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Efficacy of single shot preoperative antibiotic dose in laparoscopic appendicectomy for simple nonperforated acute appendicitis

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Abstract
Background: Acute appendicitis is one of the most common acute surgery events and its main treatment is surgery. But medical management before and after surgery has important role in the treatment. Antibiotics are being administered both preoperatively and postoperatively even in simple non-perforated acute appendicitis.
Aim: To evaluate the efficacy of single shot preoperative antibiotic versus both preoperative and postoperative antibiotics in laparoscopic appendicectomy for simple non-perforated acute appendicitis.
Methods: This is a prospective study done in department of general surgery at KVG medical college and hospital, sullia. Study done on 50 patients undergoing laparoscopic appendicectomy for simple non-perforated acute appendicitis. Study period between June 2017-june 2019. First group received one dose of intravenous antibiotic preoperatively (ceftriaxone 1gram and metronidazole 500miligram), 1 hour prior to surgery and other group received antibiotics both preoperatively and Postoperatively.
Results: There were no significant statistical difference in rate of surgical site infection in both the groups.
Conclusion: A single preoperative antibiotic dose is sufficient in patients with simple non-perforated acute appendicitis patients undergoing laparoscopic appendicectomy.

Keywords: appendicectomy, appendicitis, nonperforated, surgery

Introduction

- Acute Appendicitis is the most common abdominal disease and requires surgical interventions, with lifetime risk of 6-20%.1.
- Appendicectomy is a clean contaminated surgery.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
- Studies reported that postoperative antibiotics may not be needed in nonperforated appendicitis.
- But due to fear of development of infection, antibiotics are being administered both preoperatively and postoperatively even in uncomplicated nonperforated appendicitis and this can increase financial burden and emergence of resistant microbes.

Aims and Objectives

- 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.

Methodology

- This is a prospective comparative study at KVG Medical college hospital, Sullia, in general surgery department from june 2017 to june 2019.
- Sample size-50
- Study was approved by institutional human ethics committee.
- Informed consent for the study was obtained from patients

Selection criteria

- Inclusion criteria-Patients with simple uncomplicated nonperforated acute appendicitis above 18 years of age undergoing laparoscopic appendicectomy were included in the study.
- Exclusion criteria-patients with perforated appendicitis, appendicular abscess or mass, gangrenous appendicitis
- 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 Ceftriaxone (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 ceftriaxone (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 Ceftriaxone (1gm) and two doses of Metronidazole (500mg) intravenously within 24 hours after surgery, further doses of Ceftriaxone (1 gm) 12th hourly and Metronidazole (500 mg) 8th hourly intravenously were given over next 48 hours. Then these participants in group B were given antibiotics Tab Cefixime (200mg) 12th hourly and Tab Metronidazole 400 mg 8th 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 5th postoperative day. Suture removal was done on 7th 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

Observations and Results

- In this study, 50 patients were considered for the study.
- Exclusion of patients was done based on exclusion criteria and due to alternate intraoperative diagnosis.
- Finally of 50 patients, 25 patients were in Group A (preoperative antibiotics only) and 25 patients in Group B (both preoperative and postoperative antibiotics).

Table 1

Characters	Group A	Group B	P value
Age in years	23.5±4	22.9±3	0.3
Gender (Male: Female)	13:12(52: 48)	14:11(56: 44)	0.9
BMI(Kg/m2)	22.2±1	22.3±1	0.4
WBC count in cumm	12459.6± 7	12402.6± 6	0.6
Duration between onset of symptoms and surgery (in hours)	21 ±6	20 ±6	0.3
Timing of prophylactic antibiotic before surgery (in minutes)	29.2±3	29.8±1	0.8
Duration of operating time (in minutes)	44.1±1	43.8±7	0.7

- 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 2

Character	Group A	Group B	P value
Surgical site infection	2(25)	3(25)	>0.005
Post-operative hospital stay	3.4±1	4.1±1	0.0009

- 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).
- 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).

Table 3

Pathology	Group A	Group B	P value
Normal	1(4%)	2(8%)	
Inflammatory	6(24%)	5(20%)	0.3
Suppurative	18(72%)	17(68%)	

- 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 Amoxiclav and 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.

Discussion

- Laparoscopic appendectomy is a widely performed technique due to many advantages, including smaller surgical wound and faster recovery than open appendectomy [10-12].
- Since patients receiving this surgery have shorter hospital stays and faster return to work, SSI, such as wound infection, can substantially affect the outcome of patients. Thus, many studies have been conducted to reduce the risk of SSI12. Although it has been shown that administration of prophylactic antibiotics lowers the risk of SSI, debates are underway on whether postoperative antibiotics have any efficacy and for how long they should be administered.
- Moreover, there is only a few data on this issue.
- 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).9
- 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.
- Therefore, the use of postoperative antibiotics in uncomplicated appendicitis did not show any clinical benefit in our study.
- Furthermore, longer hospital stays and more expensive medical costs incurred by these procedures may not be necessary.
- These results are not much different from other studies; however, the studies we mentioned above enrolled patients who underwent open appendectomy and patients who underwent laparoscopic appendectomy, and did not compared the two groups separately.
- This study enrolled only patients who underwent laparoscopic appendectomy, which may be meaningful in that we can analyze how the administration of antibiotics affect the outcome of patients undergoing laparoscopic appendectomy, regardless of other variables made by the surgery type.
- Study conducted by le *et al*1 compared 321 patients received both pre and postoperative antibiotics whereas 186 patients received only preoperative antibiotic and observed that there is no significant association with postoperative antibiotic therapy with SSI which is consistent with the present study.
- Study conducted by Himabindu *et al*. 15 compared where 82 patients received only preoperative antibiotic and 80 patients received both preoperatve and postoperative antibiotics observed that there is no significant association with postoperative antibiotic therapy with SSI which is consistent with the present study.
- 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.9,13
- Although many studies recommended prophylactic antibiotics, only few studies mentioned that single dose of preoperative antibiotic could reduce postoperative wound infection in nonperforated appendicitis. 9,13
- Medical expenses due to postoperative antibiotics usage, longer hospital stay and risk of antibiotic related complications may be unnecessary.

Limitations

- Study population is too small, hence further large-scale studies are needed to establish standard protocol of antibiotic usage.
- Postoperative antibiotics in nonperforated appendicitis were not found to decrease surgical site infection but increased cost of care.
- Apart from efficacy and safety, cost effective antimicrobial prophylaxis can be considered by collaborative work in institution to minimize or eliminate postoperative dosing.14
- 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.

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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