Original Article

Wound infection in surgery department in bsmmu: A study of 100 cases

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Abstract

Background *Surgical site infections (SSI) are the most common nosocomial infection in surgical patients, accounting for 38% of all such infections, and are a significant source of postoperative morbidity resulting in increased hospital length of stay and increased cost.*

Objectives *To find out the incidence of wound infection in patients following elective surgery and the most likely causative organisms and their resistance pattern.*

Methods *Prospective data were collected on 496 surgical patients admitted in the surgery department in BSMMU from January 2010 to June 2010. All preoperative risk factors were evaluated. Patients operated were followed in the post operative period and if any wound infection noted, swab from the site of infection was sent for culture and sensitivity and antibiotics were given accordingly.*

Results *Following 496 elective operations 20.16 % patients developed wound infection. Highest numbers of infection were seen in the fifth decade with slight female preponderance. Wound infection progressively rises with the degree of contamination and increasing operative time. The common risk factors for development of surgical wound infection were anemia (52%), malnutrition (44%), diabetes (38%), jaundice (30%), contaminated operation (44%) dirty operation (38 %), obesity and smoking. The most predominant isolated organism was Escherichia coli (43%) followed by Staphylococcus aureus (33%) and Pseudomonas aeruginosa (11%). Ceftriaxone still remains the most effective antibiotic although the incidence of resistance is rising.*

Conclusion *Despite a good numbers of variables influence surgical site infections; it is still possible to reduce the infection rate by correcting modifiable risk factors, reducing degree of contamination and duration of operation. To battle the emerging resistance of pathogens a definitive guideline is essential.*

Key Words *Surgical site infection, wound infection, nosocomial infection, anemia, risk factor.*

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Introduction

Examination of the causes of late mortality in individuals seeking surgical attention reveals that as much as 78% of all deaths may be attributed to septic complications[1], suggesting the value of understanding the prevention and treatment of sepsis. Despite adequate systemic support and meticulous application of the principles of appropriate wound care, certain wounds are still prone to infection.

Over the past decade increased attention has been focused on the risk factors both intrinsic[2], such as weight, presence of diabetes, haemoglobin values etc. and extrinsic risk factors[3], such as shaving, preoperative skin preparation, skin asepsis, operative room ventilation, inadequate sterilization of instrument, poor haemostasis, duration of operation etc. that contribute to the development of these infections. The surgical

techniques and infection control measures that can be used to reduce the incidence of infection and the appropriate antimicrobial agents that can and should be used to treat these potentially devastating complications effectively need careful evaluation from time to time.

The pattern of bacteria causing infections in surgical patients is being analyzed in multiple reports. Most important pathogen appeared as Staphylococcus aureus, Esch. Coli, Pseudomonas spp. and Klebsiella spp[4, 5]. The single most disadvantages with these microbes stood as their multidrug resistance property. To overcome this problem newer Cephalosporin and Quinolone antibiotics are randomly used for prophylactic and therapeutic purposes. But this approach is not cost effective in developing countries. Many a time patient cannot afford these antibiotics due to poverty. So, treatment course remains incomplete leading to a chance of emerging resistance to that particular drug by those particular bacteria. This is rather a chronic situation; hence high magnitude of resistance would be rightly explored.

There are still some controversies in the application of antibiotic prophylaxis. The first major controversy concerns the choice of drug[6]. Although patients present with a variety of sources of infections, every hospital should have antibiotic prophylaxis protocol. Protocol must be reviewed and updated regularly. New agents may become available that are more appropriate and more importantly, resistance pattern may change with time.

Methods

Present prospective study comprised of patients admitted and operated for different types of elective surgery in the surgery department of Bangabandhu Seikh Mujib Medical University during the period from January 2010 to June 2010. Patients with operations involving obviously infected wounds were excluded. Those requiring more than one operation in same admission were excluded. Skin preparation consisted of shaving prior to surgery. Povidone Iodine solution was used as a pre-operative antiseptic skin preparation. Cloth drapes were standard and steridrapes were not used. After each operation, the surgeon was required to assign a specific classification to the surgical wound, using a standard classification system. In brief, dirty and contaminated wounds were considered to be those with gross contamination or spillage in the operative field, whereas clean—contaminated wounds were those that involved the surgical transaction of a nonsterile mucocutaneous surface. All other procedures were considered to be clean. If unexpected problems were discovered at the time of surgery, surgeons were instructed to indicate them in the wound classification. Duration of operation was noted from operation note. Operated patients were followed in the post operative period. All incisions were examined post-operatively. The diagnosis of infection was based on fulfilment of one from the following criteria-

1. Discharge of pus from the wound;

2. Microorganisms present in swabs taken from any discharge from the wound;

3. Surgical revision and drainage of the wound with positive bacteriology;

4. Antibiotic treatment due to clinically suspected infection.

Deep infection was defined as infection located under the deep fascia. Specimens were obtained for culture from all surgical wounds with evidence of infection, and all isolates recovered were identified by standardized methods of culturing. Patient related data was collected using a structured research instrument (data collection format) containing variables of interest.

Results

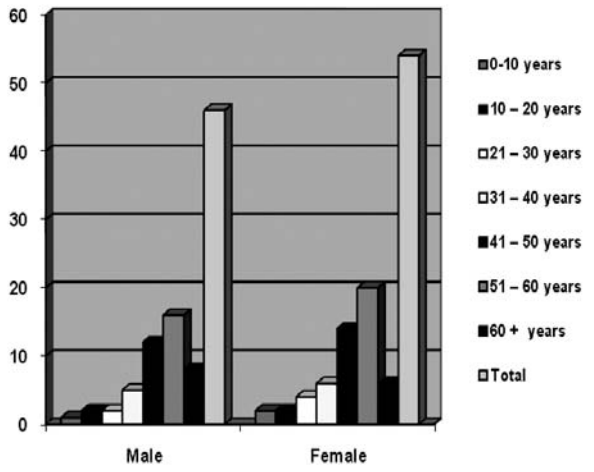

Fig 1 *Distribution of wound infection according to age and sex*

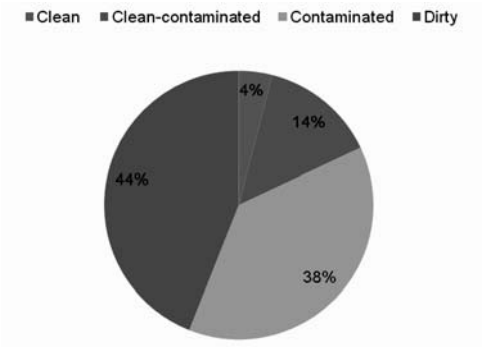

Fig 2 *Distribution of wound infection according to types of surgery and nature of wound (n=100)*

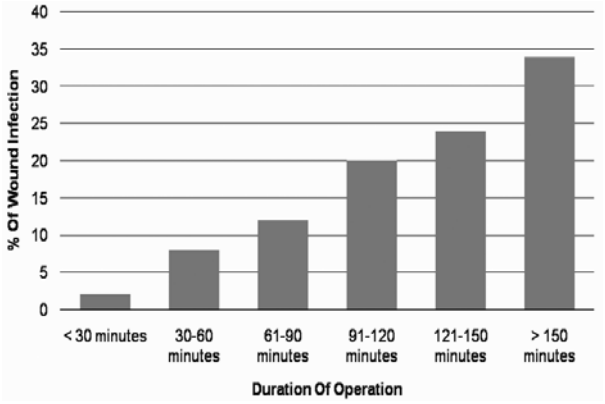

Fig 3 *Distribution of wound infection according to duration of operation [n=100]*

Table I
Relation of surgical wound infections with risk factors (n=100)

Risk Factors	No. of Wound Infection	% of wound infection
Anemia	52	52%
Malnutrition	44	44%
Diabetes	38	38%
Jaundice	30	30%
Renal Failure	06	06%
Hypotension	04	04%
Steroid Therapy	08	08%
Smoking	20	20%
Obesity	18	18%
Contaminated Operation	38	38%
Dirty Operation	44	44%

Table II
Distribution of organism in positive cultures [n=93]

Organism Isolated	Number of positive culture
Escherichia coli	43
Staphylococcus aureus	33
Pseudomonas aeruginosa	11
Bacteroids	02
Mixed	04
Total	93

Table III
Resistance pattern of organisms to different antibiotics [n=93]

	Amoxycillin	Gentamycin	Ciprofloxacin	Ceftriaxone	Nitrofurantoin	Cloxacillin	Meropenem
Escherichia coli	93.02%	37.21%	32.56%	11.63%	25.58%	ND	ND
Staphylococcus aureus	87.88%	48.48%	36.36%	12.12%	ND	63.64%	ND
Pseudomonas spp.	100.00%	27.27%	27.27%	18.18%	ND	ND	0%

DISCUSSION

Among 496 patients 20.16 % patients developed wound infection postoperatively mostly (36%) in the 1st postoperative week. The highest numbers of infection were seen in the fifth decade followed by fourth decade. Female had slight higher infection rate than male. An odd ratio of surgical wound infection is 1.2 for every 10 years of age[7]. It is thought to be due to multiple factors like low healing rate, malnutrition, increased catabolic processes and low immunity[8].

Most of the wound infection occurred among day laborers followed by service holder, housewives and students and least in teachers. This is probably due to lack of education, personal cleanliness, poor nutritional status etc.

Wound infection rate varies according to the type of wound created surgically. In this series wound infection rate in clean wounds were 4%, clean-contaminated wounds were 14%, contaminated wounds were 38% and in dirty wounds were 44%. This clearly showed that chances of wound infection progressively rises with the degree of contamination of the wound.

The common risk factors for development of surgical wound infection were analyzed and showed that anemia (52%), malnutrition (44%), diabetes (38%), jaundice (30%), contaminated operation (44%) dirty operation (38 %), obesity, smoking etc. carried significant association with wound infection. Risk of wound infection had repeatedly been shown to be proportional to the length of operative procedures. A higher incidence of post operative wound infection was observed when duration of operation was more than 150 minutes. Cruse PJE et al.[9] found an increase in wound infections with longer procedures, roughly doubling with every hour of the procedure. This may be due to several factors like doses of bacterial contamination increases with the time and longer procedures are more liable to be associated with blood loss and shock, thereby reducing the general resistance of the patients. Increased amount of suture and electro-coagulation may also reduce the local resistance of the wounds.

In this study 93 % wound infections revealed growth of microorganism and 07% yielded no growth of organism even with the presence of other signs of surgical site infection. This may be due to presence of anaerobic bacteria, prior use of antibiotics which inhibited the growth of any bacteria in vitro culture. The most predominant isolated organism was *Escherichia coli* (43%) followed by *Staphylococcus aureus* (33%) and *Pseudomonas aeruginosa* (11%). The resistance pattern was identified using the commonly used antibiotics. *Escherichia coli* was found resistant to Amoxycillin in 93.02% cases followed by Gentamicin in 37.21%, Ciprofloxacin in 32.56%, Nitrofurantoin in 25.58% and least being Ceftriaxone in 11.63%. Siguan SS[10], 1990 showed a lower resistance to Ampicillin (70%), Ciprofloxacin (0%) but a higher resistance to Gentamicin (50%), although a similar resistance is shown against Ceftriaxone (15%). This difference may be due to that with time and increased use of Ciprofloxacin and Gentamicin the resistance has increased. In case of Staphylococcus aureus, it is most resistant to Amoxycillin (87.88%) followed by Cloxacillin (63.64%), Gentamicin (48.48%), Ciprofloxacin (36.36%) and least resistant to Ceftriaxone (12.12%). In this study Pseudomonas aeruginosa remained resistant to Amoxycillin in all (100%) cases. Although it showed 27.27 % resistance to Gentamycin and Ciprofloxacin, Ceftiraxone is resistant in 18.18% cases and no organism was resistant to Meropenem (0%). In a nutshell, Ceftriaxone still remains the most effective antibiotic although the incidence of resistance is rising. The increasing resistance against the oral forms especially Ciprofloxacin is alarming. Gentamicin, although an old and cheap agent still remains one of the strength for the surgeons. Proper handling of the patients by a dedicated and expert group of staffs with prompt action, use of antiseptic technique and judicial use of chemotherapeutic agents should surely decrease the rate of wound infection in the ward.

Surgical wound infections delay the recovery of patients by about 10 days and in some cases significantly prolong the duration of hospital stay[11]. The unexpected post operative hospital stay due to development of wound infection varied from 2-20 days. In case of localized cellulitis, surgical intervention was not required and patients were discharged on oral antibiotics. But when abscess developed and required surgical intervention, patients remained in the ward for more than the expected duration; 26 patients with SSI stayed between 2-5 days, 30 patients 5-10 days and 44 of them between 10-20 days.

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