Bacteriology of Surgical Site Infections and Antibiotic Susceptibility Pattern of the Isolates at a Tertiary Care Hospital in Karachi

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Abstract

Objective: To study post surgical infections and sensitivity of the isolates so that recommendations can be made for their prevention and empirical antibiotic treatment.
Setting: Swabs/pus specimens from the patients developing surgical site infections at PNS Shifa, Karachi were processed in the Department of Pathology during January, 1998 to September, 1999.
Methods: One hundred and twenty-nine swabs/pus specimens from various types of surgical sites suspected to be infected on clinical grounds were processed, by standard methods and antibiotic susceptibility testing of all the isolates was done by using Modified Kirby Baur disc diffusion technique.
Results: Of the one hundred and fifty-three organisms isolated, the most common was Staphylococcus aureus (50.32%), followed by Pseudomonas aeruginosa (16.3%), Escherichia coli (14.37%), Klebsiella pneumoniae (11.76%), miscellaneous gram negative rods (5.88%) and Streptococcus pyogenes (1.30%). About 50% of the Staphylococcus aureus isolates were found to be methicillin resistant. In case of Pseudomonas aerüginosa and Escherichia coli more than 60% of the isolates were found resistant to Gentamicin. The resistance to third generation cephalosporins and the quinolone ciprofloxacin was also quite high. Other isolates also showed a very high level of antibiotic resistance.
Conclusion: In addition to the economic burden for antibiotic treatment, such infections for multi-resistant organisms are a serious threat to our surgical patients. To prevent these happenings, there is art urgent need to adopt basic principles of asepsis and sterilisation and to make judicious use of prophylactic and therapeutic antibiotics (JPMA 50:256, 2000).

Introduction

Surgical site infections (SSI) are the third most frequently reported nosocomial infections accounting for 14-16% of all the infections in hospitalised patients. Among surgical patients SSI are the most common nosocomial infections[1]. These remain a complication of surgical procedures resulting in increased morbidity, mortality and cost[2]. The risk of developing a surgical site infection depends upon the balance between factors determining the number of bacteria contaminating the site and the factors determining the resistance of the site against infection[3,4].

One of the major problems faced by the surgeons these days is to deal with the post surgical infections, as most of these are being caused by multiple resistant bacteria5. Gram positive cocci and Gram negative bacilli are being implicated in most of such cases[5,6]. The problem of infected surgical sites can only be tackled properly if all these are examined bateriologically and feed back given to the surgeons well in time, so that they can treat these with appropriate antibiotics[7]. Not only this but, the microbiologist should provide them the guidance regarding proper use of prophylactic antibiotics. But, according to the cure". prevention of surgical rate infections by adopting basic principles of asepsis is the key to the solution of this problem.

Material and Methods

One hundred and twenty nine wound swabs/pus specimens collected from patients developing surgical site infections during a period from January, 1998 to September, 1999 were included in the study. Most of our patients were young males (n=80). Rest were females (n=38) and children (n=1 I). The age range was between 4-65 years and had undergone different kinds of surgery including general surgery (n70), gynecological/obstetric surgery (n48) and orthopedic surgery (n1 I). Pus swabs/specimens were collected from infected surgical sites by standard technique using commercially available sterile stick swabs. The specimens were immediately transported to the Department of Pathology, PNS Shifa for bacteriological study. All the specimens were inoculated onto blood and MacConkey's agar within two hours of collection. The agar plates were incubated at 37°C aerobically and were examined for the presence of any growth after 24 hours. Those plates showing no growth were incubated for another 24 hours. The isolates were identified by colonial morphology, Gram's stain and conventional biochemical tests, based upon methods of Cowan and Steel[8] and also by using API 20 E galleries (System Montalieu Vercieu, France) for enterobacteriaceae. Antibiotic susceptibility pattern of the isolates was studied using Kirby Baur method[9]. Mueller Hinton agar (Difco) was used for antibiotic susceptibility testing. Staphylococcus aureus ATCC 25932, Escherichia coli ATCC 25922 and Pseudomonas aeruginosa ATCC 27853 were included as control strains.

Results

One hundred and fifty three organisms were isolated from the 129 specimens processed. One hundred and five specimens yielded growth of single organism while two isolates were present in rest of the twenty-four cases. The most common pathogen isolate was, Staphylococcus aureus (50.32%), followed by Pseudomonas aeruginosa (16.33%), Escherichia coli (14.37%), Klebsiella pneumoniea (11.76%), Streptococcus pyogenes (1.30%) and miscellaneous gram negative rods (5.88%) including Acinetobacter baumanni i, Proteus m irabi lis and Citrobacter diversus (Table 1).

Table 1. Pathogens isolates from surgical site infections.

Organism	No.	Percent
Staphylococcus aureus	77	50.32
Pseudomonas aeruginosa	25	16.33
Escherichia coli	22	14.37
Klebsiella pneumoniae	18	11.76
Acinetobacter baumannii	4	2.61
Proteus mirabilis	3	1.96
Citrobacter diversus	2	1.30
Streptococcus pyogenes	2	1.30
Total	153	

In case of Staphylococcus aureus 49.36% of the isolates were found resistant to methicillin. Antibiotic susceptibility pattern of gram-positive cocci (Staphylococcus aureus and Streptococcus pyogenes) to other antibiotics are shown in Table 2.

Table 2. Antibiotic susceptibility pattern (Percent sensitive) of gram positive cocci.

Antibiotic	Staphylococcus aureus %	Streptococcus pyogenes %
Penicillin	0	100
Methicillin	50.64	-
Erythromycin	18.96	100
Co-trimoxazole	11.84	0
Doxycline	39.68	0
Cephradine	50.64	100
Gentamicin	45.33	-
Amikacin	100	-
Ciprofloxacin	63.63	-
Vancomycin	100	100

In case of Pseudomonas aeruginosa only 8 isolates (32%) were gentamicin sensitive, while all except two were sensitive to amikacin. Quite a few strains were also found resistant to pipracillin, ciprofloxacin and ceftazidime. Antibiotic susceptibility pattern of all the Gram negative rods (GNRs) studied is shown in Table 3.

Table 3. Antibiotic susceptibility pattern (percent sensitive) of gram negative rods (GNRs).

Antibiotic	P. aeruginosa %	E. coli %	K. pneumoniae %	Misc. GNRs %
Ampicillin	-	0	0	0
Co-trimoxazole	-	0	10.52	11.11
Doxycycline	-	0	-	-
Cephradine	-	19.04	22.22	0
Cefotaxime	-	70.58	58.82	66.66
Ceftriaxone	-	70.58	60	55.55
Ceftazidime	64	90.90	64.28	62.5
Ciprofloxacin	68	70.58	84.21	55.55
Tazobactam+ Pipracillin	77.27	100	88.60	94.26
Imipenem	88	100	94.73	100
Meropenem	88	100	94.73	100
Gentamicin	32	36.36	40	11.11
Amikacin	92	95.45	94.73	100

Discussion

Surgical site infection can be defined as the presence of pus alongwith signs of inflammation in the surgical wound margins[10]. Predisposing underlying conditions for surgical site infections include immunosuppression, irradiation, steroid administration, diabetes mellitus and malnutrition. The risk of infection after surgery depends upon the factors including the type and length of surgical procedure; age, underlying conditions and previous history of the patient: skill of the surgeon; diligence with which infection control procedures are applied and the type and timing of pre-operative antibiotic prophylaxis[11] Most of the patients included in the study were young males with minimal predisposing factors except that six of these were diabetic. So the factors most probably operative in causing infections in our patients were related to the surgical team or surgical environment. Staphylococcus aureus is considered to be the leading pathogen in such post-surgical wound infections followed by the members of the enterobacteriaceae[1,12]. But in our study the Psedomonas aeruginosa was the second commonest isolate after Staphylococcus aureus. Otokwefer, TV and Datube, B[13] also have found similar isolates in most of the patients included in their study.

Most of our isolates were found resistant to the commonly used antibiotics. This is a matter of great concern because treatment of such infections warrants newer and costly antibiotics. The incidence of methicillin resistant Staphylococcus aureus (MRSA) in our study in about 50%. MRSA infections cannot be treated by beta lactarnase resistant penicillins and not even by the cephalosporins[14]. Treatment of these infections is possible either by the Fluroquinolones (if the isolate is found sensitive) or by the vancomycin only[15]. Likewise 86% of our Pseudomonas aeruginosa isolates were resistant to gentarnicin, the most commonly used aminoglycoside. But most of these isolates were found sensitive to ciprofloxacin and ceftazidime, which are thus the minimal choice to treat Pseudomonas aeruginosa infections. But an empirical treatment to be really effective against such isolates will have to include either amikacin or one of the carbapenems alone or in combination. Even the Escherichia coli, Klebsiella pneumonia and the other Gram negative isolates in our study are showing fairly high antibiotic resistance. In view of such highly resistant organisms causing wound infections in our hospital. it will become very difficult to treat these cases. So the only hope lies with prevention of such surgical site infections. To achieve this goal we will have to return to the preventive measures including fundamental principles of asepsis. Individual patient risk factors must be identified and modified whenever possible. In addition to the skin asepsis and peri-oeprative prophylactic antibiotics, care and attention to the theatre environment is also very important[16]. Last but not the least, surgical expertise and theatre discipline is also the essential components against surgical site infections.

Conclusion

We should clearly understand and identify the SSI as a problem and devise a system to track, analyze and monitor these. Hospital infection control committees should meet regularly and make recommendations at all levels for prevention of such incidents. Otherwise it will be impossible to overcome the serious issues of economic loss and high hospital morbidity and mortality caused by SSI.

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