

# Burning: Etiologies, Pathophysiology and Prognosis

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## Abstract

The burn is a frequent accident most often of domestic origin. Causal agents are diverse and can be associated. The quality of the care depends initially on a good diagnosis of the different lesions with precision and description of their characteristics which play a primordial role in the evaluation and the prognosis of the burn.

**Keywords:** Burn ;etiologies ;physiopathology ;prognosis

## Introduction General

Burns are an acute trauma to the skin with an increasing frequency. In France, it is estimated at 400,000 cases of burns per year, of which almost 4,000 require hospitalization in a specialized center. According to the World Health Organization, 300,000 burns people die each year worldwide [1].

## Etiologies of the Burn

The destruction of the skin covering and the underlying tissues results from many factors. It can be:

### Thermal burn

Defined by an attack on the skin by a liquid, a flame or an explosion with a temperature above 60 ° and the exposure time lasts a few seconds. It occurs on healthy skin and causes local skin reactions leading to complications and sequelae such as hypertrophy and congestion. The thermal burn can be associated with the chemical burn in the event of a gas or liquid explosion, thus aggravating the main skin consequences mentioned above; Hence the importance of preventive and curative management of burn and after-effects [1].

### Electrical Burns

Considered above all as a domestic accident that can be encountered at any age (child or adult). The

electric current follows a body passage from the hand (in adults) or the mouth (in children) and exits through the foot. In this case, there is no hypertrophy or congestion because often the segments of the affected limbs are destroyed immediately and recovery remains difficult depending on the characteristics of the electric current which can cause immediate cardiac arrest. However, the heat released on contact with current by flash or electric arc effect causes skin lesions similar to those caused by thermal burns.

### Chemical burn

Is classified as the most dangerous by its cutaneous consequences. The causative agent must be identified upon receipt of the patient with precision of its nature, its acidic or basic pH, its concentration, its molar mass and especially the duration of exposure. The initial treatment is based on hemodynamic stabilization, pain management and then immediate transfer to a specialized center.

### Pathophysiology of the burn

Before each burn, there are rules to take into consideration and measures to take and mention

### Location of the burn

May determine the prognosis for life (in case of upper airway involvement) or functional (in case of burns of the extremities).

## Extent or area of burn

Estimated in percentage by Wallace's rule in adults:

- a. 9% for the head and neck and each upper limb.
- b. 18% for each side of the trunk and each lower limb.
- c. And 1% for the perineum and external genitalia and for the palm of each hand.

The Lund and Browder tables give more precision because the area is estimated according to age [2].

## Burn Depth

The main difficulty in the initial management of the burn remains the estimation of the depth when receiving the burn patient. We can distinguish 4 degrees: [2,3] 1st degree burn: this is a sunburn or erythema where the blood circulation and capillary pulse are intact. Superficial 2nd degree burn: (Figure 1) corresponds to the destruction of the superficial part of the epidermis without or with partial damage to the basement membrane and Malpighi cells. Clinically, it results in blistering, redness and warmth of the underlying skin, severe pain with the possibility of a small hemorrhage on scarification. Healing takes place without unsightly sequelae after two to three weeks. Deep 2nd degree burn: (Figure 2) skin destruction affects the entire epidermis and part of the dermis. Clinically, after excision, a whitish or pinkish floor is observed with minimal bleeding and hypoaesthesia. The roots of the hairs, sweat and sebaceous glands remain intact hence the resistance of the hairs during traction. Spontaneous healing lasts longer up to a month unless there is significant malnutrition or superinfection. 3rd degree burn: (Figure 3) corresponds to carbonization or necrosis secondary to the total destruction of the epidermis and dermis, hence the impossibility of spontaneous epidermization. Clinically: The skin appears dark, brown or black, cardboard and unresponsive with thrombosed veins. In this case, dermal-epidermal grafting preceded by excision of necrosis is required.



Figure 1: 3<sup>rd</sup> degree burn with relief incision.



Figure 2: Deep 2<sup>nd</sup> degree burn in the center of the back.



Figure 3: 3<sup>rd</sup> degree burn with relief incision.

## Burn prognosis

The estimation of the surface and the depth makes it possible to establish two prognostic indices [1,3].

### The Baux rule

(Professor Serge Baux, pioneer of world burn science), which allows the vital prognosis of a burn patient to be assessed by taking into account the age, area, depth of the burn and any associated defects. The calculation is simple, it consists of adding the age in years to the body surface area burned (SCB), and if there are defects, we add 15 to the addition. The prognosis is strongly involved and even death if the index exceeds the total of 100.

### The UBS Index

Corresponds to the following rule:

Sum of total burns in% + 3 times the% of deep burns (3<sup>rd</sup> degree).

- a. Severe burn if UBS <40
- b. Severe burn if 60 <UBS <80
- c. Severe burn if 60 <UBS
- d. Prognosis initiated if 150 <UBS
- e. Exceptional survival if 200 <UBS.

- a. Involvement of the upper airways following inhalation of toxic fumes occurring in 20% of cases with the consequences of chemical burns of the tracheobronchial tree.
- b. Certain localizations are sensitive by their repercussions such as the face and the hand (aesthetic repercussions), the joints and the extremities of the limbs (functional repercussions) and natural orifices (infectious repercussions). (Figure 4)

Besides surface and depth parameters, the prognosis of burn patients depends on the presence of other factors [4]:



**Figure 4:** Joint location of the burn on the elbow.

- c. Small age, advanced age, essential defects such as high blood pressure, diabetes, heart failure, etc. act on the progression and healing of initial lesions.
- d. The table summarizes the different cases of burns

and classifies them as mild and severe according to the parameters mentioned.

**Table 1:** Classifications of burns according to the French Society for the Study and Treatment of Burns (SFETB) [2].

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Severe burns	Benign burns
Burns that exceed 10% of the total body surface area	-Burns less than 10% of the total body surface area
Burns less than 10% of the total body surface area but associated with one or more of the following severity parameters:	-No associated severity parameter.
Age less than 3 years or more than 60 years;	
Serious associated pathology;	
Existence of third degree lesions;	
Localized burns to the face, neck, hands or perineum;	
Burns that occurred during an explosion, a fire in a closed environment or an accident on the public highway;	
Electrical or chemical burns.	

**Conclusion**

Burn is a progressive disease and its parameters can change and worsen over time hence the need for a good initial examination

upon reception of the burn patient and establishment of a prognosis; without forgetting the regular and close monitoring of any patient at risk of malnutrition and super infection.

## Conflicts of Interest

The authors declare that they have no conflicts of interest.

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