vary in size from minute granular deposits to the size of an orange.
- Factors that favor formation of stones include infection, urinary stasis, and periods of immobility, all of which slow renal drainage and alter calcium metabolism.
- The problem occurs predominantly in the third to fifth decades and affects men more often than women.

Pathophysiology

- Presence of stones anywhere in the urinary tract
    - Most commonly found in the renal pelvis and calyces
        - Stones forming in the kidney—nephrolithiasis
        - Stones formed in the ureters—ureterolithiasis
    - May be single or multiple calculi, ranging in size from a grain of salt to the size of a pebble or staghorn calculus
- Composition of calculi
    - Formed of mineral deposits—predominantly calcium oxalate and calcium phosphate
    - Uric acid, struvite, and cystine are also calculus formers

Etiology

- Slow urine flow allows accumulation of crystals—damaging the lining of the urinary tract and decreasing the number of inhibitor substances that would prevent crystal accumulation
- May remain asymptomatic until passed into a ureter or urine flow is obstructed, at which time the potential for renal damage is acute and the level of pain is at its highest.
- Causes: dehydration; heredity; excessive intake of vitamins C and D, grapefruit juice, and purines (gout); congenital renal abnormalities; and some medications, such as acetazolamide (Diamox) or (Crixivan)

Clinical Manifestations

Manifestations depend on the presence of obstruction, infection, and edema. Symptoms range from mild to excruciating pain and discomfort.

Stones in Renal Pelvis

- Intense, deep ache in costovertebral region
- Hematuria and pyuria
- Pain that radiates anteriorly and downward toward bladder in female and toward testes in male
- Acute pain, nausea, vomiting, costovertebral area tenderness (renal colic)
- Abdominal discomfort, diarrhea

Ureteral Colic (Stones Lodged in Ureter)

- Acute, excruciating, colicky, wavelike pain, radiating down the thigh to the genitalia
- Frequent desire to void, but little urine passed; usually contains blood because of the abrasive action of the stone (known as ureteral colic)

Stones Lodged in Bladder

- Symptoms of irritation associated with urinary tract infection and hematuria

- Urinary retention, if stone obstructs bladder neck
- Possible urosepsis if infection is present with stone

Assessment and Diagnostic Methods

- Diagnosis is confirmed by x-rays of the kidneys, ureters, and bladder (KUB) or by ultrasonography, IV urography, or retrograde pyelography.
- Blood chemistries and a 24hour urine test for measurement of calcium, uric acid, creatinine, sodium, pH, and total volume.
- Chemical analysis is performed to determine stone composition.

Diagnostic Studies

- Urinalysis: Color may be yellow, dark brown, bloody. Commonly shows RBCs, WBCs, crystals (cystine, uric acid, calcium oxalate), casts, minerals, bacteria, pus; pH may be less than 5 (promotes cystine and uric acid stones) or higher than 7.5 (promotes magnesium, struvite, phosphate, or calcium phosphate stones).
- Urine (24-hr): uric acid, calcium, phosphorus, oxalate, or cysteine may be elevated.
- Urine culture: May reveal UTI (Staphylococcus aureus, Proteus, Klebsiella, Pseudomonas).
- Biochemical survey: Elevated levels of magnesium, calcium, uric acid, phosphates, protein, electrolytes.
- Serum and urine BUN/: Abnormal (high in serum/low in urine) secondary to high obstructive stone in kidney causing ischemia/necrosis.
- Serum chloride and bicarbonate levels: Elevation of chloride and decreased levels of bicarbonate suggest developing renal tubular acidosis.
- CBC:
    - Hb/Hct: Abnormal if patient is severely dehydrated or polycythemia is present (encourages precipitation of solids), or patient is anemic (hemorrhage, kidney dysfunction/failure).

    - RBCs: Usually normal.
    - WBCs: May be increased, indicating infection/septicemia.
- Parathyroid hormone (PTH): May be increased if kidney failure present. (PTH stimulates reabsorption of calcium from bones, increasing circulating serum and urine calcium levels.)
- KUB x-ray: Shows presence of calculi and/or anatomical changes in the area of the kidneys or along the course of the ureter.
- Intravenous Pyelogram IVP: Provides rapid confirmation of urolithiasis as a cause of abdominal or flank pain. Shows abnormalities in anatomical structures (distended ureter) and outline of calculi.
- Cystoureteroscopy: Direct visualization of bladder and ureter may reveal stone and/or obstructive effects.
- CT scan: Identifies/delineates calculi and other masses; kidney, ureteral, and bladder distension.
- Ultrasound of kidney: To determine obstructive changes, location of stone; without the risk of failure induced by contrast medium.

Nursing Priorities

1. Alleviate pain.
2. Maintain adequate renal functioning.
3. Prevent complications.
4. Provide information about disease process/prognosis and treatment needs.

Medical Management

- Basic goals are to eradicate the stone, determine the stone type, prevent nephron destruction, control infection, and relieve any obstruction that may be present.

Pharmacologic and Nutritional Therapy

- Opioid analgesic agents (to prevent shock and syncope) and nonsteroidal antiinflammatory drugs (NSAIDs).

- Increased fluid intake to assist in stone passage, unless patient is vomiting; patients with renal stones should drink eight to ten 8oz glasses of water daily or have IV fluids prescribed to keep the urine dilute.
- For calcium stones: reduced dietary protein and sodium intake; liberal fluid intake; medications to acidify urine, such as ammonium chloride and thiazide diuretics if parathormone production is increased.
- For uric stones: low protein and limited protein diet; allopurinol (Zyloprim).
- For cystine stones: low protein diet; alkalinization of urine; increased fluids.
- For oxalate stones: dilute urine; limited oxalate intake (spinach, strawberries, rhubarb, chocolate, tea, peanuts, and wheat bran).

Stone Removal Procedures

- **Ureteroscopy:** stones fragmented with use of laser, electrohydraulic lithotripsy, or ultrasound and then removed.
- Extracorporeal shock wave lithotripsy (ESWL).
- Percutaneous nephrostomy; endourologic methods.
- Electrohydraulic lithotripsy.
- Chemolysis (stone dissolution): alternative for those who are poor risks for other therapies, refuse other methods, or have easily dissolved stones (struvite).
- Surgical removal is performed in only 1% to 2% of patients.

Nursing Process

Assessment

- Assess for pain and discomfort, including severity, location, and radiation of pain.
- Assess for associated symptoms, including nausea, vomiting, diarrhea, and abdominal distention.

- Observe for signs of urinary tract infection (chills, fever, frequency, and hesitancy) and obstruction (frequent urination of small amounts, oliguria, or anuria).
- Observe urine for blood; strain for stones or gravel.
- Focus history on factors that predispose patient to urinary tract stones or that may have precipitated current episode of renal or ureteral colic.
- Assess patient's knowledge about renal stones and measures to prevent recurrence.

Diagnosis

Nursing Diagnoses

- Acute pain related to inflammation, obstruction, and abrasion of the urinary tract
- Deficient knowledge regarding prevention of recurrence of renal stones

Collaborative Problems/Potential Complications

- Infection and urosepsis (from urinary tract infection and pyelonephritis)
- Obstruction of the urinary tract by a stone or edema, with subsequent acute renal failure

Planning and Goals

- Major goals may include relief of pain and discomfort, prevention of recurrence of renal stones, and absence of complications.

Nursing Interventions

Relieving Pain

- Administer analgesics (IV or intramuscular) with IV NSAID as prescribed.
- Encourage and assist patient to assume a position of comfort.
- Monitor pain closely and report promptly increases in severity.

Monitoring and Managing Complications

- Encourage increased fluid intake.
- Begin IV fluids if patient cannot take adequate oral fluids.
- Monitor total urine output and patterns of voiding.
- Crush any blood clots passed in urine, and inspect sides of urinal and bedpan for clinging stones.
- Instruct patient to report decreased urine volume, bloody or cloudy urine, fever, and pain.
- Instruct patient to report any increase in pain.
- Monitor vital signs for early indications of infection; infections should be treated with the appropriate antibiotic agent before efforts are made to dissolve the stone.

Teaching Points

- Explain causes of kidney stones and ways to prevent recurrence.
- Encourage patient to follow a regimen to avoid further stone formation, including maintaining a high fluid intake.
- Encourage patient to drink enough to excrete 3,000 to 4,000 mL of urine every 24 hours.
- Recommend that patient have urine cultures every 1 to 2 months the first year and periodically thereafter.
- Recommend that recurrent urinary infection be treated vigorously.
- Encourage increased mobility whenever possible; discourage excessive ingestion of vitamins (especially vitamin D) and minerals.
- If patient had surgery, instruct about the signs and symptoms of complications that need to be reported to the physician; emphasize the importance of followup to assess kidney function and to ensure the eradication or removal of all kidney stones to the patient and family.

- If patient had ESWL, encourage patient to increase fluid intake to assist in the passage of stone fragments; inform the patient to expect hematuria and possibly a bruise on the treated side of the back; instruct patient to check his or her temperature daily and notify the physician if the temperature is greater than 38C (about 101F), or the pain is unrelieved by the prescribed medication.

- Provide instructions for any necessary home care and followup.

Providing Home And Follow-up

Instruct patient to increase fluid intake to assist passage of stone fragments (may take 6 weeks to several months after procedure).

- Instruct patient about signs and symptoms of complications: fever, decreasing urinary output, and pain.

- Inform patient that hematuria is anticipated but should subside in 24 hours.

- Give appropriate dietary instructions based on composition of stones.

- Encourage regimen to avoid further stone formation; advise patient to adhere to prescribed diet.

- Teach patient to take sufficient fluids in the evening to prevent urine from becoming too concentrated at night.

Evaluation

Expected Patient Outcomes

- Reports relief of pain

- States increased knowledge of health seeking behaviors to prevent recurrence

- Experiences no complications