Resistance Pattern of Aerobic Gram Negative Isolates from Wound Infections in a Teaching Hospital

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Abstract

Introduction A retrospective analysis of reports from blood cultures was done to determine the spectrum of bacterial isolates and their antibiograms. Altogether, 1050 blood cultures were performed in the clinical microbiology laboratory of the Teaching Hospital of Manipal Medical College of Medical Sciences during the period January 1, 2002 to December 3, 12.2002.

Objectives To study the pattern of Gram Negative bacterial isolates in wound infection and their antibiogram so that recommendations can be made for empirical antibiotic treatment.

Methods This study was carried out at Department of Microbiology, Manipal Teaching Hospital, Pokhara, Nepal. A total of 416 specimens were received from various cases of wound infection for a period of 1 year from January 2002 to December 2002. They were processed by standard microbiological methods and antimicrobial testing was performed by the Kirby-Bauers disc-diffusion method as per NCCLS recommendations.

Results Of 416 samples cultured, 95 (22.84%) grew Gram negative organisms. The most frequent offender was *Escherichia Coli* (25.26%) followed by *Klebsiella spp.* (24.21%), *Proteus* (17.89%), *Pseudomonas* (15.79%) and other less frequent isolates. Resistance was frequently seen in commonly prescribed antibiotics.

Conclusion The emergence of multiple resistance among pathogens is increasingly recognized. The varying microbiological pattern of wound infection warrants the need for ongoing review of causative agents and their antibiotic sensitivity patterns. Judicious use of antimicrobials and education among the medical community and lay public should be undertaken to increase the awareness of emergence of resistant pathogens.

Keywords Wound infection, Gram negative bacteria, Drug resistance

Introduction

Wounds have been with humankind from the prehistoric beginning. Wound infection has been defined as the emergence of pus from a wound irrespective of results from a subsequent culture[1]. Wound infections occur as complications of surgery, trauma or disease that may interrupt a mucosal or skin surface. The nature of the infecting organism depends on the underlying condition and location of the infective process. Gram negative bacterial plays an important role in wound infection[2], most of them being members of the family Enterobacteriaceae. The treatment and healing of wounds is an art as old as humanity[3]. Despite many advances the deleterious effects of the seemingly indiscriminate and widespread community distribution of broad-spectrum antibiotics has resulted in increasing number of resistant pathogens[4]. Irrespective of etiology, the

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choice of antibiotic should be based on culture and sensitivity reports. Empirical therapy can be started based on the Antimicrobial surveillance report of that region.

The present study was done to analyze the spectrum of gram negative organisms in wound infection and their resistance pattern.

Materials and methods

The study was conducted at Department of Microbiology, Manipal Teaching Hospital, Pokhara, Nepal. A total of 416 specimens were received from cases of wound infection during the period January 2002 to December 2002. From each case two swabs were taken; one for smear studies and the other for culture. The medias' used were Blood Agar, Chocolate Agar, MacConkey's Agar and Mueller Hinton Agar. Any growth was identified by colony characteristics and standard biochemical tests[5]. Antimicrobial testing was performed by the Kirby-Bauers disc-diffusion method as per NCCLS recommendations.

Results

Of 416 samples cultured, 95 (22.84%) grew Gram negative organisms. The most frequent offender was *Escherichia coli* (25.26%) followed by *Klebsiella species.* (24.21%), *Proteus* (17.89%), *Pseudomonas* (15.79%) and other less frequent isolates as shown in Table I.

Table I Gram negative isolates

Organism	Total isolates	%
Escherichia coli	24	25.26
Klebsiella species	23	24.21
Proteus species	17	17.89
Pseudomonas species	15	15.79
Enterobacter species	8	8.42
Acinetobacter species	3	3.16
Morganella morganii	3	3.16
Citrobacter species	1	1.05
Chryseobacterium species	1	1.05
Total	95	100

The drug resistances of these organisms are as shows in Table II.

Table II: Resistance pattern of Gram negative isolates

Organisms	G	Ak	Cf	Ci	Ca	Cb	Pc
Escherichia coli	10	3	8	5			
N=24	(41.66)	(12.5)	(33.33)	(20.8)	-	-	-
Klebsiella species	8	3	7	7	-	-	-
N=23	(34.7)	(13.0)	(30.4)	(30.4)	-	-	-
Proteus species	3	1	3	2	-	-	-
N=17	(17.6)	(5.89)	(17.6)	(11.76)			
Pseudomonas	5	1	4	2	2	2	2
Species	(33.33)	(6.67)	(26.67)	(13.3)	(13.3)	(13.3)	(20.0)
N=15							

* Figures shown in table are numbers of resistant isolates.

Figures shown in parentheses indicate percentage of resistant isolates

G-gentamicin, ak-amikacin, Cf-ciprofloxacine, Ci-ceftriaxone, Ca-ceftazidime

Cb –carbenicillin, Pc-pipercillin

Discussion

The varying microbiological pattern of wound infection warrants the need for ongoing review of causative agents and their antibiotic sensitivity patterns.

Fluoroquinolones are widely used because of their broad-spectrum antimicrobial activity, bio-availability, tolerability and modest cost. Availability in both parental and oral formulations allows their use in therapeutic as well as prophylactic settings. The resistance is due to mutation in gyr A gene, leading to an alteration at the quinolones target site DNA grase[7] although resistance may also be mediated by barriers in diffusion through the cell wall[8]. A single operon facilitates resistance of Pseudomonas to quinolones, beta-lactams, tetracyclines via drug efflux[9]. The primary mechanism for resistance to aminoglycosides is modifying enzymes[10]. Streptomycin and kanamycin have fallen out of clinical use due to these enzymes, however amikacin is least vulnerable to these inactivating enzymes but may be rendered ineffective by alterations in the ribosomal target[11]. In our study, 22.84% grew Gram negative organisms. Of these 27.36% were resistant to Gentamicin and 8.42% to Amikacine. The overall chance of treatment failure

increased if Gentamicin was preferred than Amikacin. Ceftriaxone is a good alternative to amikacin, however it should be used judiciously.

Overall resistance by these organisms towards Ciprofloxacin was 23.15% with widespread use we may witness gradual emergence of resistance with consequent loss of use of this valuable group of compounds. In our institution, Amikacin followed by ceftazidime and Carbenicillin is the drug of choice for treating infections caused by *Pseudomonas species*. 26.67% of these strains were resistant to *Ciprofloxacin* and 33.3% were resistant to gentamycin.

The emergence of multiple resistance microbe pathogens is increasingly recognized. Antibiotics should ideally be prescribed according to the local susceptibility patterns. Thus establishing a local antimicrobial surveillance center needs to be addressed. Judicious use of antimicrobials and education among the medical community and lay public should be undertaken to increase the awareness of emergence of resistant pathogens.

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