

2005 CE Series - Lesson Seven

Burns and Their Treatment

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Goals and Objectives

Goals: To provide the pharmacist with information regarding burn injuries and discuss the major role of the pharmacist in the treatment of burns.

Objectives: After completing this article, the pharmacist should be able to:

1. Recognize the various types of burns.
2. Discuss the classification and sources of burns.
3. Assess burn injuries.
4. Counsel patients with regard to the appropriate therapeutic approach for a burn injury.

There are more than two million burn accidents in the USA each year. These result in more than two million days spent in hospitals by 100,000 or about five percent of individuals involved. Although this is a large number of individuals, 95 percent of the problems associated with burns require outpatient therapy or are self-limiting and self-treatable.

The majority of injuries associated with burns occur in the home or from industrial accidents. More than 75% of these injuries occur in individuals under 17 years of age. Burns are also more common in members of the lower socioeconomic groups and in rural areas where fireplaces and/or space heaters provide heat.

Fortunately, severe injuries and deaths from burns have been reduced over the last several decades as a result of improved safety standards in many areas (i.e., housing, clothing) and better therapy

Classification of Burns

Burns are usually classified and evaluated on the basis of the depth of penetration of the burn into the skin and the area of the body involved. The extent of the burn is usually expressed as a percentage of the total area of the body surface. The most rapid method of estimating the percentage of body surface involved is the Rule of Nines.

The body is divided into eleven areas with each area representing about 9% of the total as follows:

Head & Neck	9%
Anterior Trunk	18%
Posterior Trunk	18%
Each Arm & Hand	9%
Each Leg & Foot	18%

Figure 1 demonstrates this distribution. These figures are accurate for adults, but are not as good for infants and children who have different body surface distributions. Table 1 provides a list of the percent of body surface area of various body parts at several ages.

Classifying the depth of a burn is usually a clinical judgement based primarily on experience. In general, first degree burns are superficial injuries involving only the epidermis. These burns are usually associated with hot water scalds and sunburn. Complete healing usually occurs within two weeks. Second degree burns extend through the epidermis into the underlying dermis. Blisters occur and the healing process is dependent on the depth of penetration. Thermal injury extending through the full skin thickness is a third degree burn. There are no blisters, but the skin produces a dry, leathery, inelastic coagulum called an eschar. Skin grafting is often required. Burns may also be classified by their severity. Minor burns include second degree burns of less than 15% of the body surface or third degree burns of less than 2% of the body surface. These can usually be treated without hospitalization. Moderate burns consist of second degree burns of from 15% to 25% of the body surface or third degree burns of less than 10% of the body surface excluding hands, face and/or feet. These burns require hospitalization. Severe burns consist of second degree burns of over 30% of the body surface or third degree burns of the face, hands and/or feet or over 10% of the body surface. These burns require therapy at a center equipped to provide specialized care for burn injuries.

Char burns or fourth degree burns affect the entire skin thickness and underlying subcutaneous area. These may result in infection, have a black or char-like appearance, are very painful, and require a minimum of a month to heal.

Evaluation of Burns

The pharmacist is often the initial health professional consulted regarding burns. Consequently, it is important that the pharmacist make an accurate assessment of the patient and the injury to determine whether the burn is amenable to self-treatment.

In order to provide the appropriate consultation, the pharmacist should determine the cause of the burn and when it occurred. Burns which effect less than two percent of the body surface are usually self treatable. However, burns of the eye, genitalia, and perineum should be evaluated by a physician. In addition, patients with chronic diseases (i.e., diabetes mellitus) usually do not tolerate burn trauma very well. In most instances, the very young as well as the elderly should be referred to a physician because their response to burn trauma is poor.

Most burns are self-limiting, while many others may appear to be inconsequential. However, the pharmacist must be aware that the skin functions as a protective barrier for the underlying body structures. It accounts for one-sixth of the body weight and accommodates approximately 30% of the circulating blood. The skin regulates temperature, provides secretion and sensation functions,

and has a constant interchange of fluid and electrolytes between blood and its components. If the integrity of this protective barrier is destroyed, many problems will be encountered.

Therefore, the primary role of the pharmacist with regard to burns and their treatment is to make appropriate recommendations with regard to therapy for minor burns and referral to physicians for other types of burns.

Major Sources of Burns

An important component of burn therapy is the initial treatment, which may be dependent on the type of burn.

Inflammation resulting from thermal burns can often be impeded by cold water. The cold water appears to lower skin temperature which results in reduced capillary engorgement and loss of fluid. In general, this reduction in temperature facilitated by cold water slows body processes. Therefore, the burned area should be immersed immediately in cold tap water. The burned area should be soaked until it is free of pain in and out of the water.

Chemical burns require similar attention. The clothing should be removed from the affected area. Large amounts of water should be used on the burned area. Acids should be washed for a minimum of 15 minutes, while alkalis should be treated until the skin no longer feels soapy. Chemical burns to the eyes require specific attention. If involved, the eyes should be washed immediately and irrigated with tepid water for approximately 20 minutes. The eyelid should be pulled apart gently while irrigating the eye from the nasal corner to the outer corner. The face and eyelids should also be washed, but care must be taken to avoid further chemical injury to the eye.

Sunburn is the most common of burn injuries encountered. Sunlight includes radiation with wavelengths ranging from 2,900 to 18,500 Angstroms, but only ultraviolet radiation of less than 3,000 Angstroms can produce sunburn. In general, sunburn is usually a minor problem. However, pain and blistering can result from excessive exposure to ultraviolet radiation. If the affected area is large, gastrointestinal effects, chills, malaise, and fever can occur.

Sunburn is most common in the summer months. The sunlight is most intense between 10 a.m. and 2 p.m. because in this position the rays have a shorter distance to traverse through the stratosphere. Direct exposure to the ultraviolet rays is not essential for burning to occur. Reflection from water, sand, and/or shiny surfaces can cause sunburn effects. Individual variation occurs with regard to sunburn. Fair skinned individuals burn more readily than darker complexioned persons. The very young as well as older individuals are often more susceptible to sunburn.

A component of sunburn is photosensitivity. A photosensitivity reaction should be considered in a patient who experiences sunburn in greater amounts than would be expected from ultraviolet light exposure or other skin problems (i.e., rash). In some instances, these may be associated with drugs and are probably attributed to an antigen-antibody relationship or a delayed hypersensitivity reaction. The reactions vary in onset, type and duration and have been reported with a variety of drugs that represent many classes.

In the case of drug photosensitivity, the offending agent must be determined in order to alleviate the problem.

Treatment of Minor Burns

Unlike most moderate and all severe burns, minor burns are often self-limiting and self-treated. Although the pharmacist may be asked to provide information regarding treatment or refer the patient to an appropriate source for treatment of moderate or severe burns, primary treatment of minor burns will most frequently be a role for the pharmacist.

The important goals for treating minor first and second degree burns are relieving the pain associated with the burn, protecting the area from air and preventing dryness and providing a favorable environment for healing that minimizes the chances of infection. The area should be appropriately cleaned after using cold water to relieve the pain and impede progression.

In some instances, sterile, non-adherent dressings can be used to treat a small burn on an area that is easily bandaged. When these types of dressings are employed, they should be changed after 48 hours. If the burn is weeping, then dressings must be changed more often and soaking the burn several times a day may provide a soothing effect and reduce weeping.

Many minor burns heal without pharmacologic intervention. The primary use of drug therapy is to make the patient comfortable and allow the burn to heal. Third and fourth degree burns should not be treated. Individuals with these burns should be referred to the appropriate health professional(s) (i.e., hospital, physician). Pharmacologic treatment of these burns may delay needed attention in terms of time and the material employed may often need to be removed prior to initiating proper therapy.

Skin protectants are used to treat minor burns by making the wound area more comfortable and providing a barrier for the burned area. This barrier protects the burned area from mechanical irritation as well as prevents drying of the stratum corneum. However, this does not block the normal burn processes. Substances that are in this category include allantoin, cocoa butter, zinc oxide, calamine, and petrolatum.

Local anesthetics are useful for short term relief of pain associated with minor burns. The local anesthetics consist of the esters (i.e., benzoaine, tetracaine), antihistamines (i.e., diphenhydramine, tripeleminamine), amides (i.e., lidocaine, dibucaine), and the products (i.e., benzyl alcohol) which are not related to the other groups. There are advantages and disadvantages with each group. The antihistamines have only weak local anesthetic activity and may cause irritation. There is usually a high incidence of local sensitization with the esters, but they rarely cause any systemic toxicities which could occur with open skin lesions. The amide compounds have a very low incidence of sensitization, but may cause systemic adverse effects, especially if employed for prolonged periods of time and/or over a large area. In order for local anesthetics to be effective, they must penetrate the skin. The extent of damage to the skin may be the primary measure of effectiveness for the product. For example, intact skin will not respond in many cases, while severely damaged skin may only require a minimum concentration of local anesthetic because the drug can readily penetrate the burned area. Local anesthetics should be used in the lowest effective concentration (u.e.m. benzocaine 5-20%, lidocaine 0.5-4%) and should not be applied more than 3 or 4 times daily. These products will not continuously relieve pain and should be used when pain is particularly unpleasant (i.e., bedtime).

An alternative to local anesthetics is topical hydrocortisone. When employed as directed in appropriate concentrations, it is safe and effective in treating mild burns.

A major concern is infection secondary to the burn. Although the burn process itself results in a sterile area for a brief period, infections occur with all forms of microorganisms soon after the burn occurs.

Antimicrobials in soaps, skin antiseptics, cleansers and protectants are used in treating infections which may be associated with minor burns. There are many products which can be used. These include antibiotics (i.e., bacitracin, neomycin, polymyxin), antiseptics (i.e., providone - iodine), and protectants (i.e., benzalkonium chloride).

Summary

After an assessment of the burn is determined and a decision is made to recommend therapy, the pharmacist can provide appropriate consultation. The burned area should have been cooled and cleansed. If the area is small and easily bandaged, then the pharmacist should recommend a nonstick type gauze or bandage with a protectant (i.e., petrolatum).

A variety of dosage forms are available, if pharmacologic intervention is warranted. Ointments, creams and lotions are most often used. Ointments have the advantage of providing the best protection, but are usually difficult to apply and remove. Creams are easier to apply but usually provide less protection. Lotions provide protection and are easier to apply, but frequently cause more drying of the area than desired.

To treat the pain related to minor burns, there are various topical products containing local anesthetics. In addition, aspirin or acetaminophen can be used. In theory, the anti-inflammatory and inhibition of prostaglandin synthesis effects of aspirin should provide greater benefit. However, this has not been demonstrated. In general, the pharmacist must counsel all burn patients to consult a physician, if the condition has not improved within a week.

Bibliography

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Table 1

Percent Surface Area of Body Parts At Various Stages

Surface	Birth	5	15	Adult
Head	19	13	9	7
Neck	2	2	2	2
Anterior Trunk	13	13	13	13
Posterior Trunk	13	13	13	13
Buttocks	5	5	5	5

Genitalia	1	1	1	1
Upper Arms	8	8	8	8
Forearms	6	6	6	6
Hands	5	5	5	5
Thighs	11	16	18	19
Legs	10	11	13	14
Feet	7	7	7	7

Table 2
Examples of Nonprescription Burn Treatments

Americaine
 Bactine
 Betadine
 Dermoplast
 Foille
 Lanacane
 Lavacol
 Neosporin
 Nupercainal
 Pontocaine
 Polysporin
 Solarcaine
 Unguentine
 Xylocaine

Table 3
Some Drugs That Have Been Implicated in Photosensitivity

Demeclocycline
 Nalidixic Acid
 Coal Tar
 Methoxsalen
 Trioxsalen
 Bergamot Oil
 Chlorheptadine
 Chlorpromazine
 Hexachlorophene
 Furosemide
 Oral Contraceptives
 Tetracycline

Sulfisoxazole
Hydrochlorothiazide
Tolbutamide
Desipramine