*ejpmr, 2017,4(7), 251-264*

SJIF Impact Factor 4.161

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Research Article

ISSN 2394-3211

EJPMR

# COMPARATIVE STUDY BETWEEN PROPHYLACTIC CEFOTAXIM PLUS METRONIDAZOLE VERSUS CEFEPIME PLUS METRONIDAZOLE IN PREVENTION OF WOUND SEPSIS IN ELECTIVE GASTROINTESTINAL SURGERY

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**Article Received on 15/05/2017** **Article Revised on 05/06/2017** **Article Accepted on 25/06/2017**

## ABSTRACT

**Background:** We compare between prophylactic cefotaxim plus metroniadazole versus cefepime plus metroniadazole before elective gastrointestinal surgery, in prevention of post-operative surgical wound infection. **Objectives:** To compare the efficacy of a new and possibly less expensive antibiotic prophylaxis cefepime against cefotaxim and to assess the optimal duration of antibiotic dosing required in the prevention of wound infections following elective gastrointestinal surgery. **Specifically to determine:** 1. If the prophylactic antibiotic decreases the risk of post operative wound infection. 2. Broad spectrum antibiotic to cover (aerobic or anaerobic bacteria, or both) (Gram positive, or Gram negative, or both). 3. The time of beginning and duration of antibiotic in take. 4. Whether any antibiotic is clearly more effective than the currently recommended gold standard specified in published guidelines. 6. If the antibiotic is taken before or after the operation. 7. If the antibiotic is taken in single dose or multiple doses. **Search methods:** The study will be carried out in Karmos Health Insurance Hospital in Alexandria and, Al-Azhar University Hospitals in Cairo, on fourty patients through randomized controlled prospective study, for series of patients with elective gastrointestinal surgery managed in the period between November 2016 to May 2017. Patient were followed up for two weeks after surgery and every one week for a month.

**Inclusion criteria:**

- 30-70 years old
- 70-90 kg body weight
- Scheduled for elective colorectal surgery.
- Fixed condition surrounding the patient as regard aseptic theater, towels, instruments with the same method of sterilization.

**Exclusion criteria:**

- History of allergy to cefotaxim, metronidazole or cefepime.
- Evidence of an existing infection.
- Receiving antibiotics within 48 hours prior to their surgery**,** or after randomization.
- Uncontrolled diabetes.
- Impaired renal function.
- Impaired hepatic function**.**
- Immunocompromized patients.

**Main results**

**The study included four groups:**

- **Group A:** consists of ten patients who had received Cefepime (1g) plus metronidazole (500mg) on induction of anesthesia followed by another (1g) at 12 and 24 hours postoperatively.
- **Group B:** consists of ten patients who had received Cefotaxime (1g) plus metronidazole (500mg) on induction of anesthesia followed by two more doses of cefotaxime (1g) at 12 and 24 hours postoperatively.
- **Group C:** consists of ten patients who had received Cefepime (2g) plus metronidazole (500mg) single dose on induction of anesthesia.
- **Group D:** consists of ten patients who had received Cefotaxime (2g) plus metronidazole (500mg) single dose on induction of anesthesia.

In our study, we found that incidence of wound infection in patients whose receive prophylactic single dose cefepime + metronidazole was 10% and the same result in patients whose receive prophylactic thee doses cefepime + metronidazole. In our study, we found that use of prophylactic single dose cefotaxime + metronidazole was successful in preventing wound infections in 80% of patients and use of prophylactic three doses cefotaxime + metronidazole was successful in preventing wound infections in 90% of patients. **Conclusions:** The prophylactic effect of single dose Cefepime + metronidazole and the prophylactic effect of multiple doses Cefepime + metronidazole are similar in prevention of development of wound infection after different elective gastrointestinal surgery. The prophylactic effect of multiple doses Cefotaxime + metronidazole is effective than the prophylactic effect of single dose Cefotaxime + metronidazole in prevention of development of wound infection after different elective gastrointestinal surgery. **While:** prophylactic effect single dose of cefepime + metronidazole is effective than the prophylactic effect of single dose Cefotaxime + metronidazole in prevention of development of wound infection after different elective gastrointestinal surgery.

**KEYWORDS:** Cefotaxim Plus Metronidazole, Cefepime Plus Metronidazole, single dose, multiple doses, prophylactic, prevention, wound infection, anesthesia and gastrointestinal surgery.

## INTRODUCTION

Surgical wound infection has always a major complication of surgery and has been documented for 4000-5000 years. The ancient Egyptians had some concept about infection as they were able to prevent putrefaction, testified by mummification skills.[1]

Infection in a wound like infection elsewhere in the body, is a manifestation of disturbed host-bacteria equilibrium in favor of bacteria. Wound infection is the commonest and most troublesome disorder of wound healing.[2]

The remarkable success of antimicrobial drugs generated a misconception in the late 1960s and early 1970s that infectious diseases had been conquered. However, 40 years later, infectious diseases remain the third-leading cause of death, both in the third world and the developed countries and are the second-leading cause of death worldwide.[3]

The surgical site is the second most common nosocomial infection. Absolute prevention of SSI seems to be an impossible goal.[4]

## AIM

The aims of this study is to compare the efficacy of a new and possibly less expensive antibiotic prophylaxis cefepime Plus Metronidazole against cefotaxim Plus Metronidazole and to assess the optimal duration of antibiotic dosing required in the prevention of wound infections following gastrointestinal surgery.

## MATERIALS AND METHODS

The study will be carried out in Karmos Health Insurance Hospital in Alexandria and Al-Azhar University Hospitals in Cairo, on fourty patients through randomized controlled prospective study, for series of patients with elective gastrointestinal surgery managed in the period between November 2016 to May 2017. Patient were followed up after one week after surgery and every one week for a month. The study was done after approval of Ethical Committee of Faculty of Medicine and written informed consent from patients.

### Inclusion criteria

- 30-70 years old
- 70-90 kg body weight
- Scheduled for elective colorectal surgery.
- Fixed condition surrounding the patient as regard aseptic theater, towels, instruments with the same method of sterilization.

### Exclusion criteria

- History of allergy to cefotaxim, metronidazole or cefepime
- Evidence of an existing infection.
- Receiving antibiotics within 48 hours prior to their surgery**,** or after randomization.
- Uncontrolled diabetes.
- Impaired renal function.
- Impaired hepatic function**.**
- Immunocompromized patient.

### Preoperative evaluation, preparation and premedication

Evaluation of the patients will be carried out through:
Proper history taking and clinical examination, to exclude cardiovascular, respiratory, neurological and metabolic diseases.

### Routine laboratory investigations include

- Complete blood count (CBC) with differential leucocytic count.
- Haemostatic profile study: (Bleeding time, Clotting time, Prothorombin time (PT), Partial thromboplastin time (PTT), Prothrombin activity).
- Blood urea and blood creatinine.
- Fasting blood glucose.
- Liver enzymes (ALT, AST).
- Urine analysis.

On entry to the trial and prior to the patients arrival into the operating theater, their antibiotic regimen was allocated using a randomization technique.

### Trial Antibiotics

The following intravenous drug regimens were compared.

***Group A***: Cefepime (1 g) plus metronidazole (500 mg) on induction of anesthesia followed by another (1 g) at 12 and 24 hours postoperatively.

***Group B***: Cefotaxime (1 g) plus metronidazole (500 mg) on induction of anesthesia followed by two more doses of cefotaxime (1 g) at 12 and 24 hours postoperatively.

***Group C***: Cefepime (2g) plus metronidazole (500 mg) single dose on induction of anesthesia**.**

***Group D***: Cefotaxime (2 g) plus metronidazole (500 mg) single dose on induction of anesthesia**.**

**The following data will be obtained**

- Patient demographics.
- Type of surgery.
- Operative data.

Post operative complication.

All groups will be under clinical observation for 14 postoperative days to assess the rate of occurance of wound complication (presence of erythema at 2cms beyond the wound edges & presence of purulent drainage) in all groups and WBCs count will be measured on day 4 & day 10 post operative.

**Statistical analysis**

Data were analyzed using Statistical Program for Social Science (SPSS) version 20.0. Quantitative data were expressed as mean± standard deviation (SD). Qualitative data were expressed as frequency and percentage.

The following tests were done:

- A one-way analysis of variance (ANOVA) when comparing between more than two means.
- Independent-samples t-test of significance was used when comparing between two means.
- Chi-square ($X^2$) test of significance was used in order to compare proportions between two qualitative parameters.
- Probability (P-value)

– P-value <0.05 was considered significant.

– P-value <0.001 was considered as highly significant.

– P-value >0.05 was considered insignificant.

**RESULTS**

The following table shows that the mean age of group A was 59.5±6.52 ranged from 51y to 69 y, group B was 58.9±8.01 ranged from 42y to 70 y, group C was 58.6±7.63 ranged from 42y to 67y, while the mean age of group D was 55.2±13.85 ranged from 31y to 68y so the difference between the four groups according to age was statistically insignificant.

**Table (1): Comparison between the different studied groups according to age**

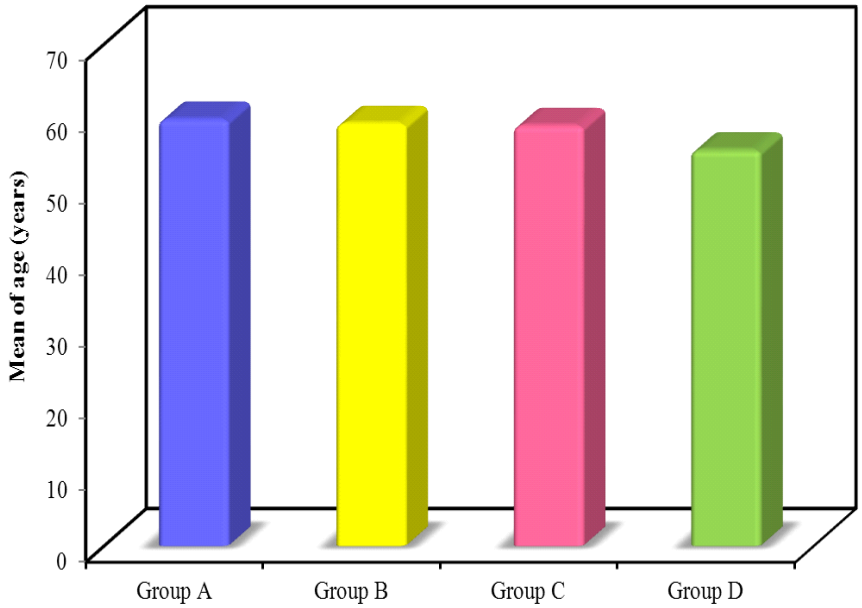
| | **Group A (n = 10)** | | **Group B (n = 10)** | | **Group C (n =10)** | | **Group D (n = 10)** | | **Test of sig.** | **P** |
|---|---|---|---|---|---|---|---|---|---|---|
| | **No.** | **%** | **No.** | **%** | **No.** | **%** | **No.** | **%** | | |
| **Age (years)** | | | | | | | | | | |
| Min. –Max. | 51.0 – 69.0 | | 42.0 – 70.0 | | 42.0 – 67.0 | | 31.0 – 68.0 | | F= 0.420 | 0.740 |
| Mean ±SD. | 59.5 ± 6.55 | | 58.9 ± 8.01 | | 58.6 ± 7.63 | | 55.2 ± 13.85 | | | |
| Median | 59.5 | | 59.5 | | 60.5 | | 60.0 | | | |

$^2$, p: $^2$ and p values for **Chi square test** for comparing between the different groups

$^{MC}$p: p value for **Monte Carlo** for Chi square test

F,p: F and p values for **ANOVA test**

This table shows that the mean age of group A was 59.5±6.52 ranged from 51y to 69 y, group B was 58.9±8.01 ranged from 42y to 70 y, group C was 58.6±7.63 ranged from 42y to 67y, while the mean age of group D was 55.2±13.85 ranged from 31y to 68y so the difference between the four groups according to age was statistically insignificant.




**Figure(1): Comparison between the different studied groups according to Age (years).**

**Table (2): Comparison between the different studied groups according to sex.**

| | Group A (n = 10) | | Group B (n = 10) | | Group C (n =10) | | Group D (n = 10) | | Test of sig. | P |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No. | % | | |
| **Sex** | | | | | | | | | | |
| Male | 7 | 70.0 | 6 | 60.0 | 5 | 50.0 | □ | □□ □□ | □□□ □□□ □□ | $^{MC}$p= 0.971 |
| Female | 3 | 30.0 | 4 | 40.0 | 5 | 50.0 | 4 | 40.0 | | |

$^{2}$, p: $^{2}$ and p values for **Chi square test** for comparing between the different groups
$^{MC}$p: p value for **Monte Carlo** for Chi square test
F,p: F and p values for **ANOVA test**

This table shows that the number of males was 7 in group A, 6 in group B, 5 in group C, and 6 in group D, while the number of females was 3 in group A, 4 in group B, 5 in group C and 4 in group D resulting into no statistically significant difference between the four groups according to the sex.

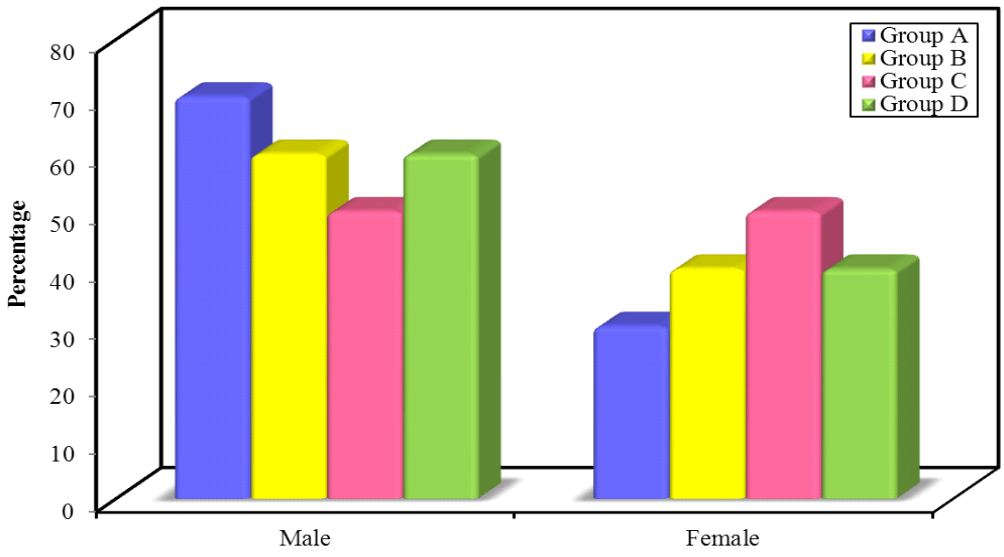



**Figure (2): Comparison between the different studied groups according to Sex.**

**Table (3): Comparison between the different studied groups according to BMI**

| | Group A (n = 10) | | Group B (n = 10) | | Group C (n =10) | | Group D (n = 10) | | Test of sig. | P |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No. | % | | |
| **BMI (kg/m$^2$)** | | | | | | | | | | |
| Min. Max. | 20.70 –31.90 | | 23.50 – 33.10 | | 25.60 – 31.20 | | 24.20 – 31.20 | | F= 0.542 | 0.657 |
| Mean ±SD. | 27.40 ± 3.50 | | 28.55 ± 2.67 | | 28.78 ± 2.07 | | 28.52 ± 2.16 | | | |
| Median | 27.20 | | 28.70 | | 29.05 | | 28.60 | | | |

$^2$, p: $^2$ and p values for **Chi square test** for comparing between the different groups
$^{MC}$p: p value for **Monte Carlo** for Chi square test
F,p: F and p values for **ANOVA test**

This table shows that the mean BMI of group A was 27.40 ± 3.50 ranged from 20.7 to 31.9, group B was28.55 ± 2.67ranged from 23.5 to 33.1, group C was 28.78 ± 2.07ranged from 25.6 to 31.2, while the mean BMI of group D was28.52 ± 2.16 ranged from 24.2 to 31.2 so the difference between the four groups according to BMI was statistically insignificant.

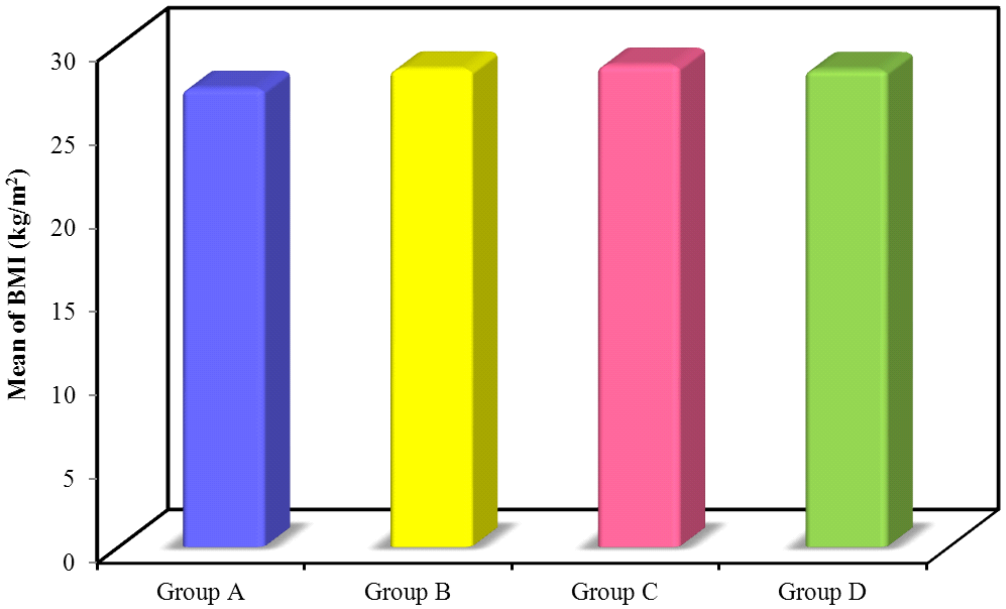



**Figure (3): Comparison between the different studied groups according to BMI (kg/m($^2$**

**Table (4): Comparison between the different studied groups according to smoking**

| Smoking | Group A (n = 10) | | Group B (n = 10) | | Group C (n =10) | | Group D (n = 10) | | □□ | $^{MC}$p |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No. | % | | |
| Non smoker | 8 | 80.0 | 7 | 70.0 | 9 | 90.0 | □ | □□ □□ | □□ □□ | 0.948 |
| Smoker | 2 | 20.0 | 3 | 30.0 | 1 | 10.0 | 2 | 20.0 | □ | |

$^2$, p: $^2$ and p values for **Chi square test** for comparing between the different groups
$^{MC}$p: p value for **Monte Carlo** for Chi square test

This table shows that the number of smokers in group A was 2, in group B was 3, in group C was 1 and in group D was 2 resulting into no statistically significant difference between the four groups according to the smoking.

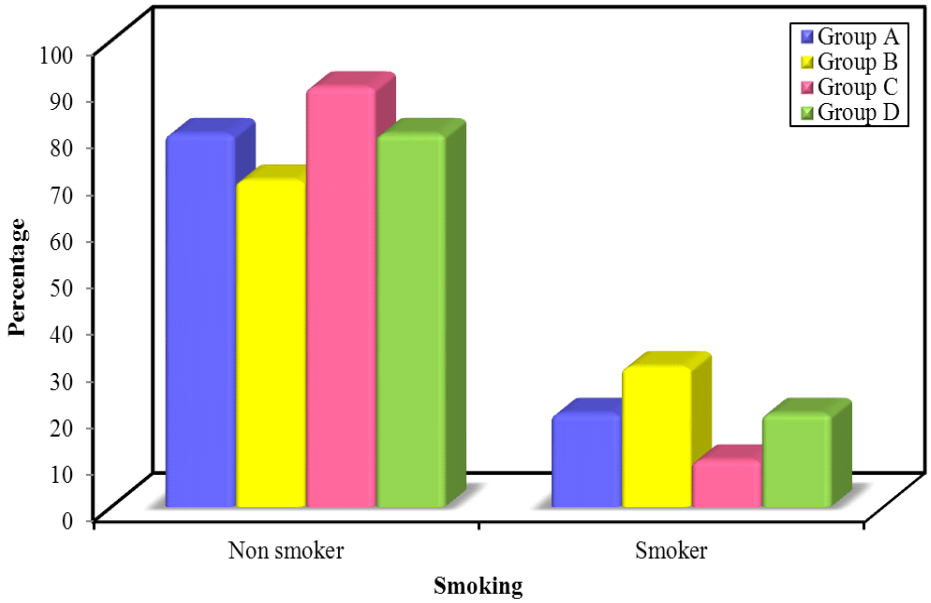



**Figure (4): Comparison between the different studied groups according to smoking**

**Table (5): Comparison between the different studied groups according to type of anesthesia**

| Type of anesthesia | Group A (n = 10) | | Group B (n = 10) | | Group C (n =10) | | Group D (n = 10) | | □□ | MCp |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No. | % | | |
| General | 4 | 40.0 | 5 | 50.0 | 6 | 60.0 | □ | □□ □□ | □□□ □□ | 0.902 |
| Spinal | 6 | 60.0 | 5 | 50.0 | 4 | 40.0 | 6 | 60.0 | | |

2, p: 2 and p values for **Chi square test** for comparing between the different groups
MCp: p value for **Monte Carlo** for Chi square test

This table shows that the number of operations done under general anesthesia was 4 in group A, 5 in group B, 6 in group C and 4 in group D while the number of operations done under spinal anesthesia was 6 in group A, 5 in group B, 4 in group C and 6 in group D resulting into no statistically significant difference between the four groups according to the type anesthesia.

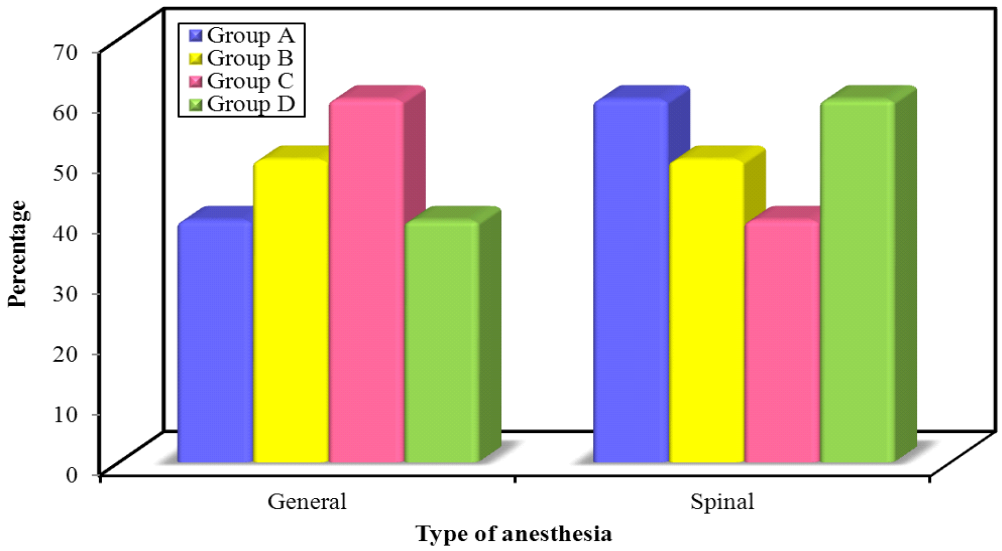



**Figure (5): Comparison between the different studied groups according to type of anesthesia**

**Table (6): Comparison between the different studied groups according to count of WBCs (Preoperative & in 4th day and in 10th day post operative)**

| WBCs ($x10^3$) | Group A (n = 10) | Group B (n = 10) | Group C (n =10) | Group D (n = 10) | H | P |
|---|---|---|---|---|---|---|
| **Preoperative** | | | | | | |
| Min. – Max. | 4.7 – 8.86 | 5.0 – 8.0 | 5.0 – 8.0 | 5.30 – 7.70 | 2.713 | 0.438 |
| Mean ± SD. | 6.05 ± 1.23 | 6.68 ± 1.08 | 6.38 ± 0.89 | 6.47 ± 0.83 | | |
| Median | 5.85 | 6.85 | 6.15 | 6.55 | | |
| **4th day** | | | | | | |
| Min. – Max. | 6.50 – 11.0 | 6.50 – 13.0 | 6.2 – 11.0 | 6.0 – 16.0 | 0.840 | 0.835 |
| Mean ± SD. | 7.24 ± 1.49 | 7.7 ± 2.19 | 7.17 ± 1.57 | 8.12 ± 3.27 | | |
| Median | 6.50 | 6.50 | 6.5 | 6.5 | | |
| **10th day** | | | | | | |
| Min. – Max. | 6.5 – 17.0 | 6.5 – 11.20 | 5.90 – 9.70 | 6.50 – 14.5 | 2.239 | 0.524 |
| Mean ± SD. | 7.82 ± 3.30 | 7.42 ± 1.62 | 6.94 ± 1.15 | 7.90 ± 2.70 | | |
| Median | 6.50 | 6.50 | 6.50 | 6.60 | | |
| **$p_1$** | 0.022* | 0.139 | 0.123 | 0.259 | | |
| **$p_2$** | 0.022* | 0.184 | 0.123 | 0.192 | | |
| **$p_3$** | 0.593 | 0.109 | 0.109 | 0.345 | | |

H,p: H and p values for **Kruskal Wallis test** for comparing between the different groups
$p_1$: p value for **Wilcoxon signed ranks test** for comparing between **preoperative** and **4th day**
$p_2$: p value for **Wilcoxon signed ranks test** for comparing between **preoperative** and **10th day**
$p_3$: p value for **Wilcoxon signed ranks test** for comparing between **4th** and **10th day**
*: Statistically significant at $p \leq 0.05$.

This table shows that the mean of preoperative WBCs was 6.05 ± 1.23 ranged from 4.7 to 8.86 in group A, 6.68 ± 1.08 ranged from 5.0 to 8.0 in group B, 6.38 ± 0.89 ranged from 5.3to 7.7 in group C, while was 6.47 ± 0.83 ranged from 6.0to 16.0 in group D.

It also shows that the mean of WBCs in fourth day postoperative was 7.24 ± 1.49 ranged from 6.5 to 11.0 in group A, 7.7 ± 2.19 ranged from 6.5to 13.0 in group B, 7.17 ± 1.57 ranged from6.2to 11.0 in group C, while was 8.12 ± 3.27ranged from 6.0to 16.0 in group D.

And also shows that the mean of WBCs in tenth day postoperative was 7.82 ± 3.30 ranged from 6.5 to 17.0 in group A, 7.42 ± 1.62 ranged from 6.5to 11.2 in group B, 6.94 ± 1.15ranged from 5.9 to 9.7 in group C, while was 7.90 ± 2.70 ranged from 6.5 to 14.5 in group D.

So there was statistically significant between preoperative & 4th day postoperative and preoperative & 10th day post operative according count of WBCs, the rest have insignificant.

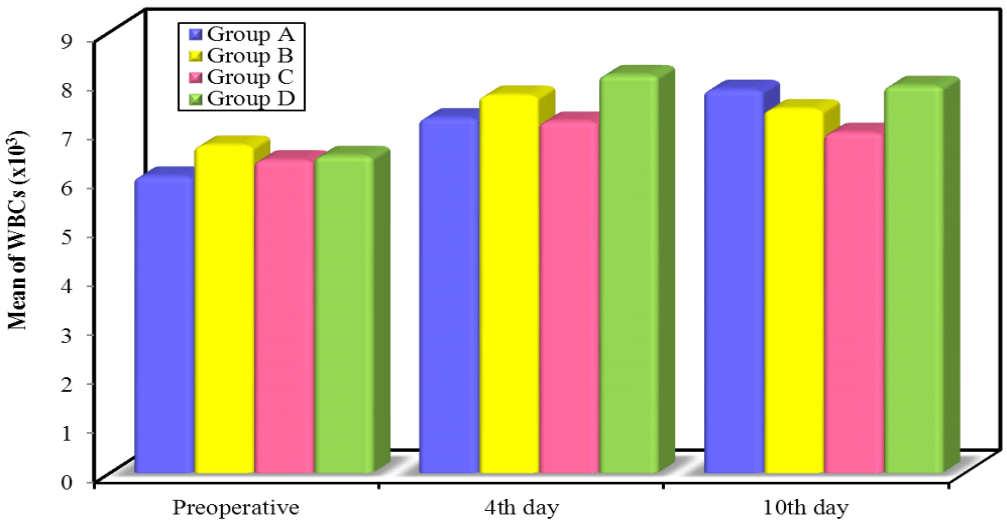



**Figure (6) :Comparison between the different studied groups according to count of WBCs (Preoperative & in 4th day and in 10th day post operative).**

**Table (7): Comparison between the different studied groups according to count of neutrophils in 4th day and in 10th day post operative**

| Neutrophils | Group A (n = 10) | Group B (n = 10) | Group C (n =10) | Group D (n = 10) | H | p |
|---|---|---|---|---|---|---|
| **4th day** | | | | | | |
| Min. – Max. | 60.0 – 65.0 | 60.0 – 75.0 | 60.0 – 70.0 | 57.0 – 72.0 | 0.101 | 0.992 |
| Mean ± SD. | 61.20 ± 2.10 | 61.70 ± 4.72 | 61.8 ± 3.82 | 62.60 ± 5.10 | | |
| Median | 60.0 | 60.0 | 60.0 | 60.0 | | |
| **10th day** | | | | | | |
| Min. – Max. | 54.0 – 73.0 | 52.0 – 64.0 | 45.0 – 62.0 | 50.0 – 69.0 | 0.531 | 0.912 |
| Mean ± SD. | 60.7 ± 4.72 | 59.2 ± 3.16 | 58.8 ± 4.89 | 59.30 ± 5.52 | | |
| Median | 60.0 | 60.0 | 60.0 | 60.0 | | |
| **$p_1$** | 0.785 | 0.109 | 0.109 | 0.068 | | |

H,p: H and p values for **Kruskal Wallis test** for comparing between the different groups
$p_1$: p value for **Wilcoxon signed ranks test** for comparing between **4th** and **10th day**
*: Statistically significant at $p \leq 0.05$

This table shows that the mean of neutrophils in fourth day was 61.20 ± 2.10 ranged from 60 to 65 in group A, 61.70 ± 4.72 ranged from 60 to 75 in group B, 61.8 ± 3.82 ranged from 60 to 70 in group C, while was 62.60 ± 5.10 ranged from 57 to 72 in group D and also shows that the mean of neutrophils in tenth day was 60.7 ± 4.72 ranged from 54 to 73 in group A, 59.2 ± 3.16 ranged from 52 to 64 in group B, 58.8 ± 4.89 ranged from 45 to 62 in group C, while was 59.30 ± 5.52 ranged from 50 to 69 in group D. So the difference between the four groups according to count of neutrophils in 4th day and in 10th day post operative was statistically insignificant.

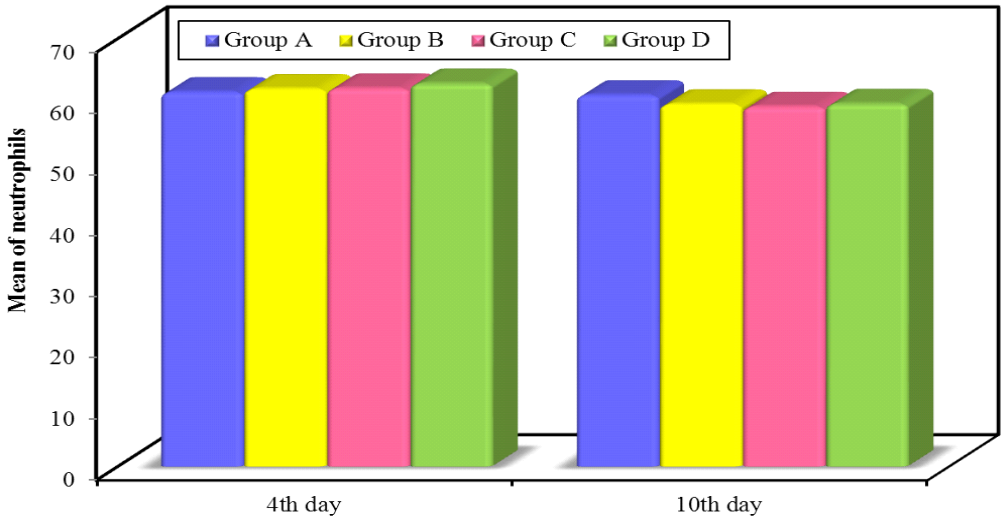



**Figure (7): Comparison between the different studied groups according to count of neutrophils in 4th day and in 10th day post operative**

**Table (8): Comparison between the different studied groups according to duration of surgery**

| Duration of surgery | Group A (n = 10) | Group B (n = 10) | Group C (n =10) | Group D (n = 10) | H | p |
|---|---|---|---|---|---|---|
| Min. – Max. | 75.0 – 120.0 | 60.0 – 180.0 | 70.0 – 120.0 | 60.0 – 165.0 | 3.378 | 0.337 |
| Mean ± SD. | 96.0 ± 18.38 | 87.50 ± 34.50 | 92.0 ± 17.51 | 95.0 ± 31.89 | | |
| Median | 92.50 | 75.0 | 90.0 | 82.50 | | |

H, p: H and p values for **Kruskal Wallis test** for comparing between the different groups

This table shows that the mean duration of surgery per minutes was 96.0 ± 18.38 ranged from 75 to 120 in group A, 87.50 ± 34.50 ranged from 60to 180 in group B, 92.0 ± 17.51ranged from 70 to 120 in group C, while was 95.0 ± 31.89 ranged from 60 to 165 in group D so the difference between the four groups according to duration of surgery per minutes was statistically insignificant.

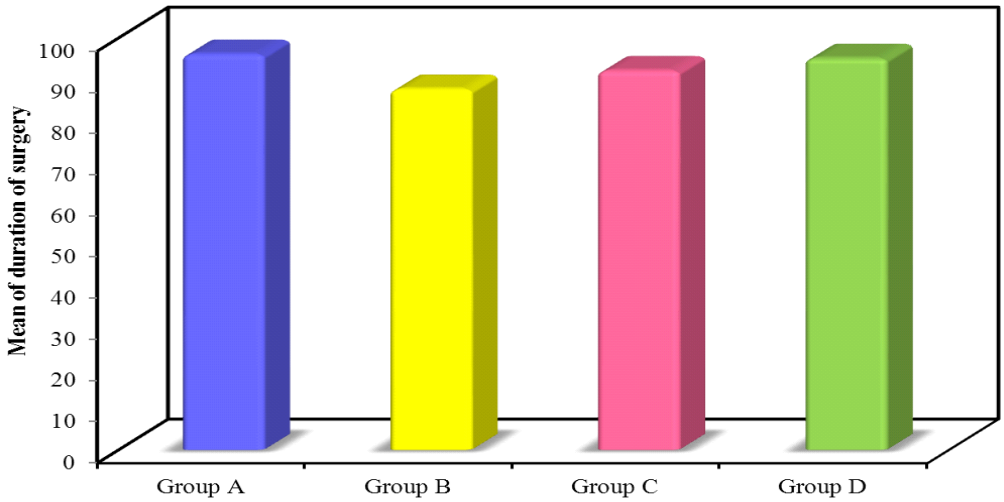



**Figure (8): Comparison between the different studied groups according to duration of surgery**

**Table (9): Comparison between the different studied groups according to length of incision**

| Length of incision (cm) | Group A (n = 10) | Group B (n = 10) | Group C (n =10) | Group D (n = 10) | F | p |
|---|---|---|---|---|---|---|
| Min. – Max. | 12.0 – 25.0 | 15.0 – 25.0 | 12.0 – 25.0 | 10.0 – 25.0 | 0.972 | 0.416 |
| Mean ± SD. | 19.50 ± 4.20 | 21.10 ± 3.41 | 19.20 ± 5.20 | 17.60 ± 5.32 | | |
| Median | 20.0 | 21.0 | 19.0 | 18.50 | | |

F, p: F and p values for ANOVA test

This table shows that the mean length of incision per cm was 19.50 ± 4.20 ranged from 12cm to 25cm in group A, 21.10 ± 3.41ranged from 15cm to 25cm in group B, 19.20 ± 5.20 ranged from 12cm to 25cm in group C, while was 17.60 ± 5.32 ranged from 10cm to 25cm in group D so there was no statistically significant between groups according to length of incision.

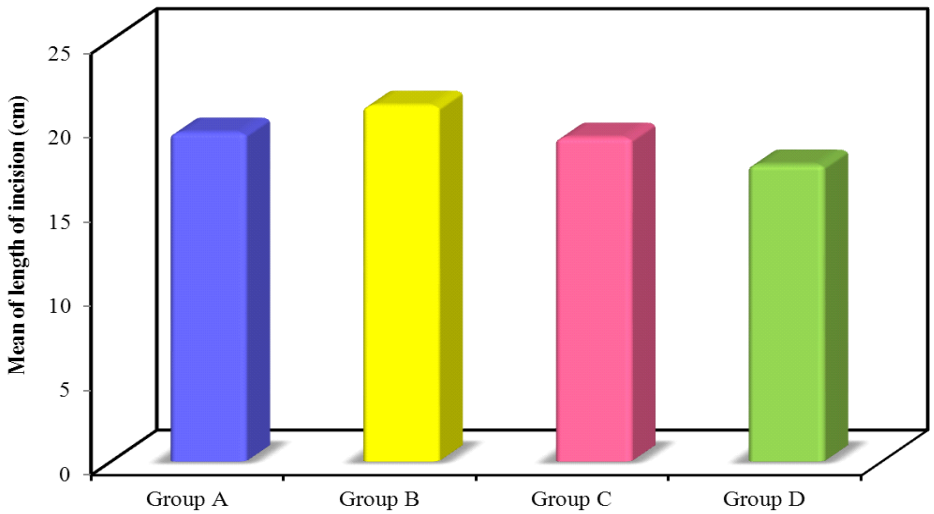



**Figure (9): Comparison between the different studied groups according to length of incision**

**Table (10): Comparison between the different studied groups according to wound complication (Erythema & Seroma and Wound infection)**

| | Group A (n = 10) | | Group B (n = 10) | | Group C (n =10) | | Group D (n = 10) | | □□ | MCp |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No. | % | | |
| **Erythema** | | | | | | | | | | |
| No | 10 | 100.0 | 10 | 100.0 | 10 | 100.0 | 8 | 80.0 | 3.811 | 0.235 |
| Yes | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 2 | 20.0 | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Seroma** | | | | | | | | | | |
| No | 10 | 100.0 | 10 | 100.0 | 9 | 90.0 | 10 | 100.0 | 2.880 | 1.000 |
| Yes | 0 | 0.0 | 0 | 0.0 | 1 | 10.0 | 0 | 0.0 | | |
| **Wound infection** | | | | | | | | | | |
| No | 9 | 90.0 | 9 | 90.0 | 9 | 90.0 | 8 | 80.0 | 0.969 | 1.000 |
| Yes | 1 | 10.0 | 1 | 10.0 | 1 | 10.0 | 2 | 20.0 | | |

$^{2}$, p: $^{2}$ and p values for **Chi square test** for comparing between the different groups
$^{MC}$p: p value for **Monte Carlo** for Chi square test

This table shows that the numbers of cases that developed erythema was two in group D only, the numbers of cases that developed seroma was one in group C only, while the numbers of cases that developed wound infection was two in group D and one in each other groups so there was no significant difference between all groups and development of wound complication (erythema & seroma and wound infection).

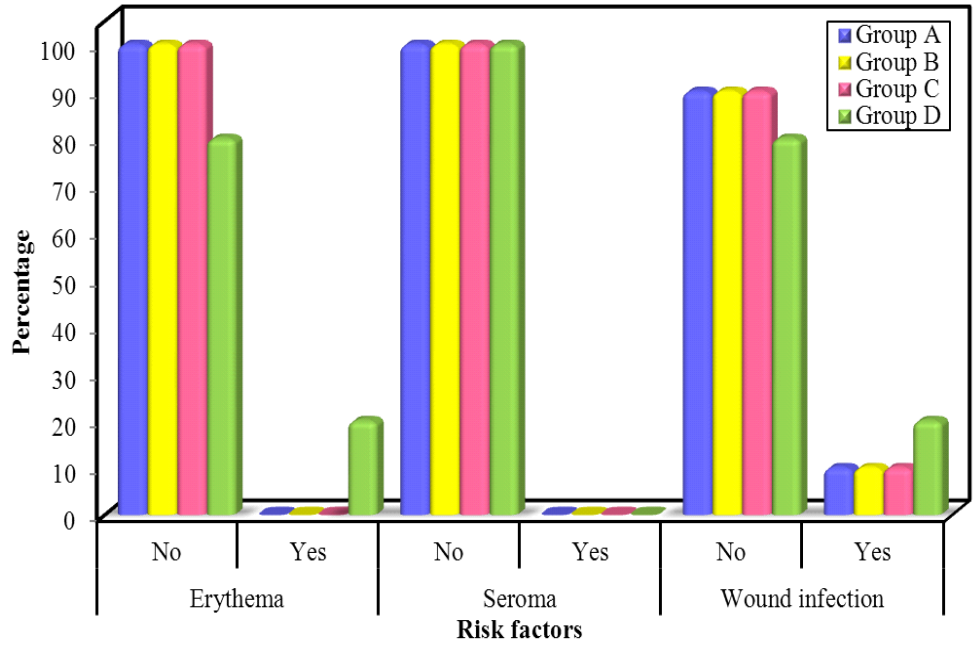



**Figure (10): Comparison between the different studied groups according to wound complication (Erythema & Seroma and Wound infection)**

**Table (11): Comparison between the different studied groups according to post-operative hospital stay in days**

| post-operative hospital stay | Group A (n = 10) | Group B (n = 10) | Group C (n =10) | Group D (n = 10) | H | P |
|---|---|---|---|---|---|---|
| Min. – Max. | 1.0 – 7.0 | 1.0 – 5.0 | 1.0 – 6.0 | 1.0 – 10.0 | 0.820 | 0.845 |
| Mean ± SD. | 3.40 ± 2.22 | 2.70 ± 1.77 | 2.80 ± 1.81 | 3.60 ± 2.72 | | |
| Median | 3.0 | 2.50 | 3.0 | 3.0 | | |

H,p: H and p values for **Kruskal Wallis test** for comparing between the different groups

This table shows that the mean of postoperative hospital stay in days was 3.40 ± 2.22 ranged from 1 to 7 days in group A, 2.70 ± 1.77 ranged from 1 to 5 days in group B, 2.80 ± 1.81 ranged from 1 to 6 days in group C, while was 3.60 ± 2.72 ranged from 1 to 10 days in group D so the difference between the four groups according to post operative hospital stay in days was statistically insignificant.

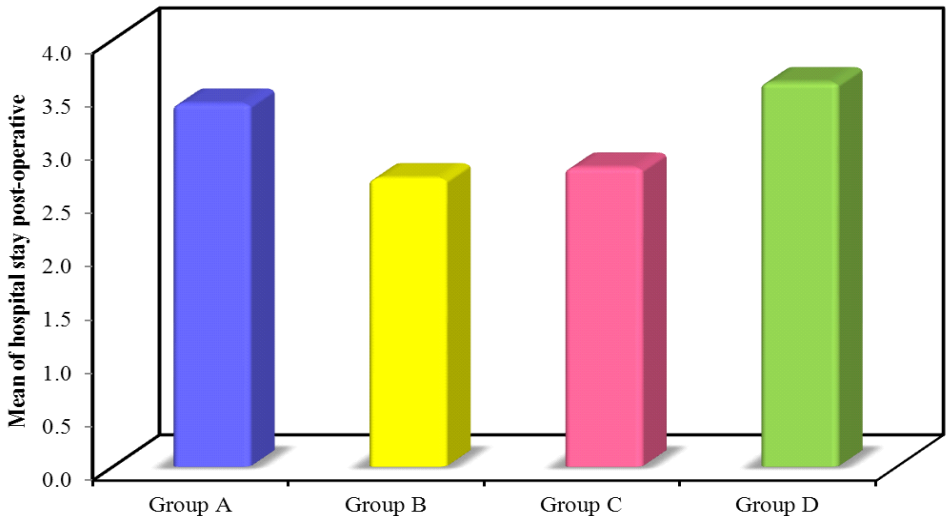



**Figure (11): Comparison between the different studied groups according to post-operative hospital stay in days**

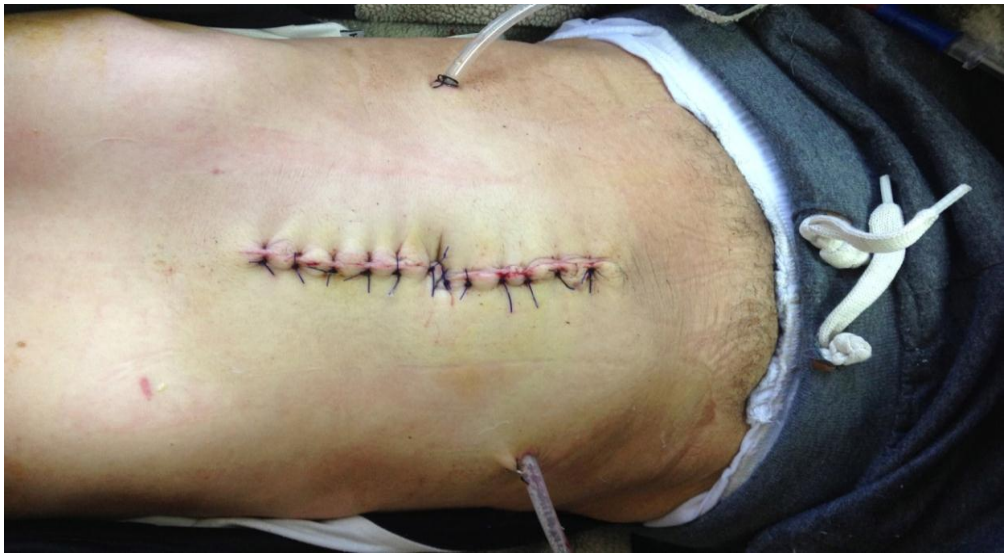


**Figure (12): Clean wound post Rt. Hemicolectomy**

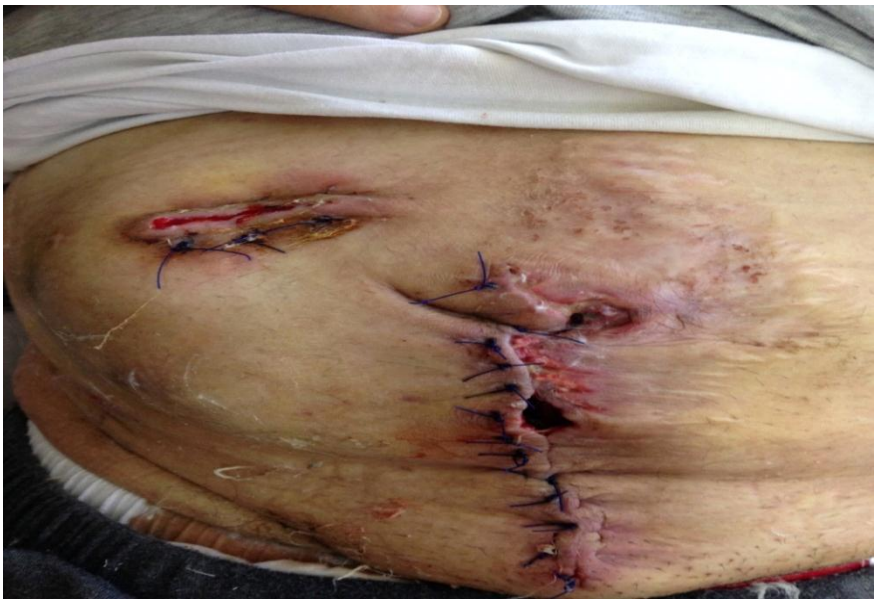


**Figure (13): Infected wound post closure of ileostomy and ileo-rectal anastomosis**

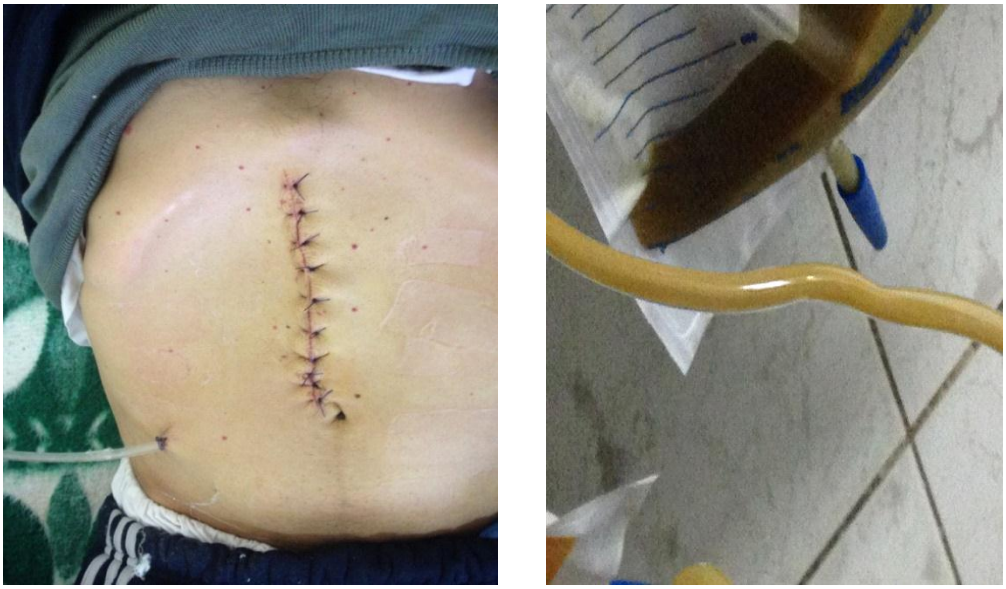


**Figure (14): Infected pseudopancreatic cyst post pseudopancreatic cysto-jujenostomy**

## DISCUSSION

The goal of surgical infection prevention is to decrease the morbidity and mortality associated with postoperative surgical site infection by promoting appropriate selection and timing of administration of prophylactic antimicrobials.[5]

Antibiotic use provides selective pressure favoring resistant bacterial strains; inappropriate use increases the risk for selection and dissemination of antibiotic-resistant bacteria. Therefore, one would expect that drugs more commonly affected by bacterial resistance in developing countries are generally inexpensive and popular broad-spectrum agents. However, the relationship between antibiotic use and the emergence and spread of resistance is complex.[6]

When the surgical wound is closed, the patient's fate is sealed relative to wound infection and the postoperative antibiotics given after the wound closure do not impact the natural history of the disease. It is assumed that the bacteria have been eliminated from the wound with the single dose and additional dose do not further reduce infection rates.[7]

Naturally, the antibiotic(s) must be active against the relevant pathogens. This is most clearly illustrated by the requirement that the agent used have activity against enteric anaerobes for procedures involving the lower GI tract. Although yet to be studied in a systematic manner, there is general agreement that antibiotic agents used for prophylaxis should be different from agents usually chosen as first-line choices for treatment of established infections.[8]

Cephalosporins in general have the advantages of beta-lactamases stability, good activity against target proteins (PBPs) and good ability to penetrate bacterial cell wall. Although they may be active against a wide range of microorganisms.[9]

Cefotaxime is a parenterally administered third generation cephalosporin with a broad spectrum of antimicrobial activity. After more than a decade of use, cefotaxime continues to play an important role in the treatment of patients with serious infections, particularly those caused by Gram-negative bacteria.[10]

Cefepime is a 'fourth' generation cephalosporin that has a broader spectrum of antibacterial activity than the third generation cephalosporins and is more active in vitro against Gram-positive aerobic bacteria. cefepime may be useful for treatment of infections resistant to earlier cephalosporins. cefepime 2 g twice daily intravenously (alone or in combination with metronidazole) was effective for the treatment of intra-abdominal infection.[11]

Clinical uses of cefepime are similar to those of the third-generation cephalosporins. Cefepime was approved in January 1996. It was approved for the treatment of complicated intra-abdominal infections in January 1998. In early 2007, the safety of cefepime relative to other beta-lactam antibiotics was questioned. A meta-analysis evaluating the efficacy and safety of cefepime reported a higher all-cause mortality in patients treated with cefepime compared to other beta-lactams.[12]

Thus, cefepime has the advantage of an improved spectrum of antibacterial activity and is less susceptible to hydrolysis by some beta-lactamases, compared with third generation cephalosporins.[11]

Clinical practice guidelines suggest cefepime with metronidazole as empiric therapy in patients with high risk or severity community-acquired, health care-associated, or biliary infections.[13]

Cefepime shows highly activity against enterobactor & pseudomonas aerugenosa and no clinical activity against bacteroids while cefotaxime shows limited activity against enterobactor & bacteroids and no clinical activity against pseudomonas aerugenosa. Both cefepime and cefotaxime shows highly activity against E.coli, klebsiella and proteus & moderately activity against S.aureus.[14]

There was a strong motivation to study the issue of giving single or multiple dose, prophylactic antibiotics in our hospital for economical and scientific purposes.

This study randomized prospective and comparative study of single dose cefepime or cefotaxime (2 gm) + metronidazole versus three doses cefepime or cefotaxime (1 gm) + metronidazole.

The study includes patients who were electively operated for different gastrointestinal operations in surgical department, karmous health insurance hospital.

In our study, we found that incidence of wound infection in patients whose receive prophylactic single dose cefepime + metronidazole was 10% and the same result in patients whose receive prophylactic thee doses cefepime + metronidazole.

**Zanella and Rulli,** ***2000*** compared two prophylactic antimicrobial regimens in 615 patients undergoing elective colorectal surgical procedures. Patients were randomized to receive preoperative infusions of 2 gm cefepime or 2 gm ceftriaxone, followed by 500 mg metronidazole. Patients were followed for up to 4 to 6 weeks after surgery. Antimicrobial prophylaxis was successful in preventing primary surgical site infections in 92.8% of patients in the cefepime + metronidazole arm and 92.9% of patients in the ceftriaxone + metronidazole arm. A single dose of cefepime + metronidazole thus seems to be a very useful alternative to other regimens for prophylaxis in patients undergoing colorectal surgery.

**Del Rio et al., 2008** found that a single dose of Cefepime seems to be a very useful alternative to other regimens for antibiotic prophylaxis of postoperative infectious complications in the elective surgical treatment of cholelithiasis.

**Joel et al., 2015** found that the difference between cefepime and ceftriaxone in preventing SSIs following elective clean orthopedic surgery was not statistically significant.

In our study, we found that use of prophylactic single dose cefotaxime + metronidazole was successful in preventing wound infections in 80% of patients and use of prophylactic three doses cefotaxime + metronidazole was successful in preventing wound infections in 90% of patients.

## CONCLUSIONS

The prophylactic effect of single dose Cefepime + metronidazole and the prophylactic effect of multiple doses Cefepime + metronidazole are similar in prevention of development of wound infection after different elective gastrointestinal surgery.

The prophylactic effect of multiple doses Cefotaxime + metronidazole is effective than the prophylactic effect of single dose Cefotaxime + metronidazole in prevention of development of wound infection after different elective gastrointestinal surgery.

**While** prophylactic effect single dose of cefepime + metronidazole is effective than the prophylactic effect of single dose Cefotaxime + metronidazole in prevention of development of wound infection after different elective gastrointestinal surgery.

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