

The Role of Prophylactic Antibiotics in the Management of Post Surgical wound Infection

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Abstract

Introduction: Prophylactic antibiotics have been shown to be effective in reducing the incidence of febrile morbidity associated with surgical operations. Surgical site infections (SSI's) account for approximately 15% of nosocomial infections and are associated with prolonged hospital stays and increased costs.

Objective: To improve the outcome and to reduce the time stay at the hospital.
To determine the independent risk factors for post surgical infection.
To decrease the incidence of post surgical wound infection.

Study Design: An intervention randomized study.

Aim of the work: To evaluate the efficacy of prophylactic antibiotics in reducing the incidence of post surgical wound infection.

Place and Duration: Department of Obstetrics and Gynecology, Department of Surgery and Department of urology, Faculty of Medicine Al-Azhar University from January to June 2011.

Patient and Method: Three hundred patients undergoing surgical operations were enrolled in this study and classified into two groups:

Group1:150 patients received parental prophylactic antibiotics, 1st dose at the time of induction of anesthesia, 2nd dose after 12hs from the surgery.

Group2: 150 patients received oral antibiotics for five days postoperative.

Results: In this study ,Total 300 patients were enrolled,6 patients from group 1 developed wound infection(4%),39 patients from group 2 developed wound infection(26%) ,with prolonged stay at the hospital,2.3 days in group1, and 4.9 days in group 2.

Conclusion:

The use of prophylactic antibiotics therapy is satisfactory in our surgical environment, this practice would be efficient, cost effective and prevent the emergence of nosocomial infection in developing countries.

Key words: Surgical Site Infections (SSI's) – Prophylactic antibiotic.

Introduction

Despite the knowledge about preventing infection and the progress of contemporary surgery, in many hospitals, infection of surgical wound is the most common nosocomial infection (25%) and the one of the major limiting factor of

successful surgery (Boribonhiunsarn *et al.*, 2007& Ledger, 2006).

Sources of infection may be endogenous, exogenous, or hematogenous.

Most infection occurs due to organisms implanted during the procedure. In obstetrics and gynecological patients the

site surgical infection are typically caused by maternal coetaneous or endometrial/vaginal flora.(Lofgren *et al.*, 2004).

Modern sterilization techniques, including pre-packed instrument sets for individual surgical procedures, the establishment of centralized sterile supply department and infection control teams have all contributed to minimize preoperative infection. However despite all these precautions and techniques, the occurrence of this infection has been not abolished completely, with an incidence of 12% to 25% even in clean surgical procedures (Chang *et al.*, 2005).

The incidence of SSI depends upon type of surgery, patient risk factors and hospital antimicrobial practices (Gordon *et a* 2006) A preoperative site infection (endometritis and pelvic cellulites) is the most common complication of cesarean delivery and hysterectomy. In the absence of antibiotic prophylaxis, approximately 30% to 40% of women having an unscheduled cesarean delivery develop endometritis, after a scheduled cesarean, approximately 10% to 15% is infected. Approximately one third of women having vaginal hysterectomy have pelvic cellulites if they do not receive prophylactic antibiotics. Prophylactic antibiotics should be recommended for all women undergoing abdominal hysterectomy, women who did not receive prophylactic antibiotics had a higher surgical infection rate (Eason *et al.*, 2004). Wound infection may take one of two forms: an incision abscess or Wound cellulites. Patients with former condition typically have erythema and warmth at the margins of the wound and purulent discharge from the incision itself. Patients with wound cellulites have an intense erythematous reaction that spreads centripetally from the wound. The affected skin is warm and quite tender to the touch but the purulent drainage does not exude from the wound (Peipert *et al.*, 2004).

Preoperative antimicrobial prophylaxis has long been advocated in surgical procedure, but recent guidelines and publications show that single dose or two doses prophylaxis is equally effective in

elective&emergency& clean and clean contaminated surgical procedures (Nisa *et al* 2005).

Appropriate and prolonged use of antibiotics is a serious problem .It increases the morbidity and mortality of patients and also increases health care cost due to increased antibiotics resistance rate (Her-Young *et al.*, 2005).

To address this problem, we conducted an intervention study in order to evaluate the effectiveness of two doses prophylactic antibiotics in the different surgical procedures.

Patients and Methods

An intervention study was conducted at Obstetrics and Gynecology Department, Department of Surgery, and Department of Urology at AL-Zahra University Hospital &AL- Hussein University Hospital from April to June 2011.

Three hundred patients undergoing different surgical operations elective or emergency in the three Departments were classified into two groups:

Group 1: Including 150 patients were received parental prophylactic antibiotics 1st dose at the induction of anesthesia, and the 2nd dose 12hs postoperative.

Group 2: Including 150 patients were received oral antibiotics postoperative.

Exclusion Criteria: All patients with medical disorders (Diabetes-Hypertention-Anamia-Blood Disease-and etc.

Immunosuppressive patients.

Inclusion Criteria:

Male or Female patients.

Infection control methods.

Age and Social class.

Duration of preoperative hospitalization.-

Preoperative hair removal.

Elective operations or emergency.

Duration of operation.

Proper surgical technique.

Any complications during operation.

Duration of hospital stay.

Type of suture materials.

Patients who had established infection prior to operation or had had any antibiotic in the preceding week.

The Role of...

Research design: This was an intervention randomized control study.

Within 24 hour before surgery, a baseline assessment was performed that included measurement of vital signs (pulse rate, respiration rate, blood pressure, and body temperature), general physical, systemic and gynecological examination. Blood and urine samples were also sent for hematology, blood chemistry, and urine analysis.

Follow up:

Routine postoperative observation was done during hospital stay.

In the second day after operation follow up of patient sheet for hyperthermia (temperature more than 38 degree) and if recurrent as a sign of fever. In the third day of operation (day of discharge of the patient), the patient had the discharge card, the treatment was free of antibiotics in the group 1, and oral antibiotics for five days for group 2.

Febrile morbidity: Temperature of more than 38 degree obtained on 2 or more occasions at least 4 hours apart was early sign of infection.

Signs of wound infection according to Killian *et al*(2001) are:

*Redness or excessive swelling in the wound.

*Throbbing pain or tenderness in the wound area.

*Generalized chills or fever.

*Pus or watery discharge collected beneath the skin or draining from the wound.

*Foul odor from the wound.

*Red streaks in the skin around the wound, or progressing away from the wound.

*Erythema, induration, cellulitis or purulent drainage.

*Uterine tenderness after 48hrs.

*Offensive or purulent lochia.

Results

Three hundred patients were enrolled in this study, full history and examination were taken, 142 Obstetric cases, 63 Gynecological cases, 85 surgical cases, and 10 Urological cases.

Table (1) Mean of study variable

	Age(years)	Duration of hospital stay (days)
Group 1	38.3	2.3
Group 2	39.9	4.9

The duration of hospital stay was longer in group 2.

Table (2)

No. of patients	Low social class	High social class	Female	Male
Group 1	144(96%)	6(4%)	93(62%)	112(74.6%)
Group 2	139(92.7%)	11(7.3%)	57(38%)	38(25.4%)

Most of the cases were from low social class. Percentage of females was higher than males in both groups.

Table (3)

Type of surgery	Total no. of patient	1 ST Group	2 ND Group
Gall Bladder	10(3.4%)	4	6
Cesarean section	142(47.3%)	72	70
T. A. H	38(12.6%)	21	17
Vaginal hysterectomy	5(1.6%)	2	3
Laparotomy	20(6.6%)	9	11
Hernias	32(10.6%)	14	18
Thyroid	25(8.3%)	13	12
Breast	16(5.4%)	7	9
Genitourinary	12(4%)	7	5

Table (4)

Duration of operation	Group 1	Group 2
Within 30 min	85(56.6%)	75(50%)
31- 60 min	45(30%)	50(33.3%)
More than 60 min	20(13.4%)	25(16.4%)

The duration of most of obstetric cases were within 30 min, While the duration of most of gynecological cases were from 31- 60min, and in some of gynecological cases and most of Surgical and urological cases were more than 60 min. Prolongation of the time of operation, led to increase the incidence of postoperative infection.

Table (5)

	Group 1	Group 2
Elective operation	90(60%)	110(73.3%)
Emergency operation	60(40%)	40(26.7%)

The incidence of post operative infection was higher between patients of emergency operation because there was no time for preoperative preparation especially in obstetric patients with prolonged labor and rupture of membrane.

Table (6)

	Group 1	Group 2
Wound infection with pyrexia	2(1.3%)	29(19.3%)
Wound infection without pyrexia	4(2.6%)	10(6.6%)

*The incidence of postoperative wound infection was higher in group 2 and 9 patients from the same group need readmission
For intravenous antibiotics therapy, three patients from them need repeat surgery.*

Discussion

Wound infection remains an important postoperative complication. Its occurrence is associated with readmission, repeat surgery or intervention, prolonged hospitalization and significant clinical and economic consequence (*Sadique et al., 2009*).

The risk is particularly high in developing countries because of malnutrition, illiteracy, improper surgical technique, substandard sterilization of operation theatres and inadequate or over burdened health facilities. To overcome this, prophylactic antibiotics have been

recommended by many research workers (*Killian et al., 2001*).

The objectives are to decrease the incidence of SSI, reduce the effect of antibiotics on normal bacterial flora, reduce adverse effects, use effective & appropriate antibiotics, minimal change in host defenses, and augment host defense mechanisms at time of bacterial invasion and therapy decreasing the size of inoculums (*Sullivan et al 2007*)

The benefits to reduce the incidence of SSI, overall the costs and hospital stay (*Tita et al 2009*).

Several antibiotics have been used in various combinations, single dose or multiple dose regimes given preoperative or over the course of several days. Many

studies showed that properly administrated prophylactic antibiotics can prevent postoperative infection (Smail *et al.*, 2007 & Oliver *et al.*, 2009).

Appropriate choice of, its timing of administration and proper duration of antibiotics therapy are the factors influencing successful prophylaxis. The timing of prophylactic antibiotics is very important, for prophylactic therapy to be effective; the anti microbial must be present in an adequate concentration while the surgical wound is opened (Costantine *et al* 2008).

In this study, group 1 received the 1ST dose of prophylactic antibiotics at the time of induction of anesthesia, and the 2ND dose after 12hrs from the operation and group 2 received antibiotic therapy postoperative for five days and the incidence of postoperative wound infection was lower in group 1 (6 cases 4%) in comparison to group 2 (39 cases 26%) and this with correlation with Sadique *et al* (2009) in their study on 305 patients undergoing obstetric, gynecological surgical operations received only one single dose of intravenous antibiotics, there was obvious reduction in wound infection, ten patients had postoperative wound infection (3.2%).

Also the study conducted by Her Young (2005) has shown that prophylaxis antibiotics can reduce the antibiotic cost by 75-80%. Additional cost saving was also found were related to decrease resistance organism outbreaks and decrease postoperative wound infection.

Also Smail (2007) showed that in women undergoing either elective or non elective cesarean section with no signs of infection before operation, the use prophylactic antibiotics has been shown to reduce the risk of endometritis by two thirds to three quarters and a decrease of wound infection justifies the policy of recommending prophylactic antibiotics to women undergoing elective or non elective surgery.

In this study the group 1 received 1ST dose of antibiotics by the anesthesiologist during the induction of anesthesia because the timing of prophylactic antibiotic administration is also very important. For prophylactic therapy to be effective, the

antimicrobial must be present in an adequate concentration while the surgical wound is opened. The most important factor in pathogenesis of wound sepsis is the presence of bacteria at the time of wound closure thus too early or too late administration of antibiotic therapy cannot produce adequate tissue drug level while surgery is going on and this in agreement with many researchers who suggested that responsibility for prophylactic antibiotic should be assigned to the anesthesiologist at the induction of anesthesia (Costantine *et al* 2008 & Sadique *et al* 2009 and Vernessa *et al* 2011). SaeTia L *et al* (2006) showed that antibiotics were effective only if given within 4hrs of inoculating bacteria into a wound.

The duration of operation more than 60 min was 20 cases in group 1 and 25 cases in group 2 and the incidence of wound infection was higher between these cases, and this in agreement with Oliver *et al* (2009) who demonstrated that the risk of postoperative wound infection was considerably reduced when the operation time was short. In the course of prolonged operation, there was significant tissue devitalization resulting from tissue handling reduced tissue perfusion.

In this study the duration of hospital stay was longer in group 2 in comparison to group 1 (mean 4.1 days to 2.3 days) and 12 patients from group 2 need readmission and this means increased cost for both patient and hospital, this in correlation with Sadique *et al* (2009) who revealed that inappropriate and prolonged use of antibiotics is a serious problem. It increases the morbidity and even the mortality of patients and also increases health care costs due to increased antibiotics resistant rate.

The present study showed no significant difference as regards to the age of the patients in both groups.

The present study the majority of patients was women, and from low social class in both groups and the incidence of wound infection was high between them because of lack of health education, poor nutrition, improper health care illiteracy and bad hygiene. These findings were in agreement with many studies (Nisa *et al* 2005 & Oliver *et al* 2009 and Walaa *et al* 2011).

Conclusion:

In conclusion, our study showed that use of prophylactic antibiotics are effective and associated with prevention of serious infectious morbidity associated with surgical operations.

Shorting of the duration of antibiotic prophylaxis may reduce medical cost, resistant microorganism and postoperative complications.

Recommendations:

-Prophylactic antibiotic therapy must be used in our hospital in elective and non elective operation.

-Increased awareness about health education and infection control method.

Proper preoperative preparation.-

Apply proper surgical technique.-

-Maintenance of standard sterilization techniques of operation room.

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دور المضادات الحيوية الوقائية في الحد من تلوث الجروح بعد العمليات الجراحية

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المقدمة:

المضادات الحيوية الوقائية مجردة قد تكون فعالة في الحد من الإصابة بأمراض الحمى المرتبطة بالعمليات الجراحية كما ان لها تأثير ملحوظ في انخفاض نسبة تلوث الجروح بعد العمليات الجراحية .
و كان الغرض من هذه الدراسة هو تحسين النتائج لتخفيض حالات إصابة الجروح بالتلوث بعد العمليات الجراحية ولتقليل وقت الإقامة في المستشفى وايضا معرفة عوامل الخطر التي تؤدي الي التلوث.

الهدف من الدراسة:

لتقييم فعالية المضادات الحيوية الوقائية في الحد من حالات الإصابة بتلوث الجروح.

تصميم الدراسة:

دراسة تدخل عشوائية.

المواد و الطرق:

شملت هذه الدراسة 300 من المرضى الذين خضعو لعمليات جراحية بأقسام النساء و التوليد , الجراحة العامة و المسالك البولية بمستشفى الزهراء الجامعي و مستشفى الحسين الجامعي وتم تقسيم المرضى الي مجموعتين.
المجموعة الاولى شملت 150 مريض و مريضة تم اعطائهم جرعة المضاد الحيوي الوقائي الاولي أثناء التخدير و الجرعة الثانية بعد 12 ساعة من العملية عن طريق الحقن.
المجموعة الثانية شملت 150 مريض و مريضة تم اعطائهم جرعة المضاد الحيوي بعد العملية لمدة 5 أيام عن طريق الفم.

النتائج:

كانت نسبة التلوث و الإصابة في الجروح اقل بشكل ملحوظ في المجموعة الاولي كما كانت ايضا فترة الإقامة في المستشفى اقل من المجموعة الثانية.

الاستنتاج:

المضادات الحيوية الوقائية وسيلة فعالة و امنة في الحد من نسبة إصابة الجروح بالتلوث بعد العمليات الجراحية و هو يؤدي الي تكلفة اقل للمريض و للمستشفى و هو عنصر فعال أيضا في مكافحة العدوى في المستشفيات.