Faculty of Clinical and Industrial Pharmacy
Dermatology Course
Semester 8

Photosensitivity, Photoaging and Sunburns

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Learning Objectives

• Study the pathophysiology of photosensitivity disorders.

• Discuss photosensitivity disorders, and their management.

• Discuss photoprotection and sunscreen types.

• Study sunburn and how to manage sunburn.

• Discuss photoaging and its treatment.
Contents

• Introduction.
• Pathophysiology of photosensitivity disorders.
• Photosensitivity and photoprotection.
• Photoaging.
• Phototoxicity and photoallergy.
• Treatment of photosensitivity disorders.
Photosensitivity disorders of the skin are conditions in which an abnormal cutaneous response occurs after exposure to ultraviolet radiation (UVR) or visible light.
Introduction

- UVR is divided into four categories on the basis of wavelength:
  - UVA 1
  - UVA 2
  - UVB
  - UVC

- UVB is the most erythemogenic and melanogenic.
Introduction

- The most common photosensitivity disorders are:

1. Sunburn.
2. Phototoxicity, and photoallergy.
3. Photoaging.
Pathophysiology
Pathophysiology
Erythema and Oxygen Free Radicals

- Excessive exposure of the epidermal and dermal layers of the skin to UVR can result in an inflammatory erythematous reaction.
Pathophysiology
Erythema and Oxygen Free Radicals

- The dermis also may be damaged when endogenous components of the skin absorb UVR energy and subsequently interact with oxygen to form tissue-damaging oxygen free radicals.
Sunburn

- The skin undergoes adaptive changes in response to UVR exposure.

- When keratinocytes in the epidermis are damaged and lose their typical organization, both the epidermis and the stratum corneum thicken and attempt to serve as a barrier to UVR, particularly to UVB.
Sunburn (cont)

- The skin’s normal protective immune response, however, is altered with exposure to UVR.

- Proteolytic enzymes that are produced from low-dose UVR exposure, cause degradation of collagen and elastin in the dermal matrix.
Skin Tanning

• Tanning is a process whereby skin colour is darkened or tanned.

• Tanning is an adaptive mechanism of the skin to UVR.

• It is mediated primarily by melanocytes.
Skin Tanning (cont)

- Tanning occurs by two different mechanisms:
  1. Immediate pigment darkening (Meirowsky phenomenon).
  2. Delayed tanning (occurs 48 to 72 hours after exposure).
Photocarcinogenesis

• UV exposure can cause:

1. Squamous Cell and Basal Cell Carcinoma.
2. Cutaneous Malignant Malignant Melanoma.
Photoeffects on the eye

• Exposure to UV radiation can cause many types of ocular adverse effects including cataracts, conjunctival degeneration and proliferation, as well as squamous cell carcinoma of the cornea and conjunctiva.
PHOTOTOXICITY AND PHOTOALLERGY

- Phototoxicity and photoallergy are often drug- or chemical-induced reactions to UVR exposure and account for up to 8% of adverse drug reactions.
Phototoxicity

- **Phototoxicity** is the most common type of drug-induced photosensitivity reaction.

- **Common drug classes known to be phototoxic include:** fluoroquinolone, tetracycline, sulfonamide antibiotics, amiodarone, diuretics, sulfonylureas, NSAIDs.
Phototoxicity (cont)

- Usually has a **rapid onset** (often within several hours after UVR exposure) and presents as exaggerated or intensified sunburn with erythema, pain, prickling, or burning on UVR-exposed areas.
Photoallergy

• Photoallergy results from a similar mechanism to phototoxicity, except that the immune system is involved.

• It produces an intensely pruritic, eczematous form of dermatitis.
Photoprotection

- Photoprotection encompasses all methods of UVR blocking, including sunscreens, protective clothing, and sunglasses.
- Sunscreens are widely used to prevent sunburn and reduce the incidence of premature aging and carcinogenesis.
Patient Assessment

- Patient assessment should include determination of the patient’s skin type.
- People with blond, red, or light brown hair or blue or green eyes tend to have greater skin reactivity to sunlight than do people with darker colored hair or eyes.
Patient Assessment (cont)

- Patients can be classified into six sun-reactive skin types on the basis of their response to initial sun exposure, skin color, tendency to sunburn, ability to tan, and personal history of sunburn.

- According to the skin type, the sunscreen SPF is selected.
<table>
<thead>
<tr>
<th>Complexion</th>
<th>Skin Type</th>
<th>Skin Characteristics</th>
<th>Suggested Product SPF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very fair</td>
<td>I</td>
<td>Always burns easily; never tans</td>
<td>20–30</td>
</tr>
<tr>
<td>Fair</td>
<td>II</td>
<td>Always burns easily; tans minimally</td>
<td>15–20</td>
</tr>
<tr>
<td>Light</td>
<td>III</td>
<td>Burns moderately; tans gradually</td>
<td>10–15</td>
</tr>
<tr>
<td>Medium</td>
<td>IV</td>
<td>Burns minimally; always tans well</td>
<td>8–10</td>
</tr>
<tr>
<td>Dark</td>
<td>V</td>
<td>Rarely burns; tans profusely</td>
<td>8</td>
</tr>
<tr>
<td>Very dark</td>
<td>VI</td>
<td>Never burns; deeply pigmented</td>
<td>8</td>
</tr>
</tbody>
</table>

SPF, sun protection factor.
Risk Factors

- Risks for development of long-term effects of UVR include: congenital pigmentation (skin type, hair color, and eye color), excessive sun exposure (especially in early childhood), history of frequent sunburn or intermittent high-intensity exposures, a large number of moles, and positive family history.
Treatment

• Appropriate use of sunscreens or other photoprotective behaviors (e.g., protective clothing, sunglasses) can help mitigate the incidence of adverse effects from UVR.

• Although sunscreens are widely used to prevent sunburn and prevent premature aging, clothing and avoiding direct sunlight offer the best protection.
Sunscreens types

- Meradimate
- Benzophenones
- Cinnamates
- Dibenzoylmethanes
- Aminobenzoic Acid and Ester Derivative
- Salicylates
- Camphor derivatives
- Physical Sunscreens (Titanium Dioxide, Zinc Oxide)
Instructions on how to apply the sunscreen

- Apply it 30 minutes before exposure.
- It is best to reapply the sunscreen every 1 to 2 hours or after sweating, swimming, or toweling off.
Sunburn

- Sunburn is a self-limiting condition, which is generally managed with symptomatic treatment.

• **Medical care should be sought when:**

  1. Sunburn is accompanied by constitutional symptoms (fever, chills, nausea, vomiting),
  2. Infection is present
  3. There is a second- or third-degree burn.
Sunburn (cont)

• **Prevention** through the use of sunscreen or other photoprotection (clothing, sunglasses) is important.

• **Sun protection in early childhood is essential**, as most of a person’s lifetime sun exposure occurs in childhood and the harmful effects of UVR are cumulative.

• Protective clothing is rated by the ultraviolet protection.
Treatment of sunburn includes

- **Symptom management** with oral (e.g., ibuprofen, aspirin) or topical (e.g., camphor, menthol) analgesics.

- **Topical anti-inflammatory agents** (e.g., hydrocortisone cream, aloe vera gel)

- **Cooling compresses.**

- **Topical anesthetics** (e.g., benzocaine, lidocaine) provide only transient analgesia for up to 45 minutes.
Sun safety
Protect yourself while playing at the beach.

- Apply waterproof sunscreen.
- Play in the shade during the hottest periods of the day between 10 a.m. and 4 p.m.
- Wear sunglasses to protect your eyes from the sun’s harmful ultraviolet rays.
- Stay cool and covered with a wide-brimmed hat.
- Drink water to stay hydrated.
Phototoxicity/Photoallergy Management

• General management includes removal of exposure to the potential photosensitizer and reduced exposure to the sun.
Photoaging

• Photodamaged skin is characterized as being wrinkled, yellowed, and sagging.

• It is important that they are recognized as real medical problems, not just cosmetic or aesthetic concerns.
Risk factors for photoaging

1. Advancing age,
2. Fair skin,
3. Male gender,
4. High sun exposure,
5. Smoking.
Photoaging Treatment

• **Topical retinoid therapy** for patients 50 to 70 years of age with moderate to severe photoaging may partially reverse some of the clinical and histological changes seen.
Topical retinoid therapy

• Tretinoin and tazarotene are the only two topical retinoids FDA approved for the treatment of photoaging.

• Moisturizing is important when using retinoid therapy.
Thank you