JKBMS, Vol.2, No.1, P.1-5, 2016 https://doi.org/10.56056/amj.2016.09

Comparison between single dose preoperative and postoperative effect of antibiotics in reduction of post appendectomy complications

***Baderkhan Saeed Ahmed, Sabah Jalal Sherif*, Botan Abdul Kadir Ali ***

Abstract

Background and objectives: Acute appendicitis is one of the most common surgical emergency conditions. This study was done to clarify the effect of antibiotics in reducing post appendectomy complications after open and laparoscopic appendectomy in patients with non-perforated appendicitis. **Methods:** This is a randomized controlled trial. Three hundred and twenty one patients, who underwent appendectomy for non-perforated appendicitis and fulfilled the selection criteria, were randomly divided into two groups. The patients in group A received double dose of pre-operative and postoperative antibiotics (third generation cephalosporin and metronidazole), while the group B patients received one dose of the same antibiotics pre-operatively. Patients of both groups were followed-up for 30 days to assess postoperative infective complications. **Results:** Group A had 133, while group B comprised of 188 patients. The groups were comparable in the baseline characteristics. Statistically there was no significant difference in rates of localized wound complications between both groups ($p = 0.4713$). Mean hospital stay was 2.1 ± 0.73 and 2 ± 0.48 days for group A and B respectively **Conclusions:** Single dose of pre or post-operative antibiotics (third generation cephalosporin and metronidazole) was sufficient in reducing the wound related complications after appendectomy for non-perforated appendicitis.

Keywords: Acute appendicitis, pre & post-operative antibiotic, histopathology of appendix, wound infection.

Introduction

Acute appendicitis (AA) is the most common cause of acute surgical emergency, and appendectomy is among the most frequently performed emergency operation[1-2].

With the discovery of antibiotics and their introduction into clinical practice in 1940s, it had appeared at that time to every surgeon that the abolition of surgical sepsis was about to be achieved, but this was not the case, and throughout 1950s and 1960s antibiotic prophylaxis largely fell into disrepute, not only did it frequently fail, but there were suggestions that infective complications of surgery were increased by giving antibiotics. The use of prophylactic antibiotics in non-perforated appendicitis has been questioned by many authors, because of the relatively minor degree of bacterial inoculation in these patients and the relatively low incidence of infection[3].

Early and accurate diagnosis is essential to prevent morbidity and mortality related to appendicitis. According to available statistics, 1 out of 5 cases of appendicitis is misdiagnosed whereas a normal appendix is found in 15-40% of patients who undergo an emergency appendectomy.

The diagnosis of appendicitis is clinical and essentially is based on history, clinical examination and routine laboratory tests[4].

Cases of non-perforated appendicitis (NPA) are categorized as clean contaminated operations. Several studies have proved the efficacy of pre-operative prophylactic antibiotics in reducing the postoperative infective complications after appendectomy[5-8].

Therefore, virtually all the patients undergoing appendectomy in our hospital are given pre-operative prophylactic antibiotics; however, the role of postoperative antibiotics in reducing the infective complications in NPA is still controversial[9-11].

The practice of prescribing postoperative antibiotics varies enormously around the globe and no consensus exists on whether postoperative antibiotics are beneficial for preventing infective complications in NPA. Therefore, this trial was conducted to determine the role of postoperative antibiotics in reducing the surgical site infections (SSIs) and intra-abdominal abscess formation after open appendectomy in patients with NPA, and to define the uniform guidelines in the management of these patients in our institution[12-13].

Despite the success of conventional appendectomy,

*Hawler medical university, College of Medicine, Department of Surgery.

there is still the problem of wound infection and length of hospital stay. This is consistent with previous publications. Wound infections though may not beserious complications but represent a major problem to the patient's quality of life[14].

The use of prophylactic antibiotic therapy during operative procedure is a Controversial issue, especially in the clean or clean-contaminated procedures. The efficacy of antibiotic prophylaxis in acute appendicitis has been examined in several trials have shown that prophylactic antibiotic therapy can significantly reduce the risk of surgical site infection in non-perforated appendicitis compared with placebo[15].

Despite improved surgical techniques, postoperative complications including wound infection and intra-abdominal abscess still account for a significant rate of morbidity. It has been shown that antibiotic prophylaxis is effective in prevention of postoperative complications in appendectomies patients, whether the administration is given pre-, periorpost-operatively. Without any pre- or perioperative antibiotic prophylaxis, wound infection rates in patients undergoing appendectomy are 10% or more when the appendix is normal, increasing to 30% when the appendix is phlegmonous or gangrenous, Metronidazole is among the most effective drugs against anaerobic organisms and has been widely used either parenterally or intrarectally in appendicitis[16].

In patients with non-perforated appendicitis, the use of prophylactic antibiotics has been questioned in some studies, however, a large number of reports 28–32 indicate that, without prophylaxis, the infection rate is significant, and ranges from 10% to 20%15. Surgical site infection could complicate 1-5% of appendectomy cases16. Surgical site infections (SSI's) account for approximately 15% of nosocomial infections and are associated with prolonged hospital stays and increased costs[17].

We found that the overall wound infection rate after Appendectomy in non-perforated cases of appendicitis can be reduced from 8.3% in an untreated control group to 2.5% with a single preoperative cefoxitin dose [3].

Patients and methods

This is a randomized controlled trial carried out in the general surgical department, of emergency hospital in Erbil city.

All patients who underwent either an open or laparoscopic appendectomy for acute appendicitis were identified.

Appendectomy was performed by the standard operating techniques whether by open or laparoscopy. Surgeries were performed by surgical trainees or consultants or both. Informed consent has been taken from all the patients.

According to Antibiotic usage, we divide the patient in to two groups; group A are those patients with 2 dose of antibiotic in relation to the operation (i.e. First dose either pre-operative or intra operatively and the second dose 24 hour post-operatively). Similarly group B are those with single dose pre operatively or with the induction of anesthesia.

The antibiotics used were mainly third generation cephalosporin directed against gram-negative organisms and metronidazole-covering anaerobes.

In all patients, both groups (A and B) antibiotic treatment were given intravenously according to the weight/kg dosage efficacy of both cephalosporin and metronidazole drug, presumed by test for allergy.

The patients were divided into three main groups based on the intra-operative state of the appendix. Patients who had simple (catarrhal/inflamed) appendicitis were categorized as Group 1.

Similarly, those who had a gangrenous, purulent, necrotic appendix were placed into Group 2 as 'severe' appendicitis. Patients with a normal appendix at operation were included in a separate group (group 3), perforated appendicitis, and complicated appendix as abscess and mass were excluded from the study. Immuno-compromized patients, diabetes mellitus and pregnant patients were also excluded.

The entire specimen sent for histopathological study. If there was a discrepancy between the surgeons' findings and the pathology report, the state of appendix documented in the pathology report was used in data analysis.

Patients were discharged when they were fully mobilized, afebrile, could tolerate normal diet, with evidence of normal bowel activity and had adequate pain control on oral analgesics.

On discharge, the patients were booked for follow-up visit in surgical clinic and on 10th postoperative day for removal of stitches and wound assessment. They were also advised to report immediately to the emergency department of the hospital in case of fever, tenderness or pus discharge from the wound. Second follow-up visit was arranged after a month of surgery. Surgical site infection was defined as pus discharge from the wound that necessitated wound opening and drainage. Intra-abdominal collection was defined as the fluid collection inside the peritoneal cavity con-

firmed by ultrasound or computed tomography that required drainage. All the infected wounds were managed by laying open the wound, wound toilet with normal saline, and loose packing of the wound followed by secondary closure or healing by secondary intention.

The data regarding the demography, duration of symptoms, temperature and white cell count on admission, duration of surgery, operative findings, postoperative antibiotics, hospital stay, and complications were collected on the proformance and tabulated into Microsoft Office Excel 2010 for the calculation of mean values and standard deviation. Student's t-test was used to compare the continuous variables and categorical variables were compared by chi-square test. The p value of ≤ 0.05 was considered as statistically significant.

Results

During the study period, 486 patients were admitted with the clinical diagnosis of acute appendicitis for open and laparoscopic appendectomy. Sixty seven patients were excluded from the sample because of pre-defined exclusion criteria, six patients also excluded because of allergy reaction to antibiotic.

Ninety two patients failed to report for follow-up, were also excluded from the study.

Finally, 321 patients were subjected to statistical analysis. These patients ranged in age from 10 years to 53 years (mean age 26.35 years), with 197 males and 124 females, 133 patients belong to group A with double dose antibiotics and 188 patients are group B. The number of patients in each group, according to the state of the appendix at operation is shown in Table 1.

Table (1): Frequency distribution of complications by state of appendix at operation.

State of appendix at operation	Groups	No. of patients (%)	No. of complications (%)
Catarrhal/inflamed	1A	48(36.1)%	2(1.5)%
	1B	79(42)%	3(1.6)%
Gangrenous/necrosis	2A	74(55.6)%	5(3.8)%
	2B	94(50)%	7(3.7)%
Normal	3A	11(8.3)%	0
	3B	15(8)%	0
Total	**A**	**133**	**7(5.2)%**
	B	**188**	**10(5.3)%**

The majority of the patients had severe appendicitis (55.6% and 50% - Group 2A and B) and this was followed by patients with simple appendicitis (36.1% and 42% - Group 1 A and B) respectively. The incidence of negative appendectomy was very small in this series (8.3% - 8% in Group 3). Patients belonging to Group 3 were excluded from some of the analyses as there were no post-operative complications amongst them.

The overall complication rate was 5.3 %(17/321 patients), 5.2% and 5.3% in group A and B respectively ($p<0.001$). And the type of complications which were occurred in both groups was shown in Table 2.

Table (2): Frequency distribution of complications by groups.

Complications		Group A1	Group A2	Group B1	Group B2	.Total no
Local	Wound infection	1	3	1	2	7
	Hematoma		1	1		2
	Seroma		1	1	1	3
Abdominal	Paralytic ileus	1			1	2
	Abscess				1	1
Systemic	Sepsis				1	1
	Chest infection				1	1
Total		**(5.2%)7**		**(5.3%)10**		**17**

The majority of complications were in group 2 (5/7 patient complications in group A 3.8% (p=0.3) and 7/10 patient complications in group B 3.7% (p=0.2) and the type of complications whether it's local, abdominal or systemic, the majority of them were wound related complications 6 patients 4.5% (p=0.2) in group A and 6 patients 3.2% in group B (p=0.2). One patient in group A developed abdominal complication (0.8%) as paralytic ileus. Two patients in group B developed abdominal complications (1.1%) in form of paralytic ileus which re admitted to hospital and managed conservatively and one as pelvic abscess which suspected clinically and confirmed by ultrasound and CT scan and treated conservatively. Two patients develop systemic complication as sepsis and chest infection in group B (1.1%) and both patient were heavy smoker.

Statistically, there was no significant difference between mean age, duration of symptoms, admission WBC count and duration of surgery between the groups. Mean hospital stay was 2.1 ± 0.73 and 2 ± 0.48 days for group A and B respectively (p = 0.4713). There was no perioperative mortality amongst our patients during this study period.

Discussion

Prophylactic antibiotics must be administered to the patient within 1 hour prior to surgical incision. Prophylactic antibiotics must be discontinued within 24 hours from the end of surgery. Several studies have tried to find out the utility of prophylactic antibiotics in surgery. A wide variety of antibiotics, either singly or in combination, have been valuated. With regards to surgical prophylaxis, the data from these studies support several recurring themes: A single preoperative dose of antibiotic is as effective as a 5-day course of postoperative therapy assuming an uncomplicated procedure[18-22].

Despite improved surgical techniques, post-operative complications including wound infection and intra-abdominal abscess still account for a significant rate of morbidity. It has been shown that prophylactic antibiotic is effective in prevention of postoperative complications in appendectomies patients, whether the administration is given pre-, peri or post-operatively. There is variation in the incidence of post-operative infection for non-perforated appendicitis, ranging from 0 to 11.7%. These discrepancies could be attributed to differences in the number of patients, type of antibiotics used, follow-up duration and definition of wound infection. In the current study, wound infection rate was between 5.2 to 8.2% which is consistent with previous studies.

In the present trial, there was no intra-abdominal abscess or collection. Which is consistent with a previous study, our findings showed that a single dose of prophylactic antibiotic is enough to prevent infective complications following open appendectomy for non-perforated appendicitis. Furthermore, our results are supported by recent randomized controlled trials, showing that even in complicated appendicitis; prolonged use of antibiotics did not decrease the rate of postoperative infective complications.

Small number of included patients was regarded as a limitation of the present study. Therefore, conducting larger trials may be required to detect significant differences among treatment arms, if any. Taken together, a combined single dose of metronidazole and ceftraixone preoperatively appears to be sufficient to prevent surgical site infections in patients with uncomplicated appendicitis. We recommend that preoperative antibiotic prophylaxis be administered to all patients undergoing appendectomy.

We found that the overall wound infection rate after appendectomy in non-perforated cases of appendicitis can be reduced from 8.3% in an untreated control group to 2.5% with a single preoperative cefoxitin dose. However, regarding intra-abdominal abscess formation, no significant difference was found between the groups[23].

Although one cannot strictly compare the results from these studies and the present study, we conclude that the present study establishes the value of a preoperative single dose antibiotic against both anaerobic and aerobic organisms in reducing the incidence of wound infection to a minimum after appendectomy in non-perforated cases.

Single dose cefoxitin given before operation seems to be sufficient and not inferior to postoperative antibiotic treatment in preventing wound infection-after appendectomy for gangrenous appendicitis. Cefoxitin is well-tolerated, and no side effects were seen in our 485 patients. We recommend a dose of 2 g Cefoxitin before appendectomy.

Conclusions

Single dose of pre-operative antibiotics (cefuroxime and metronidazole) was sufficient in controlling the SSIs after appendectomy for NPA. Postoperative

antibiotics did not add an obvious clinical benefit in these patients. Therefore, surgeons need to update their practice of antibiotic prophylaxis according to the standard guidelines and evidence based medicine.

References

1. Al-Mefreji KA. Antibiotics prophylaxis in non-perforated appendicitis a prospective study. Al-Kindy Col Med J. 2005;3 (1) P:51.

2. Al Wadan A, Al Senebani J,Al Ahnoomi A,Al Saadi A. Early complication and re-admission after laparoscopic and open appendectomy. Egyptian Journal of Surgery. 2010;29(4).

3. Al-Mefreji KA. Antibiotics prophylaxis in non-perforated appendicitis: a prospective study. Al-Kindy Col Med J. 2006; 3: 49-51.

4. O'Connel PR,Williams NS,Bulstrode CJ, O'Connel PR,editors. The Vermiform Appendix In: Bailey and Love's Shortpractice of surgery. 25th ed. London: Edward Arnold. 2008; p.1204-18.

5. Mangram AJ, Horan TC, Pearson ML, Silver LC, Jarvis WR.Guidelines for prevention of surgical site infection. Infect Control Hosp Epidemiol. 1999; 20:247-78.

6. Bauer T, Vennits BO, Holm B, Pedersen J, Lysen D, Galatius H, et al. Danish multicenter study group III. Antibiotics prophylaxis in acute non-perforated appendicitis. Ann Surg. 1989; 209:307-11.

7. Fraser JD, Aguayo P, Leys CM, Keckler SJ, Newland JG, Sharp SW, et al. A complete course of intravenous antibiotics vs. a combination of intravenous and oral antibiotics for perforated appendicitis in children: a prospective, randomized trial. Pediatr Surg. 2010, 45:1198-202.

8. St Peter SD, Tsao K, Spilde TL, Holcomb GW, Sharp SW, Murphy JP, et al. Single daily dosing ceftriaxone and metronidazole vs. standard triple antibiotic regimen for perforated appendicitis in children: a prospective randomized trial. J Pediatr Surg. 2008; 43:981-5.

9. Mui LM, Ng CS, Wong SK, Lam YH, Fung TM, Fok KL, et al. Optimum duration of prophylactic antibiotics in acute non perforated appendicitis. ANZ J Surg. 2005; 75:425-8.

10. Le D, Rusin W, Hill B, Langell J. Postoperative antibiotics use in non perforated appendicitis. Am J Surg. 2009; 198:748-52.

11. Ravari H, Jangjoo A, Motamedifar J, Moazzami K. Oral metronidazole as antibiotic prophylaxis for patients with non perforated appendicitis. Clincal Experimenl Gastroenterol. 2011;4:273-6.

12. St. Peter SD, Kuojen T, Troy L, Spilde, et al. Single daily dosing ceftriaxone and metronidazole vs standard triple antibiotic regimen for perforated appendicitis in children: a prospective randomized trial. Pediatr Surg. 2008; 43(6): 981-985.

13. Bauer T, Vennits B, Holm B, Pedersen J. Antibiotic Prophylaxis in Acute Non perforated Appendicitis. Ann Surg. 1989;209(3) 307-311.

14. Tang E, Ortega AE, Anthone GJ, Beart RW. Intra-abdominal abscesses following laparoscopic and open appendectomies. Surg Endosc. 1996; 10:327-8.

15. Ravari H, Jangjoo A, Motamedifar J, Moazzami K. Oral metronidazole as antibiotic prophylaxis for patients with non perforated appendicitis. Clinical and Experimental Gastroenterology. 2011;4:273-276

16.Mashhadia MT, Mousavib SH, Mashizi K, Mobarhand MG, Sahebkard AH. Optimum duration of per operative antibiotic therapy in patients with acute non-perforated appendicitis: a prospective randomized trial. Asian Biomedicine. 2012;6(6); 891-894.

17. Antibiotic prophylaxis for surgery. [Internet].Treatment guidelines: The Medical Letter; 2004; 2(20):27-32.

18. Antibiotic prophylaxis for surgery. [Internet].Treatment guidelines: The Medical Letter; 2005;1(18):16-19.

19. Antimicrobial prophylaxis in surgery. [Internet].Treatment guidelines: The Medical Letter; 2001;43:92-98.

20. Fabian TC, Croce MA, Payne LW, et.al. Duration of antibiotic therapy for penetrating abdominal trauma: a prospective trial. Surgery. 1992;112:788-95.

21. Bozorgzadeh A, Pizzi WF, Barie PS, et.al. The duration of antibiotic administration in penetrating abdominal trauma. Am J Surg. 1999;177:125-31.

22. Luchette FA, Borzotta AP, Croce MA, et.al. Practice management guidelines for prophylactic antibiotic use in penetrating abdominal trauma. Available online at: http://www.east.org. [Accessed 09 October 2006].

23. Henry MC, Walker A, Silverman BL, Gollin G, Islam S, Sylvester K, et al. Risk factors for the development of abdominal abscess following operation for perforated appendicitis in children: a multicenter case-control study. Arch Surg. 2007;142:236-41.