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Original Research Article

Comparative study of single dose preoperative antibiotics versus both preoperative and postoperative antibiotics in laparoscopic appendicectomy for nonperforated appendicitis

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ABSTRACT

Background: Antibiotics are being administered both preoperatively and postoperatively even in uncomplicated nonperforated appendicitis. Studies regarding role of postoperative antibiotics in laparoscopic appendicectomy for nonperforated appendicitis are sparse. The aim of the study is therefore to study the efficacy of single dose preoperative antibiotics versus both preoperative and postoperative antibiotics in reducing surgical site infection in laparoscopic appendicectomy for uncomplicated nonperforated acute appendicitis.
Methods: This is a prospective study done in general surgery department at Malla Reddy institute of medical sciences from September to April 2016.162 patients with nonperforated appendicitis were randomly allocated into two groups. 80 patients in Group A were given single dose of preoperative prophylactic antibiotics. No further antibiotics were given. 82 patients in Group B were given both preoperative and postoperative antibiotics. Postoperative surgical site infection and duration of postoperative hospital stay were compared between both groups. Statistical analysis was done using ANOVA, Fisher's Exact test and Chi-square test wherever necessary.
Results: There was no significant difference in the rate of surgical site infection in both groups. The mean duration of postoperative hospital stay was shorter in preoperative antibiotics only group (Group A). Age and gender had no significant association with surgical site infection. There was no deep incisional or organ space infection in this study.
Conclusions: Single dose prophylactic antibiotics would be sufficient in cases of laparoscopic appendicectomy for simple uncomplicated nonperforated acute appendicitis. Postoperative antibiotic administration would not be necessary in these cases.

Keywords: Acute appendicitis, Laparoscopic appendicectomy, Nonperforated, Prophylactic antibiotics

INTRODUCTION

Acute Appendicitis is common surgical emergency. Appendicectomy is a clean contaminated surgery.[1,2] Rate of wound infection in nonperforated appendicitis is less than 5% to less than 10% after open appendicectomy and even less after laparoscopic appendicectomy.[3-7] Prophylactic antibiotics are recommended in appendicectomy.[3,4,8] Studies reported that postoperative antibiotics may not be needed in nonperforated appendicitis.[4,8,9] But due to fear of development of infection, antibiotics are being administered both preoperatively and postoperatively even in uncomplicated nonperforated appendicitis. This can increase financial burden and emergence of resistant microbes.[10] Studies on the role of single dose preoperative antibiotics without postoperative antibiotics in laparoscopic appendicectomy are sparse. The aim of the study is therefore to study the efficacy of single dose preoperative antibiotics versus both preoperative and postoperative antibiotics in

reducing surgical site infection after laparoscopic appendicectomy for uncomplicated nonperforated acute appendicitis.

METHODS

This is a prospective study at Malla Reddy institute of medical sciences in general surgery department from September 2016 to April 2017. Patients with simple uncomplicated nonperforated acute appendicitis above 18 years of age undergoing laparoscopic appendicectomy were included in the study. Study was approved by institutional human ethics committee.

Informed consent for the study was obtained from patients. Exclusion criteria were patients with perforated appendicitis, appendicular abscess or mass, gangrenous appendicitis, diffuse peritonitis, presentation more than 48 hours from the onset of symptoms, immunocomprised, comorbidities like diabetes, heart, lung, renal, liver disease, local or generalized infection before surgery, currently taking antibiotics for other ailments, drug allergy, on chemotherapy and steroid therapy, malnutrition, anaemia, American society of anesthesiologists (ASA) score 2 and more, patients who already received antibiotics prior to admission, duration of surgery more than 2 hours, body mass index (BMI) greater than 25, laparoscopic converted to open surgery, pregnancy.

Clinical diagnosis of acute appendicitis was made based on history and physical examination. All necessary investigations were done including ultrasound abdomen. Patients were considered to have simple uncomplicated nonperforated acute appendicitis when the symptoms were less than 48 hours duration and no evidence of perforation on imaging and intraoperative findings as mentioned in literature though final confirmation was obtained by histopathological examination.

All necessary uniform guidelines of aseptic precautions and management were followed. Operative area was cleaned with Povidone iodine and surgical spirit.

The duration of symptoms was recorded from time of onset of symptoms according to the patient until surgery. Patients were given single dose of prophylactic preoperative antibiotics intravenously Cefotaxime (1gm) and Metronidazole (500 mg) half an hour before skin incision for port placement. Laparoscopic appendicectomy was done using three port technique, one 10 mm port subumbilicus and two 5mm ports at suprapubic and left lower quadrants. Mesoappendix was resected with electrocautery. Appendix was ligated with chromic catgut endoloop and removed from umbilical trocar site which is then closed with 2-0 Vicryl and skin with 3-0 Ethilon.

No drain was inserted in these cases. Patients with nonperforated appendicitis diagnosed intraoperatively were randomly allocated by opening sealed envelopes into two groups, Group A and Group B. Group A patients were given single dose of prophylactic preoperative antibiotics intravenously Cefotaxime (1gm) and Metronidazole (500mg) half an hour before skin incision for port placement. No further antibiotics were given in Group A. Group B patients were given single dose of prophylactic preoperative antibiotics intravenously Cefotaxime (1gm) and Metronidazole (500mg) half an hour before skin incision for port placement and were given further one dose of Cefotaxime (1gm) and two doses of Metronidazole (500mg) intravenously within 24 hours after surgery, further doses of Cefotaxime (1 gm) 12^{th} hourly and Metronidazole (500 mg) 8^{th} hourly intravenously were given over next 24 hours. Then these participants in group B were given antibiotics Tab Cefpodoxime (200mg) 12^{th} hourly and Tab Metronidazole 400 mg 8^{th} hourly orally for 5 days. No blinding was done during the study.

Appendix specimen was sent for histopathological examination. Primary outcome was surgical site infection. Patients were monitored in postoperative period. Temperature chart was maintained. Wound dressing was opened after 48 hours and examined for any signs of surgical site infection as defined by Centers For Disease Control and Prevention (CDC) with features of erythema, local edema, fever or discharge of pus that requires surgical drainage. Patients were discharged when they were afebrile (less than37.5 degrees Celsius), had no signs of wound infection, fully mobilized, could tolerate normal oral diet following return of bowel activity, had adequate pain relief with oral analgesics. If patient was discharged, follow up was done on 5^{th} postoperative day. Suture removal was done on 7^{th} postoperative day. In cases of wound infection, swab for culture and sensitivity was sent to microbiology lab. Further follow up was done in all cases for a minimum period of 30 days. Secondary outcome was duration of postoperative hospital stay.

Statistical analysis

Statistical analyses were done using IBM SPSS Statistics version 17.0. Values were presented as mean ± standard deviation or percentages. ANOVA Test was used. Fisher's Exact test and Chi-square test were used wherever necessary. p value of less than 0.05 was considered statistically significant.

RESULTS

In this study, 202 patients were considered for the study. Exclusion of patients was done based on exclusion criteria and due to alternate intraoperative diagnosis. Patients after random allocation were excluded when patients withdrew from study and had alternate diagnosis on final histopathological examination. Finally of 162 patients, 80 patients were in Group A (preoperative antibiotics only) and 82 patients in Group B (both preoperative and postoperative antibiotics) (Figure 1).

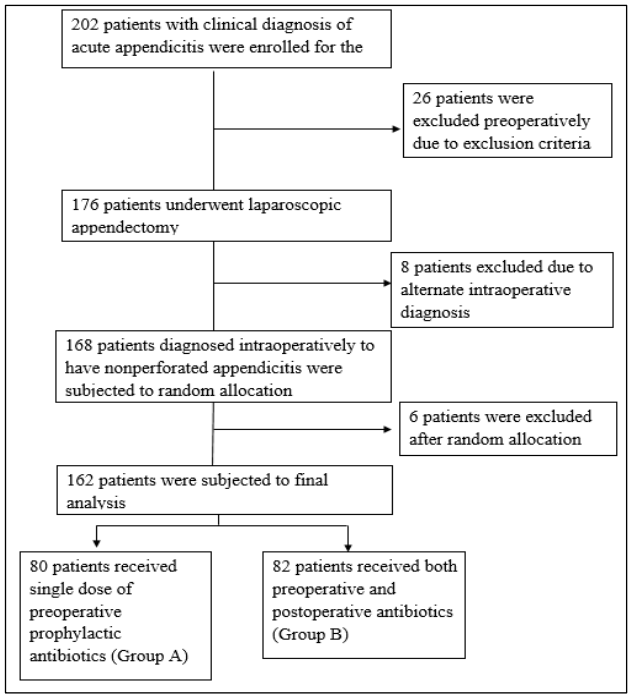

Figure 1: Flowchart of patients in study.

Patients included were in the age group of 20-34 years with no significant difference in age between both groups. Both the groups were comparable with respect to baseline characteristics (Table 1). The rate of surgical site infection in group A was 2.5% and in group B was 3.6% and the difference was not statistically significant (p=0.6705; Chi Square test) (Figure 2).

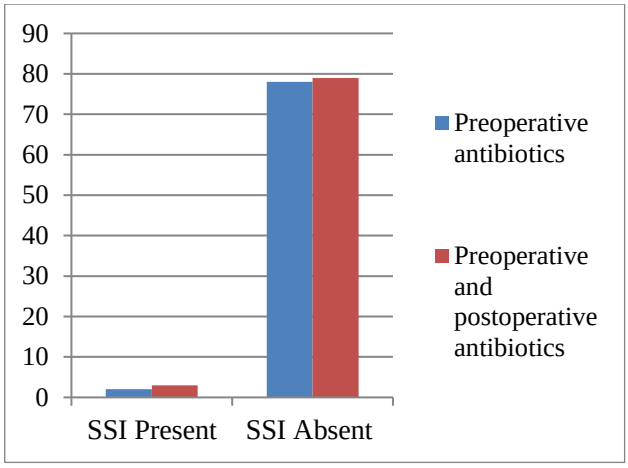

Figure 2: Rate of surgical site infection (SSI) in Group A (preoperative antibiotics only) and Group B (both preoperative and postoperative antibiotics).

All the patients with wound infection were superficial surgical site infections detected on 3rd-5th postoperative day and managed by daily normal saline dressings, swab for culture and sensitivity was sent though empirical treatment was given with antibiotics like Amoxicillin Potassium Clavulanate, Metronidazole orally. Wound infection in all cases resolved within 4-6 days and healed by secondary intention. No deep incisional or organ space infection or intraabdominal abscess was found in this study. There was no perioperative mortality.

Table 1. Characteristics of patients in Group A and Group B.

Characteristic	Group A	Group B	p value
Age (in years)	23.575±4.181	22.9634±3.4191	0.3091
Gender (Male:Female)	44 (55): 36 (45)	47 (57.3): 35 (42.7)	0.7663[a]
Body mass index (BMI) (Kg/m^2)	22.21±1.4643	22.39±1.4636	0.4351
White blood cell (WBC) count (cells per cubic mm)	12459.625±743.5877	12402.683±649.3321	0.6041
Duration between onset of symptoms and surgery (in hours)	21.05±6.91	20.10 ±6.75	0.3774
Timing of prophylactic antibiotic before surgery (in minutes)	29.93 ±2.0273	29.878 ±1.1043	0.8391
Duration of operating time (in minutes)	44.1875±7.5659	3.8415±7.2987	0.7674

Values are presented as mean±standard deviation, number (%); Statistical analysis: ANOVA Test; Gender: [a] Chi square test, Group A: Single dose preoperative antibiotics only Group B: both preoperative and postoperative antibiotics.

Table 2: Comparison of outcomes of Group A and B.

	Group A (n=80)	Group B (n=82)	p value
Surgical site infection (SSI)	2 (2.5)	2 (3.6)	0.6705[a]
Superficial incisional SSI	2 (2.5)	3 (3.6)	0.6705
Deep incisional SSI	0 (0)	0 (0)	
Deep/organ SSI	0 (0)	0 (0)	
Duration of postoperative hospital stay (in days)	3.4875 ±1.079	4.12±1.2809	0.009[b]

Values are presented as mean ± standard deviation, number (%). [a] Chi square test; [b] ANOVA, Group A: n Single dose preoperative antibiotics only Group B: both preoperative and postoperative antibiotics.

The mean duration of postoperative hospital stay was 3.4875±1.079 in group A and in group B was 4.12±1.2809 and the difference was found to be significant (p= 0.009; ANOVA Test) (Table 2). There was no significant association of surgical site infection with respect to age (p= 0.7094; Chi square test) and gender (p=1.00; Fisher's Exact test).

DISCUSSION

Surgical site infection is most common complication after appendicectomy.[3,4] Standard criteria for surgical site infection were defined by Centres For Disease Control and Prevention (CDC).[11] Antimicrobial prophylaxis is recommended in clean contaminated cases.[4,8] Prophylactic antibiotic is effective when administered at appropriate time and dosage before incision so that therapeutic tissue levels are reached.[4,8]

In this study, there was no statistically significant difference in the rate of surgical site infection in Group A and Group B. Similar findings were observed in studies by Choi et al, Le et al.[12,13] In this study there was no significant difference in wound infection with respect to age and gender and this was also found in Choi et al study.[12] In this study, the mean duration of postoperative hospital stay was longer in group B than in group A and the difference was statistically significant. Similar finding was observed in Choi et al, Coakley et al studies.[12,14] But there was no significant difference in postoperative hospital stay between both groups in Hussain et al study.[15]

There are not many studies that studied the efficacy of single dose prophylactic antibiotics in patients undergoing laparoscopic appendicectomy only as most of the studies included open or both open and laparoscopic procedures together. So, this study has included only laparoscopic appendicectomy cases for better understanding of the efficacy of single dose prophylactic antibiotics in these cases.

Laparoscopic appendicectomy is being widely preferred due to advantages like shorter postoperative hospital stay and less wound infection than open appendicectomy.[16-19] Prophylactic antibiotics are recommended in nonperforated appendicitis in many studies.[8,20-22] But the practice of administration of antibiotics postoperatively could result in antibiotic related complications following prolonged antibiotic use.[14,23]

However, prophylactic antibiotic administration is no substitute for good surgical technique with established surgical principles.[4] Moreover postoperative antibiotic administration was not found to reduce infectious complications but could increase antimicrobial resistance and hence may not be beneficial in nonperforated appendicitis.[9,24] Although many studies recommended prophylactic antibiotics, only few studies mentioned that single dose of preoperative antibiotic could reduce postoperative wound infection in nonperforated appendicitis.[9,12,13,25] Medical expenses due to postoperative antibiotics usage, longer hospital stay and risk of antibiotic related complications may be unnecessary.

Postoperative antibiotics in nonperforated appendicitis were not found to decrease surgical site infection but increased cost of care.[12-14] Apart from efficacy and safety, cost effective antimicrobial prophylaxis can be considered by collaborative work in institution to minimize or eliminate postoperative dosing.[26] In this study, postoperative antibiotics in addition to preoperative antibiotics in nonperforated appendicitis did not show any added advantage in reducing wound infection when compared to single dose preoperative antibiotics only. Therefore, single dose preoperative prophylactic antibiotics without any further postoperative antibiotics could be preferred in uncomplicated nonperforated appendicitis.

However, this study has limitations as the study population is small, hence further large-scale studies are needed to establish standard protocol of antibiotic usage.

CONCLUSION

Single dose prophylactic preoperative antibiotics would be sufficient in cases of laparoscopic appendicectomy for simple uncomplicated nonperforated acute appendicitis. Postoperative antibiotic administration would not be necessary in these cases.

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