Bacterial Meningitis

M.Emadoleslami MD

اکسترن بایددرپایان جلسه مننژیت باکتریال بتواند:

۱–تعریف مختصری ازمننژیت وانسفالیت وانسفالوپاتی بیان کند.
۲–انواع علل میکروبی بیماری رابرشمارد.
۳–علایم مننژیت درکودکان رابیان کند.
۵–نحوه تشخیص بیماری وتغییرات بیوشیمیایی مایع نخاع راتوضیح دهد.
۶–تشخیص های افتراقی وعوارض بیماری رابرشمارد.

Introduction

- One of the most potentially serious infections occurring in infants and older children, is associated with a high rate of acute complications and risk of long-term morbidity

- It should be included in the differential diagnosis of those with altered mental status and other evidence of neurologic dysfunction
- Many microorganisms are influenced by the age and immune status of the host and the epidemiology of the pathogen

- Viral infections of the CNS are much more common than bacterial infections, which, in turn, are more common than fungal and parasitic infections

- Meningitis implies primary involvement of the meninges, whereas encephalitis indicates brain parenchymal involvement

- Many patients have evidence of both meningeal and parenchymal involvement and should be considered to have meningoencephalitis

- Brain abscess, the best example of a focal infection of the CNS

- The diagnosis of diffuse CNS infections depends on examination of cerebrospinal fluid (CSF) obtained by lumbar puncture (LP)

Etiology & Transmission

- ✓ The mode of transmission is probably person-to-person contact through respiratory tract secretions /droplets

- ✓ The most common causes in children older than ١ mo of age in USA, Streptococcus pneumoniae and Neisseria meningitides

- ✓ Bacterial meningitis caused by S. pneumoniae and Haemophilus influenzae type b has become much less common in developed countries due to universal immunization

Risk Factors

- Certain underlying immunologic (HIV infection, Ig G subclass deficiency), anatomic (splenic dysfunction, cochlear defects/ implants) disorders also may be at increased risk of infection caused by these bacteria
- Alterations of host defense resulting from anatomic defects/immune deficits, increase the risk of meningitis from less-common pathogens, P. aeruginosa, Staphylococcus aureus, coagulase-negative staphylococci, Salmonella spp
- Young age, recent colonization with pathogenic bacteria, close contact (household, daycare centers, college dormitories, military barracks) with individuals having invasive disease caused by N. meningitides/H. influenzae type b, crowding, poverty, and male gender

- The risk of meningitis is increased among infants and young children with occult bacteremia

*Risk Factors**

- Defects of the complement system (C٥-C٨) are associated with recurrent meningococcal infection, and defects of the properdin system are associated with a significant risk of lethal meningococcal disease
- Splenic dysfunction (sickle cell anemia)/asplenia (caused by trauma or congenital defect) is associated with an increased risk of pneumococcal, H. influenzae type b (to some extent), and, rarely, meningococcal sepsis and meningitis

- T-lymphocyte defects (congenital/acquired by chemotherapy, AIDS, or malignancy) are associated with an increased risk of L. monocytogenes infections of the CNS

Pneumococcal Meningitis

- A congenital/acquired CSF leak across a mucocutaneous barrier, such as a lumbar dural sinus, cranial or midline facial defects (cribriform plate), or CSF leakage through a rupture of the meninges as a result of a basal skull fracture into the cribriform plate or paranasal sinus

- The risk of bacterial meningitis, caused by S. pneumoniae, in children with cochlear implants, more than ٣٠ times the risk in the general population

- Additional risk factos, otitis media, sinusitis, pneumonia, CSF otorrhea or rhinorrhea

Staphylococci Spp.

- Lumbosacral dermal sinus and meningomyelocele are associated with staphylococcal, anaerobic, and Gram-negative enteric bacterial meningitis CSF shunt infections increase the risk of meningitis caused by staphylococci (especially coagulase-negative species) and other low-virulence bacteria that typically colonize the skin

Neisseria Meningiditis

- ✓ Cases occur throughout the year but may be more common in the winter and spring and following influenza virus infections
- ✓ Nasopharyngeal carriage of N. meningitidis., in ١-١٥% of adults
- ✓ The incidence of disease occurring in association with an index case in the family is ١%, ١٬٠٠٠-fold the risk in the general population
- ✓ Most infections from a contact in a daycare facility, a colonized adult family member, an ill patient with disease
- ✓ Children <٥ yr, the highest rates of meningococcal infection. A second peak in ١٥- ٢٤ yr of age
- ✓ Living in dormitories, increased incidence of infection compared to non–college-attending, age-matched controls

Clinical Manifestations

The onset of acute meningitis has ٢ predominant patterns

- The more dramatic and, fortunately, less common presentation is sudden onset with rapidly progressive manifestations of shock, purpura, disseminated intravascular coagulation, and reduced levels of consciousness often resulting in progression to coma or death within ٢٤ hr

- More often, meningitis is preceded by several days of fever accompanied by upper respiratory tract or gastrointestinal symptoms, followed by nonspecific signs of CNS infection, such as increasing lethargy and irritability

- The signs and symptoms of meningitis are related to the nonspecific findings associated with a systemic infection and to manifestations of meningeal irritation
- Nonspecific findings, fever, anorexia and poor feeding, headache, symptoms of upper respiratory tract infection, myalgias, arthralgias, tachycardia, hypotension, and various cutaneous signs, petechiae, purpura, or an erythematous macular rash
- Meningeal irritation, nuchal rigidity, back pain, Kernig sign (flexion of the hip ٩٠ degrees with subsequent pain with extension of the leg), and Brudzinski sign (involuntary flexion of the knees and hips after passive flexion of the neck while supine)
- In children, in those younger than ١٢-١٨ mo, Kernig and Brudzinski signs are not consistently present
- Fever, headache, and nuchal rigidity are present in only ٤٠% of adults with bacterial meningitis

- Increased ICP is suggested by headache, emesis, bulging fontanel or diastasis (widening) of the sutures, oculomotor (anisocoria, ptosis) or abducens nerve paralysis, hypertension with bradycardia, apnea or hyperventilation, decorticate or decerebrate posturing, stupor, coma, or signs of herniation
- Papilledema is uncommon in uncomplicated meningitis and should suggest a more chronic process, such as the presence of an intracranial abscess, subdural empyema, or occlusion of a dural venous sinus. Focal neurologic signs usually are a result of vascular occlusion

- Cranial neuropathies of the ocular, oculomotor, abducens, facial, and auditory nerves may also be the result of focal inflammation

- ١٠-٢٠% of children with bacterial meningitis have focal neurologic signs
- Seizures (focal or generalized) caused by cerebritis, infarction/electrolyte disturbances, in ٢٠-٣٠% of patients
- Seizures, on presentation/within the ١st ٤ days of onset, no prognostic significance

- Seizures that persist after the ٤th day of illness and those that are difficult to treat may be associated with a poor prognosis

- Alterations of mental status are common among patients with meningitis, consequence of increased ICP, cerebritis,/ hypotension
- Manifestations, irritability, lethargy, stupor, obtundation, and coma

- Comatose patients have a poor prognosis

- Additional manifestations of meningitis, photophobia and tache cérébrale, which is elicited by stroking the skin with a blunt object and observing a raised red streak within ٣٠-٦٠ sec

DIAGNOSIS

- The diagnosis of acute pyogenic meningitis is confirmed by analysis of the CSF, which typically reveals microorganisms on Gram stain and culture, a neutrophilic pleocytosis, elevated protein, and reduced glucose concentrations

LP should be performed when bacterial meningitis is suspected

Contraindications for an immediate LP include

(١) Evidence of increased ICP (other than a bulging fontanel), such as ٣rd/٦th cranial nerve palsy with a depressed level of consciousness, or hypertension and bradycardia with respiratory abnormalities

(٢) Severe cardiopulmonary compromise requiring prompt resuscitative measures for shock/in patients in whom positioning for the LP would further compromise cardiopulmonary function;

(٣) Infection of the skin overlying the site of the LP

(٤) Thrombocytopenia is a relative contraindication for LP

(٥) GCS<٧

- If an LP is delayed, empirical antibiotic therapy should be initiated. CT scanning for evidence of a brain abscess or increased ICP should not delay therapy. LP may be performed after increased ICP has been treated or a brain abscess has been excluded

- Blood cultures should be performed in all patients with suspected meningitis
- Blood cultures reveal the responsible bacteria in up to ٨٠-٩٠% of cases of meningitis
- Elevations of the C-reactive protein, erythrocyte sedimentation rate, and procalcitonin have been used to differentiate bacterial (usually elevated) from viral causes of meningitis

- Differential Diagnosis In addition to S. pneumoniae, N. meningitidis, and H. influenzae type b, many other microorganisms can cause generalized infection of the CNS with similar clinical manifestations

- These organisms include less typical bacteria, such as Mycobacterium tuberculosis, Nocardia spp., Treponema pallidum (syphilis), and Borrelia burgdorferi (Lyme disease); fungi, such as those endemic to specific geographic areas (Coccidioides, Histoplasma,Blastomyces) and those responsible for infections in compromised hosts (Candida, Cryptococcus, and Aspergillus); parasites, Toxoplasma gondii and those that cause cysticercosis , most frequently, viruses

- Focal infections of the CNS, brain abscess and parameningeal abscess (subdural empyema, cranial and spinal epidural abscess) may also be confused with meningitis. In addition, noninfectious illnesses can cause generalized inflammation of the CNS. Relative to infections, these disorders are uncommon and include malignancy, collagen vascular syndromes, and exposure to toxins

- Determining the specific cause of CNS infection is facilitated by careful examination of the CSF with specific stains (Kinyoun carbol fuchsin for mycobacteria, India ink for fungi), cytology, antigen detection (Cryptococcus), serology (syphilis, West Nile virus, arboviruses), viral culture (enterovirus), polymerase chain reaction (herpes simplex, enterovirus)

- Other potentially valuable diagnostic tests include blood cultures, CT/MRI of the brain, serologic tests, and, rarely, meningeal or brain biopsy

- In addition to bacterial, tuberculous,/ fungal infection , the differential diagnosis also includes immune or inflammatory diseases CNS vasculitis, sarcoidosis, lymphoma

- Acute viral meningoencephalitis is the most likely infection to be confused with bacterial meningitis

- Although, in general, children with viral meningoencephalitis appear less ill than those with bacterial meningitis, both types of infection have a spectrum of severity

- Some children with bacterial meningitis may have relatively mild signs and symptoms, whereas some with viral meningoencephalitis may be critically ill