ANAESTHETIC MANAGEMENT OF A BURNED PATIENT

Essay

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in Anaesthesia

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To My Parents

بسم الله الرحمن الرحيم

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Hala Amin Hassan

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A major burn is catastrophic: to the patient, to his family, and to the attending staff who are taking care of the patient.

The anaesthesiologist is involved in many steps in the care of the burned patient: in securing the airway and breathing immediately after admission into hospital, in the intensive care unit where the patient may sometimes be admitted, and during the multitudes of surgical procedures the burned patient is exposed to.

A sound knowledge of the pathophysiological changes following burns is mandatory for a better outcome and an easier recovery.

TYPES AND CLASSIFICATION OF BURNS

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In the past burn wounds have been described as first, second or third degree, indicating in increasing order the depth of the tissue destruction. First degree burns involve only the epidermis, second degree burns extend into the dermis, and third degree burns involve the entire epidermis and dermis to the level of the subcutaneous tissue. So-called fourth degree burns involve muscle, tendons, and bone (Moncrief, 1979 a).

It is more characteristic today to describe thermal injury as either partial thickness or full thickness. Partial thickness wounds include the old classification of first and second degree burns characterized by destruction of local tissues for varying depth from the epidermis into the dermis, with at least some epidermal elements or dermal appendages remaining from which the wound can be spontaneously epithelialized (Moncrief, 1979 a).

The superficial partial thickness wound (Corresponding to first degree and some second degree) involves usually only the epidermis and extends in general to the upper portion of the dermal papillae (Moncrief, 1979 a).

The deep partial thickness wound destroys the entire thickness of the epidermis, including the dermal papillae, but leaves intact the sweat glands and hair follicles (Moncrief, 1979 a).

The full thickness burn includes destruction of not only the epidermis but all of the dermal appendages and other epithelial elements, so that spontaneous restoration of skin coverage is not possible (Moncrief, 1979 a).

The superficial partial thickness wound takes two forms. The surface may be covered with blisters or bullae of varying sizes, and the epidermis beneath them is weeping, glistening, bright pink or bright red, and is extremely sensitive to temperature changes, exposure to air and light touch. Deeper partial thickness wounds are waxy white but still soft and elastic, and, although they are sensitive to pressure, they are insensitive to light touch or soft pin prick. With effective topical therapy these wounds heal spontaneously with extensive hypertrophic scarring (Wang and Macomber, 1976).

The full thickness injury is hard and dry, is tan coloured, and with exposure to air becomes rapidly desiccated, parchment-like and translucent, and the thrombosed dermal vessels beneath the surface can readily be visualized. This injury results in a very inelastic eschar which leads to compression of deeper tissues when oedema forms beneath it (Wang and Macomber, 1976).

The deep partial thickness wound is converted to full thickness wound by exposure to the drying effects of ambient air or infection. Extreme care must be taken to prevent this conversion, particularly in large burns (Bain and Taylor, 1983).

When viewed at an angle immediately after injury, the partial thickness wound appears oedematous and raised above the surrounding surface of unburned or more deeply burned skin. The wet, glistening appearance of the surface of the superficial partial thickness injury accentuates this difference. In the full thickness wound the dry, inelastic eschar is shrunken and depressed to a level well below that of the surrounding unburned or partially burned skin (Moncrief, 1979 a).

Partial thickness injuries are caused by flash, spill scalds and brief exposure to radiant energy or flame. Full thickness wounds are the result of exposure to flame for more than very brief periods of time, immersion scalds, or intense radiant energy; they can be caused by less significant thermal transfers in the very elderly or the very young because of their thinner skin. Also, exposure to the same temperature for the same duration in different parts of the body will result in burns of different depths according to the thickness of skin (Bain and Taylor, 1983).

Causes of Burns

Burns are due to either thermal, chemical, or electrical injury. Thermal injury results from energy transfer from a heat source to the body, either by direct conduction or by electromagnetic radiation. In the human body many factors modify thermal conduction, such as conductivity of the local tissue; nerves and blood vessels are the most conductive (Ponder, 1962), as well as the peripheral circulation because it can be altered rapidly and with great magnitude (Moritz, 1947). Surface pigmentation, the presence or absence of clothing of different pigment densities, the presence or absence of other insulating material such as hair, natural skin oils and cornified layers of surface epithelium, and total water content are other factors (Moncrief, 1979 a).

Radiant energy can also produce major thermal injury. Such energy occurs from the electromagnetic spectrum, which includes a wide variety of radiant energy forms. X-rays and microwaves are common examples, infrared, U.V., visible light and gamma rays are included. Radio and television waves are included in this spectrum but are of no immediate significance (Moncrief, 1979 a).

Bull (1958) reported that about two thirds of thermal burn cases are due to domestic accidents and one third to industrial accidents. The outstanding feature of domestic burn accidents is that those in which clothing catches fire produce the most extensive and severe injuries.

The primary cause of burns is scalding, then fire, hot objects, electricity, and lastly come the chemical agents. Although fire and scalding are almost equally common causes of burns, there is a significant difference in age groups, where fire predominates as a cause of burns in adults (Skoog, 1963).

In general, it may be stated that in children under three years of age the most common cause of burns is scalding. From three to 14 years, flame burns due to ignited clothing predominate; from 15 to 60 years, industrial accidents account for a large number of burns; for those over 60 years of age, accidents associated with momentary blackouts, smoking in bed or house fires are the most common. In young children scalds are commoner in boys, whereas clothing burns are more common in girls because girls' clothing is more flammable, hence more children's deaths occur in girls. The clothing catches fire and the child runs, fans the flames and becomes the victim of a severe burn (Bull, 1958).

Prognosis in Burns

It is extremely difficult to determine prognosis in any specific burn with any degree of accuracy. Mortality increases with the severity of burn and with advancing age. At one time, few patients survived burns involving more than one third of the body surface, but this is no longer true. For example, with modern treatment many patients with burns involving up to 50 to 60 per-cent of the body surface survive, and the outlook for those more extensively burned is not entirely hopeless. The prognosis of the burned patient should be guarded if the percentage of second- and third- degree burn is more than 40. It may be several days or weeks before the ultimate outcome can be predicted. Frequently, extensively burned patients survive the initial few weeks after the injury only to die later due to complications. Thirty-five years ago most of the deaths occurred in the first 2 days or so, but this now rarely happens in the absence of other complicating factors, and the deaths now occur in the second or third week, or even later (Bain and Taylor, 1983).

The seriousness of a burn, with its potential mortality is often underestimated by lay people and even by medical and nursing staff. A severely burned patient is frequently conscious and able to reply to questions for sometime after his admission, this is in contrast with the patient who has sustained severe multiple injuries, as in falls from buildings, when the patient is often unconscious. It is very difficult for the attending staff to accept that such talking burned patients have a very high risk of dying in later stages (Moncrief, 1979 a).

A 20 % full thickness burn produces an injury as severe as having both legs crushed by a train. One rule of thumb assessment states that if the extent of the burn, expressed as a percentage of the body surface area, plus the patient's age is 100 or more, that patient has a very poor prognosis (Bull, 1971).

The use of probit analysis in consideration of burn mortality was introduced in 1949 by Bull and Squire. Bull and Fisher (1954) have updated approximate mortality probabilities for various combinations of age and body surface area. Using similar computation of probit analysis, two other investigators (Barnes, 1957; Pruitt et al., 1964) have made excellent reports on burn mortality in recent years, taking into consideration the percentage of body surface burned and the age of the patient. From the data in