

OUTCOME OF MIDLINE LAPAROTOMY WOUND CLOSURE WITH INTERRUPTED X-SUTURE TECHNIQUE VERSUS CONTINUOUS SUTURE TECHNIQUE IN MARDAN MEDICAL COMPLEX

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ABSTRACT

Background: One of the procedures that the general surgery and gynecology departments do most often in emergency cases is laparotomy. Wound closure is one of the key factors influencing how well this procedure works. While some surgeons choose interrupted closure techniques, others favor continuous closure of the linea alba.

Objective: to evaluate the results of laparotomy wound closure in midline laparotomy patients using the interrupted X-suture method versus the continuous suture technique.

Study design: Randomized Controlled Trial (RCT)

Duration and place of study : Medical Complex's Department of General Surgery and Gynaecological participated in this randomized controlled trial. This study covered January 2018–December 2019

Materials & Methods: Adult emergency midline laparotomy patients at Mardan Medical Complex's Department of General Surgery and Gynaecological participated in this randomized controlled trial. This study covered January 2018–December 2019. Two hundred patients were studied. They were randomly divided into two groups. These patients had their abdominal incisions sealed with continuous sutures. People in Group II had interrupted X-sutures to close their abdominal wounds. Patients were evaluated daily for difficulties in the first week and after two weeks. **Results:** Group I's mean age was 43.8 ± 8.7 years, whereas Group II's was 42.6 ± 10.9 years (p -value = 0.39). In group I, there were 77% of male patients, while in group II, there were 74% (p -value 0.74). The most prevalent etiology was peritonitis caused by a gut perforation, accounting for 63% of cases in group I and 68% in group II (p -value = 0.55). 9.5% of patients in group I and 3.5% of patients in group II were diagnosed with laparotomy wound dehiscence (p -value 0.006). Regarding other issues, no statistically significant difference was seen.

Conclusion: After an emergency midline laparotomy, the interrupted suture method (X-suture) is superior to the continuous suture technique for closing the abdominal wall. The interrupted X-suture procedure has considerably reduced the incidence of wound dehiscence.

Keywords: Acute abdomen, peritonitis, gut perforation, emergency midline laparotomy, and laparotomy wound dehiscence.

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INTRODUCTION

one procedure that is often performed in all surgical specialties is the exploratory laparotomy. Abdominal surgery often uses a midline incision. It is recommended to open the abdomen via the midline since it is a rapid,

Citations: Muhammad Hussain, Mukhtar Ali, Hemasa Gul, Muhammad Ibrahim Shuja, Ajmal Khan, & Abdullah. (2022). OUTCOME OF MIDLINE LAPAROTOMY WOUND CLOSURE WITH INTERRUPTED X-SUTURE TECHNIQUE VERSUS CONTINUOUS SUTURE TECHNIQUE IN MARDAN MEDICAL COMPLEX: Original Article. Journal of Bacha Khan Medical College, 3(01), Page No. 1–5. <https://doi.org/10.69830/jbkmc.v3i01.24>

bloodless method, particularly for emergency laparotomy treatments.^{1,2,3} After a laparotomy, abdominal closure is a serious problem that might lead to complications. With growing knowledge of the physiology and engineering of abdominal wall closure, methods for closing midline abdominal incisions have changed throughout time. The key to lowering postoperative morbidity, such as wound discomfort, wound infection, and laparotomy wound dehiscence (LWD), is the systematic and secure closure of such a laparotomy wound.⁴

There is still disagreement over the best course of action for closing the abdominal wall after a midline laparotomy. Several randomized clinical studies and meta-analyses on abdominal wall closure techniques after midline laparotomy have been reported with inconsistent outcomes. Diener (2010) discovered that the most effective method of wound closure for patients undergoing elective laparotomies is the continuous suture approach, which employs monofilament, progressively absorbable sutures with a 4:1 suture to wound ratio.⁵

Fortelny found that a continuous method with smaller bites is linked to fewer problems after laparotomy wound closure in a systematic study.⁶ However, Zuker et al. stressed that more consistent research is required to find the best wound closure technique following laparotomy procedures because the best technique to lower the incidence of wound dehiscence cannot be determined from the available material.

The best method and material for closing the abdominal fascia after a midline laparotomy is still debated. Thus, despite recent meta-analyses and randomized clinical trials, surgeons continue to close abdominal fascia according to their preferences. The techniques used for abdominal fascial closure vary widely across centers and even among surgeons working in the same facility.^{5,8} Abdominal fascial closure complications are prevalent, particularly in nations with minimal resources like Pakistan.

Therefore, to enhance surgical results, it was crucial to comprehend the procedures and related risks of fascial closure at Mardan Medical Complex.

Our experiences with abdominal fascial closure after midline laparotomy were documented in this paper. This research was carried out at the Mardan Medical Complex, a tertiary care hospital in Mardan, KPK, to compare the results of midline laparotomy closure

with continuous sutures and interrupted sutures in terms of complications.

MATERIALS & METHODS

This randomized controlled study included midline laparotomies at the Mardan The Bacha Khan Medical College teaching hospital and tertiary care institution Medical Complex. The research ran from January 2017 to December. Significant abdominal procedures, uncontrolled diabetes, abdominal cancer, and loss of follow-up were banned. Study participation required written permission from patients or guardians. The ethical review board at our hospital also approved. Two equal 200-patient groups were randomly assigned. These individuals have continuous sutures on their abdominal incisions. Bites were 1 cm apart, and continuous sutures were applied proximal to distal. Group II had abdominal wounds sealed with interrupted X-sutures. The groups used non-absorbable polypropylene sutures. Slide the needle outside through one wound side, then inside through the other, then in an X pattern from inside to outside.

Preoperative physicals and histories were performed on each participant. Diagnostic and surgical readiness studies were done. If required, ECG, chest X-ray, urea, sugar, and complete blood count were done. The initiation of anesthesia included single doses of metronidazole, gentamicin, and cephalosporin. All patients underwent midline incision exploratory laparotomy under general anesthesia.

A consultant surgeon or senior resident conducted them under his supervision. In operation notes, surgical type and fascial closure were examined. Post-surgery abdominal incisional sequelae such as surgical site infection, wound dehiscence, stitch sinus development, and chronic discomfort were examined. Patients were assessed daily for the first week and after the second week to determine the outcome. After laparotomy, patients were monitored for two weeks to assess research results.

Pain, discomfort, swelling, redness, heat, purulent drainage from the incision, and organism isolation from an aseptically acquired culture of superficial incision fluid or tissue define a surgical site infection. Dehiscence was a complete wound rupture with or without abdominal evisceration needing prompt reoperation. Chronic wound pain was detected after a month of activity restrictions.

SPSS 23 analysed data. A Chi-square test was employed to compare laparotomy wound dehiscence and qualitative features across groups, with a p-value of ≤ 0.05 indicating significance.

RESULTS

We laparotomized 221 people for various stomach issues throughout the study. Twenty-one patients did not meet the inclusion criteria and were excluded from the study. Thus, 200 entered the study. Males outnumbered females 3:1, with 151 men and 49 women. Male patients comprised 77% of group I and 74% of group II ($P=0.74$).

Patients' median age at presentation was 42 years, ranging from 18 to 70 years (mean age: 43.8 ± 8.7 years in group I and 42.6 ± 10.9 years in group II, p-value 0.39) —table 1.

For various stomach issues, all research patients had midline laparotomy. Some 100 patients had interrupted sutures, while others had continuous sutures. The two groups experienced surgical site infection, stitch sinus, wound pain, and laparotomy wound dehiscence. Table 2

DISCUSSION

Secure closure of a laparotomy incision is still a crucial part of any abdominal operation to avoid postoperative morbidity and accelerate the patient's recovery. Midline exploratory laparotomy and its closure are routinely performed procedures in surgical and allied departments worldwide ⁴. An intra-abdominal illness's clinical manifestation that requires surgery is an acute abdomen. If the acute abdomen is not treated promptly, it may result in a very high morbidity and fatality rate since it is linked to electrolyte imbalances, dehydration, and even sepsis ⁹. ¹⁰, Laparotomies in emergency rooms are often performed as a result of firearm injuries and peritonitis brought on by intestinal perforations ¹⁰. In emergency rooms, midline laparotomy is the recommended laparotomy procedure.

An important concern after a laparotomy is abdominal closure. The closure technique needs to possess enough tensile strength and accurate tissue

Table 1: Baseline Study Characteristics(n=200)

S#	Group I (Continuous)	Group II (Interrupted X-suture)	P Value
Age (mean±S.D.)	43.8±8.7	42.6±10.9	0.39
Female gender (%)	23.0 %	26.0%	0.74
BMI (Kg/m2)	24.81±2.45	24.61±2.86	0.61
Perforated Peritonitis	63	68	0.55
Fire Arm Injury	37	32	

Table 2: Complications (n=200)

S.No.	Complication	Group 1(continuous suture)	Group 2 (interrupted suture)	Statistical significance
1	Surgical site infection	38(19)	40(20)	0.800
2	Laprotomy wound dehiscence	19(9.5)	7(3.5)	0.014
3	Stitch sinus	24(12)	37(18.5)	0.70
4	Persistent wound pain	22(11)	32 (16)	0.143

approximation to facilitate adequate wound healing and tolerability ¹¹. The best method and kind of suture for closing the abdominal wall have long been under discussion. Despite a large body of research, an ideal method for closing abdominal wounds still needs to be developed. This is due to variations in study designs, patient inclusion criteria, and inconsistent findings in published studies ¹². The goal of the current study was

to compare the effectiveness of the continuous suture technique versus the interrupted X-suture technique for closing the linea alba following an emergency midline laparotomy. We measured the closure of the linea alba regarding laparotomy wound dehiscence, wound infection, formation of stitches, conditions, and persistent wound pain.

In our investigation, there was a statistically significant difference in the diagnosis of wound dehiscence: 9.5% of patients in the continuous suture group and only 3.5% of patients in the interrupted X-suture group. In a related research, Khan et al. contrasted the results of the X-suture and continuous suture techniques. According to the authors, 4.0% of patients with an X-suture and 16% of patients with a continuous suture approach for wound closure had wound dehiscence. Thirteen Shashikala et al. found in another investigation that the x-suture approach outperforms the continuous method. They found that 26.67% of patients receiving continuous sutures and 6.67% receiving interrupted X-sutures had wound dehiscence. Similarly, 5.4% of wound dehiscence in the interrupted X-suture method and 20.1% in the continuous suture approach were observed by Bansiwala et al.¹⁵ Additionally, Choudhary et al. found that interrupted sutures had superior outcomes than continuous sutures (2.5% wound dehiscence in the interrupted method vs 10% in the continuous suture approach). With 6.6% wound dehiscence in the interrupted approach compared to 16% in the continuous technique, Kanju et al. almost achieved equivalent results.¹

Some studies found wound dehiscence in 5.0% of continuous and interrupted x-closure patients. These results indicate that both methods are effective and provide acceptable wound strength. Sharma et al. found no difference in abdominal wound dehiscence between interrupted and continuous procedures (3.33% and 6.66%).¹⁷

Our results contradict earlier studies that indicated continuous suturing was better than interrupted sutures. The laparotomy incision's uniform stress distribution may explain this.^{18,19} Unlike a constant method, an interrupted technique does not depend on a single knot, yet knot tightness may vary. Tissue ischemia and wound margin necrosis due to tension variations might cause an infection or incisional hernia in the laparotomy wound. Eighteen years old in 1993. Leif Israelsson and his Swedish author group determined the continuous closure approach to be better when the stipulated suture/wound length ratio was at least 4:1.¹⁹

The best closure method should reduce infection, discomfort, and surgical incision sinus formation. Multiple studies have compared monofilament, delayed-absorbable, and absorbable laparotomy closure materials. Still, no victor has emerged.^{3,17} In

this study, interrupted suturing technique patients had higher rates of stitch sinus formation (18.5% vs. 12%) and chronic wounds (16% vs. 11%), although these differences were not statistically significant.

Midline abdominal incisions are utilized for emergency laparotomies at our hospital. Wound closure typically involves continuous and intermittent X-sutures. Interrupted X-sutures reduce wound dehiscence and are better than continuous ones, according to this study.

CONCLUSION

To close the abdominal wall after an emergency midline laparotomy, the interrupted X-suture method is preferable to the continuous suture technique. The incidence of laparotomy wound dehiscence has dramatically decreased due to the interrupted X-suture method.

REFERENCES

1. Kunju RD, Thakkannavar V, Merta S, et al. A clinical study of continuous and interrupted fascial closure in emergency midline laparotomy at a tertiary care center. *Int Surg J.* 2017;4(6):2014-7.
2. Nahai F, Brown RG, Vasconez LO (1976) Blood supply to the abdominal wall related to planning abdominal incisions. *Am J Surg* 42:691-695 3. Ellis H, Bucknall TE, Cox PJ (1985) Abdominal incisions and their closure. *Curr Probl Surg* 22:1-51
3. Chawla S (2012) A comparison between mass closure and layered closure of midline abdominal incisions. *Med J Dr DY Patil Univ* 5:26-27
4. Israelsson LA, Millbourn D (2012) Closing midline abdominal incisions. *Langenbecks Arch Surg* 397:1201-1207
5. Diener MK, Voss S, Jensen K, et al. Elective midline laparotomy closure: the inline systematic review and meta-analysis. *LWW*; 2010.
6. Fortelny RH. Abdominal Wall Closure in Elective Midline Laparotomy: The Current Recommendations. *Front Surg.* 2018;5:34.
7. Zucker BE, Simillis C, Tekkis P, et al. Suture choice to reduce the surgical site infection, hernia, wound dehiscence, and sinus/fistula: a network meta-analysis. *Ann R Coll Surg Engl.* 2019;101(3):150-61.
8. Seiler CM, Bruckner T, Diener MK, Pappan A, Goucher H, Seidlmayer C, et al. (2007) Interrupted or continuous slowly absorbable sutures for closure of primary elective midline abdominal incisions: a multicenter randomized tri-

- al (INSECT: ISRCTN24023541). *Ann Surg* 249:576–582
9. Sreeharsha H, Sp R, Sreekar H, et al. Efficacy of POSSUM score in predicting the outcome in patients undergoing emergency laparotomy. *Pol J Surg.* 2014;86(4):159-65.
 10. Uranues S, Fingerhut A, Ozkan OV. *Laparoscopy: A Diagnostic and Therapeutic Tool for Acute Care Surgery. Acute Care Surgery Handbook: Springer; 2016. p. 27-41.*
 11. Williams ZF, Hope WW. Abdominal wound closure: current perspectives. *Open Access Surg.* 2015;8:89.
 12. Tamini N, Cereda M, Capelli G, et al. Searching for the safest abdominal closure technique after emergency laparotomy for Hinchey III and IV peritonitis. *Int Surg J.* 2017;4(8):2534-8.
 13. Khan AA, Khan N, Qayyum A, et al. Comparison of continuous versus interrupted x-suturing technique for abdominal wall closure in emergency midline laparotomy wound. *J Postgrad Med Inst.* 2018;32(4):390-4.
 14. Shashikala V, Abhilash S, Abhishek G, et al. A comparative study between continuous and x-interrupted sutures in emergency midline laparotomies. *Int Surg J.* 2018;5(5):1753-7.
 15. Bansawal RK, Mittal T, Sharma R, et al. Comparative study of abdominal wound dehiscence in continuous versus interrupted fascial closure after emergency midline laparotomy. *Int Surg J.* 2019;6(3):886-91.
 16. Mohsin Khan AJ, Ojha A. A comparative study of single-layer interrupted closure versus single-layer continuous with intermittent Aberdeen's knots closure of laparotomy wounds. *Int JSci Res.* 2018;7(6):48-9.
 17. Sharma AC, Gupta AK, Singh N, et al. Comparison of continuous versus interrupted abdominal fascia closure using polydioxanone suture in laparotomy. *Int Surg J.* 2019;6(8):2832-6.
 18. Gupta H, Srivastava A, Menon GR, Agrawal CS, Chumber S, Kumar S (2008) Comparison of interrupted versus continuous closure in abdominal wound repair: a meta-analysis of 23 trials. *Asian J Surg* 31:104–114
 19. Israelsson LA, Jonsson T. Suture length to wound length ratio and healing of midline laparotomy incisions. *Br J Surg* (1993) 80(10):1284–6. doi: 10.1002/ bjs.1800801020

Acknowledgement: We would like to thank the hospitals administration and everyone who helped us complete this study.

Disclaimer: Nil

Conflict of Interest: There is no conflict of interest.

Funding Disclosure: Nil

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