Original Research Article

A comparative study single dose versus multiple dose of pre operative antibiotic in operative cholecystectomy

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Abstract

Aim: Our study is aimed to compare the impact of single vs. multiple dose of antibiotic in cholecystectomy in terms of post-operative infection related complications. **Materials and Method:** The present study was prospective and longitudinal. Total 180 patients who were admitted for elective cholecystectomy were included in our study. The patients were randomly divided in two equal groups: single dose (SD) group and multiple dose (MD) group, comprising of 90 patients in each group. SD group was given ceftriaxone (2 gm) intravenously at the time of induction of anaesthesia. Whereas, MD group was given ceftriaxone (2 gm) intravenously at the time of induction of anaesthesia followed by ceftriaxone (1 gm) intravenously twice a day for two days post-operatively. **Results:** In single dose antibiotic group, total post-operative infection rate was 4.4% and that in multiple dose groups was found to be 3.3%. Data was analysed with Chi- square test and the difference in the rate of SSI in both the groups was found statistically insignificant. **Conclusion:** The rate of post-operative SSI after single dose antibiotic intravenously at induction of anaesthesia is comparable with that of multiple dose antibiotics. So single dose antibiotic regimen can be safely practiced in elective cholecystectomy.

Keywords: Single dose vs. multiple dose, Antibiotic prophylaxis, cholecystectomy

Introduction

Cholelithiasis is one of the common health problems encountered in surgical practice worldwide. The prevalence of gall stone disease in developed countries is 10-15% of adult population and that in India is 10-22%. So cholecystectomy is a frequently performed procedure. Today, cholecystectomy (LC) is a standard procedure done for gall stones as it is less invasive, associated with less tissue trauma, less post-operative pain, less hospital stay and reduced cost to the hospital as compared to open cholecystectomy[1-4].

Surgical site infection (SSI) is a major post-operative complication associated with any surgery which will lead to increased hospital stay, loss of productive hours, hospital cost and patient morbidity and mortality. Although antimicrobial prophylaxis plays an important role in reducing the rate of SSIs, other factors such as attention to basic infection-control strategies, the surgeon's experience and technique, the duration of the procedure, hospital and operating-room environments, instrument sterilization issues, preoperative preparation (e.g., surgical scrub, skin antisepsis, appropriate hair removal), perioperative management (temperature and glycemic control), and the underlying medical condition of the patient may have a strong impact on SSI rates. But, frequently, antibiotics are used irrationally for unduly long period in an attempt to reduce the SSI, which will increase the financial burden to the hospital and probable emergence of drug resistance and drug related adverse effects. So a systematic predefined approach is to be followed to prevent it. Laparoscopic cholecystectomy is a clean and less invasive surgery. So there is no consensus on usage of prophylactic antibiotic in Laparoscopic Cholecystectomy. Chang WT et al[5-8].

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Do not recommend the use of prophylactic antibiotics in elective laparoscopic cholecystectomy because they will not decrease the already low rate of postoperative infectious complications. Many other authors have also drawn the same conclusion. Whereas Lippert H et al, has concluded that neither laparoscopic nor conventional open cholecystectomy should be performed without adequate perioperative antimicrobial prophylaxis[9-12].

Worldwide, cephalosporins are being used frequently as prophylactic antibiotics. The reason being, they are safe, effective, nontoxic, having excellent antimicrobial activity and good tissue penetration. Our study is aimed to compare the impact of single vs. multiple dose of antibiotic in cholecystectomy in terms of post-operative infection related complications[13].

American Society of Health-System Pharmacists (ASHP) has published therapeutic guidelines on antimicrobial prophylaxis in surgery. The guidelines are intended to provide practitioners with a standardized approach to the rational, safe and effective use of antimicrobial agents for the prevention of surgical-site infections (SSIs) based on currently available clinical evidence and emerging issues. According to the guidelines, an antimicrobial agent should be active against the pathogens most likely to contaminate the surgical site, given in an appropriate dosage and at a time that ensures adequate serum and tissue concentrations during the period of potential contamination, safe and administered for the shortest effective period to minimize adverse effects, the development of resistance and costs[6].

Materials and method

This prospective study was conducted at Department of Surgery, at Patna Medical College and Hospital, Patna. The study was approved by institutional research and ethical committee. An informed and written consent was taken from all the participating subjects before the commencement of the study. The study was conducted over a period from January 2020 to May 2021.A total of 180 cases were included in this study with prior informed consent. The study was carried out over a time period of six months

The patients admitted for elective laparoscopic cholecystectomy were included in our study. patients with acute cholecystitis, associated choledocholithiasis, associated medical pathology like, diabetes mellitus, hypertension, cardiac /renal failure, ischeamic 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 randomly divided in two equal groups: single dose (SD) group and multiple dose (MD) group, comprising of 90 patients in each group. SD group was given ceftriaxone (2 gm) intravenously at the time of induction of anesthesia. Whereas, MD group was given ceftriaxone (2 gm) intravenously at the time of induction of anesthesia followed by ceftriaxone (1 gm) intravenously 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 swab was taken for microbial culture and antibiotic sensitivity and patients were given empirical antibiotic treatment. Data was was tabulated and was subjected to statistical analysis SPSS software for Chi-square test.

Results

Our study was completed with 180 patients between January-2019 and June-2019. The age range of the patients was from 22 years to 70 years, the mean age being 44±7 years. Out of total study group, 64 (35.6%) were male and 116 (64.4%) were female patients. Male: female ratio was (1:1.8). Demography and clinical features were comparable in both the groups studied.

Table 1: Complications in SD (n=90) group.

Type of SSI	Time of follow up.		
	2nd POD	After 1 Week	After 3 weeks
Fever	0	0	0
Surgical site redness / tenderness	0	2	0
Wound discharge	0	1	0
Wound gap	0	1	0
Wound abscess	0	0	0

Out of 90 patients of SD group, none of the patients was having any complaint till second post operative day. At one-week follow up, 2 (2.2%) patients presented with umbilical port site redness and tenderness and both were asymptomatic with anti-inflammatory drug. One (1.1%) patient was having wound discharge. Fluid swab was taken for microbial culture and antibiotic sensitivity. But he recovered with antibiotic treatment before the report of culture and sensitivity arrived. One (1.1%) patient developed wound gape. Daily dressing was done and empirical antibiotic started. The wound got healed on 14th post-operative day without the need of secondary suturing. At three-week follow up all patients were found asymptomatic (Table 1).

Table 2: Complications in MD (n=90) group.

Type of SSI	Time of follow up.		
	2nd POD	After 1 Week	After 3 weeks
Fever	1	0	0
Surgical site redness / tenderness	0	2	0
Wound discharge	0	0	0
Wound gap	0	0	0
Wound abscess	0	0	0

Out of 90 patients of MD group, 1 (1.1%) patient was having fever on first post-operative day. He recovered with antipyretic drug. At one-week follow up, 2 (2.2%) patients were having port-site redness and tenderness. Both of them recovered with anti-inflammatory drug. At three-week follow up none of them was having any signs of SSI (Table 2).

Discussion

Surgical site infection is a common problem associated with clean-contaminated and contaminated surgical procedures. SSI is an important factor in surgical outcome as it will lead to increased hospital stay, hospital cost and patient morbidity and mortality. To reduce the rate of SSI, with antibiotic prophylaxis in clean-contaminated and contaminated surgery, is an acceptable approach to make the surgical outcome better. But this approach is still ambiguous in clean surgery like LC.

As the prevalence of gall stone disease is considerably high in many parts of the world, cholecystectomy is a frequently performed procedure worldwide. Open cholecystectomy is associated with higher rate of SSI as compared to Laparoscopic Cholecystectomy. So advantage of antibiotic prophylaxis is well documented in open surgery, but query remains for Laparoscopic Cholecystectomy. Our study is to evaluate the impact of single dose vs. multiple dose antibiotics on SSI in elective laparoscopic cholecystectomy[14,15].

Cholelithiasis is more common in females in their 4th decade of life. In our study, 64.4% of the patients were females and the male: female ratio was 1:1.8 and the mean age of the patients was 44 years, which coincides with the findings of S.A. Abu-Eshy et al[16].

In our study, out of 90 patients who belonged to SD group, 4 (4.4%) patients developed post-operative complications: 2 (2.2%) of them were having port-site redness and tenderness, 1 (1.1%) patient was having wound discharge and 1 (1%) presented with wound gape at first week follow up. All of them were treated conservatively and at three week follow up all patients were asymptomatic. From the MD group, 3 (3.3%) patients were having post-operative complications: 1 (1.1%) patient was having fever and 2 (2.2%) patients presented with port-site redness and tenderness. All were treated conservatively and at three week follow up all of them were asymptomatic. The infection rate of our study correlates with that of Koc M et al, where they concluded that the rate of SSI after LC is 2-3%. In contrast, R. Chaudhary et al were having SSI rate as high as 12.76%, in their study, which is higher as compared to our SSI rate. This might be due to the fact that they had included both the open and laparoscopic cholecystectomy procedures in their study. Moreover, we have excluded, all patients with acute inflammation and any associated medical pathology, from our study[17,18].

In our study, the rate of SSI in SD group is 4.4% whereas that in MD group is 3.3%, which was analyzed using Chi-square test and the rate of infection in both the groups was found to be statistically insignificant ($p>0.05$). This suggests that single dose antibiotic is as effective as multiple dose antibiotics in terms of rate of post-operative SSI. Meijer WS et al conducted a randomized, controlled, double-

blind, multicenter trial and they did not find any significant difference between the one-dose and multiple-dose regimens in preventing post-operative wound infection which is in accordance to the conclusion of our study. In contrary, Abro A et al in their prospective randomized trial, concluded, that multiple doses of prophylactic antibiotic should be used instead of single dose in surgical prophylaxis in clean-contaminated and contaminated procedures. Waldvogel FA et al have suggested that SSI may be found even in clean surgery as numerous microbial factors play a role in that and antibiotic prophylaxis for not more than 24 hours is sufficient to prevent it as the critical period for the development of infection is short. So it is advisable that unnecessarily long post-operative antibiotic regimen should be avoided and hospital cost should be lowered with single shot antibiotic in clean and clean-contaminated surgeries[19-21].

Conclusion

The rate of post-operative SSI after single dose ceftriaxone (2 gm) intravenously at induction of anesthesia and multiple dose ceftriaxone (1 gm) intravenously post-operatively for two days in addition to peri-operative dose is comparable in elective cholecystectomy. Furthermore, hospital cost can be reduced with single dose antibiotic regimen. So single dose of ceftriaxone (2 gm) can be used safely in clean surgery like cholecystectomy.

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