



Evidence Based Cosmeceuticals for a Fitzpatrick Skin Type II Patient

Chang D*

Academy of Aesthetic Medicine, Korean Medical Aesthetics Clinic, Singapore

*Corresponding author: Daniel Chang, Medical Director, Academy of Aesthetic Medicine, Korean Medical Aesthetics Clinic, Singapore, Tel: + 65-98341433; E-mail: drdanielchang1107@gmail.com

Received date: July 12, 2017; Accepted date: September 08, 2017; Published date: September 29, 2017

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Abstract

Cosmeceuticals are defined as agents claiming to have medicinal properties, example anti-ageing etc. These are supported with weak clinical data. A Fitzpatrick skin type II usually burns and tans minimally. At the age of 55, sun-damaged females would have lost a fair bit of collagen and elastin from their dermis layer. Pigmentation with freckles and solar lentiginosis are common, especially amidst sun exposure and lack of a good skincare regimen. Skin tends to be drier and more prone to erythema, due to weakening of the stratum corneum skin barrier and inflammation. Therefore, it is vital to commence a long term skin care maintenance regimen to improve skin appearance and reduce further photo-damage. Toxins target the muscle layer and help reduce dynamic rhytides, while cosmeceuticals would improve the static rhytides. Fillers help replace lost volume in the subcutaneous layer, most commonly in the deep fat compartments of the face. This leaves the epidermis and dermis layer, which can be improved with cosmeceuticals.

Keywords: Rhytides; Neurotransmitter; Melanosome; Corneum; Rosacea

Introduction

People with Fitzpatrick skin type II usually get a light tan with frequent exposure to sun. They have a very high risk for skin cancer including melanoma which is considered as the deadliest kind of skin cancer. Therefore these patients are advised to take extreme care, use sunscreen and protect themselves from the dangerous UV rays as extreme sun exposure can result in serious damage, premature ageing and skin cancers such as squamous cell carcinoma SCC. The incredible advancement in the field of cosmetic science has produced a great variety of the fresh skincare products with advanced and highly refined dynamic ingredients. Here we will discuss about specific clinical skin conditions relevant to our Fitzpatrick Type 2 skin type client and will prescribe skincare treatment for these patients.

Classes of Cosmeceuticals

Sunscreen

A good sunscreen regimen is the foundation of healthy skin. A daily sunscreen regimen would reduce pigmentation and sun damage. Evidence shows a heightened risk of sunburn, skin malignancy and premature skin ageing with UV radiation exposure [1]. Pharmacologically, sunscreens have been divided into chemical or physical depending on their mode of action. Chemical sunscreens prevent sunburn by absorbing UV radiation and re-emitting this as heat. An example is Para Benzoic Acid (PABA). Physical sunscreens form a barrier to reflect this UV radiation. Examples include zinc and titanium oxide. Used daily and in the right amount, these agents have led to a statistical reduction in the occurrence of skin cancer, photo ageing and sunburns [2].

Peptides

Peptides have *in vitro* evidence of their use in cell regulation, copper delivery (which is an essential mineral for wound healing) and stimulation of cellular mechanisms vital for skin health. Examples include carrier peptides and signal peptides (e.g. pentapeptide Pal-KTTKS); neurotransmitter peptides (e.g. hexapeptide argireline) which have been shown to inhibit the release of neurotransmitter resulting in muscle weakness (clinical data is still pending) [3-8].

Skin lightening

Acquired hyperpigmentation is a common concern and can be secondary to inflammation and trauma, hormonal imbalances, photodamage, systemic medical conditions. The cosmeceutical agent which target dyspigmentation are wide-ranging. When used in combination with exfoliants to aid in cosmeceutical penetration, these agents achieve peak efficacy. To target the dyspigmentation in our client, cosmeceuticals would be useful. Glycolic acid accelerates keratinocyte renewal by shortening the cell cycle and increases desquamation of melanin carrying cells. Vitamin C blocks the production of pigment through its reduction of L-dopaquinone, which is a precursor of melanin [9,10]. Botanicals, like soy, kojic acid have a lightening effect too, though the evidence is weak [11]. Hydroquinone works by inhibiting the activity of tyrosinase, the enzyme needed to make melanin, hence reducing the production. It enhances melanosome breakdown (melanin pigment granules) in the skin's pigment cells (melanocytes).

Exfoliants

Exfoliants remove the upper layers of the epidermis. AHA (Alpha Hydroxyl Acid) works by thinning the epidermal stratum corneum through the reduction of corneocyte cohesion at the lowest levels of the stratum corneum, adjacent to the stratum granulosum. Clinically, exfoliants enhance the quality of the skin and reduce signs of ageing such as thinning of the skin, fine rhytides and dyspigmentation [12].

Vitamins (A, E and C)

Vitamin A will be discussed under the section, retinoids. Vitamin E is a good antioxidant and photo-protective. In the skin, Vitamin E is the primary anti-oxidant of the skin barrier. It arrests chain propagation by scavenging lipid peroxy radicals. Studies have shown reduced acute skin responses (erythema, oedema, lipid peroxidation) and chronic skin reactions (skin wrinkling, skin tumor formation) to UVR if topical Vitamin E is applied. Vitamin C occurs naturally. It has anti-ageing properties through the following modes of action.

- Reduces oxidative stress.
- Collagen and elastin synthesis.
- Photo protection and anti-inflammatory

Topical vitamin C application shows clinical signs of improvement on photo damaged skin [13]. Collagen production is also increased, and this has a skin tightening and firming effect. Studies show statistically significant improvement from biopsies, showing increase in Grenz zone collagen in treated side on photo damaged skin [14]. In addition, there is highly significant decrease in deep furrows in vitamin C group. Histology demonstrated elastic tissue repair, therefore benefit in on all parameters of actinically damaged skin [15].

Retinoids

Retinoids are a class of compounds derived from vitamin A. Benefits of retinoids includes the following:

- Epidermal cell renewal
- Shielding UV rays
- Controlling oxidative stress and skin bacterial flora
- Slowing down skin-ageing and photo-ageing

Retinoids are the gold standard for the treatment of photo-damaged skin [16-19]. Their action is via regulating gene expression profiles. They have also been extensively proven to be effective in the treatment of other skin conditions such as acne, rosacea and psoriasis. Rosacea is common in the Caucasian population. The main side effects of retinoids are local irritation and teratogenicity. Synthetic retinoid analogues have a similar mechanism of action but with varying pharmacological properties [20-22].

Clinical Applications of Cosmeceutical Agents

Facial wrinkles

For our client, upper face wrinkles, glabellar lines, forehead lines and crow's feet would be common concerns. Cosmeceutical agents which improve the appearance of facial wrinkles are constituents of moisturizing creams and are broadly divided into categories which reflect their mechanism of action [23-25].

Botanical antioxidants

These can be divided into flavonoid, polyphenol and carotenoid antioxidants. Flavonoids include soy and silymarin, polyphenols include curcumin and green tea whereas carotenoids include lutein and lycopene.

Vitamin antioxidants

Vitamins such as Vitamins A, C and E can act as antioxidants.

Cellular regulators

These agents include fibroblast growth factors (e.g. epidermal growth factor, platelet-derived growth factor), signal peptides (e.g. pentapeptide Pal-KTTKS), neurotransmitter peptides (e.g. hexapeptide argireline) which have been shown to inhibit the release of neurotransmitter resulting in muscle weakness (pending clinical data). Therefore, consistent use of moisturizing creams would be essential to maintain skin health.

Dry skin

Agents used in the treatment of dry skin include:

Occlusive

These agents help to reduce trans-epidermal water loss. Examples include petrolatum, lanolin and liquid paraffin.

Humectants

These agents help to enhance movement of water from the dermis to the epidermis aiming to increase the hydration of the stratum corneum. Examples include glycerin, hyaluronic acid and panthenol.

Stratum corneum modifiers

These agents modify the structure and function of the stratum corneum e.g. through a reduction of corneocyte adhesion or increasing the keratinocyte binding sites for water. Examples include ceramides, urea and lactic acid.

Emollients

These agents act as 'glue' between corneocytes which are desquamating, therefore allowing the skin to appear smooth and supple. Examples include cetyl stearate and dicaprylyl maleate. In summary, moisturizers will often contain a combination of the above ingredients so as to target the pathophysiology of dry skin on many levels. The aim of treatment is to increase the water content of skin, enhance the smoothness and suppleness of skin and alleviate any symptoms resulting from the dryness [26].

Erythema

The underlying condition causing facial erythema can be varied, ranging from eczema and rosacea to dermatitides. The pathophysiology is vasodilatation and leucocyte recruitment that occurs as a result of the inflammatory cascade activation. Therefore the cosmeceutical agents indicated for the treatment of these conditions are characterized by their anti-inflammatory properties and their benefits on the barrier function of the skin. The erythema targeting agents found within moisturizers can be divided into broader categories that reflect their mechanism of action:

Mucilage agents

These are rich in mucopolysaccharides and form a protective film over the skin surface so as to enhance the barrier function. Examples include aloe vera and prickly pear.

Polyphenols

These have anti-inflammatory properties. Examples include green tea, tea tree oil, ginkgo biloba.

Naturally-occurring anti-inflammatory agents

Examples include aloe vera (which contains choline salicylate), bisabolol, allantoin.

Humectants

These retain moisture, hence improving skin hydration and barrier function. Examples include panthenol (vitamin B5) [27].

Pigmentation

In Fitzpatrick skin type II patients, pigmentation is a common problem. Here are key skin-lightening agents relevant to our client's skin condition and desired outcome.

Hydroquinone

It is the gold standard skin lightening agent, but can cause significant side-effects such as skin irritation and exogenous ochronosis. It is now a prescription only medication in most countries, and is widely used in combination with vitamin C, glycolic acid and retinoids.

Glycolic acid (AHA)

Glycolic acid increases the renewal of pigmented cells and through this action also improves penetration of other agents e.g. hydroquinone. As it carries a risk of irritation, desquamation and post-inflammatory hyperpigmentation, it is important to start patients at lower concentrations and gradually build up.

Ascorbic acid (Vitamin C)

It has a low irritating effect and serves as a mild lightening agent.

Retinoids

These work best in combination therapies, being mildly effective when used alone. As lightening agents can cause barrier damage, their administration can be delivered through moisturizing agents which help to minimize their drying and therefore barrier damaging effects. All patients should be aware that treatment with these agents can result in skin injury leading to post inflammatory hyperpigmentation, causing further darkening of the pigmentation condition [28].

Conclusion

Cosmeceutical agents are derived from a range of both naturally occurring and synthetic sources and have wide-ranging functions and clinical applications. Every skin is different. Hence, patients may present with the same condition, but the cosmeceutical treatments indicated for each patient may be different, owing to the individual's skin-type, their environment and their response to treatment. Though the effects and actions of a number of cosmeceutical have been well established, further robust clinical studies must continue to corroborate the efficacy of these agents *in vivo*. My treatment protocol for the client, to improve her skin appearance and reduce pigmentation, erythema, dry skin and facial wrinkles would hence include the following:

In the morning

- Sunscreen to protect the skin and reduce photo-ageing and further pigmentation.
- AHA based exfoliants to renew skin and enhance penetration of additional cosmeceuticals.
- Vitamins C, E with ferulic acid to increase absorption.
- Moisturizer to keep skin hydrated and supple.

At night

- Topical retinoid in combination with AHA based exfoliants for synergistic skin rejuvenation to reduce photo-damaged skin.
- Hydroquinone to lighten existing pigmentation.
- Moisturizer rich in Peptide and ceramide to hydrate and plump up the skin, reducing appearance of wrinkles.
- Hydrating face mask once a week-rich in humectants (panthenol), polyphenols (green tea) and mucilage (*Aloe vera*) to lock in moisture, reduce inflammation and enhance the skin barrier respectively.

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