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Antibiotic resistance in the *Staphylococcus aureus* containing cutaneous abscesses of HIV patients

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Keywords

Cutaneous Abscesses; HIV Infection; Antibiotic Resistance

Introduction

Skin and soft tissue infections are a frequent cause of visits to hospital emergency departments. Pallin et al. estimated that there were approximately 3 million emergency department visits with a diagnosis of cellulitis and/or abscess in 2005, three times the estimated level in 1993. (1) Customary treatment for these lesions is incision and drainage if abscess formation is evident. It is not always clear when to prescribe antibiotics after incision and drainage.

The joint statement of the American Medical Association, the Infectious Disease Society of America and the Centers for Diseases Control and Prevention (AMA/CDC/IDSA) suggests that antibiotics should be prescribed for lesions that are indicative of cellulitis and in some cases when the abscess has been incised and drained. (2) However, others have suggested that antibiotic therapy is not necessary when the abscess has been adequately drained. (3) In actual practice prescribing antibiotics seems to be quite frequent. Pallin et al. reported that antibiotics were prescribed in 78% of emergency department visits for skin and soft tissues infections. (1)

The choice of an antibiotic for treatment of skin lesions is determined by the clinician's judgment as to whether the patient is in a group that is considered to be at high risk for MRSA. Risk factors for MRSA include a recent hospitalization or stay in a long term care facility, living in close quarters or participating in activities that involve close skin contact such as encountered in shared bathing facilities, prisons, military barracks, athletic fields and locker rooms. (5) Community acquired (CA) MRSA can occur in almost any person who has skin-to-skin contact with another individual who is colonized with MRSA. For example, the

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presumed transmission of CA-MRSA as a consequence of close physical contact during heterosexual intercourse has been reported. (4)

HIV infected patients also are at high risk for CA-MRSA. Several authors have reported high prevalence in this population, (5,6) with one report that it is 18 times more prevalent than among those who are not HIV infected. (7)

HIV infected patients present a special challenge to clinicians as it is not clear on the best options for the empiric selection of an antibiotic to treat cutaneous infections in this population. The AMA/CDC/IDSA recommendations state that skin and soft tissue infections in these patients should be treated as if they were MRSA and to use medications that would provide coverage for this type or organism. However these guidelines also state that cross resistance is likely in this population or that it may rapidly develop if it is not already present. This dilemma of which antibiotic to select faced the clinicians at the Thomas Street Clinic of the Harris County Hospital District in Houston Texas USA. This clinic is one of the largest of its kind in the United States and serves only the HIV infected. More than 3500 HIV infected individuals, the majority of whom are indigent, receive primary care at the clinic. A study was conducted to determine the patterns of antimicrobial resistance in HIV infected patients who presented at Thomas Street Clinic with cutaneous lesions requiring incision and drainage.

Methods

The clinic has a Treatment Room/Urgent Care Center that is equipped to treat a variety of patient problems including abscesses requiring incision and drainage. Prescriptions, including antimicrobials, are available on-site. The treatment protocol for cutaneous abscesses specifies that exudates from all lesions be submitted for culture and drug resistance studies.

The investigators retrospectively reviewed the records of 113 consecutive occasions when patients required incision and drainage of cutaneous abscesses. All had cultures and sensitivity tests for resistance to cephazolin, penicillin, oxacillin, erythromycin, rifampin, trimethoprim-sulfamethoxazole (TMP/SMX), ciprofloxacin, tetracycline, and vancomycin. Sensitivity tests for clindamycin were performed if the initial report indicated MRSA and/or there was a possibility of a sulfa allergy.

Results

Of the 113 specimens, bacterial growth was observed in 93 cultures. Sixteen of the specimens had organisms other than *S. aureus* (3 with *Corynebacterium*, 9 with coagulase negative S*taphylococcus*, and one each with *S. typhi,* gamma hemolytic S*treptococcus*, *Enterobacteriaceae cloacae* and one patient had both coagulase negative S*taphylococcus* and C*orynebacterium*) The remaining 77 abscesses (84.6%) were *Staphylococcus aureus* positive. These represented 71 individuals as four patients had two cultures performed at different times and different abscess locations. Another patient had four time-separated bouts of cutaneous abscesses indicating re-infection. The 71 patients were demographically similar to the patients usually seen at the clinic. They were 75% male, 57% African –American, 22% Hispanic and 20% non-Hispanic white. The age ranged from 21 to 67 years with a median age of 41.

As can be seen in Table 1, Column A, resistance patterns of the *Staphylococcus aureus* cultures were as follows: resistant to penicillin G (93.5%), oxacillin (87%), cefazolin (84.4%), erythromycin (84.4%), ciprofloxacin (52.2%), tetracycline (15.6%). Fifty eight patients' lesions were also tested for clindamycin with 29.3% resistant. No patient had organisms that were resistant to rifampin, vancomycin or trimethoprim-sulfamethoxazole (TMP/SMX). 85.7% of the patients were infected with methicillin resistant *Staphylococcus aureus* (MRSA),

demonstrating resistance to both oxacillin and penicillin. 100% of cultures were resistant to either penicillin or oxacillin (Table 1).

As can be seen in Columns B to I in Table 1, there was a high level of antibiotic cross resistance. Most of the antibiotics commonly used when MRSA was suspected in the general patient population would prove ineffective in HIV infected patients. For, example, 98.5% of MRSA cultures were also resistant to cephazolin; 93.9% to erythromycin; 54.8% to ciprofloxacin. It is noteworthy that 35.4% of the MRSA cultures also showed resistance to clindamycin. It should be noted, however, that tests for clindamycin sensitivity were only done when MRSA was suspected or if the patient was thought to be allergic to sulfa drugs. Of the tested antibiotics, Tetracycline demonstrated the lowest level of resistance to MRSA (16.9%). Again, rifampin, TMP/SMX and vancomycin did not show resistance regardless of the resistance status of other drugs.

Discussion

While it would be expected that CA-MRSA would be found in HIV infected patients, its high prevalence was remarkable. Of the 93 cultures, for which there were recoverable organisms, 69 (74.2%) were MRSA positive. Even more interesting and worrisome was the high degree of resistance to the other antibiotics, many of which have been previously recommended for known or suspected MRSA infections.

The findings suggest that HIV infection should be included in a history for any person presenting with a skin or soft tissue abscess. The history also should include other risk factors associated with MRSA that were described above, i.e. recent incarceration, hospitalization, residence in a long term care facility, living in close quarters or participating in activities that involve close skin contact such as encountered in shared bathing facilities, military barracks, athletic fields and locker rooms.

While resistance profiles would be expected to vary in different communities, these results strongly suggest that HIV infected individuals with skin and soft tissue infections should be empirically treated as if they not only have MRSA but that there is a reasonable probability that the patient has a lesion that is resistant to many other commonly prescribed antibiotics. The empiric antimicrobial therapy most likely to effectively treat these abscesses in HIV infected individuals is trimethoprim-sulfamethoxazole alone or in combination with rifampin. Rifampin should not be used as a single agent but it is a helpful adjunct to TMP/SMX therapy. Such therapy is inexpensive and highly effective. Rifampin should be avoided by patients taking protease inhibitors because of its impact on the blood levels of some of those medications. In cases where allergy to sulfa drugs precludes the use of trimethoprim-sulfamethoxazole, alternatives include doxycycline, daptomycin, tigecycline and quinupristin-dalfopristin. Linezolid is an additional, albeit expensive, alternative.

Vancomycin can be used if other agents prove to be ineffective despite its high cost. However, it should be reserved for patients with complex courses requiring intravenous antimicrobial therapy. Clindamycin is a reasonable alternative, though its use should be based on sensitivity testing and should be closely monitored because HIV infected persons have reasonable probability of having organisms that are resistant to it. If clindamycin resistance is not already reported by a reference lab, such resistance testing could be ordered to assess the likelihood of success with a regimen based on this medication. .

If incision and drainage of an abscess is required in this patient population, the wound should be cared for using standard wound care techniques. Next day follow-up is appropriate. Subsequent follow up is necessary to care for a healing wound and to assure that the empiric antimicrobial agent being utilized is likely to be effective based upon the antimicrobial

sensitivity profile obtained from the wound culture. If a non-invasive strategy is utilized for smaller or less complicated skin lesions, follow up should be arranged to assure clinical improvement and to assess the appropriateness of the chosen antimicrobial agent.

The results of the study highlight the importance of health care agencies monitoring the results of antimicrobial sensitivity profiles in their patient populations. Such monitoring will allow the clinician to base the empiric antimicrobial therapy for patients at risk for CA-MRSA containing cutaneous infections upon local resistance patterns. Close cooperation between clinicians and infection control practitioners is helpful as the latter may be aware of current antimicrobial resistance patterns in patients living with HIV/AIDS in that geographic area.

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Table 1

Drug Resistance and Cross Resistance in *Staphylococcus aureus* Positive Specimens Taken from Skin Lesions that Required Incision and Drainage of HIV Positive Patients

Column A **Drug** **(% resistant)**	**Column B** **Penicillin G** **(n=77)**	**Column C** **Oxacillin** **(n=77)**	**Column D** **Erythromycin** **(n=77)**	**Column E** **Cephazolin** **(n=77)**	**Column F** **Ciprofloxacin** **(n=73)**	**Column G** **Clindamycin** **(n=58)**	**Column H** **Tetracycline** **(n=75)**	**Column I** **TMP/SMX* Rifampin Vancomycin** **(n=77)**
Penicillin G (93.5%)	-	88.9%	32.1%	90.3%	97.4%	32.1%	91.7%	0%
Oxacillin (87.0%)	88.9%	-	34.7%	97.0%	89.5%	34.7%	91.7%	0%
Oxacillin and Penicillin G (85.7%)	-	-	93.9	98.5%	54.8%	35.4%	16.7%	0%
Erythromycin (84.4%)	32.1%	34.7%	-	93.8%	50.0%	37.0%	45.5%	0%
Cephazolin (84.4%)	90.3%	97.0%	93.8%	-	89.5%	35.4%	91.7%	0%
Ciprofloxacin (52.2%)	97.4%	89.5%	50.0%	89.5%	-	50.0%	26.3%	0%
Clindamycin (29.3%)	32.1%	34.7%	37.0%	35.4%	50.0%	-	45.5%	0%
Tetracycline (15.6%)	91.7%	91.7%	45.5%	91.7%	26.3%	45.5%	-	0%
TMP/SMX* Rifampin Vancomycin (0%)	0%	0%	0%	0%	0%	0%	0%	0%

*Trimethoprim-sulfamethoxazole