

REDUCTION OF POSTOPERATIVE WOUND INFECTION AFTER APPENDECTOMY BY PERITONEAL CLOSURE AND WOUND IRRIGATION WITH NORMAL SALINE

Ahmad Jaleel Abdul-Razzak* & Zeki A Al-Faddagh@

*MB,ChB, Al-Mawanee General Hospital. @MB,ChB, CABS, Professor of Surgery, Head of Department of Surgery, Basrah Medical College, Basrah, IRAQ.

Abstract

The most common complication following appendectomy is postoperative wound infection and since it has major effects on patient's health & recovery and on the health system as it consumes time and essential resources so from this fact came the importance of the researches that are done to find any means to reduce postoperative wound infection and many of them have been shown to be beneficial in reducing wound infection like the use of prophylactic antibiotics, postoperative antibiotics and laparoscopic appendectomy but in this study we look for the effectiveness of 2 simple measures which are peritoneal closure and wound irrigation with normal saline in reducing the incidence of postoperative wound infection. Aim of the study: to know if peritoneal closure and wound irrigation with normal saline would significantly reduce the incidence of postoperative wound infection after appendectomy.

The study had been carried out from January 2010 to January 2012 in Al-Mawanee General Hospital and it had been done by the same surgeon and as emergency cases.

The study included 297 patients divided into: The control group: include those in whom no peritoneal closure and no wound irrigation were done, patients in this group were 153.

Case group: include those in whom peritoneal closure and wound irrigation with normal saline had been done and it included 144 patients. Comparison between the two groups had been done according to sex, age, and the state of inflammation of the appendix also factors affecting wound healing and increasing the incidence of wound infection had been taken in consideration. Data were analyzed using P value to determine the significance of the results.

Although the incidence of acute appendicitis was slightly higher in males but the incidence of wound infection was found to be higher in females but it was not statistically different so sex is not a risk factor for the development of wound infection in both groups. Regarding age, in both control and case groups, the highest rate of incidence of acute appendicitis was in the age group 21-40 years but the highest rate of wound infection was in the age group 60 years and above, it was 50% in control group and 16% in the case group and so age is a risk factor for the development of wound infection and there is a clear reduction in the incidence of wound infection after the use of peritoneal closure and wound irrigation with normal saline and there were also reduction in the incidence of wound infection in all other age groups after using these two measures. Regarding the state of severity of inflammation of the appendix the highest rate of wound infection was found in the severe appendicitis subgroup in both the control (infection rate was 31.4%) and case (9.6%) groups but again there was a clear reduction in the incidence of wound infection.

In conclusion: peritoneal closure and wound irrigation with normal saline help in reducing the incidence of postoperative wound infection after appendectomy.

Introduction

The most common complication after appendectomy is wound infection¹⁻³, it is found to be 5-10% in UK¹ but it may vary from county to county and from one study to another, due to its effects on health and survival of

the patients and on the health system as a whole, it has been the target of many researches over the years². Some researches found that the use of prophylactic antibiotic is effective in preventing wound infection³, others have studied the benefits of the use of postoperative antibiotics and found that it clearly reduce the incidence of wound infection⁴.

Some researchers carried their studies about the advantages of laparoscopic appendectomy over open one and it was found that laparoscopic appendectomy associated with reduced incidence of wound infection⁵.

Generally, there are several factors affecting wound healing and the incidence of postoperative wound infection and it is divided into:

1. General factors: like nutritional status, obesity, systemic diseases (like diabetes mellitus, renal failure, malignancy, and HIV infection), drugs (steroids, immunosuppressant) & radiation.

2. Local factors: include blood supply, foreign bodies⁶.

The presence of any of these factors is associated with increased incidence of wound infection and delayed wound healing.

Also the severity of inflammation of the appendix and the presence of perforation is directly related to the incidence of wound infection as it is associated with increase in the rate of wound infection. Some authors favor leaving the wound open after operation for perforated appendix and close it later by delayed primary closure.

Most of the cases of appendectomy are done as an emergency operation for acutely inflamed appendix and this might be associated with increased risk of wound infection due to the state of inflammation of the appendix, peritoneal contamination and preparation of the patients but sometimes appendectomy done as elective procedure⁷ (which are not included in our study).

The aim is to study the role of simple steps (peritoneal closure and wound irrigation with normal saline) in reducing post-operative wound infection after appendectomy.

Patients and Method

This is a prospective cohort study involving 297 patients subjected to emergency appendectomy for acute appendicitis in Al-Mawanee General Hospital and it has been carried out from the 1st of January 2010 to the 1st of January 2012.

Patient's consent had been taken from all patients participating in this study.

Detailed information had been taken from each patient with examination and necessary investigations have been done to all of.

All patients had the same perioperative antibiotics which are ceftriaxone vial 1 gram and metronidazole infusion 500 mg one hour before surgery. Injectable antibiotics for 2 days were used then on the third day we shift to oral antibiotics which is cephalexine 500mg 6 hourly and metronidazole 500mg 8 hourly for the next 5 days, except those with severe inflammation in whom we gave the injectable antibiotics for 5 days then shift to oral antibiotics.

All operations had been done by the same surgeon.

In the theater, all patients had the same aseptic techniques and care was taken during surgery to avoid contact between the inflamed appendix and the wound as much as possible, all of them had the same type of suture material used (which is Vicryl suture material for ligation of the mesoappendix and the appendix) and Catgut suture material was used to close the peritoneum and muscle layers, vicryl used for closing the sheath, and the skin closed using Silk suture material. Also mopping had been done for all patients.

After closing the peritoneum, wound irrigation had been done using non pressurized irrigation by 50ml syringe from a distance of 10 cm from the wound

and usually using 100-200 ml of normal saline after ensuring that the wound had been thoroughly irrigated, the wound dried using sterile gauze and the rest of wound layers are closed layer by layer using the suture material mentioned above.

The patients are kept in the hospital for the first 48 hours postoperatively then before discharge, all patients had been informed about how to contact us and had been educated about early symptoms and signs of wound infection and instructed to contact their doctor immediately if they have any of these symptoms and signs. They were discharged to home on the third postoperative day except those with perforated appendicitis which were kept for longer period and all of them to be checked again at the 7th-10th day postoperatively.

Patients who found to have normal appendix were excluded from the study so as those who did not came back for follow up (38 patients).

The patients were divided into 2 groups: Studying group (144 patients) those for whom peritoneal closure and wound irrigation with normal saline had been

done. Control group (153 patients) those in whom no peritoneal closure or wound irrigation with normal saline had been done. Then the patients in each group had been divided into 3 subgroups depending on the state of inflammation of the appendix (which was assessed both by gross appearance and histopathological examination:

- 1-Mild
- 2- Moderate
- 3- Severe inflammation and perforated

The diagnosis of wound infection depended mainly on clinical bases according to the symptoms and signs of wound infection which depends on severity of wound infection ranging from just persistent pain and erythema to serosanguinous discharge and in severe infections systemic upset in the form of fever, tachycardia, pain, decrease appetite and feeling ill, in addition to pus discharge from the wound.

A statistical analysis and comparison between the groups and subgroups in regard to age, sex & severity of inflammation were done using SPSS protocol.

Results

Table I: Gender distribution in patients developed wound infection in both groups

group	Control group		Case group	
	No. of patients	Patients with wound infection	No. of patients	Patients with wound infection
Male	80(52.2%)	15(48.4%)	77(53.4%)	4(44.4%)
Femal	73(47.8%)	16(51.6%)	67(46.6%)	5(55.6%)
Total	153	31	144	9

Table I shows that incidence of acute appendicitis is slightly more in males than females in both the control group (52.2% males and 47.8% females) and case group (53.4% males and 46.6% females).

Although the incidence of acute appendicitis found to be more in male patients for both groups (52.2% for

control & 53.4% for case group), still wound infection found to be more in female patients (51.6% for control group & 55.6% for case group) as compared to

males (49.4% for control group & 44.4% for case group).

The P-value for the results considered significant if less than 0.05.

For the control group, the highest incidence of acute appendicitis found in age group 21-40 years (118 patients 77.1%), while the lowest incidence found in those of age group 60 years and above (6 patients 3.9%). However, the highest rate of wound infection found in those with age group 60 years and above (3 patients 50%). The lowest was for age group 21-40 years (21 patients 17.7%). For case group, the highest incidence of appendicitis found within same age group

as in control group which is age group 21-40 years (116 patients 80.5%), again the lowest incidence found in age group 60 years and above (6 patients 4.1%). Patients who developed higher rate of wound infection were in age group 60 years and above (1 patient 16%), those who developed the lowest rate of wound infection were in age group 41-60 years (no patients actually 0%) as demonstrated in table II.

Table II: Age distribution of wound infection in both groups

Group age	Control		Case	
	No. of patients	patients With wound infection	No. of patients	Patients with wound infection
0-20 Ys	19 (12.5%)	4 (21%)	15 (10.4%)	1 (6%)
21-40 Ys	118 (77.1%)	21(17.7%)	116 (80.6%)	7 (6%)
41-60 Ys	10 (6.5%)	3 (30%)	7 (4.8%)	0
60+ Ys	6 (3.9%)	3 (50%)	6 (4.2%)	1 (16%)
Total	153	31 (20.2%)	144	9 (6.2%)

Table III: Wound infection according to state of infection in both groups

Group State of infection	Control		Case	
	No. of patients	Patients with wound infection	No. of patients	Patients with wound infection
Mild	56(36.6%)	5 (8.9%)	48 (33.3%)	1 (2 %)
Moderate	62 (40.6%)	15 (24.1%)	65 (45.2%)	5 (7.6%)
Severe	35 (22.8%)	11 (31.4%)	31 (21.5%)	3 (9.6%)
Total	153	31 (20.2%)	144	9 (6.2%)

Table III shows the distribution of wound infection regarding the state of infection. The highest infection rate found to be in the severe infection subgroup for both groups (11 patients 31.4% for control group and 3 patients 9% for case group). Overall wound infection found to be 31 patients (20.2%) for control group and 9 patients (6.2%) for case group. The P-value for the results was significant at the level of <0.05%.

Although the incidence of wound infection is significantly reduced in both sexes (9.8% for males & 10.4% for females in control group and 2.7% for males &3.5% for females in case group) by peritoneal closure and wound irrigation with normal saline but there were no significant differences between males and females, this result is the same as a study done by Skarzynska J⁹. This means that the sex is not a risk factor for increasing wound infection¹⁰.

Discussion

For age distribution, it was found that the highest rate of wound infection was in the age group +65 years (50% for control group and 16% for case group) this reflects that older age group is associated with increase in the incidence of wound infection this might be explained by decrease in the immunity which is associated with aging process¹⁰⁻¹³, this is not so far from a study done by Huii T T et al which showed the same results¹⁴. However a study done by Paola Primatesta had shown that the highest rate of wound infection found in the age group 0-14 years. This may be explained by the small number of patients included in her study in which no patients over 45 years was found¹¹.

With regard to the severity of inflammation it was found that the highest rate of wound infection was in the subgroup of severe appendicitis and perforated appendicitis in both groups. This is true as the incidence of wound infection is directly related with the severity of the underlying inflammatory process. These results are similar to what Gilmore found in his study¹².

Two patients with moderately inflamed appendix in the control group had had immune suppression (steroids user) and both of them developed postoperative wound infection and this might be a cause of the increased incidence of wound infection in this subgroup of patients while two patients of the same subgroup in the case group were immune compromised one who was steroid user and the other was diabetic but only the last one developed wound infection while the former one did not.

Three patients of the severely inflamed subgroup in the control group had immune suppression, one of them on cytotoxic drugs for rheumatologic disease and the other two patients were diabetics (who presented with perforated appendicitis) all of them developed postoperative wound infection and this might be the cause of the high incidence of wound infection in

this group while there were 2 patients of the severely inflamed subgroup in the case group immune suppressed one of them was steroid user and the other diabetic(who presented with perforated appendicitis) and both of them developed wound infection but due to the small sample size we can not be sure whether peritoneal closure and wound irrigation with normal saline help in reducing the incidence of postoperative wound infection in immune compromised patients and there is a need to carry out larger study to determine the efficacy of these measures in reducing wound infection in immunosuppressant patients. So the overall incidence of postoperative wound infection was significantly reduced in the case group(6.2%) as compared with the control group(20.2%) by the use of peritoneal closure and wound irrigation with normal saline as they decreases the contact between intraperitoneal contents and the wound and also wound irrigation decrease the load of infective contents and cellular debris in the wound and aid in facilitating the phases of wound healing and these results are similar to the results of the study done by Ennis WJ⁸.

Conclusion

There is a significant positive association between the use of peritoneal closure and wound irrigation with normal saline and the reduction of postoperative wound infection.

Peritoneal closure and wound irrigation with normal saline are simple procedures that reduce the development of postoperative wound infection and benefit the patients and the health system by preserving resources and decreasing inpatients admission for wound infection.

Recommendations

1. Apply these two measures which are peritoneal closure and wash of the wound with normal saline during appendectomy

to help reducing the incidence of postoperative wound infection in those with immune suppression and those with perforated appendicitis.

2. Carrying out larger and longer studies to know whether these two measures benefit us in reducing the incidence of

References

1. P.Ronan O'Connell,NORMAN S. WILLIAMS,CHRISTOPHER J.K. BULSTRODE & P. Ronan o'connell), Baily & Love's SHORT PRACTICE of SURGERY,HODDER ARNOLD (publishers) Ltd,25th edition, 2008;67:1204-1219
2. Julie A. Margenthaler, Walter E. Longo. Risk Factors for Adverse Outcomes After Surgical Treatment Of Appendicitis in adults. Ann Surg ,2003; 238:5-12
3. Busuttill R W, Davidson R K, Fine M, Tompkins R K. Effect of prophylactic antibiotics in acute nonperforated appendicitis. Ann Surg,1981;194:502-509.
4. Anderson B.R.,Kallhave, F.L. and Anderson, H.K. Antibiotics versus placebo for prevention of postoperative infection after appendectomy,2002;Cochrane Database of Systemic Review Issue 3,Art. No.CD001439.
5. Golub R, Siddiqui F, Pohl D: laparoscopic versus open appendectomy: a metaanalysis. J Am Coll Surg , 1998;186:553-555.
6. P. Driscoll, Factors affecting wound infection: Published at Medmarket Diligence and Advanced Medical technologies, 2010.
7. T.E. Snyder* and J.R. Selanders, Elective Appendectomy, Infectious Diseases in Obstetrics and Gynecology, 1998; 6:30-37.2005;112:205-207.
8. Ennis WJ, Valdes W, Salzman S, Trauma and wound care, Ann Emerg Med, 2004; 291-307.
9. Skarzynska J, Cienciala A, Hospital infection in general surgery wards. BMC Surgery 2005, 5:2
10. Lecuona M, Torres Lana A: Risk factors for surgical site infections diagnosed after hospital discharge. J Hosp Infect 1988, 39(1):71-4.
11. PAOLA PRIMATESTA and MICHAEL J GOLDACRE Appendectomy for Acute Appendicitis and for Other Conditions, International journal of epidemiology 1994; 23(1):155-60.
12. O. J. A. Gilmore, T. D. M. Martin , Aetiology and prevention of wound infection in appendectomy. bjs , 2005 ; Pages: 281-287.
13. Brunicari F C ,Andersen D K ,Billiar T R. Shwartz's principles of surgery,Mc Graw Hill publisher,9th Edition , 2009; 33:1219-25.
14. Huii T T ,et al, Appendicitis in the Elderly. Surg Endosc,2002, 21: 777-781.