



Original Article

A Prospective Randomized Comparative Study Between Continuous and Interrupted X-Suture for Midline Laparotomy in Peptic Perforation

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ABSTRACT

Introduction Emergency midline laparotomy is a standard procedure for treating abdominal emergencies like peptic perforation, but it carries a notable risk of wound-related complications. Minimizing complications like wound dehiscence and burst abdomen and incisional hernia depends heavily on the choice of abdominal wall closure technique.

Objective This study aimed to evaluate and compare the outcomes of continuous and interrupted X-suture closure techniques for midline laparotomy wounds, specifically focusing on postoperative complications and closure time.

Materials and Methods: A prospective randomized comparative study was conducted at JLN Medical College and Associated Group of Hospitals, Ajmer, from June 2024 to December 2025. One hundred adult patients undergoing emergency midline laparotomy for peptic perforation were randomly assigned to two equal groups of 50. Group A underwent abdominal fascial sheath closure using a continuous suture technique, while Group B was closed using the interrupted X-suture technique. Standard perioperative care, Graham's omental patch repair and peritoneal lavage were maintained across both groups. Patients were monitored for sheath closure time and postoperative complications. Observations The mean age was 48.18 + 16.9 years in Group A and 42.06 + 13.19 years in Group B, with a notable male predominance in both groups (88% vs. 92%). The mean time required for sheath closure was significantly shorter in the continuous group (17.86 + 4.45 minutes) compared to the interrupted X-suture group (19.98 + 4.14 minutes; P = 0.015). Wound dehiscence rates were 4% in Group A and 2% in Group B (P = 0.758). Suture site sinus formation occurred in 10% of Group A and 8% of Group B (P = 0.758). Follow-up at 30 days revealed no active cases of wound dehiscence, burst abdomen.

Conclusion The interrupted X-suture technique demonstrates a favorable trend toward lower wound dehiscence and burst abdomen and incisional hernia rates compared to continuous closure. While it requires a significantly longer fascial sheath closure time, it yields similar complication rates and stands as a feasible, reliable alternative for emergency abdominal wall closure.

Keywords: Continuous And Interrupted X-Suture, Midline Laparotomy, Peptic Perforation.

INTRODUCTION

Exploratory laparotomy opens the abdominal cavity to explore and treat intra-abdominal disorders when non-invasive diagnostic methods fail or emergency action is needed. Acute abdomen, trauma (particularly hemodynamic instability), suspected perforation, haemorrhage, peritonitis, intestinal blockage, ischemia, or staging intra-abdominal cancers are the main indications¹. A midline incision under general anaesthesia allows access to all abdominal organs. The liver, stomach, intestines, and pelvic organs are examined in order². This procedure enables definitive diagnoses and therapeutic actions in critical conditions and includes midline laparotomy for rapid access to the peritoneal cavity³.

Midline laparotomy incision is the commonest abdominal incisions in emergency. It is simple in technique, allows satisfactory exposure to all quadrants, quick exposure with minimal blood loss. This technique provides excellent access to the abdominal cavity, allowing for rapid exposure of abdominal organs, minimal blood loss and satisfactory visualization of all four abdominal quadrants⁴. Linea alba, the weak midline aponeurotic zone opens during laparotomy, and it becomes even more fragile when its fibres are cut vertically. The mechanical forces acting on these fibres during closure increase the tension⁵.

Following fascial closure, problems that might occur include suture sinus development, incisional hernia, wound dehiscence, and wound infection. The most significant reasons include improper surgical technique, persistently elevated intra-abdominal pressure, and locally infected necrosis⁶. The commonest complication of median laparotomy is wound dehiscence and burst abdomen. Wound dehiscence is the parting of the layers of a surgical wound. Either the surface layers separate or the whole wound splits open. It presents as a mechanical failure of wound healing of surgical incision. Wound dehiscence, also known as burst abdomen or wound disruption, carries a substantial morbidity rate. In addition there is an increase in cost of care both in terms of increased hospital stay, nursing and manpower cost in managing cases of burst abdomen. Incidence of post laparotomy wound dehiscence / burst abdomen varies from center to center. While the incidence of wound dehiscence has been reported as 1– 3% in most centers across the world⁷. Closure technique involves a choice of continuous versus interrupted suture, the size of fascia bites, distance between consecutive sutures (stitch interval), the length and size of the suture used⁸. Continuous closure is preferred for its speed and cost effectiveness, though rates of dehiscence, complications, and incisional hernias are comparable with interrupted sutures. Continuous sutures may distribute tension evenly, but the rare risk of a single knot or strand breaking can compromise the entire suture line⁹. Interrupted sutures involve placing individual sutures, each tied off separately, which distributes tension more evenly and provides mechanical stability, especially in high-tension areas. However, this method can be time consuming and requires more suture material¹⁰. This study tries to evaluate prospectively randomized comparative the continuous sutures with interrupted x-type sutures in mass closure of midline laparotomy wound with absorbable monofilament suture p-dioxanone in patients undergoing midline laparotomy and its effectiveness.

OBJECTIVES:

The aim of the present study was to compare continuous and interrupted X-suture techniques for Midline Laparotomy wound closure in aspect of postoperative complications like Wound dehiscence, Burst abdomen, Suture sinus formation and Incisional hernia.

MATERIALS AND METHODS

A prospective randomized comparative study was conducted in the Department of Surgery, JLN Medical College and Associated Group of Hospitals, Ajmer, from June 2024 to December 2025. A total of 100 patients aged >18 years undergoing emergency midline laparotomy for peptic perforation were enrolled after obtaining informed consent. Patients with a history of previous laparotomy, incisional hernia, burst abdomen, or age <18 years were excluded.

Patients were randomly allocated into two groups of 50 patients each. Group A underwent abdominal fascial closure using a continuous suture technique, while Group B underwent closure using the interrupted X-suture technique.

All patients received standard preoperative resuscitation, antibiotic therapy, and general anesthesia.

Perforation repair was performed using Graham’s omental patch technique followed by thorough peritoneal lavage and drain placement. Patients were followed postoperatively for wound-related complications including wound dehiscence, burst abdomen, suture sinus formation, and incisional hernia. The time required for sheath closure was also recorded and compared between the groups.

Table 1 : Age Distribution of Patients Undergoing Midline Laparotomy for Peptic Perforation

	Group A (Continuous) n=50		Group B (Interrupted X-Suture) n=50		P Value
	No. of Patients	Percent	No. of Patients	Percent	
Age Group (Years)					0.0463 (S)
> 20	4	8	5	10	
21-40	15	30	18	36	
41-60	14	28	23	46	
61-80	17	34	4	8	
Mean Age	48.18 ± 16.90		42.06 ± 13.19		
Sex					0.505 (NS)
Male	44	88	46	92	
Female	6	12	4	8	

Table 2 : Comparison of Time Taken for Sheath Closure in Continuous vs Interrupted X-Suture Techniques

	Group A (Continuous) n=50		Group B (Interrupted X-Suture) n=50		P Value
	Mean	SD	Mean	SD	
Time taken for sheath closure (min.)	22.06	3.21	25.08	2.30	P<0.0001 (S)

Table 3 : Comparison of Length of Suture Used in Continuous Vs Interrupted X-Suture Techniques

	Group A (Continuous) n=50		Group B (Interrupted X-Suture) n=50		P Value
	Mean	SD	Mean	SD	
Length of suture	83.94	3.13	103.6	7.55	P<0.0001 (S)

Table 4 : Postoperative Complications in Continuous vs Interrupted X-Suture Techniques

Post Operative Complications	Group A (Continuous) n=50		Group B (Interrupted X-Suture) n=50		P Value
	No of Patients	Percent	No of Patients	Percent	
Wound dehiscence	2	4	1	2	0.758 (NS)
Suture site sinus formation	5	10	4	8	
Burst abdomen	0	0	0	0	

Table 5 : Follow-Up Outcomes at 15 Days and 30 days in Continuous vs Interrupted X-Suture Techniques

Follow Up	Group A (Continuous) n=50		Group B (Interrupted X-Suture) n=50	
	No. of Patients	Percent	No. of Patients	Percent
Follow Up at 15 days				
Patient discharged with normal wound healing	40	80	44	88
Wound infection but no wound dehiscence	5	10	4	8
Wound dehiscence	5	10	2	4
Follow Up at 30 days				
Patient discharged with normal wound healing	45	90	45	90
Wound infection but no wound dehiscence	5	10	5	0
Wound dehiscence	0	0	0	0
Incision hernia	1	2	0	0

DISCUSSION:

The mean age of patients in the present study was 48.18±16.90 years in the continuous closure group and 42.06 ± 13.19 years in the interrupted X-suture group. These findings are comparable to those reported by Shashikala V. et al. (2018)¹¹ who observed a mean age of 45.1±10.89 years in the continuous group and 43.5±12.27 years in the interrupted group. However, the mean age in the present study was higher than that reported by Sharma G et al. (2020)¹² (36.75±13.78 vs. 38.37±12.56 years), Sharma AC et al. (2019)¹³ (36.72 vs. 43.4 years), and Srivastava A et al. (2004)¹⁴ (36.37 vs. 40.09 years). In the present study, males predominated in both groups, accounting for 88% and 92% of patients in the continuous and interrupted X-suture groups, respectively, while females constituted 12% and 8%. Similar male predominance was reported by Sharma AC et al. (2019)¹³ who observed 65% and 66% males in the continuous and interrupted groups, respectively. Bansiwala RK et al. (2019)¹⁵ reported a higher proportion of males (80% and 84.7%), whereas Shashikala V. et al. (2018)¹¹ documented 83.33% and 90% males in the respective groups. (Table 1)

In the present study, the mean time taken for sheath closure was 22.06 ± 3.22 minutes in the continuous closure group and 25.08 ± 2.39 minutes in the interrupted X-suture group. Although sheath closure required slightly more time with the interrupted X-suture technique, the difference was clinically acceptable. Sharma AC et al. (2019)¹³ reported mean closure times of 17.3 minutes for continuous closure and 31.6 minutes for interrupted X-suture closure, while Shashikala V. et al. (2018)¹¹ observed closure times of 13.9 minutes and 28.4 minutes, respectively. Similar to these studies, the present study also demonstrated that interrupted X-suture closure is more time-consuming than continuous closure. However, the difference in closure time may be justified by the potential reduction in postoperative wound-related complications associated with the interrupted X-suture technique. (Table 2)

In the present study, the mean length of suture used was 83.94±3.13 cm in the continuous closure group and 103.6±7.55 cm in the interrupted X-suture group, with the difference being highly significant ($p < 0.0001$). The interrupted X-suture technique required a greater length of suture material due to the placement of multiple individual stitches. Similar findings have been reported by Srivastava et al. (2004)¹⁴ and Sharma et al. (2020)¹² who observed increased suture consumption with interrupted closure techniques compared to continuous closure. **(Table 3)**

In the present study, wound dehiscence was observed in 4% of patients in the continuous closure group and 2% in the interrupted X-suture group. Suture site sinus formation occurred in 10% and 8% of patients in the respective groups. These findings suggest a lower incidence of wound dehiscence with interrupted X-suture closure. Similar observations were reported by Sharma G et al. (2020)¹² reported wound dehiscence in 5% of patients undergoing continuous closure, while no cases were observed in the interrupted X-suture group. The findings of the present study are consistent with previous literature, indicating that interrupted X-suture closure may provide better wound security and reduce the risk of postoperative wound dehiscence compared to continuous closure. **(Table 4)**

At 15 days follow-up, normal wound healing was observed in 80% of patients in the continuous closure group and 88% in the interrupted X-suture group. Wound dehiscence occurred in 10% and 4% of patients respectively, indicating better early wound healing with interrupted X-suture closure. At 30 days, normal wound healing was seen in 90% of patients in both groups. However, wound infection persisted in 10% of the continuous closure group, while no cases were noted in the interrupted X-suture group. Incisional hernia was observed in 2% of patients in the continuous closure group and none in the interrupted X-suture group. Similar findings were reported by Sharma G et al. (2020)¹² who demonstrated lower wound-related complications with interrupted X-suture closure compared to continuous closure. **(Table 5)**

CONCLUSION:

The interrupted X-suture technique showed a trend toward a lower incidence of wound dehiscence and burst abdomen and incisional hernia compared with continuous closure. The technique required a longer fascial sheath closure time. No cases of incisional hernia were encountered in X-suture technique group. Thus, interrupted X-suture closure may be considered a feasible and reliable method of abdominal wall closure in patients undergoing emergency midline laparotomy for peptic perforation.

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