International Journal of Medical and Health Research
ISSN: 2454-9142
Received: 15-03-2019; Accepted: 30-03-2019; Published: 16-04-2019
www.medicalsciencejournal.com
Volume 5; Issue 4; 2019; Page No. 150-153

A comparison between layered closure and mass closure in laparotomy wounds

Nida Shafiq[1], Ferkhand Mohi Ud Din[2], Bilal Yousuf Mir[3], MD Wani[4*]
[1, 3] Senior Resident, Department of General Surgery, Government Medical College, Srinagar, Jammu & Kashmir, India
[2] Postgraduate Student, Department of General Surgery, Government Medical College, Srinagar, Jammu & Kashmir, India
[4] Professor & HOD, Department of General Surgery, Government Medical College, Anantnag, Jammu & Kashmir, India
[*] Corresponding Author: MD Wani

Abstract
Aim: To compare the two methods (Mass closure and Layered closure) of laparotomy wound closure in relation to post-operative complications and time for wound closure.
Materials and Methods: A prospective observational study was conducted among 80 subjects in Department of General Surgery, Government Medical College, Srinagar for abdominal surgical problems needing either elective or emergency surgery. Out of these 80 patients, 40 were randomized to have the abdominal wall closed by single layer closure technique and remaining 40 were by conventional layered closure and they were grouped as Group 1 and Group 2 respectively. The wound was examined on 3rd, 5th, 7th and 9th or 10th day and the condition of the wound noted. Complications like seroma, surgical site infections, post-operative pain, burst abdomen, hernia and wound gaping were recorded.
Results: The mean time taken for closure of wounds, by single layer closure technique was 19.05min and by conventional layered closure technique was 28.08min. Wound infection was found in 20% and 37.5% of the subjects in the single layer and conventional layer group respectively with statistically insignificant difference.
Conclusion: From the results of present study, it can be said that mass (single) closure technique is better than the conventional layered closure of laparotomy wounds in terms of operative time and postoperative complications.

Keywords: wound closure, laprotomy, operative time, mass closure, conventional closure

Introduction
Different suture techniques are used for closure of laparotomy wounds and each has its strong proponents. Ideal method of abdominal wound closure is modified frequently [1].
Techniques for closure of the midline abdominal incision have varied over time with better understanding of the physiology and engineering of closure of the abdominal wall and improvement in materials of surgical suture. The ideal wound closure provides strength and barrier to infection [2]. Commonly followed methods of abdominal closure are conventional layered closure and mass closure (single layer closure) [3].
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. Many trials carried out for determination of ideal technique for abdominal fascial closure, lacked sufficient power to show significant treatment differences also the results were conflicting and had left many surgeons uncertain about it. The best abdominal closure technique should be fast, easy, and cost effective while preventing both early and late complications [4]. Present study was 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 also to decide the most effective method among the two.

Material and Method
A prospective observational study was conducted in Department of General Surgery, Government Medical College, Srinagar, for abdominal surgical problems needing either elective or emergency surgery. Out of these 80 patients, 40 were randomized to have the abdominal wall closed by single layer closure technique and remaining 40 were by conventional layered closure and they were grouped as Group 1 and Group 2 respectively. The patients were chosen randomly, irrespective of their age, sex and nature of disease to these two groups. Patients were enrolled in the study after obtaining written informed consent from parents and approval from Institutional Ethical Committee. Inclusion criteria: patients aged 15-75 years, posted for laparotomy, either elective or emergency and who underwent surgery with midline, paramedian and subcostalincisions. Exclusion criteria: patients with co-morbid conditions like immunocompromised patients, patients on cancer chemotherapy, immunotherapy and on long term steroids and who underwent surgery by Grid-iron and Transverse abdominal incisions.
The patients were interviewed that requests for the demographic, socioeconomic status, medical history and previous history of taking any medications and supplements. Patients underwent investigations such as routine blood investigations (CBC, Blood grouping & Rh typing, S. Creatinine, B. Urea, S. Electrolytes, BT, CT, ESR, Liver function test), routine urine & stool examination and radiological examinations like Xray-abdomen, X ray-chest, USG abdomen done wherever necessary.
Group 1: This group included those patients who underwent single Layer technique of abdominal wall closure. This technique includes suture approximation of rectus sheath with peritoneum, and skin in one layer, in an

interrupted fashion. The entry and exit of PDS was 1 cm from the wound edges and 1 cm from the edge of linea Alba on either sides. The distance between two adjacent sutures was 1 cm. The skin was sutured separately.

Group 2: This group included those patients who underwent conventional closure /multiple closure with PDS loop suture. Conventional closure/multiple closure included closure of rectus fascia first in a continuous fashion. The sutures will be placed ("JENKINS RULE") 1cm from the edge of the linea Alba on both sides and 1cm was maintained between two adjacent sutures. Following this skin was closed with PDS.

Drains were used wherever necessary, through a separate stab incision. Time taken for closure of abdomen was recorded in all cases.

Post-operative: All the patients received antibiotics suitable for the case parenterally, usually for 2-3 days and orally for 5-7 days. Antibiotics were continued only whenever indicated after 10 days.

Post examination: The wound was examined on 3rd, 5th, 7th and 9th or 10th day and the condition of the wound noted. Complications like seroma, surgical site infections, post-operative pain, burst abdomen, hernia and wound gaping were recorded:

Follow up: Regular monthly follow up was done for first 3 months, once in 3 months for one year and then half-yearly. During the follow up, the patients were examined for scar complications and incisional hernia.

Statistical analysis

Data were tabulated and examined using the Statistical Package for Social Sciences Version 22.0 (IBM SPSS Statistics for Mac, Armonk, NY: IBM Corp, USA). Descriptive statistical analysis had been carried out in the present study. Results on continuous measurements are presented as Mean±SD. Categorical data has been presented as frequency distribution. The statistical power calculation was based on the assumption that the data were normally distributed. P-value of <0.05 was considered as significant. Difference between two groups was determined using chi square test and student T test for categorical data and continuous data respectively.

Results

In the single layer closure group, maximum subjects were in the age group of 25-50 years (55%), followed by 51-75 year age group (25%) and 10-25 years (20%). Similar age group distribution was found in the conventional layer closure group. The present study showed male dominance in both single layer (67.5%) as well as conventional layer group (75%). Female were found to 32.5% and 25% in single layer and conventional layer group respectively.

Hb<8 g/dl was revealed in 15% and 25% of the subjects in single layer and conventional layer group respectively with statistically insignificant difference. When serum creatinine and albumin was compared statistically among single layer and conventional layer group, it was found to be statistically insignificant (table 1).

There was a difference in the time taken for closure of wound between the two techniques used which was statistically significant (p=0.001), indicating that the time needed for single layer closure technique was significantly less than that needed for conventional layered technique (table 2). The mean time taken for closure of wounds, by single layer closure technique was 19.05min and by conventional layered closure technique was 28.08min.

In this study, 55% of patients in single layer closure groups had suture removal done on 10th to 15th day while the same was found to be in 40% of the patients in conventional layer closure group with statistically insignificant difference (table 3).

In the present study, wound infection was found in 20% and 37.5% of the subjects in the single layer and conventional layer group respectively with statistically insignificant difference. Seroma and burst abdomen was reported in 5 and 10% of the subjects in the single layer and conventional layer group respectively. Hernia was revealed only in 1 subjects belonged to conventional layer group (table 4).

Table 1: Haemoglobin comparison among the study groups

Parameters	Single layer closure		Conventional layer closure		Chi square	p value
	N	%	N	%		
Hb						
<8 g/dl	6	15	10	25		
8-10 g/dl	11	27.5	11	27.5	0.19	0.78
>10 g/dl	23	57.5	19	47.5		
Serum creatinine						
0.8-1.4	29	72.5	30	75	0.12	0.86
>1.4	11	27.5	10	25		
Albumin						
<3.5	2	5	9	22.5		
3.5-5	37	92.5	28	70	2.89	0.09
>5	1	2.5	3	7.5		

Table 2: Operating time taken for closure comparison among the study group

Time taken (min)	Single layer closure		Conventional layer closure	
	N	%	N	%
10-15	10	25	0	0
>15-20	14	35	2	5
>20-25	15	37.5	10	25
>25-30	1	2.5	15	37.5
>30-35	0	0	11	27.5
>35-40	0	0	2	5
Chi square	5.78			
p value	0.03*			

*: statistically significant

Table 3: Comparison of time taken for suture removal among the study group

Time taken for suture removal	Single layer closure		Conventional layer closure	
	N	%	N	%
10-15 days	22	55	16	40
>15 days	18	45	24	60
Chi square	1.81			
p value	0.18			

Table 4: Comparison of wound infection, seroma, burst abdomen, wound gaping, hernia and scar comparison among the study group

Variables	Single layer closure		Conventional layer closure		p value
	N	%	N	%	
Wound infection	8	20	15	37.5	0.08
Seroma	2	5	4	10	0.72
Burst abdomen	2	5	4	10	0.72
Wound gaping	1	2.5	2	5	0.76
Hernia	0	0	1	2.5	0.98
Scar	28	70	30	75	0.25

Discussion

The present study showed male dominance in both single layer (67.5%) as well as conventional layer group (75%). Female were found to 32.5% and 25% in single layer and conventional layer group respectively. Khandra Hitesh P *et al*. [6] showed male predominance (66/100) as was also recorded by studies of Keill Penninckx *et al*. [7].

In this study, the mean time taken for closure of wounds, by single layer closure technique was 19.05min and by conventional layered closure technique was 28.08min. Single layer closure took about 9 minutes lesser time than conventional layered closure. These results were in accordance with findings of Sreeharsha M.V[8]. Sreeharsha M.V [8] reported mean time taken for closure of laparotomy wounds by single layer closure was 19.6 minutes and by conventional layered closure was 27.9 minutes. Single layer closure took about 8 minutes lesser time than conventional layered closure. In Banerjee and Chatterjee [9] study, single layer closure took about 10 minutes lesser time than conventional layered closure. Reduction in operative time prevents anesthetic hazards, reduces the cost of anesthetic agent and saves the time of the surgeon.

In this study, 55% of patients in single layer closure groups had suture removal done on 10th to 15th day while the same was found to be in 40% of the patients in conventional layer closure group with statistically insignificant difference. Little dissimilar results were reported by MV Sreeharsha[8] who revealed removal of sutures between 7th to 10th days in both the groups.

Wound infection is considered when there is an infection in the skin and subcutaneous tissue of the laparotomy wound discharging pus. In the present study, wound infection was found in 20% and 37.5% of the subjects in the single layer and conventional layer group respectively. The infection rate was little higher in the present study in comparison to Rajneesh Kumar [10] who found wound infection among 1-3 patients (6%) and 2-4 patients (8%) in single layer and conventional layered closure group respectively. MV Sreeharsha [8] reported that incidence of wound infection was 6% in single layer closure and 8% in conventional layered closure. The incidence of wound infection is reduced by taking larger bites of tissues and exerting less pressure taken in single layered closure there by maintaining adequate blood supply, rather than exerting more pressure and taking lesser tissues in the conventional layered closure, thus leading to ischaemia and necrosis which predisposes to infection. The incidence of wound infection among various study groups also confirms this observation.

Seroma was reported in 5 and 10% of the subjects in the single layer and conventional layer group respectively in the current research. Rajneesh Kumar [10] reported approximate similar results i.e. 4% seroma among single layer group and 10% seroma in conventional layer group.

In the current study, burst abdomen was reported in 2.5% (1) and 10% (4) of the subjects in the single layer and conventional layer group respectively. Incidence of burst abdomen was 0% and 3.9% for Jones [11], 0.8% and 3.8% for Bucknall *et al*. [12], 4.7% and 12% for Sharma *et al*. [13], in single layer closure and conventional layered closure respectively.

In the present research, hernia was revealed only in 1 subjects belonged to conventional layer group and that subject was having positive viral markers, low albumin level and presence of comorbidities. Mass closure method reduces the time required for closure of incision and incidence of wound dehiscence and the incidence of an incisional hernia [14].

From the above discussion, it can be said that mass (single) closure technique is better than the conventional layered closure of laparotomy wounds in terms of operative time and postoperative complications. However, longer study period is required to know the exact incidence of an incisional hernia.

Conclusion

The observations tabulated from our comparative study proved to be similar to other studies conducted by various authors thus proving that single layered technique had the following advantages in:

1. Reduces the time consumed for closure. Closure is even more secure and this allows early mobilization.
2. Reduces the incidence of wound infection, thus decreasing the hospital stay and morbidity.
3. Reduces the incidence of incisional hernia.

Thus, this method holds the promise for a safe technique of closure with minimal complication.

References

1. Kumar V, Saha AK. Comparative study between monolayer closures versus doublelayer closure in midline laparotomy-in a tertiary care hospital in Tripura, India. Int J Adv Res. 2018; 6(5):1195-1211.
2. Chawla S. A comparison between mass closure and layered closure of midline abdominal incisions. Med J DY Patil Univ, 2012; 5:26-7.
3. Banerjee P, Chatterjee A. Critical evaluation of conventional abdominal closure with single layer closure in adult and elderly. J Indian Med Assoc. 1989; 87:277-8.
4. Lai SY, Becker DG, Edlich RF; Sutures and needles. eMedicine Clinical Procedures. [cited 2019 July 28], 2010, 3.
5. Dudley HAF. Layered and mass closure of the abdominal wall, A Theoretical and Experimental Analysis. Br J Surg. 1970; 57:664-667.
6. Khandra Hitesh P, Vyas Pratik H, Patel Nilesh J, Mathew Jovin G. Factors affecting post-operative laparotomy wound complications. International Archives of Integrated Medicine. 2015; 2(1):71-5.
7. Keill RH, Keitzer WF, Nichols WK. Abdominal wound dehiscence. Surg. 1973; 106:573-7.
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):7695-09.
9. Banerjee P, Chatterjee A. Critical evaluation of conventional abdominal closure with single layer closure in adult and elderly. J Indian Med Assoc. 1989; 87(12):277-8.
10. Kumar R, Hastir A. Prospective clinical study: Mass closure versus layer closure of the abdominal wall. IJSM. 2017; 3(4):228-33.
11. Jones TE. Closure of abdominal wounds. Surg Gynecol Obstet. 1947; 72:1056.
12. Bucknall TE, Cox PJ. Burst abdomen and incisional hernia: A prospective study of 1129 major laparotomies. Br Med J, 1982, 284:931.

13. Sharma SB, Singh M, Musman Sohami KC. Single layer abdominal wound closure. Ind J Surg. 1986; 4:563-68.
14. Diener MK, Voss S, Jensen K, Büchler MW, Seiler CM. Elective midline laparotomy closure: The INLINE systematic review and meta-analysis. Ann Surg, 2010; 251:843-56.