Original Research Article

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Comparative study of wound sequlae in layer closure and retention closure of midline laparotomy

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ABSTRACT

Background: Layered closure of the abdomen has been considered to be ideal until recently however single layer mass (retention) closure technique, in which all the layers of the abdominal wall are closed in single layer is being increasingly used by surgeons. We conducted this study to analyze outcome measures in patients in whom wound closure was done by retention closure and layered closure.

Methods: This was a prospective comparative study in which 60 patients undergoing elective or emergency laparotomy were included on the basis of a predefined inclusion and exclusion criteria. In 30 cases (50%) layer closure was done whereas in remaining 30 (50%) patients retention closure technique was used. Major outcome measures studied were time required for wound closure and post-operative complications.

Results: Out of 60 studied cases there were 42 (70%) males and 18 (30%) females with M: F ratio of 1: 0.42. The time required for closure in layered suture group (group A) was 26.76±3.36 whereas in case of retention closure suturing it was 19.36±4.35. The difference was found to be statistically highly significant (p<0.0001). The complications rates were found to be statistically significantly higher in layer suturing (Group A) as compared to retention suture group (Group B).

Conclusions: We conclude that retention suturing is preferable as compared to layered suturing in patients undergoing midline laparotomy in terms of time required for closure of wound and post-operative complication rates.

Keywords: Laparotomy, Midline incision, Layered closure, Retention suturing, Outcome

INTRODUCTION

Laparotomy is one of the common surgical procedures undertaken in surgery practice. Its importance in obtaining information which is not available via clinical and imaging methods cannot be overemphasized. It is commonly performed in individuals in whom there is a strong suspicion of perforation or serious intra-abdominal pathologies but no conclusive imaging diagnosis. The other indications for laparotomy include penetrating abdominal injury or trauma as well as staging of some malignancies (such as ovarian malignancies or lymphomas), unexplained gastrointestinal bleeding and

chronic unexplained abdominal pain.² The other indications for laparotomy may include hemoperitonium, perforated viscus, peritonitis, distended bowel making laparoscopic interventions difficult or impossible, extraction of large pathological specimen such as pancreaticoduodenectomy in cases of carcinoma head of pancreas and obscure life threatening gastrointestinal bleeding. With advances in cross sectional imaging nowadays the role of exploratory laparotomy has decreased but in many situations, such as harm-dynamically unstable patient with history of abdominal trauma, laparotomy is the only recourse.³ Since emergency laparotomy is a life-saving procedure the

contraindications only include those which renders the patients unfit for surgery.⁴

The most common incision taken for laparotomy is a vertical midline incision in upper, middle or lower midline. This incision is associated with the advantage of comparatively rapid entry into the peritoneum and minimal blood loss.⁵ Since many of the patients are hemodynamically unstable it is important to prevent blood loss in these patients and a midline incision is important in this regard.⁵ The other incision which can be used for laparotomy include paramedian approach (incision taken laterally to line alba), transverse approach (transverse incision), pfannestiel approach (5cms superior to symphysis pubis in a curved fashion) and subcostal approach (inferior to diploid process and extending inferior and parallel to costal margin).6 The closure of this surgical wound is important as improper closure may result into complications such as burst abdomen, incisional hernia and sinus. The closure should be such that it should be aesthetically acceptable to the patient and patient should not feel undue discomfort.

Layered closure of the abdomen has been considered to be ideal until recently. However various methods of closure have come into vogue in the recent years. One such is the single layer mass (retention) closure technique, in which all the layers of the abdominal wall are closed in single layer. § In retention closure technique all layers including skin and subcutaneous tissue were closed in a single layer has become more popular in giving additional strength to the wound closure. These methods are important in preventing post-operative complications in patients undergoing laparotomy. §

The method should be technically easy, cost effective and should be devoid of serious postoperative complication. There is a lot of research going on in determining the ideal method of abdominal would closure but all these researches have yet to come with the best method of wound closure. ¹⁰

We conducted this comparative study to compare the methods of closure of laparotomy wound namely retention closure and layered closure. The outcome measure like time required for wound closure and post-operative complications were compared in this study.

METHODS

This was a prospective comparative study conducted in the department of surgery of a tertiary care medical college situated in an urban area. Institutional ethical committee duly approved the study and an informed consent was taken from the cases included in this study. The duration of study was 1 year from January 2018-January 2019. A total of 60 patients undergoing elective or emergency laparotomy were included in this study on the basis of a predefined inclusion and exclusion criteria. Out of 60 cases, in 30 cases (50%) layer closure

was done whereas in remaining 30 (50%) patients retention closure technique was used and they were grouped as group A and group B.

In all patients a detailed history was taken and recorded in a proforma. Particular attention was given to history of blood transfusion in past, nutritional history, jaundice, recurrent respiratory tract infections and history of operative procedures in past. A through clinical examination including systemic examination cardiovascular, respiratory and central nervous systems was done. Per abdominal examination was done and recorded in detail. All patients underwent routine investigations such as complete blood count, erythrocyte sedimentation rate (ESR), bleeding time, clotting time, blood group and Rh typing, fasting blood sugar levels and postprandial blood sugar levels. Liver and kidney function tests were also done in all the cases. Blood urea and serum creatinine was done. Chest X-ray and electrocardiogram (ECG) was done in all the cases and pre-anesthetic evaluation was also done. In selected patients erect X-ray abdomen (to rule out perforation), barium meal (suspected volvulus, obstruction and malignant stricture) and cross sectional Imaging such as computerized tomography and magnetic resonance imaging (suspected malignant growths). Suitable antibiotics were started before surgical procedure.

In all patients painting and draping was done and all patients were operated under general anesthesia. Medline laparotomy was done in all the cases. In group A the peritoneum was closed with chromic catgut by continuous locking sutures and linea alba was closed with prolene no 1 whereas in group B closure was performed by means of suturing the cut edges of peritoneum and linea alba together. Continuous locking sutures of prolene no 1 were used with and interval of 1cm from the cut edges.

In postoperative period intravenous antibiotics were continued for 2-3 days after which the antibiotics were switched to oral antibiotics which were continued for next 5 days. Antibiotics beyond 7 days were given if there was a definite indication for doing so. Analgesics were given depending upon the need (VAS scores). The wound was examined daily till 8th day post-operatively. Drains were removed on postoperative day 3. The sutures were removed on 10th day postoperatively. Following discharge the patients were followed up every monthly till 3months post-operatively. The outcome measures studied were time required for closure of laparotomy wounds and incidence of postoperative complications. The statistical analysis was done using SSPS 21.0 software and a p value less than 0.05 was taken as statistically significant.

Inclusion criteria

Informed consent was obtained from patient or caregiver. Patient aged between 18-70 years who underwent emergency or elective laparotomy

Exclusion criteria

- Patients less than 18 or above 70 years of age.
- Incision other than midline incision.
- Those who refused consent
- Patients with systemic illnesses such as diabetes, uncontrolled hypertension or immunocompromised patients.
- Patients on chemotherapy or on prolonged systemic steroid therapy.
- Patients who expired or lost to follow up.
- Patients requiring re-laparotomies.

RESULTS

In this comparative study of 60 patients undergoing elective or emergency laparotomy there were 42 (70%) males and 18 (30%) females with M: F ratio of 1: 0.42. In Group A there were 18 males and 12 females whereas in group B there were 24 males and 6 females.

The gender distribution of studied cases in the group was found to be comparable with no statistically significant difference (p=0.158).

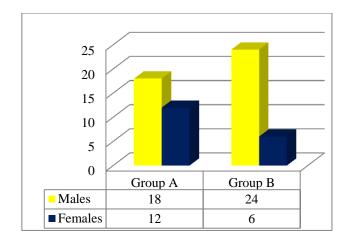


Figure 1: Gender distribution in the studied cases.

In this study, youngest age was 35 year and oldest age was 67 years. The most common affected age group was found to be 31-40 years (40%) in group A and 41-50 (46.67%) years in group B. There was no statistically significant difference in the mean age of patients in both the groups.

Table 1: Gender distribution amongst the studied groups.

Gender	Group A (layer s	Group A (layer suturing)		Group B (retention closure)	
	No. of patients	%	No. of patients	%	
Male	18	60	24	80	
Female	12	40	6	20	
Total	30	100	30	100	

p=0.158 (Not significant).

Table 2: Mean age of the studied cases.

Age in years	Group A (layer s	Group A (layer suturing)		on closure)
	No. of patients	%	No. of patients	%
18-30	4	13.33	3	10.00
31-40	12	40.00	7	23.33
41-50	7	23.33	14	46.67
51-60	5	16.67	4	13.33
61-70	2	6.67	2	6.67
Total	30	100	30	100
Mean age	38.12±11.92		42.72±12.92	

p=0.15 (Not significant).

Table 3: Comparison of variables such as BMI, hemoglobin, albumin and total protein.

Variable	Group A (layer suturing)	Group B (retention closure)	P value
Mean body mass index	26.34 <u>±</u> 8.12	27. 62 <u>±</u> 9.22	p=0.57 (Not significant)
Hemoglobin	10.92 ± 2.48	11.02±3.12	p=0.89 (Not significant)
Serum albumin	3.68 ± 0.42	3.74 <u>±</u> 0.46	p=0.59 (Not significant)
Total Serum Protein	6.78±0.60	6.48 <u>±</u> 0.72	p=0.08 (Not significant)

Various variables such as body mass index, hemoglobin, serum albumin and total serum bilirubin were compared between these 2 groups. All these parameters were found

to be comparable in both the groups with no statistically significant difference (p>0.05).

The analysis of the cases on the basis of whether the laparotomy was elective or emergency showed that majority of the cases have undergone emergency

laparotomy (70%) whereas elective laparotomy was done in 18 (30%) cases. There was no statistically significant difference in both the groups for type of laparotomy.

Table 4: Type of laparotomy (elective versus emergency) in studied cases.

True of languaterin	Group A (layer suturing)		Group B (retention closure)	
Type of laparotomy	No. of patients	%	No. of patients	%
Emergency	22	73.33	20	66.66
Elective	8	26.67	10	33.33
Total	30	100	30	100

p=0.77 (not significant).

Table 5: Comparison of time taken for closure of closure of surgical wound.

Time taken for alcoure (in minutes)	Group A (layer suturing)		Group B (retention closure)	
Time taken for closure (in minutes)	No. of patients	%	No. of patients	%
5-10	0	0	1	3.33
11-15	0	0	4	13.33
16-20	2	6.67	15	50.00
21-25	10	33.33	9	30.00
26-30	16	53.33	1	3.33
>30	2	6.67	0	0
Total	30	100	30	100
Mean age	26.76±3.36		19.36±4.35	

p<0.0001 (95% CI = -9.4088 to -5.3912)

Table 6: Complications in the studied cases.

Complications	Group A (layer suturing)		Group B (retent	Group B (retention closure)	
Complications	No. of patients	%	No. of patients	%	
Seroma	1	3.33	0	0	
Hematoma	2	6.66	1	3.33	
Surgical site infection	3	10	1	3.33	
Wound gaping	3	10	0	0	
Burst abdomen	1	3.33	0	0	
Incisional hernia	1	3.33	1	3.33	
Suture sinus formation	0	0	0	0	
Total	11	36.67	3	10	

p=0.03 (significant).

The analysis of indications for the laparotomy showed that the most common indication for laparotomy in both the groups was intestinal pathologies (24/60) followed by gastric pathologies (11/60) and hepatobiliary pathologies (9/60). Pancreatic (7/60), peritoneal (3/60) and renal pathologies (2/60) were less common causes of laparotomy in studied cases.

The time taken for the closure of surgical wound showed that the mean time for closure in layered suture group (group A) was 26.76 ± 3.36 whereas in case of retention suture the mean time for closure of surgical wound was found to be 19.36 ± 4.35 . The time required for closure of surgical wound was more in patients in who layered sutures were given as compared to patients in whom retention closure technique was used. The difference was found to be statistically highly significant (p<0.0001).

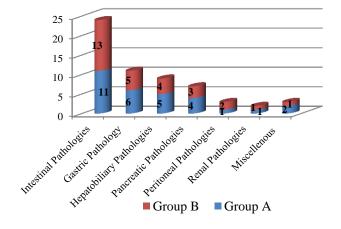


Figure 2: Indications for laparotomy.

The analysis of both the groups on the basis of complications showed that out of 30 patients in group A (layered sutures) 11 (36.67%) patients developed complications and most common complication was found to be wound infection and wound gaping which was seen in 3 (10%) patients each. In group B hematoma, surgical site infection and incisional hernia was seen in 1 patient (3.33%) each. The complications were found to be more in retention closure group (Group A) and the difference was found to be statistically significant (p=0.03).

DISCUSSION

This was a comparative study of patients undergoing elective or emergency laparotomy in which different suturing techniques such as retention closure suturing and layer suturing were compared. Total 60 patients were divided into 2 groups of 30 patients each.

The male predominance was seen in both the groups and overall M: F ratio was found to be 1: 0.42. In patients undergoing laparotomies male predominance has been consistently reported by various authors. Ramneesh et al conducted a prospective study on 50 patients who developed wound dehiscence (partial or complete) following laparotomy. There was a male predominance with a M: F ratio of 2.84: 1. Similar male predominance in patients undergoing laparotomy was reported by Simpson et al and Deshmukh et al. 12,13 In contrast to above studies the authors such as Singh et al reported a female predominance (1:2) in patients undergoing non-traumatic emergency laparotomy. 14

In our studies the other factors such as body mass index, serum albumin, total serum protein, hemoglobin and mean age of the affected cases was found to be comparable with no statistically significant difference (p>0.05). The mean age of the patients in group A and group B was found to be 38.12±11.92 and 42.72±12.92 respectively. The authors such as Koirala et al and Chiu WC et al reported the mean age of the patients undergoing laparotomy to be 42 years and 30 years respectively. Mean age of the patients in our study was found to be comparable to the studies conducted by these authors.

The time required for closure in layered suture group (group A) was 26.76±3.36 whereas in case of retention closure suturing it was 19.36±4.35. The time required for closure of surgical wound was more in patients in who layered sutures were used as compared to retention closure technique. The difference was found to be statistically highly significant (p<0.0001). Singh et al conducted a study to compare between single layer closure and layered closure after comparing it with studies available in literature. Total of 80 cases were selected at random and the study was carried out over a period of two years. The cases were equally divided into two groups of 40. In both groups, vertical midline incision was used. In the first group, abdomen was closed

using the single layer closure technique. Continuous suturing with burial of the knots was done in 20 patients and interrupted mass closure was done in another 20 patients. In the other group, the abdomen was closed in layers. The patients were followed up for minimum 6 months. The time required for closure was considerably less when continuous suture technique was used. Average time for mass closure (20 minutes) was considerably less as compared to layered closure (35 min). Similar conclusions were also reported by the authors such as Chalya et al and Patel et al. 18,19

Finally the analysis of complications in studied patients showed that out of 30 patients in group A (layered sutures) 11 (36.67%) patients developed complications and most common complication was found to be wound infection and wound gaping which was seen in 3 (10%) patients each. In group B hematoma, surgical site infection and incision hernia was seen in 1 patient (3.33%) each. The complications rates were found to be statistically significantly higher in layer suturing (Group A) as compared to retention suture group (Group B). Similar high complication rates in patients in whom single layer sutures were used were reported by Bande et al.²⁰

CONCLUSION

In patients undergoing elective as well as emergency laparotomy using a midline incision retention suturing has a distinct advantage of requiring less time for wound closure and having less complication rates as compared to layered suturing. The difference was found to be statistically significant. On the basis of these findings we conclude that retention suturing is preferable as compared to layered suturing in patients undergoing midline laparotomy.

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