

Study of Different Methods of Midline Laparotomy Incision Closure and their Outcomes

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Abstract

Background: The closure of such a laparotomy wound is important to minimize the postoperative complications like wound pain, infection, dehiscence and incisional hernia. **Aims:** The objectives of this study was to study the various techniques of midline laparotomy incision closure and their outcomes like wound dehiscence, wound infection and incisional hernia up to six months. **Materials and Methods:** A total of 100 patients who were operated for midline laparotomy were included as subject material after they satisfied the inclusion and exclusion criteria. **Results:** Most common indication of laparotomy in the study was gastric ulcer perforation. Incidence rate of surgical site infection, wound dehiscence and incisional hernia was lower in cases of smaller bite length. Incidence rate of surgical site infection wound dehiscence and incisional hernia was lower with continuous suturing. **Conclusion:** The study results showed that best technique for midline laparotomy incision closure is small bite continuous suturing with mass closure. The small bites technique with continuous suturing showed better results than small bite technique with interrupted suturing. Present study thus recommends that small bite continuous suturing with mass closure should be considered as the standard closure technique for midline incisions.

Keywords: Incisional Hernia, Small Bite Continuous Suturing with Mass Closure, Surgical Site Infection, Wound Dehiscence

1. Introduction

Midline laparotomy incision is the commonest abdominal incisions in both emergency and elective surgery¹. The closure of such a laparotomy wound is important to minimize the postoperative complications like wound pain, infection, dehiscence and incisional hernia^{2,3}.

Partial wound dehiscence is defined by separation of fascial edges without evisceration of intestinal loops. Complete wound dehiscence is defined as full separation of fascia and skin with evisceration of intestinal loops⁴. The mean time for wound dehiscence is 8-10 days after operation⁵.

Surgical Site Infections (SSI) is infection occurring in the organs, tissues or body cavities exposed by surgeons after an invasive procedures⁶.

Incisional hernia is a result of immense tension, post-operative abdominal distension due to gaseous distension

of bowel and inadequate and improper healing of previous incision, which is often associated with SSI, persistent post-operative cough, infection⁷.

The ideal method of abdominal incision closure should be: technically simple, minimal postoperative complications of burst abdomen, incisional hernia and persistent sinuses or fistulas, less painful to the patient and leave a reasonably aesthetic scar⁸. Many surgeons consider laparotomy incision closure with continuous suture technique with a suture: wound length ratio of at least 4:1 using a monofilament, slowly absorbable suture to be the preferred technique with minimal post-operative complications⁹.

Objective of the study is to evaluate various methods like mass closure or layered closure and continuous or interrupted closure of midline laparotomy incision in terms of incidence of wound dehiscence, wound infection and of incisional hernia till 6 months after closure.

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2. Aims and Objectives

1. To study the clinical outcome of various techniques of midline laparotomy incision closure.
2. To study the various complications associated with different techniques of midline laparotomy incision closure.

3. Materials and Methods

Study Design: Descriptive study

Study Setting: Department of Surgery of Dr. Vasantrao Pawar Medical College Hospital and Research Centre, Nashik, Maharashtra, India

Study Duration: August 2018 to December 2020

Study Participants: Sample Size: 100

3.1 Eligibility Criteria

Inclusion Criteria:

1. Patients in the age group of 14-65 yrs.
2. Patients who gave consent
3. Patients undergoing midline exploratory laparotomy for either emergency or elective procedures

Exclusion Criteria:

1. Patients undergoing Laparoscopic and laparoscopic assisted surgeries
2. All immune-compromised patients undergoing laparotomy

3.2 Methodology

Study included cases that were undergoing laparotomy procedure for various indications and having different methods of midline laparotomy incision closure. Patients were enrolled for the study once they were posted for laparotomy. Written informed valid consent was taken from each patient willing to be a part of this study. A detailed pre-operative clinical examination and relevant investigations were done for every patient.

Parts were prepared 2-3 hours prior to surgery and laparotomy was performed under general anaesthesia, through a vertical midline incision. Duration of surgery from time of incision till the time of closure of wound was recorded. Type of closure method, suture to wound length ratio and the type of suture material used was noted.

In the post-operative period, records were kept regarding the incidence of nausea, vomiting, urinary retention, cough, abdominal distension, pain, discharge, and fever. The midline laparotomy wounds were dressed on alternate days and were inspected for redness, discharge or gapping. Discharge if any was sent for culture and sensitivity. Presence of purulent or serous discharge positive for bacteria on culture and sensitivity testing was considered as positive for surgical site infection. The total hospital stay, any events and final outcome was also recorded.

Data was collected in the proforma prepared with relevant information from the patient and relatives. Cases were followed up for a period of 6 months post intervention at 72 hours, 10th day, and 20th day and at the end of 6 months. The data was analysed to determine the appropriate closure technique in terms of incidence of occurrence of wound infection, rectus sheath dehiscence, stitch granuloma and incisional hernia. Appropriate medical/ surgical treatment was given to the patient suffering from any of the complications.

4. Results and Discussion

Table 1. Distribution of study cases as per indication of surgery

Indication of Surgery	N	%
Appendix Perforation	24	24.0%
Blunt Trauma	14	14.0%
Duodenal Ulcer Perforation	12	12.0%
Gastric Ulcer Perforation	35	35.0%
Ileal Ulcer Perforation	6	6.0%
Obstructed Hernia	9	9.0%
Total	100	100.0%

The present hospital based prospective study aimed to evaluate the efficacy and outcomes of various techniques of midline laparotomy incision closure in terms of incidence of wound infection, dehiscence of rectus sheath and incidence of incisional hernia. Study included 100 cases undergoing midline exploratory laparotomy for either emergency or elective procedures.

Most common indication of laparotomy in present study was gastric ulcer perforation (35%) followed by perforation of appendix (24%), blunt trauma (14%) and duodenal ulcer perforation (12%) (Table 1).

Table 2. Distribution of study cases as per wound complications

Complications	N	%
SSI	25	25.0%
Wound Dehiscence	7	7.0%
Incisional Hernia	4	4.0%

Table 3. Association of wound complications with bite length

Complications	Bite length		Total	P-value
	1.0 cm (n-22)	0.5 cm (n-78)		
SSI	8	17	25	<0.05
	36.4%	21.8%	25.0%	
WD	2	5	7	0.64
	9.1%	6.4%	7.0%	
IH	1	3	4	1.00
	4.5%	3.8%	4.0%	

Table 4. Association of wound complications with method of closure and bite length

Complications	Group			Total	P-value
	Interrupted (0.5 cm) (n=40)	Continuous (0.5 cm) (n=38)	Continuous (1.0 cm) (n=22)		
SSI	15	2	8	25	<0.05
	37.5%	5.3%	36.4%	25.0%	
WD	5	0	2	7	0.09
	12.5%	0.0%	9.1%	7.0%	
IH	3	0	1	4	0.11
	7.5%	0.0%	4.5%	4.0%	

Table 5. Association of wound complications with type of closure

Complications	Type of Closure		Total	p-value
	Layered (n=28)	Mass (n=72)		
SSI	10	15	25	0.13
	35.7%	20.8%	25.0%	
WD	5	2	7	<0.05
	17.9%	2.8%	7.0%	
IH	4	0	4	<0.05
	14.3%	0.0%	4.0%	

In present study we observed that Incidence rate of surgical site infection was significantly less in cases with 0.5 cm bite length (21.8% vs 36.4%; $p < 0.05$). Incidence of wound dehiscence and incisional hernia was also lower in cases of 0.5 cm bite length (6.4% vs 9.1% and 3.8% vs 4.5%) (Table 2 & 3). Incidence rate of surgical site infection was comparable between continuous suture of 1.0 cm bite length and interrupted sutures of 0.5 cm bite length (36.4% vs 37.5%), which was significantly higher than cases of continuous sutures of 0.5 cm bite length (5.3%). Similarly the incidence of wound dehiscence and incisional hernia was significantly lower in cases of continuous sutures of 0.5 cm bite length as compared to other two groups (Table 4).

In present study, incidence rate of surgical site infection was significantly on a lower range in cases with continuous suturing (16.7% vs 37.5%; $p < 0.05$). Incidence of wound dehiscence and incisional hernia was also lower with continuous suturing (3.3% vs 12.5% and 1.7% vs 7.5%) (Table 4).

In present study, incidence rate of surgical site infection was 20.8% in cases where mass closure technique was used as compared to 35.7% where layered closure technique was used ($p = 0.13$). The odds of wound dehiscence and incisional hernia was also lower with mass closure (3.8% vs 17.9% and 0% vs 14.3%; $p < 0.05$) (Table 5).

Thus to summarize, findings in our study leads to the conclusion that small bite continuous suturing with mass closure is more effective suture closure technique for prevention of complications like surgical site infection, wound dehiscence and incisional hernia in midline incisions and should be considered as the standard closure technique for midline incisions.

5. Conclusion

The study results showed that best technique for midline laparotomy incision closure is small bite continuous suturing with mass closure. The small bites technique with continuous suturing showed better results than small bite technique with interrupted suturing. We did not observe any association of suture material with any wound related complications i.e., wound infection, dehiscence of rectus sheath and incidence of incisional hernia. Present study thus recommends that small bite continuous suturing with mass closure should be considered as the standard closure technique for midline incisions.

6. Summary

The small bite technique with continuous mass closure shows better results and fewer incidences of wound infection, wound dehiscence and incisional hernias as compared to large bite with interrupted layered closure technique. This technique is used by various surgeons for midline laparotomy closure and thus incidence of wound infection, dehiscence and incisional hernias post midline laparotomy for various indications has reduced significantly.

7. References

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How to cite this article: Joshi, D., Varandani, N. and Vaidya, M. Study of Different Methods of Midline Laparotomy Incision Closure and their Outcomes. *MVP J. Med. Sci.* 2021; 8(2): 249-252.