INTRODUCTION

An estimated 486,000 burn injuries require medical treatment annually in the United States.1 Encouragingly, the incidence of burn injuries in the United States has declined over the past two decades.2 Increased survival rates in burn patients have been attributed to a steady shift in complex burn care away from clinics and community hospitals toward high-volume burn centers that focus on optimizing fluid resuscitation, wound care, metabolic support, and infection control.3 Infection remains a major cause of morbidity and mortality in the burn population, as burns are particularly susceptible to rapid mobilization of bacteria due to disruption of normal immune function, inflammation, and metabolic disturbances, resulting in opportunity for hematogenous bacterial dissemination, multiorgan failure, and sepsis.4–6 It is estimated that 36% of mortality in more than 20% total body surface area (TBSA) burns and 75% of mortality in more than 40% TBSA burns stem from infection.7,8 Furthermore, complications from infection may prolong morbidity from burn injuries through graft loss, prolonged hospital stays, and increased readmissions.5,9,10

The current evidence regarding perioperative prophylactic antibiotic use is mixed. Several studies in patients with deep burns have demonstrated fewer donor site infections and fewer skin graft losses with antibiotic prophylaxis,11,12 whereas other studies have reported no difference in graft take with or without perioperative antibiotics.13,14 Bacteremia secondary to surgical excision is related to a TBSA greater than 45% and a burn injury older than 10 days, which suggests that antibiotic prophylaxis for small (<20% TBSA) burns may be unnecessary.15

Background: This study investigates the effect of prophylactic perioperative antibiotic use on patients with small burns [<20% total body surface area (TBSA)] on rates of infection, graft loss, or readmission.

Methods: A retrospective chart review was conducted on patients admitted to our institution’s burn center between January 2020 and July 2021. Patients were included if they had a 20% or less TBSA burn with 1 or more operating room visit for burn excision and were excluded if a preoperative infection was present. Data were gathered regarding patient demographics, burn mechanism, burn characteristics, and outcome measures including infection, graft loss, and readmission. Statistical analysis was conducted by Mann–Whitney U and Fisher exact tests, and P values reported at two-sided significance of less than 0.05.

Results: There were no significant differences in age, body mass index, TBSA, percent third-degree burn, or comorbidities between patients who received (n = 29) or did not receive (n = 47) prophylactic perioperative antibiotics. There was a nonsignificant trend toward higher length of stay in the prophylactic antibiotic group, possibly driven by a nonsignificant trend toward higher rates of flame injuries in this group. There was no difference in infection (P = 0.544), graft loss (P = 0.494), or 30-day readmission (P = 0.584) between the two groups.

Conclusion: This study finds no significant difference in postoperative infection, graft loss, or 30-day readmission in two similar patient cohorts who received or did not receive prophylactic perioperative antibiotics for acute excision of small (<20% TBSA) burns. (Plast Reconstr Surg Glob Open 2022;10:e4388; doi: 10.1097/ GOX.0000000000004388; Published online 21 June 2022.)
There are many risks associated with excessive antibiotic use in the burn population, including drug toxicity, Clostridioides difficile overgrowth, and the selection opportunity for the development of multidrug resistant bacteria such as Staphylococcus aureus, vancomycin-resistant enterococci, and Pseudomonas species.\textsuperscript{2,4,6,7} It is important to weigh these risks against the benefits of administering antibiotics to prevent postoperative complications.

The limited and inconclusive evidence for or against the use of routine prophylactic antibiotics in small burn excisions tangibly affects clinical decision-making in many of the 50,000 burn admissions in the United States every year.\textsuperscript{18} Aligning with recommendations from the antibiotic stewardship guidelines from the Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America, antibiotic therapy should be based on patient-specific factors.\textsuperscript{19} We believe that TBSA is an important patient-specific factor and investigated the effect of prophylactic perioperative antibiotic use on patients with small burns (TBSA \leq 20\%) on rates of infection, graft loss, and readmission.

**METHODS**

This study was approved by the institutional review board at our institution (IRB00289426). A retrospective chart review was conducted on 336 patients who were admitted to this institution’s burn center between January 2020 and July 2021. Patients were excluded from final analysis if they had more than 20\% TBSA burns, did not undergo burn excision, or if a preoperative infection was present. The final cohort size was 76 patients. Prophylactic perioperative antibiotic practices differ by attending surgeon at our burn center; therefore, patients were grouped by use or nonuse of perioperative antibiotics. Cause, location, and size of burn injuries were recorded, as well as detailed demographic information. Data on prophylactic antibiotic medication, dosage, and route were manually extracted from the medical record of each patient. Chart review was conducted on the 30-day postoperative window to capture mortality, readmission, graft loss, infection, and other complications (eg, pneumonia, central line-associated bloodstream infection, pulmonary embolism, etc.) as well as associated wound culture results and antibiotic management if available.

All statistical analysis was conducted using SPSS software (Version 27, IBM Corp., Armonk, NY). Frequencies and percentages were calculated for each categorical variable, and means with SD were calculated for each continuous variable. The Fisher exact test was used to determine significance in categorical variables across the two prophylaxis groups, and Mann–Whitney U was used in continuous variables; \(P\) values were reported at two-sided significance of \(P\) less than 0.05.

**RESULTS**

A total of 76 patients with less than or equal to 20\% TBSA burns who underwent burn excision were identified. Fewer patients received prophylactic perioperative antibiotics (\(n = 29, 38.2\%\)) than those who did not (\(n = 47, 61.8\%\)). The perioperative antibiotic most often administered was cefazolin (\(n = 27, 93.1\%\)), and in a minority of cases, vancomycin (\(n = 2, 6.9\%\)).

**Demographic**

The groups that received and did not receive prophylactic antibiotics were similar in median age (57.0 versus 55.0 years, \(P = 0.571\)), body mass index (26.3 versus 26.8, \(P = 0.589\)), and relevant comorbidities, including diabetes mellitus (24.1\% versus 25.5\%, \(P = 0.558\)), hypertension (31.0\% versus 31.9\%, \(P = 0.572\)), and smoking status (37.9\% versus 31.9\%, \(P = 0.626\)) (Table 1).

**Injury**

The groups that received and did not receive prophylactic antibiotics did not differ by median TBSA (5.0\% versus 5.0\%, \(P = 0.900\)) or percentage of third-degree burn (0.0\% versus 0.0\%, \(P = 0.520\)). There was no significant difference in the cause of burns between the two groups, but there were a higher rate of flame burns and a lower rate of scald burns in the prophylaxis group (\(P = 0.202\)). There was no difference in median length of stay between prophylaxis groups (13.0 days versus 11.0 days, \(P = 0.444\)). The two groups did not differ significantly in anatomic location of burn compared in the head and neck (\(P = 0.254\)), trunk and buttocks (\(P = 1.00\)), arms (\(P = 0.276\)), hands (\(P = 0.756\)), or legs (\(P = 0.244\)) (Table 1).

**Complications**

Three primary outcomes were examined in this study: infection, graft loss, and 30-day readmission. There was no significant difference between the two groups in infection (\(P = 0.544\)), graft loss (\(P = 0.494\)), or 30-day readmission (\(P = 0.584\)) (Table 2).

**DISCUSSION**

This study attempts to determine whether prophylactic perioperative antibiotics are necessary for small (\(\leq 20\%\) TBSA) acute burn excisions. We found no difference in postoperative infection, graft loss, or 30-day readmission across two highly similar groups—in age, comorbidity, and extent of burn—regardless of prophylactic antibiotic administration.
Perioperative antibiotics are often used in cutaneous surgery for extensive burn injuries, during which the large surface area of the surgical site and altered physiology puts the patient at high risk of local and systemic infection. However, no standardized data exist for prophylactic use of antibiotics in small burns, a scenario in which these risks are reduced. The potential reduction in infectious risk must be weighed against practicing antibiotic stewardship to preserve effective therapies for multidrug-resistant organisms, particularly in the susceptible burn population. This study found no difference in three crucial postoperative measures of success in burn surgery: infection, graft loss, and 30-day readmission, suggesting that systemic antibiotic use in small burn excisions may be reasonably foregone. This finding reflects previous work done in pediatric patients, which showed that routine antibiotic prophylaxis was unnecessary in the era of early excision and closure of burns, and more recent work, which showed no effect of perioperative antibiotic prophylaxis on the incidence of bacteremia graft loss, or surgical site infection. The unique practice patterns at our institution—where initial excision is randomized by surgeon call schedule and where some surgeons routinely request prophylactic antibiotics in small burn excisions and others do not—provide a natural comparison group for retrospective review. This study captured extensive demographic, comorbidity, and injury data to ensure that the decision to prescribe prophylactic antibiotics was attributable to surgeon preference rather than clinical context. The prominent similarity between the two groups in age, comorbidities, burn size, anatomic burn location, and discharge status reinforces that the prophylaxis and no-prophylaxis groups are clinically similar and that the noninferiority findings are clinically meaningful.

This study identified patients using a prospectively maintained institutional database. However, it is limited by its retrospective chart review design in capturing antibiotic prophylaxis data and subsequent complications. Detailed antibiotic administration data were collected from anesthesia notes, but the use of topical antibiotics in postoperative care was not analyzed. The most important limitation in this study is the restricted sample size of 76 patients. In particular, the overall rate of complications and readmission was relatively low, limiting the power of findings. However, the noninferiority of infections, graft loss, and readmission between the two highly similar cohorts in this retrospective study provides justification for a prospective, randomized trial for gold-standard data that can standardize prophylactic antibiotic practices in small burn excisions throughout the country.

CONCLUSIONS

In our cohort-matched retrospective review of 76 burn patients with small burns, we found no difference in outcomes between patients who did and did not receive...
prophylactic antibiotics. Although the power of the study is low, we feel that the results provide adequate justification for a practice-altering prospective trial to further characterize the use or nonuse of antibiotic prophylaxis in small burns.

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