

Comparative Study between Mass Closure and Layered Closure of Midline Abdominal Incisions at Surgery Department of AGMC and GBP Hospital, Agartala, Tripura

Biswajit Paul¹, Anup Kumar Saha², M. R. Debbarma³

¹Senior Resident, Department of Surgery, Agartala Government Medical College and GBP Hospital, Agartala, Tripura

²Professor and Head of Department, Department of Surgery, Agartala Government Medical College and GBP Hospital, Agartala, Tripura

³Assistant Professor, Department of Surgery, Agartala Government Medical College and GBP Hospital, Agartala, Tripura

Received: 25-02-2024 / Revised: 23-03-2024 / Accepted: 26-04-2024

Corresponding Author: Dr. Biswajit Paul

Conflict of interest: Nil

Abstract:

Background: A laparotomy wound is typically closed in layers that co-opt the different anatomical layers. Single layer closure technique, also known as mass closure technique, is a new closure method that has gained popularity. After comparing it with previous research published in the literature, the purpose of this study is to assess the advantages or disadvantages of single layer closure and layered closure.

Methods: Between 01 July 2017 and 30 June 2018, 60 patients of both sexes were admitted to the surgical wards of the Agartala Government Medical College and the GBP Hospital in Agartala, Tripura. This prospective comparative trial study was carried out on them. A comprehensive clinical and general assessment was performed on individuals who were suspected of having intra-abdominal pathology at the time of admission. To confirm the diagnosis, necessary biochemical and radiological tests were conducted. Following diagnosis confirmation, individuals underwent exploratory laparotomy. Either the mass closure technique or the layered closure approach was used to close the laparotomy wound. Following surgery, patients were monitored for three months to look for any late problems.

Results: A total of sixty patients were examined. The age range of the majority of patients was 61 to 65. There were more males than females. In comparison to mass closure, the layered closure group has a higher incidence of early problems such as seroma and wound infection. In the multilayer closure group, the mean wound closure time is longer. When compared to layered closure groups, mass closure technique is more economical.

Conclusion: The closure of a midline laparotomy incision can be achieved more quickly, affordably, and safely with the mass closure technique.

Keywords: Incisional Hernia, Laparotomy, Mass Closure.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

A patient who has had an abdominal procedure should be very aware of the possibility of unexpected rupture of the abdominal laparotomy wound, as this can be quite stressful for both the patient and the surgeon. Wound dehiscence, often called acute wound failure, is the term used to describe the partial or total dissociation of abdominal wound closure after surgery. If the abdominal musculoaponeurotic layers separate after surgery, it is known as acute wound failure.

This condition occurs 30 days after surgery and calls immediate care, usually while the patient is still in the hospital. [1] In the first nine days following surgery, the majority of burst abdomens

occur. [2] Dead space eradication, uniform stress 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 component of the closure are among the objectives of wound closure. [3]

The equilibrium between the tissues' ability to retain sutures and the sutures' ability to hold tissue determines the strength of the abdominal wound that has been sutured. An increased incidence of incisional hernia has been linked to a suture length to wound length (SL: WL) ratio of less than 4:1. This ratio may also enhance the patient's risk of an abdominal rupture. [4-6] The optimal abdominal

closure method should avoid difficulties both early and late and be quick, simple, and economical. The ideal technique for closing abdominal wounds should be technically so straightforward that it may be performed by trainee surgeons with results on par with those of master surgeons, does not interfere with the pathophysiology of wound healing, and has the lowest possible risk of problems after surgery. [7]

Material and Methods

Between 01 July 2017 and 30 June 2018, 60 patients of both sexes were admitted to the surgical wards of the Agartala Government Medical College and the GBP Hospital in Agartala, Tripura. This prospective comparative trial study was carried out on them. Two groups were formed out of every patient.

This study comprised patients who were between the ages of 18 and 65, were admitted for laparotomy in an emergency, and had undergone midline incision surgery. Patient who had a prior midline laparotomy but wouldn't provide permission. DM-2 patients and cancer patients were not included in this study.

Included patients were divided in two groups: Group 'A' and Group 'B'. GROUP A: Layered closure: GROUP B: Mass closure technique

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

Antibiotics appropriate for the condition will be administered parenterally to each patient, usually for two to three days, and orally for five to seven days. After ten days, antibiotics will only be

continued as needed. On the third, fifth, seventh, ninth, or tenth day, the wound will be checked and its status noted. The patients were checked for chest infections, vomiting, hiccups, and stomach distension during the recovery phase. Additionally identified were seroma and wound infection. The wounds were routinely checked for indications of wound gaping and abdominal rupture. For three months, patients underwent routine monthly follow-ups during which time they were checked for incisional hernias and scar problems.

Results

Forty of the sixty patients in the trial were men, and twenty were women. The patients' ages ranged from 18 to 60 years old, with the majority falling between 48 and 57 years old. 39 patients were contaminated out of 60, and 21 were cleanly contaminated. When the continuous suture technique was employed, the time needed for closure was significantly reduced. Group A average closing time was 28 minutes, while Group B's average was 17 minutes. Group-A's tiered closure took longer to complete than Group-B mass closure. Three patients in group A and two in group B experienced seroma and surgical site infection; three patients in group A and one in group B experienced an abdominal rupture; and two patients in group A and one in group B experienced an incisional hernia. Seroma (10%), SSI (10%), burst abdomen (10%), and incisional hernia (6.67%) were observed in group A. Seroma (6.67%), SSI (6.67%), burst abdomen (3.33%), and incisional hernia (3.33%) were the most common conditions in group B.

Table 1: 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			

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	3	10.00%	2	6.67%
Absent	27	90.00%	28	93.33%
Total	30	100.00%	30	100.00%
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	10.00%	1	3.33%
Absent	27	90.00%	29	96.67%
Total	30	100.00%	30	100.00%
p-value	0.604			

Table 4: 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			

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	0.00	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			



Figure 1: Burst abdomen following midline laparotomy



Figure 2: Incisional hernia following layered closure of midline laparotomy

Discussion

The purpose of this study was to compare the methods used for closing wounds after midline laparotomies. One of the key elements in avoiding post-operative problems such as wound infection, ruptured abdomen, and incisional hernia is the technique used to close the wound after

laparotomy. According to estimates, 16% of cases of burst abdomen result in morbidity or death. After surgery, wound dehiscence often occurs 8–10 days later.

Common post-midline laparotomy consequences include abdominal wound infection and dehiscence, particularly in emergency situations.

Table 6: Comparison of Rate of Seroma in Various Studies between Layered Closure and Mass Closure of Midline Laparotomy Incisions

Authors	Group- A (Layered Closure)	Group-B (Mass Closure)
Sreeharsha et al,[8]	10%	6%
Kumar et al,[9]	10%	4%
Deshmukh et al,[10]	3.3%	0%
Present Study	10%	6.6%

Table 7: Comparison of Rate of Wound Infection in Various Studies between Layered Closure and Mass Closure of Midline Laparotomy Incisions

Authors	Group-A (Layered Closure)	Group-B (Mass Closure)
Sreeharsha et al,[8]	8%	6%
Kumar et al,[9]	8%	6%
Deshmukh et al,[10]	6.6%	10%
Present Study	10%	6.6%

Table 8: Comparison of Rate of Burst Abdomen in Various Studies between Layered Closure and Mass Closure of Midline Laparotomy Incisions

Authors	Group-A (Layered Closure)	Group-B (Mass Closure)
Sreeharsha et al,[8]	4%	2%
Kumar et al,[9]	2%	0%
Deshmukh et al,[10]	3.3%	3.3%
Present study	10%	3.3%

Table 9: Comparison of Rate of Incisional Hernia in Various Studies between Layered Closure and Mass Closure of Midline Laparotomy Incisions

Authors	Group-A (Layered Closure)	Group-B (Mass Closure)
Sreeharsha et al,[8]	0%	2%
Kumar et al,[9]	2%	4%
Deshmukh et al,[10]	6.6%	6.6%
Present study	3.3%	6.6%

Table 10: Comparison of Mean Duration of Closure (in Minutes)

Authors	Group-A (Layered Closure)	Group-B (Mass Closure)
Singh et al,[11]	35	20
Kumar et al,[9]	23	14
Deshmukh et al,[10]	21.2	16.2
Present Study	28	17

The average closure time in the current study is 17 minutes for bulk closure and 28 minutes for multilayer closure. The mean time difference between the two approaches was around 11 minutes, which was statistically significant ($p=0.0001$) and in line with findings from other studies. Anaesthetic risks can be avoided, anesthetic agent costs can be decreased, and the surgeon's time can be saved. Seroma formation incidence in the current study was 6.6% in mass closure and 10% in layered closure; wound

infection incidence was 6.6% in mass closure and 10% in layered closure; burst abdomen incidence was 3.3% in mass closure and 10% in layered closure; and incisional hernia incidence was 3.3% in mass closure and 6.6% in layered closure.

Conclusion

The conclusion that the optimum abdominal closure technique should be quick and simple while preventing both early and late difficulties should be revoked in light of the above-mentioned outcomes.

Mass closure of laparotomy wounds in this study closed faster than traditional layered closure.

Additionally, there was a decreased risk of incisional hernia, seroma, wound infection, and burst abdomen in mass closure cases. Therefore, in terms of operating time and post-operative problems, mass closure approach is superior to traditional layered closure of laparotomy wounds.

However, more research is needed to determine the precise incidence of incisional hernias.

References

1. Challa V, Dhar A, Anand S, Srivastava A. Abdominal wound dehiscence: the science and art of its occurrence and prevention. In: Gupta RL eds. Recent Advances in Surgery-11. 1st edn. New Delhi: Jaypee Brothers 2009:225-50.
2. Shukla HS, Kumar S, Misra MC, Naithani YP. Burst abdomen and suture material: a comparison of abdominal wound closure with monofilament nylon and chomic catgut. *Ind J Surg.* 1981; 43:487.
3. Cotran RS, Kumar V, Collins T. Tissue Repair: Cellular Growth, Fibrosis, and Wound Healing. In: Robbins Pathologic Basis of Disease. 6th edn. Saunders. 2003; 89:112.
4. Ceydeli A, Rucinski J, Wise L. Finding the best abdominal closure: an evidence-based review of the literature. *Curr Surg.* 2005; 62(2): 220-5.
5. Richards PC, Balch CM, Aldrete JS. Abdominal wound closure. A randomized prospective study of 571 patients comparing continuous vs. interrupted suture techniques. *Ann Surg.* 1983;197(2):238-43.
6. Jenkins TP. The burst abdominal wound: a mechanical approach. *Br J Surg.* 1976; 63(11): 873-76.
7. Kumar P, Chaubey D, Sahu SS, Shashi K, Mundu M, Baxla RJ et al. Comparative Study of Continuous versus Interrupted X Type Abdominal Fascial Closure in Reference to Burst Abdomen. *Int J Sci Stud* 2014;2(7):10-16.
8. Sreeharsha MV. A comparative study of single layer closure and conventional layered closure of laparotomy wounds. *Journal of Evolution of Medical and Dental Sciences* 2013; 2(40): 7695-709.
9. Kumar R, Hastir A. Prospective clinical study: mass closure versus layer closure of abdominal wall. *Int J Surg Med.* 2017; 3(4):228-33.
10. Deshmukh SN, Maske AN. Mass closure versus layered closure of midline laparotomy incisions: a prospective comparative study. *Int Surg J.* 2018;5(2):584-7.
11. Singh G, Ahluwalia R. A comparison between mass closure and layered closure of midline abdominal incisions. *Med J DY PatilUniv* 2012; 5:23-6.