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The influence of substance misuse on clinical outcomes following burn[☆]

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ABSTRACT

Introduction: Ongoing increases in the prevalence of substance misuse among burn-injured patients necessitate a contemporary analysis of the association between substance misuse and clinical outcomes in burn-injured adults.

Methods: We conducted a retrospective cohort study of 1199 patients admitted to a regional burn center. History of substance misuse was derived from a prospective clinical registry and categorized as alcohol, illicit drug, or both. The primary outcome was hospital length of stay; association of substance misuse and inpatient complications were secondary outcomes. Multivariable logistic regression was used to model the association between categories of substance misuse and each outcome, adjusting for patient and injury characteristics.

Results: The incidence of substance misuse was 34% overall. After adjustment for patient and injury characteristics, drug misuse was associated with a significantly longer length of stay (RR 1.12; 95% CI 1.00-1.25), as was alcohol misuse (RR 1.32; 95% CI 1.14-1.52), and drug/alcohol misuse (RR 1.34; 95% CI 1.16-1.56). Drug/alcohol misuse was associated with significantly higher rates of bacteremia (OR 3.84; 95% CI 1.83-8.04) and sepsis (OR 2.50; CI 1.13-5.53).

Conclusions: A history of substance misuse is associated with an increased risk of inpatient complications and longer hospital stay. Providers should be cognizant of increased complications in this cohort with a view to improving outcomes.

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1. Introduction

Thermal injury affects an estimated 450 000 people annually in the United States and accounts for approximately 3000 deaths [1]. A host of risk factors for burn have been identified, including age, gender, socioeconomic status, and comorbidity [2]. More specifically, substance misuse is a known risk factor for burn and other traumatic injuries [3,4].

The U.S. Department of Health and Human Services' recent national survey found 24.6 million people (9.4%) in the US, aged 12 or older, have used illicit drugs in the past month, and that the current rate of illicit drug use is significantly higher than rates observed in previous years [5]. Similar trends have been observed among burn patients; the proportion of patients that tested positive for cannabis increased from 6% in 2002 to 27% in 2011 [6]. Some studies report that these patients have increased length of stay [7,8] and increased mortality [9] compared with those who did not abuse drugs.

Alcohol is implicated in more than 50% of burns, and intoxicated patients suffer from more extensive burns and an increased likelihood of inhalation injury compared with non-intoxicated burn patients [7,10-12]. Previous studies have attempted to elucidate the effects of acute alcohol exposure on burn by focusing on patients who exhibit binge drinking. These studies demonstrate that patients who are intoxicated at the time of injury have increased ventilator days, fluid resuscitation volumes, and rates of complications such as graft loss, cellulitis, and pneumonia [7,10,11,13,14]. In corresponding animal studies, intoxication at the time of burn leads to fluid retention and impairment of the gut-liver axis; this might predispose patients to graft loss, compartment syndrome, pulmonary complications, and worsen end-organ ischemia [15-18].

Although there is an abundance of literature exploring alcohol misuse in burn-injured patients, remarkably little research has been undertaken to understand the implications of drug misuse. Additionally, there is a dearth of research on concurrent drug and alcohol misuse. Further concern comes from the increase in illicit drug use [5] and impending legalization of particular drugs [19-21]. Existing studies on drug misuse in burn-injured patients report contradictory results, the interpretation of which is limited by small cohort sizes, poor risk adjustment, and/or focus on mortality as a primary outcome. Moreover, studies that did include concurrent drug and alcohol misuse did not differentiate between acute intoxication and those with a history of alcohol abuse [7,9,11]. Such evidence lends support for the need to better understand recent trends in drug misuse, alcohol misuse, or both drug and alcohol misuse. The potential impact of drug misuse on other important patient-level outcomes and the effects of combined drug and alcohol use on morbidity and mortality in burn patients are largely unknown.

The aim of this study is to determine the association between substance misuse, specifically drug misuse, alcohol misuse, or both drug and alcohol misuse, on burn patient outcomes. We hypothesized that burn patients with a history of substance misuse have a longer length of stay and increased rates of complications than burn patients with no history of substance misuse.

2. Methods

2.1. Study design and participants

A retrospective cohort study was conducted among burn patients admitted between 2006 and 2014 to our regional burn center. Adult patients (≥ 16 years of age) were identified from our prospective burn registry. To capture initial acute admissions for burn, patients were included if admitted within seven days of burn. Patients who died within 72h of admission were considered futile and therefore excluded from the analysis. The study protocol was approved by the research ethics board at our institution.

Data were obtained from a prospective clinical registry of all patients admitted to our burn center. Substance misuse was defined as self- or family-reported drug misuse or alcohol misuse and recorded as a comorbidity in our registry. The attending burn staff or other trained members of the burn team, such as our burn dedicated social worker, identified substance misuse on admission and during the patient history. Furthermore, patients admitted to our burn center undergo toxicology screens on admission; a positive toxicology was considered drug misuse. We defined drugs of misuse to include any of the following: cannabis, marijuana or hashish; amphetamines, cocaine, crack, or methamphetamines; opiates, heroin; hallucinogens or dissociative agents. Substance misuse was indicated based on the World Health Organization's definition: use of a substance in opposition to medical or legal guidelines [22]. For the purposes of our analysis, tobacco smoking was not considered drug misuse and as such, smokers are represented in all groups.

Patients were assigned to one of four groups: (1) no substance misuse (controls), (2) drug misuse, (3) alcohol misuse, and (4) drug misuse and alcohol misuse (drug/alcohol misuse). The primary outcome was hospital length of stay (LOS). Secondary outcomes included the incidence of each the following inpatient complications: in-hospital bacteremia, sepsis, cellulitis, acute respiratory distress syndrome (ARDS), and pneumonia.

2.2. Statistical analysis

The data are reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement [23]. Categorical data were analyzed using the Fisher's exact or χ^2 test. Normally distributed continuous variables were analyzed using the Student's t-test or one-way ANOVA and non-normally distributed variables were analyzed using the Mann-Whitney U or Kruskal-Wallis test, followed by pair-wise post-hoc analysis. Data are presented as mean (SD) for normally distributed continuous variables, median (IQR) for variables with a non-normal distribution, or number (%) as appropriate. To examine the association between drug, alcohol, and drug/alcohol use, and each outcome, individual regression models were developed. Covariates chosen a priori for each regression model were continuous variables, that included patient age and % total body surface area (TBSA) burn, and categorical variables, that included patient gender and inhalation injury. Subgroup analyses were conducted to

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