COMPARISON BETWEEN SINGLE AND MULTIPLE DAYS TREATMENT WITH PARENTERAL CEFUROXIME IN INGUINAL HERNIA MESH REPAIR SURGERY

GHULAM JILANY KHAN, RIZWAN AHMAD KHAN and ADIL RASHEED

1Department of Pharmacology and Toxicology, University of Veterinary and Animal Sciences and 2Department of Surgery, Shalamar Hospital / Shalamar Medical and Dental College, Lahore – Pakistan

ABSTRACT

Background: Objective of this study was to determine the effectiveness of cefuroxime prophylaxis in controlling the postoperative wound infection in clean inguinal hernia mesh repair surgery and to compare single day and multiple (two) days antibiotic prophylaxis by means of hospital stay and cost effectiveness.

Materials and Methods: Two hundred forty patients of inguinal hernia were studied. Patients were divided into two groups A and B comprising of 113 and 127 patients respectively. Group A was treated with three IV doses of cefuroxime 750 mg t.i.d starting from 30 min before surgery and then oral therapy of 250 mg cefuroxime b.i.d for 5 days was given. Group B received total six IV doses of cefuroxime 750 t.i.d and then shifted to oral therapy for four days. Resultant observations were analyzed by Chi square test.

Results: In Group A, 6 (5.3%) and in group B 10 (7.87%) patients developed surgical site infections. Mean hospital stay of group A and group B was 2.14 and 2.21 days respectively. Overall cost effectiveness of group A is almost two times less than Group B.

Conclusions: From our study, it is concluded that the risk of post-operative wound infection in inguinal hernia mesh repair surgery can be effectively managed by one day t.i.d treatment of cefuroxime which has the benefit of patient compliance and less hospital stay of patient as well as is cost effective thus decreasing the work load on medical and paramedical staff as well as the hospital.

Key words: Hernia mesh, antibiotic prophylaxis, Cefuroxime, surgery.

INTRODUCTION

Hernia is a protrusion of a viscous or a part of a viscous through an abnormal opening in wall of its containing cavity. Common sites of hernia include the groin, umbilicus and the linea alba. The prevalence of hernia was roughly estimated around 3.2% in mid of 1800’s. According to a rough estimate 700,000 herniae are repaired yearly in United States. The Shouldice Hospital in Toronto has one of the largest services and experience in hernia repair. According to their data of 50 years out of 250,000 patients treated at the hospital women account only for 2.5%. Abdominal wall hernia found less common in females than in males. Overall in diseased condition incidences of hernia are estimated around 3% in whole population. Different external hernias present differently and ultimate treatment is surgery. In today’s era hernia repair is one of the most practiced elective procedures in field of general surgery. On an average annual admission with hernia in major cities of Pakistan counts for 9.5 – 15% of the total Hospital admissions recommended for surgery.

The infection is an invasion of the body by different microbial agents which can enter in the body by many routes including topical route like animal bite or insect bite, can be transmitted sexually, by inhalation or by ingestion. Although significant methods have been developed for inhibiting and treating infectious diseases, still such transmissions remain a major cause of sickness and death, chiefly in regions of poor nutrition and sanitation. Approximately 16 million different operative procedures are performed in the United States yearly and recent study showed that Surgical site infections (SSIs) were the common healthcare – associated infection, accounting for 31% of all Hospital acquired infections (HAIs). According to the data of national healthcare safety network (NHSN) for period of 2006 – 2008 an overall SSI rate of 1.9% (16,147 SSIs from 849,659 operative procedures) was observed.

In order to minimize the incidences of post-operative wound infections the use of antimicrobial agents as a prophylactic measure is a common practice. Patients undergoing surgical procedures in which the infection rate and consequences of infection are serious should receive preoperative antibiotics. Such kind of treatment, rather than prophylaxis, is indicated for surgical procedures allied with evident...
preexisting infection (i.e. pus, necrotic tissue or abscess).\textsuperscript{14}

Cephalosporins are preferred first line agents for many surgical procedures. This group has the capability to target the probable pathogens that may cause the infection. The use of broad – spectrum antimicrobial agents is discouraged because it may lead to the development of antimicrobial resistance.\textsuperscript{16} Features influencing the development of SSI's include, host defenses, preoperative care, bacterial inoculums and virulence and intraoperative management. Unfortunately, an increasing number of resistant strains and particularly methicillin – resistant \textit{Staphylococcus aureus} (MRSA) are usually involved in surgical wound infections. For patients who have recently suffered from infection with vancomycin – resistant \textit{Enterococcus} (VRE) or MRSA, prophylaxis with linzolid, or quinupristin / dalfopristin can be considered.\textsuperscript{17} Common Pathogens likely to cause the post-operative infections at surgical site are almost the same as described by Chang and his colleagues.\textsuperscript{18}


The best available and logical choice which is also clinically proved could be a broad spectrum second generation cephalosporin.\textsuperscript{19} As far as bacterial spectrum of SSI is concerned, Cefuroxime which is a broad spectrum second generation cephalosporin is one of the best fit antibiotic.\textsuperscript{20,21}

\textbf{PATIENTS AND METHOD}

A quasi – experimental study was conducted in the surgical unit of Shalamar Hospital Lahore from 1\textsuperscript{st} July 2010 to 30\textsuperscript{th} June 2012. Total 240 out of 345 patients without any gender discrimination were included in the study with inguinal hernia. Seventy two (21%) patients out of 345 were not with inguinal hernia but other types of hernia which were excluded from the study. Out of 273 patients with inguinal hernia 33 patients were not included in the study because of various reasons mentioned in exclusion criteria. Remaining 240 patients were included in study.

\textbf{Inclusion Criteria}

Patients of age ranging from 16 to 65 years with both genders for elective surgery of inguinal hernia.

\textbf{Exclusion Criteria}

Patients with COPD, diabetes, hypertension, hepatitis and jaundice were not included in the study. Similarly the smokers and the patients with the history of fungal skin infection, history of any drug toxicity or drug allergy, chronic renal failure and history of pancreatitis were also excluded from the study similarly non-elective surgeries and patients of Paraumbilical hernia, Epigastric hernia and Incisional hernia were also excluded from the study (Table 1).

\textbf{Procedure of Admission}

All the patients were admitted through the OPD in the surgical ward for Hernia repair mesh surgery.

\textbf{Ethical Committee Permission}

Permission was taken from the hospital’s ethical committee for the study.

\textbf{Diagnosis Confirmation}

The patients were thoroughly examined in the wards and all the routine and specific investigations were done to confirm the diagnosis.

\textbf{Patient’s Consent from}

Detailed informed consent was taken from patient.

\textbf{Group Division}

The patients were divided into two groups A and B randomly regardless of the gender and age. Group A comprises of 113 patients and was treated with three I.V doses of 750 mg cefuroxime starting from 30 min before surgery and then two more doses with an in – between interval of 8 hours and then oral therapy with 250 mg b.i.d cefuroxime was given for 5 days. Group B comprises of 127 patients and received total six I/V doses of 750 mg cefuroxime with an interval of 8 hours starting from first dose 30 min before the procedure then this group of patients was shifted to an oral therapy of cefuroxime 250 mg b.i.d for four days (Table 4).

\textbf{Observation Period}

Patients of both groups were kept under the observation for 48 hours in ward to find any postoperative sepsis or SSI.

\textbf{Observational Parameters}

During the stay in hospital, bowel sounds and abdominal tenderness was assessed and recorded regularly, furthermore the body temperature, pulse, respiratory rate and blood pressure of the each patient was also recorded on pre-formed Performa. Then the patients were observed on the 5\textsuperscript{th}, 8\textsuperscript{th}, 15\textsuperscript{th} and 30\textsuperscript{th} day in surgical OPD for fever, wound infection and other complications. The wound infection was characterized into three grades based on the severity (Table 2).
**Statistical Analysis**

The data was collected on a pre-formed Performa and entered into SPSS software version 16 and analyzed. Mean ± Standard deviation, was calculated for age and hospital stay, frequencies and percentages were calculated for wound infection in both groups as well as the incidence of disease in both gender. To compare the frequency of wound infection in both groups, Chi Square test was used and a P-value < 0.05 was considered significant.

**RESULTS**

The results revealed that mean age of inguinal hernia patients was 48.33 years with a S.D of ± 103 years. Maximum numbers of patients were found in the age group of 46 to 60 years (Figure 1).

In group A, six patients (5.3%) developed SSI while 107 patients had normal wound healing. Four patients developed grade II infection while two patients developed grade III infection (Table 3). In group B, ten patients (7.87%) developed SSI out of which one patient developed grade I infection, five patients developed grade II infection and four patients developed grade III infection (Figure 2). Upon comparing the results of both groups by applying Chi Square test a value 0.632 was obtained which was insignificant.

Mean hospital Stay of Group A was 2.14 days with standard deviation of ± 0.63 while mean hospital stay of group B was 2.21 days with standard deviation of ± 0.79 (Table 3). In terms of cost effectiveness, including the cast of antibiotics, cost of hospital stay, medication expense and other expenditures at hospital of group B was almost twice as compared to group A.
DISCUSSION
Inguinal hernia is a very common problem all over the world. Different external hernias present differently and ultimate treatment is surgery. Inguinal hernia repair is the most common elective procedure in general surgery. On an average annual admission with hernia in major cities of Pakistan counts for 9.5 – 15% of the total hospital admissions recommended for surgery.

Cephalosporins are preferred first line agents for many surgical procedures that target the most likely pathogens. A study published in 2003 advised 2nd generation Cephalosporins prophylaxis for clean contaminated cases for ultra – short period, similarly the concept of chemoprophylaxis which is the base of our study is also recommended by the Bowater and his colleagues in the study published in 2009.

Table 1: Different hernia diseases reported.

<table>
<thead>
<tr>
<th>Disease / Indication</th>
<th>Number of Patients</th>
<th>Percentage</th>
<th>Remarks for Inclusion / Exclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hernia</td>
<td>345</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Paraumbilical hernia</td>
<td>38</td>
<td>10.01 – 11</td>
<td>Excluded</td>
</tr>
<tr>
<td>Epigastric hernia</td>
<td>20</td>
<td>5.79 – 6</td>
<td>Excluded</td>
</tr>
<tr>
<td>Incisional hernia</td>
<td>14</td>
<td>40.57 – 4</td>
<td>Excluded</td>
</tr>
<tr>
<td>Inguinal Hernia</td>
<td>273</td>
<td>79.13 – 79</td>
<td>Considered for further selection</td>
</tr>
</tbody>
</table>

Table 2: Grade of wound infection.

<table>
<thead>
<tr>
<th>Type of Infection</th>
<th>Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade I infection</td>
<td>Little flushing and hardness of wound edges for which no intervention is needed</td>
</tr>
<tr>
<td>Grade II infection</td>
<td>Minor serous discharge from wound for which no intervention is needed</td>
</tr>
<tr>
<td>Grade III infection</td>
<td>Palpable and noticeable infection or pussy discharge from wound demanding repeated change of dressings and antimicrobial therapy</td>
</tr>
</tbody>
</table>

Table 3: Data of patients reported with infection.

<table>
<thead>
<tr>
<th>Group</th>
<th>Total Patients</th>
<th>SSI Reported</th>
<th>Grade I Infection</th>
<th>Grade II Infection</th>
<th>Grade III Infection</th>
<th>Mean Hospital Stay (Days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>113</td>
<td>5.3%</td>
<td>6 Pt.</td>
<td>0</td>
<td>4</td>
<td>2.14 ± 0.63</td>
</tr>
<tr>
<td>B</td>
<td>127</td>
<td>7.87%</td>
<td>10 Pt.</td>
<td>1</td>
<td>5</td>
<td>2.21 ± 0.79</td>
</tr>
</tbody>
</table>

Table 4: Dose schedule of 750 mg cefuroxime intravenously and subsequent oral treatment with 250 mg b.i.d in both groups.

<table>
<thead>
<tr>
<th>Group</th>
<th>1st Dose</th>
<th>2nd Dose</th>
<th>3rd Dose</th>
<th>4th Dose</th>
<th>5th Dose</th>
<th>6th Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>30 min B.S</td>
<td>7.5 – 8.0 hours A.S</td>
<td>15.5 – 16 hours A.S</td>
<td>Shifted to oral therapy of 250 mg Cefuroxime b.i.d</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>30 min B.S</td>
<td>7.5 – 8.0 hours A.S</td>
<td>15.5 – 16 hours A.S</td>
<td>23.5 – 24.0 hours A.S</td>
<td>31.5 – 32.0 hours A.S</td>
<td>41.5 – 42.0 hours A.S</td>
</tr>
</tbody>
</table>

The results of our study showed that males were mostly affected by inguinal hernia disease (97.10%) as compared to females (2.89%). The results of gender frequency of our study are in the same lines as of Rutkowand and his colleagues showing that the cases of inguinal hernia among males in Pakistan is almost 34 times more as compared to females.

The results of our study showed that six patients (5.3%) developed wound infection in group A. Among these patients four patients developed grade II infection (Figure 4) and two patients developed grade III infection (Figure 5), all the patients in this group were receiving one day intravenous treatment of cefuroxime for prophylaxis. In group B which was receiving cefuroxime through parenteral route for two days for prophylaxis, ten patients (7.87%) developed wound infection. In this group one patient had Grade I (Figure 3) infection, five patients had grade II (Figure 4) infection and four patients had grade III (Figure 5) wound infections. On comparing the results of both groups, the P-value and shown statis-
tically insignificant results. Even the group which received less number of intravenous doses showed better results than Group B. Compliance of patients of Group A was also much better than Group B. In a previous study same types of results with single dose of Ceforaxime for cholecystectomy were recorded. Prophylactic use of ceforoxime for clean contaminated surgical procedures is thoroughly studied by Rashid A.S. and his colleagues and documented same types of results even with single dose.

From our studies, it is concluded that there is no difference in one day (3 I/V doses) and two days prophylaxis with six I/V doses of ceforoxime 750 mg t.i.d in patients of elective inguinal hernia mesh repair surgery in terms of post-operative surgical site infection. The risk of post-operative wound infection can be effectively managed by one day t.i.d treatment prophylactic antibiotic (cefuroxime 750 mg) which also has the benefit of cost effectiveness, patient compliance and reduced hospital stay of the patient which increases the availability of health care practitioner and number of beds for patients. Furthermore we recommend large scale multicenter studies in Pakistan to augment our conclusion.

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REFERENCES

25. Zahid MA, Bakhsh R, Dar FS, Akhter N, Malik ZI. Comparison of single dose and three dose antibiotic