Journal of Asian Multicultural Research for Medical and Health Science Study
ISSN: 2708-972X
Vol. 4 No. 1, 2023 (page 052-059)
DOI: https://doi.org/10.47616/jamrmhss.v4i1.375

The Role of Prophylactic Antibiotics in Prevention of Wound Infections in Open Appendectomy Patients in Al-Diwaniayh Teaching Hospital

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Received: February 15, 2023 Received in Revised: March 14, 2023 Accepted: March 25, 2023

Abstract

Knowing how, when, and what types of antibiotics should be used before and after an appendectomy is a very important subject for this very common intra-abdominal procedure that is performed in an emergency setting. This subject reflects the positive results of the procedure on the reduction of infectious complications, such as surgical site infection or intra-abdominal abcess. Post-operatively, we divided patients who had a non-perforated appendix into two groups: group A received pre-operative antibiotics half an hour before surgery with a single dose of 3rd generation cephalosporin (ceftriaxone)1g and metronidazole 500mg, and group B received antibiotics half an hour pre-operatively and continued antibiotics post-operatively within 24 hours. Both groups received antibiotics post-operatively. 240 patients were randomly selected and separated into two groups with an identical number in each. Of the 120 patients in group A, eight of them developed a wound infection (6.67%), and the same number of patients in group B also became infected. The 30-day follow-up period came and went without anyone developing an intra-abdominal infection. The use of a single dosage of antibiotic will be sufficient to prevent infection at the surgical site, and the advantage of post-operative antibiotic treatment in non-perforated appendix will be imperceptible.

Keywords: Single Antibiotic, Perforated Appendix, Wound Infection, Ceftriaxone

Introduction

At eight weeks of development, the appendix is discovered to be a minute outpouching of the cecum. The appendix is an organ that is located in the midgut. The cecum rotates medially and becomes permanent in the right lower quadrant of the abdomen as gestation continues, causing the appendix to become more distended and cylindrical. At the same time, the appendix also moves to the right lower quadrant of the abdomen. The columnar epithelium, neuroendocrine cells, and mucin-producing goblet cells that line the appendiceal mucosa are typical of the mucosa found in the colon. The appendiceal mucosa is found in the appendix. (Prystowsky et al., 2005).

Since it is located in the middle of the digestive tract, the appendix receives its blood supply from the superior mesenteric artery. The appendiceal artery, which travels through the mesoappendix, originates from the ileocolic artery, which is one of the primary designated branches of the superior mesenteric artery. In addition to the lymphatics of the appendix, which discharge to the ileocecal nodes, the mesoappendix also includes the blood supply that comes from the superior mesenteric artery. (Prystowsky et al., 2005; Deshmukh et al., 2014)

The submucosa of the appendix contains lymphoid tissue, which has led some people to hypothesize that the appendix may play a part in the immune system. In addition, there is evidence to indicate that the appendix may function as a repository of "good" intestinal bacteria, and it may also assist in the recolonization and preservation of the typical digestive flora. (Bollinger et al., 2007).

The microbiota of the appendix is thought to play a protective role, and it is hypothesized that its removal would result in the loss of a component that contributes to advantageous inflammatory duplication. (Girard-Madoux et al., 2018). In addition, a recently published epidemiological study discovered a substantial connection between having an appendectomy before the age of twenty and the development of prostate cancer. However, the exact causal mechanism underlying this association could not be determined by the researchers. (Ugge et al., 2018).

Acute Appendicitis

The inflammation of the appendix is a substantial public health concern that has a lifelong prevalence of 8.6% in men and 6.7% in women, with the greatest incidence happening in the second and third decade of life. This indicates that the condition is more common in older adults. (Addiss et al., 1990). Even though the prevalence of appendectomies in industrialized countries has been on the decline over the course of the past few decades, the removal of the appendix continues to be one of the most common urgent abdominal procedures. (Song et al., 2016).

The etiology of appendicitis is perhaps due to luminal obstruction that occurs as a result of lymphoid hyperplasia in pediatric populations; in adults, it may be due to fecaliths, fibrosis, foreign bodies (food, parasites, calculi), or neoplasia (Prystowsky et al., 2005; Birnbaum & Wilson, 2000; Arnbjörnsson & Bengmark, 1983).An early obstruction results in an excessive bacterial proliferation of aerobic organisms in the early period, which, in turn, results in the development of a mixed flora. According to Arnbjornsson and Bengmark (1983), obstruction almost always results in an increase in intraluminal pressure as well as transmitted abdominal discomfort to the periumbilical region. It is hypothesized that this results in compromised venous draining, mucosal ischemia that leads to bacterial translocation, and then necrosis and an intraperitoneal infection as a subsequent complication. Bacteroides fragilis and Escherichia coli are the most prevalent types of aerobic and anaerobic bacteria that are identified in cases of perforated appendicitis, respectively. (Lau et al., 1984; Bennion et al., 1990).

However, this progression is not a given, and some cases of acute appendicitis may clear up on their own without medical intervention. Non perforated appendicitis and perforated appendicitis are considered to be two separate illnesses due to the distinctions in their distribution. (Andersson et al., 1994). It has also been hypothesized that the pathophysiology of the two forms of appendicitis may be distinct from one another due to the fact that not all cases of non-perforated appendicitis develop into perforations. Appendicitis is induced by an obstruction of the gastrointestinal pathway. (Prystowsky et al., 2005). Because of its relatively short length in comparison to its internal thickness, the appendix is susceptible to the occurrence of this phenomenon. Because bacteria within the lumen continue to secrete mucous and produce gas, an obstruction in the proximal lumen of the appendix will cause an increase in pressure in the distal section of the appendix. This will occur because of the combination of these two processes. As the appendix continues to expand, the vascular draining will become increasingly compromised, which will lead to ischemia of the epithelium. In the event that the obstruction is not removed, full-thickness ischemia will develop, which will eventually result in perforation. The accumulation of bacteria distally to the obstruction is what causes the proliferation of bacteria in the appendix. (Prystowsky et al., 2005). The fact that this proliferation leads to the discharge of a bigger bacterial inoculum in instances of perforated appendicitis is the reason why this is significant. The amount of time that passes between the first signs of obstruction and the development of perforation is highly changeable and can be anywhere from a few hours to a few days. The presentation that is left after the perforation is different as well. The development of an infection in the periappendiceal region or the pelvic is the most typical complication of this condition. On occasion, however, an open perforation will appear, which will ultimately lead to widespread peritonitis. Because the appendix is an out pouching of the cecum, the flora that can be found in the appendix is very comparable to the flora that can be found in the intestine. Antibiotic covering should include compounds that address the prevalence of both gram-negative bacteria and anaerobes. Infections that are correlated with appendicitis should be considered polymicrobial. Common specimens include Escherichia coli, Bacteroides fragilis, enterococci, Pseudomonas aeruginosa, Klebsiella pneumoniae, and others (Song et al., 2018).

According to Addiss and colleagues (1990) and Korner and colleagues (1997), the frequency of acute appendicitis varies from 8.6 to 11 occurrences per 10,000 person-years.The illness strikes men at a slightly higher rate than women, but there is no difference in the prevalence of perforated instances based on gender. It is estimated that 8.6% of males and 6.7% of females will acquire severe appendicitis at some point in their lifetimes. Appendicitis in its severe form is identified in approximately 70 percent of patients who are younger than 30 years old. Young age is a risk factor. The age group of 10 to 14 years old is associated with the greatest incidence of appendicitis in males (27.6 instances per 10,000 individuals in a year), whereas the age group of 15 to 19 years old is associated with the highest incidence of appendicitis in females. (20.5 cases per 10,000 person-years). 19% of all instances of acute appendicitis result in the development of a perforation. Patients at the younger or older end of the age spectrum are more likely to suffer from perforated appendicitis than those in the middle.

Patient and Method

A prospective research was conducted at Al-diwaniayh teaching hospital on patients who were clinically identified with acute appendicitis and underwent immediate open appendectomy between the years 2019 and November of 2021. The study followed patients from the beginning of the study period in 2019. Exclusion criteria included the following: (1) Those who had surgery for complicated acute appendicitis, diagnosed pre or intra operatively (complicated appendicitis includes: perforated, appendicular abscess, gangrenous and appendicular mass); (2) patients who were taking antibiotics shortly before admission; (3) patients who failed to be followed up in outpatient visits; (4) normal appendix, negative appendectomy, or other pathology; and (5) immunocompromised patient

All of the patients gave their permission after being given all of the relevant information. Patients who were participating in a randomized control study (RCT) had their samples collected. Every patient who was committed to the Al-Diwaniayh Teaching Hospital had an appendectomy performed on them using the conventional open technique, sterile instruments and equipment, surgical incisions made at the MC Burney point, and wounds that were cleaned with normal saline before being predominantly closed. Postoperatively, we classified patients with non-perforated appendix into two groups, A and B; group A received pre-operative antibiotics half an hour before surgery with a single dose of 3rd generation cephalosporin (ceftriaxone)1g and metronidazole 500mg in accordance with the guideline protocol; group B received the same pre-operative antibiotics half an hour before surgery and continued antibiotics post-op. The pre-mentioned group was Every patient was allowed to leave the hospital once their condition had improved to the point where they could tolerate mouth nutrition, were able to move around normally, had regular stool movements, and were taking oral analgesics. We recommended that they come back to the surgical center after ten days to have their stitches removed, and we also suggested that they go to the emergency room if they experienced any symptoms of deterioration, such as temperature, discomfort, or wound discharge.

After one month has passed since the procedure, the patient will have a follow-up appointment at the surgical consulting unit. The frequency of wound infection following an appendectomy is approximately 5%. This operation is categorized as a clean-contaminated technique. The student T-test was utilized in the statistical research to differentiate between continuous variables. A p-value of less than 0.05 was taken to indicate statistical significance.

Table 1. Patients Excluded from Study

Exclusion criteria	Number of patient	Percentage
Complicated cases (perforated , abscess ,mass and gangrenous)	22	31.5%
Diabetic	8	11.4%
Normal negative appendectomy	4	5.71%
Chronic steroid use	2	28.6
Pregnant	4	5.71%
Antibiotic administered before admission	5	7.14%
Failed to complete follow up	25	35.71%
Total		100%

Results and Discussion

During the course of our research, we collected 310 samples from patients who had been identified with a severely inflamed appendix, were hospitalized, and experienced surgical procedures. After this, we screened out 45 patients who did not satisfy the restriction conditions that we had outlined earlier. Then, we also don't count an additional 25 patients because they weren't followed up on. The 240 patients who were still participating in the research were split evenly between two groups: group A received 120 samples, and group B also received 120 samples.

The pre-operative antibiotic treatment for Group A consisted of a single dosage, while both the pre- and post-operative antibiotic treatment for Group B were given. We discovered that 6.67% of patients in group A developed wound infections, which was also the case in group B, where 6.67% of patients developed wound infections. There was no discernible difference in the length of time patients experienced their symptoms before seeking surgical treatment, the average age of patients, the length of time they spent in the hospital, their admittance white blood cell count, or the temperature during operation. The non-perforated group underwent thirty days of follow-up, during which time no one in the group developed an intra-abdominal infection.

Table 2. Male – Female Ratio

	Group A	Group B	Total
Number of male	66	63	129
Number of female	54	57	111
Total	120	120	240

Table 3. Comparison of Two Groups

Variable	Group A	Group B	p-value
Number of patient	120	120	
Male –female ratio	1.22:1	1.10:1	
Duration of symptoms (days)	2	1.5	0.4805
Age (mean)	28	30	0.3284
Temperature of patient at admission	37.5	37.6	0.2698
Time of surgery(minutes)	30	32	0.3046
Surgical site infection	8 (6.67)	8 (6.67)	0.8862
Hospital stay	1.3	1.5	0.5263
Admission WBC	11.5	11.8	0.3219

p –value < 0.05 to be significant.

In our study, we relied on intra-operative findings to focus on uncomplicated cases that were not perforated. As the results came in, we found that there was no reduction in Surgical site infections with a single pre-operative antibiotic regime in group A, and there was also no benefit of adding a postoperative antibiotic regime as in group B. This indicates that adding a postoperative antibiotic regime did not improve outcomes.

In 2011, Coakley and colleagues conducted a research with a total of 728 patient samples, which they also split into two groups: the first group received antibiotics before surgery, while the second group received antibacterial medication both before and after operation. (Coakley et al., 2011). They demonstrated that there is no requirement for administering antibiotics after surgery, and they don't suggest that antibiotics play any role in reducing surgical site infections (SSIs). In addition, they discussed the adverse effects of medications that were administered, including clostridial difficile infection and antibiotic-associated diarrhea.Patients who had a perforated appendix, gangrenous appendix, appendiceal tumor, or infection were not included in this research. Neither were patients who had a compromised immune system due to diabetes, prolonged steroid use, immunotherapy, or chemotherapy. All of the samples in this study came from appendices that were not perforated. The use of perioperative antibiotics is another factor that contributes to a longer hospital stay and higher costs. (Coakley et al., 2011)

Al-Mefreji KA.and his research (Antibiotics prophylaxis in non perforated appendicitis): also addressed a comparable set of findings. The investigation was conducted by Coakley and colleagues (2011). 2006. Al-Kindy Col Medical Journal.

In this research, we proceeded to follow up patients for one month to document another contagious complication known as intra-abdominal abscess. This complication rarely occurs in the non-perforated group but can occur in problematic cases (frequency 2-4%). (Van Wijck et al., 2010).

The use of antibiotics for preventative purposes will not only reduce the likelihood of adverse effects and repercussions, such as antibiotic resistance, but it will also save money. This approach is advantageous both in terms of economics and public health. Our research was hindered by a number of factors, including its small sample size, the absence of a comparison of the two groups' costs, and the absence of an evaluation of the participants' overall quality of life.

Antibiotic treatment over an extended period of time did not preclude the development of intra-abdominal abscesses in the perforated group; therefore, this supports our findings on the effectiveness of post-operative antibiotics. (Van Wijck et al., 2010). In toddlers, the possibility of developing an intra-abdominal infection and the benefits of using antibiotics (Henry et al., 2007). Rafiq et al. (2015) and Moosavi et al. (2017) conducted two randomized controlled trials on a patient population of 390 and 152 patients, respectively, who underwent consecutively in these two studies, and they demonstrated that there is no requirement for post-operative antibiotics. (Danwang et al., 2020).

In 2012, Hussain et al. of Saudi Arabia carried out a randomized controlled study that included 377 participants. The research was performed in Saudi Arabia.195 patients in the first group were given antibiotics before their operations, and 195 patients in the second group were given antibiotics after their operations. (182 sample patient). The prevalence of SSIs in the two categories are not significantly different from one another ($p = 0.9182$). (Hussain et al., 2012).

Conclusion

We found that a single dosage of pretreatment antibiotics (ceftriaxone and metronidazole) was sufficient in the prevention of SSIs after appendectomy for NPA. This was determined by comparing the rates of wound infections that occurred in both of the groups that were examined. In group A, the administration of perioperative antibiotics did not result in any discernible improvement in clinical outcomes.

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