RESEARCH PAPER

A Prospective Observational Study Of Comparison Between Continuous And Interrupted Suturing For Rectus Sheath Closure In Exploratory Laparotomy

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ABSTRACT
Background: Optimal rectus sheath closure technique in emergency exploratory laparotomy remains controversial. Continuous suturing offers procedural efficiency, whereas interrupted suturing may provide enhanced wound security, particularly in contaminated fields.
Aim: To compare continuous and interrupted suturing techniques for rectus sheath closure in exploratory laparotomy with respect to wound complications and surgical outcomes.
Methods: This prospective observational study included 68 adult patients undergoing emergency exploratory laparotomy through midline incision. Patients were divided into interrupted (n=34) and continuous (n=34) closure groups based on surgeon preference. Primary outcome was postoperative wound dehiscence. Secondary outcomes included closure time, suture length used, surgical site infection (SSI), and duration of hospital stay. Statistical analysis was performed using independent t-test and chi-square test, with $p<0.05$ considered significant.
Results: Baseline characteristics were comparable between groups. Continuous suturing significantly reduced closure time (12.3 ± 1.8 vs 18.6 ± 2.4 minutes, $p<0.001$) and suture usage (88 ± 6 vs 102 ± 8 cm, $p<0.001$). However, wound dehiscence was significantly lower in the interrupted group (5.9% vs 17.6%, $p=0.04$). SSI rates were comparable (14.7% vs 20.6%, $p=0.52$). Mean hospital stay was shorter in the interrupted group (8.4 ± 1.9 vs 10.1 ± 2.6 days, $p=0.01$). Wound infection was strongly associated with dehiscence ($p=0.002$).
Conclusion: Interrupted closure provided superior fascial integrity and reduced hospital stay, while continuous closure improved operative efficiency. Technique selection should be individualized in emergency laparotomy settings..
Keywords: Exploratory laparotomy, Rectus sheath closure, Continuous suturing, Interrupted suturing, Wound dehiscence
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INTRODUCTION

Exploratory laparotomy remains one of the most frequently performed emergency surgical procedures in India, particularly in cases of perforation peritonitis, intestinal obstruction, abdominal trauma, and intra-abdominal sepsis. Despite advancements in surgical techniques and perioperative care, postoperative wound complications continue to be a significant source of morbidity and healthcare burden. Among these, surgical site infection (SSI), wound dehiscence, and incisional hernia are the most concerning complications following midline laparotomy incisions [1,2]. The method of rectus sheath closure is widely recognized as a crucial determinant influencing these postoperative outcomes.

Midline abdominal incisions are preferred in emergency laparotomies due to their rapid access, minimal blood loss, and ease of extension [3]. The integrity of closure of the linea alba and rectus sheath is critical to restore abdominal wall strength. Failure of adequate fascial healing may result in burst abdomen in the early postoperative period or incisional hernia in the long term [4]. The reported incidence of wound dehiscence following emergency laparotomy ranges between 2–14%, while incisional hernia rates may reach up to 20% in high-risk populations [5].

Various techniques have been described for rectus sheath closure, broadly categorized into continuous (running) suturing and interrupted suturing methods. Continuous suturing involves a single strand of suture material placed along the entire length of the incision, whereas interrupted suturing consists of multiple individually tied sutures placed at regular intervals [6]. Each technique has theoretical advantages and disadvantages.

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Continuous suturing is often favored for its shorter operative time, even distribution of tension, and economical use of suture material. The "small bites technique," which uses continuous suturing with closely spaced stitches and a high suture-to-wound length ratio (at least 4:1), has been shown to reduce the incidence of incisional hernia in elective surgeries [7]. Moreover, continuous closure may minimize tissue ischemia due to uniform tension distribution. However, critics argue that a single suture line may predispose to catastrophic wound failure if the suture breaks or becomes infected [8].

Interrupted suturing, on the other hand, provides multiple independent points of fixation. In the event of infection or suture failure at one site, the remaining sutures maintain wound integrity. This method may theoretically reduce the risk of complete wound dehiscence. However, interrupted closure is time-consuming, may cause uneven tension distribution, and can increase tissue strangulation if excessive tightness is applied [9].

Several studies have attempted to compare continuous and interrupted techniques for fascial closure, but findings remain inconsistent, especially in emergency settings. Most large randomized controlled trials supporting continuous small-bite closure have been conducted in elective laparotomy populations in Western countries [10]. The applicability of these findings to emergency exploratory laparotomies in the Indian context remains uncertain. Emergency cases often present with contaminated or dirty wounds, malnutrition, anemia, sepsis, and delayed presentation—factors that significantly impair wound healing. Therefore, extrapolation of elective surgery data may not accurately reflect outcomes in high-risk Indian patients. In India, perforation peritonitis remains one of the leading indications for emergency laparotomy, with patients frequently presenting in septic shock and poor nutritional status. Hypoproteinemia, anemia, diabetes mellitus, and prolonged operative time further increase the risk of postoperative wound complications. Under such conditions, the choice of fascial closure technique may significantly influence surgical outcomes. However, limited prospective Indian studies have directly compared continuous versus interrupted rectus sheath closure specifically in exploratory laparotomy cases.

Furthermore, healthcare resource constraints in many Indian tertiary care and district hospitals necessitate techniques that are both cost-effective and efficient, without compromising patient safety. Continuous suturing may reduce operative time and suture usage, potentially lowering procedural costs. Conversely, interrupted suturing may offer greater security in contaminated fields, which are common in emergency laparotomies. Determining which technique provides superior outcomes in terms of wound infection, wound dehiscence, postoperative pain, operative time, and length of hospital stay is of considerable clinical relevance. Given the high burden of emergency abdominal surgeries in India and the associated morbidity from postoperative wound complications, there is a clear need for prospective observational studies evaluating optimal fascial closure techniques in real-world settings. A systematic comparison between continuous and interrupted suturing for rectus sheath closure in exploratory laparotomy may provide evidence-based guidance tailored to Indian patient populations.

Therefore, the present prospective observational study aims to compare continuous versus interrupted suturing techniques for rectus sheath closure in patients undergoing exploratory laparotomy, with particular emphasis on postoperative wound complications, operative time, and overall surgical outcomes. The findings may help establish standardized closure protocols and contribute to reducing postoperative morbidity in emergency abdominal surgery.

METHODOLOGY

1. Study Design

This study was conducted as a prospective observational study comparing continuous and interrupted suturing techniques for rectus sheath closure in exploratory laparotomy. The choice of suturing method depended on surgeon preference. Patients were followed from surgery until discharge. The primary outcome was postoperative wound dehiscence, while secondary outcomes included closure time, suture length used, wound infection, and duration of hospital stay.

2. Study Setting

The study was carried out in the Department of General Surgery at SRM Medical College Hospital and Research Centre, Kattankulathur, a tertiary care teaching hospital managing emergency abdominal surgeries. All procedures were performed under standard aseptic precautions, and postoperative care was provided in surgical wards and intensive care units as required.

3. Study Duration

The study was conducted over eight months. Eligible patients presenting during this period were consecutively recruited until the required sample size was achieved. Each participant was followed postoperatively until discharge for assessment of study outcomes.

4. Participants

Patients aged above 18 years undergoing emergency exploratory laparotomy through a midline incision and who provided written informed consent were included. Patients below 18 years, those with previous midline abdominal surgery, significant comorbid conditions such as renal failure, malignancy, collagen vascular disease, those receiving chemo/radiotherapy, and patients with intraoperative increased intra-abdominal pressure were excluded.

5. Study Sampling

Consecutive sampling was used. All eligible patients admitted during the study period were included until the sample size of 68 was reached. The suturing technique was based on surgeon preference, reflecting routine clinical practice.

6. Study Sample Size

The minimum sample size was calculated to be 68 based on expected differences in wound dehiscence rates, with 95% confidence level and 80% power. Patients were equally distributed into two groups of 34 each.

7. Study Groups

Participants were divided into two groups: the study group included patients who underwent interrupted suturing of the

rectus sheath, and the control group included patients who underwent continuous suturing. Each group consisted of 34 patients.

8. Study Parameters

The primary parameter assessed was postoperative wound dehiscence. Secondary parameters included mean rectus sheath closure time, mean suture length used, incidence of wound infection, and duration of hospital stay. All outcomes were assessed clinically during the postoperative period.

9. Study Procedure

Eligible patients were identified preoperatively and informed consent was obtained. Emergency exploratory laparotomy was performed under standard protocol. Rectus sheath closure was done using either interrupted or continuous suturing. Intraoperative details and postoperative outcomes were recorded until discharge.

10. Study Data Collection

Data were collected using a structured case report form. Demographic details, operative findings, suturing technique, closure time, suture length, wound infection, wound dehiscence, and hospital stay were documented systematically. Patient confidentiality was maintained.

11. Data Analysis

Data were entered into Microsoft Excel and analyzed using appropriate statistical software. Continuous variables were expressed as mean ± standard deviation, and categorical variables as percentages. Independent t-test and chi-square test were used for comparison. A p-value <0.05 was considered statistically significant.

12. Ethical Considerations

Institutional Ethics Committee approval was obtained prior to the study. Written informed consent was taken from all participants. The study did not alter standard surgical management and posed no additional risk. Confidentiality of patient information was strictly maintained. The study was self-funded.

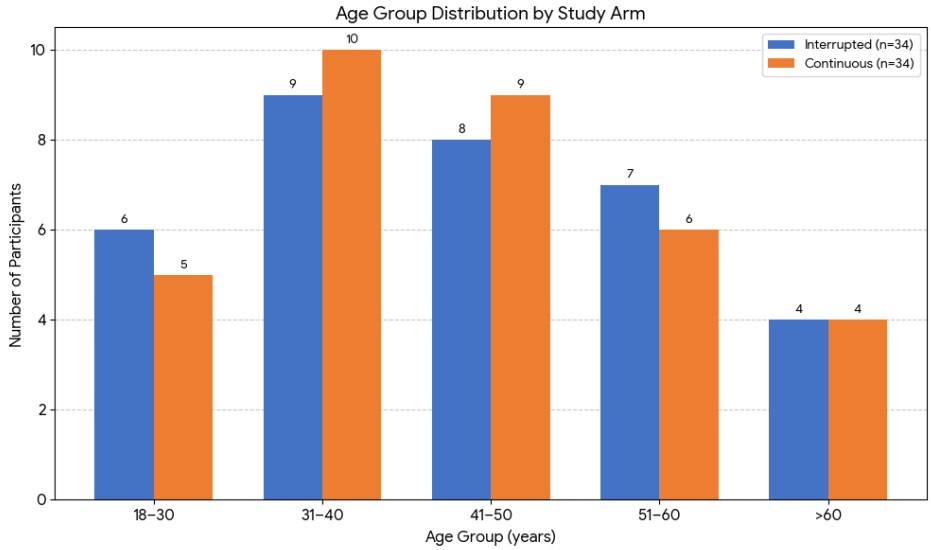
RESULTS

1: Age Distribution of Study Participants

Majority of patients belonged to 31–50 years age group. Age distribution was comparable between groups (Table 1).

Table 1: Age Distribution of Study Participants

Age Group (years)	Interrupted (n=34)	Continuous (n=34)	Total (n=68)
18–30	6	5	11
31–40	9	10	19
41–50	8	9	17
51–60	7	6	13
>60	4	4	8



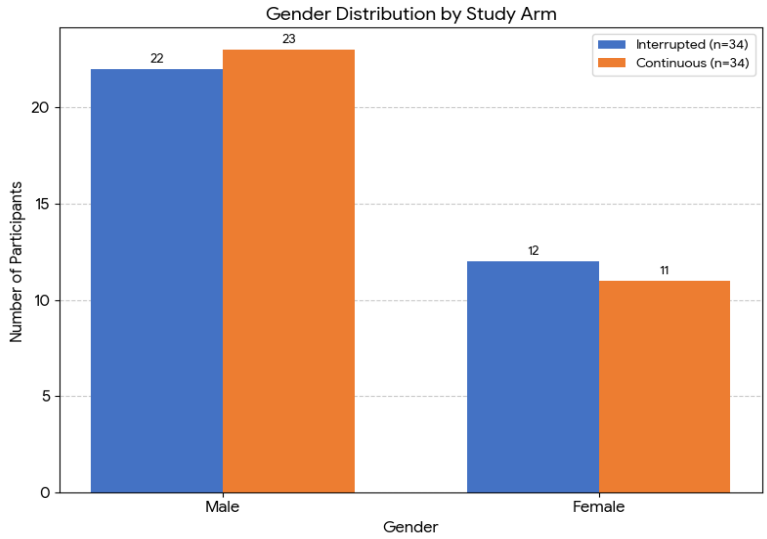
Graph 1: Age Distribution of Study Participants

2: Gender Distribution

Male patients constituted the majority of the study population. Gender distribution was similar in both groups (Table 2).

Table 2: Gender Distribution

Gender	Interrupted (n=34)	Continuous (n=34)	Total
Male	22	23	45
Female	12	11	23



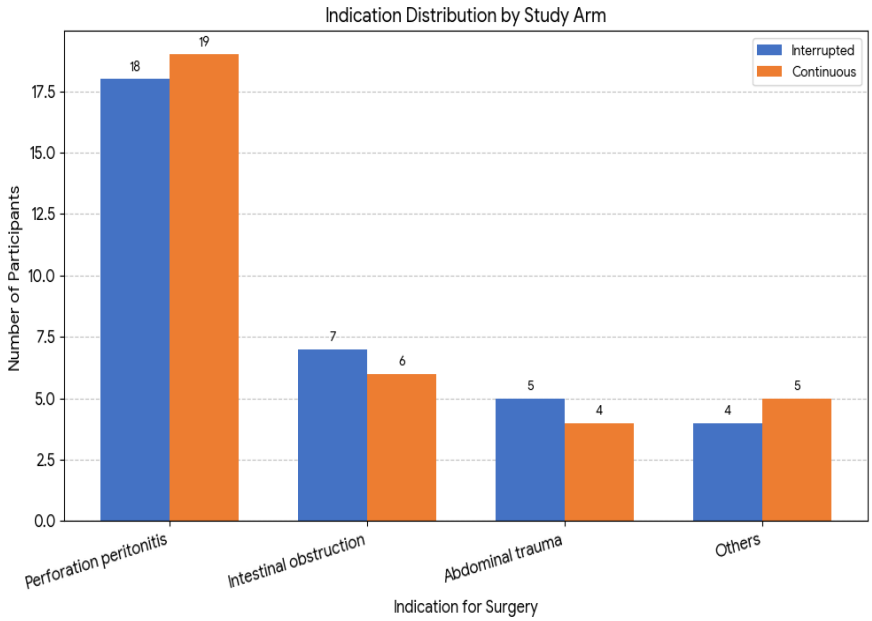
Graph 2: Gender Distribution

3: Indications for Exploratory Laparotomy

Perforation peritonitis was the most common indication. Distribution of indications was comparable (Table 3).

Table 3: Indications for Exploratory Laparotomy

Indication	Interrupted	Continuous	Total
Perforation peritonitis	18	19	37
Intestinal obstruction	7	6	13
Abdominal trauma	5	4	9
Others	4	5	9



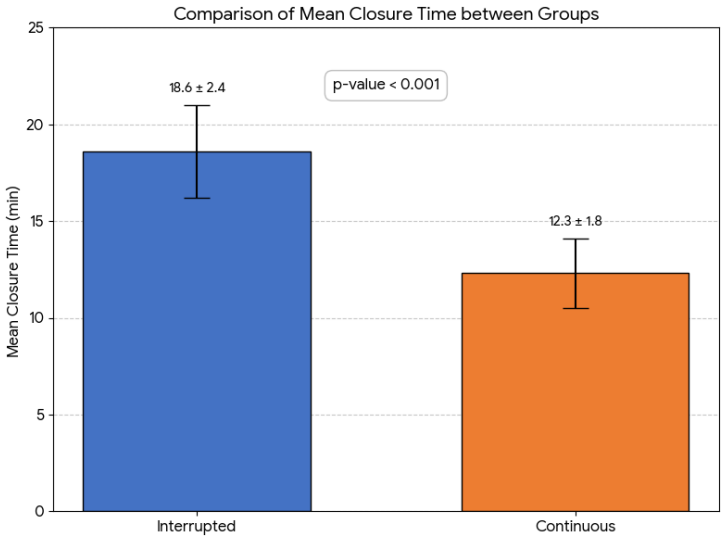
Graph 3: Indications for Exploratory Laparotomy

4: Mean Closure Time (minutes)

Continuous suturing significantly reduced closure time. The difference was statistically significant (Table 4).

Table 4: Mean Closure Time (minutes)

Parameter	Interrupted	Continuous	p-value
Mean Closure Time (min)	18.6 ± 2.4	12.3 ± 1.8	<0.001



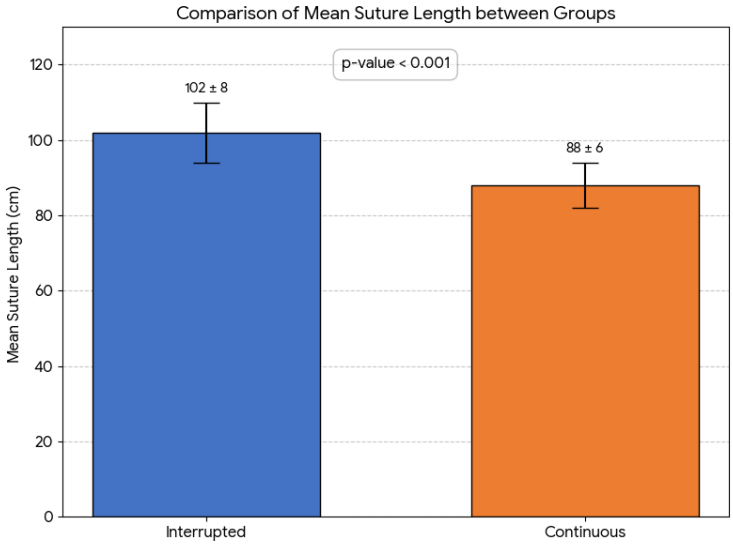
Graph 4: Mean Closure Time (minutes)

5: Mean Suture Length Used (cm)

Interrupted suturing consumed more suture material. Continuous suturing was more economical (Table 5).

Table 5: Mean Suture Length Used (cm)

Parameter	Interrupted	Continuous	p-value
Mean Suture Length (cm)	102 ± 8	88 ± 6	<0.001



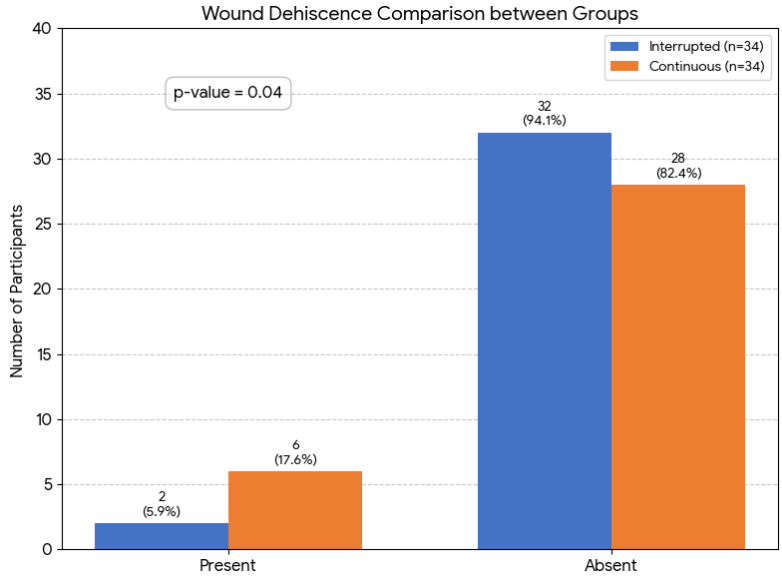
Graph 5: Mean Suture Length Used (cm)

6: Incidence of Wound Dehiscence

Wound dehiscence was lower in the interrupted group. The difference was statistically significant (Table 6).

Table 6: Incidence of Wound Dehiscence

Wound Dehiscence	Interrupted	Continuous	p-value
Present	2 (5.9%)	6 (17.6%)	0.04
Absent	32 (94.1%)	28 (82.4%)	



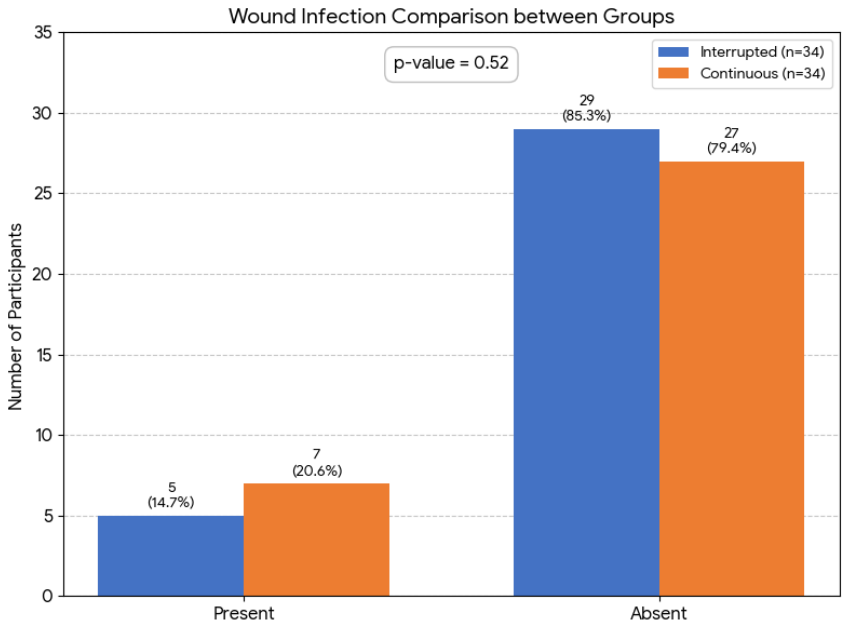
Graph 6: Incidence of Wound Dehiscence

7: Incidence of Surgical Site Infection

Wound infection rates were slightly higher in the continuous group. However, the difference was not statistically significant (Table 7).

Table 7: Incidence of Surgical Site Infection

Wound Infection	Interrupted	Continuous	p-value
Present	5 (14.7%)	7 (20.6%)	0.52
Absent	29 (85.3%)	27 (79.4%)	



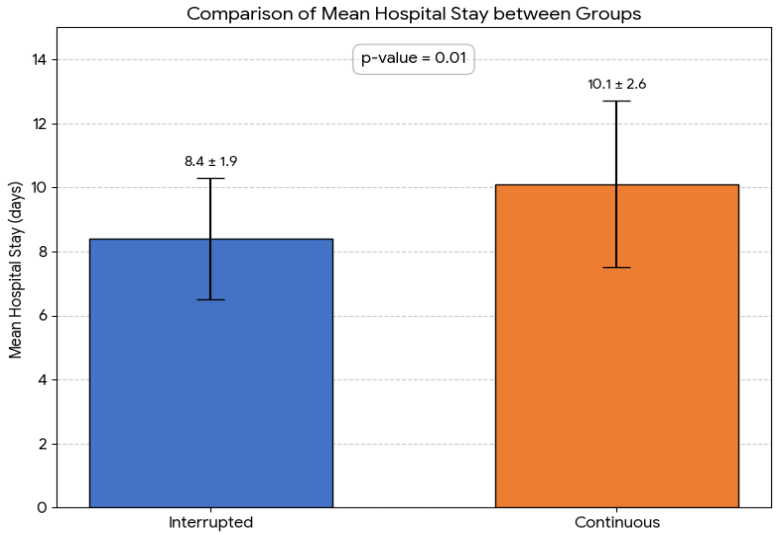
Graph 7: Incidence of Surgical Site Infection

8: Mean Duration of Hospital Stay (days)

Patients in the interrupted group had shorter hospital stays. The difference was statistically significant (Table 8).

Table 8: Mean Duration of Hospital Stay (days)

Parameter	Interrupted	Continuous	p-value
Mean Hospital Stay (days)	8.4 ± 1.9	10.1 ± 2.6	0.01



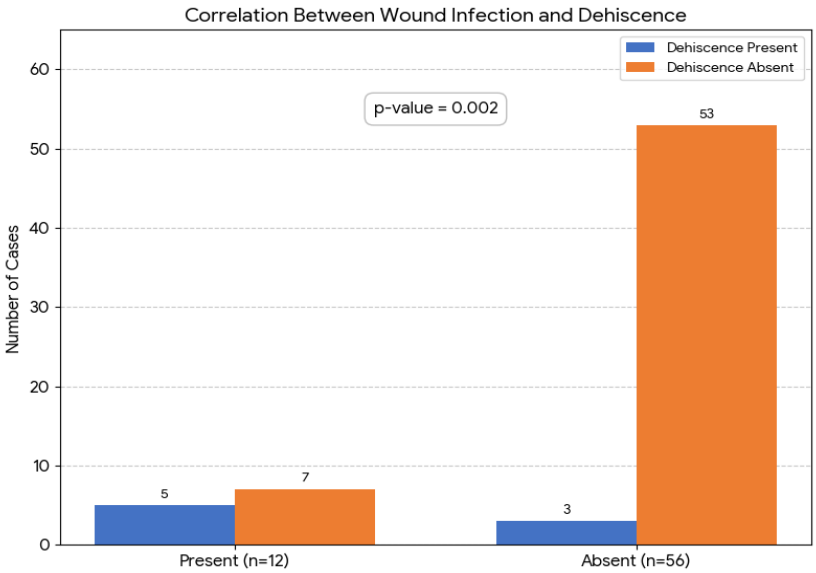
Graph 8: Mean Duration of Hospital Stay (days)

9: Association Between Wound Infection and Dehiscence

Wound infection was strongly associated with wound dehiscence. Infection significantly increased risk of dehiscence (Table 9).

Table 9: Association Between Wound Infection and Dehiscence

Wound Infection	Dehiscence Present	Dehiscence Absent	p-value
Present (12)	5	7	0.002
Absent (56)	3	53	



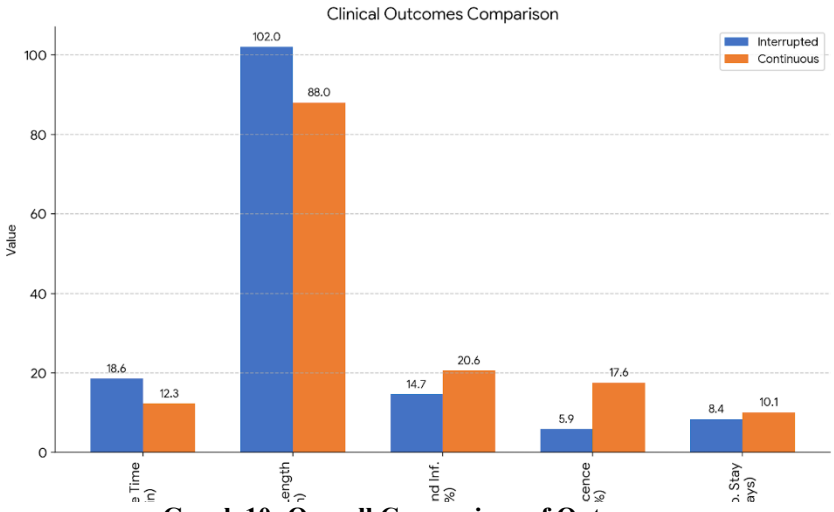
Graph 9: Association Between Wound Infection and Dehiscence

10: Overall Comparison of Outcomes

Interrupted suturing significantly reduced wound dehiscence and hospital stay. Continuous suturing significantly reduced closure time and suture usage (Table 10).

Table 10: Overall Comparison of Outcomes

Outcome	Interrupted	Continuous	p-value
Mean Closure Time (min)	18.6 ± 2.4	12.3 ± 1.8	<0.001
Mean Suture Length (cm)	102 ± 8	88 ± 6	<0.001
Wound Infection (%)	14.7%	20.6%	0.52
Wound Dehiscence (%)	5.9%	17.6%	0.04
Mean Hospital Stay (days)	8.4 ± 1.9	10.1 ± 2.6	0.01



Graph 10: Overall Comparison of Outcomes

DISCUSSION

The present prospective observational study compared continuous and interrupted suturing techniques for rectus sheath closure in exploratory laparotomy. Baseline demographic variables including age, gender distribution, and surgical indications were comparable between groups, ensuring homogeneity and reducing confounding. Perforation peritonitis constituted the most common indication (54.4%), consistent with emergency laparotomy patterns in similar surgical settings.

Continuous suturing significantly reduced mean closure time (12.3 ± 1.8 minutes vs 18.6 ± 2.4 minutes, $p < 0.001$) and required less suture material (88 ± 6 cm vs 102 ± 8 cm, $p < 0.001$). These findings align with the meta-analysis by Gupta et al. [11], which demonstrated technical efficiency and shorter operative duration with continuous closure without compromising safety. Similarly, Richards et al., in their large randomized prospective study of 571 patients, reported comparable wound outcomes between techniques, while highlighting the procedural simplicity of continuous suturing [12].

However, in our study, wound dehiscence was significantly lower in the interrupted group (5.9% vs 17.6%, $p = 0.04$). This contrasts with the findings of Van't Riet et al. [13], whose meta-analysis showed no significant difference in dehiscence rates between techniques. The higher dehiscence in the continuous group in our study may reflect emergency operative conditions, contamination severity, or variations in suture technique. Israelsson and Jonsson emphasized the importance of maintaining an optimal suture length-to-wound length ratio (≥4:1) to reduce incisional failure; deviation from this principle in continuous closure may contribute to higher disruption rates [14].

Surgical site infection rates were slightly higher in the continuous group (20.6% vs 14.7%), though not statistically significant ($p = 0.52$), consistent with prior literature indicating no clear superiority of one technique in preventing infection. Notably, infection was strongly associated with wound dehiscence in our cohort ($p = 0.002$), reinforcing the biological impact of sepsis and contamination on fascial healing.

Mean hospital stay was significantly shorter in the interrupted group (8.4 ± 1.9 vs 10.1 ± 2.6 days, $p = 0.01$), likely reflecting lower dehiscence rates and fewer wound-related complications.

Overall, while continuous suturing demonstrated clear advantages in operative efficiency and suture economy, interrupted closure showed superior outcomes in preventing wound dehiscence and reducing hospital stay in the emergency setting. These findings suggest that technique selection should balance efficiency with patient-specific risk factors, particularly in contaminated laparotomy cases.

CONCLUSION

Interrupted rectus sheath closure demonstrated significantly lower wound dehiscence rates and shorter hospital stay in emergency exploratory laparotomy, despite longer operative time and higher suture consumption. Continuous suturing offered clear advantages in procedural efficiency and suture economy but was associated with higher dehiscence rates in contaminated settings. In high-risk emergency laparotomies, interrupted closure may provide greater fascial security. Selection of technique should consider patient risk profile, contamination status, and resource availability

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