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Thermal burns

What are thermal burns?

Thermal burns are burns to the skin caused by any external heat source. This may be in the form of a naked flame from an open fireplace or house fire, a scald from steam, hot or molten liquid, or via direct contact with a hot object such as a hot oven rack or hot cooking pan.

Other types of burns include radiation burns ([sunburn](#) from the sun's ultraviolet rays), chemical burns and electrical burns.

Thermal burns



Burns from hot water bottle
(patient has no feeling in leg)



Cigarette burns
(psychiatric patient)



Oven burns
(chef)

How are thermal burns classified?

To understand the nature and classification of thermal burns it is necessary to have a brief understanding of how skin is made up. Basically, skin consists of an outer layer called the epidermis and an inner layer called the dermis. The epidermis consists of epithelial cells among which are the pigment-containing cells called melanocytes, which absorb some of the potentially dangerous UV rays in sunlight. The epidermis does not contain any blood vessels but is nourished via the blood vessels located in the dermis. Hence, the dermis is richly supplied with blood vessels, lymphatic vessels and nerves. It also contains hair follicles, sebaceous glands and sweat glands. Lying below the dermis is the hypodermis or subcutaneous fat tissue. This is not part of the skin but attaches the skin to underlying bone and muscle as well as supplying it with blood vessels and nerves.

Traditionally thermal injuries were classified as first, second or third degree burns. Nowadays many doctors describe burns according to their thickness (superficial, partial and full). The signs and symptoms experienced by a burn victim depend largely on the severity of the burn and the number of layers of skin that are affected.

Classification	Signs and symptoms
Superficial or first degree burn	<ul style="list-style-type: none"> • Involves only the epidermis skin layer • May be painful, red and warm, area turns white when touched, no blisters, moist
Partial thickness or second degree burn	<ul style="list-style-type: none"> • Involves the epidermis and some portion of the dermis • Depending on the how much of the dermis is affected the burn is further broken

	<p>down into superficial or deep</p> <ul style="list-style-type: none"> • Superficial partial thickness burns are usually painful, red, moist, with blisters, hair still intact • Deep partial thickness burns may or may not be painful (nerve endings destroyed), may be moist or dry (sweat glands destroyed), hair is usually gone
Full thickness or third degree burn	<ul style="list-style-type: none"> • Most severe burn and involves all layers of skin – epidermis and dermis • Nerve endings, small blood vessels, hair follicles, sweat glands are all destroyed • Subcutaneous fat tissue, muscle and bone may also be involved in very severe burns • Burns are painless with no sensation to touch, skin is pearly white or charred, dry and may appear leathery

What is the management of thermal burns?

The management of thermal burns involves several key steps:

- Evaluation of the burn patient
- Evaluation of the burn wound
- Identifying and treating burn wound infections
- Managing the burn wound

Evaluation of the burn patient

Evaluating the total wellbeing of the burn patient is of paramount importance, particularly in patients with large burns. The primary aim is to ensure airway support, gas exchange and circulatory stability is achieved and maintained. Secondly, a detailed history should be obtained from the patient to determine how the burn injury occurred. This may give clues for further examination, e.g. suspected carbon monoxide poisoning in individuals injured in structural fires.

Evaluation of the burn wound

Evaluation of the burn wound itself should only occur once the patient has been stabilised. The extent and depth of the burn will help guide decisions regarding wound care, inpatient or outpatient care, and monitoring.

Extent of burn	Depth of burn
<ul style="list-style-type: none"> • Estimates the size of the burn • Rules of Nines is a tool used to determine the amount of surface area burned (it basically divides the surface area of the body into sections, each roughly 9%) 	<ul style="list-style-type: none"> • Estimates the depth of the burn (what layers of skin are affected) • Equates to the classification of burns as described above • Estimating the depth of a burn is difficult and often burns are underestimated in depth on initial examination

Identifying and treating burn wound infections

Prompt diagnosis of infection of the burn wound is important to prevent further complication. Two burn wound infections often encountered are:

- Burn wound cellulitis – manifests as progressive reddening, swelling and pain in the uninjured skin around a wound, seen in the first few days after burning. Streptococcus pyogenes is the causative bacteria and infection usually responds to penicillin.

- Invasive burn wound infection – rapid growth of bacteria in burn eschar that go on to invade the underlying healthy tissues. A change in colour, new drainage, and sometimes a foul or sickly sweet odour are indicative of infection. Pseudomonas and other gram-negative bacteria are the common causative. These infections can be life threatening and usually require combined treatment with surgery and antibiotics.

Managing the burn wound

Any serious burns should be referred to a specialised burns unit, particularly those involving face, hands and genitalia. For less serious burns, management may be in the outpatient or inpatient setting.

Outpatient wound care strategies	Inpatient wound care strategies
<ol style="list-style-type: none"> 1. Teach patient and family wound cleansing techniques 2. Select a suitable wound dressing (topical medication and/or wound membrane) 3. Prescribe medication for pain control 4. Teach awareness of complications or specific conditions that require prompt medical attention 5. Plan short-term follow-up care 6. Plan long-term follow-up care 	<ol style="list-style-type: none"> 1. Initial evaluation and resuscitation 2. Initial wound excision and biologic closure 3. Definitive wound closure 4. Rehabilitation and reconstruction

The main treatment aims of burn wound management are:

- Carefully monitor wound
- Keep wounds clean
- Prevent the wound drying out
- Manage secondary infection

Commonly used topical antibacterials include 1% silver sulfadiazine cream, 0.5% silver nitrate solution and mafenide acetate 10% cream.

Related information

References:

- Book: Textbook of Dermatology. Ed Rook A, Wilkinson DS, Ebling FJB, Champion RH, Burton JL. Fourth edition. Blackwell Scientific Publications.
- [Thermal burns](#) – emedicine dermatology, the online textbook

On DermNet NZ:

- [Wound dressings](#)
- [Sunburn](#)

Other websites:

- [Thermal \(Heat or Fire\) Burns](#) – emedicine consumer health

Books about skin diseases:

See the [DermNet NZ bookstore](#)

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DermNet does not provide an on-line consultation service.

If you have any concerns with your skin or its treatment, see a [dermatologist](#) for advice.

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