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## Modern Surgery - Chapter 30. Burns and Scalds

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## XXX. BURNS AND SCALDS.

BURNS and scalds are injuries due to the action of caloric. Scalds are due to heated fluids or vapors. There is no true pathological difference between burns and scalds. Dupuytren classifies burns into six degrees, as follows: (1) characterized by erythema; (2) characterized by dermatitis with the formation of vesicles; (3) characterized by partial destruction of the skin, which structure is not, however, entirely burnt through; (4) characterized by destruction of the skin to the subcutaneous tissue; (5) characterized by destruction of all superficial structures and of part of the muscular layer; (6) characterized by "carbonization" of the whole thickness of the muscles.

The **symptoms** of a severe burn are local and constitutional. *Local symptoms* are pain and inflammation, which vary in nature, in intensity, or in degree according to the extent of tissue-damage. *Constitutional symptoms* are very weak pulse, shallow respiration, and subnormal temperature,—in other words, the condition of shock exists. The patient may die without reacting from shock, but in most cases there is reaction, followed by a severe reactionary fever, with a strong tendency to congestion of internal parts. During the existence of fever there may be vomiting, diarrhea, hemoglobinuria, albuminuria, and enlargement of the liver, spleen, lymph-glands, and tonsils. The symptomatic stages are often designated as *prostration, reaction, and suppuration*. During the first forty-eight hours after a burn there is congestion in and about the burned area—severe pain and possibly internal congestions. There may be shock and possibly toxic delirium or convulsions. From the end of the second to the end of the eighth or ninth day there is severe inflammation of the burnt area, formation of sloughs, and a strong tendency to inflammation of the brain in head burns, of the lungs in chest burns, of the abdominal organs in abdominal burns, and of duodenal inflammation in any burns. Duodenal inflammation may result in Curling's ulcer. Duodenitis and Curling's ulcer are probably due, as Wm. Hunter suggested, to the bile having become irritant by the excretion in it of toxic matter ("A Manual of Surgical Treatment," by W. Watson Cheyne and F. F. Burghard). After the eighth or ninth day the sloughs separate and healing begins. The raw surface is slow to heal, hemorrhages may occur, the granulations are apt to be exuberant and edematous, and the scars are very contractile and often produce hideous or disabling deformity. If over one-half of the body-surface is badly burnt, death will almost certainly occur, and probably within two days. The danger of a burn depends upon its extent, its depth, and its situation. Burning of a large area superficially is much more dangerous than burning a small area deeply. Burns of the extremities are not so dangerous as are burns of the head, chest, or abdomen. Death after severe burns is positively not due to loss of body-heat in the burnt area. Some think it is produced by autointoxication with retained body-secretions. High temperature produces blood-changes,—viz., disintegration of red corpuscles. Thrombosis may occur, and irritation of the kidneys and other organs is produced by "products of corpuscular degeneration." \*

The blood of burned animals contains toxins (Kijanitzen), and so does

\* Bardeen, in Johns Hopkins Hospital Bulletin, April, 1897.

the urine (Reis). It seems probable that the constitutional symptoms and death, if it occurs, are due partly to corpuscular disorganization, and partly to the absorption of toxic matter from the seat of injury, this matter having been formed by the action of heat on the body-cells and fluids. Sepsis is not infrequent. Death may be directly due to shock, to sepsis, to exhaustion, to embolism or thrombosis, to congestion of the brain, lungs, or kidneys, or to Curling's ulcer of the duodenum.

**Treatment.**—The *local treatment* of slight burns (as sunburn) is to moisten the parts frequently with a saturated solution of bicarbonate of sodium, or a 1:8 solution of phénol sodique. In burns of moderate degree a mixture of zinc ointment with iodoform, though not antiseptic, is a comfortable dressing.

If a large surface is burnt, remove the clothing with great care, and before applying dressings, give a hypodermatic injection of morphin, administer stimulants, and if the patient has a chill place him in a warm bath. Use all ordinary means to secure reaction from shock. If we desire to dress a large burn aseptically, anesthetize the patient, spray the burnt area with peroxid of hydrogen, irrigate it with a solution of boric acid, dry with sterile cotton, dust with Senn's powder (three parts of boric acid and one part of salicylic acid), and dress with salicylated cotton. Senn's powder is better than iodoform. Iodoform may allay pain, but is apt to produce dermatitis. Change the dressing no oftener than is required, and at each change proceed as above described, although it will not be necessary to anesthetize. Peroxid of hydrogen softens and loosens the dressings, and they can be readily removed. The custom in the Jefferson Medical College Hospital is to give morphin and stimulants, to cut away the clothing, to wrap the unburnt parts with blankets, and place about them cans or bags of hot water. The burnt region is sprayed with peroxid of hydrogen contained in an atomizer, and irrigated with salt solution. Portions of epidermis which remain are retained. Any blisters are opened with a sterile needle, and the part is dressed with several layers of sterile lint or tarlatan soaked in normal salt solution, and the dressing is kept moist. During the second or inflammatory stage use stimulants and concentrated food, allay pain by opium or morphin, favor elimination by the skin, bowels, and kidneys, and combat any tendency to internal congestion or inflammation.

The picric acid treatment, first suggested by Thiery, has many advocates. It greatly mitigates the pain. It is used early only in limited burns of the first and second degrees, but it can be employed in late stages of deep burns to stimulate the formation of epidermis. If used early in a large or a deep burn, it may poison the patient (may produce carboloria). The part should be disinfected, gauze saturated with a 1 per cent. watery solution of picric acid should be laid upon the burnt area, and be covered with absorbent cotton and a bandage. This dressing is not changed for three to five days, and the next dressing can be left in place until the burn is healed. D'Arcy Power has carefully studied the real status of picric acid as a remedy for burns, and some of his conclusions have been set forth above.

Périer dresses a burn with a tarlatan compress, folded six times and soaked in the following solution: boric acid, ʒijss; antipyrin, ʒjss; sterile water, ʒviiij. The following ointment is used by Reclus: iodoform, gr. xv; antipyrin, gr. lxxv; boric acid, gr. lxxv; vaselin, ʒjss.

Carron oil consists of equal parts of linseed oil and lime-water. It allays the pain of a burn, but it is a filthy preparation, and its use is followed by much pus-formation. Cosmolin gives comfort as a dressing, but should not be used on the face lest it cause pigmentation. The elder Gross used lead paint. A solution of nitrate of potassium allays the pain. Where extensive destruction of tissue has taken place use splints and extension to limit contractures, and skin-graft as soon as possible. If granulation is slow, stimulate with copper sulphate or mild silver-nitrate solutions. Exuberant granulations require burning down. Flabby granulations require pressure. If healing is slow, or if the burn is extensive, skin-graft. When an extremity has been carbonized amputation must be performed. The *constitutional treatment* is to bring about reaction; combat pain with opium; and keep the bowels and kidneys active. If suppuration occurs, give tonics, stimulants, and concentrated foods. Complications are treated according to general rules.

**Burns and Scalds of the Tongue, Pharynx, Glottis, and Epiglottis.**—A child or lunatic may drink boiling fluid or inhale steam from a tea-kettle. Firemen occasionally suffer from scalds of the tongue and pharynx after being suddenly enveloped in a cloud of hot steam, and from burns by the inhalation of hot vapor or flame. Caustic may be taken into the mouth or swallowed. The tongue and pharyngeal mucous membrane swell greatly, large vesicles form, there are shock, severe pain, dysphagia, and dyspnea. Edema of the glottis may arise.

**Treatment.**—Combat shock; give morphin for pain; puncture vesicles, and have the patient almost constantly suck bits of ice. If great swelling occurs, make multiple longitudinal incisions through the mucous membrane of the dorsum of the tongue. If edema of the glottis begins, scarify it. If this fails, perform intubation or tracheotomy.

**Burns of the Esophagus.**—The esophagus is seldom scalded, as a boiling fluid rarely gets below the pharynx. The swallowing of an acid or alkali produces severe burns at the constricted portions of the gullet (page 687). Such an accident produces shock, dyspnea, violent pain, vomiting of blood, and thirst. Death may occur from shock or perforation of the stomach. In many cases severe gastritis follows a burn of the esophagus. As the acute symptoms of a burn of the gullet gradually abate, sloughs are cast off, ulcers form, cicatrization begins, and the signs of stricture develop (page 687).

**Treatment.**—Give a remedy to neutralize the caustic. Administer several large draughts of water and wash out the stomach. Combat shock. Give morphin for pain. Feed by the rectum as long as the patient's strength does not begin to fail. On beginning mouth-feeding, use at first milk and then beef-juice, jelly, and ice-cream. In from two to four weeks after the infliction of the burn begin the use of bougies to limit contraction.

**Effects of Cold.**—*Local Effects.*—Cold produces numbness, pricking, a feeling of weight, redness of the surface followed by stiffness, local insensibility, and mottling or pallor. Sudden intense cold causes the formation of blebs, the coagulation of blood in the superficial veins, and violent pain in the limb. Cold locally produces frost-bite (page 149).

The *constitutional effects* of cold are at first stimulating, then depressing, and are exhibited by uneasiness, pain, and an intense drowsiness which, if yielded to, is the road to death by way of internal congestion. Death from prolonged cold resembles in appearance death from apoplexy. Death from sudden and overwhelming cold is caused by anemia of the brain from weak circulation and capillary embolism. To bring a partly frozen person into a warm room may cause death by embolism.

**Treatment.**—Frost-bite is treated as outlined on page 149. When a person is nearly frozen to death place him in a *cool* room, but under no circumstance in a cold bath; make artificial respiration, rub him briskly with flannel soaked in alcohol or in whiskey, and follow this by rubbing with dry hands. After a time wrap the patient in warm blankets and give an enema of brandy. Mustard plasters are to be applied over the heart and spine. As soon as swallowing is possible brandy is administered by the mouth. As the condition improves gradually raise the temperature of the room and give *hot* drinks.

**Chilblain** or **pernio** is a secondary effect of cold. It usually appears as a local congestion upon the toes, the ears, the fingers, or the nose, and now and then inflames and ulcerates. A chilblain is apt to become congested on approaching a fire or on taking exercise, and when congested it itches, tingles, and stings. Frequent attacks of congestion produce crops of vesicles; these vesicles rupture and expose an ulcer, which in rare instances sloughs.

**Treatment.**—If chilblain affects the toes, prevent congestion of the legs and feet. Order large shoes and woollen stockings, and forbid tight garters. The patient with pernio must take regular outdoor exercise and must not loiter around a hot fire. Every morning and evening he should take a general cold sponge-bath, following by rubbing with alcohol and frictions with a coarse towel, and in winter he should sleep with warm stockings on or with his feet upon a warm-water bag. When a chilblain is only a congested spot it should be washed twice a day in cold salt water, rubbed dry with flannel, and subjected to applications of tincture of iodine and soap liniment (1:2), tincture of cantharides and soap liniment (1:6), or equal parts of turpentine and olive oil (W. H. A. Jacobson). Jacobson says itching is relieved by painting belladonna liniment upon the part and allowing it to dry. Tincture of iodine may relieve it, and so may a mustard foot-bath. A valuable preparation for itching is composed of ʒj of powdered camphor and ʒiv of cosmolin, A little of this ointment is rubbed in twice a day. The following prescription, the source of which I do not remember, is very valuable for itching: ʒj of powdered camphor; ʒiiss of ichthyol; ʒss of lanolin, and ʒiv of cosmolin, rubbed into the part and covered with cotton-wool. If vesicles form, paint with contractile collodion; if ulcers form, dress antiseptically. If ulcers are sluggish, use equal parts of resin cerate and spirits of turpentine. A good antiseptic and protective is the following: oxid of zinc, gr. vj; chlorid of zinc, gr. xx; gelatin, ʒij; distilled water, ʒj.