e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2024; 16(1); 593-598

Original Research Article

To Ascertain Whether Postoperative Antibiotics are Necessary in Cases of Nonperforated Appendicitis Following a Laparoscopic Appendectomy

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Received: 01-01-2024 / Revised: 10-01-2024 / Accepted: 14-01-2024
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Conflict of interest: Nil

Abstract:

Background: One of the most prevalent acute gastrointestinal inflammatory diseases in both children and adults is appendicitis, which frequently necessitates surgery and hospitalization. Every year, about 14,000 individuals in the Netherlands get an appendectomy to treat suspected appendicitis. There are two different forms of acute appendicitis: basic and complicated. A suppurative or phlegmonous appendicitis, characterized by transmural inflammation, ulceration, or thrombosis, may or may not have extramural pus. Perforated appendicitis, gangrenous (transmural inflammation with necrosis) appendicitis, and/or appendicitis with abscess formation (pelvic/abdominal) are examples of complex appendicitis. Complex appendicitis accounts for about 25–30% of cases. Preventive antibiotic use in an appropriate manner lowers the risk of surgical site infections (SSIs) following surgery. On the other hand, there isn't a definitive recommendation about how long to use antibiotics. Numerous randomized control trials have advised a single preoperative prophylactic dosage.

Aim: The aimed to determine the need for postoperative antibiotics after laparoscopic appendicectomy for nonperforated appendicitis.

Material and Method: The Department of General Surgery carried out this randomized control study (RCT). This study included all patients admitted with acute appendicitis undergoing emergency open appendectomy. On a pre-made proforma, information on the patients' demographics, medical histories, and specifics of their clinical examinations were documented. In addition to standard tests like an abdominal ultrasound, other tests like blood urea, serum creatinine, and full blood counts were also carried out. The groups were randomly assigned using the opaque envelope approach. Seventy opaque envelopes with cards inside were produced. Of these envelopes, thirty-five had a card saying the study group, Group A, and the remaining thirty-five had a card mentioning the control group, Group B.

Results: Group B's mean age was 28.62±8.52 years; while group A's mean age was 28.54±9.62 years. Every subject in the research had right iliac fossa pain at baseline. Conservative management was applied to the three patients in group A and the two patients in group B who had grade III SSIs. There was no statistically significant difference in the incidence of SSIs between the two groups. Regarding the mean age, gender distribution, pain, fever, nausea/vomiting, McBurney's soreness, bowel sounds, total leukocyte count, ultrasonography, diagnosis, and histopathology report, there was no discernible difference between the two groups. Although group B's mean hospital stay was longer than group A's, there was no statistically significant difference.

Conclusion: Additional postoperative doses have no statistically significant benefit, and a single preoperative dose of the prophylactic antibiotics cefotaxime and metronidazole at the time of induction is sufficient to reduce the risk of postoperative SSIs. Larger scale studies with a variety of other abdominal surgeries are needed to ascertain the actual need for postoperative prophylactic antibiotics to reduce the SSIs.

Keywords: Laparoscopic Appendicectomy, Nonperforated Appendicitis, Prophylactic Antibiotics and Surgical Site Infections.

Introduction

The most common cause of sudden, intense stomach pain that necessitates surgery is appendicitis, and the most common emergency procedure is an appendectomy. Acute appendicitis is a lifetime risk for up to 20% of the population. [1] Clean-contaminated and contaminated cases are the terms used to describe nonperforated appendicitis (NPA) and perforated appendicitis (PA), respectively. The effectiveness of preoperative prophylactic antibiotics in lowering postoperative infection complications following appendectomy has been demonstrated by numerous researches. [2,3] Therefore, preoperative preventive antibiotics are likely provided to every patient having an appendectomy in our institution. Due to severe infection of the wound and peritoneal cavity, patients with perforated appendicitis following appendectomy are always treated with a varying course of postoperative therapeutic antibiotics. [4,5] It is still debatable, though, whether postoperative antibiotics can lower the risk of infection problems in NPA patients. [6]

There are two different forms of acute appendicitis: basic and complicated. Suppurative or phlegmonous appendicitis, characterized by transmural inflammation, ulceration, or thrombosis, may or may not have extramural pus. Perforated appendicitis, gangrenous (transmural inflammation with necrosis) appendicitis, and/or appendicitis with abscess formation (pelvic/abdominal) are examples of complex appendicitis. [7] Some 25–30% of all appendicitis is complex. [8,9] Antibiotic prophylaxis, whether administered prior to or during surgery, is useful in preventing postoperative complications in patients having appendicemas for both simple and severe appendicitis, according to a Cochrane Systematic review. [3]

Due to severe infection of the wound and peritoneal cavity, patients with perforated appendicitis following appendectomy are always treated with a varying course of postoperative therapeutic antibiotics. [4,10] It is still debatable, though, whether postoperative antibiotics have a beneficial effect on lowering infectious complications in NPA. [11] There is no universal agreement on whether postoperative antibiotics are helpful in reducing infectious complications in non-periodic Acute pneumonia (NPA), and prescription postoperative antibiotics varies greatly across the world.

An major contributing factor to surgical site infection (SSI) after appendicectomy is the diseased condition of the vermiform appendix. [11,12] Compared to patients with nonperforated appendicitis, patients with gangrenous or perforated appendicitis have a greater risk of SSIs. [13] Postoperative morbidities, such as pain, worry, inconvenience, lengthened hospital stays, and financial costs, are primarily caused by SSIs.14 Surgeons have worked hard and consistently to prevent sepsis in addition to medication. Despite all of this, surgical margin infection remains a significant barrier. Compared to SSIs related to organs or spaces, superficial incisional infections, which make up 60%–80% of all SSIs, have a better prognosis. [14] The likelihood of surgical site infections is decreased by 40% to 60% when antibiotics are used appropriately. Guidelines for the selection of prophylactic antibiotics, their delivery method, and their timing after an emergency appendicectomy have been established by prospective clinical trials. [15] Antibiotics administered before to surgery, during the peak of bacterial contamination, provide sufficient amounts in serum and tissue, and are essential in preventing surgical site infections. [16] For the majority of elective general surgical operations, a single-dose antibiotic prophylaxis has been advised; however, in practice, this recommendation is not followed, and multiple-dose regimens are still in use at many institutions. [17] Hence, this study was conducted to determine the need for postoperative antibiotics in reducing SSI after laparoscopic appendicectomy for nonperforated appendicitis.

Material and Methods

The Department of General Surgery carried out this randomized control study (RCT). This study included all patients admitted with acute appendicitis undergoing emergency open appendectomy. On a pre-made proforma, information on the patients' demographics, medical histories, and specifics of their clinical examinations were documented. In addition to standard tests like an abdominal ultrasound, other tests like blood urea, serum creatinine, and full blood counts were also carried out. The groups were randomly assigned using the opaque envelope approach. Seventy opaque envelopes with cards inside were produced. Of these envelopes, thirty-five had a card saying the study group, Group A, and the remaining thirty-five had a card mentioning the control group, Group B. Patients were instructed to randomly select an envelope, and they were then placed into one of the two groups based on the group that was specified in the envelope. Each patient enrolled in the trial was briefed on the nature of the procedure, necessary investigations, suggested interventions, and potential adverse outcomes before providing their written and informed consent.

Inclusion Criteria: All patients aged between 18 and 50 years of either sex presenting with uncomplicated appendicitis were considered eligible for the study.

Exclusion Criteria: Patients with complicated appendicitis (gangrenous or perforated), additional comorbidities including diabetes, immunosuppression, cardiac, renal, or liver failure, allergic to cephalosporins, refuse to give written consent and who has taken antibiotics outside before participating in the study were excluded from the study.

Prior to surgery, 500 mg of metronidazole and 1 g of ceftriaxone were given intravenously to each patient. An open appendectomy was carried out using the usual operating procedure via the McCurney incision in the right lower quadrant. In all cases, the incision was mainly closed after being cleaned with regular saline. Patients who had been diagnosed with NPA during surgery were split into two groups at random. Group A consisted of all patients who did not receive any postoperative antibiotics, and group B included all patients who got 500 mg of metronidazole and 1 g of ceftriaxone up to 24 hours following surgery. Following surgery, the patient's appendices were all sent for pathological analysis.

Redness, pain, edema, and pus discharge from the wound were considered indicators of a surgical site infection (SSI). The fluid collected inside the peritoneal cavity as confirmed by an ultrasonography or CT scan was referred to as the intra-abdominal collection. Every infected wound was treated by leaving it open, cleaning it with regular saline, packing it loosely, and then applying secondary intention. Demographic information, clinical complaints, admission temperature and CBC, length of operation, surgical findings, postoperative antibiotics, and complications were all gathered.

Intervention

According to established protocols, patients in both groups received laparoscopic appendicectomy. Both groups utilized the same suture materials and equipment. Both groups adhered to basic surgical guidelines, such as sufficient hemostasis and no excessive strain on the tissues. When anesthesia was induced, both groups received a single intravenous injection of 1 gm cefotaxime and 100 ml metronidazole as part of the preoperative protocol. However, group B also received three additional doses of the same antibiotics eight, sixteen, and twenty-four hours after the index surgery, while group A did not receive any postoperative antibiotics. On the surgeon's recommendation, intravenous fluids, analgesics, and other supportive therapies were also administered.

After 48, 72, and 7 hours, the surgical wound was examined to check for any indications of a postoperative wound infection. The Southampton scoring system (Grades 0-5) was used to track the scores at each dressing in a prepared table in order to assess wound infection.[18] For grades 0, 1, and 2, wound recovery was considered typical. For grades 3 and 4, wound infection was classified as minor, and for grades 4 and 5, it was classified as significant.

Statistical Analysis

Statistical analysis SPSS 20 was used to analyze the pooled data. The demographic characteristics were compared using a chi-square test, infection rates were compared using Fisher's exact test, and the mean duration of hospital stay was compared using an unpaired t-test.

Result

The demographics, detailed history, and clinical characteristics of the study patients are shown.

Table 1: Demographic, detailed history, and clinical characteristics of the study population

Findings	Group A, N=35	Group B, N=35
Mean age	28.54±9.62	28.62±8.52
Pain	35 (100%)	35 (100%)
Fever	10	11
Nausea/vomiting	22	24
Bowel sounds	35 (100%)	35 (100%)
Total leukocyte count		
6,000-11,000	14	12
>11,000	16	17
Ultrasonography, inflamed appendix, probe tenderness	5	6
Diagnosis		
Acute appendicitis	27	29
Chronic appendicitis	5	1
Recurrent appendicitis	2	3
Sub-acute appendicitis	1	2
Histopathology Report		
Acute appendicitis	31	33
Chronic appendicitis	4	2

Regarding the mean age, gender distribution, pain, fever, nausea/vomiting, McBurney's soreness, bowel sounds, total leukocyte count, ultrasonography, diagnosis, and histopathology report, there was no discernible difference between the two groups.

Table 2: Summary of Southampton scoring

	Group N	Grade 0	Grade 1	Grade 2	Grade 3	Grades 4 and 5
48 h	Group A	28 (84%)	5 (12%)	2 (4%)	0	0
	Group B	32 (96%)	1 (2%)	1 (2%)	0	0
72 h	Group A	28 (84%)	1 (2%)	4 (8%)	3 (6%)	0
	Group B	30 (86%)	2 (4%)	3 (6%)	2 (4%)	0
7th day	Group A	34 (98%)	1 (2%)	0	0	0
	Group B	34 (98%)	1 (2%)	0	0	0

Table 2 summarizes Southampton's rating system for SSIs after 7, 48 hours, and day 7. In the current investigation, there were no patients with grade 4 or 5 SSIs. Grades 0, 1, and 2 wound healing were regarded as normal, but patients with a grade 3 wound infection were classified as such. With daily cleaning and dressing, only 3 (6%) of group A patients and 2 (4%) of group B patients had grade 3 SSIs at 72 hours. Although group B's mean hospital stay was longer than group A's, there was no statistically significant difference.

Discussion

SSI after surgery is a concerning barrier that neither the surgeon nor the patient ever seek for. [19] Roughly 15% of nosocomial infections are SSIs, which typically arise from the translocation of endogenous flora to a normally sterile region. Perioperative care, host defenses, bacterial inoculum and virulence, and intraoperative management are factors that affect the development of surgical site infections (SSIs). [20] The risk for postoperative complications is greatly influenced by the stage of the illness process at the time of surgery and the administration of the proper preventive antibiotics. [4,21] Preoperative antibiotics have been shown in the literature to be effective in lowering the risk of surgical site infections (SSIs) after appendectomy. The therapeutic advantages and risks of postoperative antibiotic administration in addition to appropriate preoperative antibiotic prophylaxis have only been assessed in a small number of trials. [22]

Liberman et al.1995 [21] reported a high rate of wound infection (11.1%) among the patients who had received only preoperative cefoxitin compared to the patients who were given both pre-and postoperative cefoxitin (1.9%). However, they discovered that in their third patient group, which had only received one preoperative cefotetan dose, there had been no infection complications. Therefore, they suggested that the best prophylactic for NPA would be a single dosage of preoperative cefotetan.

Mui et al.2005 [3] conducted a randomized trial on 269 patients to define the optimum duration of prophylactic antibiotics in NPA. The researchers discovered no discernible variation in the rate of wound infection among the three study groups. They came to the conclusion that postoperative infection problems might be effectively prevented by a single dosage of preoperative antibiotics. Le et al.2009 [4] compared the patients of NPA who received a single dose of preoperative antibiotics with those who were given postoperative antibiotics in addition to preoperative prophylaxis. Recently Coakley et al.2011 [22] compared the outcomes of a large number of patients (728 subjects) treated with antibiotics before and after appendectomy with those who have received only preoperative antibiotics. They came to the conclusion that postoperative antibiotics increased morbidity due to greater incidence of clostridium difficile infection and antibiotic-associated diarrhea, but did not lessen infectious complications. Furthermore, without providing any discernible clinical advantage, postoperative antibiotics markedly increased the length of hospital stays and treatment costs. [23]

Daskalakis et al.2014 [24] concluded that for all patients with nonperforated appendicitis, preoperative treatment is sufficient whereas the use of postoperative antibiotic treatment is not recommended. Whereas, in the case of perforated appendicitis, postoperative broad-spectrum antibiotics are recommended. Similarly, a systematic review by Andersen et al.2005 [9] has shown that the use of antibiotics in patients with uncomplicated appendicitis is superior to placebo in reducing postoperative complications; however, concluded that no specific recommendations can be made regarding the duration of antibiotic use. However, because they have a significant risk of infective consequences, individuals with severe appendicitis should continue receiving a complete antibiotic regimen. The clinical advantages and disadvantages of administering postoperative antibiotics in conjunction with sufficient preoperative antibiotic prophylaxis have only been partially shown by research. [2]

studies conducted by Luckmann et al.1989 [25] and Anderson et al.1994 [26] reported that in contrast to perforated appendicitis, nonperforated appendicitis was related to age. According to the literature, the most significant indicator of appendicitis is soreness in the right iliac fossa, or McCurney's tenderness, which was present in all patients in both groups during the abdominal examination. [26]

But other factors including maintaining asepsis, using appropriate surgical technique, and providing quality postoperative care also contribute significantly to lower the risk of postoperative SSIs and, consequently, lower morbidity. Correspondingly, an RCT conducted by Mui et al.2005 [3] concluded that the single dose of perioperative antibiotic is adequate for the prevention of infective wound complications in patients undergoing surgery for uncomplicated appendicitis.

They also came to the conclusion that giving antibiotics for an extended period of time was unneeded and costly. A small number of further research investigations have also documented that the prevention of infective consequences after appendicectomy for nonperforated appendicitis can be achieved with a single preventive antibiotic dose. [27]

These patients did not have this problem. The concern over postoperative surgical site infections (SSIs) has led to an increase in the use of supplemental postoperative antibiotics in surgical practice. Proper surgical and aseptic practices are still necessary, and postoperative antibiotics cannot replace them. Antibiotic-resistant microorganisms, higher risk of antibiotic-related problems, and higher healthcare costs are all linked to antibiotic misuse. [28]

These factors make a comprehensive assessment of the advantages and disadvantages of antibiotic therapy necessary. Further supporting our findings are recent studies that demonstrate prolonged antibiotic usage does not lower postoperative infection complications, even in patients with complex appendicitis. [18,29]

Conclusion

The risk of postoperative surgical site infections (SSIs) can be effectively decreased with a single preoperative dosage of the preventive antibiotics cefotaxime and metronidazole given at the time of induction; further postoperative doses do not show any statistically meaningful advantages. These results, however, are restricted to one particular procedure—laparoscopic appendicectomy. Larger-scale research involving a variety of additional abdominal procedures is necessary to ascertain whether postoperative prophylactic antibiotics are truly necessary to prevent surgical site infections (SSIs). After appendectomy for NPA, a single dose of preoperative antibiotics (metronidazole and ceftriaxone) was adequate to control SSIs. Antibiotics used after surgery did not significantly improve these patients' clinical outcomes. Because of this, surgeons must update their use of antibiotic prophylaxis in accordance with accepted practices and evidence-based medicine.

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