

# The Value of Delayed Primary Wound Closure in Perforated Appendicitis

Majeed H. H Al-Amiri, FICMS \*

## Abstract

**Background:** the wound infection is the most common complication following operation for perforated appendix. Drainage and systemic antibiotic agents have not altered the incidence of wound sepsis in cases of perforated appendicitis with primary wound closure.

**Aims of study:** to study the delayed primary wound closure in preventing wound infection in cases of perforated appendicitis.

**Patients and methods:** This is a prospective study conducted on 216 patients with appendicitis who underwent operation at surgical wards of Al – Yarmouk Teaching Hospital, from January 2005- august 2008. The range of age from 11-56year, mean age was 33.5 years. For comparison purposes, the patients were divided into three groups:

Group I:- uncomplicated (non perforated) appendicitis.

Group II:- perforated appendicitis were treated with appendicectomy and primary wound closure.

Group III: perforated appendicitis who were treated with appendicectomy and delayed primary wound closure.

All the three groups patients were treated in the following manner:-

Grid-iron incision done. Aspiration or swabs of peritoneal fluid or pus and appendix stump and wound edges were taken & send to the laboratory & cultured for aerobic and anaerobic bacteria, appendicectomy done after ligation of the mesoappendix and tube drains used.

**Results:** There were no deaths encountered in the series of 216 patients. Wound infection was defined as any purulent discharge from the wound requiring drainage or repeated dressing, or any collection of purulent exudates in the wound requiring repeated dressing or drainage.

Group I:-wound infection occurred in 5.26%.

Group II:- wound infection was noted in 29.03%.

Group III. wound infection occurred in 3.03%.

**Conclusion:** the wound becomes contaminated during operation for perforated appendix by manipulation and seepage of purulent exudates into the wound. Primary closure of such a wound creates a potential closed space for infection. The high incidence 29.03% of superficial wound infection occurring in group II bears out this observation.

## Introduction:

Overall about 20% of all patients with acute appendicitis have perforation at the time of operation.<sup>[1,2,3]</sup> At the extremes of age (below 5 and above 60 years) the rate of perforation is in the region of 60%<sup>[4,5,6]</sup> Wound infection is the most common postoperative complication following appendicectomy occurring in 5- 10 % of all patients<sup>[7,8]</sup> This usually presents with pain and erythema of the wound on the fourth or fifth postoperative day, often soon after hospital discharge.

The organisms responsible are usually a mixture of gram-negative bacilli and anaerobic bacteria, predominantly, *E. coli*, bacteroides species and anaerobic streptococci.<sup>[9,10]</sup> Broad spectrum antibiotics can be given to treat such infections. The introduction of antibiotics for prophylaxis and for treatment, together with advances in anaesthesia and critical care medicine, has made possible surgery that would not previously have been considered.<sup>[11,12]</sup> Despite this it is common practice in many countries to delay wound closure in patients in whom the wound is known to be contaminated or dirty.<sup>[13]</sup> Waiting for the wound to granulate and then performing a delayed primary or secondary closure may be considered better option.<sup>[13]</sup>

-Reduced resistance to infection has several causes, host response is weakened by malnutrition, which can be recognized clinically and most easily as recent rapid weight loss that can be present even in the presence of obesity<sup>[14,15]</sup>.

Metabolic disease such as diabetes mellitus, uraemia & jaundice, disseminated malignancy and AIDS are other contributors for infection and poor healing response as are iatrogenic causes including the immunosuppression caused by radiotherapy, chemotherapy or steroid.<sup>[15]</sup>

The infection of a wound can be defined as the invasion of organisms through tissues following a breakdown of local and systemic host defenses, leading to cellulitis, lymphangitis, abscess and bacteraemia.<sup>[16]</sup>

The infection of most surgical wounds is referred to as superficial surgical site infection. Other categories include deep surgical site infection.<sup>[17]</sup>

## Patients and Methods:

This is a prospective study conducted on 216 patients with appendicitis who underwent operation at the surgical ward of Al – Yarmouk Teaching Hospital, from January 2005- august 2008.

Negative explorations and patients received pre-operative antibiotics are not included, Local Antibiotic wound lavage was not permitted, For comparison purposes, the patients were divided into three groups:-

Group I: (n=152) uncomplicated (non perforated) appendicitis. who were treated by appendicectomy and primary wound closure.

Group II: (n=31) those were with perforated appendicitis who were treated with appendicectomy and primary wound closure.

Group III:-(n=33) with perforated appendicitis who were treated with appendicectomy and delayed

primary wound closure, delayed suturing, Interrupted nylon sutures were inserted from skin through the subcutaneous fascia but were left untied with the ends left long.

All the three groups of patients were treated in the following manner:-

Grid-iron incision done. Aspiration or swabs of peritoneal fluid or pus and appendix stump and wound edges were taken & send to the laboratory & cultured for aerobic and anaerobic bacteria. And swabs from delayed primary wound closure wounds were cultured as well

Appendectomy was performed in all patients. the peritoneum was closed with continuous 2-0 catgut suture. The fascia of the oblique muscles was approximated with interrupted 2-0 catgut suture.

The wound was irrigated with saline and then packed with gauze.

On fifth postoperative day delayed primary wound closure was performed at the bedside for the group III patients by ligating the loosely nylon suture which was previously inserted, for all layer of the wound. We follow up patients for three months with daily dressing of wounds with antiseptics.

Wound infection was defined as any purulent discharge from the wound requiring drainage or repeated dressing, or any collection of purulent exudates in the wound requiring drainage then dressing.

### Results

There were 120 males and 96 females. The range of age from 11- 56 years , mean age was 33.5 years.

Group 1:- there were 152 patients, 82 males and 70 females with age from 16 – 50 years, mean age 33 years. Wound infection occurred in eight patients (5.26%)

Group 11:- there were 31 patients, 18 males' patients and 13 females' patients. The range of age from 11 – 56 years, mean age was 33.5 years. Wound infection was noted in nine patients, (29.03%)

Group 111:- There were 33 patients, 20 males and 13 females. Age of patients range from 11- 56 years mean age was 33.5 years. Wound infection occurred in one patient, (3.03%). as shown in table 1.

**Table 1: Comparability of the groups**

	Group 1	Group 11	Group 111
No. of patient	152	31	33
Mean age(yr.)	33 year	33.5 year	33.5
Male	82	18	20
Female	70	13	13
Wound infection	8(5.26%)	9(29.03%)	1(3.03%)

There were no deaths encountered in the series of 216 patients.

Bacteriology:- no growth in 16 patients 7.40%. The most common organisms cultured from the operative wound swabs were Escherichia coli which were found in 110 patients, (55%). The bacteroides fragilis found in 60 patients (30%). The various types of streptococci found in 30 patients (15%) (As shown in table II)

**Table II: Common organisms cultured from operative wound swabs**

	Group 1	Group II	Group III	Total
No. patients	152	31	33	216
E. coli	79(51.97%)	17(54.83%)	14 (42.42%)	110
Bacteroides	36(23.68%)	11(35.48%)	13(39.39%)	60
Streptococci	21(13.81%)	3(9.67%)	6(18.18%)	30
No growth	16(10.52%)	zero	zero	16

### Discussion

The wound becomes contaminated during operation for perforated appendix by manipulation & seepage of purulent exudates into the wound.

Primary closure of such a wound creates a potential closed space infection. The high incidence (29.03) of superficial wound infection occurring in cases of perforated appendicitis with closure of the wound at initial operation bears out this observation.

Delayed primary wound closure was not well accepted by patients, resulting in a longer hospital stay. Perforated appendicitis were included in this study as have high risk of wound contamination.

Maddox et al, suggested leaving the wound open for a 24-48 hour period followed by delayed closure<sup>[17]</sup>. Statistical data did not accompany this suggestion.

The usual patient with perforation remains febrile and ill for a 3-4 days period postoperatively. Closure of the wound before 5 days & prior to the presence of an afebrile state probably represents an inadequate duration of drainage of a wound potentially contaminated by aerobic & anaerobic organisms<sup>[18]</sup>.

In the present series the resultant scar following delayed primary closure appeared quite similar to that of a primary wound closure and did not present

a cosmetic problem, during the follow up of patients more than three months.

Intravenous antibiotic drugs are administered during or after operation when the diagnosis had been confirmed, to combat infection due to both gram negative and gram positive organisms, and may affect the results.

Noon et al., however reported an incidence of 22% wound infection in perforated appendicitis despite the use of such adjuncts<sup>[19]</sup>

Delayed primary wound closure in cases of perforated appendicitis has reduced the incidence of superficial wound infection when compared to a similar group of perforated cases with closure of the wound primarily<sup>[20]</sup>. Delayed primary closure may assume an important role in the pediatric age group where the highest incidence of perforated appendicitis is encountered.

Further experience with this technic is warranted.

### Conclusion:

The wound becomes contaminated during operation for perforated appendix by manipulation and seepage of purulent exudate into the wound. Primary closure of such a wound creates a potential closed space for infection. Wound infection occurred in one patient of 33 patients with perforated appendicitis, treated by delayed primary wound closure 3.03%.

### References:

- 1- Editorial sepsis after appendicectomy lancet 2002,2:195.
- 2-Wilkif D.P.D: Mortality in acute appendicular disease Br. Med. J. 2004, 1:253-255.
- 3-Wan Gen stean O.H. and wangen stean S.D.: military surgeons and surgery, old & new surgery 1998:1102-1124.
- 4-OConnell PR. Vermiform Appendix in : Williams NS, Bulstrode CJK & OConnell PR, editors .Bailey & Loves short practice of surgery. 25ed. London: Hodder Arnold, 2008. PP.1204-1218.
- 5-Miller PJ, Constantinides MS. Simple and serial excisions facial plast Surg clin north Am. 1998;6:141-147.
- 6- Lawrence W. Wound infection in: Lawrence W, editor. Current Surgical diagnosis & treatment. 22<sup>nd</sup> ed. London: Lang medical publications; 2002. PP 555-559.
- 7-Quinn JV, Ramotar K, Osmond MH. The antimicrobial effects of a new tissue adhesive. Acad Emerg Med. 1996; 3:536-537.

- 8-Rodeheaver GT, Nesbit WS, Edlich RF. A dynamic suture for wound closure. Ann Surg. Aug 1986;204:193-199.
- 9-Nichols RL. Preventing surgical site infections. Clin med Res. 2004;2:115-118.
- 10-Singer AJ, Clark RAF. Cutaneous wound healing. New Eng J Med. 1999;341: 738-746.
- 11-Stone PW, Kunches L, Hirschhorn L. Cost of hospital-associated infections in Massachusetts . Am J Infect Control. 2009;37:210-214
- 12-Dipiro JT, Martindale RG, Bakst A, et al. Infection in surgical patients, effects on mortality, hospitalization, and post discharge care. Am J Health Syst Pharm. 1998;55:777-781
- 13-Alexander JW, Aerni S, Plettner JP. Development of a safe & effective one minute preoperative skin preparation. Arch Surg. 1985;20:1357-1361
- 14- Yoshil S, Hosaka S, Suzuki S, et al. prevention of surgical site infection by antibiotic spraying in the operative field during cardiac surgery. Jap J Thorcardiovasc Surg .2001;49:279-281
- 15-Alexander JW, Rahn R, Goodman HR. Prevention of surgical site infections by an infusion of topical antibiotics in morbidly obese patients. Surg Infect. 2009;10:53-57
- 16- Hopf HW, Hunt TK, West JM ,et al. wound tissue oxygen tension predicts the risk of wound infection in surgical patients. Arch Surg. 1997; 132:997-1004
- 17-Grief R, Akca O, Hom EP, et al. Supplemental perioperative oxygen to reduce the incidence of surgical wound infection. N Eng J Med. 2003; 342: 161-167
- 18-Triulzi DJ, Blumberg N, Heal JM. Association of transfusion with postoperative bacterial infection. Crit Rev Clin Lab Sci. 1990;28:95-107
- 19-Duttaroy DD, Jitendra J, Duttaroy B; et al. management strategy for dirty abdominal incisions, primary or delayed primary closure? A randomized trial. Surg Infect. 2009; 10:129-136.
- 20- Pettigrew RA. Delayed primary wound closure in gangrenous and perforated appendicitis. Br J Surg 1981; 68:635-638

\* Department of Surgery, Al-Yarmouk Teaching Hospital, Baghdad, Iraq.

### Address for correspondence:

Dr. Majeed H.H. Al-Amiri, FICMS

Department of Surgery, Al-Yarmouk Teaching Hospital, Baghdad, Iraq.

Email: [mjdamiri@yahoo.co.uk](mailto:mjdamiri@yahoo.co.uk)

Key words: perforated Appendicitis, primary suturing, secondary suturing, delayed primary suturing.