Infectious and Inflammatory Disorders

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Intracranial Infection and Inflammation

- Cerebral abscess
- Meningitis
- Ependymitis
- Encephalitis
- Cranial neuritis
Cerebral Abscess

Sources/Predisposing Factors

- URI - Septicemia - Endocarditis
- Sinus & mastoid infections
- Immune-compromised patient
- Diabetic patient
- Congenital heart disease
- Trauma, Surgery
Brain Abscess

Infectious Agents

- Staph & strep most common
- Tuberculosis
- Fungal infection
- Parasitic infection
- Opportunistic organisms if immune-compromised
History: 45 y/o man with new seizure
Dx: Toxo cerebritis
History: 16 y/o male with new onset of seizures
Dx: Brain abscess

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Pyogenic Brain Abscess

Courtesy of ED Gotsis, PhD, Euromedica, Athens, Greece
History: 87 y/o woman on treatment for abdominal lymphoma
Dx: Abscess (Nocardia & Gram + rods)
History: 41 y/o man with headache, lethargy & inappropriate behavior
Dx: Streptococcal abscess & diabetic ketoacidosis (venous pH = 7.28)
History: 5 y/o girl with seizures
Dx: Amoebic abscesses
History: 34 y/o male with headache & a lung mass
Dx: Aspergillus abscess
Differential Diagnosis

Abscess & Tumor

- Clinical presentation
- Capsule features
- Multiple lesions
- Time course
- Diffusion Properties
- MR Spectroscopy
History: 27 y/o female with seizures
Dx: Cysticercosis – colloidal phase

2 months s/p Rx with Albendazole & Dexamethasone
Neurocysticercosis

Larval stage of the pork tapeworm (Taenia Solium)
History: 54 y/o woman with chronic seizures
Dx: Calcified diffuse cysticercosis
History: 22 y/o man with severe headaches
Dx: Intraventricular cysticercosis
History: 32 y.o. woman with headaches
History: Headaches
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Dx: Racemose cysticercosis
History: 42 y/o female with chronic headaches
Dx: TB meningitis - HIV +
History: 54 y.o. man with headaches for 2 months & decreased mental status
Dx: Cocci meningitis

Decreased mental status

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Meningitis

- Organisms
  - Bacteria
  - Virus (meningoencephalitis)
  - Tuberculosis
  - Fungus
- Enhancement of basal cisterns
- Differential diagnosis
  - Leptomeningeal seeding of tumor
  - Encephalitis
Cerebral Tuberculomas
Complications of Meningitis

- Communicating hydrocephalus
- Loculated CSF collections
- Subdural effusion / empyema
- Cerebral infarction
- Cerebral abscess
- Dural sinus thrombophlebitis
History: 39 woman with SLE on chronic immunosuppression with steroids & methotrexate
Dx: TB meningitis
History: 38 y/o man with fever & headaches
Dx: Tuberculous meningitis with vermian & left temporal lobe abscesses

Fever & headaches {Page 2}
Leptomeningeal Disease

Differential Diagnosis

- Meningitis
  - Fungal, TB, Bacterial, Neurosyphilis
- Sarcoidosis
- Cysticercosis (Racemose form)
- Metastatic disease
- Arachnoiditis
History: 37 y/o man with nausea & vomiting, low testosterone, and diabetes insipidus.
Diabetes insipidus
Dx: Neurosarcoidosis
History: 42 y.o. man with chronic head and neck pain
Dx: Chronic pachymeningeal inflammation

V/P shunt
Encephalitis

A diffuse parenchymal inflammation of the brain
Encephalitis

Organisms

- Herpes simplex
- Arboviruses
- Enteroviruses
- Lyme disease
- Congenital TORCH agents
History: 27 y.o. man with increasing confusion & lethargy
Dx: Herpes simplex encephalitis

Confusion & lethargy

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Herpes Simplex Encephalitis

- Rapid course
- Temporal lobes, inferior frontal & insular cortex
- Cortical edema & mass effect
- Gyral enhancement
- Early therapy critical
History: 50 y/o female with acute onset of headache & confusion
Dx: Herpes simplex encephalitis
Non-Herpetic Meningoencephalitis

- More benign
- Generalized cortical pattern
- Better prognosis
History: A 40 year old man with 2 days of headaches and right facial weakness and numbness
Dx: Lyme meningitis
Lyme Disease

- A tick-borne illness
- Caused by bacterium: Borrelia burgdorferi
- Flu-like symptoms
- Bull’s eye rash
- CNS: facial palsy, meningitis, encephalitis, polyradiculopathy
- Treatment: antibiotics during early stages
History: 8 year old boy with 1-2 week history of left eye ptosis, limited EOMs, and ataxia.
Dx:
Acute Disseminated Encephalomyelitis (ADEM)

- A post-infectious encephalitis
- Immune-mediated reaction
- Viral agents: measles, chickenpox or vaccination for rabies or smallpox
- Acute demyelinating disease
- Mostly a monophasic illness
History: 61 y/o woman with diabetes & hypertension presented with aphasia
Dx: Infectious encephalitis (Acute disseminated encephalomyelitis)
Neonatal Infections

TORCH

- *Toxoplasmosis*
- *Other* (Treponema, Listeria)
- *Rubella* (measles)
- *Cytomegalovirus*
- *Herpes simplex*
- *HIV*
Congenital Toxoplasmosis

Osborn & Byrd, NCNA 1:105, 1991
History: Newborn baby girl (38 wk) with microcephaly
Dx: Congenital CMV with microcephaly
History: 34 week Premature girl
HIV Infection

- RNA retrovirus
- Deficient cell-mediated immunity
- Infects monocytes & macrophages of CNS - microglial nodules
- Neurological symptoms in 39%
- At autopsy, 75-80% of brains involved
AIDS Brain Pathology

- Human immunodeficiency virus (HIV)
- Toxoplasmosis
- Cryptococcosis
- Progressive multifocal leukoencephalopathy (PML)
- Cytomegalovirus (CMV)
- Lymphoma
History: 38 HIV+ male with headache
Dx: Toxoplasmosis with good response to anti-toxo medication

Two weeks following treatment

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Toxoplasmosis

- A protozoan
- 50% of brain lesions in AIDS
- Ring-enhancing masses on CT and MR
History: 38 y/o HIV+ male with headache & weakness
Dx: Toxoplasmosis
History: 38 y/o female with progressive left sided weakness
Dx: HIV & Lymphoma

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History: 41 y/o man with a right hemiparesis & speech difficulty
Dx: Primary CNS Lymphoma

CBV
History: 45 male with AIDS, headaches & generalized wasting
Dx: Cryptococcal meningitis
Cryptococcosis

- Most common fungal infection in AIDS patients
- Produces meningitis primarily
- Access to brain via VR spaces
- Imaging studies negative in 80%
- Hydrocephalus, Brain atrophy
History: 49 y/o man with AIDS & a right hemiparesis
Hemiparesis

Dx:
History: 31 y/o male with multiple neurological deficits
Dx: AIDS - PML
Clinical Features of PML

- Reactivation of latent DNA papovavirus
- Immunocompromised host
- Defective oligodendrocytes & myelin maintenance
- Progressive neurologic deterioration
- No effective therapy - poor prognosis
History: 48 y/o HIV+ man with fever, mutism, ataxia & dysphagia
Ataxia & dysphagia
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Dx: PML - Progressive Multifocal Leukoencephalopathy

Gd+
History: 40 y/o male with headache and fever
16 months later {Page 2}
Now with lethargy & confusion
Dx: AIDS - HIV encephalitis & brain atrophy
History: 35 y/o male with fever & ataxia
Dx: HIV encephalitis
Cytomegalovirus

- Retinitis
- Encephalitis
- Ependymitis / Ventriculitis
- Neuritis of cranial nerves
- Peripheral polyneuropathy
History: 43 y/o man with visual deficits
Dx: CMV retinitis with optic pathway involvement
History: 45 y.o. man with multiple cranial nerve palsies
Dx: AIDS - CMV cranial nerve neuropathy
History: 42 y.o. man with fever and confusion
Dx: HIV encephalitis + Tuberculomas (Ca++)
Creutzfeldt-Jakob Disease

- Caused by a prion – a small non-viral, infectious, protein particle
- Neuronal loss, reactive astrocytosis and formation of cytoplasmic vacuoles
- Rapid cognitive decline, often with psychosis and delirium, leading to death within 1 year
- MRI: symmetrical increased T2 signal in basal ganglia with restricted diffusion
History: Elderly patient with progressive mental decline

Courtesy Ajax George, NYU
new variant CJD
Bovine spongiform Encephalopathy
Mad Cow Disease

Collie, et al. AJNR (2003); 24:1560-1569

The Pulvinar Sign