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Original Research Article

Peritoneal closure or non-closure in open appendectomy: a reality or a myth

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ABSTRACT

Background: The objective of this study is to analyze the difference of outcome and complications in peritoneal closure versus non-closure in open appendicectomy.
Methods: This was the prospective comparative study. 126 patients with the diagnosis of acute appendicitis undergoing open appendicectomy divided in two groups non-randomly. Group A: Open appendicectomy with closure of peritoneum (n=59) and Group B: Open appendicectomy with non-closure of peritoneum (n=67). Intra operative time and post-operative period for pain and complications like wound infections, hernia and duration of hospital stay were analyzed. Patients were shown 'visual analogue scale' on a daily basis and those who reported unbearable pain given additional analgesia.
Results: Operative time, number of doses of analgesic required, wound infections and duration of hospital stay in both groups were compared. Difference in operative time between both the groups was found to be statistically significant ($p< 0.0001$).
Conclusions: Non-closure of peritoneum in open appendicectomy is associated with lesser operative time, and shorter duration of hospital stay. Hence, it can be safely recommended.

Keywords: Appendicectomy, Operative time, Peritoneal closure

INTRODUCTION

The clinical diagnosis of appendicitis is controversial, and appendicitis continues to present challenges for surgeons even today.[1,2,3] Appendicitis is a common surgical emergency and appendectomy is a common abdominal surgical procedure done for appendicitis.[1,4,5] Re-approximation of peritoneum after appendicectomy has been widely performed on a routine basis. On the contrary, theoretical consideration and animal experiments support that suture peritonization tends to cause ischemia, necrosis, inflammation and foreign body reactions to suture material. These factors may slow down the healing process and are considered important precursors of adhesion formation. On the other hand clean excision of peritoneal surface without suturing the cut edges provides more rapid peritoneal repair and does not lead to tissue ischemia and inflammation decreasing the risk of adhesion formation.[1,6] Due to the presence of mesothelial cells in the peritoneum, spontaneous reperitonealization after injury will initiate within 48 to 72 hours and complete healing in 5 to 6 days.[7]

Closure of peritoneum at lower abdominal surgery that may be an appendicectomy have not any additional advantage, rather is associated with more complications.

Moreover, non-closure of peritoneum at lower abdominal surgery and appendectomy is associated with reduced use of analgesics and shorter hospital stay.[8]

Much of the experience on non-closure of peritoneum in the literature comes from obstetric and gynaecological surgeries. The post-operative pain still remains a controversial issue.[9] To the best of present knowledge there are very few studies in general surgery on non-closure of peritoneum. Therefore, this study was undertaken to compare the outcome and safety of peritoneal non-closure in view of operative time, post-operative pain, wound infections, duration of hospital stay and post-operative hernia in 6 months follow up.

METHODS

This was a hospital based prospective comparative study conducted after approval of the institutional ethical committee in NKP Salve institute of medical sciences and research center and Lata Mangeshkar Hospital Nagpur. Study period consisted from August 2011 to May 2013 and follow up lasted till November 2013. Total 126 patients with the diagnosis of acute appendicitis were recruited. Follow up was to be done at two weeks, 1 month and 6 months respectively.

Inclusion criteria

- All patients with clinical and radiological diagnosis of acute appendicitis undergoing open appendicectomy between 11to 65 years of age.

Exclusion criteria

- Pregnancy.
- Previous abdominal surgery
- Immunocompromised patients.
- Appendicular mass and perforated appendix.

Data collection and recording: Details of patient demography, clinical findings at admission and parameters relevant to the study were recorded.

Patients were divided in two groups non-randomly:

- Group A: Included patients subjected for open appendicectomy and who underwent closure of peritoneum.
- Group B: Included patients subjected for open appendicectomy with non-closure of peritoneum.

Active randomization of patients was not done. Therefore, all demographic data was recorded and finally compared to rule out bias.

Operative procedure

Authors have followed the standard open appendicectomy procedure to assess the results. The procedure of appendicectomy was explained to the patient and to the relatives. Surgery was performed by equally qualified surgeon. Oral feeds were started after appearance of bowel sounds. Patients were encouraged to resume daily routine work.

Study parameters

Operative time (minute)

The time required for surgery was noted from skin incision to skin closure.

Post-operative pain

As per protocol patients received inj. diclofenac as per weight in divided doses for three days. Patients were shown ‘visual analogue scale’ on a daily basis and those who reported unbearable pain were given additional analgesia in first three days or were continued on analgesics after three days. To quantify and compare pain perception patients were divided into two groups,

Standard analgesic requirement

High analgesic requirement: Patients who required analgesic for more than three days or patients who required more than one analgesic were said to be in high analgesic requirement group and others were included in the standard group.

Post-operative complications

Patients were assessed for early complications in the post-operative period like wound infection. Check dressing was done on day 3 after surgery or if there was any soakage, for detection of any wound infection. (wound infection was defined as redness and drainage from the wound requiring opening of the skin incision and packing.)

Duration of hospital stay

Duration of hospital stay was recorded from day of surgery to the day of discharge. Patients were discharged when they tolerated a regular diet and were afebrile for 24 hrs.

Post-operative follow up

Post-operative patients were followed up for 15 days, 1 month and 6 months intervals and complications if any were noted and treated accordingly.

Statistical analysis

The data was collected and calculated, the variables were compared between group A and group B using chi square test, Student t - test and p value. Chi square test of significance was used for comparison and p value < 0.05

was considered as significant and p value <0.01 was considered as highly significant. The obtained data were subjected to statistical analysis and results were interpreted.

RESULTS

126 patients with diagnosis of acute appendicitis underwent open appendicectomy were divided into two groups and the results compared.

Comparison of demographic data

- Group A: Open appendicectomy with closure of peritoneum (n=59).
- Group B: Open appendicectomy with non-closure of peritoneum (n=67).

The mean age in Group A was 29.71 years and in Group B was 28.56 years. Maximum numbers of patients were found in age group of 21-30 years in both the groups. Male to female ratio was found to be 1.36:1 in Group A and 1.09:1 in Group B. Mean pulse rate was found to be comparable in both the groups. Blood pressure was raised at presentation in 8.4% patients in Group A and 7.4% patients in Group B. Raised temperature at presentation was found in 23.7% patients in Group A and 19.4% patients in Group B. McBurney's point tenderness was found in all patients in both the groups (Table 1).

Table 1: Comparison of demographic data.

	Group A	Group B	p-value
Age	29.71±9.73	28.56±10.12	0.520,NS*
Gender (male: female)	1.36:1	1.09:1	0.661, NS
Pulse	88.31±7.73	87.88±11.97	0.815, NS
Temperature (raised)	23.7 %	19.4 %	0.555, NS
Tenderness	100 %	100 %	1.000, NS
Blood pressure (raised)	8.4 %	7.4 %	1.000, NS

*NS: Not significant

Study parameters

Operative time

Mean operative time for Group A was 81.89 minutes and for Group B was 75.52 minutes. After applying student t test, difference between operative time between both the groups was found to be statistically significant (p< 0.0001) (Table 2).

Table 2: Operative time.

Group A	Group B	p-value
81.89±5.20	75.52±3.60	<0.0001, HS*

*HS: Highly significant

Analgesic requirement

Total 8 patients (13.55%) in Group A required high analgesia as compared to 6 patients (8.95%) in Group B. This difference was statistically found to be non-significant (Table 3).

Table 3: Analgesic requirement.

Analgesic	Group A	Group B	p-value
Standard	51	61	
High	8 (13.55%)	6 (8.95%)	0.30, NS

Requirement of additional analgesia

Total 5 patients (8.4%) in group A needed additional analgesia with injection tramadol as compared to 4 patients (5.9%) in group B. This difference between two groups was statistically found to be non-significant (Table 4).

Table 4: Requirement of additional analgesia.

	Group A	Group B	p-value
Additional analgesic (tramadol)	5 (8.4%)	4 (5.9%)	0.49, NS

Post-operative complications

In the present study 4 patients (6.7%) in Group A and 3 patients (4.4%) in Group B had wound infection. Statistical Analysis was found to be non-significant.

Post-operative hospital stay

In group A mean duration of hospital stay was 6.33 days and in group B mean duration of hospital stay was 5.92 days. After applying chi-square test it was found to be statistically significant (p-value<0.0081). Even though patients in group B are discharged early it does not appear to be clinically significant (Table 5).

Table 5: Post-operative hospital stay.

Group A	Group B	p-value
6.33±0.88	5.92±0.84	0.0081, HS

Follow up

Table 6: Follow up.

Groups	No. of patients followed up at 2 weeks	No. of patients followed up at one month	No. of patients followed up at six months
Group A	56	49	37
Group B	66	61	53

Patients were followed up at an interval of 2weeks, 1 month and 6 months. Out of 126, 122 patients followed

up at 15 days. In group A, 56 patients followed up out of which, 9 patients had pain at incision site. In group B, 66 patients followed up out of which, 4 patients had pain at incision site. Because of loss of follow up of patients at 1 and 6-month duration statistical analysis was skewed and so the outcome at follow up could not be accurately commented upon (Table 6).

DISCUSSION

Simplified surgical technique requiring less foreign material is beneficial to the patient. Re-approximation of peritoneal edges even with suture material considered to be minimally reactive results in increased tissue ischemia, necrosis and foreign body reactions leading to adhesion formation.[10-12] So suturing the peritoneum may actually increase the risk of adhesion formation.

Histological studies in animals have revealed that the peritoneum regenerates de novo and not from cut edges of the defect as in skin wounds, because the entire surface becomes mesothelialized simultaneously. Therefore, peritoneal defects even large when left undisturbed demonstrate mesothelial integrity by 48 hours and complete indistinguishable healing by 5 days.[11,12]

In this study an attempt is made to evaluate the effect of non-closure of peritoneum in open appendicectomy, in terms of intra operative and post-operative course and to compare the two surgical techniques-closure and non-closure of peritoneum at open appendicectomy in various aspects described.

Demographic parameters

Age and gender distribution

Demographic data reveals similar profile of patients in both the groups indicating less likelihood of bias. This was done as patients were distributed in groups based on surgeon's preference and not by active randomization.

In the present study, 79 out of 126 patients were under 30 years of age. Maximum numbers of patients i.e. 53 (42%) were in the age group of 21-30 years in both the groups. The mean age in Group A was 29.71 years and in Group B was 28.56 years. Study conducted by Gallendo Gallego et al found that 52% of patients were in the age group between 21-30 years which is near-by comparable to present study.[13] Male to female ratio was found to be 1.36:1 in Group A and 1.09:1 in group B which is matching with Martin LC et al.[14]

Operative time

The mean duration of surgery for open appendicectomy with closure of peritoneum was more than the duration for open appendicectomy with non-closure of peritoneum. This difference of 6.4 minutes was found to be statistically significant ($p<0.0001$) but 6.4 minutes decreased operative time could not be considered clinically significant.

There are studies comparing the difference of operative time in caeserian section like Pietrantoni et al, Hull and Varner et al, Nagele et al in caesarean section and Grundsell et al in cholecystectomy.[15-18] There is at present no evidence to justify the time taken and cost of peritoneal closure in appendicectomy.[7]

As the surgical time taken varies from surgeon to surgeon and since in the present study this pool consisted of more than 15 qualified surgeons operating, the duration of surgery may not be clearly interpreted. However, since non-closure involves one less step in surgical procedure, probably operating time taken would be less.

Post-operative pain

In the present study, total 8 patients (13.55%) in Group A required high analgesia as compared to 6 patients (8.95%) in Group B. This difference was statistically found to be non-significant.

In group A, 5 patients (8.4%) needed additional analgesia with injection tramadol as compared to 4 patients (5.9%) in group B. This difference between two groups was statistically found to be non-significant. Study done by Rafique Z et al and Demirel Y et al found that there was no overall difference in visual analogue scale between the two groups.[19,20] Irion et al in caserian section found that the requirement of number of post-operative analgesia in both the groups was same.[12] The CORONIS Trial suggests that non-closure of the peritoneum may carry some short-term advantages, including a lower risk of post-operative infection, shorter operating time and shorter hospital stay.[21] However Hull and Varner et al in caesarean section.[16] Hojberg et al, in caesarean section reported post-operative pain significantly less in non-closure group but the studies identified were small and the methodology was not always strong.[22] Hull et al in a study of 113 women and Nagele et al.[16,17] in a randomized trial of 549 women, reported less use of post-operative analgesia when the peritoneum was not sutured at caesarean section, but in both of these studies pain was not the primary outcome measure.

Post-operative complications

Wound infection was found in 4 patients in group A and 3 patients in group B and was statistically non-significant. Other studies by Ellis and Heddle and Dorfman et al also observed the comparable results.[23,24]

Duration of hospital stay

Mean duration of hospital stay in group A was 6.33 days and group B was 5.92 days. This difference was found to be statistically significant (p-value <0.0081). Even though patients in group B were discharged early it does

not appear to be clinically significant. CORONIS trial showed the same result.[21]

Follow up

None of present patients had long term pain or hernia in 6 months period. Because of loss of follow up of patients at 1 and 6-month duration statistical analysis was skewed and so the outcome at follow up could not be accurately commented upon. Present results were consistent with studies done with non-closure of peritoneum in caesarean sections and laparotomies. Ellis and Heddle, in laparotomy, Dorfman et al[24] in cholecystectomy, Grundsell et al, in caesarean section.[18,23,24]

CONCLUSION

Non-closure of peritoneum at open appendicectomy is associated with lesser operating time, and shorter duration of hospital stay. No difference in postoperative analgesia requirement. No difference in the incidence of post-operative complications when compared to closure of peritoneum. Hence, non-closure of peritoneum in appendicectomies can be safely recommended.

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