

Improvement of Acne Therapy Taking into Account Clinical, Genetic and Biochemical Research Methods

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Abstract: The urgency of the problem of acne and the need to improve the effectiveness of its treatment are not in doubt due to the high prevalence of this pathology, the significance of the health disorders caused by it, the material and moral damage to patients, the complexity and insufficiently high effectiveness of therapy. The approach to treating acne in a particular patient is largely determined by the severity of the current stage of acne. Often, in order for acne to disappear, there are enough simple external products that eliminate acne and improve skin condition, as well as actions of a general health plan (healthy diet, hygiene, stress reduction, etc.). However, if acne is severe, or the above methods have been tried, but did not give the proper result, then an analysis is necessary. Only additional tests for acne help to find the root cause of acne.

Keywords: Acne vulgaris, clinic, pathogenesis, sebaceous gland hypersecretion, Cutibacterium acnes, skin microbiota, inflammation, hormonal factors, dermatology.

Introduction: In recent years, the problem of psychosomatic disorders and their correction in patients with dermatosis has become increasingly important [1]. This is evidenced by the growth in the number of studies and scientific papers devoted to this issue [1–3]. Acne rashes in open areas of the body violate the psychological health of a person. According to a psychological survey, 80% of adolescents believe that the most unattractive thing about a person is acne [4]. And it is young women who are prone to psychological status disorders (including depression) due to acne [5, 6]. The presence of acne on visible areas of the skin can cause dysmorphophobia (the idea of an imaginary external deformity) [7].

The emotional reaction is the most sensitive component of mental activity and is accompanied by a specific spectrum of vegetative and endocrine manifestations, including the release of stress hormones, including androgens, which cause the functional activity of androgen-dependent target cells. Inhibition of personal evaluation in patients with acne causes them to constantly experience acute and chronic stressful situations, provoking the above chain of metabolic changes [1, 3]. The role of acne is also

significant in the violation of a woman's sexual health [8, 9].

The term "acne" comes from the ancient Greek language and is associated with the culmination of a tear in the skin. This nosology was first mentioned in the writings of Aetius of Amid, a physician at the court of Justinian I [10]. Currently, it is generally accepted that acne is a chronic disease manifested by open or closed comedones and inflammatory skin lesions in the form of papules, pustules, and nodules [1].

Acne is one of the most common human diseases. Despite the available effective treatments, acne affects up to 95% of patients, especially women under the age of 25 and more than 50% over 25 years of age. The peak incidence occurs between 15 and 18 years of age (in girls earlier than in boys). The manifestation of the process is characterized, as a rule, by the appearance (in response to androgen-mediated hyperstimulation of the sebaceous glands) of seborrhea and microcomedones. Subsequently, open and closed comedones, as well as inflammatory elements, quickly form.

Gender distributions of incidence are approximately equal, however, in men, the disease can occur with a

predominance of severe forms and a longer course. In some cases (otherwise it contradicts the statement that more than 50% of women over 25 suffer from acne) by the age of 18-20, signs of spontaneous regression of the disease begin to be noted. In some patients, the disease acquires a chronic relapsing character, in some cases with the formation of "late acne" (acne tarda) by the age of 30-40, and the number of such patients is growing every year [11, 12].

In recent years, foreign literature refers acne to the so-called diseases of civilization, closely related to Western lifestyle factors, including dietary habits [13-16]. Western diets are high in sugar and other high glycemic index (GI) foods, as well as milk and dairy products. In the United States, 80% of fast food customers are under the age of 18. This "food culture" is expanding, and it is not surprising that both in the US and in other countries, not only the prevalence of obesity, carbohydrate metabolism disorders, but also the frequency of acne detection, including beyond adolescence, is growing. However, in countries where the population traditionally abstains from the Western diet, the prevalence of acne remains low [13, 14].

According to dermatovenereologists, the starting point in acne is often not a direct increase in the content of androgens in the body (absolute hyperandrogenism), but a genetically determined increase in its amount and / or, more often, an increased sensitivity of sebaceous gland cell receptors to testosterone derivatives (relative hyperandrogenism). Sebocytes possess enzyme systems such as 5-alpha-reductase (isoenzyme type I) and 17-beta-dehydroxysteroid dehydrogenase, which convert androgens into their active derivatives and transmit signals for cell proliferation.

There are 4 main links in the pathogenesis of acne: 1) an increase in the production of sebum; 2) excessive follicular hyperkeratosis; 3) reproduction of *Propionibacterium acnes* (*P. acnes*); 4) inflammation [11, 29].

In the occurrence of this disease, as a rule, a combination of several links of pathogenesis plays a role. According to the Clinical guidelines for the management of patients with acne (2015), acne is a multifactorial dermatosis, in the pathogenesis of which genetically determined hyperandrogenism and a genetically determined type of sebaceous secretion play an important role [29]. The diet of a woman and the action of environmental factors are also of great importance.

Hecht [1] was the first who studied the role of heredity in acne. Neonatal, nodulocystic, and conglobate acne have proven genetic influences [2]. Postadolescent acne is related with a first-degree relative with the

condition in 50 % of the cases. Chromosomal abnormalities, HLA phenotypes, and polymorphisms of various genes have been associated with acne. Data from family studies confirmed familial clustering. High heritability estimates for acne in twins were reported. Higher correlations of sebum excretion and the proportion of branched fatty acids in the fraction of sebaceous wax esters were found in monozygotic vs. dizygotic twins [8, 9]

The lack of intensive research in the field of acne genetics is surprising considering its high incidence, morbidity, and immense health service costs. Polymorphism of CYP1A1 has been reported in a subgroup of acne patients [13]. Cytochrome P-450 1A1 regulates the conversion of endogenous retinoids, which are important sebaceous gland morphogens.

Since the first *C. acnes* isolate was sequenced in 2004 (KPA171202, a type IB strain recovered from skin), a number of putative virulence genes have been identified with designated functions involved in tissue degradation, cell adhesion, inflammation, and polysaccharide biosynthesis for biofilm formation [7]. Several genetic elements specific to each lineage have since been identified, which could explain the functional differences between lineages and association with different disease states. One of the most fascinating genetic differences between *C. acnes* lineages is the presence of clustered regularly interspaced palindromic repeats (CRISPR)/Cas locus in health-associated type II strains [8]. While this system is only partially present in type III and likely non-functional, it is completely absent from type I strains [6]. CRISPR is a bacterial adaptive immune system against viruses, phages, and foreign DNA, and its presence in *C. acnes* could prevent the acquisition of extra genetic elements that promote virulence and acne pathogenesis.

METHODS

Approaches for treating acne

The approach to treating acne in a particular patient is largely determined by the severity of the current stage of acne. Often, in order for acne to disappear, there are enough simple external products that eliminate acne and improve skin condition, as well as actions of a general health plan (healthy diet, hygiene, stress reduction, etc.). However, if acne is severe, or the above methods have been tried, but did not give the proper result, then an analysis is necessary. Only additional tests for acne help to find the root cause of acne.

When answering the question of what tests to take for acne and acne, the following categories are usually indicated:

- analysis of the skin for microbial flora and the presence of parasites
- blood chemistry;

It is advisable to take skin tests for acne before starting treatment. The simplest type of analysis for acne, which is often started with, is a microscopic examination of a skin scraping conducted by a dermatologist.

It allows you to identify the presence of demodex - a subcutaneous tick, after which appropriate adjustments are made to the treatment program. However, this cause of acne is far from the most common. If any other violations of the skin microflora are detected during the analysis of the scraping, then the treatment should be concentrated in this direction (in the absence of other indications).

Tests for hormones are one of the most important in finding out the cause of acne, since it is hormonal imbalance that is one of the main causes of acne. Thus, an increase in the level of androgens during puberty very often provokes acne, and if the tests confirm an imbalance, then the treatment plan must necessarily take into account the possibility of correcting it. Acne hormone analysis will be mandatory if the following factors are present:

- Relatively late onset of acne (patient's age over 20 years);
- Manifestation of clinical signs of hyperandrogenism in women - a disorder caused by an increase in the activity of male hormones (often manifested as hirsutism);
- Irregular menstrual cycle;
- Manifestations of black acanthosis (a type of hyperpigmentation of the skin).

CONCLUSION

Diagnosis for acne, pimples should be carried out several times to determine how the process of dealing with them goes. It is advisable to check it comprehensively, this will help to identify the cause more accurately and select a specific treatment. It is also worth checking the skin for bacteria and fungal infections, as this can cause severe irritation of the epidermis, itching, burning and the appearance of unpleasant rashes in the form of acne, pimples, acne or comedones. Analyzes will be able to show what you should pay attention to and where to start therapy.

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