

Adenoviral Infection

Adenoviruses are acute respiratory infections caused by adenoviruses and clinically manifested by fever, intoxication, various clinical signs of respiratory and extrarespiratory (conjunctivitis, lymphadenopathy, diarrhea, etc.).

ETIOLOGIES.

- ✓ 47 adenovirus serotypes are known. Of these, only some are more frequently involved in human pathology, namely: serotypes 1-8 and 14-21, 34-35 and 40-41.
- ✓ The virion contains DNA, has dimensions of 70-90 nm and is uncoated.
- ✓ It has 3 antigens: group-specific antigen A, common to all types that cause adenovirus in humans;
- ✓ B antigen with toxic features;
- ✓ C specific antigen.
- ✓ Types 1-5 and 7 cause frequent disorders of adenoid tissue in children with mild forms and prolonged persistence of the virus in the tonsils and adenoid tissue (latent infection).
- ✓ Type 3 causes epidemics of pharyngoconjunctival fever, and type 8 causes epidemics of keratoconjunctivitis, which can also be caused by types 2, 19, etc.. In recent years, types 40 and 41 have been isolated in acute diarrhea in children, being called enteric adenoviruses.

Epidemiology

- **The source of infection** is a sick person or a carrier of the virus.
- Infection is spread through the **aerial-droplet route**, and also by **fecal – oral route**.
- There is evidence that the infection can be transmitted **by inoculation into the conjunctiva**.
- Excretion may continue for **2-3 weeks** and even longer.
- Immunity after infection is serotype – specific, and incomplete.

- Adenoviruses cause infection especially in childhood, infancy and among the military recruits.
- Children from six months to three years of age are particularly **susceptible** to these infections.
- Children under six months are still protected by passive immunity obtained from their mothers.

Pathogenesis

Adenoviruses can cause:

- ✓ ***Lytic infection*** in human epithelial cells that conducts to virus multiplication at high level and cell death.
- ✓ ***Latent, chronic infection*** in lymphoid cells with a low level of virus multiplication and cell death, that can be overcome by cell multiplication.
- ✓ ***Oncogenic transformation*** with the viral DNA integrated in the structure of the cellular DNA. In this case viral DNA replicates together with the cellular DNA, with no new virion production.

Pathogenesis

- Adenoviruses **infest the respiratory and intestinal mucosa**, in the epithelial cells and regional lymph nodes.
- **Catarrhal inflammation of the nasal, pharyngeal, and tonsillar mucosa.**
- The trachea and bronchi are involved in the process. Intranuclear inclusions containing DNA are found in the affected epithelium cells.
- The cells themselves are often necrotized and enucleated. Focal and confluent, polysegmental pneumonias are frequent.
- **The regional lymph nodes are affected by hyperplasia.**
- Inflammation of the eye conjunctiva, often with formation of fibrinous coats, is characteristic.

Clinical manifestations

Adenoviruses can cause several types of clinical manifestations such as:

- ✓ **Pharyngitis** (with fever, tonsillar exudate, enlarged cervical lymph nodes)
- ✓ **Acute upper respiratory tract infection** (rhinitis)
- ✓ **Pharyngoconjunctival fever** (fever, sore throat, rhinitis, bilateral conjunctivitis, adenopathy +/- diarrhea, otitis) which occurs in outbreaks during the summer, related to swimming pool usage
- ✓ **Acute laryngotracheitis**
- ✓ **Acute bronchiolitis** (severe, might be fatal)

- ✓ **Whooping cough syndrome** (no evidence of the *Bordetella pertussis*, pertussis – like cough, leukocytosis with lymphocytosis)
- ✓ **Epidemic keratoconjunctivitis**
- ✓ **Hemorrhagic cystitis**
- ✓ **Infantile diarrhea**
- ✓ **Intussusception in infants**
- ✓ **Encephalitis, meningoencephalitis**
- ✓ **Fatal disseminated infections in immunosuppressed patients and neonates.**

Conjunctivitis may appear from the first day, but more often from the second or third. .

- Catarrhal, follicular, and membranous conjunctivitis are distinguished according to the character of the inflammation.
- The conjunctiva and the eyelids look hyperemic, granular, and rather swollen. There is a sparse seromucous and seropurulent discharge.
- Edema of the eyelids is a frequent symptom.
- Sometimes there is enlargement of the liver and spleen.

Adenoviral catarrh of the respiratory tract is a frequent form of this infection, and the mildest. There is fever (for three to six days on average and longer).

- Development of an asthmatic syndrome or laryngitis is possible.
- Frequent symptoms are pharyngitis and swelling of the cervical lymph nodes.
- Occasionally there is vomiting at the onset, and frequent liquid stools for several days.

Pneumonia is the most severe form of adenoviral infection occurring mostly in infants. Pneumonia is of viral etiology with subsequent superinfection of bacterial flora.

The intestinal form of adenoviral infection occurs mostly in infants.

- Prevalent symptoms of acute gastrointestinal disorders, liquid dyspeptic stools, sometimes containing mucus, some patients develop vomiting.
- The body temperature is moderately elevated;
- Catarrh of the respiratory ducts is a constant symptom.
- The gastrointestinal disorders are present for 3-4 days.

Mesadenitis (inflammation of mesenteric lymph nodes) is a rare manifestation of adenoviral infection which develops either against the background of another syndrome.

- Acute onset with abdominal pain, fever, nausea, and infrequent vomiting.
- The tongue is coated, stools are retained.
- The pain is felt predominantly in the lower part of the abdomen, often in the right iliac region.
- Peritoneal irritation is either absent or non manifest.

- **An abortive form** of adenoviral infection appears as a rudimentary syndrome of pharyngoconjunctival fever or catarrh of the respiratory tract. Fever may be absent.
- **Complications** (otitis, sinusitis, bacterial pneumonia, pleurisy) are caused by secondary bacterial infection. They are the most common in infants with a severe course of the disease.

Adenoviruses in newborns and infants

- Are often accompanied by diarrhea.
- The body temperature is usually low-grade, there are no signs of intoxication.
- Nasal obstruction occurs, the baby becomes restless, refuses the breast, sleeps poorly.
- Conjunctivitis and lymphadenitis are exceptional.
- Obstructive bronchitis, pneumonia are the most common bacterial complications.
- In premature babies, the disease develops without fever. Fatal cases are reported.

- **THE EVOLUTION OF ADENOVIROSES CAN BE LONG.** The temperature normalizes in 5-7 days, but can be maintained longer. Catarrhal symptoms disappear in 2-4 weeks.
- In immunocompromised children, the disease occurs systematically with damage to many organs and systems.
- **COMPLICATIONS.** The most common complications are caused by bacterial superinfections: otitis, sinusitis, purulent conjunctivitis, tonsillitis, purulent bronchitis, possible pneumonia, and serous meningitis.
- Adenoviral pneumonia occurs with severe respiratory failure, the formation of hyaline membranes, is complicated by pleurisy, pulmonary fibrosis, bronchiectasis, bronchiolitis obliterans.
- **PROGNOSIS.** In fact, it is favorable, except for pneumonia in young children, which can sometimes be fatal.

Diagnosis can be suspected based on epidemiological and clinical data.

Laboratory diagnosis:

- cytopathic changes in tissue culture, identification of the virus with immunofluorescence
- detection of viral antigen from nasopharyngeal, conjunctival secretions, urine, stool (ELIZA, immunofluorescence).
- detection of viral DNA (PCR)
- detection of serum antibody rises

DIFFERENTIAL DIAGNOSIS.

- It is related to respiratory viruses:
- influenza,
- parainfluenza,
- rhinoviral infection,
- enteroviral infection,
- infectious mononucleosis.
- herpes infection,
- allergic conjunctivitis,
- kerato-conjunctivitis of other etiology,
- Haemophilus influenzae infection,
- measles,
- mycoplasmosis,
- acute diarrheal disease of bacterial etiology, etc.

Treatment

There is no etiologic therapy, only symptomatic and pathogenic treatment can be used.

THE TREATMENT is performed at home (mild and medium uncomplicated clinical forms).

Drug treatment includes: antihistamines, vitamins. Nasal and eye hygiene, topical antiviral solution are recommended: human leukocyte interferon, 3-4 drops 3 times a day in the nose and eyes for 2-3 days.

Antibiotics are indicated only in bacterial complications - pneumonia, sinusitis, angina, etc.

. Young children with severe forms and complications are hospitalized.

PROPHYLAXIS.

Specific prophylaxis is not developed.

- People with adenoviruses need to be isolated because they are highly contagious, with an average duration of contagion of 10 days.
- The contact persons are kept under observation for 10 days.