

# Removal of hyperpigmentation. Evaluation of the efficacy of treatments with tranexamic acid and vitamin C- case report

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## Abstract

**Introduction.** Hyperpigmentation of the skin predominantly occurs on the exposed body parts, such as the face, arms, neck, and hands, and results from the accumulation of melanin in the melanocytes visualized in the form of limited, irregular spots and patches or generalized discoloured lesions darker than the skin of an individual. Such changes may be congenital or acquired. Their most common cause is sun exposure or impaired hormone metabolism. The limited hyperpigmented lesions mainly include freckles, lentigines, chloasma (melasma), post-inflammatory, post-sun, scar and hormonal discoloration; phototoxic and photoallergic reactions.

**Methods.** A 44-year-old woman characterised by dry, sensitive, rather rough skin and visible capillaries, was diagnosed with hyperpigmentation lesions (post-sun patches) found on her face and arms. The course of 5 treatments was applied at 7-day intervals; each time Arkana Unitone TXA + Vit C was used involving exfoliation with AHA+BHA peelings, serum, mask and cream- a series of cosmetics with tranexamic acid, vitamin C, niacinamide and liquorice (*Glycyrrhiza glabra*) extract.

**Results.** After the entire course, the size, intensity and number of patches on the face and arms were found to be reduced. Moreover, skin redness, tension and roughness were less pronounced after five treatments. The patient's skin was smoother while the capillaries were less visible.

**Conclusions.** The therapy applied to even out skin tone with tranexamic acid and vitamin C resulted in the desired outcomes (i.e. reduced hyperpigmentation) and favourably affected the skin condition.

**Key words:** hyperpigmentation, tranexamic acid, sun discoloration

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## Introduction

Sun exposure is an indispensable element of human life. It has favourable effects on the human body, yet adverse impact has also been observed, especially related to ultraviolet (UVB) radiation. The harmful effects of UVB mainly affect individuals working outdoors and children whose skin has weaker protective properties. Higher doses of UVB cause hyperpigmentation lesions, erythema (sunburn). Moreover, significantly

increased incidences of pre-cancerous conditions have been determined [2]; sunburns are the major risk factor of malignant melanoma, which is the most dangerous skin cancer. Too long exposure to sun without suitable protective measures does not only cause aesthetic changes but may also lead to health deterioration.

Skin hyperpigmented lesions are either limited, irregular spots and patches or generalised changes darker than the skin of an individual. They are

excessive deposits of melanin in the melanocytes and can be congenital or acquired. The most common cause of hyperpigmentation is sun exposure or hormonal imbalance, predominantly of female sex hormones [1]. Hyperpigmented patches develop on the exposed parts of the body, i.e. the face, neck, hands and cleavage.

The most frequent limited hyperpigmented changes include freckles, lentigines, chloasma (melasma), post-inflammatory, post-sun, scar and hormonal discolorations as well as phototoxic and photoallergic reactions.

The depth of hyperpigmentation is determined using the Wood lamp [6,8]. Depending on depth, the hyperpigmented lesions are divided into [7]:

- Epithelial (superficial) – accumulation of melanin in the epithelium - light brown patches with distinct contours.
- Dermal (deep) - accumulation of melanin in the dermal macrophages – dark brown patches with greyish tone and blurred contours. They are the most difficult discolorations to treat and require the use of advanced technologies, including lasers.
- Mixed – heterogeneous spots of various tones and transparencies.

**Senile lentigines** are the epithelial lesions, which result from prolonged effects of sunrays or PUVA therapy. In most cases, they occur on the face, dorsal hands and forearms; furthermore, they can be single or multiple, irregular, brown and with smooth surface. In the summertime, their number increases, and they become more visible. They are not the origin points for melanoma.

**Freckles (ephelides)** are numerous tiny (1-5mm), irregular spots with smooth borders. They do not protrude above the skin level and can be of light and dark brown colour. Freckles are triggered by sun light, most commonly on the face and upper limbs. The brown tint is caused by the excess

of melanin at the normal number of melanocytes. They develop in the early childhood, about the age of two; their number gradually increases yet usually declines with older age. The formation of freckles is genetically conditioned, and their presence is an autosomal, dominant trait. Their incidence in females and males is comparable; they are particularly common in light-skinned as well as light- or red-haired individuals. Due to sun light, freckles become darker and more visible.

**Chloasma (melasma)** – i.e. limited discolorations on the face, dermal and mixed, which predominantly occur in women aged >30 years with hormonal disorders and exposed to sun light. Their colour ranges from yellow brown to dark brown. They are characterised by uneven hyperpigmentation. The changes are well-limited and of various shapes. Sun light increases their number; in the wintertime they are less visible.

**Phototoxic and photoallergic reactions.** Many cosmetics induce skin reactions when exposed to sun light; depending of the mechanism of their formation, they are called phototoxic or photoallergic reactions. Their symptoms markedly vary – from redness to itchy rash; moreover, wheals can develop or systemic changes, such as elevated temperature or deteriorated general condition. Prior to longer sun exposure, UV-sensitising cosmetics should not be applied on the skin; e.g.:

- AHA, salicylic acid, retinol
- some essential oils (e.g. lemon, orange, lavender, bergamot, vanilla, cedar and sandalwood)
- some natural raw materials used for production of eco-cosmetics, e.g. Saint John`s wort, celery, parsley, marigold.

Moreover, phototoxic and photoallergic reactions can occur after analgesics, antidepressants and diuretics as well as some acne preparations. Oral hormonal contraception combined with high sun exposure substantially increases the risk of discolorations.

**Sun spots** develop due to excessive sun exposure [1]. Long-term UV exposure increases the production of melanin; increased production results in brown spots and discolorations (irregular, dark, smaller or bigger lesions) on the skin that are difficult to remove. The most common types are lentigines (mostly at the age > 50 years) and chloasma.

### **Cosmetic treatments to eliminate hyperpigmented lesions**

Cosmetic industry offers many methods and preparations to reduce and remove the hyperpigmented lesions, including topical cosmetics applied to the altered areas and professional cosmetic treatments.

The cosmetics inhibiting the development of hyperpigmentations or with whitening properties can contain the following active substances:

- hydroquinone (HQ) and its esters,
- arbutin – a hydroquinone derivative (beta-hydroquinone glycoside),
- vitamin A and its derivatives (retinol, tretinoin, isotretinoin),
- vitamin C in complex mixtures,
- corticosteroids,
- glabridin – one of the components of liquorice root (a potent whitener, tyrosinase inhibitor),
- birch extracts (containing an effective inhibitor of tyrosinase – betulin) and Baikal skullcap root extracts (an inhibitor of tyrosinase),
- extracts of yarrow, chamomile, lemon, grapefruit, reseda, white peony, parsley, mull berry, green tea, coffee, safflower, tamarind, and soya [4].
- chemical peelings (mainly combined components) – mandelic, azelaic, phytic, kojic, citric, glycolic acids
- vitamin A – retinol, TCA (the risk of secondary hyperpigmented lesions)

Beauty parlours offer various procedures reducing discolorations:

- chemical peeling

- criosurgical treatments (e.g. topical criopeeling)
- ultrasound cavitation (plus whitening preparations) to break the molecules of melanin in the keratocytes and induce quicker exfoliation
- microdermabrasion – to exfoliate excessively pigmented keratocytes in the corneal epithelium (a combination with whitening acids and tyrosine-inhibiting substances is recommended)
- laser therapy
- IPL – intense pulsed light.

### **Tranexamic acid and active substances of Unitone therapy**

One of the most novel dermo-cosmetic therapies applied to even the skin tone and to eliminate the pigmentation disorders of various types is a combination of tranexamic acid (TXA) with vitamin C, niacinamide and liquorice extract [3,5]. TXA is an organic compound containing the cyclohexane scaffold. It can be used internally as an anti-haemorrhagic agent. In cosmetics, TXA is recommended to be applied on the skin with post-sun, post-inflammatory, hormonal or post-drug hyperpigmented lesions [3]. A course of treatments with this acid is advisable for photoaging, prior to and after IPL, laser and exfoliation therapies [3,5]. TXA lightens and evens the skin tone, prevents discolorations and eliminates the consequences of photodamage; moreover, it shows anti-inflammatory effects, alleviates pruritus, swelling and redness [9,10].

Vitamin C: 3-o-ethyl ascorbic acid – its amphiphilic form lightens discolorations, stimulates the production of collagen, neutralizes free radical and seals blood vessels.

Niacinamide – has anti-inflammatory effects, accelerates healing, prevents post-sun and post-inflammatory hyperpigmented lesions, and destroys free radicals.

Glycyrrhiza Glabra Root Extract (INCI) shows lightening properties, alleviates irritations.

### **Post-treatment recommendations**

After all treatments removing sun patches, strong makeup, potent skin washing or care agents and sun exposures should be avoided. Clothes, glass, creams with UV filters, acrylic and polycarbonate protective shields protect against UV radiation [1]. Skin moisturizing is worth remembering. In cases when individuals are exposed to sun light, it is advisable to eliminate the highest possible number of factors increasing the risk of skin patches. It is recommended to control hormonal disorders, avoid overuse of antiperspirants and perfumes during tanning and familiarise with the leaflets of the drugs being used. If the preparations have phototoxic properties, sun light exposure should be avoided [1,2].

Individuals particularly vulnerable to skin hyperpigmentation are recommended to use sunscreen creams and lotions throughout the year and not only during summer vacations [1,2,7].

## **Methods**

### **Case report**

A 44-year-old female teacher agreed to assess the efficacy of treatment with tranexamic acid, vitamin C, niacinamide and liquorice extract. The cosmetic history and skin diagnostic procedures demonstrated that she had dry, sensitive, reddened and rather rough skin. After washing, her skin exfoliates and tightens up. Moreover, it can be easily irritated by potent cosmetics; capillaries become visible.

The client was diagnosed with hyperpigmented lesions – post-sun patches on the face and arms (Fig. 1a and 2a).

The general patterns followed: she avoids long sun exposures and tanning, does not visit solaria;

however, she uses creams and lotions with UV filters only during summer holidays.

### ***The suggested management for removing hyperpigmented lesions***

The client was suggested to undergo complex treatment to even the skin tone using Arkana Unitone TXA + Vit C, which involved exfoliation with AHA+BHA peelings, followed by the application of serum, mask and cream – a series of cosmetics with tranexamic acid and vitamin C (Table 1).

### ***Cosmetic preparations applied***

Table 1 presents the list of cosmetics used during the treatment, i.e. cosmetic name, description, producer's information about its action and INCI composition.

### ***The course of treatments***

The course of 5 procedures was planned and carried out at 7-day intervals. The procedures performed during each appointment are described below. All the preparations were applied according to the producer's instructions (Arkana). Firstly, the makeup was removed using Lactobionic Micellar Gel (1) – (Table 1). The gel portion was distributed with circular movements and the skin was slightly massaged and cleansed with moistened cotton pads. Subsequently, the skin was toned up with Lactobionic Toner (2) – the pad pre-soaked in tonic was applied to cleanse the skin.

The next step was exfoliation with Arkana AHA+BHA peeling (3), applied with a brush, avoiding the lip and eye areas. The exfoliant was removed after 3-5 minutes and Unitone TXA + Vit C Serum (4) was used. In our case, the serum was applied manually; optionally, sonophoresis, needleless or microneedle mesotherapy can be performed. The further preparation applied was

Table 1. Compilation and characteristics of cosmetic preparations used during therapy

No.	Name	Characteristics	INCI
(1)	Arkana Lactobionic Micellar Gel	For every skin type. It perfectly removes impurities and makeup, preparing the skin for further treatment. It is recommended for everyday home care. It contains lactobionic acid showing moisturising and anti-oxidative properties.	Aqua, Olive Oil Peg-7 Esters, Glycerin, Lactobionic Acid, Xanthan Gum, Methyl Gluceth-20, Peg-40 Hydrogenated Castor Oil, Dehydroacetic Acid, Benzyl Alcohol, Tetrasodium Glutamate Diacetate, Parfum
(2)	Arkana Lactobionic Toner	Moisturising tonic with lactobionic acid, designed for professional and home care of every skin type, particularly during acid treatments and after intense dermo-aesthetic procedures.	Aqua, Glycerin, Lactobionic Acid, Methyl Gluceth-20, Dehydroacetic Acid, Benzyl Alcohol, Xanthan Gum, Tetrasodium Glutamate Diacetate, PEG-40 Hydrogenated Castor Oil, Parfum, Hexyl Cinnamal.
(3)	Bio Exfoliator 25 % AHA + BHA + PHA	Face peeling of creamy consistency with exfoliating effects based on AHA, arginine and a complex of 12 amino acids. Such a concentrated formula effectively supports care of all skin types. It distributes perfectly well, and its active substances permeate all skin layers.	Aqua, Glycerin, Citric Acid, Lactic Acid, Caprylic/ Capric Triglyceride, Cetearyl Alcohol, Dicapryl Phosphate, Ceteth-10 Phosphate, Glyceryl Stearate, Peg-100 Stearate, Ricinus Communis (Castor) Seed Oil, Hydrogenated Castor Oil, Copernicia Cerifera (Carnauba) Wax, Ethylhexyl Cocoate, Ppg-3 Benzyl Ether Myristate, Glycolic Acid, Sodium Pca, Sodium Lactate, Arginine, Aspartic Acid, Pca, Glycine, Alanine, Serine, Valine, Proline, Threonine, Isoleucine, Histidine, Phenylalanine, Sodium Hyaluronate, Ethylhexyl Stearate, Sodium Hyaluronate Crosspolymer, Polyglyceryl-4
(4)	Unitone TXA + Vit C Serum	Highly concentrated serum suitable for skin care during professional brightening treatments, microneedle and needless mesotherapy, sonophoresis and manual application. Skin tone evening and elimination of hyperpigmented lesions of various origin are its major effects.	Aqua, Prunus Amygdalus Dulcis (Sweet Almond) Oil, Tranexamic Acid, 3-O-Ethyl Ascorbic Acid, Parfum, Benzyl Alcohol, Lysolecithin, Sclerotium Gum, Xanthan Gum, Dehydroacetic Acid, Tetrasodium Glutamate Diacetate, Pullulan
(5)	Arkana UNITONE TXA + VIT C MASK	Dermo-aesthetic mask with tranexamic acid, active vitamin C and liquorice extract. Its active ingredients even the skin tone brighten discolorations and prevent their development. The mask maintains the effects of professional treatments brightening pigmentation disorders. Its night application, once a week, is recommended.	Aqua, Caprylic/Capric Triglyceride, Isopropyl Palmitate, Cetearyl Alcohol, Glycerin, Tranexamic Acid, 3-O-Ethyl Ascorbic Acid, Glyceryl Stearate SE, Tocopheryl Acetate, Sodium Polyacrylate, Parfum, Benzyl Alcohol, Dicapryl Phosphate, Dehydroacetic Acid, Glycyrrhiza Glabra Root Extract, Ceteth-10 Phosphate, Tetrasodium Glutamate Diacetate.
(6)	Arkana UNITONE TXA + VIT C CREAM	Highly concentrated active substances even the skin tone, brighten discolorations of various origin and prevent their development. Additionally, they have anti-inflammatory effects, reducing redness and sealing the vessels. It is recommended to use this cream after exfoliations, during brightening procedures, before and after laser and IPL therapy. The cream is also suitable for sensitive and couperose skin.	Aqua, Isopropyl Palmitate, Vitis Vinifera (Grape) Seed Oil, Cetearyl Glucoside, Sorbitan Oliviate, Glycerin, Cetearyl Alcohol, Tranexamic Acid, Niacinamide, Isoamyl Cocoate, 3-O-Ethyl Ascorbic Acid, Cetyl Palmitate, Hydrogenated Olive Oil, Sorbitan Palmitate, Olive (Olea Europaea) Oil, Sorbitan Oleate, Olive Oil Unsaponifiables, Benzyl Alcohol, Tocopheryl Acetate, Xanthan Gum, Dehydroacetic Acid, Tetrasodium Glutamate Diacetate, Parfum

Source: elaborated by the authors based on the producer's data <https://sklep.arkana.pl/> [5]



Fig. 1. Face skin before (on the left) and after (on the right) the course of treatments (photo Natalia Poticha)



Fig. 2a and b. Upper back before (on the left) and after (on the right) the course of treatments (photo Natalia Poticha)

Unitone TXA + Vit C Mask (5). Finally, the tone-evening cream with tranexamic acid and vitamin C was used (6).

### Results

After the course of 5 treatments, the size, intensity and number of patches on the face and arms was found to be reduced (Fig. 1 and 2). Moreover, redness, skin tension and roughness decreased. The skin was smoother while capillaries were less visible. Additionally, the therapy brightened the skin under the eyes, on the face and arms. According to the client, the skin elasticity improved.

### Conclusion

The tone evening therapy with tranexamic acid and vitamin C brought about the expected outcomes regarding the reduction of hyperpigmentation. Moreover, the therapy had positive effects on the general skin condition: decreased tension, roughness and redness. Beside its brightening effects, soothing and anti-inflammatory action of tranexamic acid was observed. Therefore, treatments with this acid can be particularly recommended for individuals with overreactive, sensitive skin.

Noteworthy, treatments for removing hyperpigmented lesions should be performed systematically and be combined with proper home skin care and sun protective measures.

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