



COMPARING LAYERED CLOSURE VERSUS MASS CLOSURE IN EMERGENCY MIDLINE LAPAROTOMY INCISIONS

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ABSTRACT **Background:** The search continues for the optimal method of closing abdominal incisions. This method should be standard enough to yield consistent results regardless of the surgeon's experience level. The real effectiveness of any method for closing abdominal wounds can only be assessed when it is applied to all patients by surgeons of varying levels of experience, without any selection criteria based on their training level. The ideal technique should be rapid, uncomplicated and cost-efficient, effectively minimizing both immediate and delayed complications. This study aims to compare mass closure and layered closure methods for mid-line laparotomy incisions, evaluating post-operative complications, closure time and cost-effectiveness to determine the preferred approach. **Methods:** This study was a prospective comparative trial conducted on 30 patients of both genders admitted to the surgical wards of Navodaya Medical College Hospital, Raichur, Karnataka. Upon admission, patients suspected of having intra-abdominal pathology underwent comprehensive clinical and general assessments. Radiological and biochemical investigations were performed to confirm the diagnosis. Following confirmation, patients underwent exploratory laparotomy. The laparotomy wound closure was performed using either the Mass closure or Layered closure technique. Patients were then followed up for three months post-operatively to monitor for late complications. **Results:** A total of 30 patients were included in the study. The majority of patients belonged to the 60-65 age group, with males outnumbering females. The incidence of early complications such as seroma formation and wound infection was higher in the layered closure group compared to the mass closure group. The mean time taken for wound closure was longer in the layered closure group. The mass closure technique was found to be more cost-effective than the layered closure technique. **Conclusion:** The mass closure technique is quicker, more economical, and safer for closing midline laparotomy incisions.

KEYWORDS :

INTRODUCTION

The sudden disruption of an abdominal laparotomy wound is a significant event for patients who have undergone abdominal surgery, causing substantial stress for both the patient and the surgeon. This partial or complete separation of the abdominal wound closure is known as wound dehiscence or acute wound failure. Acute wound failure specifically refers to the separation of the abdominal musculo-aponeurotic layers within 30 days after the operation and typically requires intervention during the same period of hospitalization. Most burst abdomen occur between the 6th and 9th day post operatively.^[1]

The objectives of wound closure include eliminating dead space, evenly distributing tension along deep suture lines, maintaining adequate tensile strength across the wound until tissue strength is sufficient, and ensuring proper alignment and eversion of the skin closure. The strength of the sutured abdominal wound rests on a balance between the suture holding capacity of tissues and tissue holding capacity of sutures.^[2] A suture length to wound length (SL:WL) ratio of less than 4:1 has been associated with an increased incidence of incisional hernia and may also expose the patient to an increased risk of burst abdomen.^[4-6]

The ideal abdominal closure technique should be rapid, straightforward, and cost-effective, while effectively preventing both early and late complications. It should be simple enough that trainees can achieve outcomes comparable to those of experienced surgeons.

The ideal method of abdominal wound closure should be technically so simple that the results are as good in the hands of a trainee as in those of master surgeons, does not come in the way of pathophysiology of wound healing and with least possibility of post-operative complications.^[3] The two types of closures used were:

1) Layered closure, where the peritoneum was closed using continuous sutures of Vicryl or Chromic catgut, while the linea alba was closed in a similar manner using Prolene No. 1 sutures and 2) Mass closure, where the cut edges of the peritoneum and linea alba were sutured together. Sutures were placed approximately 1cm from the margins of the cut edges, with intervals of about 1cm, using continuous Prolene No. 1 sutures. The skin was closed using non-absorbable material such as Ethilon, either with interrupted mattress sutures or staplers in both groups of patients.

Numerous clinical trials have compared layered abdomen closure

to mass abdominal closure. Some studies have shown an increased incidence of burst abdomen and incisional hernia (IH) with layered closure^[8-10], while others find no significant difference in these complications^[7]. None of the studies demonstrate a clear advantage of layered closure over mass closure. With recent advances in suture material and the use of mass closure technique, the rate of dehiscence has generally been less than 1%^[11]. The prevalence of wound disruption in Indian scenario is reported to range from 10-30% for emergency cases and 0-5% for elective cases.^[12]

This study aims to evaluate the effectiveness of mass closure versus layered closure methods for abdominal wall closure. The study assesses outcomes such as intraoperative closure time, incidence of acute wound dehiscence within 10 days post-surgery, and occurrence of incisional hernia 3 months post-surgery.

Aims and Objectives

This study aims to evaluate the effectiveness of mass closure versus layered closure methods for abdominal wall closure. The following parameters will be assessed:

- Duration of intra-operative closure time.
- Occurrence of post-operative burst abdomen within 10 days after surgery.
- Incidence of incisional hernia three months post-surgery.

Materials and Methods

The current study was a prospective comparative trial involving 30 patients of both genders who were admitted to the surgical wards of Navodaya Medical College Hospital, Raichur, Karnataka. The patients selected were aged between 18 and 60 years, posted for emergency laparotomy and those who had undergone surgery via a midline incision. Whereas, patients who had previously undergone midline laparotomy, patients who declined to give consent and patients with type 2 diabetes mellitus or malignancy were excluded from the study. Patients were divided into two groups: Group 'A' underwent layered closure, while Group 'B' underwent mass closure technique. During surgery, the time taken for abdominal closure was recorded for all cases.

Postoperatively, patients in both groups received appropriate parenteral antibiotics for 2-3 days followed by oral antibiotics for 5-7 days. Antibiotics were continued as necessary after the initial ten days.

Wounds were assessed on the 3rd, 5th, 7th, 9th, or 10th day, and their condition noted. Throughout the postoperative period, patients were monitored for abdominal distension, vomiting, hiccups, and chest infections. Incidences of seroma and wound infections were also documented.

Regular examinations were conducted to check for signs of wound gaping and burst abdomen. Monthly follow-ups were performed for three months to monitor for scar complications and incisional hernias.

RESULTS

Table 1: Post Operative seroma Formation

Seroma	Group A (Layered Closure)		Group B (Mass Closure)	
	No. of patients	Percentage	No. of patients	Percentage
Present	2	13.33	1	6.66
Absent	13	86.66	14	93.33
Total	15	100	15	100
P value	1.000			

Table 2: Surgical Site Infection

Surgical Site Infection	Group A (Layered closure)		Group B (Mass Closure)	
	No. of patients	Percentage	No. of patients	Percentage
Present	2	13.33	1	6.66
Absent	13	86.66	14	93.33
Total	15	100	15	100
P value	1.000			

Table 3: Burst Abdomen

Burst abdomen	Group A (Layered Closure)		Group B (Mass Closure)	
	No. of patients	Percentage	No. of patients	Percentage
Present	3	20	1	6.66
Absent	12	80	14	93.33
Total	15	100	15	100
P value	0.804			

Table 4: Incisional Hernia

Incisional hernia	Group A (Layered Closure)		Group B (Mass Closure)	
	No. of patients	Percentage	No. of patients	Percentage
Present	1	6.66	0	0
Absent	14	93.33	15	100
Total	15	100	15	100
P value	1.000			

Table 5: Duration Of Closure

Duration (in mins)	Group A (Layered closure)		Group B (Mass closure)	
	No. of patients	Percentage	No. of patients	Percentage
14-19	0	0	13	86.67
20-25	1	6.67	2	13.33
26-31	13	86.67	0	0
>31	1	6.67	0	0
Total	15	100	15	100
Mean+/- SD	28.26 + 1.59		17.00+/-2.05	
P value	0.0001			

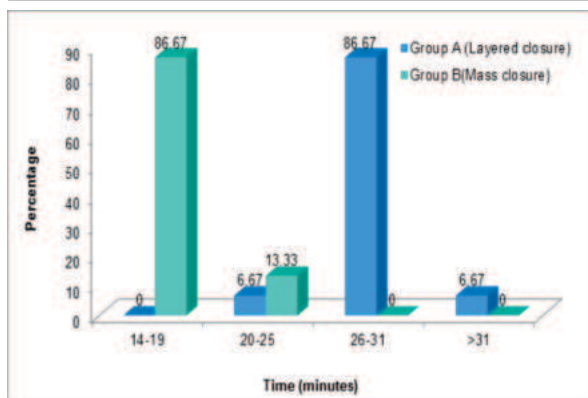


Figure 1: Graphical Representation Of Time Taken For Closure In Both Groups

In this study of 30 patients, there were 20 males and 10 females. Their ages ranged from 18 to 60 years, with a majority falling between 57 and 65 years. Of these patients, 11 were classified as clean contaminated and 19 as contaminated. Closure time was notably shorter with the continuous suture technique: Group-A averaged 28 minutes compared

to 17 minutes in Group-B. Layered closure (Group-A) took longer than mass closure (Group-B).

In terms of complications, 2 patients in Group-A and 1 in Group-B developed seroma and surgical site infections, while 3 in Group-A and 1 in Group-B experienced burst abdomen, and 1 in Group-A and 0 in Group-B had incisional hernia.

Specifically, in Group-A, seroma occurred in 13.3%, surgical site infections in 13%, burst abdomen in 20%, and incisional hernia in 6.6%. In Group-B, seroma occurred in 6.6%, surgical site infections in 6.6%, burst abdomen in 6.6%, and incisional hernia in 0%.

DISCUSSION

The current study aimed to compare different techniques for closing midline laparotomy wounds, emphasizing their role in preventing post-operative complications such as wound infection, burst abdomen, and incisional hernia. Burst abdomen is associated with a morbidity and mortality rate of approximately 16%, typically occurring around 8-10 days post-surgery. Abdominal wound infections and dehiscence are frequent complications following midline laparotomies, particularly in emergency cases. Additional factors that increase the risk of wound infection include local trauma from excessive retraction, extensive electrocoagulation, and inadequate hemostasis. The presence of foreign materials, even a single piece of sterile silk suture, significantly raises the likelihood of a contaminated wound becoming infected. Decreased perfusion is also a contributing factor.

Table 6: Comparison Of Rate Of Seroma Formation In Various Studies Between Layered Closure And Mass Closure Of Midline Laparotomy Incisions

Author and year of study	Group A (Layered Closure)	Group B (Mass Closure)
Sreeharsha et al,[13] (2013)	10%	6%
Kumar et al,[7] (2017)	10%	4%
Deshmukh et al,[14] (2018)	3.3%	0%
Present study	13.3%	6.6%

Table 7: Comparison Of Rate Of Wound Infection In Various Studies Between Layered Closure And Mass Closure On Midline Laparotomy Incisions

Author and year of study	Group A (Layered Closure)	Group B (Mass Closure)
Sreeharsha et al,[13] (2013)	8%	6%
Kumar et al,[7] (2017)	8%	6%
Deshmukh et al,[14] (2018)	6.6%	10%
Present study	13.3%	6.6%

Table 8: Comparison Of Rate Of Burst Abdomen In Various Studies Between Layered Closure And Mass Closure Of Midline Laparotomy Incisions

Author and year of study	Group A (Layered Closure)	Group B (Mass Closure)
Sreeharsha et al,[13] (2013)	8%	6%
Kumar et al,[7] (2017)	8%	6%
Deshmukh et al,[14] (2018)	6.6%	10%
Present study	20%	6.6%

Table 9: Comparison Of Rate Of Incisional Hernia In Various Studies Between Layered Closure And Mass Closure Of Midline Laparotomy Incisions

Author and year of study	Group A (Layered Closure)	Group B (Mass Closure)
Sreeharsha et al,[13] (2013)	0%	2%
Kumar et al,[7] (2017)	2%	4%
Deshmukh et al,[14] (2018)	6.6%	6.6%
Present study	6.6%	0%

Table 10: Comparison Of Mean Duration Of Closure (in Minutes) In Various Studies Between Layered Closure And Mass Closure Of Midline Laparotomy Incisions

Author and year of study	Group A (Layered Closure)	Group B (Mass Closure)
Kumar et al,[7] (2017)	23	14
Deshmukh et al,[14] (2018)	21.2	16.2
Present study	28	17

In the current study, the mean duration of closure was 28 minutes for layered closure and 17 minutes for mass closure, resulting in a statistically significant difference of approximately 11 minutes ($p=0.0001$), consistent with findings from other studies. Shortening operative time helps mitigate anesthetic risks, reduces the cost of anesthetic agents, and optimizes surgeon efficiency.

Regarding complications, the study observed a 6.6% incidence of seroma formation with mass closure compared to 13.3 % with layered closure. Wound infections occurred in 6.6% of mass closure cases versus 13.3% in layered closure. Burst abdomen was noted in 6.6% of mass closure cases and 20% in layered closure. Incisional hernia rates were 0% for mass closure and 6.6% for layered closure.

CONCLUSION

Based on the above results, it can be concluded that the optimal abdominal closure technique should prioritize speed and simplicity while effectively preventing both early and late complications. In this study, mass closure of laparotomy wounds required less time for closure compared to traditional layered closure. Additionally, the incidence of postoperative complications such as seroma, wound infection, burst abdomen, and incisional hernia was lower with mass closure. Therefore, the mass closure technique appears superior to traditional layered closure for laparotomy wounds in terms of both operative time and post-operative complications. However, further investigation over a longer duration is necessary to accurately assess the incidence of incisional hernia.

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