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Review

Delayed death in burns and the allegations of medical negligence

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Abstract

Burns and deaths due to burns to remain an important public health and social problem in India. Most of the victims, who survive the initial 24 h after burns, succumb to infection of the burnt area and its complications. Burns cause devitalization of tissues, leaving extensive raw areas, which usually remain moist due to the outflow of serous exudate. This exposed, moist area along with the dead and devitalized tissue provides the optimum environment favoring colonization and proliferation of numerous microorganisms, which is further enhanced by the depression of the immune response. All these factors, i.e., disruption of the skin barrier, a large cutaneous bacterial load, the possibility of the normal bacterial flora turning into opportunistic pathogens and the severe depression of the immune system, contribute towards sepsis in a burns victim, which usually is life threatening. Despite various advances in infection control measures, early detection of microorganisms and newer, broader spectrum antibiotics, management of burn septicemia still remains a challenge. Pulmonary, cardiac and other complications also contribute to the delayed deaths following severe burn.

Keywords: Burns; Septicemia; Toxic shock syndrome; Smoke inhalation injury; Cardiac complications; Multiorgan failure

Contents

1. Introduction

Severe burn is a major problem in many areas of the world, but deaths due to burning are the problem of great concern in India. India was the only country in the world, where fire was classified among the 15 leading causes of death in 1998 [1]. It has been reported that in India, a dowry death (the unnatural death of a woman within 7 years of her marriage directly or indirectly due to any dispute over bridal dowry) usually by burning occurs every 1 h 42 min [2]. Apart from dowry deaths, a large number of suicides,

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particularly by married women in rural India, are reported by burning. This preference for a highly painful, active and violent method can be attributed to religious and socio-cultural reasons. Traditionally, Hindu religion has given sanction to certain altruistic forms of suicide [3]. In historical times, some states in India, approved suicide under certain circumstances, as for example, 'Sati'—the phenomenon of bride burning along with dead body of the husband was very common under British rule [4]. The legal ban on the practice although has made it almost extinct in modern days, but death by burning had been and continues to be recognized as a symbol of sacrifice. Apart from this, uninterrupted access to cooking fire, kerosene, and matches, for married women make burning the most preferred easily available and surest method to commit suicide [5].

In burn victims, invasion by the bacteria is not unexpected despite advances in chemotherapy because the skin that offers maximum resistance against infection is damaged and the host defense factors compromised. It has been reported that in the absence of topical chemotherapy, the superficial areas of burn wound contain up to 100 million organisms per gram of tissue within 48 h following the trauma [2]. In view of a delicate balance between the host and his surrounding environment being upset, antibiotic therapy may fail to bring about the desired results. Furthermore, like the patient with some chronic ailments, the traumatized (burnt) patient loses many host mechanisms which predispose him to infection with organisms of little violence and moreover, general nutrition of the subject, pre-existing disease, quantity of fluid loss, prolonged immobilization, seasonal factors, etc., may play a role in initiating the process leading to a fatal outcome.

It has been noted that in alleged dowry deaths or alleged homicidal deaths, where the death of a victim occurred after a duration of few days or weeks of the burn, the defense counsel invariably asks a question to the doctor who treated the patient or who conducted the autopsy (while deposing in the court of law), ''doctor, could septicemia or the infection reported to be the cause of death in the autopsy report be prevented by better management?'' In case the doctor replying 'yes' some element of doubt is created about the standard of treatment provided to the victim. This question assumes a greater significance in homicidal burn deaths where charges, according to the Indian Law, need to be proved beyond any reasonable doubt for the conviction of the accused. In the case the doctor replies 'no', an endless discussion can be initiated by the defense counsel and the doctor finds it difficult to produce ample literature to support his version, firstly, because different studies report on a specific aspect of the burn and secondly, because textbooks focus on possible outcomes and their management or prevention and the language used as such, can be interpreted in favor as well as against the accused. The present paper, therefore, attempts to examine the various causes of delayed death in burn victims, with a forensic viewpoint.

2. Evolution of burn care

Burn management has evolved substantially from the earliest documented treatment and burn care depicted in the cave paintings of Neanderthal man and the honey and resin salve used by the ancient Egyptians [6]. Until recently, burns were associated with tragic outcomes and sustained suffering. If burn shock did not claim the life of its victim during the immediate post-burn period, death came from wound sepsis or respiratory insufficiency due to poor understanding of pathophysiology [7]. It was not until 1924 when Berkow began to formally express size as a percentage of total body surface area that burn size as a crucial determinant of pathophysiological response was recognized. Lessons learnt from treating the casualties of disastrous accidents such as the Rialto Concert Hall fire of 1930 [8] and the Cocoanut Grove fire in 1942 [9] instilled the importance of fluid requirement in burn patients, whilst the experiences gleaned during World Wars stimulated burns surgeons to attain a better understanding of burn injury [10].

In the 1970s, early excision of small deep burns and immediate auto-grafting resulted in shortened hospital stays, reduced patient suffering, and better functional outcomes [11]. To extrapolate this to larger injuries required sophisticated intensive care and blood banking technologies. The principles of burn management evolved with improving technologies and rising sophistication of critical care medicine, including development of positive pressure ventilation, lung protective ventilation strategies, general critical care techniques, improved anesthetic procedures and innovative modes of support [12,13]. This resulted in the current gold standard of near total early excision with immediate autograft/allograft cover which markedly improved survival probabilities even with major burns (involving $>80\%$ total body surface area) [14–16]. However, optimal management of severely burned persons is enormously expensive, and even after survival is ensured, may require a protracted period of surgical, medical and psychological rehabilitative measures for many years [17]. In the mean time, the burn victim encounters a long list of complications that may lead to a fatal outcome.

3. Infections

Infection in the burn patient is a leading cause of morbidity and mortality and continues to be one of the most challenging concerns for the burn team. According to reports, 75% of all deaths following burns are related to infection [18]. Several risk factors have been identified for burn infections that can be divided into: (A) patient factors, which include the extent of the burn, age of the patient, presence of pre-existing disease, wound dryness, temperature and secondary impairment of blood-flow and acidosis; and (B) microbial factors, which include virulence, number of organisms, motility, extra-cellular products such as