Original Research Article

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Effect of single dose pre-operative antibiotic prophylaxis versus conventional antibiotic therapy in patients undergoing lichtenstein tension free mesh repair

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ABSTRACT

Background: Rational use of antibiotic is important as injudicious use can adversely affect the patient, cause emergence of antibiotic resistance and increase the cost of health care. The efficacy of antibiotic prophylaxis in preventing surgical site infection in patients undergoing Lichtenstein tension free inguinal hernia repair still remains controversial.

Methods: A randomized controlled trial was conducted in patients undergoing lichtenstein tension free inguinal hernia repair between January 2015 to June 2016, and the results were compared with the control group in whom, conventional antibiotics were given for 7 days. All patients in study group undergoing surgery were given 400 mg parenteral ciprofloxacin 30 min prior to surgery. In the control group, the patients were given 2 days parenteral ciprofloxacin 400 mg twice a day and the next 5 days the same antibiotics were given in oral route, after surgery. Total 100 patients were randomized to 50 each group. The outcome in terms of duration of surgery, surgical site infection, cost and antibiotic side effects were then compared.

Results: The duration of the hospital stay, cost and side effects are significantly higher in the control group patients. Antibiotic side effects (P < 0.05) were high for control group. The infection rate was same in both the groups. There was no significant difference in terms of infection rate among two groups.

Conclusions: This study concludes that prophylactic single-dose antibiotic is effective in preventing surgical site infection and is cost-effective in patients undergoing lichtenstein tension free mesh repair.

Keywords: Antibiotics, Conventional therapy, Cost effective, MESH repair, Prophylaxis, Surgical site infection

INTRODUCTION

The prophylactic use of antimicrobial agents to reduce the postoperative infection is widely practiced. The objective of preoperative antibiotic prophylaxis is to prevent postoperative infections. Rational use of antibiotic is extremely important as injudicious use can adversely affect the patient, cause emergence of antibiotic resistance and increase the cost of health care. ^{2,3}

Antibiotic resistance has become a global menace, and WHO in 2012 had given a clear call to reduce the antibiotic use and prevent resistance to antibiotics.⁴

Several evidences have shown that strict aseptic technique alone could decrease but not eliminate the contamination of the surgical field completely. Therefore, the need for antibiotics to complement aseptic technique is now being widely recognized and accepted.⁵

In spite of wide knowledge about the effectiveness of antibiotic prophylaxis, administrative regimens are often inappropriately practiced. Main concern is the duration of prophylaxis, which is often longer than recommended.^{6,7} Antibiotic prophylaxis is a preventive method in which antimicrobial agents are used prophylactically to combat the infectious complications in a therapeutic procedure. In conventional practice, antimicrobials are used for a predetermined period after therapeutic procedure to combat the infection.⁸

Most often in government hospitals, where the environmental hygiene is not adequately maintained and over load of surgical patients with the fear of development of surgical site infection even for clean and clean-contaminated surgeries like lichtenstein tension free mesh repair, antibiotics are usually given for 7-10 days. The traditional approach for this multi dose usage often leads to huge expenditure to the hospital and enhance emergence of resistance to the particular drug and the group to which it belong. This study is thus intended to study the effect of single-dose antibiotic prophylaxis given 30 min prior to surgery with the standard chosen antibiotic versus the conventional use of the same antibiotic for 7 days.

METHODS

This study was conducted as a randomized case-control prospective study in the Department of General Surgery in K R Hospital, attached to Mysore Medical College and Research Institute, from January 2015 to June 2016. Totally 100 patients admitted for elective inguinal hernia surgery in our hospital without any co-morbid conditions were included in this study.

All the surgeries were carried out in the same operation theatre environment and same preoperative safety protocol, and post-operative care was followed for all patients. The use of antibiotics were predetermined as follows:

Study group

One dose of parenteral Ciprofloxacin 400mg IV after test dose 30 min prior to surgery and no more antibiotics were prescribed.

Control group

No pre-operative antibiotic given. In the post-operative ward for the first 2 days, IV antibiotics were given as follows:

- Parenteral ciprofloxacin 400mg IV bd.
- Next 5 days: tablet ciprofloxacin 500 mg oral bd.

Inclusion criteria

 Patients with the age group 20-60 with no comorbid conditions and posted for elective Lichtenstein tension free mesh repair for inguinal hernia were included in the study.

Exclusion criteria

- Patient with co-morbid renal, cardiac, hepatic damages.
- Patient on steroid or having immune deficiency.
- Non-willing patients.
- Patients on long-term medication for hypertension, diabetes mellitus, or psychiatric problems.

Demographic variable

The age, sex, height, weight, and socio-economic status were studied.

Variables measured

- Duration of surgery
- Development of infection based on Southampton grade.
- Complications due to the side effects of antibiotics.

Pre-operative preparation and care

All the patients posted for these elective surgeries were admitted on the day prior to surgery. All necessary investigations were done and anaesthetic fitness obtained. The operative site was cleaned/shaved with aseptic precaution. All patients were asked to take body wash with soap on the day of surgery and the operative site was covered with a sterile dressing.

Aseptic precautions in the operation theater

Asepsis is maintained, and checklists were verified. All the instruments were counter checked for sterility from the CSSD department. Standard surgical scrub for 5-10 min was mandatorily followed by the surgical team.

Operation techniques

After anaesthesia, the operative site was prepared with Povidone-iodine and spirit. The principles of surgery, especially minimal tissue handling, adequate haemostasis, less use of cautery, were followed. All patients underwent elective lichtenstein tension free mesh repair by using a monofilament polypropylene mesh. Subcutaneous suture was not used. Skin approximated with 2-0 polyamide mattress sutures.

Post-operative care

Temperature and vitals were monitored periodically, and the charts were maintained strictly. Wound inspection was done on 2nd, 3rd, 5th, and 7th day. All patients were followed up with the drugs to be administered and ensured that antibiotics were given at appropriate time as per the protocol.

RESULTS

Total 100 patients undergoing Lichtenstein tension free mesh repair for inguinal hernia were divided into two groups. Patients in the control group were given, 7 days of antibiotics. Study group patients got only one dose of prophylactic antibiotic 30minute before surgery.

The Demographic profile of all the patients in both the groups were studied and tabulated in Table 1.

Demographic profile

The mean weight, haemoglobin level, type of anaesthesia, and duration of surgery for each group of patients in different surgeries were measured.

Antibiotic profile

Study group

• Injection ciprofloxacin 500 mg IV 30 min prior to surgery

- 2nd day dressing changed and checked for infection on 3rd, 5th and 7th day.
- Suture removed on the 7th day.

Control group

- First 2 days: Injection ciprofloxacin 400 mg IV bd
- Next 5 days: Tablet ciprofloxacin 500 mg oral bd
- 2nd day dressing changed and checked for infection on 3rd, 5th and 7th day.
- Suture removed on the 7th day.

The mean weight, haemoglobin level, type of anaesthesia, and duration of surgery for each group of patients were measured and tabulated in Table 3.

Table 1: Demographic profile of the study and control group.

	Study group	Control group
Sex		
Male	30	28
Female	20	22
Total	50	50
Mean age range	e	
20-30	17	15
30-40	13	15
40-50	12	13
50-60	8	7

Table 2: Mean Hb status, weight, duration of surgery and type of anesthesia.

Study group	dy group Control group						
Weight (Kg)	Hb (g/dl)	Anesthesia	Duration of surgery	Weight (Kg)	Hb (g/dl)	Anesthesia	Duration of surgery
62	12.6	Spinal	45min	63	12.8	Spinal	48min

Infection grading in the ward

Based on the Southampton scoring system on the 3rd, 5th, and 7th post-operative period the wounds were inspected and the infection grades were documented.

Southampton scoring system

- 0 = Normal healing
- 1 = Bruising and mild erythema
- 2 = Erythema and signs of inflammation
- 3 = Clear (or) serous discharge
- 4 = Pus formation
- 5 = Deep, severe wound infection.

Out of the 100 patients' only 6 patients, 3 in each group developed infection in the post-operative period. No change in the management protocol was done. On appropriate local wound management, infections were controlled. No statistically significant difference with respect to infection prolife was noted in both the groups. The results are tabulated in Table 3.

Side effects of antibiotic treatment

All patients were observed for the known side effects of the drug used and also watched for adverse drug reactions. None developed adverse drug reactions in both the groups. None developed antibiotic side effects in the study group. In control group, four patients had gastrointestinal symptoms (nausea, vomiting and diarrhoea) and two patients had urticarial rash following the antibiotic use.

Table 3: Grade of post-operative infections.

Grade	Study group			Control group		
of infection	3rd day	5th day	7th day	3rd day	5th day	7th day
Grade I	-	2	-	-	2	-
Grade II	-	-	-	-	-	-
Grade III	-	1	-	-	1	-
Grade IV	-	-	-	-	-	-
Grade V	-	-	-	-		-

DISCUSSION

Our study which was done to assess the effectiveness of a single dose of prophylactic antibiotic versus the traditional use of 7 days antibiotics has shown no significant difference in the wound infection rate in both the studied groups. However, there is a significant increase in the cost and side effects of antibiotics in the control group using conventional 7 days antibiotics.

The use of prophylactic antibiotic in all surgical cases are advocated ever since, the concept of use of antibiotic preoperatively to curtain and prevent wound infection was postulated by Bernard and Cole in 1964.

The overall experience from around the world has evidently recommended using the specific antibiotics in the pre-operative period than traditional use of 5-7 days of antibiotics in the post-operative period.

With so much advancement in the strict asepsis of the environment and hygiene of the operation theatres which is being practiced widely, it was questioned in many surgical settings on the need of antibiotic at all for clean and clean-contaminated surgical cases. However, in high turnover hospitals especially in government run hospitals, even while all the sterile precautions are practiced, the surgical procedures can imbibe bacteria or other microbial agents in the blood and lead to bacteraemia. Thus the use of long-acting antibiotic to cover the perioperative period is recommended.¹⁰

In 2001, Chambers in their study recommended that first generation cephalosporin antibiotic the cefazolins are drugs of choice for the use of prophylactic antibiotics for the general surgical prophylaxis than the second or third generationcephalosporin.¹¹

Naz in a comparative study between a single-dose cephradine as the prophylactic antibiotics versus conventional dose of antibiotics in major gynaecological procedures have stated prophylactic antibiotic use is adequate provided standard principles of operative surgery are adhered. 12

Wideman and Matthijssen in his study conducted on the use of cefazolin versus cefotaxime as the prophylactic antibiotic in 118 hysterectomy patients in 1982 stated cefotaxime and cefazolin are equally beneficial on all aspect, and use depend on the cost and availability.¹³

Several studies have been conducted on the choice of antibiotic and timing of use of antibiotics. Most of the studies have recommended the first dose to be given 30-60 min prior to surgery, and long-acting antibiotic must be selected.¹⁴

Arjona F et al had conducted a study to find out the economic advantages following use of prophylactic antibiotic rather than traditional 7 days antibiotics, using 5260 patients in a medical Centre in Southern Taiwan and stated that use of prophylactic antibiotic alone for the surgical patients had resulted in gain of 1.5 million dollars for the public.¹⁵

Our study also concludes that, there is a significant advantage of economic gain when only prophylactic antibiotic is used.

Inadvertent and over use of antibiotics can cause side effects and also can lead to the development of drug resistance bacteria. In our study, it is also noted that a significant number of the patients had developed side effects of antibiotic during this period.

Along with prophylactic antibiotics, clean surgical environment, adequate hand washing, adequate preparation of patients and following universal precautions will improve the wound healing and prevent the infection in the patient.

CONCLUSION

Our study concludes that even in public institutions where the turnover of the patients is high, the judicious use of prophylactic antibiotic by itself can prevent any wound infections which will lead to potential economic benefits and prevent the development of resistant strains of bacteria.

Hence, single dose prophylactic antibiotic will be effective in reducing postoperative infection if following measures are undertaken alongwith:

- Proper aseptic precautions during surgery.
- Proper sterilization procedure of the operation theatre.
- Correction of anemia should be done before surgery, not after, so that tissue can carry more oxygen and take the benefit of prophylactic antibiotic.

• Improving the nutritional status of the patient and also bring awareness among the patient about personal hygiene.

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institutional ethics committee

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