

# The use of exfoliants and micro-needle mesotherapy in the reduction of symptoms of acne vulgaris. Case report

## *Zastosowanie substancji złuszczących i mezoterapii mikroigłowej w redukcji objawów trądziku pospolitego. Opis przypadku*

### ABSTRACT

Acne vulgaris is an inflammatory skin disease that occurs mainly during adolescence and affects almost 100% of young people. Skin lesions are located mainly on the face and back. The disease is characterized by a prolonged course and natural regression. There is a significant risk of scarring, which has a high impact on self-esteem and the ability to function socially. The study aimed to present a treatment in reduction of symptoms of acne vulgaris and associated acne scars in a 25-year-old client of a cosmetology salon. The treatment plan included a series of procedures that used retinol and vitamin C, micro-needle mesotherapy and acid therapy.

**Keywords:** acne vulgaris, scars, retinol, vitamin C, exfoliation, micro-needle mesotherapy

### STRESZCZENIE

Trądzik pospolity to choroba zapalna skóry, która występuje głównie w okresie dojrzewania i dotyka niemalże 100% młodzieży. Zmiany skórne zlokalizowane są głównie na twarzy i na plecach. Choroba cechuje się długotrwałym przebiegiem i naturalnym ustępowaniem. Istnieje znaczne ryzyko powstawania blizn, które mają istotny wpływ na samoocenę oraz zdolność funkcjonowania społecznego.

Celem pracy było przedstawienie terapii w redukcji objawów trądziku pospolitego oraz związanych z nim blizn potrądzikowych u 25-letniej klientki gabinetu kosmetycznego. Plan zabiegowy obejmował serię zabiegów, które wykorzystywały retinol i witaminę C, mezoterapię mikroigłową oraz terapię kwasową.

**Słowa kluczowe:** trądzik pospolity, blizny, retinol, witamina C, złuszczenie, mezoterapia mikroigłowa

### ACNE VULGARIS

The aetiopathogenesis of acne vulgaris is unclear and involves multiple causes, including both internal and external influences that affect its progression. The main factor in acne formation is the increased secretion of sebum on the skin surface by the sebaceous glands. The overproduction of sebaceous glands may originate from a variety of factors, such as hormone imbalances and hereditary predisposition.

Androgens promote the growth of the sebaceous glands and enhance the production of sebum. Moreover, prolactin and progesterone exhibit similar effects. Based on genealogical analyses and studies of twins, a hereditary basis for the disease is indicated, in particular a tendency to severe acne variants. Excessive keratinisation of outlets of hair follicles leads to an inhibition of the exfoliation of the stratum corneum cells,

resulting in their retention in the ductus externa and on the epidermal surface. The deficiency of unsaturated linoleic acid in the composition of sebum production in acne patients contributes to the weakening of corneocyte adhesion in the ducts of the sebaceous glands and the separation of keratinised cells. This results in the plugging of the follicle orifices and the formation of microcalcifications, the precursor lesions to other acne lesions. Due to alterations in the nature and quantity of sebum, the sebaceous glands become more susceptible to colonisation by *Cutibacterium acnes* bacteria. The proliferation of *C. acnes* stimulates inflammatory processes through the production of chemotactic and inflammatory mediators. In addition, according to many studies, these bacteria are involved in immunological processes [1-3] and the release of chemotactic and inflammatory mediators further stimulates the proliferation of *C. acnes*.

## ACNE SCARS

The primary forms of acne that may result in acne scarring are: necrotic acne (*acne rodens*) and acne *vulgaris* and its variants: adolescent acne (*acne juvenilis*), purulent acne (*acne phlegmonosa*), clustered acne (*acne conglobata*), scarring acne (*acne keloida*), and fulminant acne (*acne fluminans*) [4-6].

### Acne vulgaris

- Adolescent acne is a common inflammatory skin condition that occurs during puberty and affects almost 100% of the teenage population. The skin lesions are mainly located on the face and back. A long-standing course and spontaneous resolution is characteristic. The risk of scarring is based on the severity of the skin lesions and family history [7].
- In purulent acne, skin lesions are most commonly located on the face and chest. They take the form of pus-filled cysts and nodules and resolve with atrophic and hypertrophic scars [8].
- Clustered acne occurs after puberty in both sexes. In the course of this disease, deep infiltrates and purulent cysts appear, with a tendency to merge with numerous comedones. As larger clusters heal, scarring, known as keloids, occurs. Skin lesions occur on the face, back, chest, arms, buttocks and abdomen [9, 10].
- In scarring acne, each acne lesion resolves leaving scars. It is quite often accompanied by a clustered and suppurative form. Lesions usually appear on the décolletage, arms and neck [10].
- Acne fulminans is the most severe form of acne, occurring primarily in teenage boys, on the face, décolleté, shoulders, back. This kind of acne is characterised by the presence of general symptoms such as fever, muscle pain, joint pain, weight loss, abnormal laboratory test results. It often requires hospitalisation in the initial phase of treatment. Inflammatory infiltrates, nodules and tumours with a tendency to disintegrate, haemorrhagic ulcerations

covered with gelatinous masses and necrotic scabs are present. As the skin lesions heal, extensive, hypertrophic scarring usually develops [8-10].

## TREATMENTS TO REDUCE THE SIZE AND VISIBILITY OF ACNE SCARS

### Salicylic acid

Salicylic acid is classified as a beta hydroxy acid and was initially derived from willow bark, which remains a natural source for obtaining this molecule. In bound form, it is also found in poplar bark, senescent leaves and chamomile flowers. It is obtained from phenol by synthetic extraction. This compound is in the form of a white crystalline powder or colourless needles, and is soluble in ethanol, but has little solubility in water. It has lipophilic, anti-inflammatory, anaesthetic, fungicidal, seboregulatory, comedolytic and antibacterial properties, so it is ideal for acne therapies and the reduction of skin hyperpigmentation. It decreases the proliferation of *C. acnes*. The antibacterial properties are due to its benzoic acid-like structure. The reduction in the size and number of blackheads, on the other hand, is because of the action of salicylic acid on the skin surface and in the lipophilic environment of the sebaceous gland outlets. Due to its lipophilicity, it shows greater concentration and penetration in the sebaceous gland area. It has an irritant impact and, depending on the concentration, induces a keratolytic or cytotoxic effect. When applied to the skin, salicylic acid causes superficial exfoliation of the epidermis by penetrating the stratum corneum and leads the intercellular cement to dissolve. Exfoliation is induced by the removal of bounded lipids from the surface of the corneocytes, by destruction of covalent bonds [11-14].

### Yellow Peel

Yellow Peel is a treatment that belongs to the chemical peels, and cause removal of layers of the epidermis at different levels. Vitamin C and retinol stimulate the production of collagen, glycosaminoglycans and elastin. Yellow Peel is used to reduce acne scars, hyperpigmentation, wrinkles, skin sagging, acne therapy and seborrhoeic skin disorders [15].

Retinol is the primary form of vitamin A and is the most widely used, and best studied retinoid. When used in correct formulation and concentration, it is converted to retinoic acid in the skin. Together with retinal and retinoic acid, it belongs to the first generation of retinoids, which are natural, monoaromatic compounds. Vitamin A derivatives, as a result of binding to receptors on the cell nucleus, affect keratinocytes and sebocytes, thereby accelerating skin healing. They regulate the function of sebaceous glands, reduce comedogenesis, influence even distribution of melanin, accelerate metabolism and synthesis of support proteins such as collagen, glycosaminoglycans, and elastin. They participate in the processes of metabolism and cell division, stimulate the secretion of transcription and growth factors. Retinol inhibits the activity of enzymes

degrading elastin and collagen, and normalises the process of epidermal keratinisation. By improving the structure of the stratum corneum, protective functions are strengthened, and reduction of transepidermal water loss (TEWL) is observed. This is due to the proliferation of the cells of the viable epidermal layer and exfoliation of the stratum corneum. Retinol increases the number of fibroblasts and stimulates the process of transforming those with low activity into cells characterised by increased collagen production. Activating and increasing the number of fibroblasts has an extremely beneficial effect on the condition of the connective tissue of the dermis and improving the elasticity, firmness and hydration of the skin. Retinol reduces the amount of sebum produced by the skin, decreasing the tendency to form blackheads, hence its widespread use in acne therapies. It reduces the appearance of skin discolouration by contributing to the proper distribution of melanin in the skin [16-20].

Vitamin C, often known as ascorbic acid, is a type of vitamin that dissolves in water. It is derived from a saccharide. The term "pure vitamin C" refers specifically to L-ascorbic acid. Vitamin C exhibit a depigmenting effect by inhibiting the enzyme tyrosinase, by interacting at the active site of tyrosinase, the acid with copper ions. This results in reduced melanin production. In order to obtain better brightening effects, vitamin C is often combined in therapy with retinol. Thanks to sequential electron transfer, vitamin C effectively combats free radicals so it protects the skin's lipid structures from oxidative stress and inhibits immune decline and damage to genetic material caused by ultraviolet radiation. It enhances the effect of sunscreens. In addition, thanks to its ability to inhibit the activation of proteins responsible for the release of pro-inflammatory cytokines, vitamin C plays an important role in preparations aimed at alleviating inflammation in the treatment of rosacea, acne vulgaris and other conditions. Ascorbic acid prevents the oxidation of sebum found on the surface of the skin. It soothes irritation, seals and strengthens blood vessel walls [21-24].

### Micro-needle mesotherapy

Micro-needle mesotherapy is a technique that uses mechanical puncturing of the skin to cause controlled micro-damage. The numerous punctures of the skin made during the procedure create micro-injuries and micro-bleeds. The obtained micro-channels significantly facilitate the penetration of active substances contained in preparations applied on the skin surface. As a result of damage to the blood vessels, a small amount of blood flows outwards, which starts the process of activating thrombocytes. Cytokines play an important role in skin regeneration processes, and their release occurs through small amounts of blood components that penetrate the extravascular space. As a result of these processes, so-called 'growth factors' are released which include transforming growth factor beta (TGF- $\beta$ ), transforming growth factor alpha

(TGF- $\alpha$ ), fibroblast growth factor (FGF-2), the FGF-basic - the stimulation of connective tissue cells, i.e. fibroblasts to produce extracellular matrix (ECM) building proteins, epidermal/epidermal growth factor (EGF), platelet derived growth factor (PDGF), and connective tissue growth factor (CTGF).

The skin stimulation processes during a mesotherapy treatment can be divided into three stages:

- The first one involves inflammation, during which the previously mentioned growth factors are produced. These stimulate keratinocytes and fibroblasts to divide and consequently produce elastin and collagen.
- The second phase involves the formation of elastin, collagen and new tissue and blood vessels.
- In the third phase (remodelling), new blood vessels continue to form and collagen is converted to type I.

The overall processes occurring during self-renewal enhance the mechanical strength and elasticity of the tissues. Skin remodelling and regeneration in the treatment area can continue for up to several weeks after treatment. The punctures trigger a series of skin renewal processes, which are facilitated by the quick mending of the outer layer of the skin. These processes occur in a safe environment, as the skin acts as a complete protective barrier against any dangerous external factors [26-28].

## MATERIAL AND METHODS

A 25-year-old woman came to the cosmetology salon with a problem of acne scarring. The client's clinical skin picture included acne scars, post-inflammatory hyperpigmentation and primary inflammatory lesions on the cheeks and jawline. The woman had not previously received any in-office cosmetic treatments and was limited to home care only. Her skin care included washing the skin with a highly drying gel and applying various creams. The client admitted that she frequently changed the creams, but still had not found the right one for her. She did not use photoprotection.

The woman led a very busy and stressful lifestyle. She worked in a corporate, managerial position where she spent most of her day, in addition to studying part-time. She complained of chronic fatigue - sleep did not give her adequate rest, and she experienced headaches of very severe intensity. Furthermore, she encountered difficulties in maintaining a healthy eating pattern - despite her slim shape, she persistently desired to reduce her weight through a stringent, severely low-calorie regimen.

The treatment plan included a series of retinol and vitamin C applications, micro-needle mesotherapy and acid therapy. The treatment series began with salicylic acid therapy (25%, pH 2.15) - three applications, every fortnight. This was followed by four micro-needle mesotherapy treatments, every three weeks. After completing the micro-needle mesotherapy series, two Yellow Peel treatments (retinol 5% and vitamin C 15%) were performed, every three weeks.

## ANALYSIS AND INTERPRETATION OF PROJECT OUTCOMES

Following the initial application of salicylic acid, a visual assessment revealed a soothing effect and decrease in the size of the main inflamed skin lesions. After two more applications of salicylic acid, a more noticeable soothing effect and decrease in initial inflammatory skin lesions were observed. Furthermore, a minor improvement in the lightening of post-inflammatory hyperpigmentation was also noted.

Following four sessions of micro-needle mesotherapy and three sessions of salicylic acid treatment, a significant decrease in post-inflammatory hyperpigmentation and a reduction in the depth of post-inflammatory scars were noticed.

After the administration of salicylic acid, retinol, and vitamin C therapy, as well as micro-needle mesotherapy treatments, notable improvements were noted. These included a substantial decrease in acne hyperpigmentation, a more uniform skin texture and colour, a reduction in the depth of acne scars, and the total elimination of initial inflammatory lesions (fig. 1).



Fig. 1 Skin condition before (top photos) and after therapy (bottom photos)  
Source: Own archive

## DISCUSSION

In the course of acne vulgaris, atrophic scars usually develop alongside post-inflammatory hyperpigmentation. Combination therapies and monotherapies have shown positive results in reducing their appearance. In order to evaluate the effectiveness of combination therapy in reducing acne scars, a study was carried out involving a 25-year-old man and a 26-year-old woman with the problem of post-inflammatory hyperpigmentation and atrophic scars on the skin of the back, however, no hypertrophic scars or keloids were registered. A series of four diamond microdermabrasion treatments and four exfoliations with acid preparations were performed, after which a brightening of post-inflammatory hyperpigmentation and a reduction in the appearance of acne scars on the skin of the back was observed in both the woman and the man.

A study showed that exfoliation with  $\alpha$ -hydroxy and  $\beta$ -hydroxy acid preparations and diamond microdermabrasion are effective treatments used to reduce the appearance of post-inflammatory hyperpigmentation and acne scars [10].

Salicylic acid belongs to the group of beta-hydroxy acids. When applied to the skin, it causes superficial exfoliation of the epidermis, penetrating the stratum corneum and causing the intercellular cement to dissolve. It has lipophilic, anti-inflammatory, anaesthetic, fungicidal, seboregulatory, comedolytic and antibacterial properties, so it is ideal for acne therapies and the reduction of skin hyperpigmentation. It reduces *C. acnes* proliferation. A 19-year-old man experienced a series of six treatments with 40% salicylic acid with pH = 2, which confirmed the anti-inflammatory and antibacterial effects of the preparation used. After completion of the treatment series, the inflammatory lesions were completely eliminated and the number of subcutaneous papules was reduced. A decrease in the number of comedones and a narrowing and shallowing of the sebaceous gland outlets occurred as a result of exfoliation of the epidermis [11].

Micro-needle mesotherapy is a method of mechanically puncturing the skin, causing controlled damage to the skin. The resulting micro-channels significantly facilitate the penetration of active substances contained in preparations applied to the skin surface. It has effectively been used for the treatment of skin imperfections like acne scars or hyperpigmentation, enabling individuals dealing with these issues to restore their confidence and psychological well-being. This method is highly effective for enhancing the absorption of topically applied medicines, hence amplifying their therapeutic impact. The alteration in the thickness of the epidermis caused by consistent application of the treatment is a crucial element of its impact. The combination of micro-needle mesotherapy with salicylic acid enhances the depth of penetration into the epidermis, hence improving the treatment's efficacy [28, 29].

According to a self-reported study, a combination therapy using a micro-needle mesotherapy treatment and exfoliating substances showed a visible improvement in the complexion. The effects were evident from the first treatment, and included a unification of skin tone, an evenness of the epidermal surface and a reduction in hyperpigmentation and scarring.

## CONCLUSIONS

1. The studies cited and above-presented case report showed that combined methods can be used to reduce acne scarring in order to comprehensively address the skin changes caused by acne vulgaris.
2. The proposed and performed series consisting of three treatments with 25% salicylic acid pH 2.15, four micro-needle mesotherapy treatments and two Yellow Peel treatments (retinol 5% and vitamin C 15%) brought visible results for both cosmetologist and client, which, when

compared with studies by other authors, confirms the effectiveness of the combination therapy.

## SUMMARY

Acne vulgaris is a multifaceted disorder that requires an extensive treatment process and typically results in the formation of scars and hyperpigmentation. A significant number of cosmetology clientele consists of individuals with noticeable acne scarring. Based on research findings, it can be inferred that the utilisation of a combination therapy involving acids and micro-needle mesotherapy yields satisfactory outcomes in diminishing acne scars. Nevertheless, further research is necessary to formulate comprehensive findings.

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