EFFECTIVENESS OF INITIAL FLUID RESUSCITATION FOR POSTBURN MULTIPLE ORGAN DYSFUNCTION SYNDROME

Thesis

Submitted for partial fulfillment

Of

M.D DEGREE IN ANAESTHESIA

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1999

بسم الله الرحمن الرحيم

وما أوتيتم من العلم إلا قليلاً

(الاسراء : ٨٥)

صدق الله العظيم

Acknowledgment

First of all, thanks to God, to whom I relate success in achieving any work in life.

I want to express my sincere and grateful appreciation to ***Professor Dr. Farouk Sadek,*** *Professor of Aneasthesiology, Ain Shams University, for his valuable guidance, kind advices and continuos help during the work that facilitated the completion of this work.*

I am really thankful and grateful to ***Professor Dr. Ahmed Gamal Essa****, Professor of Aneasthesiology, Ain Shams University, for his faithful help, kind support, honest assistance and valuable scientific contributions in this study that made it possible.*

Also, I wish to express my deepest thanks for ***Professor Dr. Mohamed Zaghloul,*** *Professor of Aneasthesiology, Ain Shams University, for his continuos support and encouragement along the whole way of this study. Without his direct supervision and follow up, this study would not be achievable.*

I am again sincerely thankful to ***Professor Dr. Khalid Khairallah,*** *Professor of Aneasthesiology, Ain Shams University, for his great help and kind support.*

Finally, I have to thank everybody shared and helped me during the completion of this work and participated in implementing this study through all its phases.

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INTRODUCTION

Burns are among the most devastating injuries seen in the medical practice; they range in severity from sunburn to lethal injuries. Thermal injury of the skin is a main source of morbidity and mortality which are further increased by the presence of smoke inhalation and intercurrent sepsis (Shirani et al., 1996).

Burns are the leading cause of accidental death in the home and the fifth leading cause of death allover for children aged 14 years or younger. It was found that scalding is the most common cause of burns in children under three years (Salisbury, 1990).

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. About 80% of burn accidents occur in the home (Brigham & McLoughin, 1996).

Burn injury results in a rapid loss of intravascular volume and transcapillary shift from plasma into interstitial space, which reduces the circulating blood volume and generates the need for fluid therapy to combat hypovolemia. The net volume loading can be reduced markedly by initial resuscitation of large body surface area burn injury using a

colloid, and can be further reduced by use of hypertonic saline colloid which rapidly improve the cardiovascular hemodynamics, maintain baseline oxygen delivery, improve the blood flow to the heart, kidney and liver and prevent occurrence of hyponatremia (Kinsky et al., 1996).

Multiple organ dysfunction syndrome (MODS), is a syndrome in which more than one organ system fails. Failure of these multiple organ systems may not be related to the initial injury or disease process or which the patient was admitted to the intensive care unit, often it ends in multiple organ failure (MOF) and death (Huang et al., 1992).

Multiple organ failure, this life threatening condition which first became recognized in the middle of 1970s considered one of the major causes of death in patients with severe burns (Kirkpatrick et al., 1996).

REVIEW OF LITERATURE

Origin of burns:

Although the majority of burns are thermal injuries, either from open flame, steam or hot water but special types of burn may exist as electrical burn; which is thermal energy that actually destroys tissues, particularly those with high resistance like skin and bone. It is impossible to predict the precise location and extent of tissue damage; periosseous muscle may be destroyed even though the superficial tissues are viable. Myoglobin release is a frequent complication of electrical injury. Patients often present with associated injuries such as fractures of the spine due to arching, long bone fractures, subdural hematomas and damaged internal organs. Vital organs that are particularly sensitive to electrical injuries include myocardium, where damage may be presented as arrhythmias (including ventricular fibrillation) and the spinal cord which may demyelinate after electrical trauma.

On the other hand, in chemical burns; the degree of injury depends on the particular chemical, its concentration, duration of contact and the penetrability and resistance of the tissues involved. Some substances that cause chemical burns e.g. phosphorus are absorbed systematically producing symptoms of poisoning (Miller et al.,1992).

Pathophysiology of thermal injuries:

The skin is the largest organ of the body, its thickness varies from 1 to 3 mm, being thicker on the dorsal and extensor aspects of the body. It is not only a waterproof barrier for the body, but also aids in temperature regulation.

The skin is composed of two layers, the epidermis and the dermis. The epidermis comprises the outer layer of the skin and is further divided into sublayers (Fig 1). From superficial to deep, these layers include: the stratum corneum, the stratum lucidum (present only in thick areas, such as the palms and the soles), the stratum granulosum and the stratum germinativum.

The stratum corneum; which is the most superficial layer of the epidermis forms the vapour barrier of the body because of its keratin and lipid content. When this layer is damaged, fluid loss may be extensive. The stratum germinativum is the layer from which new epidermal cells are produced. Portions of the stratum germinativum are also found around some of the epidermal appendages that lie in the dermis (e.g. hair follicles, sebaceous glands and sweat glands). If the entire epidermis is damaged, but the epidermal appendages within the dermis remain intact, the stratum germinativum that surrounds these appendages may regenerate a new epidermis.

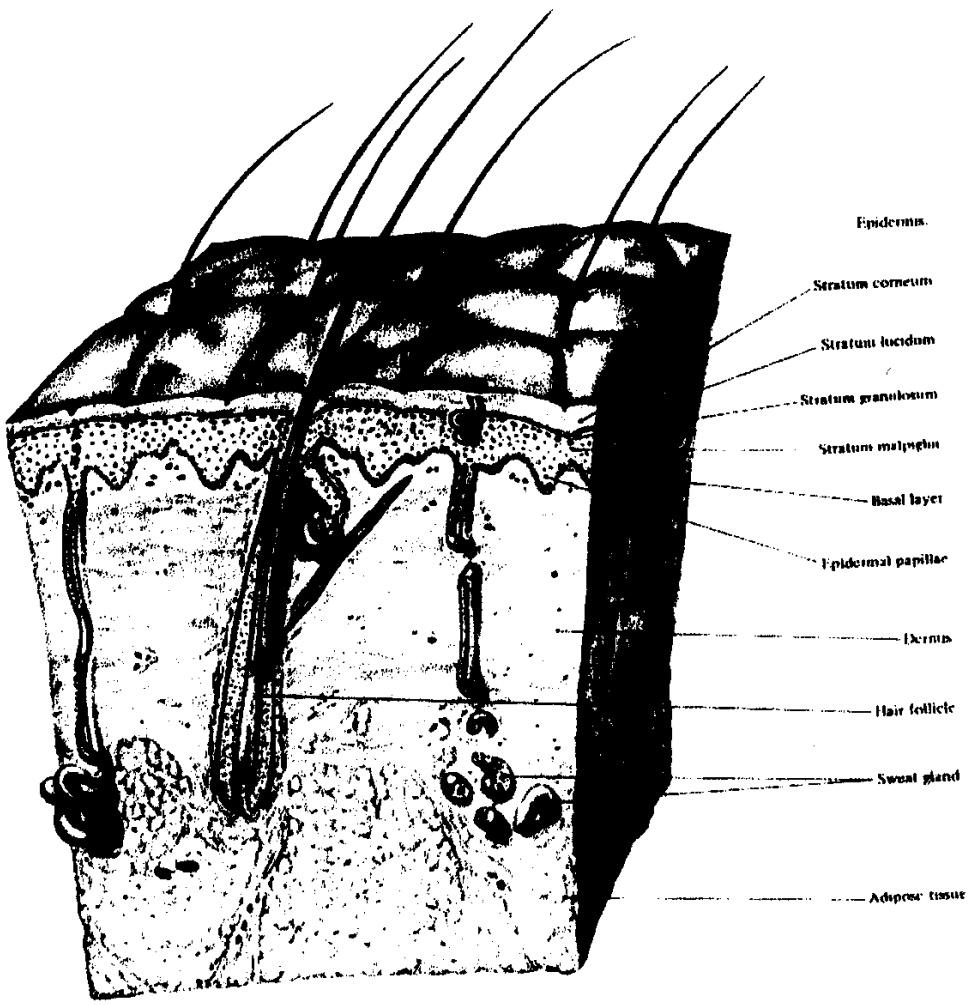

FIG 1. Histological section of the skin.
(From: Richard 1993)

The dermis contains fibrous connective tissue and blood vessels that support the epidermis and supply it with nutrient (Fig 1). The dermis also contains peripheral nerve fibers that form a plexus near the lipodermal junction, so superficial burns are more painful than deeper burns because these pain-transmitting nerve fibers which lie deep in the dermis are irritated in superficial burns rather than being destroyed as they are in a deeper burn.

Beneath the dermis lies a subcutaneous layer, which contains areolar and adipose tissue. The water, lipid content, and vascularity of these various layers influence heat conductivity and subsequent depth of the burn. The greater the water content, the greater the heat conduction, and the more rapidly damage occurs. In highly vascular areas, however, heat can be transferred away from the burn site by blood flow, and this heat dissipation may decrease the depth of burn in such an area (Richard, 1993).

Classification of the severity and extent of injury:

I - According to the burn surface area:

1- Rule of nines:

The adult body surface area is divided into 11 areas, each equal 9% or multiples thereof (Fig 2A). The genitalia are assigned the final 1%. In children the estimation of the body surface area is slightly different; during the first year of life, each leg accounts for 13%, while the head accounts for 18%. Until adolescence, these percentages of body surface in children change by a small amount each year.