Polio virus

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Introduction

• The cause of poliomyelitis
• Polios: gray
• Myelos: marrow or spinal cord
• Global eradication is anticipated in 21st century
History

- Exists from antiquity
- 1890: First described formally by Medin
- 1908: viral etiology
- 1953: Salk vaccine “IPV”
- 1961: Sabin “OPV”
- 1979: eradication in USA
- 1991: eradication in western world
Virology

• The genus *Enterovirus*
• Three serotypes
• Infection causes type specific immunity
• Type 1, most common
• Humans are the only natural host
• CIRCULATING TYPES
  – Wild type
  – Live attenuated OPV
  – Virulent polioviruses derived from OPV (VDPV)
• OPV differ from wild type in 1% genetic composition
• VDPV arise from mutation in OPV after circulation in low immunity population for yrs
Pathogenesis

- Implantation at mucosa
- Replication in gut
- Disseminate to reticuloendothelial tissue
- Could be contained at this stage and immunity is formed (Ab)
- Others: major viremia: constitutional symptoms
- CNS invasion
- Neural spread once in CNS
- MOTOR AND AUTONOMIC NEURONS
- Destruction + inflammation
Polio Morbidity

- asymptomatic 95%
- stiff neck 2%
- paralysis less than 1%
- minor symptoms 2%

Suzanne Humphries, MD
2012
Pathology

- Grey matter of anterior horns
- Motor nuclei of pons and medulla
- Recover virus in early days
- Inflammation persist for months
Clinical features

• IP: 9-12 days until first symptoms and 11-17 days until paralysis

• Types:
  – Asymptomatic 95%
  – Abortive polio: 5%: fever, HA, vomiting
  – Nonparalytic polio: meningeal irritation
  – Paralysis: 0.1%
<table>
<thead>
<tr>
<th>Percent of all infected</th>
<th>Days after exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Minor illness (NONSPECIFIC)</td>
<td>1.2%</td>
</tr>
<tr>
<td>Major illness (CNS INVOLVED)</td>
<td>1.2%</td>
</tr>
<tr>
<td>Frank cases</td>
<td>1.2%</td>
</tr>
<tr>
<td>Abortive</td>
<td>4.8%</td>
</tr>
<tr>
<td>Inapparent</td>
<td>90.95%</td>
</tr>
</tbody>
</table>

Virus present in:
- Blood
- Throat
- Feces
- CNS (Frank cases)

- May persist 12-17 wks

Antibodies present
- Neutralizing
- Comp. fixing

- Persist for life
- Persist 1-5 years (?)

Days after exposure
Paralytic polio

- Severe myalgia
- Localized cutaneous hyperesthesia
- Muscle spasm
- After 1-2 days: paralysis
- Severity: single muscle – quadriplegia
- Flaccid
- Asymmetric
- Proximal ms >> distal ms
- Legs >> arms
- One leg > one arm > both legs + both arms
- 2-3 days to paralysis
- Sensory loss is very rare
Bulbar polio

- Cranial nerves
- 5-30% of paralytic cases
- Dysphagia
- Nasal speech
- Dyspnea
Polio-Encephalitis

- Confusion
- Infants
- Uncommon
- Sz
- Indistinguishable from other encephalitis
Complications

• Respiratory compromise
  – Intercostal ms
  – Diaphragm
• Airway obstruction
  – Bulbar involvement
• Myocarditis: rare
• GI:
  – HRG
  – Paralytic ileus
  – Gastric dilatation
Risk factors

- Paralysis more common in boys
- Pregnant
- Heavy exercise (during major illness)
- IM injection
- Tonsillectomy (to bulbar polio)
D Dx

- E 71
- WNV
- Guillain Barre syndrome
TABLE 53-3  Clinical Aspects of Poliomyelitis, Guillain-Barre Syndrome, and Transverse Myelitis

<table>
<thead>
<tr>
<th>Signs and Symptoms</th>
<th>Poliomyelitis</th>
<th>Guillain-Barre Syndrome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever at onset</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Meningeal irritation</td>
<td>Usually</td>
<td>Usually Not</td>
</tr>
<tr>
<td>Muscle Pain</td>
<td>Severe</td>
<td>Variable</td>
</tr>
<tr>
<td>Paralysis</td>
<td>Usually asymmetric</td>
<td>Symmetric ascending</td>
</tr>
<tr>
<td>Progression of Paralysis</td>
<td>3-4 days</td>
<td>2 weeks</td>
</tr>
<tr>
<td>Residual paralysis</td>
<td>Usually</td>
<td>Usually not</td>
</tr>
<tr>
<td>Paresthesia</td>
<td>Rare</td>
<td>Frequent</td>
</tr>
<tr>
<td>Sensation</td>
<td>Normal</td>
<td>Maybe diminished</td>
</tr>
<tr>
<td>Tendon Reflexes</td>
<td>Diminished or absent</td>
<td>Diminished, may return</td>
</tr>
<tr>
<td></td>
<td></td>
<td>in few days</td>
</tr>
<tr>
<td></td>
<td>WBC high; protein normal to 25%</td>
<td>WBC normal or slight increase; protein very high</td>
</tr>
<tr>
<td>Spinal fluid at onset</td>
<td>Increase</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2-20%</td>
<td>5-10%</td>
</tr>
</tbody>
</table>

(From the World Health Organization: Global Poliomyelitis Eradication by the Year 2000. Manual for Managers of Immunization Programmes. WHO/EPI/Polio/89.1.1989, with permission.)
Dx

- CSF: Aseptic meningitis
- Virus from throat
- Virus from feces
- Serology
Prognosis

- Permenant in 2/3
- Rare full recovery
- Bulbar polio: usual recovery
- Respiratory: rare recovery
- Mortality 5% (old data)
Mx

• No specific treatment
• Bed rest
• Physical therapy once paralysis ceased
• +/- mechanical ventilation
Post polio syndrome

- Some pt who recover
- Fatigue, ms weakness yrs later
- 20-30% of paralytic polio pt
- Not severe disease
Vaccines

• IPV / OPV x 30 yrs at least
• Efficiency: OPV >> IPV
• OPV
  – LOWER COST
  – MORE IMMUNOGENIC
  – EASE ADMINISTRATION
  – HERD IMMUNITY
  – INDUCE GI IMMUNITY
Vaccines

- OPV: causes paralytic polio
  - 1: 2.6 million doses
- Developing countries: OPV
- Developed countries: IPV
Eradication

![Maps showing eradication of polio](image)

Afghanistan, Nigeria, and Pakistan
Arabic region

• 37 cases in Syria
• 2 cases in Iraq