aesthetic medicine

Review

Oncological cosmetics: cosmetic selection criteria

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Abstract
As a result of the increase in the number of cosmetic products aimed at oncological patients, and the lack of unified criteria of these products, there exists a need to determine and agree upon the characteristics required to add value to a cosmetic product for its use in oncology. The main aim of this work has been to define the criteria that a cosmetic product must complete for its use with oncological patients, with the aim of improving the health and quality of life of the patients.
The evaluation and development of these criteria has been carried out based on the bibliographic investigation compiled and the assessment, appraisal and safety evaluations from more than 500 materials amongst selected active ingredients and compounds in current cosmetics, obtaining guidelines of the composition of cosmetic products aimed at oncological patients.
It is believed that a cosmetic product for oncological patients must, as a minimum, preserve and not damage the skin, must be effective at relieving dryness, itching and sensitivity, must protect them from solar rays, and be safe, given the vulnerability of these patients.

Keywords
Cutaneous toxicity, cosmetic ingredients safety, skin care in oncological patient, chemical composition cosmetic, oncology

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Introduction

The oncological patient needs to adapt their cosmetic needs (hygiene, hydration, sun protection and make up) to their new situation. Their skin, mucous membranes and extremities (hair and nails), can be subject to changes and adverse effects either directly (radiotherapy, surgery), or indirectly (chemotherapy, directed treatments, immunotherapy, hormonotherapy) produced by the treatments.

There exists evidence of the beneficial, and even therapeutic, benefits that cosmetics play in managing some of the adverse dermatological effects produced by antineoplastic therapies. A cosmetic product could be a very useful contributory therapeutic to: i) prepare and strengthen the skin before receiving a treatment, ii) reduce the skin toxicity produced by antineoplastic treatments (xerosis, itching, erythema, paronychia, fissures, rashes, hyperkeratosis, radiodermititis, photosensitivity), iii) increase the oncology treatment adherence and iv) allow image recovery and improve the quality of life[1,2,3]. The cosmetic needs of an oncological patient start from before the beginning of the treatment: to prepare the skin, avoid irritation, sensitivity and allergenic substances. Later, during the treatment, it will be necessary to relieve the increased dryness, protect from the sun, and be covered by concealing make up. Finally, after treatment the skin will need regeneration.

When choosing a cosmetic product, the oncological patient must not only take into account personal care use but also those uses carried out during professional treatments, whether they are aesthetical, for illness or physiotherapy.

The main aim of this work is to define the criteria that a cosmetic product must complete for its use by oncological patients, identifying both the suggested ingredients and those that aren't recommended. S such we have focused our work on the following areas:

- Raise awareness of the importance of suitable oncological cosmetic products, both to medical professionals and to patients.
- Create a list of non-recommended ingredients that allow for avoidance protocols to be carried out, identifying inappropriate agents for oncological patients.
- Create a list of recommended ingredients, to maintain and improve skin qualities, and contribute to limit adverse dermatological effects caused by treatments. Assess the producers of these products
- Produce guides to therapeutic cosmetic products that improve the choice of ingredients for cosmetic products based on their different uses.

Materials and Methods

The following bibliographic searches have been carried out:

1) A bibliographic review done through the following technical criteria: I): key words: cutaneous toxicity, cosmetic ingredients safety, skin care in oncological patient, chemical composition cosmetic, chemical composition cosmetic and oncology; II) thesaurus: Pub med, Cochrane, Ovid; III) filters: reviews, full text articles, from the last 5 years.
2) Compilation of the information from cosmetic care before, during and after oncological treatment, cited in: i) specialist studies in oncology and aesthetics (Masters in Quality of Life and Medical Aesthetic Care edition I and II) and ii) in health institutions and scientific societies such as: ASCO (American Society of Clinical Oncology), SEOM (Spanish Society of Oncological Medicine), SEOR (Spanish Society of Oncological Radiotherapy), OMS (World Health Organisation), AEDV (Spanish Academy of Dermatology and Venereology), ADD (American Academy of Dermatology), SKF (Skin Cancer Foundation).
3) A review and adjustment of algorithms an criteria of cosmetic care for other at-risk group (immunocompromised, photosensitive, atopic, sensitive skin and altered dermal barrier patients).
4) A review of the profile of more than 500 ingredients: evaluation of their valuation, ratings and security analysed in the following databases: Scientific Committee on Consumer Products (SCCS) of the European Commission, Cosmetic Ingredient Review (CIR), Environmental Working Group (EWG), Cosing (database of cosmetic ingredients proposed by the European Commission). Note: SCCS and CIR emit judgements that direct legal changes in Europe and North America, respectively. The ingredients have been selected from current cosmetic products catalogued by their producers as "for oncological use and other ailments", such as sensitive and atopic skin and those suitable for children.

Results

The three recommended cosmetic products with most consensus have been:

- Hydrating emulsions free of alcohol, perfumes and hypoallergenics
- ph neutral soaps
- high photoprotection

Of the ingredients analysed, there are approximately 40% with studies that show potentially harmful effects to oncological patients: irritation, allergic reactions, endocrinic disruption, toxicity, photosensitivity, carcinogenicity, toxic effects on reproduction, mutagenic. This paper gives the conclusions taken from analysis of more than 100 ingredients selected according to their beneficial properties, perjudicial effects and/or frequency of appearance in current European cosmetic products (*Table 1*). The results of this complete work (analysis of 500 ingredients) will be published in the 1st edition of the Vademécum de Cosmética Oncológica, which will be presented at the 35th SEME Congress.

CLICK HERE TO SEE TABLE 1

***Table 1** - The most and least recommended ingredients have been represented in green and red respectively, catalogued according to the information obtained and adapted to the extra vulnerability of the oncological patient.*

Discussion

The antineoplastic treatments reduce the skin's tolerance to cosmetic products, and this has been attributed to an imbalance in the corneal layer (modifications in the proliferation/maturity of the keratinocytes or keratinization mechanisms) which affects the functioning of the dermal barrier[1,4,5]. The use of appropriate cosmetic products can control the seriousness of the symptoms derived from this disruption. This still isn't an accepted definition of "barrier repair products". It is believed that use of cream moisturiser is an excellent therapy to counteract the disruptions in altered or diseased skin[6].

The ingredients of a cosmetic product formulated to improve skin quality before, during and after oncological treatment must be: i) active ingredients, ii) auxiliary ingredients (water, moisturisers, emollients, firming oil, emulsifiers, gelling agents, surfactants and conservatives), iii) gentle and free of alcohol (colorants, perfumes, aromas and essential oils), iv) non-sensitising or hypoallergenic and v) non-blocking [4,5,7].

According to European Parliament regulations regarding cosmetic products, it is possible to guarantee the safety of finished cosmetic products on the basis of the security of the knowledge relating to the ingredients that they contain.

Various active ingredients with antimicrobiotic, antioxidant, cleansing, deodorant, antiperspirant, emollient, hair conditioning, moisturising, keratolytic, hydrating, refreshing, skin conditioning, skin protecting, and calming cosmetic functions have been evaluated, such as those used in cosmetic products.

These ingredients can produce anti-inflammatory effects (alpha-bisabolol, vit. E, calendula, shea butter, etc.), antipruritic (dexpanthenol, niacinamide, evening primrose oil), restoratives (rose hip oil, dexpanthenol, alpha- bisabolol, vit. E, omega 3, omega 6, allantonin, Asiatic pennywort, marigold, niacinamide, vit F, growth drivers, etc.), and hydrators (Aloe Vera, hyaluronic acid, Urea, etc.) but in some products irritants, sensitizers, endocrinic disruptors, CMR (carcinogens, mutagenic and toxic for the reproduction) and nanomaterials have been found that could be counterproductive in the oncological patient.

Fragrances are the most common cause of allergies in cosmetic products, followed by conservatives and hair dyes; but all of the components must be considered potentially sensitizing[8,9,10]. The sensitivity to fragrances refers to those both of a synthetic and natural origin. According to the SCCS report on essential oils, it hasn't been demonstrated, in the scientific literature reviewed, that the compounds of natural fragrances are safer than synthetic ones[11]. Neither do they justify that it might be possible to establish the concentration in which it would be improbable that sensitivity is induced by the fragrance[12].

A recent study on the presence and distribution of conservatives in more than a thousand products advised to prompt measures that lead to a restriction in the use of problem conservatives, and they consider that compiling cosmetic ingredients allows the creation of "prohibited" product lists for sensitive people[13].

The conservatives that are added to cosmetic products can cause the skin to become sensitized for the exposed user[20]. Cases of allergy to safe conservatives are increasingly frequent where they have made damaged skin more sensitive[14]. We must choose the least sensitizing conservatives with special attention to skin with an altered dermal barrier[15].

It should be highlighted that the term natural is not synonymous with innocuous, and that the extracts of many plants are chemically complex[16].

The cosmetic products are considered to be within the elements that can be exposed to humans and the endocrine disruptors[17,18]. These chemical substances are capable of altering the hormonal equilibrium and their exposition has been related to different endocrine disorders (obesity, diabetes, etc.), alterations in the reproductive functions and different types of cancer (breast, prostate, pancreas, brain)[17,19,20,21,22].

The European Union REACH (Registration, Evaluation, Authorization, and Restriction of Chemicals) considers that chemicals of endocrine alteration are products of a similar risk as substances classed as "high concern" or SVHC (Substances of Very High Concern).

In 2018 the UN published a list prepared by the commission of The International Panel on Chemical Pollution (IPCP) of 45 chemical substances that have been identified as chemical substances of endocrine alteration (EDC) or potential EDC (until the end of July 2017). In it are found substances that could be present in cosmetics, such as: triclosan, parabens, phthalates, sun filters (benzophenone-3 (Oxybenzone), 4-Metyhlbenzylidene camphor (4-MBC), Ethylhexyl methylcinnamate (Octinoxate,OMC).

The intrinsic photoprotection mechanisms of the skin can become diminished and be insufficient to prevent photoaging and photo photocarcinogenesis[23], making the skin of the oncological patient more vulnerable to sun exposure. The increased photosensitivy owing to treatments requires that the protection adequately covers the UVA spectrum, which causes the majority of the photosensitivity mechanisms, and the visible and infrared light because of the risk of hyperpigmentation[24].

Chemical solar filters can have photodegrading problems because of the action of sunlight. They can also cause the possibility of producing irritation and variable phototoxicity, presenting a higher risk of causing contact reactions compared with mineral screens[23,25]. For this reason there is a special risk of intolerance in sensitive skin after chemotherapy and/or radiotherapy.

EU legislation on the regulation of cosmetics establishes that they must be produced to the standards of best practice, which include an evaluation of safety for human health of the finished cosmetic product, before it is launched on the market. Even so, there are still concerns about the release and/or possible presence of trace contaminants during some manufacturing processes. For example, the CIR emphasized that the polymerization in benzene of carbomer and other acrolytes must be avoided[26] and limits the impurities of heavy metals present in zinc salts. The SCCS recommends using amines for cosmetics that aren't easily nitro sated and/or give rise to non-carcinogenic nitrosamines. Some

publications have found that residues of ethylene oxide remain after the manufacture of some cosmetics[18]. Many compounds have received favourable reports from expert commissions on the grounds that they are manufactured in concentrations and dosages as "non-irritant". The manufacturer must provide information if they are produced as non-irritant.
There are contradictory reports and studies[27] which has made it difficult to catalogue some ingredients.
Other ingredients have favourable reports when applied to healthy or intact skin or with sunburn, and these have been classed as apt. However because of their characteristics, such as size, it is not recommended to apply these on skin with an altered dermal barrier (nano titanium dioxide, nano zinc oxide), because of the risk of percutaneous absorption. The use of nano ZnO in cosmetic products must not imply a risk to the consumer in the absence of a substantial systemic exposure[28].

Conclusion

Oncological treatments can alter the functioning of the skin barrier, making it more permeable and sensitive to certain ingredients.
The terms of use of cosmetics can go further than hygiene purposes. Many of the ingredients of cosmetic products which are left on can accumulate with time and contribute to long term toxic effects which are hard to evaluate. The following composition recommendations are given for a cosmetic product for an oncological patient:

- It must not contain more ingredients than are strictly necessary. It must not contain substances (including impurities or traces) with the following properties: carcinogenic, mutagen, reproductively toxic properties (CMR), with disruptive endocrine activity, potentially allergic nor with criteria included in lists of substances subject to authorization. The legislation advises this for vulnerable people (children under three years old, the elderly, pregnant or breastfeeding women and people with altered immune responses).

- They must not contain substances under suspicion, which are included in credible lists such as VHCs (Very High Concern Chemicals) compiled by REACH. They must not contain substances which are being studied, as The Scientific Committee on Consumer Safety can take up to five years to emit judgements.

- Priority must be given to substances with reports compiled by expert commissions and which are supported in the scientific literature.

- Cosmetics destined for patients with skin diseases must have been clinically proved and have demonstrated a good tolerance profile.

- Studies are needed on absorption through skin with an altered dermal barrier.

- The production methodology must be of maximum security.

- Many new ingredients show highly allergenic properties with use and over time. For this reason, that the formulation of a cosmetic product aimed at altered skin should not only not contain potentially allergenic substances, but also contains those which have been proven to not be so.

- The evaluation of ingredients and the creation of lists must be open, reviewable, updateable and be subject to modifications according to judgements and evaluations published by expert commissions.

The oncological cosmetic criteria proposed by the authors of this work are the following:

1 **Low allerginicity**
Free of sensitising substances allergenics, fragrances, perfumes, some sun screens, conservatives and colorants, etc.)

2 **Free of irritants**
surfactants, acids, alcohols, formaldehydes, parabens, etc.)

3 **Free of endocrine disruptores**
(resorcinol, 4-cloro methylphenol, DEP or diethyl phthalate, benzophenone 1, Oxybenzone, 4-Methylbenzylidene Camphor, Octinoxate, Methylparaben, Butylparaben, Ethylparaben, Propylparaben, Triclosan, Homosalate, etc)

4 **With recomended physical and chemical sunscreens**
(Titanium Dioxide, Zinc Oxide, Drometrizole trisiloxane, etc.)

5 **With recomended active ingredients**
(Alpha bisabolol, Vit. E, calendula, shea butter, Dexpanthenol, niacinamide, evening primrose oil, rosehip oil, Alpha- bisabolol, Vit. E, Omega 3, Omega 6, Allantoin, Asian pennywort, Calendula, Niacinamide, Vit F, Aloe Vera, hyaluronic acid, Urea, etc.)

6 **Adequate dosage form**
(emulsions, lotions, pastes, ointments, cleansers without soap, etc.)

7 **Dermatologically tested**
(good tolerance profile tested and clinically proven in patients with skin diseases and oncological patients)

8 **Free from potentially toxic substances and carcinogens**
(octamethylcyclotetrasiloxane, nitrosamines, boric acid, phthalates, formaldehyde, etc.)

9 **Manufactured with a methodology of maximum safety**

10 **Adapted to every patient and situation**

Conflict of interests

The authors declare that they have no conflict of interests.

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