**Ultraviolet Light in Medicine**

**Concepts you will learn:**

 In this Chapter, we will be exploring the field of dermatology. More specifically, we will look at how UVA and UVB Phototherapy can be used to treat certain skin diseases. You will learn distinguishing characteristics of UVA and UVB rays and phototherapy treatment. You will also learn about the treatment process for a patient using these methods.

**What are ultraviolet (UV) rays?**

 Ultraviolet rays are invisible to our eyes. We feel them as heat from the sunlight. These rays are what cause sunburn when we are outdoors for too long without any sun protectant. Ultraviolet rays come in two forms: UVA and UVB. Ultraviolet A (UVA) rays have longer wavelengths that can penetrate skin and cause you to tan. Ultraviolet B (UVB) rays have a short wavelength that can only penetrate the superficial layers of the skin. This leads to sunburn.

**So, what is UVB Phototherapy?**

 UVB Phototherapy is a medical treatment for skin eruptions using artificial ultraviolet light. UVB rays are part of the components from the sun that causes sunburn. They can be utilized in a medical setting to treat certain skin diseases. This therapy works by using special light bulbs that can emit UVB radiation. A patient will expose an area needing treatment such as psoriasis on their arm to the light for a specific amount of time as directed by their dermatologist. A dermatologist is a doctor that specializes in treating skin related conditions.

**Why do we use UVB instead of UVA for phototherapy?**

Doctors tend to choose to treat their patients using UVB instead of UVA because it can be used on its own. With UVA, a plant-derived chemical called psoralen must be used to sensitize the skin in order for the UVA rays to work. Psoralen is a chemical compound derived from plants that inhibits DNA synthesis and cell division by crosslinking the DNA which then prevents DNA from replicating. This type of treatment using UVA is referred to as PUVA (Psoralen Ultraviolet A)

**How does Phototherapy actually work?**

Phototherapy works in two ways depending on which type is used. UVB phototherapy works by stopping the overproduction of skin cells by damaging their DNA. PUVA phototherapy works by preventing the skin cells from dividing by locking the DNA in place. Additionally, this treatment works by suppressing the immune system.

**So how does PUVA and PUVB Phototherapy treatment work?**

First, we need to understand a few things about the diseases it treats. For most skin diseases, they are caused by an overstimulation of the immune system. For example, eczema is seen as itchy inflammation of the skin. Below the surface of the skin, the immune system is being overstimulated by some trigger such as an allergen. Now, to treat this type of disorder the overstimulation of the immune system must be stopped and regulated to a normal level. UVB Phototherapy’s role in this is that it influences the body by shutting off the immune cells in the skin.

**What does this type of treatment look like to a patient?**

 A patient would do this type of therapy three times a week until they have done somewhere between 20 and 30 treatments. The treatments start with a small amount of exposure. A patient would expose the affected skin area to the UVB light for 15-30 seconds during the first treatment and increase exposure time by 15 seconds after each treatment. Non-affected areas are covered during treatment. The exposed skin can redden in a similar manner to a sunburn after the treatment. The skin should return back to normal a few hours after each treatment. The treatments are given gradually to prevent burning the skin and to allow the skin to acclimate to the treatments. The goal of UVB Phototherapy is to reduce the severity of the skin disease or push it into remission depending on the severity.

**When is Phototherapy used?**

 Phototherapy is a second line treatment. This means that it is used only after a first line treatment such as a steroid cream or other prescription was used first and was unsuccessful at relieving the symptoms of the illness.

**What are the risks involved with this therapy?**

 The main risk of UV phototherapy is that it makes the skin sensitive to the sun, increasing the risk of skin cancer. Also, protective eyewear is required to protect the eyes from the radiation. UV radiation can damage the eyes if contact is made directly for a period of time. A side effect of this treatment is dry skin. The severity may vary from case to case. This treatment has been around for a long time; however, the machines used are advancing as technology grows. Depending on the type of machine used for the therapy a patient could have nothing else to worry about aside from treatment or undergo a rigorous regimen of skincare. Some treatments require the patient to take medications or to use creams to help it be more effective. A patient is highly sensitive to the sun so they must wear protective clothing outdoors.

**What diseases can be treated with UV Phototherapy?**

There are a wide range of diseases that can benefit from UV Phototherapy such as psoriasis, atopic dermatitis, vitiligo, and mycosis fungoides. Psoriasis is a skin disease characterized by chronic inflammation. It appears as red plaques on the skin. It can be itchy or painful. Atopic dermatitis also known as eczema is an intense itchy rash that can be triggered by allergens and other triggers. Vitiligo is a pigment disorder of the skin, where the skin lacks pigments causing discoloration of the skin. Mycosis fungoides in a type of lymphoma where the T-cells within the immune system turn cancerous and attacks the skin, organs, and various tissues.

**Key Terminology & Concepts:**

Phototherapy is a prescription treatment that using UVB or UVA radiation to treat diseases on the skins surface.

UVA is a type of radiation that comes from the sun and leads to the tanning of the skin. It has a long wavelength that can penetrate deep into the skin.

UVB is a type of radiation with a short wavelength that can only penetrate the superficial layers of the skin. This leads to sunburns on the surface of the skin.

**Sources:**

Phototherapy: UVB - American Osteopathic College Of Dermatology (AOCD)." Aocd.org. N.p., 2018. Web. 3 Apr. 2018.

Treating Psoriasis: Light Therapy And Phototherapy | National Psoriasis Foundation." Psoriasis.org. N.p., 2018. Web. 3 Apr. 2018.

Krutmann, Jean, and Akimichi Morita. "Mechanisms Of Ultraviolet (UV) B And UVA Phototherapy." Journal of Investigative Dermatology Symposium Proceedings 4.1 (1999): 70-72. Web.

"Psoralen." Pubchem.ncbi.nlm.nih.gov. N.p., 2018. Web. 3 Apr. 2018.

“Psoralen Plus Ultraviolet Light Therapy (PUVA) For Atopic Dermatitis." WebMD. N.p., 2018. Web. 3 Apr. 2018.

Mycosis Fungoides (Including Sézary Syndrome) Treatment." National Cancer Institute. N.p., 2018. Web. 3 Apr. 2018.

Vangipuram, R, and SR Feldman. "Ultraviolet Phototherapy For Cutaneous Diseases: A Concise Review." Wiley Online Library. N.p., 2018. Print.