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Adverse effects of phototherapy: A review

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Abstract

It's very fortunate that skin diseases are treated and can be cured not only by the use of drugs but by applying the medicines topically and some therapies are very much effective. These therapies can be used after applying drugs and without drugs as well. Phototherapy is also an emerging branch of photobiology which are frequently used in treating various skin conditions. It now has become a popular way of treating various skin conditions like psoriasis, vitiligo and several types of dermatoses. Phototherapy which was started through natural means like sunlight in the treatment of vitiligo by Egyptians now has become advanced where several types of light of various wavelengths are being used to treat diseased skin conditions. After frequent and common use of these phototherapeutic options scientists have come across various adverse effects of phototherapy. So some protocols and SOPs have evolved for better outcomes and lesser side effects.

The common adverse effects encountered are sunburn, erythema, pruritus, dry skin, and various types of dermatoses. These side effects are very much common after applying photosensitizing drugs like psoralens. Besides these bad effects ocular and GIT-related side effects are also found. The most grievous adverse reactions are skin cancers which must be addressed. Here in this review, we are discussing some of them so as to avoid them and phototherapy can be used in a better way.

Keywords: Phototherapy, psoralens, sunburn, erythema, skin cancers

Introduction

Phototherapy or photobiology is an emerging and successful treatment modality. Photobiology is the science where the effects of UV Rays and visible light over the body are studied nowadays where nonionizing radiations, especially of the ultraviolet spectrum used to treat various diseases and skin disorders. In modern times light is used as a medicine in neonatal jaundice, cancers, sleep disorders, and mostly in skin disorders^[1].

As far as history is concerned skin color is usually not made the subject of thinking by philosophers and is overcome by myths rather than of facts. But still to have beautiful skin is of prime importance, especially in royal and elite societies^[2]. The 'light' as a treatment option used from more than 3500 years in Egypt as Ebers papyri recorded^[9]. Besides this Indian and Chinese medicine literature also describe the use of it where sunlight is used to treat patients of vitiligo. Actually, it was a form of photochemotherapy as various photosensitizing drugs like (*Atrilal*) *Ammi majus* and (*Babchi*) *Psoralea corylifolia* was used over the skin, and patients were asked to sit in the sunlight. Unani physicians commonly applied these drugs and used to ask the patients to sit in the sun which was the only means of phototherapy at that time. They found it helpful in treating these patients. Because of sunlight, it was termed 'heliotherapy'. In modern times Nils Ryberg Finsen (1860-1904) is a great name who founded modern phototherapy. He used an electric carbon arc torch which emits radiation of a particular wavelength in treating lupus vulgaris using ultraviolet radiation. Eventually, phototherapy using artificial light acquired importance in alleviating skin diseases. Later on, William Henry Goeckerman (1884-1954) applied an ultraviolet Blight to treat psoriasis successfully this regimen is still in use to treat psoriasis. In modern times the light of various wavelengths is used to diagnose skin disorders as well as for treatment. In recent years newer devices evolved for better use of phototherapy with lesser side effects nevertheless phototherapy is still not fully safe. Here we discuss the adverse effects caused by it^[4, 6, 18].

Modern uses of phototherapy and its adverse effects

The primary function of melanin is to protect the skin after blocking the free radicals which produce after UV exposure it is a protective phenomenon against photo damage and skin aging^[14]. Although the modern definitions of phototherapy include the use of low incident

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Light energy levels to achieve an athermal and atraumatic, but clinically useful, effect in tissue". But still, adverse effects cannot be excluded as the skin of large no. of patients may show a reaction to any amount of light energy and sometimes to achieve desired therapeutic effects skin is needed to expose to various wavelengths. There is a large no of skin disorders in which phototherapy is used successfully [5, 11].

Some scientists are so much emphasized careful photo therapy after applying photosensitizing drugs as it can cause severe phototoxicity severe burns and even death [12].

The side effects of phototherapy can be classified as acute and chronic side effects. The most commonly reported acute side effects are erythema, pruritus, and nausea. Acute side effects are usually moderate and transient and are mostly related to UV doses. Chronic side effects are accelerated skin aging, pigmentary changes, and increased risk of skin carcinoma [19]. UVA can also cause cancers besides photodamage. UVB exposure also exerts a negative impact on collagen synthesis resulting in wrinkle formation [13].

Erythema and Burn

Erythema and burning are the most common side effects of phototherapy. It can occur after treatment of any dose and length and can cause a variable degree of erythema. Erythema may be delayed (after 48-72 Hrs) in PUVA therapy. A variable degree of erythema and itching may occur or burning may also result especially in skin phototypes I & II [1, 3, 10, 15].

Sunburn

It's a very common phenomenon, especially in white races and skin phototypes I & II where melanin pigment is not so enough to go for protection from sun rays and other artificial radiations of various wavelengths. Sometimes clear demarcation can be made between sun-exposed and hidden areas as redness and edema are there on the skin in the former [8].

Pruritus

Pruritus is the commonest symptom associated with skin ailments. Phototherapy may also cause pruritus usually it caused by dryness after the therapy. Sometimes UV therapy is beneficial in pruritic conditions [1, 3, 7, 15].

Adverse effects in diseased patients

For example, Herpes simplex virus infection may get activated after phototherapy if the patient had a previous infection sometimes blisters may ensue after therapy as in psoriasis plaques but it can be easily managed by dose reduction and regimen changes. Flare-up of polymorphic light eruptions in some patients PML eruptions can get worse after phototherapy [1, 3, 15].

Sunburn

It is a result of the UV spectrum it may be acute or chronic for the short term it can cause photodamaging, and dry skin, and may also result in cancers like squamous cell carcinoma chronic use. So doses and ranges of wavelengths should be cautiously applied. These side effects can frequently be seen after 8-10 years, especially after photochemotherapy [1].

Photo ageing

Ageing is a normal process as it is a natural phenomenon that

occurs in every cell of the body. But in photoaging, the UVR or phototherapy occurs due to structural damage to the cell structures. The effects of which can be seen in the form of wrinkles, dryness, irregular patchy pigmentation, and telangiectasias besides this lentigines, keratosis and non-melanoma skin cancers may result after PUVA. Sometimes premature aging of the skin, and cataract formation may occur [1, 10].

Carcinogenesis

UVR exposure to the skin seems can induce skin cancer, especially after long-term therapies and excessive therapies. If low doses are applied squamous cell carcinoma can occur while on chronic exposure Basal cell carcinoma may be the effect. Some drugs may increase the risk of skin carcinoma severalfold that's why the use of phototherapy is contraindicated like systemic calcineurin inhibitors increase the risk of UV-induced cutaneous squamous cell carcinomas in all patients. Pruritus and pain usually pruritus complaints are from those patients who are taking treatment after applying photo-sensitizing chemicals like (Atrilal) *Ammi majus* or Babch (*Psoralea corylifolia*) [1, 8, 9, 16].

Photodermatoses

Several types of allergic dermatoses may result are common to people who have sensitive skin. Sometimes bizarre-shaped macular lesions are seen after phototoxicity [17].

Ophthalmic and Gastrointestinal side effects

This is more commonly noticed after PUVA as psoralens penetrate the ocular lens which binds with the protein in the lens. This may cause decreased lacrimation, conjunctival redness, and cataract also. It can be avoided by using protective sunglasses. Besides this GIT symptoms are also not uncommon usually encountered after chemophototherapy e.g. after PUVA common symptoms are nausea vomiting etc. [1, 3].

Conclusion

Here we can say that several types of phototherapy is needed for skin diseases which result in side effects that may be minimal or severe. Most of the side effects can be avoided by using protective measures like clothes, eye protection etc. some side effects can be minimized by adjusting the doses. As the field is new so more studies are needed for effective therapy and lesser side effects.

Conflict of Interest

Not available

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