GOOD MORNING

Viral Meningoencephalitis

ETIOLOGY

Enteroviruses are the most common cause of viral meningoencephalitis ,The severity of infection caused by enteroviruses ranges from mild, self-limited illness with primarily meningeal involvement to severe encephalitis resulting in .death or significant sequelae

Human enterovirus 68 has been associated with neurologic symptoms including flaccid paralysis. Parechoviruses may be an important cause of aseptic meningitis or encephalitis in infants. The clinical manifestations are similar to that of the enteroviruses with the exception of more severe MRI lesions of the cerebral cortex and at times an absence of a .CSF pleocytosis

Arboviruses are arthropod-borne agents, responsible for some cases .of meningoencephalitis during summer months

Herpes simplex virus (HSV) type 1 is an important cause of severe, sporadic encephalitis in children and adults. Brain involvement usually is focal; progression to coma and death occurs in 70% of cases without antiviral therapy. Severe encephalitis with diffuse
brain involvement is caused by HSV type 2 in neonates who usually contract the virus from their mothers at delivery. A mild transient form of meningoencephalitis may accompany genital herpes infection in sexually active adolescents; most of these infections are caused by HSV type 2. Varicella-zoster virus may cause CNS infection in close temporal relationship with chickenpox. The most common manifestation of CNS involvement is cerebellar ataxia, and the most severe is acute encephalitis. Human herpes virus 6 can cause encephalitis, especially .among immunocompromised hosts

Mumps meningoencephalitis is mild, but deafness from damage of the 8th .cranial nerve may be a sequela

Meningoencephalitis is caused occasionally by respiratory viruses .(adenovirus, influenza virus, parainfluenza virus), rubeola, rubella

PATHOGENESIS AND PATHOLOGY

Neurologic damage is caused by direct invasion and destruction of neural tissues by actively multiplying viruses or by a host reaction to viral antigens. Tissue sections of the brain generally are characterized by meningeal congestion and mononuclear infiltration, perivascular cuffs of lymphocytes and plasma cells, some perivascular tissue necrosis ,with myelin breakdown, and neuronal disruption in various stages including, ultimately, neuronophagia and endothelial proliferation or necrosis. A marked degree of demyelination with preservation of neurons and their axons is considered to represent predominantly .postinfectious" or an autoimmune encephalitis"

The cerebral cortex, especially the temporal lobe, is often severely affected by HSV; the arboviruses tend to affect the entire brain; rabies has a predilection for the basal structures. Involvement of the spinal .cord, nerve roots, and peripheral nerves is variable

CLINICAL MANIFESTATIONS

The progression and severity of disease are determined by the relative degree of meningeal and parenchymal involvement, which, in part, is determined by the specific etiology. Some children may appear to be mildly affected initially, only to lapse into coma and die suddenly. In others, the illness may be ushered in by high fever, violent convulsions interspersed with bizarre movements, and hallucinations .alternating with brief periods of clarity, followed by complete recovery

The onset of illness is generally acute, although CNS signs and symptoms are often preceded by a nonspecific febrile illness of a few days' duration. The ,presenting manifestations in older children are headache and hyperesthesia and in infants, irritability and lethargy. Headache is most often frontal or .generalized; adolescents frequently complain of retrobulbar pain

,Fever, nausea and vomiting, photophobia, and pain in the neck, back .and legs are common

As body temperature increased there may be mental dullness, progressing .to stupor in combination with bizarre movements and convulsions

WNV and nonpolio enteroviruses may cause anterior horn cell injury and a flaccid paralysis. acute flaccid paralysis may be noted in approximately 5% of patients. Nonetheless, many patients have a nonspecific febrile illness “West Nile fever” and may never seek medical attention. Loss of bowel and bladder control and unprovoked emotional outbursts .may occur

Exanthems often precede or accompany the CNS signs, especially ,with echoviruses, coxsackieviruses, varicella-zoster virus, measles rubella, and, occasionally, WNV. Examination often reveals nuchal rigidity without significant localizing neurologic changes, at least at the .onset

Specific forms or complicating manifestations of CNS viral infection include Guillain-Barré syndrome, transverse myelitis, hemiplegia, and .cerebellar ataxia

DIAGNOSIS

The diagnosis of viral encephalitis is usually made on the basis of the clinical presentation of nonspecific prodrome followed by progressive ,CNS symptoms. The diagnosis is supported by examination of the CSF .which usually shows a mild mononuclear predominance

Other tests of potential value in the evaluation of patients with suspected viral meningoencephalitis include an electroencephalogram and neuroimaging studies. The EEG typically shows diffuse (EEG) .slow-wave activity, usually without focal changes

Neuroimaging studies (CT or MRI) may show swelling of the brain .parenchyma

Focal seizures or focal findings on EEG, CT, or MRI, especially involving the

.temporal lobes, suggest HSV encephalitis

Differential Diagnosis

acute bacterial meningitis.1

Parameningeal bacterial infections such as brain abscess or.2
.subdural or epidural empyema

Infections caused by M. tuberculosis, T. pallidum (syphilis), B..3
.burgdorferi (Lyme disease), and Bartonella henselae

Analysis of CSF and appropriate serologic

.tests are necessary to differentiate these various pathogens

fungi, rickettsiae, mycoplasma, protozoa, and other parasites.4

noninfectious disorders may be associated with CNS inflammation .5

malignancy, autoimmune diseases, intracranial hemorrhage, and exposure

.to certain drugs or toxins

Acute disseminated encephalomyelitis.6

Laboratory Findings

The CSF contains from a few to several thousand cells per cubic millimeter. Early in the disease, the cells are often polymorphonuclear; later, mononuclear cells predominate. This change in cellular type is often demonstrated in CSF samples .obtained as little as 8-12 hr apart

The protein concentration in CSF tends to be normal or slightly elevated, but concentrations may be very high if brain destruction is extensive, such as that accompanying HSV encephalitis. The glucose ,level is usually normal, although with certain viruses, for example mumps, a substantial depression of CSF glucose concentrations may be observed. The CSF may be normal with parechovirus and in those who have encephalitis in the absence of meningeal .involvement

The success of isolating viruses from the CSF of children with viral meningoencephalitis is determined by the time in the clinical course that the specimen is obtained, the specific etiologic agent, whether the ,infection is a meningitic as opposed to a localized encephalitic process and the skill of the diagnostic laboratory staff. Isolating a virus is most likely early in the illness, and the enteroviruses tend to be the easiest to isolate, although recovery of these agents from the CSF rarely exceeds 70%. culture should also be obtained from nasopharyngeal .swabs, feces, and urine

Detection of viral DNA or RNA by polymerase chain reaction is the test of choice in the diagnosis of CNS infection caused by HSV, parechovirus and enteroviruses, respectively. CSF serology is the diagnostic test of .choice for WNV

A serum specimen should be obtained early in the course of illness and, if viral cultures are not diagnostic, again 2-3 wk later for serologic .studies

Serologic tests may also be of value in determining the etiology of nonenteroviral CNS infection, such as arboviral infection

TREATMENT

With the exception of the use of acyclovir for HSV encephalitis, .treatment of viral meningoencephalitis is supportive

.Treatment of mild disease may require only symptomatic relief

Headache and hyperesthesia are treated with rest, non–aspirincontaining analgesics, and a reduction in room light, .noise, and visitors

Acetaminophen is recommended for fever. Opioid agents and medications to reduce nausea may be useful, but if possible, their use in children should be minimized because they may induce misleading signs and symptoms. Intravenous fluids are occasionally necessary because of poor oral intake. More-severe disease may .require hospitalization and intensive care

It is important to monitor patients with severe encephalitis closely for convulsions, cerebral edema, inadequate respiratory exchange, disturbed fluid and electrolyte balance, aspiration and asphyxia, and .cardiac or respiratory arrest of central origin

In patients with evidence of increased ICP, placement of a pressure .transducer in the epidural space may be indicated

The risks of cardiac and respiratory failure or arrest are high with severe disease. All fluids, electrolytes, and medications are initially given parenterally.In prolonged states of coma, parenteral alimentation is indicated.SIADH is common in acute CNS disorders; monitoring of serum sodium concentrations is required for early ,detection.Normal blood levels of glucose

magnesium, and calcium must be maintained to minimize the likelihood of convulsions. If cerebral edema or seizures become .evident, vigorous treatment should be instituted

PROGNOSIS

Most children recover completely from viral infections of the CNS, especially those due to enteroviruses, whereas others have high mortality rate e.g. rabies & HSV, or have severe sequelae e.g. intellectual, motor, psychiatric, epileptic, visual, or auditory. Therefore, neurodevelopmental and audiologic evaluations should .be part of the routine follow-up

PREVENTION

Widespread use of effective viral vaccines for polio, measles, mumps,rubella, and varicella has almost eliminated CNS
. complications from these diseases

Control of insect vectors by suitable spraying methods and eradication of insect breeding sites, however, reduces the incidence of these infections. Furthermore, minimizing

-mosquito bites through the application of N,N-diethyl-3

methylbenzamide (DEET)-containing insect repellents on exposed

skin and wearing long-sleeved shirts, long pants, and socks when outdoors,especially at dawn and dusk, reduces the risk of arboviral

.infection

THANK YOU