

Single Layer Closure (Mass Closure) Versus Layered Closure in Midline Laparotomy Incisions: An Comparative Study**Sudhir Kumar¹, Kumar Shubham², Ashok Kumar³, Khursheed Alam⁴, Sunil Kumar Ranjan⁵**¹Senior Resident, Department of General Surgery, Govt. Medical College and Hospital, Bettiah, West Champaran, Bihar.²Senior Resident, Department of General Surgery, Govt. Medical College and Hospital, Bettiah, West Champaran, Bihar.³Assistant Professor, Department of General Surgery, Govt. Medical College and Hospital, Bettiah, West Champaran, Bihar.⁴Assistant Professor, Department of General Surgery, Govt. Medical College and Hospital, Bettiah, West Champaran, Bihar.⁵Associate Professor and HOD, Department of General Surgery, Govt. Medical College and Hospital, Bettiah, West Champaran, Bihar.

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Conflict of interest: Nil

Abstract

Background: The best technique for closing abdominal wounds has still to be found. Technically, it should be so easy that even a trainee can perform the procedure with the same level of quality as an expert. The ideal abdominal closure method should be quick, simple, and economical while avoiding both early and late problems. The goal of the current study is to determine which of the two laparotomy wound closure techniques—mass closure and layered closure—is the most beneficial in terms of post-operative complications, wound closure time, and cost effectiveness for both groups.

Methods: From March 2025 to August 2025, this prospective comparative study was carried out in the Surgery Department of Govt. Medical College and Hospital, Bettiah, West Champaran, Bihar. Patients suspected of intraabdominal pathology had a comprehensive clinical and general evaluation upon admission. The diagnosis was supported by the necessary radiological and biochemical tests. Patients underwent exploratory laparotomy upon diagnostic confirmation. Either mass closure or layered closure was used to seal the laparotomy wound. Following surgery, patients were monitored for six months in order to identify any late problems.

Results: A total of thirty patients were examined. The majority of patients were between the ages of 61 and 65. There were more men than women. Compared to mass closure, the layered closure group has a higher incidence of early problems such seroma and wound infection. The multilayer closure group has a longer mean wound closure time. Layered closure groups are more expensive than mass closure techniques.

Conclusion: For the closure of midline laparotomy incisions, the mass closure technique is safer, more economical, and requires less time.

Keywords: Layered closure, Mass closure, Midline Laparotomy Incision.

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Introduction

The abdomen is the site of most general surgeons' operations. As a result, the most frequent procedure in operative surgery is the incision and suturing of the abdominal layers. In both elective and emergency situations, laparotomies are frequently performed. A painful occurrence in the life of a patient who has had an abdominal procedure, sudden disruption of the laparotomy wound is a substantial source of stress for both the patient and the surgeon. Wound dehiscence, sometimes

referred to as acute wound failure, is the term used to describe the partial or total separation of abdominal wound closure following surgery. When the abdominal musculoaponeurotic layers separate within 30 days of surgery, it is referred to as acute wound failure. This condition necessitates care, typically during the same hospital stay.[1] The majority of cases of burst abdomens happen between the sixth and ninth post-operative day.[2] The objectives of wound closure include

elimination of dead space, uniform tension distribution along deep suture lines, preservation of tensile strength throughout the wound until tissue tensile strength is sufficient, and approximation and eversion of the epithelial section of the closure. The strength of the sutured abdominal wound depends critically on a balance between the tissues' ability to hold sutures and the sutures' ability to hold tissues. An increased risk of incisional hernia has been linked to a suture length to wound length ratio of less than 4:1. Additionally, it can put the patient at higher risk for an abdominal rupture.[3]

The ideal abdominal closure method should avoid both early and late difficulties and be quick, simple, and affordable.[4] The ideal technique for closing abdominal wounds should have the fewest post-operative complications, not interfere with the pathophysiology of wound healing, and be technically straightforward enough to produce comparable good results in the hands of both trainees and master surgeons.

The partial or total separation of wound margins is known as wound dehiscence, and it frequently results in acute wound failure.[5] Surgical success in abdominal surgery is greatly impacted by the choice of incision and closure technique, taking into account variables including ease, time, cost, and rates of wound complications.

There are several methods for closing laparotomy wounds, including mass closure, layered closure, retention sutures, and the Smith-Jones approach. Although layer-by-layer closure was the conventional approach, new research indicates that the mass closure method produces better results. With the exception of the skin, which is sutured individually, all layers are closed together during mass closure. The main benefit is a good approximation that reduces strain around the borders of the wound and requires less operating time.[6] However, due to insufficient wound examination, it may result in insufficient

vascularization of the deeper tissues, which would hinder wound healing and raise the risk of surgical site infection (SSI).

Material and Methods

From March 2025 to August 2025, this prospective comparative study was carried out in the Surgery Department of Govt. Medical College and Hospital, Bettiah, West Champaran, Bihar on 30 patients. 15 patients were subjected for mass closure and layered closure was carried out in remaining 15 patients. Both the groups were comparable for midline vertical incisions, elective laparotomy cases and PDS suture material.

All the patients above 20 and up to 65 years of age, regardless of sex, undergoing laparotomy by midline incision were included in the study. Patients below 20 and above 65 years, emergency operation, immune-compromised patients undergoing laparotomy and grossly obese patients (patients having BMI>35) were excluded from this study.

On admission detailed history and thorough clinical examination was performed as per proforma. History regarding age, sex, education, occupation, residence, socioeconomic status, symptoms, and associated diseases were documented after direct interview with patient. Necessary laboratory and radiological investigations were done in each and every patient to confirm the clinical diagnosis. Out of 30 patients undergoing laparotomy, 15 patients were subjected for mass closure and 15 patients for layered closure of laparotomy incision.

The data collected were entered into MS Excel sheets and analysis was carried out using statistical package for social sciences (SPSS-version 24.)

Results

Thirty consecutive patients with intraabdominal pathology undergoing laparotomy by midline incision were included in the study.

Table 1: Age distribution

Age group (years)	No. of cases	Percentage
20-30	6	20%
31-40	5	16.66%
41-50	5	16.66%
51-60	3	10%
61-65	11	36.6%

In this study, the age group most at risk was 61 to 65 years old (31.66%), followed by 20 to 30 years old (21.66%).

Table 2: Sex incidence

Sex	Total cases	Percentage	Male : female ratio
Male	19	63.33%	1.7:1
Female	11	36.66%	
Total	30	100%	

Out of 30 patients, 19 were male and 11 were females with F: M ratio of 1.7:1

Table 3: Intra-abdominal pathologies treated with midline laparotomy incisions

Intra-abdominal pathologies	Total cases	Intra-abdominal pathologies	Total cases
Upper GI malignancy	14%	Bleeding duodenal ulcer	1%
Gastric outlet obstruction	3%	Common bile duct stone	2%
Hydatid cyst of liver	2%	Lower GI malignancy	18%
Splenic abscess	1%	Volvlus	1%
Pseudocyst of pancreas	3%	Mesenteric Cyst	3%
Achalasia cardia	2%	Retroperitoneal tumours	3%
GERD	2%	Soft tissue tumours	1%
Splenomegaly	3%	Carcinoma of bladder	1%

Table 4: Distribution according to abdominal incisions

Abdominal incision	Total cases	Percentage
Upper midline	17	56.6%
Mid midline	4	13.3%
Lower midline	9	30%
Total	30	100%

Upper and lower midline incisions are most commonly used in present study.

Table 5: Postoperative complications

Post-operative complications	Mass closure	Layered closure	P value
	No. of patients (%)	No. of patients (%)	
Hematomas	0(0%)	0(0%)	>0.05
Seroma	0(0%)	1(3.33%)	
Wound infection	3(10%)	2(6.66%)	
Burst abdomen	1(3.33%)	1(3.33%)	
Incisional Hernia	2(6.66%)	2(6.66%)	
Suture sinus formation	0(0%)	1(3.33%)	

As compared to mass closure the incidence of early and late complications is slightly more in layered closure group but is statistically not significant.

Table 6: Mean closure time

Type of closure	Mean closure time (min)	P value
Mass closure	16.2	<0.01
Layered closure	21.2	

As compared to mass closure mean wound closure time is more in layered closure group which is statistically significant.

Discussion

The mass closure group's wound infection rate in the current prospective study is 10%, which is consistent with previous research [7,8,12]. It is lower than studies by Leaper DJ et al. and Khan NA et al., which could be due to the current study's small sample size [13–14]. The mass closure group in the studies by Israelsson et al. and Bloemen et al. had wound infection rates of 9.4% and 7.7%, respectively [15,16]. In contrast to research by Ellis H. et al. (5%) and Kendal et al. (5%), the current study's wound infection rate in the multilayer closure group is 6.66%. Layered closure has a higher rate of wound infection than mass closure; this could be because the wound is exposed to more air and tissue. The mass closure group has a 3.33% incidence of abdominal bursts. It is similar to research done by Ellis H et al., Khan NA et al., and Murtaza B et al. [17]. The multilayer closure

group's incidence of burst abdomen is 3.3%, which is consistent with previous research [8,11]. The current study's 6.6% incidence of incisional hernia for mass closure is consistent with previous research [8, 11, 14, 18]. The current study's small sample size may be the reason for the increased incidence of incisional hernia in the multilayer closure group (6.6%) compared to previous studies [8,11]. The mass closure group in the current study has a 0% incidence of suture sinus development. While the incidence of suture sinus formation in the layered closure group in the current study is 3.33%, which is equivalent to the Wissing et al. study [10, 18, 19], similar results were observed in the investigations by Krukowski et al. and Brodin et al.

In the current study, the mass closure group's mean wound closure time was 16.2 minutes. The Kendal et al. study [11] and this figure are equivalent. In the current study, the mean closure time for the multilayer closure group is 21.2 minutes, whereas in the Kendal et al. study, it is 18 minutes.

Since all of the faculty members were involved in the patient's care, the time needed in the multilayer closure group in the current study may be slightly higher due to individual variance.

According to the current study, the mass closure technique outperforms the layered closure technique. The research conducted by Ausobsky JR et al. and Pollock AV et al. revealed similar results [20, 21].

Conclusion

When it comes to closing midline laparotomy incisions, the mass closure technique is safer, less expensive, less time-consuming, and linked with fewer post-operative problems than multilayer closure.

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