e-ISSN: 0976-822X, p-ISSN:2861-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2023; 15(4); 233-239

Original Research Article

An Analysis of the Role of Minimal Antibiotic Therapy and Routine Long-Term Postoperative Therapy in Elective Surgery: Prospective Analytical Analysis

Nitish Prabhakar

Senior Resident, Department of General Surgery, Government Medical College, Bettiah, Bihar, India

Received: 03-01-2023 / Revised: 26-02-2023 / Accepted: 20-03-2023
Corresponding author: Dr. Nitish Prabhakar
Conflict of interest: Nil

Abstract

Aim: The aim of the present study was to evaluate the effect of three doses of 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 analytical study was conducted on 200 Patients attending outpatient Department of General surgery, Government Medical College and Hospital, Bettiah, Bihar, India for the period of 18 months.

Results: There was no significant variation between data of the two groups based on age. 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 in group I was 6.65 with SD of ±0.72 and the same in group II was 6.64 with SD of ±0.74. There was no significant difference between both the groups based on diabetes and addiction. No significant difference was found for post-operative infection on day 3 and day 5. There was no significant difference between both the groups based on the type of surgery. 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, post-operative day (POD), Antimicrobial resistance (AMR).

Introduction

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. [1] They are associated with prolonged hospital stay, increased economic loss, additional surgical procedures and increased chances of mortality. Multiple risk factors are involved in development of SSI ranging from general health of the patients to the 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. [2] Most of the studies state that pre-operative antibiotic prophylaxis is effective in reducing the risk of wound

infection in surgical procedures and has been a standard practice followed in many surgeries. However different studies propose administration of antibiotics at different timings of surgery and timing of first dose is considered as a crucial factor in reduction of SSI. Most of the studies suggest that there is no benefit in administration of antibiotic after wound closure and when compared to single dose and multiple dose administration revealed no benefit than single dose in reduction of SSI after procedure. Prolonged administration of prophylactic antibiotic has been associated with development of resistant bacterial strains and predisposes the patient to the development of wound infection. [3,4]

The basic surgical skills of post-operative precaution, pre -operative preparation, excellent surgical technique, fastidious wound care and post-operative management are corner stones in the prevention of SSI and infection prophylaxis. In case of elective and clean surgeries where respiratory, genital and alimentary canal is not involved, the decisive period of administration of antibiotic is crucial and operations begin and end within this period. So it is always wise to administer prophylactic antibiotic during this period and to maintain the levels of antibiotics in tissues above the level of minimum inhibitory concentrations. [5]

Use of most effective, least toxic and least expensive antibiotic for precise duration of time is important 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. A coagulum of blood and fibrin is impermeable to 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. [6] With respect to the usage of antibiotics, vital for infection control are careful surgical skills, 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. [7] 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 longer 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 of 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 200 Patients attending outpatient Department of General surgery, Government Medical College and Hospital, Bettiah, Bihar, India for a period of 18 months.

Inclusion and Exclusion Criteria

Patients of 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 were taking drugs 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 defined as minimum prophylactic antibiotic therapy group and group II defined as 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 followed for all patients.

The guidelines for antibiotic usage was 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 was recorded. 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 statistically significant.

Results

Table 1: Patients demographic

Features	Group I (N=100)	Group II (N=100)	p value
Age	44.78±15.75	40.82±14.66	0.40
Sex ratio (M/F)	70/30	64/36	
Hemoglobin	12.06±1.60	11.70±1.25	0.0190
Serum protein	6.65±0.72	6.64±0.74	0.55
History			
Diabetic			
Yes	20 (20)	15 (15)	0.80
No	80 (80)	85 (85)	
Addiction			
Yes	17 (17)	10 (10)	0.90
No	83 (83)	90 (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, 70 (70%) patients were male and 30 (30%) were female. In group II 64 (64%) patients were male and 36 (36%) 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 in group I was 6.65 with SD of ±0.72 and same in group II was 6.64 with SD of ±0.74. 20 (20%) cases had diabetes in group-I and 15 (15%) cases in group II and addiction was present in 17 (17%) 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		p value	Group II		p value
Diabetic	Yes (N= 20) %	No (N= 80) %		Yes (N= 15) %	No (N= 8 5) %	
After 3rd day	3 (15)	5 (6.25)	0.50	1 (6.66)	4 (4.70)	0.85
After 5th day	1 (5)	4 (5)	0.66	2 (13.34)	2 (2.35)	0.30
Addiction	Yes (N=17)	No (N=83)		Yes (N=10)	No (N=90)	
After 3 day	2 (11.76)	4 (4.81)	0.59	0 (0)	5 (5.55)	0.91
After 5th day	0 (0)	5 (6.02)	0.65	1 (10)	3 (3.34)	0.89

Similarly out of 100 cases in group II, 20 cases were diabetic out of which 1 (6.66%) case had post-operative infection on day 3 and 2 (13.34%) cases had post-operative infection on day 5. 10 cases had history of addiction, out of which no case had post-operative infection on day 3 and 1 (10%) 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	7 (7)	8 (8)	0 (0.0)	0 (0.0)
Eneucleation of fibroadenoma	13 (13)	18 (18)	0 (0.0)	1 (10)
Eversion of sac	16 (16)	10 (10)	3 (25)	2 (20)
Excison of lipoma	3(3)	5 (5)	1 (8.34)	1 (10)
Hernioplasty	35 (35)	40 (40)	6 (50)	6 (60)
Lap cholecystectomy	20 (20)	18(18)	1 (8.34)	0 (0.0)
Lap hernioplasty	6 (6)	1 (1)	1 (8.34)	0 (0.0)
Total	100 (100)	100 (100)	12 (100)	10 (100)
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 35 (35%) in group I and 40 (40%) in group II followed by eversion of sac with 16 (16%) in group I and lap cholecystectomy with 10 (10%) in group II. There was no significant difference between both the groups based on type of surgery. In group I, 12 cases were infected with grade II SSI, in which 6 (50%) cases were of hernioplasty followed by 5 (33.33%) cases of eversion of sac and in group II, 10 cases were infected with grade II SSI, in which 6 (60%) cases were of hernioplasty, while 2 cases (20%) of eversion of sac and 1 cases (10%) each of enucleation and excision of lipoma.

Table 4: Grading of SSI in group I and II

South hampton grade	Group 1 (%)				Group 2 (%)			
	POD 3	POD 5	POD 10	POD 15	POD 3	POD5	POD10	POD15
Grade 1								
Grade 2	7 (7)	5 (5)			6 (6)	4 (4)		
Grade 3								
Grade 4								
Grade 5								
p value	0.90							

Two groups of cases with 100 cases each were evaluated for post-operative SSI, it was found that in group I, 12 (12%) cases had grade 2 SSI (7 cases on POD 3rd and 5 cases on POD 5th). In group II, 10 (10%) cases had grade 2 SSI (6 cases on POD 3 and 4 cases on POD 5). The p value was 0.90 and was not significant. There was no statistically significant difference between both the groups based on Southhampton grade.

Discussion

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. [8] Antibacterial drugs are powerful agents to prevent infections but an excess use of antibiotics leads to increased resistance towards the antibiotics used and thus has risen the expense in medical support. [9] 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 emergence of Antimicrobial resistance (AMR). [10]

The age range of 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 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. [11] 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 showed that in chronic infections, the decrease in tissue oxygen tension of the surrounding tissue seems to be a major driving cause for their persistence. [12] In this study, it was found that the levels of hemoglobin was a significant predictor in the outcome of surgery.

Mean serum protein levels 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 this study, the level of serum protein did not had a convincing role in determining the outcome of surgery as the serum protein level in the cases taking part in the study was within the normal limits. [13] 20 (20%) cases had diabetes in group-I and 15 (15%) cases in group II and addiction was present in 17 (17%) 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. 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 this study,no significant increase in rate of SSI was found and hence there was no added advantage of long term routine antibiotic post-operatively.

Khichy et al conducted a randomized comparative study taking 2 groups 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. [14] Yavuz S et al in their studies reported a clear association of reduced Hemoglobin as a risk factor in the development of SSIs and was statistically significant in his study. [15] 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. [16,17]

Conclusion

There was no difference found in SSI either using single dose pre-operative antibiotic prophylaxis or using five days conventional post-operative antibiotic therapy. 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.

References

1. CDC. Data from the National Hospital Discharge Survey. 2010.
2. CDC National and State Healthcare-Associated Infections Progress Report, March 2016.
3. Dionigi R, Rovera F, Dionigi G, Imperatori A, Ferrari A, Dionigi P, Dominioni L. Risk factors in surgery. Journal of Chemotherapy. 2001 Jan 1;13(sup4):6-11.
4. Bratzler DW, Houck PM, Surgical Infection Prevention Guidelines Writers Workgroup. Antimicrobial prophylaxis for surgery: an advisory statement from the National Surgical Infection Prevention Project. Clin. Infect. Dis. 2004; 38:1706-15.
5. Bratzler DW, Hunt DR. The surgical infection prevention and surgical care improvement projects: national initiatives to improve outcomes for patients having surgery. Clinical infectious diseases. 2006 Aug 1;43(3): 322-30.
6. Howells CHL, Young HB. A study of completely undressed surgical wound. Br J Surg. 1966;53(5):436-9.
7. Leuva HL, Khambholja JR, Nayak KK, Shah RC. Role of antibiotics in clean surgeries: Prophylaxis v/s. conventional. Gujarat Med J. 2014; 69:96-8.
8. Burke .I: The effective period of pleventire antibiotic action in experimental incisions and dennat tesims. Surge 1!161; 50: 151-158.
9. Bratzler DW, Dellinger EP, Olsen KM, Perl TM, Auwaerter PG, Bolon MK, Fish DN, Napolitano LM, Sawyer RG, Slain D, Steinberg JP. Clinical practice guidelines for antimicrobial prophylaxis in surgery. Surgical infections. 2013 Feb 1;14(1):73-156.
10. WHO-Surveillance of Antimicrobial resistance.
11. Scott JD, Forrest A, Feuerstein S, Fitzpatrick P, Schentag JJ. Factors associated with postoperative infection. Infect Control Hosp Epidemiol. 2001; 22:347-51.
12. Londahl M, Fagher K, Katzman P. What is the role of hyperbaric oxygen in the management of diabetic foot disease? Curr Diabet Rep. 2011;11 (4):285-93.
13. Sindgikar V, Narasanagi B, Tejasvini V, Ragate A, Patel FA. Effect of serum albumin in wound healing and its related complications in surgical patients. Al Ameen J Med Sci. 2017;10 (2):132-5.
14. Khichy S, Singh B. To Compare the Effectiveness of Short-term Three Dose Perioperative Antibiotic Coverage during Decisive Period with Conventional Prolonged Postoperative Antibiotic usage in Clean Elective Surgical Cases: An Indian Perspective. Niger J Surg. 2017;23(2):92-7.
15. Yavuz SS, Bicer Y, Yapici N, Kalaca S, Aydin OO, Camur G, Kocak F, Aykac Z. Analysis of risk factors for Sternal surgical site infection emphasizing the appropriate ventilation of the operating theaters. Infection Control & Hospital Epidemiology. 2006 Sep;27(9):958-63.

16. Rasouli MR, Restrepo C, Maltenfort MG, Purtill JJ, Parvizi J. Risk factors for surgical site infection following total joint arthroplasty. JBJS. 2014 Sep 17;96(18): e158.

17. Srivastava D. M., Chowdhury D. S., & Vishal D. G. Giant Mucocele of Maxillary Sinus, Scarce Occurrence: Case Report. Journal of Medical Research and Health Sciences, 2022; 5(2): 1774–1778.