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Research Progress on Pathogenesis and Drug Therapy of Atopic Dermatitis in Children

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Abstract:

Children with atopic dermatitis (AD) are a chronic inflammatory skin disease with obvious itching symptoms and high recurrence rate in clinical practice. Under the clinical research of atopic dermatitis in children, the clinical treatment plan has increased significantly. This article reviews the research progress of drug treatment of atopic dermatitis in children.

Keywords:

Children atopic dermatitis
Pathogenesis
Medication
Research progress

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1. Introduction

Atopic dermatitis (AD) is a chronic inflammatory skin disease with a high clinical incidence, which has severe itching symptoms and a high recurrence rate. The clinical treatment options are diluted bleaching bath, corticosteroids, and antibiotics to carry out systematic or local treatment. In the study report, it was pointed out that the prevalence of the disease showed an increasing trend year by year. At present, the clinical understanding of AD is relatively shallow, and the understanding of the pathogenesis of the disease is proposed under the research of clinical medicine, epidemiology, molecular biology and genetics. This article reviews the pathogenesis and treatment of atopic dermatitis.

2. Pathogenesis of AD in children

2.1. Autoimmune diseases

In the study, 24 autoimmune diseases in children were investigated, and 13 diseases were associated with AD in children [1]. Children with atopic dermatitis have a higher incidence of autoimmune diseases in the musculoskeletal system, blood system, gastrointestinal system, endocrine system and skin tissue. At the same time, there is a strong correlation between AD and atopic diseases, and the relationship between AD and autoimmune diseases needs further analysis, mainly because the prevalence of autoimmune diseases is significantly lower than that of AD and asthma [2]. The disease is mostly related to the skin tissue factors of children, and it is necessary to pay attention to the screening of children with autoimmune diseases during treatment.

2.2. Skin microecology

There is a certain relationship between atopic dermatitis in children and abnormal skin microflora [3]. Symbiotic bacteria exist in the skin, with the assistance of IL-1, improve the cellular capacity of Th1 and inhibit the function of Th2 cells, thus inhibiting Th2-related allergic diseases and regulating the developmental system of children. During the onset of the disease, the amount of Staphylococcus aureus on the surface of the skin tissue of the child varies, and the level varies as the disease progresses [4].

2.3. Skin infection

Patients with atopic dermatitis are at risk of skin infection, and the specific influencing factors include immunosuppressive agents, increased infection, bacterial values, decreased antimicrobial peptides, immune disorders, and skin barrier dysfunction. At the same time, the use of systemic immunosuppressive drugs during treatment for disease can lead to an increased risk of infection [5]. Other studies have shown that patients with atopic dermatitis are closely related to skin infections at other locations, urinary tract infections, pharyngitis, and infections, and can also change under the influence of diseases such as bone and joint infections, meningitis, endocarditis, and septicemia [6].

2.4. Environmental and genetic factors

Genetic studies have shown that there is a certain relationship between disease persistence and skin barrier changes in atopic dermatitis [7]. In particular, FLG mutation in serogan protein coding can lead to the onset of AD disease, which is a genetic factor with a high risk of occurrence. Family inheritance is one of the major disease-causing mechanisms that cannot be changed during a child's illness [8]. Since the 20th century, the incidence of atopic dermatitis has increased significantly worldwide, affecting up to one in five children worldwide, especially as environmental changes have also led to an increase in the disease. Other studies have shown that in the daily environment, precipitation, ultraviolet exposure, humidity, temperature and other factors also have a certain impact on the disease, increasing the prevalence of AD [9]. Through the analysis of the severity of the disease and the degree of air pollution, it can be seen that the more serious the environmental pollution, the more serious the condition of the patients. It can be seen that there are adverse effects on children's skin health under the change of the earth's climate.

2.5. Allergic contact dermatitis

This disease refers to the delayed allergic skin reaction in children to allergens in the surrounding environment. The incidence of this disease is similar to that of the adult population, and it is rarely detected in pediatric diagnosis, even less than one-tenth of all patch tests. Most children with allergic contact dermatitis are missed. In daily life, emollients, preservatives, topical drugs, perfumes, metals, etc., can affect the onset of disease. In the study report, allergic contact dermatitis and AD disease can occur simultaneously, which makes the diagnosis of atopic dermatitis more difficult. The acute phase of the disease includes erythema plaques, eczematous papules, pruritus, etc. Chronic phase may present pigmentation, skin cracks or lichenization [10].

2.6. Food impact

Food allergy is a target factor for accurate treatment of all allergic diseases. Under the influence of food pathophysiological characteristics, the allergy of biomarkers can be defined to ensure clinical effects and diagnostic results. According to the research report [11], foods such as shrimp, hazelnuts, peanuts, eggs and milk have high specificity in allergy diagnosis. During the diagnosis of AD disease, it is known that the defective skin barrier is more allergic after contact with food, which is also related to the genetic action of skin tissue and immunoglobulin-mediated food. At present, during the treatment of children with AD disease, it is necessary to understand the treatment and prevention measures of food allergy, and give certain early diagnosis and evaluation and treatment of psychological disorders [12].

The skin barrier function can inhibit the entry of sunlight, microorganisms, antigens, etc., and has the inherent function of shrinking and preventing water loss. The skin barrier function can maintain the normal operation of the human body, regulate the absorption of foreign substances through the skin, and regulate the evaporation of skin water. Abnormal lipid composition and sebum moisture in human skin will damage skin

barrier function, lead to abnormal PH value of skin tissue, and affect the integrity of the stratum corneum. Studies have shown that childhood AD is one of the inflammatory diseases with obvious skin barrier function impairment.

3. Drug treatment research

3.1. TCM treatment

Chinese medicine is selected for the local treatment of AD disease in children, and the prescription includes the mixed treatment of chestnut, platycypress, leshu, wild rose and dogwood in a ratio of 1:1:1:1:4 [13]. The drug can inhibit NO and IL-4 in children and reduce the release of mast cell degranulation markers. At the same time, enhancing drug concentration can reduce the release of DPPH free radicals. Studies have reported that providing Ziyun cream treatment for children is ideal for the control of inflammatory response, and can also improve the state of local skin damage, and the actual effect is similar to tacrolimus. At the same time, it can be seen from biological activity studies that traditional Chinese medicine has obvious effects of inhibiting angiogenesis, anti-oxidation, anti-allergy and anti-inflammatory. After medication, children with AD can improve skin barrier function in time, inhibit discomfort symptoms, and have high safety.

3.2. Crenoral

Creborol is a PDE4 inhibitor, which can reduce the level of cyclic adenosine phosphate and reduce the inflammatory response in children with AD. According to the study report, through the overall static test of children, it can be seen that the use of clariborol in the treatment of AD children is ideal. In addition, the use of the drug in the US Food and Drug Administration has been extended to infants aged 3 months and older, with gradual approval in China in 2020.

3.3. Depruliumab

The drug is a common monoclonal antibody biologic in clinical practice and has inhibitory effects on IL-3 and IL-4, the signal transduction. In the report, it was shown that the efficacy of dupriuzumab in the treatment of children with AD aged 6-11 years was ideal. The adverse reactions after treatment only appeared at the injection site, including eosinophil increase, conjunctivitis, etc. Most of them were mild and could be resolved by themselves.

3.4. Tapinaro

The drug is a therapeutic aromatic pidgin receptor modulator, which can raise the expression of skin barrier genes and adjust the expression of Th2 cytokines after administration to avoid inflammatory oxidative damage in children. Some studies have proposed that medication in children with AD can improve their discomfort symptoms in time, with ideal improvement efficiency and fewer adverse reactions [14].

3.5. Targeted therapy

Childhood AD involves multiple immune modes in clinical practice, the main mechanism of which is type 2 natural lymphocytes, TH2 cells and related factors driving immune response. Therefore, the targeted therapy of type 2 pathway should be emphasized during clinical treatment. At present, there have been a variety of targeted therapies for children with AD disease in clinical practice.

3.6. Wet wrap treatment and emollients

Studies in China have shown that the use of emollients can be used as adjuvant therapy for children with moderate and severe AD, thereby avoiding excessive use of glucocorticoid drugs and helping children repair skin barrier function. At the same time, with the progress of medical research, it is clinically proposed to take wet wrap treatment for severe refractory children, and select gauze wrap treatment based on local drug use and skin moisturization, which can significantly improve the discomfort symptoms of patients and restore the skin barrier function of patients.

3.7. Oral JAK inhibitors

A variety of cytokines participate in the inflammatory process of AD disease, indicating that JAK inhibitors have a better oral effect. The drug can inhibit the proliferation of some growth factors and cytokines. In the study report, it was pointed out that the disease improvement rate of AD children after medication is as high as more than 90%. At the same time, the drug has good tolerance, no obvious adverse reactions in children, and the drug safety is high.

3.8. Remote diagnosis and treatment of diseases

At present, telemedicine plays an important role in the treatment of AD disease. With the help of telemedicine, the diagnosis of children's AD disease is evaluated, and the appropriate treatment plan is selected according to the actual condition of the patient. Some data suggest that remote diagnosis and treatment can ensure the diagnosis accuracy of about 85% [15]. Children with mild AD can improve their disease under the management of health care doctors, and children with severe AD can be guided to the hospital for treatment in time.

4. Summary

The pathogenesis of childhood AD is diverse and complex, and with the deepening of clinical understanding of the pathogenesis of childhood AD, the treatment methods will be more diversified. Although the treatment of moderate and severe AD in children is still a great challenge, with various new therapeutic methods, especially the use of targeted therapy for moderate and severe AD in children, doctors and patients are full of hope for the treatment of the disease.

Disclosure statement

The authors declare no conflict of interest.

Reference

[1] Schlessinger J, Shepard JS, Gower R, et al., 2020, Safety, Effectiveness, and Pharmacokinetics of Crisaborole in Infants Aged 3 to Months With Mild-to-Moderate Atopic Dermatitis: A Phase Open-Label Study (CrisADeCARE 1). American Journal of Clinical Dermatology, 21(2): 275–284.

[2] Teixeira C, Yilmaz O, Bernardo D, et al., 2024, IL-13 Inhibition in the Treatment of Atopic Dermatitis – New and Emerging Biologic Agents. Journal of International Medical Research, 52(11): 919–934.

[3] Rusiol L, Puig L, 2024, A Narrative Review of the IL-18 and IL-37 Implications in the Pathogenesis of Atopic Dermatitis and Psoriasis: Prospective Treatment Targets. International Journal of Molecular Sciences, 25(15): 8437.

[4] Armario-Hita JC, Galan-Gutierrez M, Dodero-Anillo JM, et al., 2023, Updated Review on Treatment of Atopic Dermatitis. Journal of Investigational Allergology & Clinical Immunology, 33(3): 158–167.

[5] Amy SP, Elaine CS, Diamant T, et al., 2020, Efficacy and Safety of Dupilumab With Concomitant Topical Corticosteroids in Children 6 to 11 Years Old With Severe Atopic Dermatitis: A Randomized, Double-Blinded, Placebo-Controlled Phase 3 Trial. Journal of American Academy Dermatology, 83(5): 1282–1293.

[6] Kumar S, Gonzalez A, Farbo D, et al., 2024, The Effects of Proton and Photon Radiation Therapy on the Development of Pediatric Dermatitis. Radiation, 4(4): 336–345.

[7] Divya S, Pavadee P, Deepak K, et al., 2021, Contact Dermatitis in Children. Pediatric Annals, 50(5): e198–e205.

[8] Natalia MS, Svetlana VK, 2021, Experience in the Treatment of Dermatitis in Children: Clinical Examples. Meditsinskiy Sovet, 2021(1): 168–172.

[9] Emel I, Sibel EE, Tuna HA, et al., 2021, Challenging Diagnosis and Rare Disease in Children: Dermatitis Artefacta. Journal of Paediatrics and Child Health, 57(10): 1710–1712.

[10] Léa F, Anne-Claire B, Nadine P, et al., 2019, Senna Laxative-Induced Dermatitis in Children: A Dermatitis Mimicking Child Abuse. European Journal of Dermatology, 29(3): 327–329.

[11] Slomski A, 2016, Melatonin to Improve Skin and Sleep in Pediatric Dermatitis. JAMA, 315(8): 742.

[12] Reddel S, Chierico DF, Quagliariello A, et al., 2019, Gut Microbiota Profile in Children Affected by Atopic Dermatitis and Evaluation of Intestinal Persistence of a Probiotic Mixture. Scientific Reports, 9(1): 1–10.

[13] Kumar S, Gonzalez A, Farbo D, et al., 2024, The Effects of Proton and Photon Radiation Therapy on the Development of Pediatric Dermatitis. Radiation, 4(4): 336–345.

[14] Zabet D, Reinsberger H, 2017, Dermatitis Artefacta in Children From a Forensic Perspective: A Case Report. La Revue de Médecine Légale, 8(3): 127–131.

[15] Baffa EM, Bianchi L, Venturini E, et al., 2025, A Pediatric Case of Severe Atopic Dermatitis on Dupilumab Treatment and Pulmonary Tuberculosis. Pediatric Dermatology, 1–2.