Genital Burns in the National Burn Repository: Incidence, Etiology, and Impact on Morbidity and Mortality

Bethany G. Harpole, Lucy A. Wibbenmeyer, and Bradley A. Erickson

OBJECTIVE To better characterize national genital burns (GBs) characteristics using a large burn registry. We hypothesized that mortality and morbidity will be higher in patients with GBs.

METHODS The National Burn Repository, a large North American registry of hospitalized burn patients, was queried for patients with GB. Burn characteristics and mechanism, demographics, mortality, and surgical interventions were retrieved. Outcomes of interest were mortality, hospital-acquired infection (HAI), and surgical intervention on the genitalia. Adjusted odds ratios (aOR) for outcomes were determined with binomial logistic regression controlling for age, total burn surface area, race, length of stay, gender, and inhalation injury presence.

RESULTS GBs were present in 1245 cases of 71,895 burns (1.7%). Patients with GB had significantly greater average total burn surface area, length of stay, and mortality. In patients with GB, surgery of the genitalia was infrequent (10.4%), with the aOR of receiving surgery higher among men (aOR 2.7, $P < .001$) and those with third-degree burns (aOR 3.1, $P < .002$). Presence of a GB increased the odds of HAI (aOR 3.0, $P < .0001$) and urinary tract infections (aOR 3.4, $P < .0001$). GB was also an independent predictor of mortality (aOR 1.54) even after adjusting for the increased HAI risk.

CONCLUSION GBs are rare but associated with higher HAI rates and higher mortality after adjusting for well-established mortality risk factors. Although a cause and effect relationship cannot be established using these registry data, we believe this study suggests the need for special management considerations in GB cases to improve overall outcomes. UROLOGY 83: 298–303, 2014. © 2014 Elsevier Inc.

Burns to the genitalia are rare, thought to reflect the relatively protected nature of the genitalia from burn insults. The few single-institution studies reporting genital burns (GBs) cite an incidence of 2.7%-12.5%, with wide variability in presentation, demographics (ie, pediatric burns vs those obtained in military combat), and clinical outcomes.[1-3] Mortality rates of those with GBs have ranged from 2.7% to 67%. Accurate interpretation of the incidence, burn characteristics, and outcomes of GBs is hindered by the paucity of studies.

The goal of this study was to use the National Burn Repository (NBR) to better understand the epidemiology and management of hospital-admitted patients with GB in the United States. Second, we wanted to study the impact that the presence of GBs had on overall morbidity and mortality. On the basis of our own clinical observations, we present the hypothesis that given the general association of GB with burns of worse severity, those with GBs will have higher overall mortality rates. An additional hypothesis is that patients with GB will have higher overall infection rates given the assumed increased risk of GB contamination from urine and feces.

METHODS

Data for this study were retrieved from the American Burn Association (ABA) NBR version 5, an anonymously coded computerized database whose history, evolution, and characteristics are well described.[4,5] Briefly, the NBR database version 5 of ABA contains over 168,000 cases from January 2002 to June 2011[4,5] and includes all burn data from hospitalized burn patients treated at ABA-verified burn centers in North America. Nonverified centers can also voluntarily contribute data. The NBR was created in 1994 when the ABA partnered with the American College of Surgeons to develop the hospital-based burn registry, which uses NATIONAL TRACS software (Digital Innovation, Inc.). The NBR itself is organized as a star schema with a main data table and 7 dimensional tables: comorbidity, complication, diagnoses, drug screen, inhalation injury, operations, and resource utilization. The main table contains patient demographic, length of stay, and injury characteristic information. Each record in the NBR associated with 1 patient visit is assigned a random and unique number, linking patient records from the main data table with its dimensional tables.

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From the Department of Urology, University of Iowa, Carver College of Medicine, Iowa City, IA; and the Department of Surgery, University of Iowa, Carver College of Medicine, Iowa City, IA

Reprint requests: Bradley A. Erickson, M.D., M.S., Department of Urology, University of Iowa, Carver College of Medicine, 200 Hawkins Dr 3RCP, Iowa City, IA 52242. E-mail: brad-erickson@uiowa.edu

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We performed an initial review of the raw data to exclude all duplicate patient records and those with missing values in mortality, gender, race, and/or age using previously established NBR-specific methods, leaving us with 71,895 total burn patients for analysis (duplicate data are common in the NBR because of reporting methodologies).[6,7]

To then ensure that the study cohort was a valid representation of the total burn population, we compared the GB (2.4% vs 1.7%) and mortality (3.5% vs 5.5%) of the included and excluded men, respectively, and found rates to be roughly similar. All included burn cases from the data set were then queried for GB, coded by ICD-9-CM code 942 and arranged by the NBR into second- or third-degree burn categories (first-degree burns are not included in the NBR.) For each patient, we collected data on age, race, gender, total burn surface area (TBSA), total hospital length of stay (LOS), presence of inhalation injury, mortality, the number and type of surgical interventions, and the development of a hospital-acquired infection (HAI) defined as evidence of postburn bacteremia, catheter-associated blood stream infection, septicemia, and urinary tract infection (UTI).

Primary study outcomes were mortality, HAI, and surgical intervention to the genitalia. Surgical intervention was determined by NBR ICD9-CM codes. Queried codes included circumcision (64.0); penectomy or penile reconstruction (64.3, 64.44); testicular graft (62.69); uni- or bilateral orchiectomy (62.3, 62.41, 62.42); scrotectomy and scrotal reconstruction with rotational or pedicle flaps (61.3, 61.49) or other skin graft to the perineum (70.64, 64.44, 64.49); excisions (61.2, 61.3, 64.2, 71.3, 71.61) or incisions (64.91, 71.09); laceration sutures (61.41); or other repair of the penis, scrotum, or vulva (61.49, 64.49, 71.79). HAI was determined by TRAC code or string variable of bacteremia (5511), catheter-associated blood stream infection, septicemia (5507), or UTI (29, 6003, 6004, 6005). Importantly, specific information on skin grafting of the genitalia and perineum could not reliably be elucidated from this data set.

Demographic and clinical characteristics were compared between patients with and without GBs. Descriptive statistics were generated for all variables. Categorical variables and continuous variables with normal distributions were analyzed using chi-square tests or t-tests, respectively; continuous variables without normal distributions were compared using the Mann-Whitney *U* test. Binomial logistic regression provided adjusted odds ratios (aOR) for mortality outcomes, HAI and surgical intervention, controlling for age, TBSA, burn depth, race, LOS, gender, and inhalation injury presence. Statistics were performed with SPSS (SPSS, Inc., Chicago, IL). Statistical significance was considered when an odds ratio was not equal to 1% and 95% confidence interval did not cross 1, with a *P* value <.5. Adjusted aOR and 95% confidence intervals are given in parenthesis. The study was approved by the University's Institutional Review Board.

RESULTS

Demographics

From a study population of 71,895 burn patients, 1245 had a GB (1.7%) of which 405 (32.5%) were second-degree, and 840 (67.5%) were third-degree burns (Table 1). The most common burn etiology for both GB and non-GB patients was fire/open flame (49.1% and 37.9%, respectively). Of the third-degree GBs, a higher percentage was caused by fire or open flame (67.9%) than second-degree burns (40.0%), which were most commonly caused by scalds (43.5%). Patients with GBs had significantly larger TBSA (37.9% vs 8.9%; *P* <.0001) and a longer LOS (18.4 vs 8.9 days; *P* <.0001) than those without GB.

Table 1. Demographic comparison of patients with genital burns with patients without genital burns

Patient/Burn Variable	GB (N = 1245)	Non-GB (N = 71895)	*P*
Age, mean y (SD)	36.8 (25.3)	34.7 (22.6)	.035
Male gender, n (%)	874 (70.2)	50371 (70.1)	.470
Total TBSA, mean % (SD)	37.9 (28.4)	8.9 (13.9)	<.0001
Inhalation injury			<.0001
No	711 (57.1)	56367 (78.4)	
Yes	179 (14.4)	5825 (8.1)	
Unknown	355 (28.5)	9703 (13.5)	
LOS, mean d (SD)	35.6 (46.7)	11.9 (21.1)	<.0001
Died, n (%)	329 (26.4)	3686 (5.1)	<.0001
Ethnicity, n (%)			<.0001
Asian	43 (3.5)	1595 (2.2)	
Black	233 (18.7)	13791 (19.2)	
Hispanic	183 (14.7)	10879 (15.1)	
White	715 (57.4)	42709 (59.4)	
Other	71 (5.7)	2921 (4.1)	
Mechanism, n (%)			<.0001
Fire/flame	611 (49.1)	27250 (37.9)	
Scald	435 (34.9)	17199 (23.9)	
Electrical	43 (3.5)	2313 (3.2)	
Chemical	30 (2.4)	1731 (2.4)	
Other	73 (5.9)	9488 (13.2)	
Unknown	53 (4.3)	13914 (19.4)	
Infection, n (%)			<.0001
Bacteremia	22 (1.8)	249 (0.35)	
CABSI	20 (1.6)	160 (0.22)	
Septicemia	63 (5.1)	460 (0.64)	
UTI	119 (10.0)	1440 (2.0)	

CABSI, catheter-associated blood stream infection; GB, genital burn; LOS, length of stay; SD, standard deviation; TBSA, total body surface area; UTI, urinary tract infection.

Infection

Patients with GB had significantly higher rates of HAI (18.0% vs 2.8%; *P* <.0001; Table 1), most notably UTI (10.0% vs 2%) and septicemia (5.1% vs 0.64%). On binomial logistic regression, the presence of GB tripled the odds of developing any HAI (aOR 2.998, 2.391-3.760, *P* <.0001; Table 2), most notably UTI (aOR 3.435, 2.576-4.581, *P* <.0001).

Mortality

Overall mortality for patients with GB was significantly higher than non-GB patients (17.0% vs 4.7%; *P* <.0001). The presence of GB independently predicted mortality (aOR 1.520, 1.188-1.944, *P* <.0001; Table 3) even after controlling for other well-established burn-specific mortality predictors, including age, ethnicity, TBSA, inhalation injury, and burn depth. When the presence of a HAI was included in the multivariate mortality model, GB remained a strong mortality predictor (aOR 1.514, 1.183-1.939, *P* <.001).