Original Article

ISSN (O): 2663-8347; ISSN (P): 2663-8339

Efficacy of Single Dose versus Multiple Dose of Pre-Operative Antibiotic: Teaching Hospital Based Study

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Abstract

Background: The major crisis in any type of surgery is understood to be Surgical Site Infection (SSI). Although laparoscopic cholecystectomy is a nominally invasive procedure, there is a dominant prevalence of SSI in patients. It is also believed that prophylactic antibiotic has major impact in reducing SSI. **Subjects & Methods:** Seventy cases were enrolled in this study with knowledgeable consent. The study was carried out over a time period of ten months. The subjects acknowledge for elective laparoscopic cholecystectomy were incorporated in our study. **Results:** Out of the 70 randomized patients, 35 were allotted in single dose (SD group) while 35 patients were allotted in multiple doses (MD group), who got planned treatments and were then investigated. Of the 70 patients, female patients were 58(82.9%) and males were 12(17.1%). Total 43.62 ± 12.18 years was the mean age of patients having symptomatic cholelithiasis, with 18 years as minimum and 77 years as maximum age. The peak of disease was documented in the age group of 30 to 39 years (28.6%). **Conclusion:** Utility of single antibiotic dose before anesthesia induction in laparoscopic cholecystectomy was likewise efficient as the use of multiple antibiotics doses in surgical site infection of postoperative periods.

Keywords: Single dose, multiple dose and Antibiotic

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Received: 02 January 2020 **Revised: 06 February 2020** **Accepted: 14 February 2020** **Published: 27 December 2020**

Introduction

The major post-operative complication in any surgical procedure had been surgical Site Infection (SSI) which might lead into longer hospital stay, slaughter of productive hours, cost of hospital stay and treatment and also patients mortality and morbidity.[1] In developing countries like India symptomatic cholelithiasis is a frequent health crisis. The first open cholecystectomy was introduced and performed by Langenbach in 1892 while laparoscopic cholecystectomy was introduced by Philip Mouret, which today is measured as a gold standard procedure for symptomatic cholelithiasis.[2] The major problem in any type of surgery is understood to be Surgical Site Infection (SSI). Although laparoscopic cholecystectomy is a minimally invasive procedure, there is a dominant prevalence of SSI in patients. It is also believed that prophylactic antibiotic has major impact in reducing SSI.[3,4] However, extreme use of antibiotics might guide to pointless cost, unfavorable drug effects or development of multiple drugs resistant microorganisms. Diverse studies suggests diverse regimen of antibiotic to be used during laparoscopic cholecystectomy.[5,6] Yet, majority of the studies were done in richer country setting where there is high hygiene maintenance in operating rooms, automatic doors, laminar air flow systems which might have contributed lesser numbers of SSI's postoperatively and are specially diverse from conditions of developing country. Our study intended to evaluate the single antibiotics dose against multiple doses in laparoscopic cholecystectomy related surgical site infections in patients.

Subjects and Methods

The present study was accomplished in the Surgery Department, at Varun Arjun Medical College & Rohilkhand Hospital, Banthra, Shahjahanpur, and Uttar Pradesh, India during the period from January 2019 to October 2020. Prior approval for the study was taken from the institutional research committee. Total of 70 cases were included in this study with prior informed consent. The study was carried out over a time period of ten months the patients acknowledge for elective laparoscopic cholecystectomy was enrolled in our study. Patients with acute cholecystitis, associated choledocholithiasis, asso-

ciated medical pathology like, diabetes mellitus, hypertension, cardiac /renal failure, ischemic heart disease, immunosuppression and converted to open surgery were excluded from this study. After admission, detailed history, clinical examination findings, routine blood investigation reports and ultrasonography report were noted in proforma sheet. The patients were haphazardly categorized in two equal groups: One group was allotted as single dose group (SD) while another group was allotted as multiple dose group (MD). Each group consisted 35 patients. SD group was treated with intravenous ceftriaxone (2 gm) during anesthesia induction, while MD group was treated with intravenous ceftriaxone (2 gm) during anesthesia induction followed by intravenous ceftriaxone (1 gm) twice a day for two days post-operatively. Routine cholecystectomy was performed with all due aseptic precautions. All patients were followed up daily for two post-operative days and then 1-week and 3-week follow up was done for any SSI. Fever, port-site redness and tenderness, wound discharge, wound gape and wound abscess were considered as SSI. Patients with fever and port-site redness and tenderness were given antipyretic and anti-inflammatory drugs respectively. In case of wound discharge, fluid mop was taken for microbial analysis and antibiotic sensitivity testrs and patients were given empirical antibiotic treatment.

Statistical Analysis

The observations were analyzed statistically SPSS-20, utilizing chi-square test and independent sample t-test. Continuous measurement results were obtained as mean ± SD (min-max) and categorical measurement results on numbers (%). The p-value of <0.05 was considered to be significant statistically.

Results

A total of 70 randomized patients, 35 were in single dose (SD) group while 35 patients were allotted as multiple doses (MD) group, who received planned treatment and was evaluated. Out of the 70 patients, females were 58(82.9%) and males were 12(17.1%). The mean age of subjects with symptomatic cholelithiasis was 43.62 ± 12.18 years, of which 18 years was minimum and 77 years was maximum age. The peak of disease was documented in the age group of 30 to 39 years (28.6%) as shown in [Table 1].

Of the 70 patients enrolled, single dose of ceftriaxone (1gm) during anesthesia induction (SD group) was obtained by 35 patients while the next 35 (MD) group patients received multiple doses of ceftriaxone (1gm) during anesthesia induction which continued twice a day for 24 hours (MD group) postoperatively. No statistically significant difference was seen in demography of two groups [Table 2].

Only 1(2.9%), out of 35 patients in SD group, developed fever on first postoperative day which improved with antipyretic drugs. 2 more patients (5.7%) got tenderness,s erythema and redness around umbilical cord at the week 2 follow up, which improved with anti-inflammatory drugs and suture removal. Another one patient (2.9%) also had complains of discharge in the wound which again improved with drainage, removal of suture, and a course of antibiotics. However culture and sensitivity test for wound swab was performed with sterile results. All these patients were followed up to 4th week and they became asymptomatic [Table 3].

Table 1: Distribution of patients in different age groups:

Age Group in years	No. of Patients (%)
10-19	02 (1.43)
20-29	14 (20.0)
30-39	20 (28.6)
40-49	18 (25.7)
50-59	09 (12.9)
60-69	07 (10.0)
70-79	00 (00.0)
Total	70 (100)

Similarly, in MD group out of 35 patients, 2 patients (5.7%) had umbilical port site redness and mild tenderness which was improved at 2nd week follow up with anti-inflammatory drugs. Another one patient had a gaped wound, which simply improved with regular dressings and antibiotics course. By secondary intention wounds healed without any suturing by 3rd week [Table 4].

On supplementary assessment of wound infections between groups, only 4 patients (11.43) of single dose (SD) group and 3 patients (8.6) in multiple doses (MD) groups tend to develop various infection severity as depicted by figure 1. No statistically significance was seen in incidence of wound infection between SD and MD group.

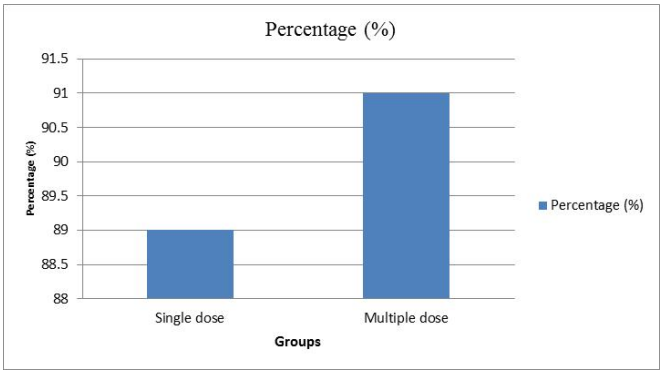

Figure 1: Wound infection comparison of between SD and MD groups

Table 2: Wound complications in SD group

Type of Surgical Site Infection	First Post-Operative day	Second Post-Operative day	After2nd week	After 4th weeks
Fever	1	Nil	Nil	Nil
Port site redness, tenderness	Nil	Nil	2	Nil
Discharge from wound	Nil	Nil	1	Nil
Wound gape	Nil	Nil	Nil	Nil
Wound abscess	Nil	Nil	Nil	Nil

Table 3: Wound complications in MD group

Type of Surgical Site Infection	First Post-Operative day	Second Post-Operative day	After2nd week	After 4th weeks
Fever	Nil	Nil	Nil	Nil
Port site redness, tenderness	Nil	Nil	2	Nil
Discharge from wound	Nil	Nil	Nil	Nil
Wound gape	Nil	Nil	1	Nil
Wound abscess	Nil	Nil	Nil	Nil

Table 4: Comparison of wound infection between two groups using chi-square test

Groups	Wound infection, n (%)	No wound infection, n (%)
Single dose	4 (11.43)	31(88.6)
Multiple dose	3 (8.6)	32(91.43)

Discussion

The most common problem in any surgical procedure is understood to be surgical site infection, which leads to hospital stay increase, overall cost, the morbidity and mortality rate. Hence to minimize surgical site infection prophylaxis of antibiotic has classic responsibility in contamination free surgery.[5–7] Although the role antibiotic prophylaxis in laparoscopic cholecystectomy is still uncertain. Chances of SSI in Laparoscopic cholecystectomy is much lesser due to various reasons like least tissues handling, not as much of contamination and minute incisions.[8,9] However there has been no recommendation of the utilization of prophylactic antibiotics in laparoscopic cholecystectomy by Chang WT et al do.[10] Moreover one antibiotics dose was sufficient preoperatively as studied by Sutariya PK et al.[6] Although Abro et al recomended a multiple dose approach of antibiotics rather than single dose.[11] It is to be understood that the majority of the studies were carried out in richer countries where hygeine and surgery infrastructure were far superior than developing countries. Our recent study intended to find comparision between single dose against multiple antibiotics doses for SSI in laparoscopic cholecystectomy. It had been observed that females are more commonly affected by gall stone disease than males. In our study, 58(82.9%) were female patients while 12(17.1%) were male patients. Generally the 4th decade of life is seen to be affected by gall stones disease. In our present study the range of age varied in-between 18-79 years of which 30-39 years (28.6%) was seen to be the maximum age range follow by 40-49 years (25.7%). The overall age mean was (43.62 ± 12.18) years, which was concordant with the Saudi Arabia study.[12,13] It has been clearly understood that age has been a self-governing risk factor in open cholecystectomy but has no correlation with laparoscopic cholecystectomy related SSI. Wound infection rate had been 4% among all the 35 patients in SD group. Only one patient (2.9%) developed postoperative day fever, and another two patients (5.7%) had complains of port site redness, tenderness. Another single patient (2.9%) had developed wound discharge. Management of these complains were done conservatively using wound dressings, analgesics and antipyretics, hence all patients completely recovered by

4th week follow up. On the other hand, MD groups wound disease rate was only 3%. Only two patients (5.7%) reported port site redness, tenderness while another single patient had a gaped wound complain which was managed conservatively and recovered by 4th week follow up. We concluded that the overall surgical site infections (SSI) rate in our study was 3.5% which was comparable with the studies of Gaur et al and Koc et al who had shown 2-3% of wound infection in laparoscopic cholecystectomy.[14,15] it was evidenced that wound infection rate is 4% in SD group while in it was 3% in MD group, both of which was statistically insignificant. Hence it can be clearly said that single antibiotics dose might be equally efficient against multiple antibiotics doses against SSI, although a few studies were stern in the use of multiple antibiotics doses.[11] Although, Meijer et al, on a similar study of ours, did not demonstrate any difference in SSI either with single or multiple antibiotics doses.[16] Equally, Waldvogel and colleagues suggested prophylaxis with antibiotic not to exceed 24 hours.[17] The might of our study has been its sample size, which sufficiently motorized surgical site infection detection. Although the observations of our study might be applicable to various facilities in India and other developing countries since interventions settings and environment of operating room are very similar. However the main restraint of our study was its single blind nature as the study was a single facility teaching hospital based study.

Conclusion

Our findings propose that, the use of single antibiotic dose just before anesthesia induction for laparoscopic cholecystectomy is likewise effective as in the use of multiple antibiotics doses in surgical site infection in post-operative periods. To add to it, the cost of hospital could be minimized with single antibiotic dose regimen. However, if the study would have been larger and had included patients from multiple centers it would have been more educational.

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How to cite this article: Gupta KP, Singh DP. Efficacy of Single Dose versus Multiple Dose of Pre-Operative Antibiotic: Teaching Hospital Based Study. Acad. J Surg. 2020;3(2):25-29.

DOI: dx.doi.org/10.47008/ajs/2020.3.2.7

Source of Support: Nil, **Conflict of Interest:** None declared.