Section: General Surgery

Original Research Article

PERITONEAL CLOSURE VERSUS NON-CLOSURE FOLLOWING NON-INFECTIVE AND ELECTIVE LAPAROTOMIES UTILIZING MIDLINE INCISION: A COMPARATIVE EVALUATION

Rohan Khairatkar[1], Shweta Kallurkar[2]

[1]Associate professor, Department of General Surgery, Government Medical College, Dharashiv, Osmanabad, Maharashtra, India
[2]Assistant professor, Department of Obstetrics and Gynaecology, Dr. Vaishampayan Memorial Government Medical College (VMGMC), Solapur, Maharashtra, India

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Corresponding Author:
Dr. Rohan Khairatkar,
Email: rohankhairatkar@gmail.com

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Abstract

Background: Closure versus non-closure of peritoneum in laparotomy is a controversial issue among surgeons. However, there is no clarity and existing data is scarce for comparison of closure versus non-closure. The present study aimed to comparatively assess the short-term and long-term advantages of peritoneal closure versus non-closure following non-infective and elective laparotomies utilizing midline incision. **Materials and Methods:** The study assessed 248 subjects who were undergoing laparotomy utilizing midline incision at the Institute within the defined study period. The subjects were randomly divided into two groups of 124 subjects each based on peritoneal closure and non-closure. Short-term complications assessed were hospitalization duration, VAS for pain at 2, 6, 24, and 48 hours postoperatively, analgesics needed, infection, and wound-related fever. Long-term complications assessed were intraperitoneal adhesion and incisional hernia one year following surgery. **Result:** The study results showed a non-significantly lower rate of analgesic need, infection, and wound-related fever in the peritoneum non-closure group with p=0.07, 0.47, and 0.46 respectively. The incidence of incisional hernia and adhesion rate after one year of surgery was not significant in the two groups with p=0.584 and 0.361 respectively. Significantly lower pain intensity was seen in a non-closure group compared to the closure group in the first 2, 6, and 24 hours with p=0.007, 0.003, and 0.03 respectively. However, a non-significant difference was seen at 48 hours with p=0.144. **Conclusion:** The present study concludes that closure of peritoneum following non-emergency, non-infected laparotomy increase the postoperative pain. However, it has no benefit on long-term complications including intra-peritoneal adhesion and incisional hernia.

INTRODUCTION

The term laparotomy usually describes the vertical midline incision given in the abdomen for various surgical procedures. The peritoneum is the innermost layer in the wall of the abdomen, which, when opened surgically provides accessibility to the abdominal cavity. However, there is a disagreement concerning the closure of the peritoneum following laparotomy. One of the primary reasons that few surgeons prefer the suturing of the peritoneum is the maintenance of the anatomical structure of the abdominal wall and to minimize the risk of adhesion, incisional hernia, and infection.[1,2]

However, on the contrary, the reason attributed by various surgeons to the non-closure of the peritoneal layer is its rapid healing rate of 28 to 72 hours as reported without using any suture material, length of hospitalization, need for analgesics, and reduced surgery time. Hence, there is still a disagreement over the closure or non-closure of the peritoneum layer of the abdomen following abdominal surgeries.[3]

The majority of the previous studies assessing closure or non-closure of the peritoneum layer of the abdomen have assessed the transverse incision of the abdomen and in subjects from the Department of Obstetrics and Gynecology undergoing cesarean section and the literature data for surgical patients undergoing midline laparotomy incisions is less.[4] Hence, the present study aimed to comparatively

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assess short-term and long-term advantages of peritoneal closure versus non-closure following non-infective and elective laparotomies utilizing midline incision.

MATERIALS AND METHODS

The present double-blinded clinical randomized clinical study was aimed to comparatively assess short-term and long-term advantages of peritoneal closure versus non-closure following non-infective and elective laparotomies utilizing midline incision. The study subjects were from the Department of General Surgery and Gynaecology of the Institutes. Verbal and written informed consent were taken from all the subjects before study participation.

The study included all the subjects that underwent laparotomy with midline incision at the Institute within the defined study period where 248 subjects met the inclusion criteria and were finally included in the study. The inclusion criteria for the study were subjects aged 18 years or more who underwent laparotomy with midline incision. The exclusion criteria for the study were subjects that were emergency cases, obstetrics surgery, infection, known connective tissue disorders, diabetes mellitus, and laparotomy history.

The study assessed 248 subjects who were undergoing laparotomy utilizing midline incision at the Institute within the defined study period. The subjects were randomly divided into two groups of 124 subjects each based on peritoneal closure and non-closure. For the closure group, closure of the peritoneum was done using absorbable continuous sutures, whereas, in the non-closure group, the peritoneum was not separately closed and direct closure of the abdominal fascia was done using 1-0 nylon sutures. The closure of the skin was done using 2-0 or 3-0 nylon interrupted sutures.

Short-term complications assessed were hospitalization duration, VAS for pain at 2, 6, 24, and 48 hours postoperatively, analgesics needed, infection, and wound-related fever. Long-term complications assessed were intraperitoneal adhesion and incisional hernia one year following surgery. Physical examination of the subjects was done at 1 year to assess incisional hernia presence and a radiologist performed abdominal sonography to evaluate any recurrence or adhesion.

The gathered were analyzed statistically using the chi-square test, Fisher's exact test, Mann Whitney U test, and SPSS (Statistical Package for the Social Sciences) software version 24.0 (IBM Corp., Armonk. NY, USA) using ANOVA and student's t-test. The significance level was considered at a p-value of <0.05.

RESULTS

The present double-blinded clinical randomized clinical study was aimed to comparatively assess short-term and long-term advantages of peritoneal closure versus non-closure following non-infective and elective laparotomies utilizing midline incision. The study assessed 248 subjects who were undergoing laparotomy utilizing midline incision at the Institute within the defined study period. The subjects were randomly divided into two groups of 124 subjects each based on peritoneal closure and non-closure. The mean age of the study subjects was 31.51±13.00 and 29.33±11.26 years in closure and non-closure groups which was statistically comparable with p=0.319. The gender distribution in the closure and non-closure groups was statistically comparable in the two groups with p=0.714 [Table 1].

The study results showed that on comparison of analgesic need, infection, and fever in two groups of study subjects, analgesics were needed in 32.3% (n=40) subjects from the closure group which was non-significantly higher compared to the non-closure group where analgesics were needed by 17.7% (n=22) subjects with p=0.07. Infection was seen in 9.6% (n=12) subjects from the non-closure group which was non-significantly higher compared to the non-closure group where the infection was noted in 4.8% (n=6) subjects with p=0.453. A similar non-significantly higher incidence of fever was seen in the closure group compared to the non-closure group with p=0.486 [Table 2].

It was seen that for comparison of the rates of incisional hernia, adhesin, hospitalization length, and VAS (pain intensity) in two groups of study subjects, the length of hospitalization was 2.4±1.2 in the closure group which was lesser compared to a non-closure-group-where-hospitalization-length was 4.0±1.1 showing non-significant difference with p=0.06. Concerning pain intensity, it was seen that pain intensity in the two groups was comparable in the closure and non-closure groups. However, at 6 and 24 hours, significantly higher pain was reported in the closure group compared to the non-closure group with p=0.003 and 0.03. Overall pain intensity was significantly higher in the closure group compared to the non-closure group with p=0.007 [Table 3].

The study results also showed that on assessing the long-term complications in two groups of study subjects, rates of intraperitoneal adhesion were assessed using sonography after one year of surgery and was lower in a non-closure group compared to the closure group, However, the difference was statistically non-significant with p=0.361. The incidence of incisional hernia in the closure group was in 9.3% (n=10) of study subjects compared to 12.5% (n=14) in the non-closure group. However, the difference was statistically non-significant with p=0.361 [Table 3].

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Table 1: Comparison of demographic data in two groups of study subjects

S. No	Parameters	Closure group (n=124)		Non-closure group (n=124)		p-value
1	Incisional hernia	10 (9.3)		14 (12.5)		0.584
2	Adhesion	18 (16.7)		12 (10.7)		0.361
S. No	Parameters	Closure group		Non-closure group		p-value
		n=124	%	n=124	%	
1	Age (years)	31.51±13.00		29.33±11.26		0.319
2	Gender					
A	Male	46	37.1	50	40.3	0.714
B	Female	78	62.9	74	59.7	

Table 2: Comparison of analgesic need, infection, and fever in two groups of study subjects

S. No	Parameters	Closure group		Non-closure group		p-value
		n=124	%	n=124	%	
1	Analgesics need	40	32.3	22	17.7	0.07
2	Infection	12	9.6	6	4.8	0.453
3	Fever	10	8	6	4.8	0.486

Table 3: Comparison of the rates of incisional hernia, adhesin, hospitalization length, and VAS (pain intensity) in two groups of study subjects

S. No	Parameters	Closure group (n=124)	Non-closure group (n=124)	p-value
1	Incisional hernia	10 (9.3)	14 (12.5)	0.584
2	Adhesion	18 (16.7)	12 (10.7)	0.361
3	Hospitalization (days)	2.4±1.2	4.0±1.1	0.06
4	Pain intensity			0.007
A	First 2 hours	6.8±0.7	6.1±1.1	
B	First 6 hours	6.7±0.7	6.2±1.1	0.003
C	First 24 hours	5.1±0.6	4.8±0.7	0.03
D	First 48 hours	3.8±0.2	3.7±1.1	0.144

DISCUSSION

The present study assessed 248 subjects who were undergoing laparotomy utilizing midline incision at the Institute within the defined study period. The subjects were randomly divided into two groups of 124 subjects each based on peritoneal closure and non-closure. The mean age of the study subjects was 31.51±13.00 and 29.33±11.26 years in closure and non-closure groups which was statistically comparable with p=0.319. The gender distribution in the closure and non-closure groups was statistically comparable in the two groups with p=0.714. These data were comparable to the previous studies of Gurusamy KS et al,[5] in 2013 and Whitfield RR et al,[6] in 2007 where authors assessed subjects with demographics comparable to the present study in their respective studies.

It was seen that on comparison of analgesic need, infection, and fever in two groups of study subjects, analgesics were needed in 32.3% (n=40) subjects from the closure group which was non-significantly higher compared to the non-closure group where analgesics were needed by 17.7% (n=22) subjects with p=0.07. Infection was seen in 9.6% (n=12) subjects from the non-closure group which was non-significantly higher compared to the non-closure group where the infection was noted in 4.8% (n=6) subjects with p=0.453. A similar non-significantly higher incidence of fever was seen in the closure group compared to the non-closure group with p=0.486. These results were consistent with the findings of Israelsson LA et al,[7] in 2013 and Walming S et al,[8] in 2017 where the comparison of analgesic need, infection, and fever reported by the authors in their studies was comparable to the results of the present study.

The study results showed that for comparison of the rates of incisional hernia, adhesin, hospitalization length, and VAS (pain intensity) in two groups of study subjects, the length of hospitalization was 2.4±1.2 in the closure group which was lesser compared to the non-closure-group-where-hospitalization length was 4.0±1.1 showing the non-significant difference with p=0.06. Concerning pain intensity, it was seen that pain intensity in the two groups was comparable in the closure and non-closure groups. However, at 6 and 24 hours, significantly higher pain was reported in the closure group compared to the non-closure group with p=0.003 and 0.03. Overall pain intensity was significantly higher in the closure group compared to the non-closure group with p=0.007. These findings were in agreement with the results of Takreem A et al,[9] in 2015 and Khan AW et al,[10] in 2017 where a comparison of the rates of incisional hernia, adhesin, hospitalization length, and VAS (pain intensity) in closure and non-closure peritoneum similar to the present study was also reported by the authors in their studies.

It was also seen that on assessing the long-term complications in two groups of study subjects, rates of intraperitoneal adhesion were assessed using sonography after one year of surgery and was lower in a non-closure group compared to the closure group, However, the difference was statistically non-significant with p=0.361. The incidence of incisional hernia in the closure group was in 9.3% (n=10) of study subjects compared to 12.5% (n=14) in the non-closure group. However, the difference was

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statistically non-significant with p=0.361. These results were in line with the findings of Bamigboye AA et al,[11] in 2014 and Altinbas SK et al,[12] in 2013 where long-term complications in closure and non-closure peritoneum reported by the authors in their studies were comparable to the results of the present study.

CONCLUSION

Considering its limitations, the present study concludes that closure of the peritoneum following non-emergency, non-infected laparotomy increases postoperative pain. However, it has no benefit on long-term complications including intra-peritoneal adhesion and incisional hernia. The study had a few associated limitations a smaller sample size, shorter monitoring, and a single-institute background. Hence, further clinical studies with larger samples and longer monitoring will be needed to reach a definitive conclusion.

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