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Prognostic indicators in acute burned patients-a review

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ABSTRACT

Burn trauma is in need for prognostic indicators or admission scores. This aims for realistic documentation of the burn injury, expectation of the prognosis, and to facilitate a patient stratification to evaluate therapeutic strategies. A computer search through different medical websites was performed looking for articles correlating prognosis with different burn indices. These were carefully summarized and analyzed for this review. Variable studies were found related to that issue; the reliable indicators found had been classified as general or specific. All of them had certain clinical importance, but limitations are a common feature. All the listed indices are useful to serve in the only special clinical situations. We couldn't claim that they are actual prognostic indicator in burn victims. We believe that we still lack the proper prognostic indicator in burn patients. Researchers are invited for more effort to organize a more reliable prognostic indicator and scoring system for burn patients.

1. Introduction

Scoring systems for immediate post-traumatic patient evaluation, classification and outcome prediction have gained increasing acceptance during the past three decades. Among the wide variety of scores, the injury severity score, trauma score and the Glasgow coma scale have found widespread recognition[1]. The importance of burn prognostic indices lies not only in the prediction of outcome of an individual patient, but also in the distribution of the patients in comparable groups of severity for therapeutic and research purposes. Although the realistic prediction of the outcome of an individual patient is the first and main question of a patient's family, the quantitative measurement of a patient's illness using these indices is of great importance for the burn centre in deciding its therapeutic policy, evaluating new therapy and the quality of patient care, and estimating the cost of their services. The more accurate an index, the more useful it is for this latter purpose. For this reason, nowadays, several burn indices based on different statistical methods have been analyzed in an effort to make them more accurate in their predictions. Nevertheless, the accurate prognostic index in a burn centre is achieved either by using one of the known indices adopted to its particular needs and conditions or by producing its own new index and updating it continuously[2].

2. Methods

This is a review work aiming to gather the different burn indices in one article. A computer search using the internet websites was performed. A structured literature search in Medline, Embase, Pub Med, Clinical Evidence,

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and the database of library of Ain Shams University hospitals had been performed. The used keywords were "burn patient", "assessment", "prognostic", "risk factor", "index", "indices", "morbidity", "mortality", "outcome" and "death". In addition to that, reference lists of related journal articles, key journals and existing reviews were also searched for additional data. All used articles were in English or with English translation of the abstracts.

After data collection, we classified the most reliable resulted parameters into two groups: general and specific prognostic indices. The general prognostic indicators are concerned mainly with the patient's general status, burn wound condition and the potential of overall mortality. In the other group, researchers were found to investigate only a single parameter in burned patient. Others examined a single parameter in certain patient's groups as in pediatric burn, inhalation injury, electric burn, *etc*.

3. Classification of prognostic indicators

Analysis of the search results identified various articles dealing with the burn prognostic indicators. With respect of the researcher's opinions regarding the importance of their investigated parameters, classification and documentation of these articles formed the bulk of this review.

3.1. General prognostic indicators

The first burn score was developed in 1902 by Wiedenfeld who correlated total burned surface area (TBSA) and age with the mortality of his patient population (TBSA+Age $\geqslant$ 100; this carries poor prognosis). The same parameters were employed in the pioneering work of Bull and Squire in 1949[3].

Tobiasen and colleagues presented the abbreviated burn severity index in 1982, based on a multivariate logistic regression model[4]. This score included for the first time additional parameters, such as gender, presence of third degree burns or inhalation injury.

The size and depth of burn and patient age are useful for early prognostic indicators in burned patients, but have limited value in predicting mortalities. The objective of another study was to identify additional variables in the first 10 days of burn injury which could better predict patient outcome[5]. The regression analyses revealed that patient age and burn size were significant predictors of mortality on admission and throughout the first 10 days postburn. In addition, absolute monocyte count, absolute lymphocyte count, maximum daily temperature, and blood urea nitrogen were also significant predictors. These data indicate that logistic regression models can identify simple prognostic variables in burned patients which may improve clinicians' ability to identify high-risk patients early in the course of their burn injuries[5].

Mortality predictive factors of burned patients are analyzed in 1 929 patients. Among the variables studied (TBSA, deep burn area, superficial burn area, age, sex, burn location, preexisting disorders), two only, deep burn area and age, have been retained as predictive factors which, when associated, allow to classify 94.47% of the patients in either survival or death group[6].

A study aimed to define the clinical, microbiological and laboratorial predictors of mortality with a view to focus on better burn care. Mortality rate was 5.0%; it was higher in elderly, larger burn area, presence of fungi and the presence of multi-resistant bacteria in the wound[7].

Stavropoulou and colleagues had a study on a 342 burned patients[2]. They compared the reliability of the usual burn indices with the APACHE II severity score in prediction of mortality. The study resulted in forming a new prognostic index, which is more accurate in the prediction of mortality, because it considers objectively and in detail the patient's general condition on admission. APACHE III score had been suggested by Tanaka and colleagues to be used as a more efficient predictor of mortality in burn patients[8].

Another study evaluating the prognostic factors in severely burned patients was done by Danilla and colleagues evaluating multiple variables[9]. Pre hospitalization variables (burn injury of the respiratory tract, early intubation, fasciotomy, prompt fluid restitution), initial surgical attention variables (early escharectomy, fasciotomy, compartmental syndrome release, allogeneic skin grafts), and intra-hospital complication variables (acute renal failure, mechanical ventilation, shock, sepsis, *etc*.). The results of this study stated that prompt fluid restitution was the most important prognostic factor of pre hospitalization variables; burn injury of the respiratory tract was not statistically significant. Early escharectomy is a strong protective factor of the initial surgical attention variables. Compartmental syndrome, fasciotomy, and the use of allogeneic skin grafts are not associated with changes in survival. Mechanical ventilation, acute renal failure, shock and multiple organic failure are nosocomial complications associated with higher mortality[9].

A new study was done to investigate the possibility of using supervised statistical models (the orthogonal projections to latent structures) to assess burn injury patterns, outcomes and their interrelationship. Female

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