Case Report

Bacteriological Study Of Post-operative Abdominal Wound Infection- A Case Study

Tamanna FTJ[1], Ahmed Z[2]

Abstract:
Fifty different cases of post-operative abdominal wound infection and per-operative contamination related to wound infection were analized from swabs/pus. Most common organism isolated was *Escherichia coli* and next was *Staplylococcus* sp., indicate most wound infection after abdominal surgery is caused by endogenous organism of gastrointestinal tract.

Invasive microbial infection is the most common causes of significant postoperative morbidity and mortality. Infection increases the discomfort and disability experienced by patients following elective operations and may in their most severe forms endanger life. Wound sepsis continues to be bugbear of emergency abdominal surgery where the procedure is often inevitably performed on infected tissue[1]. On the basis of contamination, surgical wound is classified in to four categories; clean wound-infection rate 1.5-2%, clean contaminated wound-infection rate 5-7%, contaminated wound-infection rate 15.2-20% and dirty wound-infection rate up to 40% [2,3]. Postoperative wound infections alarmed the surgeons in early 1950. Most of them were due to *Staphylococcus aureus*. This was attributed mainly to emergence of antibiotic resistant strains. The organisms recovered from 100 consecutive wound infections have been reported from different hospitals. Pattern of distribution was fairly constant. The intensity of infection depends mainly on virulence of the organism and also

number of the organisms. The minimum pus-forming does of *S. pyogenes* is more than one million. It has been estimated that the enhancement of virulence by a suture is 10,000 times. The cause of this deleterious effect is not clearly known. Hospital infection is the result of the transmission of pathogenic organism to a previously uninfected patient from a source of environment of the hospital. The incidence of cross infection is maximum in the surgical and maternity wards. Patients having large area of denuded integument may be the cause. Raw surface provides an admirable avenue for bacterial invasion. The commonest organisms are *staphylococcus aureus* and gram-negative intestinal bacilli. Staphylococcal cross-infection manifest various types of infection like wound infection, Skin infection e.g., boil, bullous, impetigo etc., Enterocolitis, Pneumonia, Breast abscess in lactating women, Acute conjunctivitis in newborn. Contamination is inevitable especially in operations upon the patients with rupture or perforation of gastrointestinal tract as there is gross spillage. It is common in conditions with continuous drainages of faecal, tracheobroncheal or genitourinary discharge or actual drainage of purulent materials. Wound infection is responsible for a major cause of postoperative morbidity and mortality of the patients. By identification of the organism and use of appropriate antibiotics according to the culture and sensitivity reports can reduce the morbidity and mortality of the patient. In order to achieve this goal this study is indented to identify the different types of organisms responsible for post operative abdominal wound infection in different types of operation and to find out the drug sensitivity of different organisms responsible for postoperative abdominal wound infection.

This study were undertaken with a sample size of 50 patients who of abdominal surgery in a surgical unit of BIRDEM Hospital from January 2011 to July 2011 time period. The blood culture media used in this study were BACTEC PLUS Aerobic/F and BacT/Alert FA. The BACTEC PLUS system utilizes an antibiotic-binding resin bead technology for the removal of antibiotics. Various specimens were collected from different speciment such as Blood (for total count of WBC, differential count of WBC, ESR, Hb%, Random blood sugar, Blood urea/Serum

1. Fatima-Tuz-Johora, Department of Microbiology, Primeasia University, Bangladesh;
2. Zakaria Ahmed, Department of Microbiology, Primeasia University, Bangladesh

Corresponds to: Zakaria Ahmed, Department of Microbiology, Primeasia University, Bangladesh. E-mail: zakariaahmed70@gmail.com

creatinine); Urine (for R/E, M/E and C/S) and Stool (for R/E, M/E and C/S); and wound swab/pus (for C/S). It was observed that most infection occurred during 4^{th} to 6^{th} post operative periods. Patients who were admitted in a surgical unit in BIRDEM Hospital during the study period and underwent abdominal surgery, developed postoperative wound infection are included in this study. Age group was from 13 and above, both male and female patients underwent emergency or routine abdominal surgery were included. Patients who are admitted during the study period discharged from the hospital without surgery were excluded. Those who underwent surgery other than abdominal operation also excluded. Those who underwent abdominal surgery did not develop postoperative wound infections during hospital stay also .excluded. Those patients who developed Seroma also excluded.

Fifteen cases were ileal perforation, 10 cases were acute appendicitis, 8 cases were duodenal ulcer perforation who had choledocholithiasis, 3 cases were sigmoid colon volvulus, 3 cases were small bowel obstruction, 2 cases were recurrent appendicitis, 3 cases were burst appendix, 1 for each of following, blunt abdominal trauma, cholelithiasis where wound infection rate of specific type of operation were 30%, 20%, 16%, 8%, 6%, 6%, 4%, 6%, 2% and 2% respectively (Table I). Among the all infected cases the rate of infection was 2% in clean wound, 14% in clean contaminated wound, 32% in contaminated wound and 52% in dirty wound (Table II). Infection was 30% in extended midline, 20% in Right paramedian, 4% in Left paramedian, 16% in Grid iron, 16% in midline, 8% in Rutherford Morrison, 6% in Kocher's (Table III). Table IV showed that causative organisms that were isolated were mainly *Escherichia coli* (60%), *Staphylococcus* sp., *Proteus* sp. (16%), *Klebsiella* sp. (8%), coliform (2%) and 6% cases no bacteria could be isolated. Table V showed that among the abdominal wound infected cases, all required antibiotics and regular dressing. where 70% required secondary stitch, 26% required no secondary stitch and 4% required excision with secondary stitch.

The risk of wound inflection is not entirety determine by the degree of contamination, however many physiological and immunological factors limit the patient's resistance. Classically, the presence of postoperative infection has been confirmed by documenting the typical clinical signs of inflammation along with drainage of purulent or culture positive material from the wound. Early diagnosis by clinical features and isolation of organism from the wound by culture with use of most appropriate antibiotic obtained through antibiogram, the morbidity and mortality due to the post operative wound infection can be reduced[4]. Postoperative wound infection results from bacterial contamination during or after the surgical procedure. The infection usually involves the subcutaneous tissue. The clinical manifestation depends on the amount of contamination. If contamination is minimum, and there is no injury and without any dead spaces, infection rarely occurs. The rate is higher for those types of operation, which indicates poor asepsis, faulty operative technique etc. Severely contaminated wounds such as in operation on the unprepared colon or emergency operation for internal bleeding or perforation may have an infection risk of 15-30%. Unnecessary trauma from retractors, inappropriate use of electrocoagulation gross ligation of bleeding points, foreign bodies and dead space contribute a vital role in postoperative wound infection. Since even a minor postoperative wound infection prolongs hospitalization and causes economic loss, every effort must be made to keep the infection rate low. Protection of the surgical patients from infection is a primary consideration throughout the pre-operative and per-operative care. Bacterial infection of surgical incisions may have results that range from inconvenience to disaster - from small stitch abscess to massive tissue necrosis, septicaeia and even death. Some of the factors that determine wound infection and its consequences are beyond the control of surgeons. Prevention of infection in pre-operative techniques[5] can be done by (a) preparation of skin with 1% iodine or 0.5% chlorhexidine in 70% isopropyl alcohol; (b) scrubbing; a six-minute scrub with soap and water reduces the bacterial population to as little as 1%. and (c) impermeable gloves. On the other hand, prevention of infection in postoperative care can be ensured by immediate postoperative dressing by gauge and leucoplast. Acrylic resin is preferred by surgeon for dressing purpose. In order to control post operative wound infection specific measures should be adopted whenever possible e.g., control of diabetes, transfusion of fresh blood in granulocytopenia. Delayed wound healing can be anticipated in patients whose tissue repair process is complicated. Many factors may influence healing, but the following are of clinical importance viz. protein depletion, Vitamin C deficiency, marked dehydration and oedema, severe anaemia. Cathy *et al*[6] evaluated all surgical site infections (SSI) and postoperative bacteremias sec-

ondary to SSI as part of an ongoing active surgical surveillance program at a community hospital, where they identified 515 patients with SSI and 47 with postoperative bacteremia secondary to SSI. Patients with *S. aureus* isolated in either pure or mixed culture from SSI were more than twice as likely to have postoperative bacteremia secondary to SSI than were those without *S. aureus* wound infection. Chia *et al*[7] stated that the postoperative wound infectonis of great importance to both the surgeon and patients. Therefore, according to their investigation, the overall wound infeclion rate was 2.26%. The types of surgical wounds according to Chia *et al*[7] includes clean wounds and clean-contaminated wounds where the infection rates were 0.79% and 3.6% respectively. In another study, it was observed that wound infection after caesarean section 12,083 women, 10.9% had caesarean section; of these, 8.1% developed an abdominal incision infection during hospitalization, 86.9% were classed as positive where *S. aureus* (42%), *E. coli* (27.7%), *Klebsiella* sp. (20.5%), *Pseudomonas* sp. (5.3%), *Enterococcus* sp. (2.7%) and 1.8% anaerobes. Invasive microbial infection is the most common cause of the significant postoperative morbidity and mortality. In our study (Table I), It was observed that maximum wound infection were developed after different abdominal surgery from ileal perforation (30%) followed by acute appendicitis (20%) whereas Chia *et al*[7] reported that infection rate was 2.26% in case of gynaecological operations. It was found that percentage of wound infection was higher in case of dirty (52%) as shown in table II; whereas Chia *et al*[7] showed that the infection rates were 0.79% and 3.6% in case of cleanwound andclean contaminated wound, respectively. Rate of wound infection in different incision (Table III) infection was 30% which extended the midline, on the other hand, Kaplan *et al*.[8] reported 86.9% were classed as positive includes 8.1% developed an abdominal incision infection. It was observed (Table IV) that *E. coli* was the predominant microbes responsible for different wound infection which reflect different pictures reported by Kaplan *et al*.[8] where they observed *S. aureus* was the predmonent one (42%).

Incision and infection were related to each other; in our study, highest rate of wound infection is 30% through extended midline incision; on the other hand, the rate of infection was found low 2.0% in Kocher's incision[9]. Types of operation and infection rate were related, like wound infection rate varies according to the type of operation. Infection rate is higher in emergency surgery than elective procedure[10]. In this series among the 50 wound infected cases the wound infection rate in clean wound was 2.0% clean contaminated cases was 14%, contaminated cases was 32% and dirty cases 52%. This series shows the wound infection rate varies according to contamination of wound during operation and it is higher in dirty wound in relation to other types of wound. In comparison to other study this study shows post operative wound infection is higher in dirty wound. Cruse and Frood[11] reported that the wound infection rate was higher in dirty wound (40.0%) followed by contaminated wound (15.2%) whereas Ali and Khan[12] reported that contaminated wounds (54.8%) was found higher at Chittagong Medical College Hospital followed by clean contaminated wound (28.6%). Rate of wound infection as reported by Rasul and Ashraf[9] showed that no infection in clean and 23% in contaminated cases. Motin[13] and Ashraf[14] reported that the higher causative organism in wound infection was detected as *E. coli* (60.0%) which was found similarity with our study. Wound infection is related to the interaction between microorganisms, environmental factors and host defense mechanism. In present study it is shown that wound infection is higher in dirty wound than in clean or clean contaminated wound. This study showed that wound infection after abdominal surgery mostly caused by gram-negative organisms, among the gram-negative bacilli. *E. coli* was the most common isolated organism, which is the normal inhabitant of the gastrointestinal tract, and common organism causing biliary tree infection. By knowing the common organism responsible for postoperative abdominal wound infection, and by using the appropriate antibiotic against the harmful bacteria, the mortality and morbidity related to postoperative wound infection can be reduce significantly. By this way hospital stay, patients and hospital cost can also be reduced. It also helps to reduce the workload of the hospital, which helps to provide better services to the patients as well as to increase turn over of the patient which ultimately provide more service can be provid to the patient. This present study enable to make a suggestion that identification of organism prior to operation or early post operative period with the use of appropriate prophylactic antibiotics reduces the morbidity and mortality of the patient due to post operative wound infections. By this means postoperative hospital stay, cost of the patient and cost of the hospital can be reduced significantly.

Table-I: Rate of wound infection

Name of disease	Name of operation	No of infection	Percentage of infection
Ileal perforation	Repair and peritoneal toileting/ ileostomy	15	30
Acute appendicitis	Emergency appendicetomy	10	20
Duodenal ulcer perforation	Repair of perforation and through peritoneal toileting	8	16
Choledocholithiasis	Choledocholithotomy	4	8
Sigmoid volvulus	Resection and anastomosis	3	6
Small intestinal obstruction	Resection and anastomosis	3	4
Recurrent appendicitis	Interval appendicectomy	2	4
Burst appendix	Emergency appendicectomy and through peritoneal toileting.	3	6
Blunt abdominal trauma	Laparotomy	1	2
Cholelithiasis	Cholecystectomy	1	2

Table-II: Analysis of infection rate related to wound types among all infected cases.

Type of wounds	Number of infection	Percentage of infection
Clean	1	2
Clean contaminated	7	14
Contaminated	16	32
Dirty	26	52

Table IV: Types of organisms in post-operative abdominal wound infection

Name of organisms	Number	Percentage
Escherichia coli	30	60
Staphylococcus aureus	8	16
Proteus sp.	4	8
Klebsiella sp.	4	8
Coliform	1	*2*
No growth	3	6

Table -III: Precetage of Incision and infection

Incisions	Number	Percentage
Midline, Extended	15	30
Right paramedian	10	20
Left Paramedian	2	4
Grid iron	8	16
Midline	8	16
Rutherford Morrison	4	8
Kocher's	3	6

Table V: Management and control of postoperative wound infection

Management	Number of patients	Percentage of management to control infection
Antibiotic according to *C/S* + dressing + secondary stitch	35	70
Antibiotic according to *C/S* + wound dressing	13	26
Antibiotic according to *C/S* + wound excision + delayed	2	4

C/S= Culture sensitivity

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