The Effect of Perioperative Use of Prophylactic Antibiotics on Surgical Wound Infection

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ABSTRACT:

BACKGROUND:

Surgical site infection is one of the commonest complications after surgical operations and the use of antibiotics in preventing or reducing infection is associated with many problems.

OBJECTIVE:

To evaluate the use of peri- operative prophylactic antibiotics in preventing or reducing surgical site infection in different types of operations

PATIENTS AND METHODS:

This prospective study was conducted on(560) patients from June 2002 to January 2007 in general surgical department in Baghdad teaching hospital.

The patients were divided into(3) groups according to the type of operation; clean operations which included 200 patients, clean-contaminated operations which included 160 patients and contaminated operations which included 200 patients) and they were further subdivided into 2 groups, group A of patients were treated with peri operative prophylactic Cefotaxime antibiotic while the group B patients were treated with therapeutic dose of the same antibiotic for prolonged duration (5 days).

Those patients were followed up for 4 weeks after operation and when signs of wound infection appeared, swab for culture and sensitivity was taken to determine the type of bacteria, and effective antibiotics against them.

RESULT:

Result showed that (3) patients (3%) in clean surgery developed wound infection when using perioperative regimen as compared to(2) patients (2%) when using therapeutic regimen. In clean contaminated wounds infection appeared in (5) patients (5%) in patients using prophylactic or postoperative regimen while in contaminated wounds, (11) patients (11%) developed wound infection when using perioperative regimen as compared to(6) patients (6%) who developed wound infection in patients using postoperative antibiotics.

Statistically, there is little difference in effectiveness of the two regimens (A and B) in both group(1) and(2) operations but in the group(3) operations, although prophylactic antibiotic regimen reduced the infection rate to 11% but it was not as effective as the therapeutic regimen in reducing wound infection (6%) .

CONCLUSION:

Postoperative antibiotics should be resisted in clean and clean contaminated operations instead perioperative antibiotics can be used, and prolonged postoperative antibiotics should be used only in contaminated operations.

KEY WORDS: wound infection, prophylactic antibiotics.

INTRODUCTION:

Surgical site infection is defined as infection that occur within 30 days of the operation if no implant is left in place [(1)].It is one of the commonest problems after different types of surgery which increases hospital stay and cost, due to invasion of the surgical wound by bacteria either living inside patient's body (endogenous infection), or exogenous from the external environment and other people [(2)].Wound infection is common surgical complication accounting for (14-16%) of all nosocomial infections in hospitalized patients [(3)].

Surgical wounds are classified into clean wounds with infection rate at surgical site without antibiotics (1-2%), Or clean contaminated wounds with infection rate without antibiotics is 20-30%. The third type is contaminated wound and Infection rate in those patients without antibiotics is up to 60%. Dirty wounds are

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considered when gross pus is encountered at operation as in perforated appendicitis and diverticulitis with intraperitoneal abscess collection and Infection rate at surgical site without antibiotics is 60% or more. Staph aereus considered the most common pathogen in surgical wound infections in clean operation (4, 5) while in other types of surgery infection is usually due to endogenous microorganisms [(5)].

The best time of administering prophylactic antibiotic is at time of induction of anesthesia or 30-60 minutes before and other one or two doses may be given per and post operatively depending on type and duration of operation[(6,7,8,9)] .

The aim of this study to assess the role of perioperative antibiotics in different types of surgery.

PATIENTS AND METHODS:

This prospective study was conducted on 560 patients who where admitted and operated upon in the first surgical unit in Baghdad teaching hospital between June, 2002 to January, 2007.

Patients were classified into three groups according to types of surgery:

1) Group 1, clean surgery which includes 200 patients.

2) Group 2, clean contaminated surgery which includes 160 patients.

3) Group 3, contaminated surgery which includes 200 patients.

Dirty operations associated with pus encountered during operations were not included in this study because infection already exist and there was no role for using prophylactic antibiotics.

Group 1 operations were breast surgery like lumpectomy and mastectomy (42 cases) while cases of breast abscess were excluded, hernia repair (61 cases), thyroid operations (36 cases), lymph node excisional biopsy (18cases), lipoma (12cases), varicocele (8cases), hydrocele (14 cases), undescended testes (5 cases) and gynecomastia (4 cases).

Group 2 operations include cholecystectomy (94 cases), hydatid cyst of the liver (27cases) and intestinal obstruction without enterotomy (39 cases).

Group 3 operations included cases of non perforated acute appendicitis (128 cases), pilonidal sinus (20 cases) and intestinal obstruction with enterotomy (52 cases) .

Patients were further divided into two equal groups; group (A) received prophylactic antibiotics in the form of 2 doses of cefotaxime 1g intravenously, one at the time of induction of anesthesia and the other after12 hours after explanation of this treatment regimen to patients or relatives and obtaining their permission, and group (B) received therapeutic regimen of same antibiotic for 5 days and first dose was administered in the ward after recovery from anesthesia at. The dose of cefotaxime in children was 100 mg/kg/day in 2 divided doses (6) and we excluded 3 patients who were allergic to cephalosporin.

The average length of hospital stay in all types of operations was 2 days.

All the wounds were followed up for 4 weeks and examined before discharge and second examination at time of stitch removal with instruction given to the patients to attend for examination if any sign of infection appear in the wound.

When wound infection was developed, we sent a swab for culture and sensitivity and immediately started to deal with infection before waiting the result by drainage of pus in cases of abscess collection and we continued treatment with cefotaxime antibiotic until the result of culture was available.

T-test was the statistical method used to determine the significance of the study.

The cost of treatment in group A was 2750 Iraqi Dinars while in group B was 13750 Iraqi Dinars.

RESULTS:

The total number of patients included in this study was 560 and the age range of those patients was between 3 and 76 years. Male patients constituted 219 patients while 341 patients were female,

Among A1 group, 3 patients (3%) developed wound infection (2 cases of hernia repair and 1 case of mastectomy for stage II carcinoma of breast) while in B1 group, 2 patients (2%) developed wound infection (1 case of hernia repair and another case of gynecomastia).

In eachA2 and B2 group, 5 patients (6.25%) developed wound infection (in A2 group, 4 cases of intestinal obstruction and one case of cholecystectomy while in B2 group, 3 cases of intestinal obstruction and 2 cases of cholecystectomy).

In A3 group, 11 patients (11%) developed wound infection (8 cases of acute appendicitis, 2 cases of intestinal obstruction and 1 case of PNS.) .While in B3 group, 6 patients (6%) developed wound infection (4 cases of acute appendicitis, 1 case of intestinal obstruction and1 case of PNS.).

Statistically, no significant difference was detected in the effectiveness of the two regimens in both group 1 and group 2 operations while in group 3 operations, although perioperative prophylactic antibiotic regimen reduced infection rate but it was not as effective as therapeutic regimen.

Clinical and bacteriological results showed that in A1 group 3 patients (3%) developed wound infection, 1 case (1%) of cellulitis developed after 3 days and 2 cases (2%) of abscess collection developed after7 and 8 days while in B1 group 2 patients (2%) developed wound infection, 1 case (1%) of cellulitis developed after 4 days and one case (1%) of abscess developed after 7 days, culture of infected wounds inA1 and B1 groups reveals S. aureus bacteria in all cases except one case of cellulitis in B1 group, in which no growth of bacteria could be detected and this may be due to deep subcutaneous infection which gave us negative culture (Table 1).

In A2 group 5 patients (6.25%) developed wound infection, 2 cases (2.5%)of cellulitis after 3 and 4 days with 3 cases (3.75%)of abscess developed after 6, 7 and 8 days. in B2 group also 5 patients (6.25%) developed wound infection, 4 cases (5%) of cellulitis after 3 days (1 case) and 4 days (3 cases) and one patient (1.25%) developed abscess after 9 days, the culture in all the above cases revealed S. aureus bacteria except 1 case of cellulitis in A2 group which revealed E.coli. In A3 group,11 patients (11%) developed wound infection, 4 cases (4%)of cellulitis after 3 days (2 cases) and 4 days (2 cases), and 7 patients (7%) developed abscess after 7 days (4 cases), 8 days (1 case) and 9 days (2 cases) while in B3 group, 6 patients (6%) developed wound infection, 3 cases (3%) of cellulitis after 2 days (1 case) and 3 days (2 cases) and 3 cases (3%) of abscess after 7 days (2cases) and after 8 days (1 case) culture of infected wounds revealed E. coli as a most common bacteria in both A3 and B3 groups.

DISCUSSION:

Prophylactic antibiotics are given in clean contaminated and contaminated operations although some surgeons give prophylactic antibiotics even in clean operations in certain circumstances [6,10] as in our work due to many factors affecting the wound environment making these wounds susceptible to wound infection, such as bad personal hygiene of the patients.

In this study we found that in different types of operations, perioperative prophylactic antibiotic regimen significantly reduced wound infection rate.

Both regimens prophylactic one or therapeutic reduced infection rate to acceptable rates, and no significant difference between the two regimens was found in both groups of clean and clean contaminated operations but in contaminated operations, therapeutic regimen was more effective than prophylactic regimen in reducing the infection rate .

The results of prophylactic use of antibiotic in this study were 3% for the clean operations 6.25% in clean contaminated operations and 11% in contaminated wounds as compared to the results of Russel [11] who showed the results of prophylactic antibiotic use of 1-2% for clean wounds <10% in clean contaminated wounds and 15-20% for contaminated wounds.

In our result, the use of perioperative prophylactic antibiotic reduces infection rate to acceptable level as compared to the results of Russel, and the effectiveness was like the therapeutic regimen in both clean and clean contaminated wounds but in contaminated wounds the perioperative prophylactic antibiotic, although reduced wound infection rate to acceptable level (11%) if compared with the study above (15-20%), but was not as effective as therapeutic regimen which reduced infection rate to (6 %) (Table 2).

A study was conducted by Cunningham et al [12] on the effect of prophylactic antibiotic in breast surgery (clean wound), concluded that prophylactic antibiotics significantly reduce the incidence of surgical site infection, this result is similar to the result of clean operations in our study.

Durig et al [13] in their study on colorectal surgery (clean contaminated) using Cefazolin concluded that the use of prophylactic antibiotic is as effective as treatment for longer duration as in our work .

A study in Thailand in patients underwent uncomplicated open appendectomy (contaminated wound) using prophylactic Gentamicin and Metronidazole regimen versus multiple doses of same drugs with longer duration concluded that single dose of these antibiotics was found to be as effective as multiple doses in reducing surgical site infection [14] and this result was different from our study which could be due to the use of more than one type of antibiotic in the study above. Another study was conducted in Belgium compared the use of prophylactic antibiotics

(using gentamicin I.V.) and multiple antibiotics (gentamicin and clindamycin) in abdominal surgery ; they concluded that single preoperative parenteral dose of antibiotic is not as effective as multiple antibiotics [15].

The cost of using prophylactic antibiotics was much less than using full course of antibiotics and this should be considered in the developing countries and poor countries as they face plenty of difficulties to ensure the coverage of medical care for the patients and antibiotics is one of the important items when calculating the health services costs.

CONCLUSION:

Prophylactic antibiotic effectiveness is similar to therapeutic regimen in both clean and clean contaminated surgery so, it is preferable to resist temptation of using antibiotics for longer duration with higher doses to reduce problems associated with the use of antibiotics, but in the contaminated surgery therapeutic regimen of antibiotic is preferable because it reduces infection rate more than prophylactic regimen.

Table 1: The Infection Rate in Different Types of Surgery.

groups of the operations	regimen-A			regimen-B			total
	Patients NO.	Infected cases	%	Patients NO.	Infected cases	%	
Group1 clean	11 100	3 3	3%	100	2	2%	200
Group 2 Clean-contaminated	80	5	6.25%	80	5	6.25%	160
Group 3 Contaminated	100	11	11%	100	6	6%	200
Total number	280	19	6.78%	280	13	4.64%	560

Table 2: Comparison between the infection rates in our study and other study (2) when using regimen-A.

Types of operation	our study	Russel study
Group-1	3%	1-2%
Group-2	6.25%	<10%
Group-3	11%	15-20%

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