

THE EFFECTIVENESS OF ALKALINE WATER ON OILY AND ACNE-PRONE SKIN: A CASE REPORT

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A – study design, B – data collection, C – statistical analysis, D – interpretation of data, E – manuscript preparation, F – literature review, G – sourcing of funding

ABSTRACT

Background: Skin lesions and excess sebum on the surface of epidermis occur mainly among people suffering from acne vulgaris. Scientists are constantly searching for cosmetic procedures that, can not only complement dermatological treatment and decrease sebum production, but also increase patients' quality of lives.

Aim of the study: To evaluate the effectiveness of alkaline water in the treatment oily skin and acne vulgaris in a 21-year-old woman.

Case report: A 21-year-old female reported problems with too high a sebum level and skin eruptions like blackheads, whiteheads, and pustules. The sebum level was measured and the global acne severity scale (GAGS) score was used to check the amount of skin eruptions before and after a series of treatments with alkaline water.

Conclusions: After a series of cosmetological treatments with alkaline water, there was a significant reduction of sebum secretion and skin eruptions.

KEYWORDS: alkaline water, oily skin, cosmetology, women, sebumeter

BACKGROUND

Acne vulgaris is an inflammatory disease characterized by skin eruptions such as comedones, nodules, pustules, papules, blackheads and whiteheads. These lesions most commonly appear on the face, especially in the T-zone (forehead, nose, chin), but are also observed on the mandible and upper back area. The development of acne vulgaris may be due to follicular hyperkeratinisation, colonization of *Cutibacterium acnes*, or too high a level of testosterone. A poor diet rich in simple sugars, dairy products, and spicy food may also contribute to deterioration of the skin condition in these patients [1]. Severe forms of acne cause scarring, and, consequently, can diminish the quality of life. Scars or facial deformities affect up to 20% of teenagers [2,3,4]. Skin lesions formed after

acne treatments may negatively influence daily life activities and, eventually, lead to depression, suicidal thoughts and suicide attempts [5,6].

Various cosmetic treatments are effective at reducing skin lesions and sebum secretion. These include cosmetic acids such as azelaic (AzA), salicylic and pyruvic acids. Szymańska et al., showed that peels containing 30% AzA reduced acne skin eruptions and secretion of sebum. Similarly, Jaffary et al. found that pyruvic acid (50%) and salicylic acid (30%) improved mild and moderate acne without side effects [7,8]. Cosmetic acids can also be used to reduce skin discoloration, which often occurs in people struggling with acne. In the treatment of skin hyperpigmentation, different levels of exfoliation are used, depending on the nature of the discoloration. The most frequently used acids in this case are glycolic,

trichloroacetic, and salicylic acids. However, it should be noted that these cosmetic acids often cause side effects after application, including redness, burning, irritation of the skin, and peeling, which often causes discomfort [9].

Preparations containing plant extracts also are extremely helpful in treating acne or excess sebum production. In the case of problematic skin, plant extracts such as green tea or lotus can be used. Mahmood et al. examined the effectiveness of the above-mentioned plant extracts for treating oily skin in men. In one study, green tea and lotus extracts were used externally, resulting in a significant reduction in sebum levels. In another study conducted by the same authors, a 3% green tea gel was used externally for 8 weeks, which also reduced sebum on the skin surface [10,11].

Cosmetology is an interdisciplinary science which is constantly developing. Scientists are continually looking for new methods to treat acne-prone skin types. Recently, hydrogen cleansing has been introduced. This treatment is based on pushing active hydrogen particles into the skin at a high pressure. Hydrogen cleansing is a non-invasive procedure with no reported side effects such as skin reddening, burning, or breaking. The electrolysis apparatus used for this treatment produces alkaline water (pH=9).

It should be noted that a cosmetic treatment is selected for each patient individually, and contraindications for potential treatments are extremely important to consider. Not every person suffering from acne will be able to undergo a treatment with the use of cosmetic acids, plant extracts or ultrasound, for example. Therefore, a preliminary interview to determine the indications and contraindications for a procedure are necessary for the selection of a safe and effective individual treatment method.

AIM OF THE STUDY

The purpose of this study was to assess the efficacy of alkaline water in reducing acne skin eruptions and decreasing sebum levels.

MATERIAL AND METHODS

Study design, setting and duration

Hydrogen purification with alkaline water was used as a cosmetic treatment in the current study. The procedure consisted of 6 treatments with the alkaline water (pH=9) occurring every 7 days. Makeup was removed with a micellar fluid before each treatment. The treatment was performed with the use of alkaline water generated by the apparatus.

To obtain high pressured alkaline water a special tip was used. The water used during the procedure was sucked into a special container and the vacuum set at 12%. Each treatment lasted 10 minutes and was finished with the application of tonic and a moisturising cream. This study was conducted between January 2020 and February 2020 at Opole University in Poland.

Participant

The participant was a 21-year-old female who reported some problems with excessive sebum secretion and skin eruptions such as blackheads, whiteheads and pustules. The condition was present in the patient for the past 6 years.

Inclusion criteria

The patient met the inclusion criteria for the study including an age of 19–23, no dermatological treatment within last 12 months, mild-to-moderate acne as measured by the global acne severity scale (GAGS), and no current hormonal contraception.

Exclusion criteria

Exclusionary criteria for this study were pregnancy, breastfeeding, active inflammation of the skin, bacterial, viral, allergic, and fungal skin diseases, disturbed skin condition, active rosacea, eczema, psoriasis, numerous telangiectasias, numerous melanocytic nevi, skin cancers, oral contraceptive pill use, oral antibiotic use within the previous three months, or isotretinoin use within the previous year.

Ethical Considerations

The study was approved by Human Research Ethics Committee of the Opole Medical School (KB/54/NOZ/2019), according to the principles of the Declaration of Helsinki. The participant was informed about the principles and purpose of the study, signed a voluntary written consent form, and was informed that she could withdraw from the study at any time without giving a reason.

Data sources/ Measurements

The participant was diagnosed with mild acne vulgaris (**GAGS score=17**). The GAGS scale divides the body into areas (forehead, cheeks, nose, chin, chest and back) and assigns a factor to each area on the basis of size. The location and factors are: Forehead – 2; Right cheek – 2; Left cheek – 2; Nose – 1; Chin – 1; Chest and upper back – 3. Each type of lesion is also given a value depending on severity: no lesions=0,

comedones=1, papules=2, pustules=3, and nodules=4. The score for each area (Local score) is calculated using the following formula: Local score=Factor × Grade (0–4). The global score is the sum of local scores, and acne severity is graded using this metric. A score of 1–18 is considered mild, 19–30 moderate, 31–38 severe, and >39 very severe [12,13].

Sebum measurement was performed using a Derma Unit SCC 3 sebumeter. Measurements were taken before the series of cosmetic treatments and 14 days following the last treatment. The patient was asked to remove make-up and not to apply any cosmetics the evening before the examinations, which were carried out in the morning hours. The temperature in the examination room was 22 degrees Celsius and the humidity was 40–50%. The patient was allowed to acclimate to the conditions for 20 minutes prior to each examination and the level of sebum was checked between the eyebrows and on the chin.

The patient was informed that during the treatment, and for the two weeks following, other cosmetic procedures, dermatological treatments, applying new cosmetics, going to a swimming pool or solarium, or supplementation with any substances reducing sebum were forbidden. She was recommended to use only micellar fluids and moisturising creams in homecare. Cosmetics with mattifying or sebum-regulating effects were also strongly contraindicated.

RESULTS

After the series of cosmetological treatments using alkaline water, it was found that there were reduced skin eruptions (Table 1) and sebum levels (Table 2). These measurements indicated an improvement in the condition of the skin. Treatments reduced the GAGS score from 17 to 10 and the level of sebum decreased between the eyebrows (251 to 152 $\mu\text{g}/\text{cm}^2$) and on the chin (183 to 130 $\mu\text{g}/\text{cm}^2$).

Table 1. GAGS score before and after treatment

GAGS score before the treatment	GAGS score 14 days after the last treatment
17	10

Table 2. Sebum level before and after treatment

Area of measurement	Sebum level before the treatment ($\mu\text{g}/\text{cm}^2$)	Sebum level 14 days after the last treatment ($\mu\text{g}/\text{cm}^2$)
Between the eyebrows	251	152
On the chin	183	130

DISCUSSION

Key results

Alkaline water is a useful treatment for people struggling with skin eruptions (acne vulgaris) and with those who have high levels of skin oiling.

Interpretation

The series of cosmetic treatments with alkaline water in a 21-year-old female appeared to be very effective at reducing her skin eruptions. Alkaline water has a high pH, which reduces sebum on the surface of epidermis. It may also have an anti-inflammatory effect [14]. Face washes such as soaps also have a high pH, but when used daily may over dry the skin and cause irritation [15]. The treatment in the current study was performed weekly; therefore, the skin parameters improved rather than worsened. Alkaline water is well-known in the world of science. Gadek et al. showed that drinking 2 litres of alkaline water daily decreased glucose HbA1c levels in people with type 2 diabetes [16]. This substance has also been used to treat cancer, and to decrease cholesterol and creatinine [17,18]. As the application of alkaline water to treat acne is relatively new, few studies exist in the literature. However, Chilicka et al. examined the use of hydrogen purification in people with acne, and observed positive results in terms of the reduction of skin eruptions [19]. Given these findings, and our own results, we hope that the study of alkaline water treatments will become more popular among other researchers.

As mentioned above, it is not only apparatus treatments that are effective at reducing skin eruptions and excessive sebum levels. Plant extracts such as green tea have produced positive results in many studies. For example, Lu et al. found that the treatment of acne patients with green tea capsules administered orally significantly decreased skin eruptions [20]. Moreover, Jung et al., in their study, obtained a reduction of open comedones and pustules after using green tea [21].

Sebum is an oily material that is produced in the sebaceous glands. It is a mixture of triglycerides, wax esters, squalene, and cholesterol esters. High sebum levels can be present on face (forehead, nose, chin), shoulders, and back. Sebum has a protective function, but too much can increase the likelihood of developing acne. While acne treatments can decrease sebum, it is important to note that, given its important biological functions, cosmetological procedures that reduce sebum levels by too much may result in unwanted side effects [22].

According to Fąk et al., microdermabrasion in a group of healthy people was effective in reducing sebum. In particular, a statistically significant difference in stratum corneum hydration was found on the cheeks 30 minutes after treatment and in the T-zone immediately after the procedure. Sebum reduction was observed immediately after the procedure irrespective of skin type and face area [23]. Kołodziejczak et al. also showed that a series of mixed treatments, including microdermabrasion and cavitation peeling, improved the condition of seborrheic skin. Following these treatments a statistically significant improvement in skin sebum levels was observed in all facial areas examined [24].

The advantage of cosmetic treatment lies mainly in its complete lack of side effects such as irritation of the skin or burning of the epidermal surface. On the contrary, cosmetic acids, despite their positive effects on the acne and oily skins, produce side effects that may cause some discomfort [1,5].

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