**Cutaneous Abscesses in Children**

**Epidemiology in the Era of Methicillin-Resistant Staphylococcus aureus in a Pediatric Emergency Department**

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**Objective:** Skin and soft tissue infections are a major public health issue. Previous literature suggests a recurrence rate of 4% in children. The purpose of this study was to examine the epidemiology, body location, and history of previous infections among children in the emergency department setting.

**Methods:** A retrospective study was performed using electronic medical records from all subjects treated in a large pediatric emergency department with attending physician diagnosis and billing codes indicative of a cutaneous abscess from July 1, 2007, to December 31, 2007. Descriptive statistics were used to evaluate abscess location, prior history of infection, bacterial etiology, and patient disposition.

**Results:** Three hundred eighteen abscess visits occurred in 308 individual subjects; 79% were due to methicillin-resistant Staphylococcus aureus. Approximately 14% of subjects presented with more than 1 abscess. Those 2 years or younger were more likely to have buttock abscesses ($P < 0.001$). Of the 192 subjects for whom responses were documented, 82 (43%) had a history of a prior abscess. Children 2 years or younger were significantly more likely to be hospitalized or go to the operating room: 49% versus 15% ($P < 0.001$).

**Conclusions:** Many children with a cutaneous abscess have a prior history of infection. Multiple abscesses are common. Young children are more likely to have abscesses in the diaper area or be hospitalized. Studies of effective hygiene practices and interventions to reduce recurrence are urgently needed.

**Key Words:** abscess, epidemiology, skin and soft tissue infections, methicillin-resistant *Staphylococcus aureus*

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Skin and soft tissue infections represent a major public health problem, especially in children. An increasing number of cases are associated with community-acquired methicillin-resistant *Staphylococcus aureus* (MRSA) infection. Previous literature has demonstrated little to no additional therapeutic benefit of antibiotics after incision and drainage (I&D) of uncomplicated abscesses yet many patients still receive antimicrobial agents. With controversy surrounding best treatment practices, direct preventive measures may play an important role in limiting infection. There is a paucity of literature examining the recurrence rate or location distribution of skin and soft tissue infections in children. An improved understanding of the epidemiology of these infections could assist in the development of efficacy studies of preventive measures and therapeutic regimens. To that end, we sought to evaluate the epidemiologic factors associated with abscesses in children presenting to the emergency department (ED).

**METHODS**

**Study Design**

We conducted a retrospective descriptive study using electronic medical records (EMRs) from July 1, 2007, to December 31, 2007 from a pediatric ED with approximately 60,000 visits annually. Records from ED visits were identified for review if billed using a primary International Classification of Diseases, Ninth Revision, Clinical Modification code of 682.xx (skin or soft tissue infection). Visits made by patients 21 years or younger were eligible for inclusion if the final diagnosis was abscess, as recorded by the attending physician in the EMR. Visits were excluded for a final diagnosis of cellulitis (without abscess), a wound check only, an evaluation as a private outpatient of the surgical service, foreign body, known mammalian bite at the site of the abscess, immunodeficiency of the patient, or abscess surrounding a lymph node or tooth. Records from children with perirectal abscesses or a pilonidal cyst were also excluded. The study was approved by the institutional review board of Akron Children’s Hospital.

**Study Protocol**

A standardized data collection form was used to record data from the EMR by the 3 study authors who were aware of the study objectives. The institution’s EMR allows providers to document using a variety of templates, including one specifically designed for patients with skin and soft tissue infections. This template prompts the provider to record any prior history of similar infection in the patient, a history of a family member with a skin or soft tissue infection, the size and location of the abscess, the presence of multiple abscesses, and any I&D procedure. These responses were recorded on the data collection form, along with the patient’s age, race, temperature, and wound culture results (with antibiotic sensitivities). Data regarding antibiotic treatment upon hospital admission or discharge were also recorded. Handwritten physician records were reviewed when electronic data were not available (<5% of records).

**Data Analysis**

All data were entered into SPSS version 14.0 for analysis (SPSS, Chicago, Ill.). Descriptive statistics were used to evaluate abscess location (categorized by age), previous history of abscesses, frequency of multiple abscesses, bacterial etiology, treatment, and disposition.

**RESULTS**

During the study period, 620 visits were associated with an International Classification of Diseases, Ninth Revision, Clinical Modification diagnosis of 682.xx. After exclusion of 189
patients with cellulitis without abscess, 24 patients who presented for a wound check only, and 30 patients who had a private outpatient surgical visit, an additional 59 patients were found to have abscesses associated with other exclusion criteria. In total, 318 visits for abscess occurred by 308 individual patients during the 6-month study period, representing 0.95% of all ED visits.

The median age was 7 years, and 51% of subjects were female. Approximately 61% of children were white, 36% were black, and 3% were of other racial backgrounds. The age and race distributions of patient visits for abscesses were similar to those of the general ED population, except that 10% of all ED visits were made by children aged 1 year, whereas 18% of all visits for abscesses were made by children aged 1 year. Approximately 14% of all patients presented with more than 1 abscess. Only 8% of patients had fever >38.0°C or greater at the time of triage. Children 2 years or younger were significantly more likely to have abscesses on the buttocks, yet less likely to have an abscess located on the lower arm or lower leg compared with those older than 2 years (Table 1).

Among the 192 patient visits for which the provider documented a history of previous abscess, 82 (43%) had a history of prior abscess. Similarly, among the 108 visits for which the provider documented a history of a household contact with a skin or soft tissue infection, 59 patients (54.6%) had a positive history of a household contact. Caregivers of children 2 years or younger were significantly more likely to report a household contact with a skin or soft tissue infection than caregivers of children older than 2 years (67.3% and 42.4%, respectively, \(P = 0.01\)).

Of the 249 patient visits associated with I&D at our institution, 237 (95%) had a wound culture performed. Methicillin-resistant S. aureus was detected in 79% of abscesses (Table 2). Patients with more than 1 abscess were no more likely to be positive for MRSA than those with only 1 abscess (\(P = 0.22\)). Of the 262 patients in whom the largest abscess was measured, the mean size was 3.2 ± 1.8 cm (range, 0.2–10 cm).

About 88% of patients discharged to home received an antibiotic that was potentially active against MRSA (trimethoprim-sulfamethoxazole, clindamycin, doxycycline, or tetracycline). Only 5% of patients were discharged to home without a prescription for an antibiotic. Almost all (98.9%) of children who were admitted or taken to the operating room received an intravenous antimicrobial agent to which MRSA was potentially susceptible (clindamycin, trimethoprim-sulfamethoxazole, or vancomycin). Overall, approximately 28% of subjects were admitted to the hospital or taken to the operating room for I&D: 49% of subjects 2 years or younger versus 15% of subjects older than 2 years (\(P < 0.001\)).

**TABLE 1. Location of Abscesses Categorized by Age**

<table>
<thead>
<tr>
<th>Body Site</th>
<th>(&lt;2) y, n (%)</th>
<th>(\geq2) y, n (%)</th>
<th>(P^*)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face or neck</td>
<td>4 (3.0)</td>
<td>19 (7.7)</td>
<td>0.08</td>
</tr>
<tr>
<td>Upper arm</td>
<td>2 (1.5)</td>
<td>13 (5.3)</td>
<td>0.1</td>
</tr>
<tr>
<td>Lower arm</td>
<td>1 (0.8)</td>
<td>26 (10.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Hand</td>
<td>0 (0)</td>
<td>3 (1.2)</td>
<td>0.55</td>
</tr>
<tr>
<td>Trunk (excluding buttock/axilla)</td>
<td>19 (14.4)</td>
<td>23 (9.3)</td>
<td>0.13</td>
</tr>
<tr>
<td>Buttock</td>
<td>59 (44.7)</td>
<td>21 (8.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Upper leg</td>
<td>33 (25.0)</td>
<td>81 (32.8)</td>
<td>0.12</td>
</tr>
<tr>
<td>Lower leg</td>
<td>4 (3.0)</td>
<td>27 (10.9)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Foot</td>
<td>0 (0)</td>
<td>9 (3.6)</td>
<td>0.03</td>
</tr>
<tr>
<td>Axilla</td>
<td>5 (3.8)</td>
<td>14 (5.7)</td>
<td>0.42</td>
</tr>
<tr>
<td>Scalp</td>
<td>1 (0.8)</td>
<td>4 (1.6)</td>
<td>0.66</td>
</tr>
<tr>
<td>Genital area</td>
<td>4 (3.0)</td>
<td>7 (2.8)</td>
<td>1</td>
</tr>
</tbody>
</table>

*Probability values refer to the \(2 \times 2\) \(\chi^2\) (or Fisher exact) comparison between children 2 years or younger and those 3 years or older.

**DISCUSSION**

The true incidence of recurrence after skin and soft tissue infection remains unknown, as are the epidemiologic factors associated with the likelihood of developing repeated infections.

Lee et al. performed a retrospective chart review and found a recurrence rate of only 4% over a 2- to 6-month period among children with abscesses. The study was limited by a relatively small sample size (n = 69). Our data suggest that recurrence may be more frequent, because a history of prior skin and soft tissue infection was noted in 43% of visits made by children with abscesses (when documented by the provider). This rate is closer to that found by Duong et al., who reported that 28% of children with abscesses enrolled in a randomized controlled trial developed new lesions at 3 months post-enrollment.

Similar to our findings regarding site of infection, Hasty et al. described the buttock area as a common site for abscesses among children. However, only 2% of children in their cohort of 270 presented with multiple abscesses, much less than our rate of 14%. It is possible that MRSA is more likely to cause multiple abscesses than methicillin-susceptible S. aureus (MSSA), since Hasty et al. reported a lower proportion of infections due to MRSA than we detected (22% vs 79%, respectively). Our study may have had limited power to detect an association between MRSA and multiple abscesses because a high proportion of infections were positive for MRSA.

Invasive infections such as sepsis among patients with abscesses treated with I&D are extremely rare regardless of antimicrobial therapy, and clinical outcomes are similar for patients with abscesses because of either MRSA or MSSA. A multicenter study of adult ED visits and an analysis of nationally representative data have demonstrated that 76% to 78% of patients receive a prescription for antibiotics after treatment of skin and soft tissue infections. Similarly, our study found that providers in the ED of a large children’s hospital usually prescribe antibiotics to which MRSA could be susceptible.

Because providers often prescribe antibiotics despite lack of clear evidence of efficacy after I&D, preventing skin and soft tissue infections may reduce antibiotic exposure in children. The high prevalence of previous infection among children treated with antibiotics remains unknown, as are the epidemiologic factors associated with the likelihood of developing repeated infections.
in the ED and the frequency of multiple infections support the need for effective preventive measures.

Our study is limited by its retrospective nature. Not all data elements were available for every patient visit, yet electronic documentation and templates facilitated this research. Records were reviewed only for those patients with primary diagnosis of abscess; therefore, some patients may have been excluded if an alternative primary diagnosis was chosen.

Regardless, this study confirms that the buttock is the most common location of abscesses in children 2 years or younger. Because most children in this age group wear diapers, local skin irritation in the gluteal area may play a role in the etiology of soft tissue infections due to MRSA. Little research has been performed in this area. One prior study does suggest an increased risk of MRSA in those with skin breakdown, although this was not limited to the pediatric population.18 Future research exploring the role of perineal barrier creams or mupirocin ointment in abscess prophylaxis in young children may be warranted.

CONCLUSIONS

In an unselected population of children from a pediatric ED, a prior history of infection is common on presentation (estimate of 43%). Multiple abscesses are frequently encountered. Buttock abscesses predominate in children 2 years or younger. For children older than 2 years, the location is more likely to be the upper leg. Children 2 years or younger are also significantly more likely to be hospitalized or taken to the operating room for I&D. This study suggests that future research regarding prevention of buttock abscesses in diapered infants and young children is warranted. Efficacy studies of hygiene practices and interventions to reduce recurrence of abscesses are urgently needed.

REFERENCES


