The prevalence of antibiotic resistance in anaerobic bacteria isolated from patients with skin infections

Research Article

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Summary

Antibiotic resistance in Anaerobic bacteria and the lack of proper outline to treatment of anaerobic infections have been increased in recent years. In this study 100 patients with skin infections (10-60 years old) were considered. Specimens were collected in the sterile condition and transported and cultured in the Thioglycolate media. After growing and staining of bacteria ( gram staining) from selective media, bacteria were cultured in the differentiated media. Strains that were isolated, undergone antibiogram test (Kirby bauer method). Skin infections are usually polymicrobial involving aerobic and anaerobic bacteria. Common aerobic and anaerobic facultative bacteria contained: Staphylococcus aureus (37.3%), non coagolase Staphylococci (8.5 %), group A streptococci (16.3 %), group D enterococci (5.7%), E.coli (15.6 %), enterobacter-spp (5.6%), c"trobacter-spp (0.8%), Pseudomonas aeruginosa (6.9%), proteus-spp (2.7%), others (0.6%). Predominant anaerobic bacteria contained: Peptostreptococcus-spp (42.5%), pigmented prevotella and Porphyromon-spp (5.4%), Fusobacterium (7.6%) Bacteroides-spp (23.2%), Clostridium-spp (18.4%), Propionebacteriom acnes (2.1%), others (0.8%). Atibiogram test was done on aerobic-anaerobic facultative bacteria. Susceptibility of these bacteria were as following: Cefizoxim 100%, Ciprofloxacin 98%, Ceftazidim 82%, Tobramycin 47%, and Amikacin 33%. And their resistance to Gentamycin was 97%, Penicillin 93%, Cloxacillin 86%, and Erythromycin 62%. In anaerobic bacteria, susceptibility to Ciprofloxacin was 100%, Ceftizoxim 100, Ceftazidim 91% Rifampin 76%, Colistin 67%, and their resistance to Penicillin was 95%, Erythromycin 83%, Cloxacillin 85%. Susceptibility of both anaerobic and aerobic bacteria to Ceftizoxim was 100 %, so we suggest this drug for treatment of many skin infections.

I. Introduction

Anaerobic bacteria are important because they dominate the diagnose flora. They are commonly found in different infections. Some of these infections are serious and have high mortality rate (Brook, 1995; Finegold, 1995; Summanen et al, 1995). It has to be paid more attention to anaerobic infections because special precautions are needed for appropriate collection and transport of specimens. Isolation and identification of anaerobic bacteria can be complex, difficult, labor-intensive, and expensive. The majority of these infections have caused mixtures of numerous strains of aerobic and anaerobic bacteria. Interpreting culture to establish the extent, to which any one particular anaerobe in the mixture is contributing to infection, is difficult (Brook et al, 1997; Wexler and Finegold, 1998). Treatment considerations for these mixed anaerobic infections are difficult and causing even more problem with increasing resistance among these groups of organisms. A number of antimicrobials have poor or no activity against some bacteria (Wexler et al, 1998; Chau, 1999; Nichols et al, 1999). Failure to provide antibacterial coverage against the anaerobes in a mixed aerobic-anaerobic infection may lead to inadequate response. This could, of course, be attributed to another factor such as the possibility of an untrained abscess (Holten and Onusko, 2000). The therapeutic approach in anaerobic infections is complex and involves modification of the local environment of the infected site and the use of appropriate antibacterial agents.

Surgical management, particularly drainage and debridement is an important aspect of treatment of the most anaerobic infections. In a large number of soft tissue infections, anaerobes may play an important role. Among these are superficial infections of the skin and skin
structures such as cellulites, infected cutaneous ulcer, infected sebaceous or inclusion cysts, hidradenitis supportive, pyoderma, paronychia, and tropical ulcer (Goldstein et al, 2002). The choice of single-agent therapy of mixed infections is ideally based on local data of susceptibility patterns of the bacteria involved in these infections.

II. Materials and methods

This descriptive study was performed at faculty of medicine in medical university of shaheed Beheshti and medical sciences from March 2002 through 2003. In this research, 100 patients with skin infections including samples of ulcer (in foot, gluteal, nose, under breast, knee, elbow), abscesses (from inguinal, neck, perianal, nose), pastula, acnes and bullea were examined.

Collecting was done with syringe and swabs. All of specimens were transferred to transport media. Swab specimens were thoroughly mixed before inoculation. For transport media Tripticase soy broth for aerobic bacteria and Thioglycolate broth for anaerobic bacteria were used. Then we cultured these specimens in blood agar, (with L-cysteine, yeast extract vitamin k and hemin), selective media bile-esculin agar which is anaerobic blood agar containing Kanamycin to inhibit facultative gram negative rods and Vancomycin to inhibit gram positive bacteria, chocolate agar and Mac conkey agar, for first screening. Therefore, we used 6 plates for each specimen; 3 plates for aerobic condition that were examined after 24 h and 3 plates for anaerobic. Plates must be immediately placed in anaerobic jars condition (jar with gas pack generates H₂ gas and a cold palladium catalyst converts remaining O₂ to water) and examined after 48-72 h. After growing of the colonies, we stained colonies of bacteria with gram staining and determined shape of bacteria. Then we used specific culture and test for identifying type of bacteria. In the mean time we used aerobic and anaerobic condition. When we identified type of bacteria which caused infections, we performed antibiogram test by Kirby-Bauer method (gel diffusion test) in blood or chocolate agar with Muller-Hinton base agar. After 24 h for aerobic and 48-72 h for anaerobic bacteria, we reported susceptibility of bacteria to antibiotic disk.

III. Results

We examined 100 samples from patients with ulcer (in foot, Gluteal, nose, under breast, knee, and elbow), abscesses (from inguinal, neck, perianal, nose), pastula, acnes, bullea. In our research, we examined 58 specimens from women (Figure 1) and 42 specimens from men with age between 10-60 years old (Figure 2). Common aerobic and anaerobic facultative bacteria (Figure 3) were: Staphylococcus aureus (37.3%), non coagolase Staphylococci (8.5 %), group A Streptococci (16.3 %), group D Enterococci (5.7%), E.coli (15.6 %), Enterobacter-spp (5.6%), Citrobacter- spp (0.8%), Pseudomonas aeruginosa (6.9%), Proteus-spp (2.7%), others (0.6%) (Figure 4).

Figure 1. The symptoms in infectious skin in women

Figure 2. The age of patients with skin infection
Figure 3. Microbiology of specimens from patients with skin infection

Figure 4. The prevalence of aerobic bacteria isolated from patients with skin infection

Predominant anaerobic bacteria were: Peptostreptococcus-spp (42.5%), pigmented Prevotella and Porphyromon-spp (5.4%), Fusobacterium (7.6%) Bacteroides-spp (23.2%), Clostridium-spp (18.4%), Propionebacterium acnes (2.1%), others (0.8%) (Figure 5). Atibiogram test was done on aerobic-anaerobic facultative bacteria. Susceptibility of these bacteria were as following: Cefizoxim 100%, Ciprofloxacin 98%, Ceftazidim 82%, Tobramycin 47%, and Amikacin 33%. And their resistance to Gentamycin was 97%. Penicillin 93%, Cloxacillin 86%, and Erythromycin 62% (Figure 6). In anaerobic bacteria, susceptibility to Ciprofloxacin was 100%, Ceftizoxim 100, Ceftazidim 91% Rifampin 76%, Colistin 67%, and their resistance to Penicillin was 95%, Erythromycin 83%, Cloxacillin 85% (Figure 7). Susceptibility of both anaerobic and aerobic bacteria to Ceftizoxim was 100 %, so we suggest this drug for treatment of many infections.

Figure 5. The prevalence of anaerobic bacteria isolated from patients with skin infection
IV. Discussion

Expecting exact correlation of laboratory results with clinical outcome is not realistic. Infections involving anaerobes are typically polymicrobial (Caceres et al, 1999; Bryskier, 2001; Ueno et al, 2002); It is often not necessary to eradicate all of the organisms to gain a cure. Appropriate surgical manipulation, the patients general health status, and the microenvironment at the site of the infection will have a significant impact on the outcome, regardless of whether a particular isolate is susceptible to the antimicrobial. The aims of this study were to determine the antimicrobial susceptibility pattern and to study the role of bacteria which had been isolated from the cultures which had been taken from different skin infections.

In many studies of skin and soft tissue, Staphylococcus aureus was the most common pathogen. Group A Streptococci ranks as a second common pathogen in gram positive cocci (Caceres et al, 1999; Chau, 1999; Goldstein et al, 2002; Ueno et al, 2002). In our study we found S.aureus (37.3%) and streptococcus pygenes (16.3%). Other reports showed that the isolation rates of Bacteroides Fragilis group organism have recently been increasing in both primary and post operative infection (Caceres et al, 1999; Bryskier, 2001; Goldstein et al, 2002) and Peptostreptococci typically are the most common isolated anaerobic bacteria (Wexler and Finegold, 1998; Wexler et al, 1998; Chau, 1999). We isolated Peptostreptococci (43%) and Bacteroides group organism (23.2%), which is as same as the other reports. Nevertheless, accurate information regarding the efficacy of a certain agent in inhibiting or killing the organism will certainly give useful clinical information for choice of a therapeutic agent. A consensus group of infectious disease clinicians concluded that in the most serious infections involving anaerobes, susceptibility test results correlate with the clinical response. The mechanisms by which anaerobic bacteria become resistant to βlactames antibiotics are similar to those described in aerobes and include the production of β lactames, changes in penicillin G binding proteins, and changes in outer membrane...
permeability to β-lactams (Holten and Onusko, 2000; Bryskier, 2001). Antibacteria therapy must cover the key pathogens. Some compounds have significant activity against both aerobic and anaerobic microorganisms (Caceres et al, 1999; Chau, 1999; Goldstein et al, 2002; Ueno et al, 2002). The antibiogram test of anaerobic and aerobic isolated from Iranian patients with skin infection was determined by using the most common antimicrobial agents used in Iran.

In our survey, it was shown that anaerobic and aerobic facultative bacteria resistance rate were: Cloxacillin (86%), Penicillin (93%), Gentamycin (97%) and susceptibility were Ceftizoxim (100%), Ciprofloxacin (98%).

In anaerobic bacteria, resistance to penicillin were (95%), Cloxacillin (85%), Erthromycin (83%), and susceptibility to Ciprofloxacin, Ceftizoxim were (100%), Ceftazidim (91%).

We concluded that, in skin infections which are composed of both aerobic and anaerobic bacteria, Ciprofloxacin, Ceftizoxim were highly active drugs that could eradicate the major pathogens bacteria found from skin infection in Iranian patients.

In conclusion, the results of the present investigation show a high level of resistance in aerobes and anaerobes bacteria. This may be the result of the extensive antibiotic used in patients.

References