International Journal of Research in Medical Sciences
Shirah BH et al. Int J Res Med Sci. 2016 Jan;4(1):225-230
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012

DOI: http://dx.doi.org/10.18203/2320-6012.ijrms20160035

Research Article

Wound infection in non-perforated acute appendicitis- single dose preoperative antibiotics vs. prophylactic postoperative antibiotics: does it make any difference?

Bader Hamza Shirah[1]*, Hamza Asaad Shirah[2]

[1]King Abdullah International Medical Research Center / King Saud bin Abdulaziz University for Health Sciences, Jeddah, Saudi Arabia
[2]Department of General Surgery, Al Ansar General Hospital, Medina, Saudi Arabia

Received: 14 November 2015
Accepted: 17 December 2015

***Correspondence:**
Bader Hamza Shirah,
E-mail: shirah007@ksau-hs.edu.sa

ABSTRACT

Background: Antibiotics are used pre and postoperatively in acute appendicitis for preventing wound infection. Recent studies showed that the use of postoperative antibiotics is not necessary in cases of non-perforated appendicitis as only prophylactic antibiotics are sufficient. Therefore, we aim in this study to evaluate the outcome of two protocols of wound infection prophylaxis in non-perforated appendicitis with single dose preoperative antibiotics only compared to pre and postoperative antibiotics.
Methods: 482 Saudi Arabian patients treated surgically for acute appendicitis between January 2010 and December 2014 were reviewed. Inclusion criteria included adult patients diagnosed initially as acute appendicitis. Patients proven to have had perforated appendix were excluded.
Results: 482 patients, 213 (44.2%) male and 269 (55.8%) female were included. The mean age was 26.21±6.123 years. Mean hospital stay was 2.17 ± 0.81. In group 1 (only preoperative antibiotics) the total number of patients was 237 (49.7%), in which 17 (3.5%) developed wound infection. In group 2 (pre and postoperative antibiotics), the total number of patients was 245 (50.8%), in which 20 (4.1%) developed wound infection. The overall wound infection rate was 7.6 % (37 patients out of 482).
No significant difference between both groups in regard to wound infection was found, (p = 0.9182).
Conclusions: Patients undergoing operation for non-perforated appendicitis needed only a single dose of preoperative antibiotics to prevent postoperative wound infection. Continuing antibiotic prophylaxis in the postoperative period did not add an appreciable clinical benefit in these patients.

Keywords: Acute appendicitis, Prophylactic antibiotics, Wound infection

INTRODUCTION

Acute appendicitis is the most common cause of acute abdomen in young adults. It occurs most frequently in the second and third decades of life. The incidence is approximately 233/100,000 population and is highest in the 10 to 19 year-old age group. It is also higher among men (male to female ratio of 1.4:1), who have a lifetime incidence of 8.6 percent compared with 6.7 percent for women.[1]

Appendicectomy is the treatment of choice for acute appendicitis. Non-perforated appendicitis has a reported wound infection rate of less than 10% while perforated appendicitis has an infection rate of 15–20%.[2] Postoperative wound Infection can increase the morbidity and lead to increased length of postoperative hospital

stay, drastically escalated expense, higher rates of hospital readmission, and jeopardized health outcomes.[3] Consequently, it can lead to increase in postoperative pain, sepsis and patient dissatisfaction.[4]

Appendicectomy for non-perforated appendicitis is a clean contaminated surgery, and several authors have proved the efficacy of preoperative antibiotics in preventing postoperative infective complications. Therefore; as a standard protocol, all the patients undergoing appendicectomy are given prophylactic antibiotics half to one hour before surgery. If properly used, antibiotics can reduce the rate of infection by 50%.[5]

Patients with perforated appendicitis are universally given postoperative antibiotics, which is necessary to reduce the complications of wound infection and pelvic abscess that may arise as a result of contamination of the wound and the peritoneal cavity.[6]

On the other hand, the use of postoperative antibiotics for preventing infective complications in nonperforated cases is still controversial. The practice of giving postoperative antibiotics in non-perforated uncomplicated cases of appendicitis varies around the world and no consensus exist on its use.[7]

When postoperative antibiotics are not used in non-perforated cases, some authors have shown high rates of wound infection (11%) while others showed no significant infection rate (4.6%).[8]

Some adverse events are also associated with postoperative antibiotic use like prolonged hospital stay, increase in financial burden, clostridium difficile infection and postoperative diarrhea.[9] And many recent research data supports the use of single dose preoperative antibiotics in non-perforated appendicitis.[10]

Patients undergoing open appendectomy often remain in hospital for 3-5 days after operation. In a study from Saudi Arabia, the mean length of stay in open appendectomy was 3.02 ± 1.27 days. To date there is increasing pressure on surgeons to minimize the time that the patients stay in hospital. Therefore, there is a need to establish guidelines for reasonable length of stay standards for common operations.[11]

Published data from major cities in Saudi Arabia reported post appendectomy wound infection rate of 5.3%, and 7%.[12,13] In Medina city, a good number of the patients population comes from nearby villages, towns, and rural areas. Therefore, we aim in this study to evaluate the outcome of two protocols of wound infection prophylaxis in non-perforated appendicitis with single dose preoperative antibiotics only compared to pre and postoperative antibiotics.

METHODS

Retrospective database analysis of the treatment outcome of 482 Saudi Arabian patients treated surgically for acute appendicitis between January 2010 and December 2014 at a general public healthcare hospital in Medina, Saudi Arabia was done.

Inclusion criteria included adult patients (12 years old and above – according to the age guidelines of the Saudi Arabian ministry of health**),** diagnosed clinically and/or radiologically by ultrasound in the emergency department as acute appendicitis, and operated as an emergency case within 4 hours of admission.

Exclusion criteria included patients proven to have had perforated appendix, appendicular mass, pregnant female patients, and all the patients who were started as conservative treatment and had received antibiotics within 24 hours of admission.

Collected data included age, sex, presenting symptoms, physical examination findings, fever, leukocytosis, ultrasound findings, histopathological findings. Data was recorded on a database computerized file for analysis.

In the hospital where the study was done, 2 general surgical teams (each consists of a consultant and specialist general surgeon) alternate the on call duty day after day. Team 1 adopted the single preoperative antibiotics, while team 2 adopted the protocol of one preoperative and three postoperative doses of antibiotics.

Accordingly, the patients were classified into 2 groups: Group 1: single preoperative antibiotics dose, and Group 2: single preoperative and three postoperative antibiotics doses.

All the patients received one dose of preoperative intravenous antibiotics (cefazoline 1 gram and metronidazole 500 milligram) one hour before surgery. In the second group, the patients received 3 doses of antibiotics (cefazoline 500 milligram and metronidazole 500 milligram every 8 hours).

Sterilization technique intraoperatively was done by cleaning the right iliac fossa by iodine and alcohol. All the patients had open appendectomy through a standard Grid-iron incision. Wound was closed with prolene 2-0 sutures. No drains were used at all.

Wound dressing change was done to all patients in the first postoperative day by iodine antiseptic solution, and all patients were discharged in the second postoperative day.

All patients were followed in the postoperative clinic once every week for one month. All sutures were removed in the 10th postoperative day (second postoperative clinic visit), except infected wounds (opened whenever infection developed).

Any patient developing wound infection during this period was managed by removing the skin stitches, twice daily dressings and immediately starting the patient on postoperative antibiotics (Ceftriaxone and Metronidazole).

The demographic age, gender, and living place, presenting symptoms and signs, temperature, CBC, ultrasound, operative diagnosis, duration of symptoms, duration of hospitalization, antibiotics protocol, wound infection and complications were analysed.

RESULTS

A total of 482 patients, 213 (44.2%) male and 269 (55.8%) female were included in the study. The mean age of the patients was 26.21±6.123 years with a range of 16–42 years. There were 198 (41.1%) patients in the range of 12–20 years, 186 (38.6%) patients in the range of 21–30 years and 117 (24.3%) patients in the range of 31–42 years.

327 (67.8%) were from Medina city, 112 (23.2%) were from towns and villages of Al Madinah Al Monawarrah region, and 43 (8.9%) were from rural areas (Figure 1).

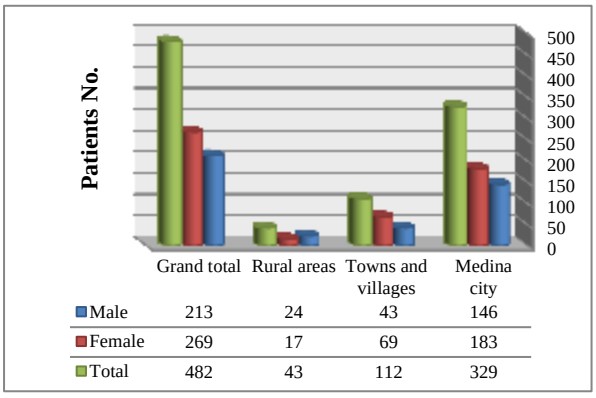

Figure 1: Geographic distribution of the study population.

Mean hospital stay was 2.17 ± 0.81. In group 1 (only preoperative antibiotics) the total number of patients was 237 (49.7%), in which 17 (3.5%) developed wound infection [9 (1.9%) male, and 8 (1.7%) female].

In group 2 (pre and postoperative antibiotics), the total number of patients was 245 (50.8%), in which 20 (4.1%) developed wound infection [11(2.3%) male, and 9 (1.9%) female].

The overall wound infection rate was 7.6 % (37 patients out of 482). 3 (0.6%) patients who had wound infection were from Medina city, 16 (3.3%) were from villages, and 18 (3.7%) were from rural areas (Table 1, Figure 2,3).

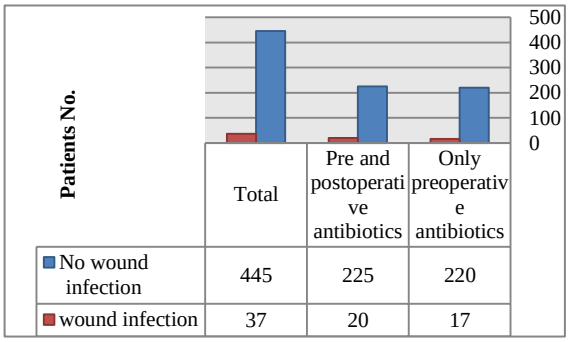

Figure 2: Comparison between both groups regarding wound infection.

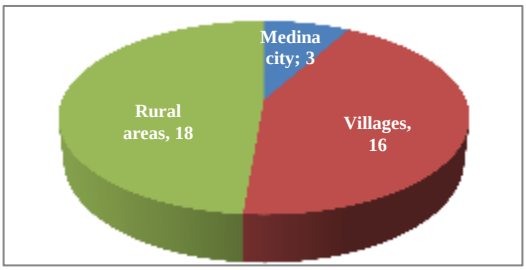

Figure 3: Geographic distribution of wound infection.

The infected wounds were opened by removing the skin stitches, cleaning twice daily with saline soaked packing, and oral antibiotics (cefazoline 500 milligram and metronidazole 500 milligram every 8 hours).

The wound infection in all patients resolved within 4–6 days with these measures and their wounds were delayed primarily closed.

Prophylactic single dose preoperative antibiotics were found effective in 216 (91.14%) out of 237 of the patients. Their wounds healed primarily without any infection.

Prophylactic single dose preoperative antibiotics and three doses postoperatively were found effective in 219 (92.4%) out of 237 of the patients. Their wounds healed primarily without any infection.

No significant difference between both groups in regard to wound infection was found, (p = 0.9182).

No significant effect of age and gender on wound infection in the study population was detected, (p = 0.4403).

Table 1: Demographic data and wound infection in both groups.

Patients group	No wound infection		Wound infection		Total		All total
	Male	Female	Male	Female	Male	Female	
Group 1 (only preoperative antibiotics)	108	112	9	8	117	120	237
Group 2 (pre and postoperative antibiotics)	85	140	11	9	96	149	245
Total	193	252	20	17	213	269	482

There was a significant difference ($p<0.05$) regarding rate of wound infection among patients from rural areas and villages compared to Medina city patients).

DISCUSSION

Wound infection after any surgery is a dreadful complication which is never wanted by the patient as well as the surgeon. It is always a depressing situation for the patient when he comes to know that his/her postoperative hospital stay and recovery has been prolonged because of wound infection. There is also a great financial impact of wound infection. Davey and Nathwani found that there is increase in hospital expenses over a patient when a wound becomes infected.[14]

Wound infections, if not controlled, can lead to major complications like burst abdomen, incisional hernia, necrotizing fasciitis and septicemia. Bucknall et al found that wound infection was a major contributing factor in burst abdomen and incisional hernia in his series. Irvin et al found that dehiscence and herniation was observed more in infected wounds, and in view of the increased incidence of such complications, it is always desirable to avoid wound infection whenever possible.[14,15]

Frequency of infective complications including wound infection in patients undergoing appendicectomy for uncomplicated appendicitis is generally very low.[16] However, it has been observed in daily practice that these patients usually receive costly parenteral postoperative antibiotics for prolonged period. The logic of this practice is the fear of the dreadful complications of wound infection. This prolonged administration of antibiotics on one hand is unnecessary, can increase antibiotic resistance, can have the antibiotics related side effects and on the other hand significantly increases the financial burden on the patient.[17-18]

It has now been proved by research that preoperative prophylactic antibiotics are more crucial in preventing postoperative wound infection in elective cases and in clean contaminated cases like acutely inflamed non-perforated appendicitis. The extension of administration of antibiotics to the postoperative period is usually not necessary in such cases.[19] However in cases of unwanted contamination and perforated appendicitis, postoperative administration of antibiotics is justified.[20]

Patients with acute appendicitis without perforation or peritonitis are not discharged early, due to concern on the part of the surgeon that it would increase surgical wound infection rates, and that postoperative pain would inhibit mobilization of the patient. Surgical wound infection is commonly due to contamination of the wound at the time of appendix removal. With minimal contamination, prophylactic antibiotic administration would bring the incidence of wound infection to a low level. Pain after open appendectomy could be managed with analgesics. After the pain disappears, the patients would be more comfortable, could be mobilized immediately and discharged earlier.[21-23]

Surgical wound infection is affected by several risk factors, i.e. patient, local, environmental, procedural, surgeon/operator, and care factors. Patient factors consist of age, nutritional status (malnutrition, obesity), the presence of other diseases (malignancy, chronic diseases [diabetes mellitus, hepatic cirrhosis], associated infection), the treatment received (corticosteroids, immunosuppressant, radiation) and psychological state of the patient (anxiety, fright, and sleeping difficulty).[21] In our study, a significant difference was found in wound infection due to patient geographical distribution. Rural areas and village patients had high infection rate, an observation we can attribute to the fact noticed in our patients that those group of people had low level of body hygiene.

Local factors that participate in surgical wound infection are necrotic tissue, avascular tissue, hematoma, poor hemostasis, foreign material in the wound, suture material and suturing technique, skin infection in the surgical area.[22]

Environmental factors consist of sterility of the operating room, number of personnel in operating room, air circulation of operating room, and sterility of instruments. Procedural factors of influence are length of hospital stay before operation, preoperative preparation

such as cleansing of the incision site, hair shaving, aseptic and antiseptic techniques for preparation, antibiotics administration, and degree of contamination of the type of surgical procedure, whether categorized as a clean, clean-contaminated, contaminated or dirty operation. Emergency or elective operation and duration of the operation are also included in procedural factors.[23] In our study, the sterilization process was unified in both groups to avoid any breach of sterility in the theatre.

Surgeon/operator factors are knowledge, skill and experience of the surgeon/operator, tissue handling, prevention of the spread of contamination, selection of needles, suture material and suturing technique.[22,23] In our study, those factors were unified among both teams.

Care factors that influence surgical wound infection are misevaluation (inexperience/lack of attention), lack of asepsis in wound care, less careful evaluation about progress/healing/symptoms of the patients, less mobilization, incorrect nutritional support.[21] In our study, the unified protocol of management played an important role, and we strongly recommend the establishment of clinical pathway guide for each procedure.

Open appendectomy patients with early discharge from hospital may be expected to differ in risk factors from those who are not discharged early (late discharged), presumably due to care factors after the operation.[24] This statement was tested true in our study, patients from rural areas who were discharged early had almost no care at their residence, which manifested as high number of wound infection.

In our study, 482 patients who had acutely inflamed non complicated appendicitis were subjected to the protocols adopted in our surgical practice in which only single dose preoperative antibiotics against aerobic and anaerobic organisms was compared to pre and postoperative antibiotics and observed them for wound infection. We encountered only 37 patients with wound infection and that too was minor which settled with conservative management.

Our infection rate was 7.6%. The result of our study is comparable with other studies conducted nationally as well as internationally by Busttil et al and Winslow et al.[12,13,18,20] They all concluded with the observation that adding postoperative broad spectrum antibiotics only added financial burden and side effects and had no effect towards preventing wound infection.

Our study also showed that age and gender have no significant association with wound infection in uncomplicated appendicitis.

We found minimal wound infection in non-complicated appendicitis with single dose prophylactic antibiotics which is comparable to that with pre and postoperative antibiotics, and we believe that further studies are needed in this regard to have sufficient evidence to support the single preoperative protocol, a practice that can be extended to other clean and clean contaminated surgeries as well.

CONCLUSION

We conclude that in patients undergoing operation for non-perforated appendicitis, single dose preoperative antibiotics were efficacious in preventing postoperative wound infection. Continuing antibiotic prophylaxis in the postoperative period was not necessary, and it did not add an appreciable clinical benefit in these patients. A special consideration should be attributed to personal body hygiene factors especially in patients from rural areas.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

REFERENCES

1. Humes DJ, Simpson J. Acute appendicitis. BMJ. 2006;333;530-4.
2. Andersson R. Meta-analysis of the clinical and laboratory diagnosis of appendicitis. Br J Surg. 2004;91:28-37.
3. Chamisa I. A clinicopathological review of 324 appendices removed for acute appendicitis in Durban, South Africa: a retrospective analysis. Ann R Coll Surg Engl. 2009;91:688-92.
4. Bickel A, Gurevits M, Vamos R, Ivry S, Eitan A. Perioperative hyperoxygenation and wound site infection following surgery for acute appendicitis: a randomized, prospective, controlled trial. Arch Surg. 2011;146:464-70.
5. Bickell NA, Aufses JAH, Rojas M, Bodian C. How time affects the risk of rupture in appendicitis. J Am Coll Surg. 2006;202:401-6.
6. 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.
7. Ravari H, Jangjoo A, Motamedifar J, Moazzami K. Oral metronidazole as antibiotic prophylaxis for patients with nonperforated appendicitis. Clin Exp Gastroenterol. 2011;4:273-6.
8. Andersen BR, Kallehave FL, Andersen HK. Antibiotics versus placebo for prevention of postoperative infection after appendicectomy. Cochrane Database Syst Rev. 2005;3.
9. Coakley BA, Sussman ES, Wolfson TS, Bhagavath AS, Choi JJ, Ranasinghe NE, et al. Postoperative antibiotics correlate with worse outcomes after appendectomy for nonperforated appendicitis. J Am Coll Surg. 2011; 213:778-83.
10. Malik SA, Rasheed M, Abbasi AS, Iqbal RA, Mian MA. Role of signal dose preoperative antibiotic in

acute nonperforated appendicitics. Pak Armed Forces Med J 2013;63:114-7.
11. Yagnik VD, Rathord JB, Phatak AG. A retrospective study of two-port appendectomy and its comparison with open appendectomy and three-port appendectomy. Saudi J Gastroenterol. 2010;16:268-71.
12. Shehri MY, Saif S, Ibrahim A, Abu-Eshy S, Malki T, Latif AA, et al. Topical ampicillin for prophylaxis against wound infection in acute appendicitis. Ann Saudi Med. 1994 May;14(3):233-6.
13. Eltahawy AT, Mokhtar AA, Khalaf RM, Bahnassy AA. Postoperative wound infection at a university hospital in Jeddah, Saudi Arabia. J Hosp Infect. 1992;21(1):79-83.
14. Bucknall TE, Cox PJ, Ellis H. Burst abdomen and incisional hernia: a prospective study of 1129 major laparotomies. Br Med J. 1982;284:931-3.
15. Irvin TT, Stoddard CJ, Greaney MG, Duthie HL. Abdominal wound healing: a prospective clinical study. Br Med J. 1977;2:351-2.
16. Gupta R, Sample C, Bamehriz F, Birch DW. Infectious complications following laparoscopic appendectomy. Can J Surg. 2006;49:397-400.
17. Derek WM, Lillian SK. Controversies in appendicitis. Surgical Infections. 2008;9:553-8.
18. Busttil RW, Davidson RK, Fine M, Tompkins RK. Effect of prophylactic antibiotics in acute nonperforated appendicitis. Ann Surg. 1981;194:502-8.
19. Bauer T, Vennits B, Holm B, Hahn-Pedersen J, Lysen D, Galatius H, et al. Antibiotic prophylaxis in acute nonperforated appendicitis. Ann surg.1989;209:307-11.
20. Winslow RE, Dean RE, Harley JW. Acute nonperforating appendicitis efficacy of brief antibiotic prophylaxis. Arch Surg. 1983;118:651-5.
21. Nichols RL. Preventing surgical site infections: surgeon's perspective. Emerg. Infect Dis. 2001;7:220-4.
22. Nichols RL. Current strategies for prevention of surgical site infections. Curr Infect Dis Rep. 2004;6:434-42.
23. Rubin RH. Surgical wound infection: epidemiology, pathogenesis, diagnosis and management. BMC Infect Dis. 2006;6:171.
24. Gottrup F, Melling A, Hollander DA. An overview of surgical site infections: aetiology, incidence and risk factors. EMWA J. 2005;5:11-5.

Cite this article as: Shirah BH, Shirah HA. Wound infection in non-perforated acute appendicitis- single dose preoperative antibiotics vs. prophylactic postoperative antibiotics: does it make any difference? Int J Res Med Sci 2016;4:225-30.