



A COMPARATIVE STUDY USING INTERRUPTED X SUTURE VERSUS CONTINUOUS SUTURES IN ABDOMINAL WALL CLOSURE AFTER MIDLINE LAPAROTOMY

General Surgery

Dr. Pradeep Kumar Seth*

Post graduate student of Department of General Surgery, K.D. Medical College, Hospital & Research Center, Mathura, India. *Corresponding Author

Dr. Vinayikaa

Post graduate student of Department of General Surgery, K.D. Medical College, Hospital & Research Center, Mathura, India.

Dr. Anurag Kumar

Post graduate student of Department of General Surgery, K.D. Medical College, Hospital & Research Center, Mathura, India.

ABSTRACT

Introduction: Midline laparotomy is a commonly performed surgical procedure for various abdominal emergencies. The choice of suture technique for wound closure significantly impacts postoperative outcomes, including pain, wound healing, and complication rates. This study aimed to compare the efficacy, safety, and clinical outcomes of Interrupted X Sutures and Continuous Sutures for midline laparotomy closure. **Materials And Methods:** A prospective, randomized study was conducted on 112 patients undergoing midline laparotomy. Patients were randomly assigned into two groups: Group A (n=56) received Interrupted X Sutures, while Group B (n=56) underwent Continuous Sutures for abdominal wound closure. Baseline demographic data, BMI, primary diagnosis, comorbidities, surgical duration and closure technique were recorded. Postoperative outcomes were assessed in terms of pain scores (VAS scale), analgesia requirements, wound related complications (discharge, dehiscence, sepsis), and length of hospital stay. **Results:** Both groups were comparable in demographic characteristics with no significant differences. Pain scores at 24, 48, and 72 hours were significantly lower in Group B (p=0.01). However, wound-related complications were higher in Group B, including wound discharge (19.64% vs. 10.71%, p=0.04) and wound dehiscence (7.14% vs. 1.79%, p=0.03). The mean hospital stay was significantly shorter in Group A (7.17 ± 2.49 days) compared to Group B (9.55 ± 2.46 days, p=0.04). **Conclusion:** While Continuous Sutures provided better pain control, Interrupted X Sutures were associated with fewer wound complications and a shorter hospital stay. These findings suggest that Interrupted X Sutures may be a superior choice for midline laparotomy closure. Further research with larger sample sizes is recommended to confirm these results.

KEYWORDS

Laprotomy, Continuous suture, interrupted X suture and Visual Analogue Scale (VAS)

INTRODUCTION

Midline laparotomy remains one of the most frequently performed surgical procedures, widely adopted in both emergency and elective settings. 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 quadrants.^[1] Its simplicity and effectiveness make it the preferred choice for various surgical conditions. Despite these advantages, midline laparotomy is not without complications, with wound dehiscence, burst abdomen, and incisional hernias being significant postoperative concerns. These complications can profoundly affect patient recovery and are associated with increased morbidity, prolonged hospital stays, and higher healthcare costs.^[2] Effective closure techniques that minimize tissue damage and promote optimal wound healing are therefore critical to improving surgical outcomes^[3]. One essential consideration in abdominal wall closure is minimizing tissue trauma by avoiding the inclusion of abdominal wall musculature in the suturing process. This approach is particularly feasible with midline incisions compared to paramedian or transverse incisions.^[4] The choice of suture material also plays a vital role. Non-absorbable monofilament sutures, such as polydioxanone, are often favoured for their lower risk of sinus tract formation and better long-term strength. These sutures are associated with fewer complications compared to braided non-absorbable sutures like silk, which carry higher risks of infection and sinus formation.^[5] The suturing technique-whether interrupted or continuous-has been a subject of ongoing debate. 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 material. Continuous sutures use a single running strand, offering faster application and potential time savings, which are particularly valuable in emergency scenarios. Nevertheless, continuous sutures may be more vulnerable to complete failure if the strand breaks or the knot fails^[6]. To address this gap, this study was designed as a randomized controlled trial to compare the effectiveness and safety of continuous sutures versus interrupted X sutures for the closure of midline laparotomy. Both techniques were assessed focusing on key postoperative outcomes, and the development of incisional hernias one year after surgery. By systematically evaluating these two closure methods, this study aims to provide robust evidence to guide surgical practice in emergency and elective settings, ultimately improving

patient outcomes and reducing the burden of postoperative complications. The findings will contribute to standardizing abdominal wall closure techniques, particularly in high-risk and emergency surgical population.

MATERIALS AND METHODS

A randomized, prospective, double-blinded (patient and interviewer), interventional case-control study was conducted to compare the effectiveness and safety of continuous sutures versus interrupted X sutures for the closure of midline laparotomy. Ethical approval was obtained from the Institutional Ethics Committee, KD Medical College, Mathura. The type of suture used in the study was **PDS 1-0**. Study was conducted over a period of 24 months. Patients who provided informed and valid written consent to participate in study were included. Sample size of study was 112.

Inclusion Criteria

- Patients who underwent exploratory laparotomy through a midline incision.

Exclusion Criteria

- Patients below 18 years of age.
- Patients with a history of previous abdominal surgery with a midline incision scar.
- Patients with comorbid conditions such as diabetes mellitus, renal failure, malignancy, those undergoing radiotherapy or chemo therapy, and those with collagen vascular diseases.
- Patients with midline abdominal wall injuries.
- Patients with connective tissue disorders.

Data collection was at pre-operative, intra operative (duration of surgery) and post operative (pain at different time interval).

Statistical Analysis:

The collected data were entered into SPSS Version 25. Continuous variables were analyzed using means and standard deviation, while categorical variables were analyzed using the chi-square test. Mean comparison between two variables was done by independent t test. A p-value of less than 0.05 was considered statistically significant.

RESULTS

In this study, a total of 112 patients undergoing abdominal surgeries

were randomly assigned to two groups: Group A (Interrupted X Sutures, n=56) and Group B (Continuous Sutures, n=56). Postoperative outcomes were evaluated, including total duration of surgery, pain severity (VAS scores), analgesia requirements, duration of hospital stay, and the occurrence of postoperative complications such as seroma formation, infections, and incisional hernia.

The mean duration of surgery was similar between the groups-92.36 ±18.45 minutes for Group A and 91.39 ±19.83 minutes for Group B- with a p-value of 0.40, indicating no significant difference in surgical time between the two closure techniques. (Table 1)

Table 1. Total Duration Of Surgery Distribution In Study Population

Total Duration Of Surgery (Minutes)	Group A- Interrupted X Sutures	Group B- Continuous Sutures	p-value
Mean ± SD	92.36±18.45	91.39±19.83	0.40

Test used- independent t test, p>0.05 insignificant

Pain severity, At 6 hours postoperatively, both groups was Group A: 4.8±1.0; Group B: 4.8±0.73 with a p- value of 1, indicating a insignificant result. At 24 hours, pain reduced in both groups, with Group A VAS score was 4.5±1.1 compared to Group B 3.9± 0.68 (p=0.01). This trend continued at 48hours (Group A 4.2±0.9 vs. Group B 2.8±0.6) and 72 hours (Group A: 3.5±0.8vs.GroupB: 2.0±0.5), both with statistically significant p-values of 0.01, indicating consistently lower pain levels in the Continuous Sutures group. (Figure 1)

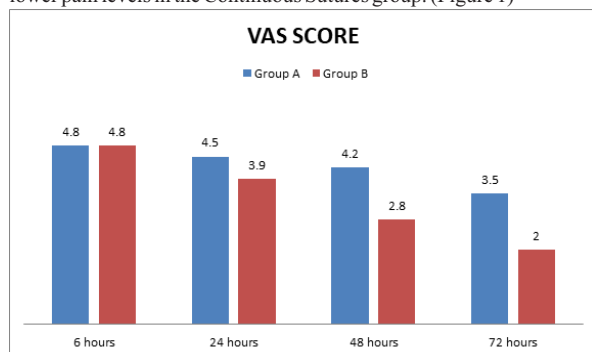


Figure 1- Postoperative Pain Severity (VAS Scores)

The duration of postoperative hospital stay revealed a significant difference between the groups. Group A had a shorter, mean hospital stay of 7.17 ± 2.49 days compared to 9.55±2.46 days in Group B, with a p-value of 0.04, indicating a statistically significant longer stay for patients in the Continuous Sutures group. (Figure 2)

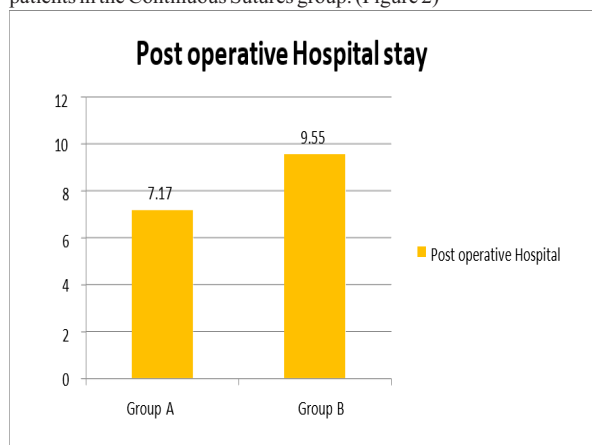


Figure 2- Duration of Postoperative Hospital Stay (Days)

Postoperative complications were more common in Group B. Incisional hernia occurred in 1 patient (1.79%) in Group A and 3 patients (5.36%) in Group B (p=0.06). Infections were reported in 3 patients (5.36%) in Group A and 6 patients (10.71%) in Group B (p=0.06). Seroma formation was more frequent in Group B (17.86%) compared to Group A (8.92%), with a p-value of 0.04, indicating a statistically significant difference. Notably, 47 patients (83.93%) in

Group A had no postoperative complications, compared to only 37 patients (66.07%) in Group B (p = 0.03), suggesting a higher overall complication rate in the Continuous Sutures group. (Figure 3)

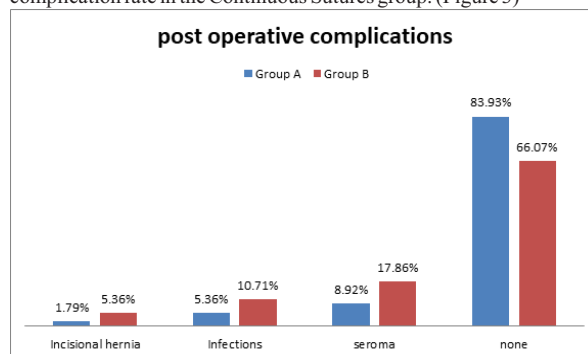


Figure 3- Post Operative Complications

DISCUSSION

Our study observed no significant difference in surgical duration between the two groups (92.36 ± 18.45 minutes in Group A vs. 91.39 ± 19.83 minutes in Group B, p = 0.40). Mohanty et al. (2021) [7] similarly reported no substantial time difference between suture techniques (mean 93.5 ± 17.2 minutes) and Geetha et al. (2019) [8] reported comparable results, noting that while continuous sutures theoretically reduce closure time, the overall surgical duration remained similar (mean time 93.2 ± 17.5 minutes) due to other intraoperative factors.

Pain severity was a significant differentiating factor between the two groups. In our study, Group B (Continuous Sutures) exhibited lower pain scores at 24, 48, and 72 hours postoperatively, with statistically significant differences (p = 0.01). These findings align with Mishra et al. (2022) [9], who reported that continuous sutures were associated with lower pain levels (p = 0.02) due to reduced tissue handling and Seiler et al. (2009) [10] also reported lower postoperative pain with continuous sutures (mean VAS score 3.5 vs. 5.2 in interrupted sutures, p<0.05).

Our study showed that Group A (Interrupted X Sutures) had a significantly shorter hospital stay (7.17 ± 2.49 days) compared to Group B (9.55 ± 2.46 days) (p = 0.04). This finding aligns with Mishra et al. (2022) [9], who reported a mean hospital stay of 7.2 ± 2.1 days for interrupted sutures and 9.3 ± 2.5 days for continuous sutures (p = 0.03), attributing the difference to higher wound complication rates in continuous sutures. Akbar et al. (2021) [11] found no significant difference in hospital stay between groups

CONCLUSION

The results of this study comparing Interrupted X Sutures (Group A) and Continuous Sutures (Group B) in surgical patients revealed several key findings. There was no statistically significant difference total duration of surgery between the two groups.

However, Group A demonstrated shorter postoperative hospital stays and Group B demonstrated lower postoperative pain severity. Additionally, Group B showed a higher frequency of postoperative complications, such as incisional hernia, infections, and seroma formation, compared to Group A.

These findings suggest that the Interrupted X Sutures technique may offer advantages over the Continuous Sutures technique in terms of shorter hospital stays and lower complication rates and continuous Suture technique may offer advantages over the Interrupted X Suture technique in terms of pain management. Further studies with larger sample sizes and longer follow-up periods are recommended to validate these results and assess the long-term impact of different suture techniques on surgical outcomes.

REFERENCES

- Ellis H. Midline abdominal incision. Br J Obstet Gynecol. 1984; 91:1-2.
- Riou JPA, Cohen JR, Johnson H. Factors influencing wound dehiscence. Am J Surg 1992; 163:324-30.
- Krukowski ZH, Cusick EL, Engeset J. Polydioxanone or polypropylene for closure of midline abdominal incisions: A prospective comparative clinical trial. Br J Surg. 1987; 74:828-30.
- Corman ML, Veidenheimer MC, Collier JA. Controlled clinical trial of three suture

- materials for abdominal wall closure after bowel operations. *Am J Surg.* 1981; 141:510-13.
5. Jenkins TPN. The burst Abdominal wound: A mechanical approach. *Br J Surg* 1976; 63:873-76.
 6. Peponis T, et al. Interrupted versus continuous fascial closure in patients undergoing emergent laparotomy: a randomized controlled trial. *J Trauma Acute Care Surg.* 2018;85(3):459–65.
 7. Mohanty A, Paljor YD, Sharma R. Evaluation of abdominal wound closure using continuous versus interrupted sutures in patients of perforation peritonitis. *International Surgery Journal.* 2021 Feb 25;8(3):844-46
 8. Geetha D, Sathaiah C. A prospective study to compare continuous versus interrupted X suture in prevention of burst abdomen. *IOSR J Dent Med Sci.* 2019; 18(1):10–17. doi:10.9790/0853-1801131017.
 9. Mishra PR, Kumar S, Mishra S, Dhar A, Kataria K, Seenu V, Pandey RM, Misra MC, Srivastava A. Interrupted X-Suture Prevents Burst Abdomen: Analysis of Randomised Controlled Trials from India. *Indian Journal of Surgery.* 2022 May 3:1-8.
 10. Seiler CM, Bruckner T, Diener MK, Pappan A, Golcher H, Seidlmayer C, Franck A, Kieser M, Büchler MW, Knaebel HP. Interrupted or continuous slowly absorbable sutures for closure of primary elective midline abdominal incisions: a multicenter randomized trial (INSECT: ISRCTN24023541). *Ann Surg.* 2009 Apr; 249(4):576-582.
 11. Akbar F, Khan M, Ahmad N, Abbas S, Khan N. Comparison of Laparotomy Wound Dehiscence (LWD) Rate Using Interrupted X-Suture Technique vs Continuous Suture Technique in Rectus Sheath in Emergency Laparotomy. *Journal of Saidu Medical College, Swat.* 2021;11(3):133-36.