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ORIGINAL ARTICLE

Microbiologic assessment of non-surgical traumatic wound infections and surgical site infections in hospitalized patients

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ABSTRACT

Background: Surgical site infections (SSIs) are the most common nosocomial infections in surgical patients. Depending on the source of a traumatic wound, particular pathogens are expected to be present while their prevalence varies in different conditions. This study focused on determination of microorganisms in traumatic wound infection and the frequency of *Staphylococcus aureus* and other organisms in SSIs.

Patients and methods: A total of 116 patients were studied among whom 86 patients (18 females and 68 males) underwent microbiological assessment for non-surgical wound infections and 30 patients (all were males) had SSIs. Specimens were cultured on blood agar, MacConkey agar, and chocolate agar while direct examination and gram-staining were also achieved for each sample.

Results: *Staphylococcus aureus* (20.9%) was the most commonly isolated organism among non-surgical traumatic wound infections, however, *Proteus mirabilis, Salmonella Arizona* and *streptococcus* group A were less commonly isolated (1.1% each). Similarly, *S. aureus* (40%) was the most prevalent isolated organism in SSIs while *enterobacter* Spp was found only in 4 cases (13.3%).

Conclusion: Our results revealed that *S. aureus* is the most commonly isolated organism in non-surgical traumatic wound infections and SSIs, therefore, appropriate therapeutic approach and applying efficient preventive modalities are of utmost importance.

Keywords: *Surgical site infections, Staphylococcus aureus, Microbiology*.
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INTRODUCTION

Normal skin is a proper physical barrier against bacterial infections unless a defect is present to infest the integrity of epidermis. Surgery, trauma, diabetic ulcers, etc. can cause such defects that in special situations such as immunocompromised states and the continued rise in antibiotic-resistant pathogens, infection will be ensued.

Multiple factors including the mechanism of injury, site of colonizing bacteria, site of the injury, number of organisms in the wound and the time interval from injury to treatment, determine the risk of infection in traumatic injuries (1). Most of admissions to emergency centers are due to traumatic injuries and infections causing 30-80% of associated deaths (2).

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Depending on the source of a traumatic wound, particular pathogens are expected to be present. Therefore, determination of dominant pathogen in non-surgical traumatic wound infections and surgical site infections is of utmost importance based on which one can prescribe the appropriate antibiotic.

Surgical site infections (SSIs) are the most common nosocomial infections in surgical patients (14-17% of all nosocomial infections) and define as infections occurring within 30 days after a surgical operation and affecting either the incision or deep tissue at the operation site (2-4). The occurrence of SSIs depends on several factors including host derived factors (advanced age, malnutrition), duration of surgical procedure and factors related to preoperative status of the patient.

Staphylococcus aureus is the commonest pathogen causing SSIs worldwide; however its incidence is dramatically increasing. This pathogenic agent is a gram-positive spherical bacteria belonging to the *staphylococci* group that can cause suppurative infections.

The present study was aimed on determination of microorganisms in traumatic wound infection and the frequency of *S.aureus* and other organisms in SSIs.

PATIENTS and METHODS

This cross-sectional study was performed in Rassol-Akram and Hazrat Fatemeh hospitals in 2007.

A total of 116 patients (without immunocompromised states) were studied among whom 86 patients (18 females and 68 males) underwent microbiological assessment for non-surgical wound infections and 30 patients (all were males) with confirmed SSIs were chosen by surgeons without prophylactic antibiotic administration (regardless to type of operation and hospitalization stay). Sampling was performed from wound discharges or pus by three sterile swabs wetted with saline normal, then cultured on blood agar, MacConkey agar, and chocolate agar for one day at 37°C (aerobic and anaerobic cultures). Meanwhile, direct examination and gram-staining were achieved for each sample.

The presence of *S. aureus* and other organisms were finally confirmed by complementary tests such as coagulase.

Data were analyzed using SPSS software (version 11.5, SPSS Inc., Chicago, USA) and chi square and Fisher's exact tests were used, when appropriate.

RESULTS

Staphylococcus aureus was the most commonly isolated organism among non-surgical traumatic wound infections, found in 18 cases (20.9%). The mean age of *S. aureus*-infected patients was 23.8±16.0 years. Table 1 demonstrates the frequency of isolated organisms from non-surgical traumatic wound infections.

Similarly, *S. aureus* (12 cases, 40%) was the most prevalent isolated organism in SSIs followed by *Staphylococcus epidermis* (8 cases, 26.7%), *E. coli* (6 cases, 20%) and *enterobacter* spp. (4 cases, 13.3%).

Table 1. Frequency of isolated organisms from non-surgical traumatic wound infections

Organisms	Frequency	Percent
Acinetobacter	9	10.5
E.coli	15	17.4
Enterobacter	1	1.2
Enterobacter.spp	4	4.7
Enterococcus	3	3.5
Klebsiella .spp	3	3.5
Klebsiella pneumoniae	9	10.5
Proteus mirabilis	1	1.2
Pseudomonas .spp	2	2.3
Pseudomonas aeroginosa	5	5.8
Salmonella arizonea	1	1.2
Staphylococcus aureus	18	20.9
Staphylococcus epidermidis	12	13.9
Streptococcus group A	1	1.2
Streptococcus group B	2	2.3
Total	**86**	**100**

DISCUSSION

Multiple factors culminate in secondary skin infection in acute traumatic and chronic wounds. When antibiotic treatment is administrated, therapy should be directed toward type and characteristic pathogens expected to contaminate specific wounds, so identification of current pathogens is of utmost importance (3,5).

SSIs as a nosocomial infection impose a pivotal burden of mortality, morbidity and also heavy demands on healthcare resources due to prolonged hospitalization (2,6,7). There are evidences and also recommendations that show the burden of mortality and morbidity associated with SSIs, hence, further attention towards multiple patients-related and procedure-related risk factors could lead to a decrease in SSIs risks. Table 2 provides main recommendations of the Centers for Disease Control and Prevention (CDC) for surgical site infection (SSIs) (8).

Table 2. Centers for Disease Control and Prevention (CDC) guidelines for surgical site infection (SSIs).

Preparation of the patient:

1-Don't remove hair around the operation site, unless it will interfere with the operation.
2-Use an appropriate antiseptic for skin preparation.
3-Do not withhold necessary blood products as a means of preventing SSIs.

Antimicrobial prophylaxis:

1-Administer antimicrobial prophylaxis only when indicated and select agent according to efficacy against most common pathogens associated with a specific procedure.
2-Don't routinely use vancomycin for antimicrobial prophylaxis.

Post operative incision care and surveillance:

1-Wash hands before and after changing dressing and any contact with the surgical site.
2-Protect an incision that has been closed primarily with a sterile dressing for 24-48 h postoperatively.
3-Use CDC definitions of SSI without modification for identifying SSI among surgical inpatients and out patients.
4-Periodically calculate operation-specific SSI rates stratified by variables shown to be associated with increased SSI risk. (e.g. surgical wound class).

In our setting, *S.aureus* was the most commonly isolated organism in SSIs. This is in agreement with prior studies conducted by Immer, Sharma, Helics and Tang (9-12). Nevertheless, Kian et al reported *E.coli* and *S.aureus* as the most frequent organisms isolated in wound infections (6).

Sohrabi et al demonstrated that traumatic wound infections are more commonly associated with *Staphylococci* spp. (57.4%), *Klebsiella* (14.2%), and *E. coli* (14.2%) (13), however, Qurbanalizadegan et al has noted that the rate of nosocomial infection as a result of *S.aureus* was 39.6% (14). Finally, in clean surgical wound infections of patients undergoing hernial operation, *staphylococci* spp. Infected 90.3% of subjects (15).

In conclusion, much more attentions should be paid towards the nosocomial infections especially SSIs and non-surgical wound infections. Moreover, further studies are required to evaluate the risk factors of SSIs and draw the resistance pattern of antibiotics.

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