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Original Research Article

A Prospective Observational Assessment of the Effectiveness of Minimal Antibiotic Therapy and Routine Long Term Post-Operative Therapy in Elective Surgery

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Abstract

Aim: The aim of the present study was to evaluate the effect of three doses prophylactic antibiotic an hour before a surgical intervention with the chosen standard antibiotic with regard to the conventional use of same antibiotic for 5 to 7 days.

Methods: The present prospective observational study was conducted on 100 Patients attending outpatient Department of Surgery, Bhagwan Mahavir institute of medical science, Pawapuri, Nalanda, Bihar, India for the period of 8 months.

Results: The age range of the patients in group I was 18–85 years with mean and standard deviation (SD) of 44.78±15.75 and the age range of the patients in group II was 18–74 years with mean and SD of 40.82±14.66. There was no significant variation between data of the two groups based on age. In group I, 34 (68%) patients were male and 16 (32%) were female. In group II 30 (60%) patients were male and 20 (40%) patients were female. Mean hemoglobin level in group I was 12.06 with SD of ±1.60 and in group II it was found to be 11.70 with SD of ±1.25. Mean serum protein levels found to be in group I was 6.65 with SD of ±0.72 and same in group II was 6.64 with SD of ±0.74. 10 (20%) cases had diabetes in group-I and 8 (16%) cases in group II and addiction was present in 9 (18%) cases in group I and 10 (10%) cases in group II. There was no significant difference between both the groups based on diabetes and addiction. Two groups of cases with 50 cases each were evaluated for post-operative SSI, it was found that in group I, 5 (10%) cases had grade 2 SSI (3 cases on POD 3rd and 2 cases on POD 5th). In group II, 5 (10%) cases had grade 2 SSI (3 cases on POD 3 and 2 cases on POD 5). The p value is 0.90 and was not significant. There was no statistical significant difference between both the groups based on Southhampton grade.

Conclusion: A minimal dose antibiotic prophylaxis is equally efficient and has added advantage of reducing the duration of hospital stay and cost of medicines for the patients. Hence minimal dose antibiotic is better than a routine long term antibiotics therapy.

Keywords: Antibiotic prophylaxis, Surgical site infection, Cost effective

Introduction

Postoperative infectious complications are an important cause of morbidity and mortality in the surgical patient. Efforts to reduce these complications include careful attention to surgical technique and perioperative antimicrobial prophylaxis. Prospective randomized controlled clinical trials have established the utility of perioperative antimicrobial prophylaxis in some settings. [1] Antibacterial drugs are powerful agents to prevent infections but excess use of antibiotics led to increase of resistance towards the antibiotics used and thus has risen the expense in medical support. [2] Resistance towards antibiotics is a world-wide dangerous phenomenon so, World Health Organization (WHO) in the year 2012 had raised a clarion call for the reduction of the usage of antibiotics and thereby raising measure to avoid the resistance towards antibiotics. [3] The antibiotic prophylaxis is given to maintain adequate tissue concentration in body, right drug is given in the right time and for right duration, this will reduce the antibiotic resistance. [2] It will also prevent the complications arising due to infections in therapies. The usage of antibiotics conventionally, is usually

for fixed period of time after a procedure which is done therapeutically to prevent infections. [2]

Use of most effective, least toxic and least expensive antibiotic for precise duration of time need to cure or prevent infection. Pathogen specific guidance in hospital policy is encourage that is based on local antibiogram, availability, cost, toxicity, efficacy, action and pharamacokinetics. [4] A coagulum of blood and fibrin is impenetrable to the bacteria and its formation time is 48-72 hours. Thus if the wound could be kept free from micro-organism till the coagulum formation, there would not be any infection subsequently. [5] With respect to the usage of antibiotics, vital for infection control are careful surgical skill, handling tissues properly, a clean environment, good preparation done preoperatively, friendly theatre setting, and good care of wounds; which are now being given less priority. [6] In hospitals despite the adherence of all sterile precautions, the contamination during the surgical procedure can lead to increase in the bacterial load in the blood, can lead to the use of antibiotics for long period to cover the postoperative infection. The conventional use of antibiotics for prolonged period often results in high cost to the patient.

The aim of the present study was to evaluate the effect of three doses prophylactic antibiotic an hour before a surgical intervention with the chosen standard antibiotic with regard to the conventional use of same antibiotic for 5 to 7 days.

Materials and Methods

The present prospective observational study was conducted on 100 Patients attending outpatient Department of Surgery, Bhagwan Mahavir institute of medical science, Pawapuri, Nalanda, Bihar, India for the period of 8 months.

Patients having age 18 years and above, both male and female with no co-morbid conditions undergoing elective surgeries and admitted a day before were included in the study. The patients who did not gave consent and with co-morbid condition like diabetes mellitus and malignancy, cephalosporin group hypersensitivity and history of treatment with steroids and those who are taking drug classified to cause immune deficiency, Patients having unclean wounds and females who were pregnant were excluded. Ethical consideration was made through institutional ethical committee and informed consent was taken from the subjects prior to study.

Patients were randomly assigned into group I and group II, where group I is defined as minimum antibiotic therapy group and group II is defined as the routine long term antibiotic therapy group. All surgical interventions were carried out in similar operative backgrounds, and with identical preoperative methods of safety, and care given post-operatively is followed for all patients.

The guidelines for antibiotic usage are decided as follows

Group I included three dosage of injectable ceftriaxone 1 gram intravenous peri-operatively, first dose twelve hour before surgery and second dose half hour before surgical incision and third dose twelve hours after surgery.

Group II included injectable ceftriaxone 1 gram intravenous peri-operatively, first dose twelve hour before surgery and second dose half hour before surgical incision and then followed by injection (conventional dose) ceftriaxone 1 gram/day I.V twice daily for the first 5-7 days post-operatively.

Using Southampton wound grading system, surgical site infection in post-operative patients were recorded.15 Follow up was done on the 3rd, 5th, 10th and 15th days post operatively. Data was recorded in Microsoft excel and checked for its completeness and correctness then it was analysed by using suitable statistical software and p value<0.05 was considered as a statistically significant.

Results

Table 1: Patients demographic

Features	Group I (N=50)	Group II (N=50)	p value
Age	44.78±15.75	40.82±14.66	0.42
Sex ratio (M/F)	34/16	30/20	
Hemoglobin	12.06±1.60	11.70±1.25	0.0180
Serum protein	6.65±0.72	6.64±0.74	0.52
History			
Diabetic			
Yes	10 (20)	8 (16)	0.84
No	40 (80)	42 (84)	
Addiction			
Yes	9 (18)	5 (10)	0.95
No	41 (82)	45 (90)	

The age range of the patients in group I was 18–85 years with mean and standard deviation (SD) of 44.78±15.75 and the age range of the patients in group II was 18–74 years with mean and SD of 40.82±14.66. There was no significant variation between data of the two groups based on age. In group I, 34 (68%) patients were male and 16 (32%) were female. In group II 30 (60%) patients were male and 20 (40%) patients were female. Mean hemoglobin level in group I was 12.06 with SD of ±1.60 and in group II it was found to be 11.70 with SD of ±1.25. Mean serum protein levels found to be in group I was 6.65 with SD of ±0.72 and same in group II was 6.64 with SD of ±0.74. 10 (20%) cases had diabetes in group-I and 8 (16%) cases in group II and addiction was present in 9 (18%) cases in group I and 10 (10%) cases in group II. There was no significant difference between both the groups based on diabetes and addiction.

Table 2: Grade II SSI in group I and group II cases with history of diabetes and addiction

History	**Group I**			**Group II**		
Diabetic	**Yes (N=10) %**	**No (N=40) %**	**p value**	**Yes (N=8) %**	**No (N=42) %**	**p value**
After 3rd day	1 (10)	3 (7.50)	0.50	1 (12.5)	3 (7.14)	0.85
After 5th day	1 (10)	2 (5)	0.66	2 (25)	1 (2.38)	0.30
Addiction	Yes (N=9)	No (N=41)		Yes (N=5)	No (N=45)	
After 3rd day	1 (11.11)	2 (4.87)	0.59	0 (0)	3 (6.66)	0.91
After 5th day	0 (0)	3 (7.31)	0.65	1 (20)	1 (2.22)	0.89

Similarly, out of 50 cases in group II, 10 cases were diabetic out of which 1 (10%) case had post-operative infection on day 3 and 1 (10%) cases had post-operative infection on day 5. 9 cases had history of addiction, out of which no cases had post-operative infection on day 3 and 1 (11.11%) case had post-operative infection on day 5. No significant results were found for post-operative infection on day 3 and day 5.

Table 3: Type of surgery and percentage of infection in both groups

Type of operation	**Group I (%)**	**Group II (%)**	**Infection in group I (N**	**Infection in group II (N)**
Appendicectomy	4 (8)	4 (8)	0	0
Eneucleation of fibroadenoma	6 (12)	9 (18)	0	1
Eversion of sac	8 (16)	5 (10)	2	1
Excison of lipoma	1 (2)	2 (4)	1	1
Hernioplasty	17 (34)	20 (40)	3	2
Lap cholecystectomy	10 (20)	8 (16)	1	0
Lap hernioplasty	4 (8)	2 (1)	1	0
Total	50 (100)	50 (100)	8	5
p value	0.25		0.90	

Different surgical procedures performed in patients of Group I and II, the most common surgical procedure in both the groups was hernioplasty 34% in group I and 40% in group II followed by eversion of sac with 16% in group I and lap cholecystectomy with 10% in group II. There was no significant difference between both the groups based on type of surgery.

Table 4: Grading of SSI in group I and II

Southhampton grade	**Group 1 (%)**				**Group 2 (%)**			
	POD 3	**POD 5**	**POD 10**	**POD 15**	**POD 3**	**POD5**	**POD10**	**POD15**
Grade 1								
Grade 2	3 (6)	2 (4)			3 (6)	2 (4)		
Grade 3								
Grade 4								
Grade 5								
p value	0.90							

Two groups of cases with 50 cases each were evaluated for post-operative SSI, it was found that in group I, 5 (10%) cases had grade 2 SSI (3 cases on POD 3rd and 2 cases on POD 5th). In group II, 5 (10%) cases had grade 2 SSI (3 cases on POD 3 and 2 cases on POD 5). The p value is 0.90 and was not significant. There was no statistically significant difference between both the groups based on Southhampton grade.

Discussion

Surgical site infections are still an increasing threat to the surgeons despite advances in techniques of surgery, patient care and sterilization practices. They are the most common health care associated infections as reported globally. [7] They are associated with prolonged hospital stay, increased economic loss, additional surgical procedures and increase chances of mortality. Multiple risk factors are involved in development of SSI ranging from general health of the patients to type of surgery, wound and procedure employed. Few of the risk factors are modifiable eg: conditions of the operating room whereas few factors like diabetes mellitus, patient's immune status are non-modifiable. [8]

The age range of the patients in group I was 18–85 years with mean and standard deviation (SD) of 44.78±15.75 and the age range of the patients in group II was 18–74 years with mean and SD of 40.82±14.66. There was no significant variation between data of the two groups based on age. In group I, 34 (68%) patients were male and 16 (32%) were female. In group II 30 (60%) patients were male and 20 (40%) patients were female. Mean hemoglobin level in group I was 12.06 with SD of ±1.60 and in group II it was found to be 11.70 with SD of ±1.25. Mean serum protein levels found to be in group I was 6.65 with SD of ±0.72 and same in group II was 6.64 with SD of ±0.74. 10 (20%) cases had diabetes in group-I and 8 (16%) cases in group II and addiction was present in 9 (18%) cases in group I and 10 (10%) cases in group II. There was no significant difference between both the groups based on diabetes and addiction. There was no significant variation between data of the two groups based on age whereas a definite correlation was found between age and efficacy of antibiotics in a study done by Scott et al which involved around 2016 cases showing increasing age associated with a reduced efficacy of the antibiotic. [9] Mean hemoglobin level in group I was 12.06 with SD of ±1.60 and in group II it was found to be 11.70 with SD of ±1.25. Londahl shown that in chronic infections, the decrease in tissue oxygen tension of the surrounding tissue seems to be a major driving cause for their persistence. [10] In our study, we found that the levels of hemoglobin as found to be significant in the outcome of the surgery.

Similarly, out of 50 cases in group II, 10 cases were diabetic out of which 1 (10%) case had post-operative infection on day 3 and 1 (10%) cases had post-operative infection on day 5. 9 cases had history of addiction, out of which no cases had post-operative infection on day 3 and 1 (11.11%) case had post-operative infection on day 5. No significant results were found for post-operative infection on day 3 and day 5. Mean serum protein levels found to be in group I was 6.65 with SD of ±0.72 and same in group II was 6.64 with SD of ±0.74. Study done by Sindgikar et al demonstrated that increased postoperative morbidity and mortality was associated with decreased serum protein levels whereas in our study, the level of serum protein did not have a convincing role in determining the outcome of surgery as the serum protein level in the cases taking part in the study were within the normal limits. [11] Diabetes is known to decrease the immunity of the cases and increase the risk of infections post-operatively. Also, diabetes decreases wound healing, hence diabetes increases SSI, but in our study no significant increase in rate of SSI was found and hence there is no added advantage of long-term routine antibiotic post-operatively.

Different surgical procedures performed in patients of Group I and II, the most common surgical procedure in both the groups was hernioplasty 34% in group I and 40% in group II followed by eversion of sac with 16% in group I and lap cholecystectomy with 10% in group II. There was no significant difference between both the groups based on type of surgery. Khichy et al conducted a randomized comparative study in which it was found that incidence of SSI was 4% in group A and 24% in group B. It was concluded that short dose peri-operative antibiotic was sufficient in preventing SSI. [12] Yavuz S et al in their studies reported a clear association of reduced Hemoglobin as a risk factor in development of SSIs and was statistically significant in his study. [13] Reduced hemoglobin reduces or impairs oxygenation to the tissues making the tissues more vulnerable for development of infection. Reduced oxygenation to the tissues also retards wound healing making the site more favorable for development of resistant microbes leading to delay in treatment and increasing the hospital stay. [14]

Two groups of cases with 50 cases each were evaluated for post-operative SSI, it was found that in group I, 5 (10%) cases had grade 2 SSI (3 cases on POD 3rd and 2 cases on POD 5th). In group II, 5 (10%) cases had grade 2 SSI (3 cases on POD 3 and 2 cases on POD 5). The p value is 0.90 and was not significant. There was no statistically significant difference between both the groups based on Southhampton grade.

Conclusion

No significant disparity was observed in surgical site infections (SSI) between the administration of a single pre-operative dose of antibiotic prophylaxis and the conventional post-operative antibiotic therapy lasting for five days. The utilization of a minimal dosage of antibiotic prophylaxis has been found to be equally effective, while also providing the additional benefit of reducing both the length of hospitalization and the

financial burden associated with medication expenses for patients. Therefore, it can be argued that administering a minimal dose of antibiotics is more advantageous compared to a conventional long-term antibiotic treatment regimen.

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