Diyala Journal of Medicine

ORIGINAL RESEARCH
Published: 15 October 2022
Doi: 10.26505/DJM.23016550524

Non-closure of the peritoneum during open appendicectomy decreases postoperative analgesia requirement

Ahmed Modher Khalaf (FIBMS)[1]
[1] College of Medicine, University of Diyala , Diyala, Iraq

Abstract

Background: Acute appendicitis is considered the most common surgical emergency in both adults and children. Open rather than laparoscopic appendectomy is still the most commonly performed procedure.
Objective: To assess the effect of non-closure of the peritoneum during appendectomy on postoperative pain and finally on the analgesia requirement.
Patients and Methods: Two hundred patients underwent appendicectomy. The patients were divided into two equal groups; each had one hundred patients. Group 1 (control or closure Group) in which, the peritoneum is closed; in group 2 (study or non-closure Group), the peritoneum is left alone without closing it.
Results: The mean pain score in the non-closure group was less compared to that in the closure group. A significant decrease in parenteral analgesia requirements was shown in the non-closure group compared to the closure group.
Conclusion: Leaving the peritoneum not sutured during appendicectomy has a positive outcome on postoperative pain and decreases the requirement for analgesia.
Keywords: Appendicectomy, Peritoneal closure, Post appendectomy pain

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Correspondence Address: Ahmed Modher Khalaf
College of Medicine, University of Diyala , Diyala , Iraq

Email: Khalaf@uodiyala.edu.iq

Website:https://djm.uodiyala.edu.iq/index.php/djm

Received: 24 May 2022
Accepted: 14 June 2022
Published:15 October 2022

Introduction

Acute appendicitis is considered the most common surgical emergency in both adults and children [1]. Almost 250,000 cases of appendicitis are recorded annually in the United States [2]. In Europe, the incidence ranges from 105 in Eastern Europe to 151 in Western Europe per 100.000 population a year [3]. Appendectomy is the standard treatment for dealing with appendicitis. Appendicectomy can be achieved through either an open or laparoscopic approach. Despite laparoscopic appendectomy becoming eminent in the last decade, open appendicectomy is still most commonly performed by surgeons [4] It is traditional to suture close all the abdominal layers which were opened during surgery for restoring the anatomy, approximating the tissue layers for ensuring healing, providing a peritoneal barrier to decrease the risk of wound infection, herniation, and dehiscence, and also because it is thought this will decrease the incidence of adhesion formation. In fact, this is what most surgeons are taught and do.

Numerous studies [5-7] forbid the worry of increased adhesion formation following peritoneal non-closure. The experience of non-closure of the peritoneum in the articles

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comes substantially from gynaecological and obstetric surgeries. Kerr mentioned the original approach of lower segment cesarean section surgery in 1926 and supported routine closure of the parietal peritoneum [8]. Most gynecology and obstetrics textbooks mention inadequate data to close the peritoneum but still advocate the routine closure of it at the end of cesarean sections and hysterectomy procedures [9]. The last twenty years witnessed much research which revealed better outcomes with leaving the peritoneum non-closed [10-12].

Concordant literature on non-closure of the peritoneum following abdominal surgery dates back to the 1930s [13].

Considering the theoretical review and experiments on animals, the conclusion was reached that suturing the peritoneum causes ischemic necrosis of the peritoneum and inflammatory reactions to suture material, regarding the latter as a foreign body. Such factors may adversely affect the healing process and are considered an important cause of adhesion formation. On the contrary, leaving the cut edges of the peritoneum without suturing achieves better peritoneal repair and reduces the risk of adhesion formation. Peritoneal suturing causes more pain due to ischemia resulting from the suturing. [14] Because of the presence of mesothelial cells in the parietal peritoneum, self-reperitonealization following injury begins within 48 to 72 hours and the healing is completed in 5 to 6 days [15]. This is supported by histological examinations in rabbits, in which it has been seen that the injured peritoneum is re-mesothelialized by itself and throughout the wound with minimal inflammatory reaction. [16]. Spontaneous peritoneal re-epithelialization was also revealed by Shapiro *et al*. in it's study [17], decreasing postoperative pain during appendicectomy due to non-closure of the peritoneum has been seen in a study done by Suresh *et al*. Huseyin Kazim and Bektasoglu *et al*. The mentioned studies revealed that the mean visual analogue scale (VAS) score for pain was lower in the non-closure group on postoperative day one. [18-19].

The current study aims to assess the effect of non-closure of the peritoneum during appendectomy on postoperative pain and finally on the analgesia requirement.

Patients and Methods

This is a cross-sectional study of two hundred patients who underwent appendicectomy in the department of surgery in Baquba teaching hospital/ Diyala province over a period of two years (January 2018–January 2020). The purpose of the study was to assess the effect of non-closure of the peritoneum on post-appendectomy pain and analgesia requirements. The patients were divided into two equal groups; each have one hundred patients. Group 1 (control or closure group) in which the peritoneum is closed using 2-0 Vicryl (polyglactin). In group 2 (study or non-closure group), the peritoneum was left alone without being closed. The selection of patients in either group was based on the odd and even distribution, depending upon their sequence of presentation to the emergency room. Patients with ultrasonographically demonstrated typical symptoms and signs of acute appendicitis met the inclusion criteria. Exclusion criteria include children under 12 years of age, patients who are neurotic or

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psychotic, patients with complicated appendicitis, patients with additional pathology found intraoperatively requiring additional operations, and patients who developed surgical site infection. Open appendicectomy is achieved under general anesthesia and through a grid iron incision.

Both of the two groups were matched with regard to age, sex, operative time, any additional surgical procedures, intraoperative complications, and postoperative wound infection.

Following removal of the appendix, the peritoneum was closed using 2-0 Vicryl or left open based on the random allocation mentioned earlier. The remaining layers were closed as routinely done. The time taken when the operation was completed was zero hours, and the day of the operation was taken as zero day. Visual Analogue Scale (VAS) was used to measure post-appendectomy pain. Using a ruler, the Visual Analogue score is determined by marking the distance (mm) on the 10-cm line (100mm) providing a range of scores from 0–100. A higher score means greater pain intensity. Based on this, (0–4 mm) indicates no pain; (5-44 mm) indicates mild pain; (45–74 mm) indicates moderate pain, and (75–100 mm) indicates severe pain. Pain killers were given when VAS was greater than 40 mm on the scale. The analgesics required were recorded. The type of analgesia prescribed ranged from non-opiates (Intravenous Paracetamol) to opiates (Tramadol hydrochloride). The patients were observed for surgical site infection (SSI**).**

Statistical Analysis

Categorical variables as sex, any additional surgeries, complications and surgical site infection, were expressed as frequencies. Age and duration of surgery are expressed as mean (average). Continuous variables as visual analogue score and the frequency of parenteral analgesics needed were presented as mean ± SD and the comparison among the two groups made by applying independent student's t test. The cutoff 5% is taken as a level of significance with p-value of <0.05 considered significant.

Results

Among the 200 patients included in the study, 100 patients had their peritoneum non-closed (study group); the other 100 patients had their peritoneum closed (control group). The mean age, gender, and anesthesia data were comparable in both groups. The average duration of surgery was 7 minutes less in the non-closure group. Nine patients in the closure group and ten patients in the non-closure group were excluded from the current study because of the associated additional pathology, complications, and postoperative wound infection Table (1). Visual analogue score data is revealed in table 2. The mean pain score in the non–closure (study) group was less compared to that in the closure (control) group (P<0.001 on day 0, 1 and 2). A significant decrease in parenteral analgesia requirements was shown in the non-closure group compared to the closure group (P<0.05 on day 0, and <0.001 on day 1 and 2) for non-opiate analgesia and (P<0.001 on day 0, 1, and 2) for opiate analgesia Table(3).

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Table (1): Patients characteristic and operative details

Patient's characteristics	Control (Closure group)n	Study (Non-closure group)
Mean Age (years)	24.8	25.3
Gender (male: female)	48:43	44:46
Duration of surgery (Miutes)	39	32
Any additional surgeries	4 (2 patients Meckel's excision,1 ruptured ovarian cyst,1 twisted ovarian cyst)	5 (1 patient Meckel's excision,3 ruptured ovarian cyst,1 twisted ovarian cyst)
Complications	2 (1 appendicular abscess, 1 perforated appendicitis)	1 (perforated appendicitis)
Postoperative surgical site infection	3	4

Table (2): Visual analogue score among the two groups on day zero, one and two

	Control (Closure group) n=91	Study(Non-closure group) n=90	P-value
Day – 0	51.68±2.99	42±0.97	<0.001
Day – 1	41.92±0.8	38.67 ± 3.56	<0.001
Day – 2	32.61±1.28	29.03 ± 4.04	< 0.001

Table (3): The frequency of parenteral analgesics needed among the two groups

	Non-opiate analgesia (IV Paracetamol)			Opiate analgesia (IV tramadol hydrochloride)		
	Closure (control) group n.= 91	Non Closure (study) group n= 90	P Value	Closure (control) group n=91	Non closure (study) group n= 90	P Value
Day 0	2.25 ± 0.52	2.02 ±0.76	<0.05	2.4 ±0.49	1.14 ± 1.22	<0.001
Day 1	1.87 ±0.66	0.99 ±0.1	<0.001	1.37 ±0.92	0.53±0.50	<0.001
Day 2	1.07± 0.26	0.32 ± 0.47	<0.001	0.86 ± 0.59	0.28 ± 0.45	<0.001

Discussion

Achieving operative technique demanding no foreign material is healthy for the patient. Suturing the peritoneal edges is regarded as having minimal reactive results, but in fact it is associated with an increased risk of tissue ischemia and necrosis [20-22]. Additionally, approximating the peritoneum with sutures may increase the risk of adhesion formation resulting from reactions to the suture material.

Studies in animals have revealed histologically that the parietal peritoneum regenerates from the base and not from cut edges, as in skin wounds, and that the entire raw area becomes mesothelized simultaneously. Therefore, a non-closed defect in the peritoneum, including a large one, reveals more than 50% mesothelial integrity within 48 hours and complete healing within 5 days[21, 22].The peritoneum has a rich nerve supply but poor blood supply. Therefore, suture closure of the

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peritoneum causes more pain due to ischaemia[23]. The outcome of non-closing the peritoneum with regard to post-operative pain remains a subject of conflict. Some studies reported reduction in the post-operative pain when not to close the peritoneum, while others did not [24, 25]. The current study revealed significant reduction in the post-operative mean visual analogue scores in the non-closure group compared to the closure group (p-value <0.001on day 0, 1 and 2).

These results are compatible with those obtained by Suresh B et al. in which there was a significant decrease in the VAS (p<0.001, <0.05, <0.01 on day 0, 1, and 2, respectively) [26].

In addition, the current study showed fewer analgesic requirements in the non-closure group when compared to the closure group. Suresh B et al. also revealed similar results in their study (p<0.05, <0.05, 0.01 on day 0, 1, and 2 respectively) [26]. Dr. Shamaila Ayub et al. in their study (Does peritoneal closure increase post appendectomy pain?) also revealed a significant reduction in the VAS in the non-closure group when compared to the closure group (p= 0.03 in males and p=0.0005 in females). Furthermore, Dr. Shamaila Ayub et al.'s study revealed that the closure group required more analgesics than the non-closure group [27].

Also, the current study results are compatible with those achieved by Hajsedvadi and Rasekh with regard to the analgesics requirement [28], in which a caesarean section was done for 160 pregnant women. Hajsedvadi and Rasekh revealed that the analgesic requirement was 90.8 mg of diclofenac and 1.16 capsules of mefenamic acid in the non-closure group, whereas it was 112.9 mg of diclofenac and two capsules of mefenamic acid in the closure group. A study conducted by Ghongdemath found that the non-closure group required fewer postoperative analgesics, but statistically, it was not statistically significant (mean visual analogue scores in the closure group and non-closure group were 5.5 and 4.24, respectively; p-0.05) [39].

Conclusions

The need for analgesics is reduced and postoperative pain is improved when the peritoneum is not sutured during appendicectomy.

Recommendations

Not to close the peritoneum at appendectomy.

Source of funding: The current study was funded by our charges with no any other funding sources elsewhere.

Ethical clearance: The study was done after having ethical approval from the institutional ethical committee. After proving the diagnosis of acute appendicitis, an informed written consent was obtained from all patients to participate in the study. The number of approvals by the ethical committee was 87 in 22/12/2017.

Conflict of interest: Nil

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Diyala Journal of Medicine

ORIGINAL RESEARCH
Published: 15 October 2022
Doi: 10.26505/DJM.23016550524

عدم خياطة البريتون يقلل من شدة الألم بعد اجراء عمليات استأصال الزائدة الدودية

د.احمد مظهر خلف[1]

الملخص

خلفية الدراسة: يشكل التهاب الزائدة الدودية اكثر الحالات الجراحية الطارئة في وحدة الطواريء. على الرغم من امكانية استأصال الزائدة الدودية بالناظور الجراحي، مازالت عمليات استأصال الزائدة الدودية تجرى عن طريق فتح البطن.
اهداف الدراسة: لدراسة تأثير عدم خياطة البريتون على شدة الألم واحتياج المريض الى مسكنات الألم بعد عمليات استأصال الزائدة الدودية.
المرضى والطرائق: تم اجراء عمليات استأصال الزائدة الدودية لمائتان مريض. تم تقسيم المرضى الى مجموعتين، كل مجموعة تتكون من مائة مريض. تم خياطة البريتون في المجموعة الاولى ولم يتم خياطته او غلقه في المجموعة الثانية.
النتائج: كانت شدة الم مابعد العملية واحتياج المريض الى المسكنات الجراحية اقل في المجموعة الاولى مقارنة بالمجموعة الثانية.
الاستنتاجات: عدم خياطة البريتون يقلل من شدة الألم بعد عمليات استأصال الزائدة الدودية ويقلل من احتياج المريض للأدوية المسكنة للألم.
الكلمات المفتاحية: استأصال الزائدة الدودية،غلق البريتون، الام بعد عمليات استأصال الزائدة الدودية
البريد الالكتروني: Khalaf@uodiyala.edu.iq
تاريخ استلام البحث: ٢٤ آيار ٢٠٢٢
تاريخ قبول البحث: ١٤ حزيران ٢٠٢٢

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[1] كلية الطب - جامعة ديالى - ديالى- العراق