The role of comorbidities in the prognosis of thermal burns

ABSTRACT

Context: Burn injury is a complex trauma with multiple changes in physiology of the patient. Assessing prognosis of the burn patient is a subject of debate with various prognostic scores available. The presence of inhalational injury and percentage (total body surface area) of thermal burns are the most important factors affecting the outcome of the burn patient. The role of comorbidities is another very important factor and its importance cannot be undermined, especially with massive fluid shifts associated with resuscitation and body catabolism in the rehabilitative stage, respectively. Charlson Comorbidity Index (CCI) is an attractive scale that has stood the test of time as a scale to measure objectively the severity of comorbidities on the prognosis.

Aims: The aim of the study was to understand the role of comorbidities have on the outcome of thermal burns.

Materials and Methods: This was a retrospective analysis of burn patients admitted in the burns center over the past 1 year fulfilling the inclusion criteria. Descriptive analysis of patient records was done.

Results: A total of 18 patients with comorbidities admitted in the burns center fulfilling the above-said inclusion criteria. Ten patients survived, while eight patients succumbed to the burn injuries. The average CCI of the survivor group was 2.2 (range: 1–4), whereas the mean CCI of the nonsurvivor group was 3.5 (range: 2–6).

Conclusion: Comorbidities do have an impact on the prognosis of a burn patient, and objective assessment of prognosis of the burn injury must include the CCI as a tool to predict the outcome correctly and reliably.

Keywords: Burn prognosis, comorbidities, thermal burns

INTRODUCTION

Burn injury is a devastating trauma. It is the fourth most common type of trauma traffic accidents, interpersonal violence, and falls.[1]

Survival following burns has been on the rise due to the advances in medical care globally with more protocols and guidelines for managing each aspect of burns coming up every day.

Objective assessment of the outcome of the burns is a very tempting and challenging aspect, which has been attempted by various scores. Initial scores took into consideration the total burn surface area and the presence of inhalational injury.[2,3]

Comorbidities such as diabetes, age, cardiac disease, renal disease have a separate and significant bearing to the outcome of the patient with a burn injury.

The effect of comorbidities can be objectively measured by the Charlson Comorbidity Index (CCI). The score, developed in 1987, helps to predict the 10-year mortality of patients with...
a range of comorbid conditions. Each comorbid condition is given a score ranging from 1 to 6. The total score is added and higher total score predicts a higher rate of mortality.\[7\]

The preexisting comorbidities including cardiovascular, pulmonary, and renal disease can complicate each phase of management of thermal burns.

Fluid resuscitation, a cornerstone of burn management, is typically complicated by the comorbid illness.

Surgical management also is another aspect, which is more likely to get complicated due to poor tolerance to blood loss, intubation, and anesthesia.

Nutrition is another factor, maintaining nutrition in a patient with liver disease/renal disease is troublesome.

Patients with alcohol abuse have complications such as delirium and electrolyte abnormalities due to withdrawal.

Studies that have looked for the effect of medical comorbidities on burn outcomes have been limited by relatively small samples from single burn centers with a few mortalities and a limited number of patients within each medical comorbidity category. They have also been limited by the lack of clearly defined comorbidity categories and diagnoses.\[8,9\]

Our study is a step to understand the role comorbidities have on the outcome of thermal burns in terms of mortality, and we would like to share our preliminary results.

**MATERIALS AND METHODS**

This was a retrospective analysis of data of burns admitted over 1 year in JTBC.

**Inclusion criteria**

1. Thermal burns total body surface area (TBSA) <60%
2. Patients must have one or more comorbidity (history of myocardial infarction, congestive heart failure, peripheral vascular disease, dementia, chronic obstructive pulmonary disease, peptic ulcer disease, liver disease, diabetes mellitus, renal disease, leukemia, lymphoma, human immunodeficiency virus, and tumors).

Burns >60% TBSA, electric burn injuries, and patients with inhalational injury were excluded from the study.

Mortality and survival was the only endpoint measured.

CCI score [Table 1] was calculated for each patient, and the end result was noted.

The data were divided into patients who survived versus patients who did not survive (survivors vs. nonsurvivors).

The CCI for both groups was compared, and other confounding factors such as age, type of burns, gender, and TBSA burns were evaluated separately. The data was tabulated according to the group [Tables 2 and 3].

Although patients with inhalational burns were excluded from the study, the criteria for the diagnosis of inhalational burns were purely clinical and no bronchoscopy was done to rule it out.

**RESULTS**

This was a retrospective analysis of documents of patients admitted with burns in a tertiary burn center in southern India in the past 12 months. A total of 18 patients with comorbidities admitted in the burns center fulfilling the above-said inclusion criteria.

Ten patients survived, while eight patients succumbed to the burn injuries.

The average CCI of the survivor group was 2.2 (range: 1–4), while the mean CCI of the nonsurvivor group was 3.5 (range: 2–6).

**Table 1: Charlson Comorbidity Index Score System**

| Comorbidity                              | Score |
|-----------------------------------------|-------|
| MI                                      | 1     |
| CHF                                     | 1     |
| PVD                                     | 1     |
| Dementia                                | 1     |
| Chronic pulmonary disease               | 1     |
| Rheumatological disease                 | 1     |
| Peptic ulcer disease                    | 1     |
| Mild liver disease                      | 1     |
| Diabetes without chronic complications  | 1     |
| Diabetes with chronic complications     | 2     |
| Hemiplegia or paraplegia               | 2     |
| Renal disease                           | 2     |
| Solid tumor                             | 2     |
| Leukemia                                | 2     |
| Lymphoma                                | 2     |
| Moderate or severe liver disease        | 3     |
| AIDS/HIV                                | 6     |
| Metastatic solid tumor                  | 6     |
| Maximum comorbidity score               | 37    |

MI: Myocardial infarction, CHF: Congestive heart failure, PVD: Peripheral vascular disease, HIV: Human immunodeficiency virus, AIDS: Acquired immunodeficiency syndrome
The mean age was 34.2 years in the survivor group and 36.4 years in the nonsurvivor group.

Seven out of the ten patients (70%) in the survivor group were females, while six of eight patients (75%) in the nonsurvivor group were females.

Only second- and third-degree burns were included, and first-degree burns were not included in the analysis.

The mean TBSA burns was 38.4% (18%–45%) in the survivor group and that of the nonsurvivor group was 42.5% (25%–54%).

**DISCUSSION**

The above is a preliminary result of the study to look for the effect of comorbidities on the outcome of major thermal burns. The use of CCI to predict prognosis based on comorbidities is a time tested one with its use in all types of intensive care patients.

Although the most important factors affecting the prognosis of a burns patient are age >65 years, the presence of inhalational burns, and the presence of burn injury with TBSA >40%, the role of comorbidities in burn prognosis has not been highlighted.

The previous studies on the subject are few and far in between.

A study (2007) by Thombs et al. looked at the effect of comorbidities on burn mortality in patient records over 10 years with a big sample size using the CCI. Their findings were similar to ours in that many medical conditions, especially renal disease, metastatic cancer, and liver disease have a very poor prognosis in acute burns.\(^8\)

Knowlin et al. in 2016 evaluated the role of CCI in burn outcome and measured the effect of comorbidities on the LA50 TBSA (TBSA at which 50% of patients are expected to die). They found that comorbidities significantly affect the LA50 and outcomes.\(^9\)

Lundgren et al. evaluated the outcomes in older adults and found that comorbidities and age are the two very important factors affecting both the hospital stay and mortality.\(^9\)

Our study is a small step in the same direction. The above are the preliminary results, and statistical analysis is needed to rule out the same.

The lack of objective criteria to rule out inhalational injury, which according to most studies, is the single most important predictor of burn mortality, is another drawback of the study.

**CONCLUSION**

Comorbidities do have an impact on the prognosis of a burns patient, and objective assessment of prognosis of the burn injury must include the CCI as a tool to predict the outcome correctly and reliably.

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**Conflicts of interest**

There are no conflicts of interest.

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