1. Case of Encephalitis (1)

Case of Encephalitis

70 year old with gradual decline in activities of daily living, grooming urinary incontinence

Hospitalized
Acute renal failure
Rhabdomyolysis

Seizures, Fever

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2. Case of Encephalitis (2)

Case of Encephalitis

BP 82/54  P80  T39  R Ventilator
Obtunded, Non-responsive
No reflexes

CSF  150 WBC  87% polys

↑ L pupil

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3. Common Viral Causes of Encephalitis

<table>
<thead>
<tr>
<th>Epidemic</th>
<th>Arboviruses</th>
<th>WEE</th>
<th>EEE</th>
<th>SLE</th>
<th>California</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Picornaviruses</td>
<td>Polio</td>
<td>Coxsackie</td>
<td>Echo</td>
<td></td>
</tr>
<tr>
<td>Sporadic</td>
<td>Herpes</td>
<td>Herpes Simplex</td>
<td>VZV</td>
<td>CMV</td>
<td>EBV</td>
</tr>
<tr>
<td></td>
<td>Adenoviruses</td>
<td>Postvaccinal</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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4. Herpes Simplex Encephalitis

HERPES SIMPLEX ENCEPHALITIS

- Non-epidemic, sporadic, acute focal encephalitis
- Potentially treatable

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5. HSV Encephalitis (1)

HSV ENCEPHALITIS

- There is no clinical finding which distinguishes HSV encephalitis

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6. Clinical Findings in Encephalitis

CLINICAL FINDINGS IN ENCEPHALITIS

- Symptoms

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Altered Consciousness</td>
<td>97%</td>
</tr>
<tr>
<td>Fever</td>
<td>90%</td>
</tr>
<tr>
<td>Headache</td>
<td>81%</td>
</tr>
<tr>
<td>Personality Change</td>
<td>71%</td>
</tr>
<tr>
<td>Seizures</td>
<td>67%</td>
</tr>
<tr>
<td>Vomiting</td>
<td>46%</td>
</tr>
<tr>
<td>Hemiparesis</td>
<td>33%</td>
</tr>
<tr>
<td>Memory loss</td>
<td>24%</td>
</tr>
</tbody>
</table>

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7. Clinical Findings in HSV Encephalitis

**CLINICAL FINDINGS IN HSV ENCEPHALITIS**

- **Signs**
  - Fever: 91%
  - Personality Change: 85%
  - Dysphasia: 76%
  - Automatic dysfunction: 80%
  - Ataxia: 40%
  - Hemiparesis: 38%
  - Seizures: 38%
  - Cranial Nerve Deficits: 32%

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8. HSV Encephalitis CSF Fluid Abnormalities

**HSV ENCEPHALITIS CSF FLUID ABNORMALITIES**

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
<th>Normal Range</th>
<th>Percent Normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein</td>
<td>80 mg/dl</td>
<td>(7-755)</td>
<td>(18% normal)</td>
</tr>
<tr>
<td>WBC</td>
<td>130 mm</td>
<td>(0-1,100)</td>
<td>(4% normal)</td>
</tr>
<tr>
<td>RBC (&gt;500)</td>
<td>18%</td>
<td></td>
<td>(16% normal)</td>
</tr>
</tbody>
</table>

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9. HSV Encephalitis (2)

****HSV ENCEPHALITIS****

- Neurodiagnostic Exam
  - Focal EEG 83%
  - Focal CT 71%

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10. HSV Encephalitis Diagnosis

****HSV ENCEPHALITIS DIAGNOSIS****

**Neonates**
- CSF culture

**Adults**
- CSF PCR for HSV
- Brain biopsy

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11. Mortality in HSV Encephalitis

**MORTALITY IN HSV ENCEPHALITIS**

- Age
- Level of consciousness
- Duration of disease

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12. HSV Encephalitis Key Points

**HSV Encephalitis Key Points**

- Temporal Lobe Involvement
- Treatable with Acyclovir
- CSF generally with RBC and WBC
- Dx - CSF PCR

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13. Case of Encephalitis

Birds
Horses ← Mosquitos → Man
↑
Eastern Equine Encephalitis
Ticks
Birds ← Mosquitos → Man
Swine
↑
West Nile Virus

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14. Eastern Equine Encephalitis (1)

Eastern Equine Encephalitis

Symptoms and Signs

- Fever 83%
- Headache 75%
- Nausea/Vomiting 61%
- Malaise/Weakness 58%
- Confusion 44%
- Stiff Neck 36%
- Seizures 25%

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15. Eastern Equine Encephalitis (2)

**Eastern Equine Encephalitis**

**CSF Findings**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pleocytosis</td>
<td>97% (370 cells)</td>
</tr>
<tr>
<td>Protein elevated</td>
<td>94% (97 mg/dl)</td>
</tr>
<tr>
<td>RBC</td>
<td>77%</td>
</tr>
</tbody>
</table>

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16. Eastern Equine Encephalitis (3)

**Eastern Equine Encephalitis**

**Prognosis**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality</td>
<td>36%</td>
</tr>
<tr>
<td>Mild Impairment</td>
<td>40%</td>
</tr>
<tr>
<td>Severe Impairment</td>
<td>15%</td>
</tr>
<tr>
<td>Moderate Impairment</td>
<td>8%</td>
</tr>
</tbody>
</table>

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17. West Nile Virus Encephalitis

**West Nile Virus Encephalitis**

- RNA flavivirus (single strand)
- (St. Louis Encephalitis, Japanese Encephalitis, Dengue, Others)
- Vector - Mosquito (culex)
- Vertebrate host
  - Birds

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18. Encephalitis Key Points

**Encephalitis Key Points**

- Diffuse involvement of brain substance
- HSV most common fatal but only treatable form
- Arbovirus regional associations

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Rabies

- Neurotropic lyssavirus
- Animal to human transmission
- Rare cases Iatrogenic Transmission (corneal grafts)

Rabies Pathogenesis

- Glycoprotein attachment to cells
- Peripheral nerve entry (large inoculum)
- Skeletal muscle amplification (small inoculum)
- CNS entry
  Unmyelinated sensory and motor terminals
21. Rabies Pathogenesis (2)

Rabies Pathogenesis

- Spread 8-22 mm per day
- Spinal cord pain
- Paresthesia
- Spread from CNS saliva, salivary glands

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22. Rabies Clinical Manifestations

Rabies Clinical Manifestations

- Irritation or paraesthesia at original legion
- May present as basal encephalitis
  - Fever, altered personality, periodic extreme agitation
- Stimulation face/mouth with air/water -> spasms
- Paralytic Rabies - ascending paralysis

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23. Rabies Diagnosis Histology

Rabies Diagnosis Histology

- Negri bodies
- Rabies genome CSF
- Corneal scrapings, saliva, urine
  Skin Bx (neck)

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24. Rabies Prevention

Rabies Prevention

- Wash wound
- HRIG
- Rabies Vaccine

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25. Post Infectious Syndromes (1)

Post Infectious Syndromes

- Guillain-Barre
- Transverse myelitis
- Neuritis

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26. Post Infectious and Vaccine Associated Encephalitis

Post Infectious and Vaccine Associated Encephalitis

Pathogenesis
- Perivenular mononuclear inflammation
- Edema
- Demyelination

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27. Post Infectious Syndromes (2)

Post Infectious Syndromes

Guillain-Barre

- Ascending paralysis
- CSF elevated protein
- CSF lymphocyte or no cells
- Association
  - Mycoplasma (respiratory)
  - EBV
  - Campylobacter (GI)

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28. Human Prion Diseases

Human Prion Diseases

- Jacob-Creutzfeldt
- Kuru
- Bovine Spongiform Encephalopathy

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29. Pathogenetic Features of Prion Diseases

### Pathogenetic Features of Prion Diseases

<table>
<thead>
<tr>
<th>Disease</th>
<th>Host</th>
<th>Mechanism of Pathogenesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kuru</td>
<td>Fore people in New Guinea</td>
<td>Infection through ritualistic cannibalism</td>
</tr>
<tr>
<td>Creutzfeldt-Jakob disease</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iatrogene</td>
<td>Humans</td>
<td>Infection from prion-contaminated human growth hormone, dura mater grafts, and so forth</td>
</tr>
<tr>
<td>New variant</td>
<td>Humans</td>
<td>Infection from bovine prions?</td>
</tr>
<tr>
<td>Familial</td>
<td>Humans</td>
<td>Germ-line mutations in the PrP gene</td>
</tr>
<tr>
<td>Sporadic</td>
<td>Humans</td>
<td>Somatic mutation or spontaneous conversion of PrP&lt;sup&gt;o&lt;/sup&gt; into PrP&lt;sup&gt;Sc&lt;/sup&gt;?</td>
</tr>
</tbody>
</table>

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30. Prions New Concepts

### Prions New Concepts

- Infectious pathogens devoid of DNA or RNA
- Infectious, genetic or sporadic
- Accumulation of PrP<sup>Sc</sup>
- Variety of conformations

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31. Prions Infectious Proteins

**Prions**

**Infectious Proteins**

- PrP<sup>c</sup> conversion to PrP<sup>Sc</sup> (scrapie) isoform
- Encoded chromosomal gene
- Proteolysis PrP<sup>Sc</sup> to PrP
  which polymerizes into amyloid

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32. New Variant Creutzfeldt-Jacob Disease

**New Variant Creutzfeldt-Jacob Disease**

- Young adults Britain and France
- Mean onset age 26 years
- Duration of illness 14 months
- BSE like proteins

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