Acute poliomyelitis, infantile paralysis

- **an acute viral disease, usually affecting children and young adults, caused by any of three polioviruses, characterized by inflammation of the motor neurons of the brain stem and spinal cord, and resulting in a motor paralysis, followed by muscular atrophy and often permanent deformities.**

Etiology

- **Poliovirus (PV) belong to the genus Enterovirus, family *Picornaviridae*,**
- **Types I, II and III, all of them cause paralysis.**
- **The type I is the most frequently isolated and is the most often causes epidemics.**

Epidemiology

- **The sources of infection** :
  - patients with clinically manifest poliomyelitis,
  - persons suffering from atypical,
  - abortive and frustes forms

- **The mechanism of infection.** By contagion from one person to another, basically, by the **fecal-oral route;**
- **The virus is found much less often in the nasopharynx of patients, and mainly during the first 3 to 7 days.**

Pathogenesis

- The virus enters through the mouth and nose, multiplies in the throat and intestinal tract, and then is absorbed and spread through the blood and lymph system. The time from being infected with the virus to developing symptoms of disease (incubation) ranges from 5 - 35 days (average 7 - 14 days).

INCUBATION PERIOD

- The incubation period is approximately 7-14 days for paralytic cases, although periods have been reported 3-35 days.
- The virus can be transmitted during the duration of its excretion. The poliovirus is demonstrated in the pharyngeal secretions from 36 h after exposure to infection up to a week and feces 72 h after exposure to a maximum of 3-6 weeks, both in symptomatic cases and in the asymptomatic.

❑ Non paralytic Clinical forms of poliomyelitis

- Asymptomatic forms – 90-95% cases
- Abortive poliomyelitis (minor disease) – 4-8%
- Polio meningitis (aseptic meningitis)

❑ Paralytic Clinical forms of poliomyelitis

- spinal paralytic poliomyelitis,
- bulbar paralytic poliomyelitis,
- polioencephalitis,
- mixed forms (spino-bulbar, spino-encephalitic, bulbo-encephalitic)

Clinical stages

(incubation period - 5-35 days)

1) Minor illness (2-3 days)
2) Latency period (3-5 days)
3) Mayor illness
   - ✓ Preparalytic phase (1-2 days)
   - ✓ Paralytic phase
4) Recovery stages
5) Stage of sequelae
6) Post poliomyelitis syndrome (20-40 years after initial episode of poliomyelitis

The paresis and paralysis in poliomyelitis are characterized by:

- signs of damage of the peripheral motoneuron.
- paralysis is usually asymmetrical, and predominantly affects the proximal parts of the extremities.
- the paralysis is flaccid,
- little or no active movement (partial or complete degeneration reaction)
- the affected limbs are usually cold and cyanotic.
- absence of tendon reflexes.
- loss of muscle tone,
- muscular atrophy
- atrophy of definite muscular groups, and contractures and deformities of the limbs and trunk.
- **Sensory deficits are not characteristic !!!**

Preparalytic stage

- The disease starts acutely with a marked rise of temperature.
- **Catarrh of the upper respiratory tract** (nasopharyngitis, coryza, angina, bronchitis) is present from the first days of the disease.
- **Gastrointestinal disturbances** (diarrhea, constipation)

General symptoms

- General symptoms of irritation and functional derangement predominate **on the side of the nervous system** (headache, vomiting, dimmed consciousness, adynamia, lassitude, drowsiness or insomnia, sometimes delirium, tremor, muscular jerking, and convulsions). Convulsions are particularly frequent in nursing babies.
- Symptoms pointing to **irritation of the nerve roots and meninges** are seen with great constancy. Flexion of the head and back, and pressure on the spine are painful, there is pain in the limbs and general hyperesthesia. Rigidity of the occipital muscles and Kernig's, Lesage's, and Bnidzinsky's signs are often found.

- The characteristic painfulness of the spine is demonstrable by the “spinal symptom”: a sitting patient is unable to touch his knees with his lips because of strong pain experienced in the back. To reduce the weight-load on the spine and to render it immobile a sitting child tries to shift his weight and supports himself by the arms (the “tripod” symptoms). The mind remains clear. General and local hyperhidrosis is a particularly frequent manifestation of vegetative derangement.

- The preparalytic stage usually lasts from **2 to 5 days.**

- In some cases the course of this stage is biphasic with a double peak in the temperature curve. Fever, catarrhal phenomena, or intestinal disturbances are not lasting for several days; brief apyrexia follows, and then a second elevation of temperature accompanied with general cerebral and meningeal phenomena

Cerebrospinal fluid

- the fluid is under considerable pressure and is transparent;
- protein content is normal or slightly elevated;
- cell count is increased due to lymphocytosis, and the number of cells be as high as **100-200•10^{6}/l** (100-200 per mm^{3}) or even greater.
- Sugar content is normal or slightly elevated.

Paralytic stage

- The temperature falls at the end of the initial stage and **paresis** and **paralysis** occur. Paralysis may develop at the height o the fever, usually suddenly; a child, who had no distinct disturbances o motor function in the evening, may wake up paralyzed in the morning ("morning paralysis"). The suddenness, however, is only apparent. Careful examination will have revealed hypotonia, muscular weakness, and loss o reflexes several days previously. In the majority of cases paralysis sets in till the fifth day, but may develop much later, on the eighth-tenth day.
- The paralytic stage may last several days or **1 or 2 weeks**, but seldom longer.

- Various groups of muscles in the most diverse combinations become involved. The lower limbs are most often affected (58 to 82 % of cases); the deltoid muscles come second in order of frequency of implication.
- Muscles of the trunk and neck, and abdominal and respiratory muscles are less commonly affected.
- Spinal paralysis may be combinated.
- With lesions of the cranial nerves nuclei (n.faciclis is affected in 10 to 12 % of cases). Lesions of the abducent, oculomotor, and accessory nerves are less common. The nuclei of vagus, glossopharyngeal and sublingual nerves are also seldom affected, but lesions of these nerves are accompanied with ominous symptoms of disturbance of swallowing and respiration.
- Paralysis is **usually asymmetrical**, and predominantly affects the **proximal parts** of the extremities.

Stage of restitution

- Restoration of movement in individual groups of muscles usually begins several days after the development of paralysis. The headache and hyperhidrosis abate at the beginning of this stage, and the pain in the spine and limbs also subsides in the majority of cases.
- Functional restoration in the paralysed muscles is very rapid at first because some cells were only temporarily affected (as a result of inflammatory edema, vascular changes in the brain matter, or mild reversible lesions in the nerve cells proper). Tendon reflexes reappear or become intensified with the restoration of active movement. But after two months the rate of improvement becomes slower. The stage of restitution may continue for 1, 2 or 3 years. Muscles whose function is not recovered become atrophied. Paralytic contractures (chiefly flexion) may develop as a result of uneven affliction and restoration of various muscular groups.

Stage of residual phenomena

- The **stage of residual phenomena** is characterized by stable flaccid paralysis, atrophy of definite muscular groups, and contractures and deformities of the limbs and trunk.

Diagnosis

- **Lumbar puncture**
- **Viral culture (stool, throat, and CSF)**
- **PCR of blood or CSF**
- **Serologic testing for poliovirus serotypes, enteroviruses**

Differentiation of poliomyelitis

- poliomyelitis-like diseases caused by Coxsackie and ECHO viruses
- Meningeal poliomyelitis can easily be confused with various forms of meningitis, and primarily with serous forms of various etiology
- lesions of n. facialis
- various diseases and injuries to the bones and joints, polyradiculoneuritis, polyneuritis

Prognosis

- In nonparalytic forms, recovery is complete.
- In paralytic forms, about two thirds of patients have residual permanent weakness. Bulbar paralysis is more likely to resolve than peripheral paralysis.
- Mortality is 4 to 6% but increases to 10 to 20% in adults and in patients with bulbar disease.

Treatment

- In the acute period of the disease (the preparalytic and paralytic stages) a regimen based on the principle of protective inhibition should be maintained.
- Strict physical and mental rest in bed should be enjoined for 2 or 3 weeks.
- Thermal procedures (hot wet packs, light baths, paraffin and ozokerite therapy, and transthermia from the 5 or 7 day).
- Mild hypnotics and bromides are given to prolong physiological sleep.
- gamma-globulin may only be relied upon apparently when it is given during the preparalytic stage.

- Antibiotics indicated to combat complications resulting from secondary infection.
- **Vitamins:** ascorbic acid, vitamin B_1; vitamin B_{12}.
- **Spinal puncture** is indicated in the presence of marked meningeal phenomena: reduce the pressure of cerebrospinal fluid.
- Treatment of **edema of the brain** and of its meninges and **respiratory disorders**.

- The following thermal procedures are also widely employed during the **stage of restitution***:* warm and hot baths, hot packs, paraffin and ozokerite therapy, and transthermia.
- Stimulants of interneural and myoneural conduction
- Glutamic acid and other aminoacids (improves metabolic processes) processes in the nerve tissue, facilitates conduction of nerve impulses, and influences die contractility of muscle fibers (10-15 days).

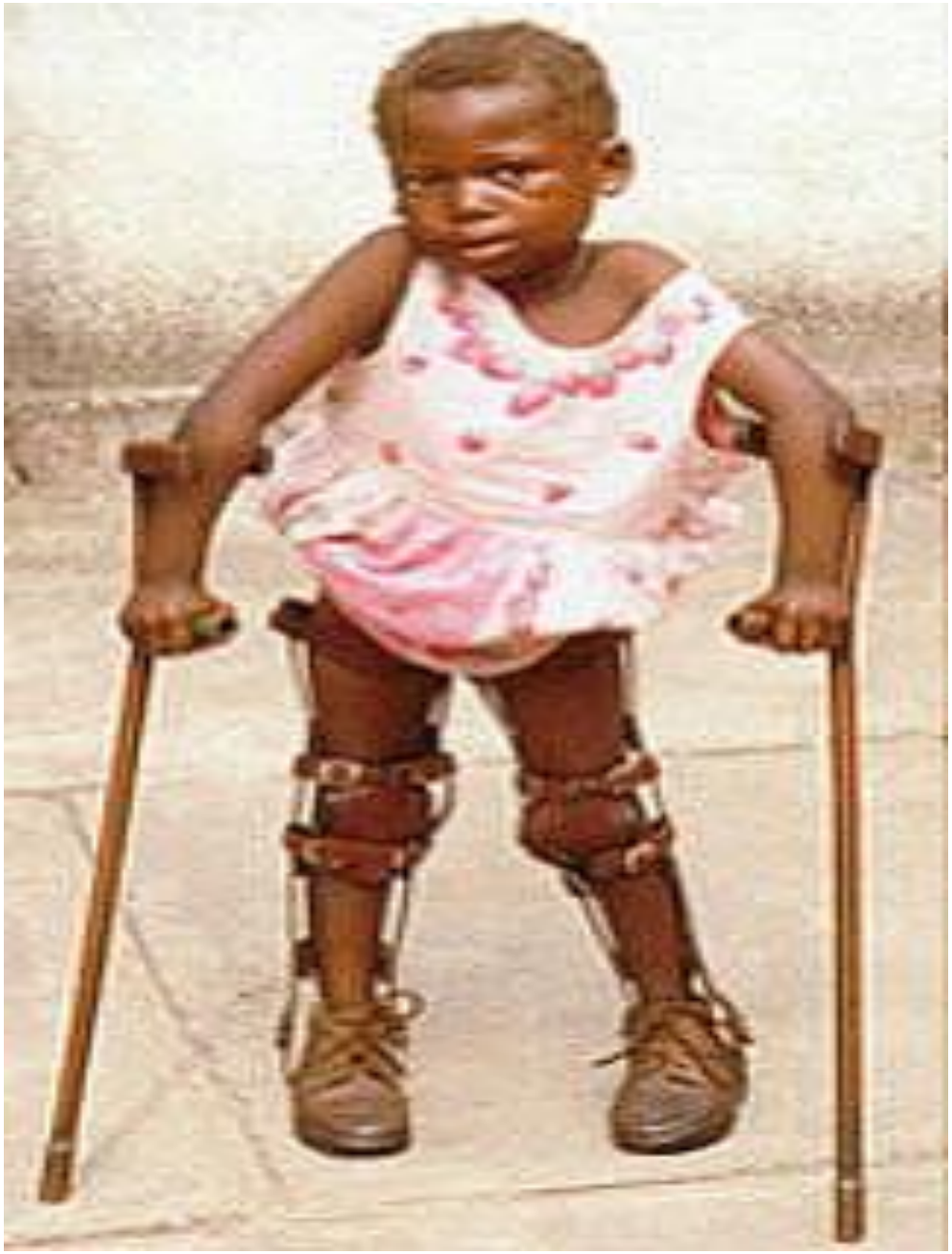
The stage of restitution.

- Massage and kinesitherapy.
- They are begun as early as possible (immediately after the abatement of pain),
- Continued systematically and persistently for a period of 2 to 3 years. To prevent deformities and contractures the limbs should be appropriately positioned and secured by sandbags, splints and other devices.

- **Post-polio syndrome** is a complication that develops in some patients, usually 30 or more years after their initial infection. Weakness may get worse in muscles that were previously weakened. Weakness may also develop in muscles that previously were thought not to be affected.

The so-called vaccine-associated poliomyelitis

- The so-called vaccine-associated poliomyelitis (affection of the anterior horns of the spinal cord with flaccid paresis, mostly monoparesis, with a favorable course) occurs extraordinarily rare (1:1-4 million of vaccinated persons or those who had contacts with the vaccinated). The complication occurs more frequently in persons having immunodeficiency.



Prophylaxis

- In cases with clear signs of poliomyelitis immediate hospitalization in special departments is obligatory.
- After the patient is isolated (for 21 days from the onset of die disease) final disinfection is performed in his dwelling.
- Contacts are observed for 20 days after isolation of the patient, but are not quarantined.
- APDP-vaccination