Section: General Surgery

Original Research Article

COMPARATIVE ANALYSIS OF PERITONEAL CLOSURE VERSUS NON-CLOSURE IN EMERGENCY OPEN APPENDICECTOMY: A CLINICAL TRIAL STUDY

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Abstract

Background: Acute appendicitis is a common surgical emergency necessitating open appendicectomy, and the technique of peritoneal closure remains a subject of debate. This clinical trial aimed to compare the outcomes of peritoneal closure versus non-closure in patients undergoing emergency open appendicectomy. **Materials and Methods:** 90 patients who met the inclusion criteria were enrolled and divided into peritoneal closure (Group A) and peritoneal non-closure (Group B). Demographic data, intraoperative parameters (operative time), and postoperative parameters (pain scores, analgesic requirements, hospital stay duration, and postoperative complications) were recorded and compared between the two groups. **Result:** In Group A (peritoneal closure), the mean operative time was 13.93 ± 2.39 minutes, while in Group B (peritoneal non-closure), it was 12.07 ± 2.51 minutes, showing a statistically significant difference ($p<0.0001$). Postoperative pain scores were significantly lower in Group B (4.33 ± 0.85) compared to Group A (5.47 ± 0.69) ($p < 0.0001$). The requirement for analgesics, including injection diclofenac, tablet paracetamol, and tablet diclofenac, was significantly lower in Group B compared to Group A ($p<0.0001$). Additionally, the duration of hospital stay was significantly reduced in Group B ($p<0.0001$). However, the two groups had no statistically significant differences in postoperative complications. **Conclusion:** This study showed the advantages of peritoneal non-closure in emergency open appendicectomy. Peritoneal non-closure was associated with shorter operative times, reduced postoperative pain, lower analgesic requirements, and shorter hospital stays.

INTRODUCTION

Acute appendicitis is a common surgical emergency that often requires an emergency open appendectomy. Traditionally, surgeons have used sutures to approximate and close the peritoneum after removing the appendix. However, research and observations have shown that this method can negatively affect healing. Closure of the peritoneum with sutures can compromise the blood supply to the area and lead to foreign body reactions, impeding proper healing and increasing the risk of adhesion formation.[1] Adhesions are abnormal connections between organs or tissues, which can cause complications and pain for the patient. On the other hand, studies have indicated that when the peritoneum is not sutured after an appendectomy, the edges of the peritoneum facilitate faster repair. This approach does not appear to compromise blood supply or cause redness, reducing adhesion formation likelihood. The mesothelium, a layer of cells in the peritoneum, facilitates rapid reperitonealization within 48 to 72 hours after injury, and complete healing typically occurs within five to six days.[2]

While there have been some studies on the non-closure of the peritoneum in obstetric and gynaecological surgeries, limited research is available specifically in general surgery. According to the literature, the debate over peritoneal closure during abdominal operations has been ongoing since the 1930s.[3] Numerous studies have examined the effects of peritoneal closure or non-closure during anterior abdominal wall repairs, primarily focusing on gynaecological and obstetric procedures. These studies have explored the influence of peritoneal closure on various postoperative outcomes, including

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pain scores, hospital stay duration, postoperative complications, and the formation of adhesions.[4,5] Therefore, this study aimed to compare the outcomes of peritoneal closure versus non-closure in open appendectomies to provide further insights into the optimal approach for this procedure.

MATERIALS AND METHODS

This clinical trial study was conducted at the Department of General Surgery, Government Thoothukudi Medical College and Hospital, from January 2019 to January 2020.

Inclusion Criteria

Patients with clinical and radiological diagnoses of acute appendicitis undergoing emergency open appendicectomy were included.

Exclusion Criteria

Patients with conditions such as pregnancy, immunocompromised status, appendicular mass, appendicular perforation, appendicular abscess, presence of abdominal drain, diabetic ketoacidosis, chronic kidney disease stage 3 and above, and non-consenting individuals were excluded.

Ninety study participants who met the inclusion and exclusion criteria were enrolled. The study was commenced after the ethical committee clearance, and informed consent was obtained from the Parent/guardian. Strict confidentiality was maintained while analysing and presenting the data.

Standard open appendicectomy procedures were followed, and the participants were divided into groups: Group A (peritoneal closure) and Group B (peritoneal non-closure). The study assessed various parameters intraoperatively and postoperatively. Intraoperatively, the duration of abdomen closure was recorded. Postoperatively, the study participants were assessed for pain using the visual analogue scale, requirement of analgesics, duration of hospital stay, and monitored for postoperative complications such as surgical site infections. Antibiotics were administered postoperatively based on intraoperative findings and individual protocols.

The investigations included complete blood count, blood sugar, renal function test, liver function test, chest X-ray, abdomen X-ray, ultrasound abdomen, and wound swab. Data collection and recording were performed, capturing demographic details, clinical findings at admission, and relevant parameters for the study. The study participants were divided into groups A and B non-randomly, and no active randomisation was conducted to minimise bias. The operative procedure followed the standard open appendicectomy technique. Surgeons of equal qualification performed the surgeries.

In Group A, the peritoneum was closed with 2-0 vicryl, and preoperatively, the participants received a single dose of intravenous antibiotics. Postoperatively, antibiotic administration varied based on the intraoperative appendix findings and individual protocols. Oral feeds were initiated upon the return of bowel sounds, and patients were encouraged to resume daily routine activities. The study parameters included operating time, postoperative pain and analgesic requirement, duration of hospital stay, and postoperative complications. Postoperative follow-up was conducted until the 10th postoperative day.

Statistical Analysis

The collected data were entered into an Excel sheet, and statistical analysis of data was performed by statistical software SPSS 21.0. Demographic data were expressed as frequency and percentage. Descriptive statistics were presented by Mean (N), Standard deviation and the value of $p<0.05$ is considered statically significant.

RESULTS

A total of 90 participants were included and assigned to two distinct groups. Group A consisted of 45 participants who underwent peritoneum closure, while Group B consisted of another 45 participants who did not have peritoneum closure performed. In Group A, there were 28 males and 17 females, whereas in Group B, there were 32 males and 13 females. There were 60 males and 30 females in this study.

The number of patients was highest in the age group 21-30 years (46.7%), followed by 31 to 40 years (32.2%). Most of the patients were of the younger age group. The younger age group is predominant, and the incidence peaks in the age group of 21-30 years and decreases with age [Table 1].

In terms of abdomen closure time, Group B (peritoneal non-closure) had a significantly shorter mean time of 12.07 ± 2.51 minutes compared to Group A (peritoneal closure) with a mean time of 13.93 ± 2.39 minutes ($p<0.0001$), and this indicates that peritoneal non-closure required less time for abdomen closure.

Furthermore, the study participants in Group B reported significantly lower postoperative pain scores, with a mean score of 4.33 ± 0.85, compared to Group A, with a mean score of 5.47 ± 0.69 ($p<0.0001$), and this suggests that peritoneal non-closure was associated with reduced postoperative pain.

The requirement for analgesics also differed between the two groups. While there was no significant difference in the requirement for Injection Pentazocine, Group B demonstrated significantly lower requirements for Injection Diclofenac ($p<0.0001$), Tablet Paracetamol ($p<0.0001$), and Tablet Diclofenac ($p<0.0001$) compared to Group A. These findings indicate that patients who did not undergo peritoneal closure had a lower need for analgesics.

Regarding hospital stay duration, the average stay for Group A was 5.18 ± 0.58 days, while Group B had a shorter average stay of 4.29 ± 0.84 days. This difference was statistically significant ($p<0.0001$),

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suggesting that peritoneal non-closure was associated with a shorter hospital stay [Table 2].

In the peritoneal closure group, 40 study participants required tablet diclofenac. In the peritoneal non-closure group, 22 study participants required tablet diclofenac. Nine patients had postoperative complications in both groups, and there is no statistical significance when the results between two groups are compared [Table 3].

Table 1: Demographic data of the study

	Peritoneum closure (Group A)	**Peritoneum non-closure (Group B)**
Male	28	32
Female	17	13
Age group in years	**Frequency**	**Percentage**
<20	2	2.20%
21-30	42	46.70%
31-40	29	32.20%
41-50	10	11.10%
51-60	3	3.30%
>60	4	4.40%
Total	90	100%

Table 2: Comparison of various doses and hospital stays between groups

	Peritoneal closure (a)	**Peritoneal non-closure (b)**	**P value**
Duration of abdomen closure	13.93 ± 2.39	12.07 ± 2.51	<0.0001
Postoperative pain (Visual Analog Score)	5.47 ± 0.69	4.33 ± 0.85	<0.0001
Inj. Pentazocine	1.02 ± 0.15	1.02 ± 0.15	1
Inj. Diclofenac 75mg im	5.04 ± 0.47	3.95 ± 0.29	<0.0001
T. Paracetamol 500mg	9.53 ± 1.73	7 ± 2.56	<0.0001
T. Diclofenac 50mg	1.47 ± 0.79	0.6 ± 0.69	<0.0001
Duration of hospital stay	5.18 ± 0.58	4.29 ± 0.84	<0.0001

Table 3: Comparison of T. Diclofenac and postoperative complications

		Peritoneal closure (a)	**Peritoneal non-closure (b)**	**P value**
T. Diclofenac	0.00	5	23	<0.0001
	1.00	17	17	
	2.00	20	5	
	3.00	3	0	
Postoperative complications	Yes	9	9	1
	No	36	36	

DISCUSSION

Several studies in obstetrics and caesarean section surgeries have explored the differences between peritoneal closure and non-closure. In a study conducted by Wilkinson et al,[6] (29, the male-to-female ratio in the peritoneal closure group was 1.36:1, while in the non-closure group, it was 1.09:1. Our study showed similar findings, with 28 males and 17 females in the closure group and 32 males and 13 females in the non-closure group. The age distribution in our study was also comparable to previous research, with the most common age group being 21 to 30 years (46.7% of participants).

Regarding the time taken for abdomen closure, our study found that cases with peritoneal non-closure required significantly less time than closure cases, with an average difference of about 2 minutes. This finding aligns with the results of studies conducted by Pietrantoni et al,[7] Hull et al,[8] Nagele et al,[9] Grundsell et al,[10] and Suresh et al,[11] which showed that peritoneal non-closure was associated with shorter closure times compared to closure. Similarly, studies conducted by Zohreh Tabasi et al,[12] and Bamigboye et al,[13] in cesarean section patients reported reduced closure times with peritoneal non-closure.

Regarding postoperative pain, our study found that patients in the peritoneal non-closure group had significantly lower pain scores based on the visual analogue scale than the closure group. This finding was consistent with the studies conducted by Huseyin Kazim Bektasoglu et al,[14] Suresh et al,[11] Farooq MS et al,[15] Zohreh Tabasi et al,[12] Nagele et al,[9] and Rafique et al,[16] which all reported less postoperative pain in patients with peritoneal non-closure, whether in appendicectomy or cesarean section cases.

Furthermore, our study demonstrated a significantly lower requirement for analgesics, such as Injection diclofenac, Tab. Diclofenac, and Tab. Paracetamol in the peritoneal non-closure group compared to the closure group. This finding was consistent with the studies conducted by Suresh et al,[9] and Farooq MS et al,[15] in appendicectomy cases, as well as Zohreh Tabasi et al,[13] Nagele et al,[11] and Rafique et al,[16] in cesarean section patients.

The duration of hospital stay was also significantly reduced in the peritoneal non-closure group in our study, which aligns with the findings of Wilkinson et al,[6] and previous studies in cesarean section patients (Zohreh Tabasi et al,[13] Nagele et al,[11] Rafique et al).[16]

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Regarding postoperative complications, our study did not find any statistically significant differences between the peritoneal closure and non-closure groups, consistent with the results of studies conducted by Wilkinson et al,[6] Ellis et al,[17] Dorfman et al,[18] Bamigboye et al,[13] and Galaal et al,[19] in cesarean section patients.

Our study's findings support the existing literature, showing that peritoneal non-closure in emergency open appendicectomy leads to shorter surgical times, reduced postoperative pain, lower analgesic requirements, and shorter hospital stays. These benefits are consistent with previous research conducted in the field of obstetrics and cesarean section surgeries. Our study did not find an increased risk of postoperative complications associated with peritoneal non-closure.

CONCLUSION

In conclusion, our study compared the outcomes of peritoneal closure versus non-closure in patients undergoing emergency open appendicectomy. The results demonstrated several advantages associated with peritoneal non-closure. These included shorter surgical times, reduced postoperative pain scores, lower analgesic requirements, and shorter hospital stays. Importantly, no significant increase in postoperative complications was observed in the non-closure group.

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