IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 22, Issue 4 Ser.5 (April. 2023), PP 50-54
www.iosrjournals.org

A comparative study on continuous and interrupted methods of abdominal fascial closure in midline laparotomy wounds

Arif Hassan[1]
Sunny Kumar Gupta[2]
Sandip Kumar[3]
Raj Shekhar Sharma[4]

[1]*Junior Resident III, Department of Surgery, Rajendra Institute of Medical Sciences, Ranchi*
[2]*Junior Resident III, Department of Surgery, Rajendra Institute of Medical Sciences, Ranchi*
[3]*Associate Professor, Department of Surgery, Rajendra Institute of Medical Sciences, Ranchi*
[4]*Professor, Department of Surgery, Rajendra Institute of Medical Sciences, Ranchi*

Corresponding Author: *Dr. Arif Hassan*
C/O Emam Hassan
J. K. Sanitation and Hardware
Near Jama Masjid, Bariatu Basti
P.O.- R.M.C.H. Ranchi- 834009.

Abstract
Introduction: *A surgical incision acts as an aperture into the body to permit the work of the operation to proceed. As majority of the surgeries performed by the general surgeons take place within the abdominal cavity and hence laparotomy is one of the most common procedure performed in emergency as well as elective settings. So, incision and closure occupies the most important aspect in the abdominal surgery. The aim of this study was to compare the benefits of interrupted and continuous closure of abdominal fascia in midline laparotomy wound and complications like seroma formation, wound gaping, burst abdomen and incisional hernia in both types of closures.*
Materials and Methods: *This hospital based prospective, randomised controlled study was done in the Department of General Surgery, Rajendra Institute of Medical Sciences (RIMS), Ranchi on 80 adult patients admitted in and operated with midline laparotomy irrespective of sex. Patients were followed up and re-evaluated at POD 3 and POD 5 and after 3 months after surgery in outpatient's department.*
Results: *Mean time required for interrupted suture was more than was required in continuous suture. Incidence of postoperative seroma formation, wound dehiscence and burst abdomen in interrupted suture in emergency cases and routine cases was less than in continuous suture. Incidence of post operative incisional hernia was found to be significantly less in interrupted suture in emergency cases as compared to continuous suture after 3 months follow up (p=0.5533) whereas no incidence of Incisional hernia was observed in routine cases.*
Conclusion: *It may be concluded that the overall outcome of interrupted suture was found to be better than the continuous suture although continuous suture requires less time.*
Key words: *Continuous, interrupted, abdominal fascia, laparotomy.*

Date of Submission: 03-04-2023 Date of Acceptance: 16-04-2023

I. Introduction

A surgical incision acts as an aperture into the body to permit the work of the operation to proceed**.** As majority of the surgeries performed by the general surgeons take place within the abdominal cavity and hence laparotomy is one of the most common procedure performed in emergency as well as elective settings. So, incision and closure occupies the most important aspect in the abdominal surgery.

Any surgical incision will depend on the underlying pathology, site, patient's factors, and the surgeon's preference and experience.

The Key principles of making surgical incisions are:- Follow Langer's lines to make incisions where possible, for maximal wound strength with minimal scarring, muscles should be split and not cut (where possible).[1]

The key principles of abdominal wall closure are:- Regardless of the type or direction of incision, the factors involved in closure are similar and will be discussed together, maintenance of tissue perfusion, minimizing necrosis, creating good initial strength, protection against late hernia formation and assuring a cosmetic result.[1]

Closure of the abdomen is one of the most important steps in laparotomy as it decides the incidence of majority of wound site complications and post operative morbidity.

Technical errors such as misplaced incision, insecure knotting and wrong selection of suture materials leads to complications like hematoma, stitch abscess, infection, wound dehiscence or evisceration, incisional hernia or unsightly scar.

The question for the best closure technique for abdominal incision continues. The surgeon's endeavour always is to eliminate the consequences of seroma formation, wound dehiscence, and burst abdomen in the acute form and the incisional hernia as the late manifestations. To achieve this goal, several modifications in opening the abdomen and closing the wound have been tried.

Aims and Objectives:- The aim of this study was to compare the benefits of interrupted and continuous closure of abdominal fascia in midline laparotomy wound and complications like seroma formation, wound gaping, burst abdomen and incisional hernia in both types of closures.

II. Material and Methods

This hospital based prospective, randomised controlled study was done in the Department of General Surgery, Rajendra Institute of Medical Sciences (RIMS), Ranchi on 80 adult patients admitted in and operated with midline laparotomy irrespective of sex from January 2021 to October 2022. Patients were followed up and re-evaluated at POD 3 and POD 5 and after 3 months after surgery in outpatient's department.

Inclusion criteria:- All patients aged 18-75 years of both gender, patients who underwent surgery with midline laparotomy incision and patients with BMI 19-27.

Exclusion criteria:- Patients with co-morbid conditions like immune compromised patients, patients on chemotherapy, immunotherapy, collagen disorders and on long term steroids, patients with previous treated or untreated incisional hernias, patients with planned ostomies and patients who underwent surgery by Grid-iron, subcostal and paramedian incisions, second laparotomy or relaparotomy.

The patients had been chosen randomly, irrespective of gender, age and nature of disease. Out of these 80 patients, 40 patients had been randomized using lottery method to have the abdominal wall closure by interrupted closure technique and remaining 40 by continuous closure and had been grouped as Group 1 and Group 2 respectively.

III. RESULTS

Table 1: Comparison of mean closure time in both type of closure

Type of Closure	Number	Mean Time
Interrupted Closure	40	10 min 05 sec
Continuous Closure	40	09 min 06 sec

Mean time for closure in interrupted suture is 10 minute 05 second whereas in continuous suture it is 9 minute 06 second. This shows that continuous suture takes less time for closure than interrupted closure.

Table 2: Comparison of postoperative seroma in emergency cases

Type of Closure	Seroma Formation	%	Normal Healing	%	Chi-square	p value
Interrupted Closure	3	15	17	85	4.179	0.0409
Continuous Closure	9	45	11	55		

In emergency cases, incidence of postoperative Seroma formation after interrupted closure is 3 out of 20 patients (15%) whereas it is 9 out of 20 patients (45%) while closing the rectus sheath with continuous suture.

Table 3: Comparison of post operative seroma in routine cases

Type of closure	Seroma Formation	%	Normal Healing	%	Chi-square	p value
Interrupted Closure	2	10	18	90	4.680	0.0305
Continuous closure	8	40	12	60		

In routine cases, incidence of postoperative seroma formation after interrupted closure is 2 out of 20 patients (10%) whereas it is 8 out of 20 patients (40%) while closing the rectus sheath with continuous suture.

Table 4: Comparison of postoperative wound gaping in emergency cases

Type of Closure	Wound Dehiscence	%	Normal Healing	%	Chi-square	p value
Interrupted Closure	4	20	16	80	3.857	0.0495
Continuous Closure	10	50	10	50		

In emergency cases, incidence of postoperative wound dehiscence after interrupted closure is 4 out of 20 patients (20%) whereas it is 10 out of 20 patients (50%) after closing the rectus sheath with continuous suture.

Table 5: Comparison of postoperative wound gaping in routine cases

Type of Closure	Wound Dehiscence	%	Normal Healing	%	Chi-square	p value
Interrupted Closure	2	10	18	90	4.680	0.0305
continuous Closure	8	40	12	60		

In routine cases, incidence of postoperative wound dehiscence after interrupted closure is 2 out of 20 patients (10%) whereas it is 8 out of 20 patients (40%) after closing the rectus sheath with continuous suture.

Table 6: comparison of postoperative burst abdomen in emergency cases

Type of Closure	Burst Abdomen	%	Normal Healing	%	Chi-square	p value
Interrupted Closure	2	10	18	90	4.680	0.0305
Continuous Closure	8	40	12	60		

In emergency cases, incidence of postoperative burst abdomen after interrupted closure is 2 out of 20 patients (10%) whereas it is 8 out of 20 patients (40%) after closing the rectus sheath with continuous suture.

Table 7: Comparison of postoperative burst abdomen in routine cases

Type of Closure	Burst Abdomen	%	Normal Healing	%	Chi-square	p value
Interrupted Closure	2	10	18	90	4.680	0.0305
Continuous Closure	8	40	12	60		

In routine cases, incidence of postoperative burst abdomen after interrupted closure is 2 out of 20 patients (10%) whereas it is 8 out of 20 patients (40%) after closing the rectus sheath with continuous suture.

Table 8: Comparison of postoperative incisional hernia in emergency case

Type of Closure	Incisional Hernia	%	Normal Healing	%	Chi-square	p value
Interrupted Closure	01	05	19	95	0.351	0.5533
Continuous Closure	02	10	18	90		

In emergency cases the incidence of postoperative incisional hernia after interrupted closure is 1 out of 20 (5%) patients whereas it is 2 out of 20 (10%) patients after closing the rectus sheath with continuous suture.

Table 9: Comparison of postoperative incisional hernia

Type of Closure	Incisional Hernia	%	Normal Healing	%
Interrupted Closure	00	00	20	100

Continuous Closure	00	00	20	100

In routine cases the incidence of postoperative incisional hernia after interrupted closure as well as continuous closure is 0 out of 20 patients (0%) in each group.

IV. Discussion

Mean time for closure was significantly more in interrupted (10 min 05 sec).

In Kumar B et al[2], time required for interrupted closure is 16 minute and was 13 minute for continuous closure. Baldev Singh et al[3], found that continuous closure is fast than interrupted closure. Shashikala B et al[4] found interrupted closure (28.4 minutes) consuming more time as compared to continuous closure (13.9 minutes). Thomas Peponis et al[5] found that time needed for closure was significantly longer in interrupted closure (22 minutes) than continuous closure (13 minute). In Avinash C. Sharma et al[6] study mean time for closure in interrupted group is 31.6 minute whereas 17.3 minute in continuous group. Sayak Roy et al[7] found that interrupted suture takes longer time than continuous suture. The result of our study was consistent with that of the above mentioned study.

In the present study, the incidence of seroma formation was higher in continuous closure (42.5%) whereas it was only 12.5% in interrupted closure. Incidence of wound dehiscence found to be higher in continuous closure group (45%) whereas low incidence is found in interrupted closure group (15%).

Richards et al[8] found that incidence of wound dehiscence in continuous group was 2% whereas 0.9% in interrupted closure. Himanshu Gupta et al[9] found that incidence of wound dehiscence in continuous closure was significantly higher than interrupted closure. Ashish Sharma et al[10] found that wound dehiscence in continuous closure was 32% whereas it was 12% in interrupted group. In Balaji C et al[11] incidence of wound dehiscence in continuous closure was 22% and in interrupted closure it was 03%. In Shashikala V et al[4], incidence of wound dehiscence was 26.6% in continuous group whereas it was 6.67% in interrupted group. In Fazli Akbar et al[12] study incidence of wound dehiscence was 15% in continuous suture and 3% in interrupted group. In Kaleem Ullah[13] incidence of wound dehiscence was 6.6% in continuous closure whereas it was 3%in interrupted closure. In Sayak Roy et al[7] incidence of wound dehiscence was 21.6% in continuous group whereas it was 0% in interrupted group.

The result of our study were consistent with that of Himanshu Gupta et al, Ashish Sharma et al, Shashikala V et al, in which incidence of wound dehiscence is more in continuous closure group compared to interrupted closure.

Baptist Trimbos et al[14] found wound dehiscence in continuous group was 2% whereas 4% in interrupted closure. In Pierre Louis Fagniez et al[15], incidence of wound dehiscence in continuous group was 1.6% whereas 2% in interrupted closure. Rahul D Kunju et al[16] found that incidence of wound dehiscence in continuous closure is 6.6% whereas it was 24% in interrupted closure. In Baldev Singh et al[3] study, wound dehiscence found was 16% in continuous closure whereas it was 2.7% in interrupted closure.

The result of our study is different from the study of Baptist Trimbos, Pierre Louis, Rahul D Kunju, Shahid Rashid, Baldev Singh and Thomas Peponis et al in which incidence of wound dehiscence is higher in interrupted closure than continuous closure group.

In present study the incidence of burst abdomen is higher in continuous group (42.5%) than with interrupted (10%) closure. In Anurag Srivastava et al[17], incidence of burst abdomen was 14.8% in continuous closure whereas it was only 2.17% in interrupted closure. In Kuldip Singh et al[18], incidence of burst abdomen was 15% in continuous closure group whereas it was 13.35 in interrupted group. In study of Bansiwal RK et al[19], incidence of burst abdomen was 20% in continuous closure group and it was 5.4% in interrupted group. In Avinash C. Sharma et al[6], incidence of burst abdomen was 6.6% in continuous closure whereas it was 3.3% in interrupted group closure.

The result of our study is consistent with the study of the above mentioned Anurag Srivastava, Kuldip Singh, Bansiwal RK and Avinash C Sharma et al, which shows that the incidence of burst abdomen is higher in continuous closure compared to interrupted closure.

In present study delayed complication like (incisional hernia) in emergency cases is higher in continuous closure (5%) whereas it was 2.5% in interrupted closure. In Avinash Sharma et al[6], incidence of incisional hernia in continuous closure group was 36% and was only 8% in interrupted closure group. In Rahul D Kunju[16], incidence of incisional hernia was 14.4% in continuous closure group whereas it was only 4% in interrupted closure group. In J. Baptist Trimbos et al[14], incidence of incidence of incisional hernia was 4% in both type of closure. In Rajendra Kumar Karwasara et al[20], incidence of incisional hernia was 4% in both type of closure. In Himanshu Gupta et al[9], no incidence of incisional hernia was found in both type of closure. In Thomas Peponis et al[5], incidence of incisional hernia in continuous closure method is 22% whereas it was only 13.5% in interrupted closure method.

The result of our study is consistent with the study of Ashish Sharma, Rahul D Kunju and Thomas Peponis et al which shows that the incidence of incisional hernia is higher in continuous closure method than with interrupted method of closure.

In Mari Colombo et al[21], incidence of incisional hernia was 10.4% in continuous closure group whereas it was only14.7% in interrupted closure group.

The result of our study is different from the result of Mario Colombo et al in which incidence of incisional hernia is higher in interrupted method of closure compared with continuous closure.

V. Conclusion

Considering the pros and cons of both methods hereby we recommend the interrupted methods of fascia closure in midline abdominal incisions. More detailed significant difference between the above two methods can be obtained by choosing a larger sample size and a longer follow up.

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Conflict of Interest :- None.

Dr. Arif Hassan, et. al. "A comparative study on continuous and interrupted methods of abdominal fascial closure in midline laparotomy wounds". *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 22(4), 2023, pp. 50-54.