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

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Abstract

Background

A common acute gastrointestinal inflammatory condition in both children and adults is appendicitis, often requiring surgical intervention and hospitalization. An estimated 14,000 persons in the Netherlands get an appendectomy annually to address suspected appendicitis. Acute appendicitis may be delineated into two distinct forms: basic and complex. A suppurative or phlegmonous appendicitis is a condition marked by inflammation, ulceration, or thrombosis in the transmural layer of the appendix, with or without surrounding pus. Complex appendicitis includes perforated appendicitis, gangrenous (transmural inflammation with necrosis) appendicitis, and/or appendicitis of the pelvis or abdomen accompanied by abscess development. An estimated 25-30% of patients are classified as complex appendicitis. Timely and appropriate administration of preventive antibiotics reduces the likelihood of surgical site infections (SSIs) after surgery. Nevertheless, there is no conclusive guideline regarding the duration of antibiotic use. Several randomized controlled studies have recommended a single preoperative prophylactic dose.

Aim

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

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Material and Method

This randomized control research (RCT) was conducted by the Department of General Surgery.
This research included all patients who were hospitalized with acute appendicitis and had emergency open appendectomy. Data on the patients' demographics, medical histories, and details of their clinical exams were recorded on a pre-established proforma. Furthermore, apart from conventional examinations such as an abdominal ultrasonography, also conducted were tests including blood urea, serum creatinine, and complete blood counts. Random assignment of groups was conducted using the opaque envelope method. Seventy opaque polymer envelopes containing cards were manufactured. Among these envelopes, thirty-five had a card identifying the study group, Group A, while the other thirty-five contained a card identifying the control group, Group B.

Results

The average age of Group B was 28.62±8.52 years, while the average age of Group A was 28.54±9.62 years. Baseline right iliac fossa discomfort was seen in every participant in the study. The three patients in group A and the two patients in group B who had grade III SSIs were treated with conservative therapy. There was no statistically significant disparity in the occurrence of surgical site infections (SSIs) between the two groups. No significant differences were seen between the two groups in terms of mean age, gender distribution, pain, fever, nausea/vomiting, McBurney's soreness, bowel sounds, total leukocyte count, ultrasonography, diagnosis, and histology report. While the average hospitalized duration of group B was greater than that of group A, there was no statistically significant disparity.

Conclusion

A single preoperative dosage of the preventive antibiotics cefotaxime and metronidazole at the time of induction is enough to lower the incidence of postoperative surgical site infections, and further postoperative doses do not provide a statistically meaningful advantage. A comprehensive investigation including a range of abdominal procedures is necessary to determine the true need of postoperative prophylactic antibiotics in minimizing surgical site infections (SSIs).

Introduction

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Appendicitis is the primary aetiology of abrupt and severe abdominal pain that requires surgical intervention, and the most often performed emergency operation is an appendectomy. An estimated 20% of the population is at lifelong risk of developing acute appendicitis. Reference 1 Nonperforated appendicitis (NPA) and perforated appendicitis (PA) are the terminologies used to characterize instances of clean contamination and contamination, respectively. Multiple studies have proven the efficacy of preoperative prophylactic antibiotics in reducing postoperative infection problems after appendectomy. [2,3] Thus, it is very probable that every patient undergoing an appendectomy at our facility will get preoperative preventative antibiotics. Patients with perforated appendicitis after appendectomy are consistently treated with a different regimen of postoperative therapeutic antibiotics due to the risk of serious infection in the wound and peritoneal cavity. [4,5] The effectiveness of postoperative antibiotics in reducing the frequency of infection complications in NPA patients is a subject of ongoing debate. Page 6 Acute appendicitis may be delineated into two distinct forms: basic and complex. Suppurative or phlegmonous appendicitis is a condition marked by inflammation, ulceration, or thrombosis in the transmural layer of the appendix, often or not accompanied by extramural pus. Complex appendicitis includes perforated appendicitis, gangrenous (transmural inflammation with necrosis) appendicitis, and/or appendicitis of the pelvis or abdomen accompanied by abscess development. [7] Approximately 25-30% of all cases of appendicitis are complicated. [8,9] A Cochrane Systematic review determined that antibiotic prophylaxis, whether given before or during surgery, is effective in reducing postoperative complications in patients with appendix mass for both mild and severe appendicitis. [3] Patients with perforated appendicitis after appendectomy are consistently treated with a tailored regimen of postoperative therapeutic antibiotics due to the serious infection of the wound and peritoneal cavity. [4,10] The effectiveness of surgical antibiotics in reducing infection problems in Newborns with Preterm Ankle (NPA) is a subject of ongoing debate. [11] There is no consensus on the effectiveness of postoperative antibiotics in preventing infectious complications in non-periodic Acute pneumonia (NPA), and the guidelines for prescribing postoperative antibiotics differ significantly worldwide. The pathological state of the vermiform appendix is a significant determinant of surgical site infection (SSI) after appendicectomy. [11,12] Patients diagnosed with gangrenous or perforated appendicitis are at a higher risk of surgical site infections (SSIs) compared to those with nonperforated appendicitis. [13] Primary causes of postoperative morbidities, including pain,

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anxiety, discomfort, extended hospital stays, and financial expenses, include surgical site infections (SSIs).14 Physicians have diligently and continuously strived to avoid sepsis in conjunction with pharmaceutical interventions. Notwithstanding these factors, surgical margin infection continues to be a substantial obstacle. In contrast to surgical site infections (SSIs) involving organs or spaces, superficial incisional infections, which constitute 60%–80% of all SSIs, have a more favorable probability of success. When antibiotics are administered correctly, the probability of surgical site infections is reduced by 40% to 60% (16). Prospective clinical studies have established precise guidelines for the selection, administration method, and timing of prophylactic antibiotics after an emergency appendicectomy. [15] Preoperative administration of antibiotics, at the height of bacterial contamination, ensures adequate quantities in both the blood and tissues, therefore playing a crucial role in the prevention of surgical field infections. [16] Although it is recommended to provide a single-dose antibiotic prophylaxis for most elective general surgical procedures, this advice is often disregarded in reality, and many institutions continue to employ multiple-dose regimens. [17] The objective of this research was to assess the need of postoperative antibiotics in minimizing surgical site infections (SSI) after laparoscopic appendectomy for nonperforated appendicitis.

Methodology and Materials

This randomized control research (RCT) was conducted by the Department of General Surgery. This research included all patients who were hospitalized with acute appendicitis and had emergency open appendectomy. Information on the patients' demographics, medical histories, and details of their clinical exams were recorded on a pre-compiled proforma. Furthermore, apart from conventional examinations such as an abdominal ultrasonography, diagnostic tests including blood urea, serum creatinine, and complete blood counts were also conducted. The groups were allocated according to randomization using the opaque envelope method. Seventy opaque polymer envelopes containing cards were manufactured. Among these envelopes, thirty-five had a card identifying the study group, Group A, while the other thirty-five contained a card identifying the control group, Group B. Participants were given instructions to choose one envelope at random, and thereafter assigned to one of the two groups according to the group indicated on the envelope. Prior to giving their signed and informed permission, every patient who participated in the research received a detailed explanation of the methodology, required tests, recommended treatments, and any negative consequences.

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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.

Each patient received infusions of 500 mg of metronidazole and 1 g of ceftriaxone before surgery. An open appendectomy was performed using the standard surgical technique by making an incision in the right lower quadrant utilizing the McCurney line. In all instances, the incision was mostly sealed after cleansing with standard saline solution. Patients diagnosed with necrotizing polyarthritis (NPA) after surgery were randomly divided into two groups. All patients in group A did not receive any postoperative antibiotics, whereas group B included all patients who received 500 mg of metronidazole and 1 g of ceftriaxone within 24 hours after surgery. Following the surgical procedure, all of the patient's appendices were submitted for pathological examination. Discoloration, discomfort, swelling, and exudate from the incision were seen as signs of a surgical site infection (SSI). The fluid gathered inside the peritoneal cavity, as verified by ultrasound or CT scan, was known as the intra-abdominal collection. The treatment approach for each infected wound was leaving it exposed, cleansing it with normal saline solution, lightly packing it, and then applying secondary intention. Demographic data, clinical symptoms, admission temperature and complete blood count (CBC), duration of surgery, surgical results, postoperative antibiotics, and complications were collected systematically.

In accordance with recognized practices, patients in both groups had laparoscopic appendicectomy. In both groups, same suture materials and equipment were used. Both groups strictly followed fundamental surgical principles, including ensuring adequate hemostasis and avoiding undue stress on the tissues. Following anaesthesia induction, all groups were given a single intravenous injection of 1 gramme of cefotaxime and 100 millilitres of metronidazole as part of the preoperative procedure. Furthermore, group B was

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given three further doses of the same antibiotics at eight, sixteen, and twenty-four hours after the first surgery, but group A did not receive any antibiotics after the operation. Additional supportive medications, including intravenous fluids and analgesics, were delivered at the surgeon's suggestion. Following 48, 72, and 7 hours, the surgical site was assessed to identify any signs of a postoperative wound infection. To evaluate wound infection, the Southampton scoring system (Grades 0-5) was used to monitor the scores at each dressing in a prepared table.18 In grades 0, 1, and 2, wound healing was regarded to be normal. In grades 3 and 4, wound infection was categorized as slight, whereas in grades 4 and 5, it was categorized as serious.

Statistical Analysis

The pooled data was analysed using SPSS 20. An unpaired t-test was used to compare the mean length of hospital stay, Fisher's exact test was used to compare the infection rates, and a chi-square test was used to compare the demographic data.

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.

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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
7^{th} 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

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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

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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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