The increasing prevalence of clindamycin resistance in *Staphylococcus aureus* isolates in children with head and neck abscesses

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METHODS: Between January 2000 and June 2008, inpatient and outpatient *S. aureus* isolates were reviewed for antibiotic susceptibility. In particular, cultures from 153 abscesses in the head and neck region were assessed for clindamycin and methicillin resistance patterns.

RESULTS: Annual clindamycin resistance rates for all *S. aureus* isolates, and specifically for *S. aureus* head and neck abscesses, revealed concerning levels of clindamycin and methicillin resistance. After 2002, the mean clindamycin resistance rate in head and neck abscesses was approximately 27%. The number of new cases of methicillin-resistant *S. aureus* per year increased from four cases in 2000 to 44 cases in 2007.

CONCLUSION: Antibiotic resistance should be considered following failed empirical therapy of head and neck abscesses with clindamycin.

Key Words: Abscess; Clindamycin resistance; Head and neck

*Staphylococcus aureus* is the most common cause of head and neck abscesses in children (1-6). It is a difficult organism to treat because it possesses the ability to adapt and develop resistance to multiple antibiotics. At Canadian pediatric otolaryngology tertiary referral centres, clindamycin is the antibiotic typically used to treat head and neck infections because most of the patients have already failed first-line therapy with penicillins. The aim of the present study was to retrospectively review trends in clindamycin resistance among *S. aureus* head and neck abscesses between January 2000 and June 2008.

PATIENTS AND METHODS

A retrospective review of all *S. aureus* bacterial cultures from a microbiology database at The Hospital for Sick Children (HSC) in Toronto, Ontario, between January 2000 and June 2008, was performed. The authors specifically identified all *S. aureus* isolates from head and neck abscesses, and reviewed antimicrobial susceptibility patterns within this population. Patients younger than 18 years of age who presented with an abscess in the head and neck region, which was cultured and grew *S. aureus*, were included in the study. Exclusion criteria included patients with intracranial lesions, a head and neck infection or a mass that did not culture *S. aureus*, or a mass that was not classified as an abscess in the microbiology database.

The following information was gathered from the medical record of each of the identified patients: age, sex, date of diagnosis, type of abscess and antibiotics at time of specimen collection. The methicillin-resistant *S. aureus* (MRSA) strains were classified as hospital-acquired MRSA (HA-MRSA) or community-acquired MRSA (CA-MRSA) according to a standard epidemiological definition (7).

The data were compared with overall trends of antimicrobial resistance in all *S. aureus* isolates (inpatient and outpatient), regardless of body site (sterile and nonsterile sites), which were tested in the HSC laboratory over the same study period.

The research ethics board of the HSC granted approval for the present study.

Laboratory analysis

The antimicrobial susceptibility profile of each *S. aureus* isolate (amoxicillin/clavulanic acid, ciprofloxacin, clindamycin, erythromycin, nitrofurantoin, gentamicin, levofloxacin, linezolid, oxacillin, penicillin, rifampin, trimethoprim-sulfamethoxazole [TMP-SMX], quinupristin/dalfopristin, tetracycline and vancomycin) was determined through testing on the BD Phoenix Automated Microbiology System (Becton Dickinson, USA) from 2001 to 2004, and through the Kirby-Bauer disk susceptibility test (oxacillin, cefoxitin, clindamycin, erythromycin and vancomycin) from 2005 to the present, in accordance with Clinical and Laboratory Standards Institute guidelines. Before 2004, isolates that were resistant to erythromycin were automatically designated as clindamycin resistant. Beginning in 2004, in

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keeping with the Clinical and Laboratory Standards Institute guidelines, all isolates that were initially susceptible to clindamycin and resistant to erythromycin were tested for inducible clindamycin resistance by the double disc diffusion test (D-test) (8).

**RESULTS**

In the dataset that specifically reviewed S. aureus head and neck abscesses, a total of 153 abscesses in 149 children were identified between January 2000 and June 2008. The median age was 15.1 months (range 0.5 to 208 months), and the male to female ratio was 1:1.33. Thirty-six per cent of patients were on clindamycin at the time of culture. Forty-three per cent of patients with clindamycin-resistant S. aureus infections were being treated with clindamycin.

**Clindamycin susceptibility in head and neck abscesses**

Among S. aureus head and neck abscesses, all years except 2005 had a clindamycin resistance rate at or above 20%. In 2001 and 2005, only 6.25% and 5.3% of abscesses, respectively, were resistant to clindamycin.

**Clindamycin susceptibility in all S. aureus isolates**

Annual clindamycin resistance rates for all S. aureus isolates between 2000 and 2007 revealed an increasing trend over the study years. This was reflected in two curves over the study period: one curve (2000 to 2003) showing an increase from 15% to 28% using a methodology that over-reported clindamycin resistance, and a second curve (2004 to 2007) showing an increase from 12% to 25%, when specific testing for clindamycin resistance became standardized. The apparent drop in 2004 was coincidental with the initiation of the D-test (Figure 1). TMP-SMX annual resistance rates remained below 7% from 2000 to 2004; the laboratory discontinued routine testing for TMP-SMX susceptibility in S. aureus isolates after 2004.

**Methicillin resistance in head and neck abscesses**

Over the study period, nine patients developed abscesses due to MRSA (Figure 2): one HA-MRSA case and eight CA-MRSA cases. Five of the CA-MRSA cases presented at the HSC, and cultured MRSA within 48 h of presentation. Three of the CA-MRSA cases were transferred to the HSC after admission and failed antibiotic management at a local community hospital; incision and drainage revealed MRSA on culture. The HA-MRSA case was attributed to a hospital admission in another country. He subsequently presented to the HSC, with persistent MRSA sepsis. He developed a posterior triangle neck abscess from which MRSA was cultured. Three of the eight CA-MRSA cases were resistant to clindamycin.

**Methicillin resistance in all S. aureus isolates**

At the HSC, the number of new cases (all isolates) of MRSA per year increased from four cases in 2000 to 44 cases in 2007. In 2007, 34% of the MRSA cases were CA-MRSA, of which 18% showed clindamycin resistance. In contrast, 45% of HA-MRSA isolates were clindamycin resistant.

During the study period, only nine (6%) head and neck abscesses were MRSA positive. However, one-third of these MRSA-positive abscesses occurred within the final six months of the study period.

**DISCUSSION**

In Canada, between 1995 and 2002, 49% of pediatric MRSA isolates (predominantly HA-MRSA) were resistant to clindamycin, whereas CA-MRSA has been largely susceptible to clindamycin (7,9). This finding was corroborated in the United States by Osowski et al (1). In their analysis of 53 pediatric head and neck abscesses due to S. aureus, they found that all MRSA isolates were susceptible to clindamycin. Therefore, they developed a treatment algorithm that recommended clindamycin as the initial empirical therapy (1). It has been further recommended by the Committee on Infectious Diseases of the American Academy of Pediatrics that TMP-SMX be used for mild skin and soft tissue infections caused by CA-MRSA (10). However, there is concern regarding its efficacy against CA-MRSA and the paucity of clinical trials to characterize its effectiveness (1,11,12). Furthermore, TMP-SMX is not effective against *Streptococcus pyogenes* and, therefore, should be used in conjunction with another agent to provide broader coverage.

A review of S. aureus head and neck abscesses in the present study demonstrated a concerning incidence of clindamycin and methicillin resistance after 2002. For clindamycin, the mean resistance rate in head and neck abscesses was approximately 27% from 2002 to mid-2008 (Figure 2). The comparatively low clindamycin resistance rates in 2001 and 2005 are likely centre specific, and may not represent regional trends. Alternatively, this may be explained by a change in the circulating strains causing head and neck infections during those years. From 2006 to mid-2008, there has been an even sharper increase in the proportion of head and neck abscesses, which were culture positive for MRSA (Figure 2). The decrease in the overall resistance for all isolates between 2003 and 2004 was due to the introduction of the D-test, which specifically tests for inducible clindamycin resistance.

At the HSC, early incision and drainage is considered for all head and neck abscesses for diagnostic and therapeutic reasons. Alternatively, needle aspiration can be used to obtain a specimen for culture until definitive incision and drainage can be achieved. Clindamycin remains the initial broad-spectrum antibiotic of choice. Co-treatment with TMP-SMX is being considered; however, it is not presently the standard practice. As clindamycin resistance increases, TMP-SMX may prove to be a useful adjuvant given that the rate of TMP-SMX susceptibility at HSC is 88% for HA-MRSA and 91% for CA-MRSA.
REFERENCES
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