Aspergillus infections

Aspergillus infections are caused by members of the genus Aspergillus. Aspergils are cosmopolitan fungi that are among the major causes of nosocomial infections. Infections occur mainly in immunocompromised patients and can be fatal.

🔎 *For more information see Aspergillus.*

Aspergillosis

The term aspergillosis includes a group of diseases that result from infection by one of the members of the genus Aspergillus.

There are four basic types of aspergillosis:

- Invasive aspergillosis (IPA), which occurs primarily in patients with severe immunodeficiency.
- Allergic bronchopulmonary aspergillosis (ABPA), common in patients with atopy, asthma or cystic fibrosis.
- Chronic necrotizing pulmonary aspergillosis, described in patients with chronic lung disease and mild immunodeficiency.
- Aspergillus, which can be found to a greater extent in patients with pre-existing cavities in the lungs.

Invasive aspergillosis

It is an infectious disease with high morbidity and mortality in immunocompromised patients caused by fungi of the genus Aspergillus, most often A. fumigatus.

Epidemiology

Aspergils are ubiquitous, occurring in air, soil, dust, building materials, some foods, and water. The main route of entry for aspergillus is the respiratory tract. After inhalation, conidiospores mature in the lungs and can also penetrate other tissues through blood vessels if they are not controlled by the body's defense mechanisms.

However, most people are naturally immune to the development of the disease because alveolar macrophages have the ability to absorb and destroy conidia. However, in patients treated with corticosteroids and in immunodeficient patients (patients with leukemia, AIDS, COPD, patients after chemotherapy or transplantation, etc.), their ability is reduced.

Risk factors

The main risk factors for the development of IPA are neutropenia, solid organ transplantation (especially lung), hematopoietic stem cell transplantation (HSCT), chronic obstructive pulmonary disease (COPD), systemic corticosteroid therapy and haematological malignancies.

Other risk factors such as hepatic and renal failure, HIV, diabetes mellitus, malnutrition, autoimmune diseases or extensive burns have also been described.

In most cases, aspergils are trapped in the lower respiratory tract by inhalation of infectious spores. Less often, IPA can start from other sites, such as the paranasal sinuses, gastrointestinal tract, and skin. The infection can spread through the bloodstream to other organs such as the brain, kidneys, liver, heart, pleura, etc.

Symptoms

Symptoms are non-specific and resemble bronchopneumonia: fever, cough, sputum formation, dyspnoea, chest pain of pleural origin due to vascular invasion leading to thrombosis and small pulmonary infarction, haemoptysis.

Diagnostics

The gold standard in the diagnosis of IPA is histopathological examination - samples of lung tissue obtained by thoracoscopy or open lung biopsy for the presence of septated, branched hyphae and positive culture. Other possibilities are examination of sputum, BAL fluid, CT examination of the chest (presence of nodules and halo sign - zone of weakness around lung nodules caused by hemorrhage and typical for neutropenic patients), ELISA test for detection of aspergillus antigens in body fluids (galactomannan - polysaccharide released from aspergils after growth time) and PCR.

Treatment

Due to the possible progression of the disease, it is recommended to start treatment when IPA is suspected, before the diagnosis is confirmed by laboratory tests. Commonly used drugs are liposomal amphotericin B, voriconazole and echinocandin derivatives such as caspofungin or micafungin.

Allergic bronchopulmonary aspergillosis

It is a disease that develops with hypersensitivity to aspergillus antigens, mainly A. fumigatus. Most cases occur in people with asthma and cystic fibrosis. The incidence is also higher in people with atopy.

The clinical picture

In ABPA, the lungs show reversible obstructive changes, which, however, may progress to irreversible changes in more advanced stages. Restrictive lung disease develops with reduced diffusion capacity due to mucus and hyphae compression of the airways and central bronchiectasis (CB).

ABPA is divided into five stages:

- acute - initial phase characterized by asthma, elevated IgE levels, eosinophilia, pulmonary infiltrates and IgG and IgE antibodies against A. fumigatus,
- remission phase - symptoms weakened (reduced),
- exacerbation - recurrence of initial symptoms, IgE level doubles,
- fibrotic phase - development of fibrosis in the upper lobes of the lungs.

Symptoms

Patients experience episodic wheezing, sputum coughing with brown coatings, chest pain of pleural origin, and fever.

Diagnostics

Diagnostic criteria for ABPA are asthma, immediate skin reaction to Aspergillus, presence of IgG and IgE against A. fumigatus in the blood, IgE level higher than 1000 IU / ml, incidence of pulmonary infiltrates on CT of the chest, eosinophilia (1000 cells / µl).

Treatment

Most cases require treatment with systemic corticosteroids. Corticosteroids (suppression of hypersensitivity and inflammatory response). The drug of choice is mainly prednisone. In some cases, itraconazole is also used.

Chronic necrotizing pulmonary aspergillosis

Chronic necrotizing aspergillosis (chronic necrotizing pulmonary aspergillosis, CNPA, semi-invasive or subacute invasive apergillosis) is an infectious process of the lung parenchyma that develops in response to local invasion, usually by A. fumigatus.

The clinical picture

It is a rare syndrome and, unlike IPA, CNPA develops slowly, several weeks to months, and vascular invasion or dissemination to other organs usually does not occur. It can be difficult to distinguish from aspergillosis. However, CNPA is a local invasion of lung tissue, and a cavity filled with Aspergilus fungi may form secondarily as a result of fungal damage to the parenchyma. CNPA is characterized by necrosis of lung tissue, acute or chronic inflammation of the cavity wall, and the presence of hyphae.

Risk factors It mainly affects elderly people with chronic lung diseases such as COPD, pulmonary TB, pneumoconiosis, cystic fibrosis, sarcoidosis, pulmonary infarction.

Symtomatics Patients often complain of fever, malaise, fatigue, weight loss, chronic productive cough, and hemoptysis. However, the course of CNPA can also be asymptomatic.

Diagnostics A CT scan of the chest is used to diagnose CNPA, on which thickening of the pleura is visible, which can lead to the formation of a broncho-pleural fistula and a cavity lesion in the upper lung lobes. Serum IgG antibodies to A. fumigatus are also found in most patients. Histopathological examination and culture are again necessary to confirm the diagnosis.

Treatment For the treatment of mild to moderate forms of CNPA, voriconazole is most commonly used. National Medicines Agency: voriconazole or itraconazole.

Aspergilloma

It is a present form of aspergillosis. It is formed by a conglomerate of hyphae, mucus, fibrin and inflammatory cells in the pre-existing cavity in the lungs.

The clinical picture The conglomerate can move within the cavity, but usually does not penetrate the surrounding parenchyma or blood vessels. The lesions usually remain stable, sometimes they may shrink or disappear spontaneously, rarely they may enlarge. In some cases, they can cause heavy bleeding by damaging the bronchial vessels or the vessels surrounding the cavities. Predisposing factors for the development of aspergillosis may be previously established pathological cavities, such as conditions after tuberculosis, sarcoidosis, bronchiectasis, bronchial cysts, ankylosing spondylitis or lung infections. [1]

Symptomatics Most patients develop hemoptysis, which can be mild but also life-threatening. Other symptoms include cough, dyspnoea and fever.

Diagnostics The diagnosis is based on an X-ray or CT of the chest, which shows the site of the lesion on the lungs. Sputum culture is positive in only 50% of cases, whereas IgG antibodies against A. fumigatus are present in most cases.

Therapy Treatment is only started when the patient is symptomatic, especially after the development of haemoptysis. The drug of choice is itraconazole. State Office for Drug Control: itraconazole. Surgical resection of aspergillosis is commonly indicated for recurrent hemoptysis. Bronchial artery embolization is recommended in patients with life-threatening hemoptysis. [2]

Links

Related Articles

- Invasive fungal infections

External links

- Aspergillus, The Aspergillus Website (https://www.aspergillus.org.uk/)
- Aspergillus, MicrobeWiki (https://microbewiki.kenyon.edu/index.php/Aspergillus,)
- Aspergillus Genome Database (http://www.aspgd.org/)
- Aspergillosis, The Aspergillus Website (https://www.aspergillus.org.uk/aspergillosisframeset.html)
- Aspergillosis, MedlinePlus (https://medlineplus.gov/ency/article/001326.htm)
- Aspergillosis, Medscape (https://emedicine.medscape.com/article/296052-overview)
- Aspergillosis, NHS Choices (https://www.nhs.uk/conditions/aspergillosis/)
- What is aspergillosis, National Aspergillosis Center (http://www.nationalaspergillosiscentre.org.uk/)

Reference

Used literature

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- KOUSHA, M – TADI, R – SOUBANI, A.O. Pulmonary aspergillosis: a clinical review. *European Respiratory review* [online]. 2011, vol. 20, no. 121, p. 156-162, Available from <www.ersjournals.com>. ISSN 1600-0617. DOI: 10.1183 / 09059180.00001011 (http://dx.doi.org/10.1183+%2F+09059180.00001011).
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