

INCIDENCE OF WOUND SITE INFECTION IN PATIENTS WITH SIMPLE AND GANGRENOUS OR PERFORATED APPENDIX AFTER PRIMARY WOUND CLOSURE: A STUDY IN SURGICAL UNIT HAYATABAD MEDICAL COMPLEX

Zafar Iqbal, Gul Shareef, Gulab Noor, Azizullah, Irfan ul Islam

ABSTRACT

Objective: To determine the incidence of surgical site infection in patients after primary closure with perforated or gangrenous and simple appendicitis.

Background: Appendectomy is the most commonly performed procedure in surgical emergency departments throughout the world. After appendectomy most surgeons nowadays prefer primary delayed closure in patients having gangrenous or perforated appendicitis. Usual outcome is more post operative pain as well as prolong hospital stay resulting in increase hospital costs which is a matter of big concern in this part of the world. There is an ongoing debate regarding primary wound closure in these patients without an obvious consensus yet. Usually in this hospital the wound is left open for primary delayed wound closure. In this study our aim was to compare the incidence of wound infection in patients having simple appendicitis to those who had gangrenous or perforated appendix after performing primary closure in both groups.

Material and Methods: This study was conducted in surgical unit Hayatabad Medical Complex Peshawar. In this observational study a total of 356 patients were included, in which 178 patients (half of total) were of gangrenous or perforated appendicitis and 178 patients (half of total) were simple appendicitis. Wounds of all patients in both groups were closed by choosing primary wound closure method. Follow up was carried out for a time period of 30 days in all patients after surgery. Data of the patients such as age, gender, operating time, histopathologic report, culture/ sensitivity report and wound infection were all gathered. A comparison between the studied groups was made using Student's *t*-test for continuous variables and χ^2 test for categorical variables.

Results: The median age of the patients was 22 years. There were 118 (33.4%) females and 238 (66.6%) males. The median operating time was 32 minutes. Wound infections were observed in 21 patients (5.8%), including 8 cases of simple and 13 cases of gangrenous or perforated appendicitis which was not statistically significant.

Conclusion: There was no statistically significant difference in wound infection between the simple and gangrenous or perforated appendicitis groups.

Key Words: Primary wound closure, Delayed wound closure, Simple and gangrenous or Perforated appendicitis, wound infection

INTRODUCTION

Wound infection is not an uncommon cause of post operative morbidity after appendectomy even after the mandatory protocol use of preoperative broad spectrum prophylactic antibiotic, which results in more post operative pain as well as prolong stay in the hospital.¹

The incidence of wound infection in simple appendicitis is less than 10%^{2,4}. But in contrast higher in gangrenous and perforated appendicitis from 15% to 20% with maximum of 35% in cases of generalized peritonitis²⁻⁵.

Usually surgeons with intent to prevent the complication of wound site infection prefer delayed primary closure in cases of gangrenous or perforated appendix^{6,7}. Up-to-date most centers in the world stick to the policy of leaving the wound open in majority of post appendectomy patients, especially in those with perforated or gangrenous appendix.¹

The main reason behind this approach was the response to the very high incidence of wound site infection in these complicated cases of upto 58%. But the limitation is that most of these reports were gathered before the era of the new day golden drugs (broad spectrum antibiotics), which have definitely resulted in decrease number of these wound site infections rates. Several trials in 80s and 90s showed marked decline in these wound site infections in patients with primary wound closure after the use of prophylactic antibiotics in these groups which is a solid reason to believe that such management might be a safe and easy option.⁷

¹ Department of Surgery, HMC, Peshawar

² Department of Surgery, LRH, Peshawar

³ Department of Surgery, Batkhela

Address for corresponding

Dr. Zafar Iqbal

Department of Surgery, HMC, Peshawar
Cell: 0300-5974858

Even studies in recent past by Chatwiriya (2002) and McGreal (2002) have shown that gangrenous or perforated appendicitis most of the times can be primarily closed.^{8,9}

As several trials have concluded that, primary closure of all incisions is indicated. Thus one of the most important reasons for the controversy in a primary or delayed closure is post-surgical wound infection.^{1,5} In this study, we have attempted to compare the incidence of wound infection after primary wound closure between patients with gangrenous or perforated versus patients with simple appendicitis.

MATERIAL AND METHODS

A total of 356 patients both males and females with the diagnosis of acute appendicitis who were operated in our surgical department between January 2012 and June 2013 were included in this study, the wound was primarily closed. The following data were gathered: age, sex, operation time, and pathologic diagnosis, length of stay in hospital, American society of anesthesiology classification, preoperative antibiotic administration and presence of wound site infection. We followed the patients for the presence of wound site infection according to Hinchey classification of wound site infection for a time period of 4 weeks after appendectomy. All patients were divided in two groups of simple and gangrenous or perforated appendicitis on the basis of their operative findings and pathology reports. Simple appendicitis (178 patients) which consisted of acute focal and acute suppurative; and the latter (178 patients) which were gangrenous and perforated.¹⁰ Patients with generalised peritonitis and those who had perforation at the base of the appendix were excluded from the study. The diagnosis of peritonitis in suspected patients was confirmed either by ultrasonography or at laparotomy. Only patients with ASA 1 were included in the study to control the confounders. Wound infections were managed by opening the wound and normal saline wash and in addition with antibiotic cover according to culture and sensitivity report for 5-7 days.

The use of prophylactic antibiotics cephalosporin and metronidazole before the skin incision and 4 doses of cephalosporin in next 2 days and 6 doses of metronidazole in next 2 days intravenously was carried out in all these patients. In cases where gangrenous or perforated appendicitis was found at the time of surgery, antibiotics were continued for the next 5 days after the patient was discharged from the hospital.

After the diagnosis of acute appendicitis, all patients were admitted, Informed consent was taken from all patients. Prophylactic antibiotic was given. Grid iron

incision and muscle-splitting technique was used. Care was taken to avoid contamination of the subcutaneous tissue and adjacent peritoneal cavity during the procedure. Appendectomy was performed with double stump ligation. The peritoneum, transverses abdominis muscle and aponeurosis of the external oblique muscle were closed in layers. Before skin closure, the wound was irrigated thoroughly with warm saline. Skin was closed with interrupted sutures. In patients with perforated appendicitis, peritoneal lavage after appendectomy was routinely performed with warm saline until the return of clear effluent. Medium size tube drain was placed in the pelvis through a separate wound in the abdominal wall. The skin and subcutaneous tissue were closed primarily.

Patients' characteristics were analyzed using student's t test for continuous variables and χ^2 test for categorical variables. A *P* value of less than 0.05 was considered to be statistically significant. All data analyses were performed using the SPSS program (version 11.5).

RESULTS

The median age of the patients was 22 years old (ranging from 15 to 65 years). There were 118 (33.4%) females and 238 (66.6%) males. On the basis of American Society of Anesthesiologists (ASA) classification, all patients were placed in class 1.

The median operation time was 32 minutes. The surgical wounds were closed primarily in 100% of the cases. The operation technique was the same in both groups. The male to female ratio in the simple appendicitis group was 87:91 and 127: 51 in the gangrenous and perforated group.

There were 21 patients (5.8%) who developed wound infection that required opening and irrigation. No other major complications, such as an intra-abdominal

Table 1. Frequency of post-surgical wound infection (PWI) according to simple and gangrenous or perforated appendicitis (*P*=0.260687).

Appendicitis type	PWI	
	Total Prevalence of PWI	No. PWI
Simple	8(4.5%)	170(95.5%) 178
Gangrenous or perforated	13(7.3%)	165(92.7%) 178
Total	21(5.8%)	335(94.2%) 356

PWI=post-surgical wound infection

abscess or perioperative mortality were seen. Simple appendicitis was diagnosed in 178 cases and gangrenous or perforated appendicitis in 178 cases, pathologically. Postoperative surgical wound infection had an incidence of 4.5% in the simple appendicitis group and 7.3% in the gangrenous or perforated appendicitis group (Table 1).

There was no statistically significant difference in wound infection between the simple and gangrenous or perforated appendicitis groups ($P=0.260687$).

DISCUSSION

As with simple appendicitis, the outcome of future debates about gangrenous or perforated appendicitis will rest on potential differences in postoperative factors such as analgesia requirements, length of hospital stay, return to regular activity and complication rates.¹¹ Some authors consider that preoperative antibiotic administration allows for primary closure of appendectomy wounds despite data suggesting that contaminated wounds have a higher rate of wound infection.¹²

This practice has been aggressively pursued by the pediatric surgical community on the basis of its association with a "low" incidence of infectious complications, the elimination of painful and time-consuming dressing changes and reduction in cost.^{13,14}

Primary wound closure of acute appendicitis with perforation has also found its way into the management of adult patients without adequate assessment of adverse outcomes. Open wound management of contaminated wounds is a practical measure that has been used for centuries.¹⁵

Previous reports indicate that the incidence of postoperative wound infection after appendectomy substantially increases with the severity of appendicitis and most infections occur after emergency appendectomy for perforated appendicitis.¹⁶

It is reported by Chiang et al that the presence of appendiceal perforation is the most important factor associated with the development of postoperative wound infection. They have concluded that in the presence of perforation, wounds should be left open to avoid an increased likelihood of wound infection and longer hospital stay.¹ However, in this study surgical wound infection had an incidence of 4.5% in the simple appendicitis group and 7.3% in the gangrenous or perforated appendicitis group. This difference was not statistically significant ($P=0.260$).

Primary closure was performed in gangrenous or perforated appendicitis, because of low incidence of postsurgical infection or other complications

CONCLUSION

In this study we have concluded that primary wound closure after appendectomy would be safe even in the presence of a perforation provided that appropriate use of broad spectrum antibiotics cover is ensured. In simple words, a primary wound closure could be recommended in patients with gangrenous or perforated appendicitis as well as in those with a simple one.

REFERENCES

1. Chiang RA, Chen SL, Tsai YC, Bair MJ. Comparison of primary wound closure versus open wound management in perforated appendicitis. *J Formos Med Assoc.* 2006; 105: 791 – 795.
2. Lemieur TP, Rodriguez JL, Jacobs DM, Bennett ME, West MA. Wound management in perforated appendicitis. *Am Surg.* 1999; 65: 439 – 443.
3. McGreevy JM, Finlayson SR, Alvarado R, Laycock WS, Birkmeyer CM, Birkmeyer JD. Laparoscopy may be lowering the threshold to operate on patients with suspected appendicitis. *Surg Endosc.* 2002; 16: 1046 – 1049.
4. Khamash MR, Ayyash K. Wound infection in primary versus delayed primary wound closure in cases of perforated and gangrenous appendicitis. *Saudi Med J.* 1994; 15: 408 – 410.
5. Adrian B. Wound healing. In: Brunicaudi FC, Andersen DK, Billiar TR, Dunn DL, Hunter JG, Pollock RE eds. *Schwartz's Principles of Surgery.* 8th ed. New York: McGraw-Hill Companies; 2005: 234 – 238.
6. Bernard M, Jaffe H, David H, Berger. The Appendix. In: Brunicaudi FC, Andersen DK, Billiar TR, Dunn DL, Hunter JG, Pollock RE. eds. *Schwartz's Principles of Surgery.* 8th ed. New York: McGraw-Hill Companies; 2005: 1131.
7. Henry MC, Moss RL. Primary versus delayed wound closure in complicated appendicitis: an international systematic review and meta-analysis. *Pediatr Surg Int.* 2005; 21: 625 – 630.
8. Chatwiriacharn W. Surgical wound infection post surgery in perforated appendicitis in children. *J Med Assoc Thai.* 2002; 85: 572 – 576.
9. McGreal GT, Joy A, Manning B, Kelly JL, O'Donnell JA, Kirwan WW, et al. Antiseptic wick: does it reduce the incidence of wound infection following appendectomy? *World J Surg.* 2002; 26: 631 – 634.
10. Rosai J, Ackerman LV. *Rosai and Ackerman's Surgical Pathology.* 9th ed. Edinburgh: New York: Mosby; 2004: 758.
11. Ball CG, Kortbeek JB, Kirkpatrick AW, Mitchell P. Laparoscopic appendectomy for complicated appendicitis: an evaluation of postoperative factors. *Surg Endosc.* 2004; 18: 969 – 973.

12. Centers for Disease Control. The National Infection Surveillance System: The national nosocomial infection surveillance (NNIS) report, data summary from October 1986 – 1996. *Am J Infect Control.* 1996; 24: 380 – 388.
13. Serour F, Efrati Y, Klin B, Barr J, Gorenstein A, Vinograd I. Subcuticular skin closure as a standard approach to emergency appendectomy in children: prospective clinical trial. *World J Surg.* 1996; 20: 38 – 42.
14. Rucinski J, Fabian T, Panagopoulos G, Schein M, Wise L. Gangrenous and perforated appendicitis: a metaanalytic study of 2532 patients indicates that the incision should be closed primarily. *Surgery.* 2000; 127: 136 – 141.
15. Cohn SM, Giannotti G, Ong AW, Varela JE, Shatz DV, McKenney MG, et al. Prospective randomized trial of two wound management strategies for dirty abdominal wounds. *Ann Surg.* 2001; 233: 409 – 413 .
16. Aranda-Narváez JM, Prieto-Puga Arjona T, García-Albiach B, Montiel-Casado MC, et al. Post appendectomy surgical site infection: overall rate and type according to open laparoscopic approach. *Enferm Infecc Microbiol Clin.* 2014; 32: 76 – 81.

ONLINE SUBMISSION OF MANUSCRIPT

It is mandatory to submit the manuscripts at the following website of KJMS. It is quick, convenient, cheap, requirement of HEC and Paperless.

Website: **www.kjms.com.pk**

The intending writers are expected to first register themselves on the website and follow the instructions on the website. Author agreement can be easily downloaded from our website. A duly signed author agreement must accompany initial submission of the manuscript.