Renal and Urinary Tract Diseases (II)

Glomerulonephritis (GN)

Glomerulonephritis literally means ‘inflammation of glomeruli’. The term is used to describe all types of glomerular disease, even though some of these (such as minimal change nephropathy) are not associated with inflammation.

Most types of glomerulonephritis are immunologically mediated and several respond to immunosuppressive drugs. Deposition of antibody occurs in many types of glomerulonephritis. Glomerulonephritis is generally classified in terms of the histopathological appearances, the most common of which is the minimal change GN.

Clinical and laboratory features of glomerular injury

• Leakage of cells and macromolecules across the glomerular filtration barrier:

* Proteinuria
* Hematuria: characteristic of inflammatory and destructive processes.

• Impaired renal function and reduced GFR

• Hypertension

In minimal change GN,:

- The histopathological appearance looks normal, except on electron microscopy, where fusion of podocyte foot processes is seen (a non-specific finding).

- Often presents as acute and often severe nephrotic syndrome.

- Good response to corticosteroids.

 It is the dominant cause of idiopathic nephrotic syndrome in children.

Nephrotic Syndrome

A medical condition characterized by heavy proteinuria due to glomerular disorder.

1. Pediatric nephrotic syndrome

Nephrotic syndrome, is defined by the presence of:

- nephrotic-range proteinuria (> 3.5 g/day)

- edema, hyperlipidemia

- hypoalbuminemia.

While nephrotic-range proteinuria in adults is defined by protein excretion of 3.5 g or more per day, in children it is defined as protein excretion of more than 40 mg/m2/h or a first-morning urine protein/creatinine of 2-3 mg/mg creatinine or greater.

Signs and symptoms

Pitting edema is the presenting symptom in about 95% of children with nephrotic syndrome. It is usually found in the legs , face and periorbital regions, and in the abdomen as ascites.

Other signs and symptoms of nephrotic syndrome may include:

- Respiratory tract infection - A history of a respiratory tract infection immediately preceding the onset of nephrotic syndrome is frequent

- Hematuria

- Symptoms of infection - Such as fever, lethargy, irritability, or abdominal pain due to sepsis or peritonitis

- Hypotension and signs of shock which is usually due to sepsis.

- Respiratory distress : caused by massive ascites and thoracic compression or pulmonary edema, effusions, or both

- Tachypnea - To compensate for mechanical restriction to breathing

- Anorexia and easy fatigability.

- Hypertension

Diagnosis:

In order to diagnose nephrotic syndrome, laboratory tests should confirm the following:

 (1) nephrotic-range proteinuria

 (2) hypoalbuminemia

 (3) hyperlipidemia.

Accordingly, initial laboratory tests should include :

* Urinalysis
* Urine protein quantification
* Serum albumin , and
* Lipid profile.

It is noteworthy to mention that hypocalcemia is a common laboratory finding in patients with nephrotic syndrome.

Treatment:

The main line of treatment include:

Corticosteroids

Diuretics

Antihypertensiveagents

Hypolipidemic drugs

1. Adult nephrotic Syndrome:

Most cases of NS are considered idiopathic or primary; membranous nephropathy and focal segmental glomerulosclerosis are the most common histologic subtypes of primary NS in adults.

Most common secondary causes of NS in adults include:

1. diabetes mellitus
2. systemic lupus erythematosus
3. adverse effects of medications.

Signs and symptoms :

Nephrotic syndrome is characterized by: peripheral edema, heavy proteinuria, and hypoalbuminemia, with hyperlipidemia. The patients typically present with edema and fatigue, without any evidence of congestive heart failure or a liver disease

New-onset edema, particularly in the legs, is the most common presenting feature of NS. patients may have edema extending to lower abdomen, or genitalia. Ascites, periorbital edema, hypertension, and pleural effusion are also presenting features.

Patients may have foamy urine, exertional dyspnea or fatigue, and significant weight gain due to fluid retention.

Diagnosis:

The diagnostic criteria for NS are :

* Clinical edema
* Heavy proteinuria : Spot urine showing a protein-to-creatinine ratio of > 3 to 3.5 mg protein/mg creatinine (300 to 350 mg/mmol), or 24-hour urine collection showing > 3 to 3.5 g protein
* Hypoalbuminemia: Serum albumin < 2.5 g per dL (25 g per L)

Treatment :

* Treating underlying cause ( in secondary NS)
* Diuretics
* Corticosteroids

Urinary Tract Infection (UTI)

In health, bacterial colonization is confined to the lower end of the urethra and the remainder of the urinary tract is sterile .

The urinary tract can become infected with various bacteria but the most common is *E. coli* derived from the gastrointestinal tract.

The spectrum of presentation of UTI include:

1. Asymptomatic bacteriuria
2. Symptomatic acute urethritis and cystitis
3. Acute pyelonephritis
4. Acute prostatitis
5. Septicemia (usually Gram-negative bacteria)

Lower urinary tract infection (UTI) is the term used to describe acute urethritis and cystitis caused by a microorganism, cystitis and urethritis are lower urinary tract infections.

Clinical features:

Typical features of cystitis and urethritis include:

• abrupt onset of frequency of micturition and urgency.

• pain in the urethra during micturition (dysuria).

• suprapubic pain during and after voiding.

• intense desire to pass more urine after micturition, due to spasm of the inflamed bladder wall.

• urine that may appear cloudy and have an unpleasant odor.

• microscopic or visible hematuria.

Diagnosis:

The diagnosis can be made from the combination of typical clinical features and abnormalities on urinalysis.

Lab diagnosis:

• Dipstick estimation of nitrite, leucocyte esterase and glucose:

Most urinary pathogens can reduce nitrate to nitrite, and neutrophils and nitrites can usually be detected in symptomatic infections by urine dipstick tests for leucocyte esterase and nitrite, respectively. The absence of both nitrites and leucocyte esterase in the urine makes UTI unlikely.

• Microscopic examination of urine for white blood cells, and organisms:

Interpretation of bacterial counts in the urine, and of what is a ‘significant’ culture result, is based on probabilities. Urine taken by suprapubic aspiration should be sterile, so the presence of any

organisms is significant. If the patient has symptoms and there are neutrophils in the urine, a small number of organisms is significant.

*In asymptomatic patients, more than 105 organisms/mL is usually regarded as significant.*

(asymptomatic bacteriuria)

• Urine culture

Typical organisms causing UTI in the community include *E. coli* derived from the gastrointestinal tract (about 75% of infections), *Proteus* spp., *Pseudomonas* spp., streptococci and *Staphylococcus epidermidis*.

In hospital, *E. coli* still predominates, but *Klebsiella* or streptococci are more common.

Acute pyelonephritis

The kidneys are infected in a minority of patients with UTI. Acute renal infection (pyelonephritis) presents as a classic triad of:

loin pain, fever and tenderness over the kidneys.

The renal pelvis is inflamed and small abscesses are often evident in the renal parenchyma. Renal infection is almost always caused by organisms ascending from the bladder, and the bacterial profile is the same as for lower urinary tract infection. Rarely, bacteremia may give rise to renal or perinephric abscesses, most commonly due to staphylococci.

Investigation

As in lower UTI but full blood count; urea, electrolytes, creatinine, blood cultures, renal ultrasound and CT scan can be helpful.

Treatment of UTI



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