

## STRESZCZENIE W JĘZYKU ANGIELSKIM

Vascular skin is characterized by erythematous lesions and telangiectasias in the face, neck and décolletage area. Erythema is most often defined as visible redness of the skin, which can be episodic or permanent. Sensitive skin, on the other hand, is characterized as a series of unpleasant sensations of varying intensity in response to stimuli that should not normally trigger such reactions. The most common symptoms are itching, stinging, burning, tingling or pain, often accompanied by erythema.

L-ascorbic acid is a key component for the normal structure and function of the skin's connective tissue. This is due to the fact that vitamin C is essential for collagen production, where it is a cofactor for the hydroxylation of proline and lysine. In addition, vitamin C is one of the most potent antioxidants. Combining vitamin C with other substances provides an opportunity to enhance its properties.

Ferulic acid is a very good antioxidant that, in addition to fighting reactive oxygen species (ROS), affects angiogenesis. Phloretin, on the other hand, has a proven ability to suppress and reduce inflammatory response, inhibit the activity of metalloproteinase MMP-1 and elastase, and have a depigmenting effect.

The study compared two methods to increase the permeability of active substances. Micro-needle mesotherapy aims to bring about controlled tissue damage using very fine needles contained in a special device. Sonophoresis, on the other hand, is a cosmetic procedure that involves the use of ultrasound. During the treatment procedure, the transport of active substances deep into the skin is improved by ultrasonic waves.

The study included 72 persons between the ages of 18 and 63, who were divided into 3 groups. The first and second groups were women with erythematous skin, and the third group consisted of subjects whose skin was classified as sensitive skin in addition to erythema. Each subject received six treatments at two-week intervals. The preparations used in the study were: group I - 20% L-ascorbic acid combined with 0.5% ferulic acid, group II - 10% L-ascorbic acid combined with 0.5% ferulic acid and 2% phloretin, group III - Injection solution containing 500mg of L-ascorbic acid (100 mg/ml). The active substances were introduced by micro-needle mesotherapy (0.2mm) on the right side of the face and by sonophoresis on the left side. Changes in erythema severity, pigmentation changes as well as hydration and transepidermal water loss (TEWL) were measured using the MPA 580 (Courage & Khazaka Electronic GmbH, Cologne, Germany) while

elasticity was measured with Cutometer® Dual MPA 580. All participants also completed a questionnaire that included questions on subjective evaluation of the skin changes observed. In addition, photographic documentation was taken.

**Objectives:**

1. Comparative evaluation of the effects of 10% pure L-ascorbic acid (100mg/ml injection solution), 20% L-ascorbic acid with 0.5% ferulic acid, and 10% L-ascorbic acid with 0.5% ferulic acid and 2% phloretin on the degree of reduction of erythematous lesions.
2. Instrumental evaluation of the effects of 10% pure L-ascorbic acid (100mg/ml injection solution), 20% L-ascorbic acid with 0.5% ferulic acid and 10% L-ascorbic acid with 0.5% ferulic acid and with 2% phloretin on: hydration, transepidermal water loss, melanin levels, erythema severity and skin elasticity.
3. Instrumental and subjective evaluation of the effectiveness of L-ascorbic acid on hydration, transepidermal water loss, melanin levels, erythema severity and elasticity in sensitive skins.
4. Comparative evaluation of the effect of micro-needle mesotherapy and sonophoresis on the effectiveness of the applied substances.
5. Preparation and development of a questionnaire in order to compare the effectiveness and safety of the therapy according to individual assessment of probands.

**The following conclusions are drawn from the study:**

1. All tested preparations significantly reduced erythema with both sonophoresis and micro-needle mesotherapy.
2. The greatest degree of erythema reduction was achieved in therapy using 20% L-ascorbic acid with 0.5% ferulic acid.
3. The utmost brightening effects registered by camera measurements were obtained in group III, where an injectable solution containing 500 mg of L-ascorbic acid (100 mg/ml) was used, although according to the questionnaire survey satisfactory skin brightening was also noted in other groups, as confirmed by photos.
4. The greatest efficacy in improving hydration and reducing transepidermal water loss was achieved with 10% L-ascorbic acid combined with 0.5% ferulic acid and 2% phloretin in group II.

5. In the opinion of the study participants, all of the formulations appeared to be effective in improving skin elasticity. Nonetheless, the greatest improvement in the apparatus tests, which was statistically significant, was obtained in group III, where the 500 mg L-ascorbic acid solution (100 mg/ml TEVA) was used.
6. There was no statistically significant difference between micro-needle mesotherapy and sonophoresis in the effectiveness of the applied active substances.
7. The use of an injectable solution containing 500 mg of L-ascorbic acid (100 mg/ml) in group III proved to be an effective and safe method of therapy for sensitive skins.
8. Based on questionnaires and own observations, it was concluded that the tested formulations were safe and did not cause any long-term side effects. In addition, based on the answers given in questionnaires, it was shown that the tested formulations significantly reduced skin sensitivity when exposed to external factors.