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Role of prophylactic antibiotics in elective laparoscopic cholecystectomy surgical site infection

Authors
Jan Mohammad Rather, Javaid Iqbal, Sobia Manzoor

Abstract

Backgrounds: *Laparoscopic cholecystectomy is a widely used procedure. The use of prophylactic antibiotics in elective laparoscopic cholecystectomy is debatable. The aim of this study is to study whether prophylactic antibiotics could prevent surgical site infection after elective laparoscopic cholecystectomy and to identify any risk factors for surgical site infection.*

Methods: *This study included 300 patients undergoing laparoscopic cholecystectomy between January 2009 and May 2012. Group A patients (180) received third generation cephalosporin 1 g intravenously after induction of anesthesia, and group B patients (120) were not given prophylactic antibiotics. The surgical site infection rates of the patients were compared and analyzed among the two groups.*

Results: *The overall rate of surgical site infection was 1.69% for the total of 300 patients. The incidence of surgical site infection was similar for the two groups: 4 of 180 patients (2.22%) in Group A, 3 of 120 patients (2.5%) in Group B (p=0.913). All of the patients with surgical site infections were well treated under conservative treatments without any sequelae. The preoperative albumin level (p=0.027) contributed to surgical site infection.*

Conclusions: *Prophylactic antibiotics have no role for elective laparoscopic cholecystectomy except for patients with poor nutritional state.*

Introduction

Laparoscopic cholecystectomy (LC) Is the gold standard treatment for symptomatic gallstone disease.[1,2] The advantages of LC include less postoperative pain, shorter hospital stays, lower morbidity and mortality, and a lower rate of postoperative infection. Another benefit is the low rate of infective complications (0.4% to 1.1%), mostly occurring at the umbilical port site.3 Multiple studies conducted, have not been able to show any benefit of prophylactic antibiotics in low risk LC. Latest guidelines on surgical site infection (SSI) do not recommend prophylactic antibiotics in low risk elective LC.[4,5,6] But prophylactic antibiotics are still recommended for the high-risk group.

Matsui et al.[1,4] have claimed that underreporting of SSIs may have occurred in previous trials and prophylactic antibiotics should be recommended for LC to reduce SSIs. Recent updates have reported that SSIs are now the most common healthcare-associated infection (HAI), accounting for 31% of all HAIs among hospitalized patients[1,5]. Hence the role of prophylactic

antibiotics should be carefully analyzed and studied.

The aim of this study was to determine if prophylactic antibiotics could prevent surgical site infection after elective LC and to identify the high-risk group for SSI.

Materials and Methods

Medical records of 300 patients who underwent elective laparoscopic cholecystectomy were studied retrospectively between January 2017 and May 2020. Cases of gallbladder empyema or acute cholecystitis were excluded from the study. Diagnoses of patients included gallstones, chronic cholecystitis, gallbladder polyp, and adenomyomatosis. Thus, a total of 300 patients were evaluated and they were divided into two groups. Group A was from January 2009 to March 2011. During this period, patients received a routine administration of 1 g of third-generation cephalosporin intravenously after the induction of anesthesia. Prophylactic antibiotic was given only once for each operation. During period B, from April 2011 to May 2012, patients did not receive any prophylactic antibiotics. There were 180 patients in group A and 120 patients in group B. Data were analyzed between the periods.

Demographic data were collected for both groups, including age, gender, body mass index (BMI), American Society of Anesthesiologists score (ASA score), information on diabetes status, length of hospital stay, operative time, and gallbladder perforation during the operation. Clinical characteristics and perioperative results were compared between the two periods.

Preoperatively investigations include white blood cell count (WBC), hemoglobin, creatinine, cholesterol, albumin, aspartate aminotransferase (AST), alanine aminotransferase (ALT), and bilirubin.

LC was performed using 4-port placements in all cases. A transverse supraumbilical incision was made and a 10 mm camera port was introduced using a Veress needle. one 10mm in epigastric position. Two additional 5 mm working ports were placed under direct vision in the right subcostal and subxiphoid areas.

Examination for SSI was made until hospital discharge and again at the first postoperative visit. All patients were followed up within 7 days from the discharge in the outpatient department and again in 1 month. Postoperative SSIs were defined according to the CDC guidelines.[1,6] Superficial incisional SSI was defined to be an infection involving only skin and subcutaneous tissue of an incision within 30 days of the operation. Additionally, the patient needs to have at least one of the following: purulent discharge from the superficial incision, positive culture result, incision that is deliberately opened by an attending physician with positive culture result, or in cases of cultures not taken, showing signs of inflammation. In a case of SSI, the standard wound care was provided: including antibiotics, dressing, or drainage.

Statistical Analysis

Analysis was performed with the Statistical Package for Social Sciences version 20 (SPSS, Chicago, IL, USA)

Result

Demographic Characteristics

The mean ages of the patients were 50.1±10.8 years for group A and 52.6±12.3 years for group B (p=0.758). The gender ratio between the two periods showed similar characteristics with male to female ratios of 42.4%: 57.6% in period 1 and 43.2%: 56.8% in group B. The median body mass indices were 22.2 kg/m^2 (range, 18.1-32.1 kg/m^2) for group A and 22.9 kg/m^2 (range, 16.4-32.9 kg/m^2) for group B (p=0.866). Most patients in the study were of normal weight, in terms of the body mass index. To assess the severity of underlying conditions, the ASA score was used. In group A, 130 patients (70.9%) had a score of 1 and in group B, 88 patients (67.7%) had a score of 1. Most patients were in the normal healthy patient category. Only 2.2% in period 1 and 3.6% in period 2 had an ASA score of 3 and no patients had a higher ASA score. A comparison of the

baseline characteristics between the two periods showed no significant differences regarding age, sex, body mass index, and ASA score. The clinical characteristics between the two periods are summarized in.

Preoperative laboratory evaluation

WBC was used to evaluate the presence of an inflammatory condition prior to operation. The results showed a mean WBC of 6500.0±2629.7/ul in period 1, and 6517.6±1832.3/ul in period 2 (p=0.550). No obvious inflammation was present in both groups prior to operation. The mean values of preoperative laboratory results showed that patients were in normal healthy condition without anemia and renal insufficiency. The mean values for albumin and cholesterol also suggested that the patients in both group were in a good nutritional state. The results of AST and ALT values showed normal liver functions prior to operation and mean bilirubin level in both periods were within normal range. Preoperative laboratory results were compared between the periods and the results also showed no significant difference.

Postoperative Results

The mean length of hospital stay during group A was 2.0±1 days and 2.1±1. days for group B (p=0.882). The total operation time during the two periods was similar with 25.0±22.9 minutes for group A and 27.3±20.9 minutes for group B (p=0.154). Intraoperative gallbladder perforation also occurred at a similar rate in both periods (6.5% in group A and 6.4% in group b, p=0.764) Postoperative results did not show significant results between the two periods, including mean length of hospital stay, operation time and intraoperative gallbladder perforation.

Incidences of Surgical Site Infection

The incidences of SSIs are shown in Five (1.79%) patients developed SSIs during Group A and three (1.56%) in Group B. There was no statistically significant difference in the development of SSI between the periods (p=0.973). SSIs presented during both periods were superficial incisional. All patients, who developed SSIs, were well treated with conservative treatments.

Risk factors in development of surgical site infection

In a further search for risk factors associated with the development of surgical site infection, binary logistic regression analysis was also carried out. With surgical site infection as a dependent variable, only the albumin level showed a significant impact on surgical site infection (p=0.023). Nutritional state may play an important role in SSI. Antibiotic use was shown not to have a significant influence on SSI (p=0.913).

	Group A	Group B	P value
Age	50.1	52.6	0.758
Gender	78/102	48/72	0.86
Bmi	22.2	22.9	0.144
ASA			0.55
1	130	88	
2	45	29	
3	5	3	

	Group A	Group B	P value
Hospital stay (Days)	2.1	2.2	0.882
Ot (min)	25.0	27.3	0.154
Gb perf	17	12	0.764
Ssi yes	5	3	0.973
no	175	117	

	P value	Odds ratio
Antibiotic	0.913	0.920
Age	0.224	1.036
Sex	0.996	0.996
Bmi	0.708	0.956
Asa	0.815	0.836
Wbc	0.507	1.000
Hb	0.073	0.696
Alb	0.023	0.215
Ast	0.967	0.999
Alt	0.577	0.982
Bil	0.270	0.107
Diab	0.515	2.038

Discussion

Since the start, role of prophylactic antibiotics have been questioned because of low infection rates. Most of the randomized trials and their meta-analysis have concluded that low risk elective LC does not require prophylactic antibiotics.[3,4,5,6,7,8,9,10,11] Our study results concur with these previous trials, thus no benefit of prophylactic antibiotics was found. Despite much

evidence against use of prophylactic antibiotics in LC, a more recent RCT by Matsui et al.[14] has recommended three doses of perioperative antibiotics to reduce SSI in elective low-risk LC. That study emphasized a possibility of overlooked SSIs and inadequate statistical power as the reasons for its discrepancy with previous trials.[14] The underreporting of SSIs during follow-up should be carefully addressed in order to obtain a reliable data. Our data was collected from a single centre experience and the reporting of SSI properly followed the CDC guidelines to minimize underreporting. SSIs are defined to be infections occurring within 30 days of an operation for LC. The follow-up was scheduled in the outpatient department at postoperative 7 days and 1 month. In a case of complicated SSI, the patient would return to the outpatient department prior to the scheduled appointment and will be accounted for in the analysis. However, in a minor SSI, the case may have been underreported. This limitation may have influenced the incidences of SSI. To minimize the underreporting of the SSIs for future studies, it is essential to have a more systemic and specific internet-based data collection system.

Despite the controversy, current guidelines do not recommend use of prophylactic antibiotics in low risk LC, as based on the evidence from many RCTs. Nevertheless, prophylactic antibiotics are recommended for the high-risk group. In defining the high-risk group, both guidelines acknowledge bile spillage (intraoperative gallbladder rupture), conversion to laparotomy, acute cholecystitis, jaundice, pregnancy, immunosuppression, and placement of drain.[12,13], the high-risk factors for SSI are considered to be: emergency procedures, diabetes, long operative time, age >70 years, ASA score of 3 or higher, and an episode of cholecystitis within 30 days before the procedure. These discrepancies in the definition of a high-risk group should be addressed in further studies. Furthermore, our data have also shown nutritional state, in terms of albumin level, as a risk factor for SSI. The preoperative albumin level was similar between the groups, but patients with a higher preoperative albumin level were at a lower risk of SSIs. nutritional state is a possible risk factor in SSI for LC; thus further evaluation is warranted.

The main limitation of this study includes the lack of statistical power to overcome the type II error. Our study was based on a single centre experience with the intention of properly assessing SSIs to reduce underreporting and compensate for this limitation. Nevertheless, results of low SSI rates in both groups suggest that further study with a sufficiently powered sample size may have a limited value.[16] Many advances have been made in infection control practices. However, the most current definition of SSI by CDC states that SSI is now the most common HAIs, which accounts for 31%.[15] Surveillance of SSI has been emphasized in the reduction of SSI risk. With the new CDC guideline on SSI expected soon, definition and surveillance protocol for SSI are being updated. With recent modifications in surveillance of SSI and more awareness, a more refined classification is recommended in the effort to reduce SSIs.

In conclusion, we could not find a benefit of prophylactic antibiotics on surgical site infection in laparoscopic cholecystectomy. SSIs were not associated with an increase in length of hospital stay and patients were well treated with conservative care in the outpatient department. Prophylactic antibiotics are not necessary for elective LC, but patients in poor nutritional state with low albumin level should consider prophylactic antibiotics.

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