ORIGINAL ARTICLE

Role of One Versus Three Doses of Antibiotics Given Prophylactically in Patients Undergoing Appendicectomy to Prevent Surgical Site Infections

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ABSTRACT

Aim: To compare the rate of surgical site infections with a single dose versus three doses of prophylactic antibiotics in patients undergoing emergency appendectomy.

Study design: A Randomized controlled trial.

Place and duration: This study was conducted at department of surgery of Allied Hospital Faisalabad for duration of nine months from January to September, 2020.

Methodology: 310 patients were randomized in this study into two groups, A and B (155subjects in both group). Group A was administered a single shot of metronidazole and cefuroximeat induction of anesthesia and three doses of metronidazole and cefuroximein Group Bi.e.,at induction of anesthesia than 8 and 16 hours after surgery. All patients were followed for 10 days postoperatively. Patient demographics including age, gender, and Surgical Site Infection (SSI) score were recorded on a standardized form. SPSS 21 version was used for Statistical analysis with calculated coefficients and mean ± SD for continuous and categorical variables, correspondingly. A probability of 0.05 was considered significant.

Results:310 patients were examined (155 in group A and 155 in group B). Both groups were compared in ration of demographic variables such as gender and age. There was no substantialvarianceamong two groups in relationshiptogeneralsurgical site infection (P = 0.295).

Conclusion: The single-dose systemic regimen of cefuroxime with metronidazole administered just before surgery is safe and reduces the possibility of surgical site infection.

Key words: appendectomy, surgical site infection (SSI), antibiotic prophylaxis.

INTRODUCTION

Appendicitis is one of the most common emergencies faced by the general surgeons. The lifetime risk is 5-10% higher in men aged 15-25, but applies to all age groups[1-2]. Appendicitis is as common as appendectomy is the most common urgent abdominal surgery (16% of the population) and is often the first major surgery performed by a trained surgeon[3]. The utmostusual postoperative complication, happening in 6-11% of all patients is Surgical site infection (SSI)[4]. The accountableorganisms are frequently a combination of anaerobic bacteria and Gram-negative rods, especiallyanaerobic streptococci and Bacteroides species[5]. Surgical site infection (SSI) causes postoperative complications and increased financial costs[6]. Antibiotic prophylactic benefits have been shown in reducing complications after open appendectomy5. During induction of anesthesia, a single dose of a prophylactic antibiotic (2 g i.v. cefuroxime + 500 mg metronidazole) reduces ZMM to 6.5%. Whereas -multiple doses of the same antibiotics given at different time intervals reduces the SSI to 0.32%[7-8]. The optimal timing and schedule of antibiotics is unknown and therefore there is the potential for over-treatment with an increased risk of post-operative infection and inadequate treatment or microbial growth[9]. In our environment, as evidenced by previous records, appendectomy is often performed (up to 15 cases per week). It is common practice to prescribe unregistered antibiotics in the perioperative period, which is associated with higher costs for the patient and the hospital[10]. In this study, our goal is to compare the efficacy of a single dose prophylactic antibiotic versus three doses for the same reasons, thereby developing a protocol for prophylactic administration of antibiotics in appendectomy patients.

MATERIALS AND METHODS

This study was conducted at department of surgery of Allied Hospital Faisalabad for duration of nine months from January to September, 2020.The goal of the analysis was to know the percentage of surgical site infections with single and three doses of prophylactic antibiotics in patients undergoing emergency appendectomy. Based on the results of the recentstudies, we assume that there is no varianceamid a single dose and three doses of a prophylactic antibiotic to prevent surgical site infection in patients undergoing appendectomy. Ethical Committee of the hospital has given approval for this study.310total consecutive patients of both sexes were included in this study reporting to the outpatient clinic (OPD) or emergency room with symptoms indicative of acute appendicitis, aged 11 to 50 years and ASA-1 patients were selected. Patients with perforated or gangrenous appendages, pus in the peritoneal cavity or diabetes, immunosuppression, and cefuroxime allergy, who did not follow the observation protocol, were not included. All cases were nominated by the non-probability technique. Patients were included in the study after obtaining their informed and written consent. A complete history was collected and a full study was conducted. After appendicitis was diagnosed and antibiotic susceptibility was confirmed, patients were assigned to group A or group B by a sequential method. The study bias and confounders were checked against strict exclusion criteria. Prophylactically; Group "A" was given cefuroxime

at dose of 1.5 g intravenously with metronidazole500 mg in a single prophylactic dose after induction of anesthesia, and group "B" received three prophylactic antibiotics intravenously, i.e., cefuroxime at dose of 1.5 gwith metronidazole 500 mg during induction, and then 2 doses after surgery at eight and sixteen hours later with 750 mg cefuroxime + 500 mg metronidazole. Patients from both groups were operated on under general anesthesia by a consulting physician. The skin was prepared with an aqueous solution of povidine. An open appendectomy was made through a Grid iron incision. After making the incision, the external oblique was cut, the internal oblique and transverse abdominal muscles were cut and open into the peritoneum. The appendix was identified and the mesoappendix was vicryl 1 was used to ligate the appendix after creating a window at its base. The appendix base was crumpled, tied with Vicryl 1 and removed. The wound was closed in layers. The skin incision was closed with subcutaneous 2/0 polypropylene skin sutures and an aseptic dressing was made. After surgery, patients are kept orally until they are completely free from anesthesia, and bowel sounds return once clear fluids begin. When they endured the liquid regime and experienced gas, a soft diet was initiated followed by a regular diet. Patients were discharged from the hospital following a regular fever-free diet, on an outpatient basis and with good pain control. The dressing was removed for examination of the surgical site before the patient was discharged from the hospital. The patients were requested for a follow-up visit within ten days. In particular, the wound was fully inspected at the follow-up visit. A consistentinquiry form was given to both groups to document data such as gender, age and SSI. Surgical site infection was definite by the Center for Disease Control and Prevention (CDC). The Surgical site infection was alienated into superficial subcutaneous tissue and deep tissue with correspondingly deep muscles and subcutaneous tissue involvement. Symptoms / features of purulent discharge, pain or redness at the incision site within 10 days after surgery were used to determine Surgical site infection. A feverish patient, high WBC> 10,000 g / dl, fluid accumulation and paralytic ileusperceived on imaging examination with abscess feature was marked as an intra-abdominal abscess. SPSS 21 version was used for Statistical analysis with calculated coefficients and mean ± SD for continuous and categorical variables, correspondingly. The percentages of patients with SSI in groups A and B were documented in tabulated form, and comparison of both groups was done with the chi-square test. Less than 0.05 P value was measured significant.

RESULTS

Prophylactically; Group "A" was given cefuroxime at dose of 1.5 g intravenously with metronidazole 500 mg in a single prophylactic dose after induction of anesthesia, and group "B" received three prophylactic antibiotics intravenously, i.e., cefuroxime at dose of 1.5 g with metronidazole 500 mg during induction, and then 2 doses after surgery at eight and sixteen hours later with 750 mg cefuroxime + 500 mg metronidazole. 155 patients were included in each group. The patients mean age in groups A and B was 27.1 ± 6.9 years and 24.6 ± 6.8 years, correspondingly, and was not statistically important (p = 0.102).

Age Distribution of patients given in Table-1

Age Group A	Group B	Total
Range (years) N (%)	N (%)	N (%)
11-20	31 (20%)	53(17.1%)
22 (14.2%)		
21-30	86 (55.5%)	171(55.1%)
85 (54.9%)		
31-40	30 (19.4%)	64(20.6%)
34 (22.0%)		
41-50	8 (5.2%	22(7.1%)
14 (9.03%)		
Total	155 (100%)	310(100%)
155 (100%)		

As revealed in Table 1, the most of subjects were between 21-30 years of age, 85 (54.9%) in group A and 86 (55.5%) in group B.

Table 2: Gender Distribution

Group A	Group B	Total	P value
N (%)	N (%)	N (%)	
Male 84 (54.2%)	80 (51.2%)	164 (52.9%)	0.79
Female 71 (45.8%)	75 (48.4%)	146 (47.1%)	
Total 155 (100) %	155 (100%)	310 (100%)	

84 (54.2%) men and 71(45.8%) women with 1.19: 1 male to female ratio in group A, group B 80 (51.2%) males and 75 (48.4%) females, 1.01: 1 males and female ratio (Tab. 2). Surgical site infection occurred in 14 patients in group A and 7 patients in group B and was not statistically significant as shown in Table 3 (p = 0.295).

Table 3: Surgical site infection

Group A	Group B	Total	P value
N (%)	N (%)	N (%)	
Yes 14 (9.1%)	7 (4.5%)	21 (6.7%)	0.295
No 141 (90.9%)	148 (95.4%)	289 (93.22%)	
Total 155 (100%)	155 (100%)	310 (100%)	

DISCUSSION

Surgical site infections are the main source of post-operative disease, accounting for about a quarter of all nosocomial infections[11]. They are classified as the 2nd or 3rd most common type of nosocomial infection, as well as blood-borne infections, pneumonia and urinary tract infections. National studies have shown that patients are generally at high risk of infection and for many specific surgical procedures[12-13]. The use of antibiotic prophylaxis before surgery has improved significantly over the past 20 years. Advances in the first application, appropriate selection of antibiotics, and shorter application times have more clearly determined the value of this technique in reducing postoperative wound infections[14]. Acute appendicitis can occur at any age and no age is exempt from it; however, the maximum number of patients is observed in the 2nd and 3rd decade of life. Prescribing antibiotics for an extended period of time does not seem to provide additional protection, as other studies have confirmed[14]. In order to reduce the incidence of postoperative wound infections, the use of antibiotics is recommended. The optimal timing for prescribing antibiotics is a currently investigated problem. The Cochrane review of prescribing antibiotics for

appendectomy suggests that single doses may be as effective in reducing postoperative complications as multiple doses[15-16]. A randomized, controlled study by Muiet colleagues investigated the effect of antibiotic duration on the frequency of problems in patients experiencing open appendectomy for non-perforated appendicitis[17]. They could not show a noteworthyvariance between a single dose, 3 doses, and a 5-day course of antibiotics[18].Captivatingly, they noticed an increased rate of antibiotic associated complications in the group that took the 5-days antibiotics[19]. The selection of prophylactic parenteral antibiotics and the timing and route of administration have been harmonized based on well-designed, prospective clinical trials. It is generally recommended that anesthetists administer a single intravenous dose of cephalosporin in the operating room just prior to incision in clean, contaminated procedures[20-21]. In general, extradosages are solitarysuggested if the procedurecontinueslengthier than 2 to 3 hours. The American Society of Pharmacists of the Health System (ASHP) recommends cephalosporin prophylaxis for uncomplicated appendicitis, and metronidazole and gentamicin are only considered alternatives for penicillin allergies[22]. Misuse of antibiotics and excessive long-term antibiotic prophylaxis can cause antimicrobial resistance. Surgeons and surgical units should update their antibiotic prophylaxis practices to meet standard guidelines and an updated evidence base[23-24].

CONCLUSION

There was no significant difference between single dosage of metronidazole and cefuroximegiven at induction of anesthesia and between three doses of metronidazoleand cefuroxime administered at induction and 8 and 16 hours after surgery and in terms of control local infection. Appendectomy has the result that increasing antibiotic doses have no effect on preventing surgical site infection. So, the single-dose systemic regimen of cefuroxime with metronidazole administered just before surgery is enough, safe and reduces the possibility of surgical site infection.

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