

# A Comparative Study between Closure by Layers Vs Mass Closure in Midline Laparotomy Incisions

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## ABSTRACT

**Background:** The ideal method of abdominal wound closure remains to be discovered. It should be technically so simple that the results are as good in the hands of a trainee as in those of the master surgeon. The best abdominal closure technique should be fast, easy, and cost effective while preventing both early and late complications. Present study is undertaken to compare the two methods (Mass closure and Layered closure) of laparotomy wound closure in relation to post-operative complications, time for wound closure and cost effectiveness in both groups and also to decide the most effective method among the two. **Methods:** The present study was a prospective comparative trial and conducted on 60 patients of either sex admitted in surgical wards of Rajindra Hospital Patiala, Punjab. On admission, patients suspected of having intra-abdominal pathology, a thorough clinical and general assessment was done. Necessary radiological and biochemical investigations were done to support the diagnosis. After confirmation of diagnosis patients were subjected for exploratory laparotomy. The laparotomy wound was closed with either by Mass closure or Layered closure technique. Patients were followed up for 3 months in post-operative period for detection of late complications. **Results:** Total 60 patients were studied. Majority of patients were in 61 to 65 age group. Male outnumbered the females. Incidence of early complications like seroma, wound infection is more in layered closure group as compared to mass closure. Mean wound closure time is more in layered closure group. Mass closure technique is more cost effective than layered closure group. **Conclusion:** Mass closure technique is less time consuming, more cost effective and safe for closure of midline laparotomy incision.

**Keywords:** Layers Vs Mass, Midline Laparotomy, Surgery .

## INTRODUCTION

The occurrence of sudden disruption of the abdominal laparotomy wound is a big event in the life of a patient who has undergone an abdominal operation and a major cause of stress to the patient as well as the surgeon. The partial or complete postoperative separation of abdominal wound closure is known as wound dehiscence or acute wound failure. Acute wound failure is defined as postoperative separation of the abdominal musculoaponeurotic layers, within 30 days after operation and requires some form of intervention, usually during the same hospitalization.<sup>[1]</sup> Most burst abdomen occur between the 6th and 9th postoperative day.<sup>[2]</sup>

The goals of wound closure include obliteration of dead space, evenly distributing the tension along deep suture lines, maintenance of tensile strength across the wound until tissue tensile strength is adequate, and approximation and eversion of the epithelial portion of the closure.<sup>[3]</sup> The strength of

the sutured abdominal wound rests on a balance between the suture holding capacity of tissues and tissue holding capacity of sutures.<sup>[1]</sup>

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.<sup>[4-6]</sup>

The best abdominal closure technique should be fast, easy, and cost effective while preventing both early and late complications.<sup>[7]</sup>

The ideal method of abdominal wound closure should be technically so simple that the results are as good in hands of 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.<sup>[8]</sup>

### Types of closure:

#### **Layered closure:**

The peritoneum was closed with Vicryl or Chromic catgut by continuous sutures, and the linea alba was closed similarly with prolene No. 1.

#### **Mass closure technique**

Closure was performed by suturing the cut edges of the peritoneum and linea alba together, bites were taken about 1cm from margins of the cut edges and interval of roughly 1cm with continuous sutures using prolene no. 1.

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The skin was closed with non-absorbable material like Ethilon using 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,<sup>[9-11]</sup> while others show no difference in these complications,<sup>[8]</sup> but no studies demonstrate an advantage of layered 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%.<sup>[12]</sup> The prevalence of wound disruption in Indian scenario is reported to range from 10-30% for emergency cases and 0-5% for elective cases.<sup>[13]</sup>

This present study is designed to assess the potential of an alternate wound closure method i.e. mass closure of abdominal wall closure in comparison to layered closure method. The results are assessed by evaluating the intraoperative time for closure, acute wound dehiscence or acute wound failure within 10 days after surgery and Incisional hernia at 3 months after surgery.

**Aims and Objectives**

To assess the potential of an alternate wound closure method i.e. mass closure of abdominal wall in comparison to layered closure method in which following parameters will be evaluated.

- Time taken for closure intraoperatively.
- Incidence of post-operative ‘burst abdomen within 10 days of surgery.
- Incisional Hernia after 3 months of surgery

**MATERIALS AND METHODS**

The present study was a prospective comparative trial and conducted on 60 patients of either sex admitted in surgical wards of Rajindra Hospital Patiala, Punjab. All the patients were assigned into two groups as per inclusion, exclusion criteria:

**Inclusion criteria:**

- Patients aged 18-60yrs.
- Patients posted for laparotomy in emergency.
- Patients who had undergone surgery by midline incision

**Exclusion criteria:**

1. Patient who underwent midline laparotomy previously.
2. Patients who refused to give consent.
3. Patient suffering from DM-2, Malignancy.

Patients were included in two groups: Group ‘A’ and Group ‘B’.

**GROUP A:** Layered closure:

**GROUP B:** Mass closure technique

**Intraoperative:** Time taken for the closure of abdomen was recorded in all cases.

**Postoperative:** All the patients will be given antibiotics suitable for the case parenterally, usually for 2-3 days and orally for 5-7 days. Antibiotics will be continued only whenever indicated after ten days. The wound will be examined on 3rd, 5th, 7th, 9th or 10th day and the condition of wound noted.

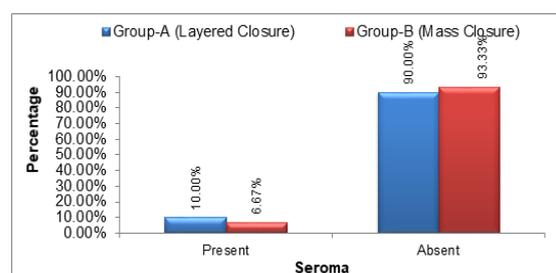
During the postoperative period, the patients were examined for abdominal distension, vomiting, hiccup and chest infection. Seroma and wound infection was also noted. Regular examination of the wounds for signs of wound gaping and burst abdomen was taken care of.

Regular monthly follow up were done for 3months, During the follow up, the patients were examined for scar complications and incisional hernia.

**RESULTS**

**Post-Operative Complications Seroma**

Seroma	Group-A (Layered Closure)		Group-B (Mass Closure)	
	No. of Patients	Percentage	No. of Patients	Percentage
Present	3	10.00	2	6.67
Absent	27	90.00	28	93.33
Total	30	100.00	30	100.00
p value	1.000			



**Surgical Site Infection**

Surgical Site Infection	Group-A (Layered Closure)		Group-B (Mass Closure)	
	No. of Patients	Percentage	No. of Patients	Percentage
Present	3	10.00	2	6.67
Absent	27	90.00	28	93.33
Total	30	100.00	30	100.00
p value	1.000			

**Burst Abdomen**

Burst Abdomen	Group-A (Layered Closure)		Group-B (Mass Closure)	
	No. of Patients	Percentage	No. of Patients	Percentage
Present	3	10.00	1	3.33

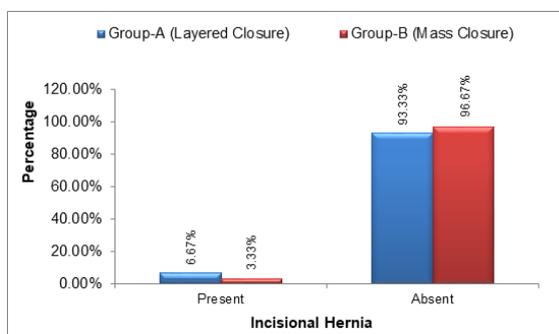
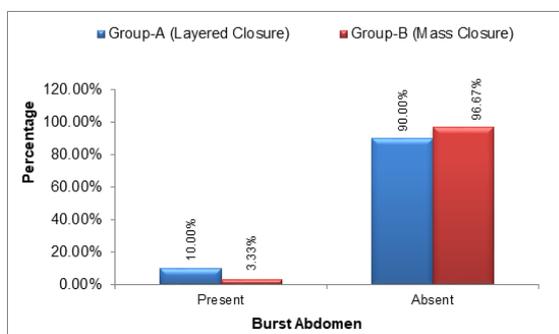
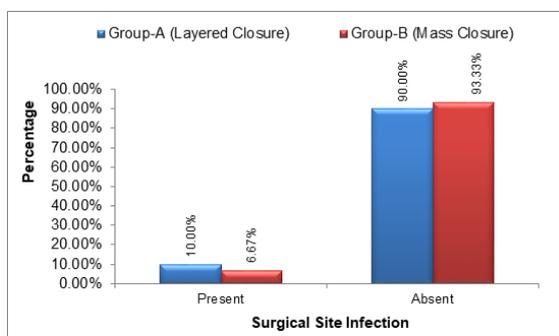
Absent	27	90.00	29	96.67
Total	30	100.00	30	100.00
p value	0.604			

**Incisional Hernia**

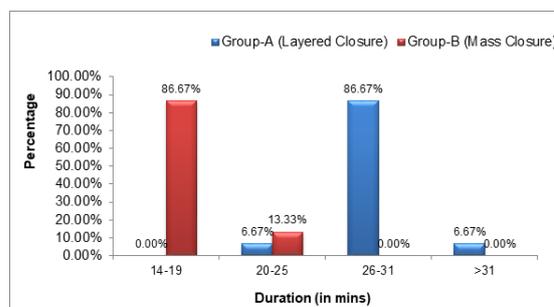
Incisional Hernia	Group-A (Layered Closure)		Group-B (Mass Closure)	
	No. of Patients	Percentage	No. of Patients	Percentage
Present	2	6.67	1	3.33
Absent	28	93.33	29	96.67
p value	1.000			

**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	0.00	26	86.67
20-25	2	6.67	4	13.33
26-31	26	86.67	0	0.00
>31	2	6.67	0	0.00
Total	30	100	30	100
Mean±SD	28.26±1.59		17.00±2.05	
p value	0.0001			



required for closure was considerably less when continuous suture technique was used. The mean duration of closure for Group-A was 28min and Group-B was 17min. The time consumed in layered closure (Group-A) was more than in mass closure (Group-B). 3 patients in group A and 2 patient in group B had seroma and surgical site infection, 3 patients in group A and 1 patient in group B had burst abdomen, 2 patients in group A and 1 patient in group B had incisional hernia. In group A seroma (10%), SSI were (10%), Burst abdomen (10%) and incisional hernia was (6.67%). In group B seroma (6.67%), SSI (6.67%), Burst abdomen (3.33%) and incisional hernia was (3.33%) prevalent.



**DISCUSSION**

The present study was aimed at comparing the techniques of midline laparotomy wound closure. The technique of laparotomy wound closure is one of the important factor in preventing post-operative complications like wound infection, burst abdomen and incisional hernia.

Morbidity and mortality associated with burst abdomen have been estimated at 16%. The mean time for wound dehiscence is 8-10 days after surgery. Abdominal wound infection and dehiscence are common complications after midline laparotomies especially in emergency cases.

Of the 60 patients in the study, 40 were males and 20 were females. The age of the patients ranged from 18 to 60 years; a majority were in the age group of 48 to 57 years. Out of 60 patients 21 were clean contaminated and 39 were contaminated. The time

Other Factors predisposing to wound infection include:

- Local trauma from excessive retraction, extensive electrocoagulation, defective hemostasis.
- The presence of foreign material: the presence of a single Piece of sterile silk suture material doubles the chance of a contaminated wound becoming infected.
- Diminished perfusion.

#### Comparison of Rate of Seroma 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. <sup>[14]</sup> (2013)	10%	6%
Kumar et al. <sup>[15]</sup> (2017)	10%	4%
Deshmukh et al. <sup>[16]</sup> (2018)	3.3%	0%
Chhabra et al. <sup>[7]</sup> (2020)	10%	5%
Present Study	10%	6.6%

#### Comparison of Rate of Wound Infection 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. <sup>[14]</sup> (2013)	8%	6%
Kumar et al. <sup>[15]</sup> (2017)	8%	6%
Deshmukh et al. <sup>[16]</sup> (2018)	6.6%	10%
Chhabra et al. <sup>[7]</sup> (2020)	37.5%	20%
Present Study	10%	6.6%

#### 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. <sup>[14]</sup> (2013)	4%	2%
Kumar et al. <sup>[15]</sup> (2017)	2%	0%
Deshmukh et al. <sup>[16]</sup> (2018)	3.3%	3.3%
Chhabra et al. <sup>[7]</sup> (2020)	10%	5%
Present study	10%	3.3%

#### 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. <sup>[14]</sup> (2013)	0%	2%
Kumar et al. <sup>[15]</sup> (2017)	2%	4%
Deshmukh et al. <sup>[16]</sup> (2018)	6.6%	6.6%
Chhabra et al. <sup>[7]</sup> (2020)	0%	1%
Present study	3.3%	6.6%

#### Comparison of Mean Duration of Closure (in Minutes)

Author and year of study	Group-A (Layered Closure)	Group-B (Mass Closure)
Singh et al. <sup>[17]</sup> (2012)	35	20
Kumar et al. <sup>[15]</sup> (2017)	23	14
Deshmukh et al. <sup>[16]</sup> (2018)	21.2	16.2
Chhabra et al. <sup>[7]</sup> (2020)	28	19
Present Study	28	17

In present study Mean duration of closure is 28minutes in layered closure and 17minutes in mass closure. There was difference of about 11 minutes in the mean time between the two methods which was statistically significant ( $p=0.0001$ ) and was comparable with other studies. Reduction in operative time prevents anaesthetic hazards, reduces the cost of anaesthetic agent and save the time of surgeon.

In present study incidence of seroma formation was 6.6% in mass closure and 10% in layered closure, incidence of wound infection was 6.6 % in mass closure and 10% in layered closure, burst abdomen was 3.3% in mass closure and 10% in layered closure, incisional hernia in mass closure is 3.3% and 6.6% in layered closure.

## CONCLUSION

Under the light of above obtained results, following conclusion could be withdrawn that the best abdominal closure technique should be fast and easy, while preventing both early and late complications. In this study, mass closure of laparotomy wounds have taken less time for closure than conventional layered closure. Also the incidence of postoperative complications like seroma, wound infection, burst abdomen and incisional hernia were less in mass closure. Hence, mass closure technique is better than conventional layered closure of laparotomy wounds in terms of operative time and post-operative complications. However, longer study period is required to know the exact incidence of incisional hernia.

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