



## A comparative study of the outcome of Mass Closure and Layered closure techniques for Midline Abdominal Incisions in a Teaching Hospital

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### Abstract

*The abdomen is the frequent site of operations in General Surgery, consequently incision and suturing of the abdominal wall is a very important aspect of surgery. Conventionally the midline incision of laparotomy wound is closed in various layers anatomically. However, a newer method called the Mass closure technique is increasingly being utilized for its advantages. We in the present study tried to evaluate the outcomes of midline abdominal surgeries using mass closures and layered closure techniques. Methods: This prospective study was carried out in the Department of General Surgery, Prathima Institute of Medical Sciences, Naganoor, Karimnagar. A total of 55 patients were identified during the study period and they were divided into two groups. Group I patients who were sutured with Mass closure technique and Group II patients who had their midline incision closed with conventional layered technique. Results: The most common complication in the group I was found to be a superficial infection in n=2(8%) of patients. The other complications were seroma, burst abdomen (wound dehiscence), suture sinus formation in n=1 (4%) cases each. In group II layered closure wound infection was found in n=2 cases, both were superficial infections which were managed adequately. Burst abdomen and seroma were also found in n=2(6.67%), hematoma, and the incisional hernia was seen in n=1 (3.33%) cases each. Conclusion: Within the limitations of the present study it can be concluded that the mass closure technique appears to be the better choice for midline laparotomy wound closure as compared to the conventional layered technique since it requires a shorter time, with minimal complications and cost-effective.*

**Keywords:** *midline abdominal incisions, Mass closure, Layered closure.*

### Introduction

A midline incision is most widely utilized to access the intra-abdominal pathologies and it is very useful especially in emergency laparotomy as it is simple, quick and provides excellent exposure [1,2]. Closure of the abdominal wall is even of greater importance and because it ultimately

impacts the outcome of the surgery. However, abdominal closure is performed in various fashions depending on the preference of surgeon or reliance on traditional and anecdotal experience [3]. The ultimate goal of wound closure is to restore the functions of the abdomen after the surgical procedure. Traditionally the laparotomy

wounds are closed in layers based on the anatomy of the abdominal wall<sup>[4]</sup>. The peritoneum and transversalis fascia are closed as layers. However, clinical and experimental studies have shown that closure of the peritoneal layer makes no difference in abdominal wound healing<sup>[5]</sup>. Hence, it can be omitted without any adverse effect on wound healing. Gilbert et al; in their study of peritoneal closure in lateral paramedian incisions, showed that wound disruption rates did not change in both groups in whom peritoneum was closed with No.1 chromic catgut as compared to those in whom peritoneum was not closed. They, however, found that layered closure of the abdominal wall provided better aesthetic outcomes. As in the words of Lord Moynihan, “every unnecessary stitch is a bad surgery” and avoidance of unnecessary step of peritoneal closure leads to a saving in time and cost<sup>[6]</sup>. Based on this a new recently developed closure technique which is called Mass closure has been adopted<sup>[7]</sup>. In this technique, all the layers of the abdominal wall except skin and subcutaneous tissues are sutured in one layer. The skin is later sutured separately with interrupted sutures generally but in some cases, continuous sutures are also used. Studies have suggested the most effective method of abdominal wall closure is elective setting is mass closure<sup>[8-10]</sup>. Gupta H et al;<sup>[11]</sup> have shown that chances of burst abdomen are reduced by 50% when an interrupted suture is used in mass closure as compared to continuous suture. There is still a lack of consensus among surgeons regarding the ideal method of abdominal wound closure. Some studies have shown conflicting results and many surgeons are uncertain about it<sup>[3, 12, 13]</sup>. The best abdominal closure should be fast, easy and cost-effective and prevent both early and late complications. With this background, we undertook the present study to compare the two commonly used methods for the closure of midline abdominal incisions in patients undergoing laparotomy in our teaching hospital.

### Material and Methods

This prospective study was carried out in the Department of General Surgery, Prathima Institute of Medical Sciences, Nagunoor, Karimnagar. Institutional Ethical Committee consent was obtained written consent was obtained from all the participants of the study. All the patients who under midline laparotomy aged from 20 to 70 years were included. The patients who had upper GI malignancy, bleeding duodenal ulcers, enteric perforations lower GI malignancy and splenomegaly were included in the study. Patients with previous midline laparotomy scars, immunocompromised patients, grossly obese patients, pregnant women, and children were excluded from the study. After the selection of the patients they were subjected detailed history and thorough clinical examination along with the examination of CVS, CNS, RS and routine laboratory investigations CBP, BT and CT, LFT, KFT, Blood sugar and lipid profile apart from HBsAg and HIV tests. All the patients were subjected to necessary radiological investigations, USG, CT for the confirmation of diagnosis. In emergency cases, the general condition of the patient was corrected by fluids for dehydration and electrolyte balance and giving antibiotics. Patients with hypertension were brought under suitable control before the surgery. General /spinal anesthesia/epidural anesthesia was administered as the cases. A total of 55 patients were identified during the study period and they were divided into two groups. Group, I patients who were sutured with Mass closure technique and Group II patients who had their midline incision closed with conventional layered technique. In both groups, a vertical midline incision was used. In the Group I the abdomen was sutured using the Mass closure technique in which all the layers of the abdominal wall except the skin and subcutaneous tissues are sutured as one layer with No. 1 prolene curved cutting needle with an interrupted suture pattern was used. In group II, the abdomen was closed in layers using a continuous suture of No. 2-0 vicryl for peritoneum and posterior rectus sheath and No

1-0 prolene for anterior rectus sheath. Drains were placed if required through a separate stab incision. All the patients have given antibiotics 3<sup>rd</sup> generation cephalosporin parenterally for 3 days followed by orally for 5-7 days. Antibiotics were continued after 10 days if indicated. Analgesics were also given to control post-operative pain. Wound examination was done regularly and drains if employed were removed on 2 or 3<sup>rd</sup> postoperative day. The suture was removed between 7<sup>th</sup> to 10<sup>th</sup> postoperative day. Post-operative examination of patients included for vomiting, hiccup, chest infection and abdominal distension. Signs and symptoms of wound infection or burst abdomen were particularly looked for in the postoperative period. All the collected data were entered in MS Excel spreadsheet and analyzed using SPSS-version 17 on windows platform.

**Results**

A total of n=25 in group I out of which n=15 were males and n=10 were females. The most common age group in the group I was 31 -25 years within=6 (24%) of patients followed by 51- 56 years n=5(20%) of patients. The other age groups in descending order were 51- 55 years n=4(16%), 36 – 40 years n=3 (12%), 45 – 50 years and > 60 years n=2 (8%) each. In group II out of the total n=30 patients, n=18 were males and n=12 were females. Most the cases were from age group 31 - 35 years n=6(20%) followed by age group 51-55 n=4(13.33%). Least numbers of patients were found in the age group 20-25 n=1(3.33%) of the patients given in table 1.

**Table 1:** showing the age-wise and sex-wise distribution of patients

Age group in years	Group I (Mass closure)		Total (%)	Group II (Layered Closure)		Total (%)
	Male	Female		Male	Female	
20 – 25	0	0	0 (0)	1	0	1 (3.33%)
26 – 30	2	0	2 (8%)	1	2	3 (10%)
31 – 35	3	3	6 (24%)	3	3	6 (20%)
36 – 40	1	2	3 (12%)	3	2	5 (16.67%)
41 – 45	0	1	1 (4%)	2	0	2 (6.67%)
45 – 50	2	0	2 (8%)	1	2	3 (10%)
51 – 55	3	1	4 (16%)	2	2	4 (13.33%)
56 – 60	3	2	5 (20%)	2	1	3 (10%)
> 60	1	1	2( 8%)	3	0	3 (10%)
Total	15	10	25(100%)	18	12	30 (100%)

The various intra-abdominal pathologies requiring surgery in the study were studied in both groups. The most common reason for surgery was lower Gastrointestinal malignancies in n=19(34.54%) of cases of both groups. The upper GI malignancy

was the reason in n=8(14.54%). Intestinal obstruction was seen in n=7(12.72%), Enteric perforations in n=6(10.9%) and splenomegaly was in n=4(7.27%). The group-wise distribution details are given in table 2.

**Table 2:** Midline incisions performed for various intra-abdominal pathologies

Pathology	Group I Mass closure	Group II Layered closure	Total	Percentage
Upper GI malignancy	3	5	8	14.54
Intestinal obstruction	4	3	7	12.72
Bleeding duodenal ulcer	5	6	11	20
Lower GI malignancy	8	11	19	34.54
Enteric perforations	2	4	6	10.9
Splenomegaly	3	1	4	7.27
Others	0	0	0	00
Total	25	30	55	100

The mean duration of wound closure was recorded in both the groups (I & II) right from the time of starting of the first suture to the completion of sutures. The mean duration of the suture in group I male was  $21.5 \pm 9.5$  min for females in group I the mean duration of closure was  $20.5 \pm 8.9$

minutes. The mean values of Group II in male were  $28.5 \pm 11.4$  minutes and in the female, it was  $26.6 \pm 11.4$  minutes. The mean values of both groups were compared using student's t test which showed p values were  $<0.05$  which was found to be significantly shown in table 3.

**Table 3:** Showing the mean time required for the wound closure in groups

Technique	Meantime for wound closure in minutes				P-value
	Sex	Number of cases (n)	Mean (minutes)	$\pm$ SD (minutes)	
Mass closure technique	Male	15	21.5	9.5	<0.05*
	Female	10	20.5	8.9	
Layered closure technique	Male	18	28.5	11.4	
	Female	12	26.6	10.2	

\*Significant

Most of the surgeries in the study were elective in both groups. The total number of elective cases

were  $n=24(80\%)$  and emergency surgeries were  $n=9(20\%)$  of all cases shown in table 4.

**Table 4:** Type of surgery performed in both groups

Type of surgery	Mass closure	percentage	Layered closure	percentage
Elective	16	64	24	80
Emergency	9	36	6	20
Total	25	100	30	100

In the group I of the total  $n=25$  cases  $n=17(68\%)$  sutures were removed on the 7<sup>th</sup> day and  $n=5(20\%)$  were removed on 8<sup>th</sup> postoperative day. In  $n=2(8\%)$  and  $n=1(4\%)$  patients, the sutures were removed on 9<sup>th</sup> and 10<sup>th</sup> postoperative days.

In the group II out of the total  $n=30$  patients  $n=18(60\%)$  cases removal of suture was done on 7<sup>th</sup> day and  $n=6(20\%)$  cases removal of sutures was done on 8<sup>th</sup> postoperative day shown in table 5.

**Table 5:** Time in days for suture removal in both groups

Time taken for suture removal (days)	Group I Mass closure	percentage	Group II Layered closure	percentage
7	17	68	18	60
8	5	20	6	20
9	2	8	2	6.67
10	1	4	4	13.33
Total	25	100	30	100

The most common complication in the group I was found to be a superficial infection in  $n=2(8\%)$  of patients. The other complications were seroma, burst abdomen (wound dehiscence), suture sinus formation in  $n=1(4\%)$  cases each. In group II layered closure wound infection was found in  $n=2$

cases, both were superficial infections which were managed adequately. Burst abdomen and seroma were also found in  $n=2(6.67\%)$ , hematoma, and the incisional hernia was seen in  $n=1(3.33\%)$  cases each shown in table 6.

**Table 6:** Complications recorded in both groups

Complication	Group I Mass closure (n=25)	percentage	Group II Layered closure (n=30)	Percentage
Wound infection	2	8	2	6.67
Hematoma	0	0	0	0.00
Burst abdomen	1	4	2	6.67
seroma	1	4	2	6.67
Incisional hernia	0	0	1	3.33
Suture sinus formation	1	4	0	0.00
<b>Total</b>	<b>5</b>	<b>20</b>	<b>7</b>	<b>23.33</b>

## Discussion

Midline incisions are most commonly used to access the abdominal cavity both in elective and emergency surgeries. The surgeon aims to restore the structural integrity of incised or injured tissue to as normal as possible<sup>[14]</sup>. The role played by sutures cannot be overstated and the technique of sutures is also an equally important part in the surgery. A poorly placed incision and unsatisfactory method of closure or inappropriate selection of suture can lead to complications like hematoma, suture infection, wound dehiscence or incisional hernia and scar formation. The two main methods of suture placement for midline laparotomy incisions are being used widely. The old conventional method which is also called a layered suture technique. The more recent one called the Mass closure technique. In the present study, the mean age of the patients in group I (mass closure) was 38.5 years and in group II (layered closure) was 41.5 years. Studies have shown that vertical midline incisions have hernia rates ranging from 5-15%<sup>[10,15,16]</sup>. The lateral paramedian incisions have reported incisional hernia rates of less than 1% [8 of oas] Despite the benefits of lateral paramedian incision it is not gained widespread use because of slower entrance and closure and decreased site exposure compared to midline laparotomy. In the present study the overall wound infection rate in all patients was 7.27% it is similar to the other studies done in this area [4-6 of 2340]. A study by Israelsson et al,<sup>[10]</sup> and has also shown the rate of infection to be 7% in their study [9 of 2340]. In comparison to mass closure the wound infection in the present study

was lesser in the layered closure in contract Deshmukh SN et al;<sup>[17]</sup> have found higher infection rates in layered closure when compared to mass closure. The difference could be because of the patient factors in wound healing.

The incidence of burst abdomen was 5.45% of all the cases. The incidence of burst abdomen in layered closure was slightly higher compared to mass closure. A study by Bhavikatt GS et al;<sup>[18]</sup> found the incidence of burst abdomen in mass closure to be 3.33% which is similar to our results, however; they found the incidence of burst abdomen in mass closure to be 23.33% which is quite high as compared to the present study. The incidence of suture sinus formation was found in 4% in mass closure. Deshmukh SN et al;<sup>[17]</sup> found an incidence of suture sinus formation in 0% of mass closure and 3.33% of the layered closure. The mean duration of wound closure in mass closure was 21 minutes and layered closure was 27.5 minutes. The mass closure took 6.5 minutes lesser time than the conventional layered closure. A study by Banerjee et al;<sup>[19]</sup> found that mass closure took about 10 minutes lesser than the conventional layered closure. In this study, the difference was lesser however, reduction in operative time is always desired as it reduces the cost of anesthetic agent and saves time for the surgeon. In the present study, seroma was found in 4% of the mass closure and 6.67% of the layered closure. Early detection of seroma and its management is very important in the post-operative period since it may lead to the formation of wound infection or tearing through the weak infected tissue with intact suture and may cause

wound dehiscence. Therefore in the present study both the techniques were compared concerning complications although layered technique did show a slightly higher rate of complication.

### Conclusion

Getting the best outcomes from the midline incision closure is a persistent challenge for the surgeons. The success of surgery depends to a large extent on wound healing with minimal complications and better cosmetic appearance. Within the limitations of the present study, it can be concluded that the mass closure technique appears to be the better choice for midline laparotomy wound closure as compared to the conventional layered technique since it requires a shorter time, with minimal complications and cost-effective.

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