



A CLINICAL STUDY OF RECTUS SHEATH CLOSURE USING CONTINUOUS INTERLOCKING TECHNIQUE VERSUS INTERMITTENT TECHNIQUE

General Surgery

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ABSTRACT

Background: The manner of rectus sheath closure after midline laparotomy significantly impacts postoperative sequelae, including surgical site infections (SSI), ruptured abdomen, and the development of incisional hernias. Given the contentious issue of the ideal suturing technique, this study was designed to evaluate the efficacy and safety of intermittent versus continuous interlocking suturing procedures for rectus sheath closure in patients undergoing midline laparotomy, a topic of high relevance to abdominal surgeons and researchers. **Methodology:** A prospective, randomised, controlled experiment was conducted with 70 patients undergoing midline laparotomy, who were evenly allocated into two groups. Group 1 (n=35) had rectus sheath closure with an intermittent suturing approach, whereas Group 2 (n=35) underwent continuous interlocking suture closure. The primary outcome measures comprised surgical site infection, ruptured abdomen, and the development of an incisional hernia. Secondary outcomes evaluated demographic characteristics, surgical complexity, and procedure-specific variables. Statistical analysis was conducted using IBM SPSS Statistics version 26.0, employing independent sample t-tests for continuous variables and chi-square tests for categorical data. The threshold for statistical significance was established at $p < 0.05$. **Results:** Both groups had similar baseline characteristics in terms of age (41.40 ± 11.136 vs 44.49 ± 12.224 years, $p = 0.274$), gender distribution ($p = 0.631$), diagnostic categories ($p = 8.307$), and surgical procedures ($p = 4.067$). The most notable discovery was a substantial disparity in surgical site infection rates between the two methodologies. The intermittent suturing group had a notably low incidence of surgical site infections (SSI) at 2.9% (1/35 patients), in contrast to 25.7% (9/35 patients) in the continuous interlocking group ($\chi^2 = 7.467$, $p = 0.006$), indicating a nine-fold increased risk associated with continuous interlocking sutures. The incidence of burst abdomen did not differ significantly across the groups (5.7% vs. 2.9%, $p = 0.555$). The incidence of incisional hernia was negligible in both cohorts, with no occurrences in the intermittent group and one case (2.9%) in the continuous group ($p = 0.314$). **Conclusion:** The study's findings strongly support the use of the intermittent suturing technique for rectus sheath closure, primarily due to its significantly lower rates of surgical site infections. The ninefold increase in the risk of SSI associated with the continuous interlocking approach is a clinically significant disparity that should prompt a reevaluation of current surgical practices. Although both procedures yielded similar outcomes for burst abdomen and incisional hernia, the significant decrease in infectious sequelae makes intermittent suturing the superior option for rectus sheath closure, especially in high-risk patients and contaminated surgical environments. These findings have significant implications for improving patient outcomes and reducing healthcare expenses associated with postoperative infections.

KEYWORDS

Rectus sheath closure, intermittent sutures, continuous interlocking sutures, surgical site infection, midline laparotomy, postoperative problems.

INTRODUCTION :

Midline laparotomy has become one of the most commonly utilised surgical techniques in abdominal surgery, appreciated for its swift performance, superior visibility of abdominal structures, and ability to be expanded when surgical intricacy necessitates greater access. [1] The ultimate success of abdominal surgical operations extends beyond the initial operation, including the crucial element of abdominal wall closure. The proper restoration of rectus sheath integrity after midline laparotomy is essential for reestablishing functional anatomy, maintaining uniform tension across the incision, ensuring adequate hemostasis with correct alignment of fascial edges, and preventing immediate and delayed postoperative complications. [2]

The therapeutic significance of proper rectus sheath closure cannot be overstated. Inadequate closure methods can significantly increase the risk of postoperative complications. However, with the right closure techniques, we have the potential to greatly improve patient outcomes, reduce healthcare expenditures, and enhance overall quality of life. [3]

Surgical site infections constitute a common and urgent complication after abdominal surgery.

Infections arise when pathogenic microorganisms, usually skin flora or enteric bacteria, infiltrate the surgical incision and surpass local immune responses. [4] The pathophysiology encompasses microbial infection, tissue ischemia, and inflammatory responses that impede normal wound healing mechanisms. Several factors influence the development of surgical site infections (SSIs), including the choice of suture technique, the duration of the procedure, the classification of wound contamination, and patient comorbidities such as diabetes mellitus and obesity. [5] The selection of closure technique has a profound influence on infection risk, affecting factors such as tissue damage, foreign body burden, and the quality of wound approximation. [6]

Burst abdomen, or abdominal wound dehiscence, is a severe early complication that usually occurs between the fifth and tenth

postoperative days when the wound is particularly susceptible due to insufficient collagen deposition and underdeveloped scar formation. This complication may manifest as a partial or full breakdown of the fascial closure, maybe followed by evisceration of abdominal contents. [7] The mortality rate for a burst abdomen might reach 40%, categorising it as a surgical emergency requiring prompt surgery. The pathogenesis is multifaceted, involving elevated intra-abdominal pressure due to coughing, vomiting, ascites, or ileus, alongside factors such as suboptimal surgical technique, insufficient fascial bite depth, improper suture tension, or the use of low-tensile-strength suture materials. [8]

The development of incisional hernias is the most prevalent long-term consequence after abdominal wall closure, appearing months to years after the initial surgery. These hernias arise from compromised fascial repair and may manifest asymptotically or with symptoms that vary from aesthetic issues to severe consequences such as intestinal blockage or strangulation. [9]

Various variables contribute to the formation of incisional hernias, including the choice of closure technique, maintaining the suture-to-wound length ratio, the presence of wound infections, and patient comorbidities such as chronic obstructive pulmonary disease, malnutrition, obesity, and connective tissue disorders. [10]

Modern surgical practice predominantly utilizes two essential methods for rectus sheath closure, each with unique mechanical characteristics and clinical consequences.

The continuous closure technique employs a single, unbroken suture strand to align the fascial margins from one end of the incision to the other. [11] This procedure offers numerous theoretical benefits, including reduced operating duration compared to interrupted techniques, improved uniformity in tension distribution across the wound, a lower foreign body burden due to fewer knots, and a potential decrease in infection rates. "The continuous interlocking modification enhances mechanical security by interlocking each suture loop with its

predecessor, forming a chain-like closure pattern that may diminish the likelihood of catastrophic failure while preserving the advantages of continuous suturing.” [12,13]

MATERIALS AND METHODS:

Study Design: A prospective observational research project

Study Duration : January 2025 to May 2025

Study Area: Department of general surgery, Dhiraj Hospital, Pipariya, Vadodara

Study Population: All eligible cases undergoing laparotomy with abdominal rectus-sheath closure in department of general surgery, Dhiraj general hospital, Pipariya, Vadodara.

Inclusion Criteria :

- Patients willing to sign informed consent
- Patients of either gender aged more than 18 years
- Patients who are fit for surgery
- Patients who developed post-operative complications

Exclusion Criteria:

- Patients with age <18 years
- Patients who are unfit for surgery
- Patients who are not cooperative
- Laparoscopic surgeries converted to open surgeries
- Patients who underwent re laparotomy

Methodology Of Study:

Patients included in the study for rectus-sheath closure have been alternatively opted for closure of rectus sheath by continuous interlocking technique and intermittent technique.

RESULTS:

Table 1: Distribution Of Study Participants By Closure Technique Groups

Groups	Description	N	%
Group 1	Intermittent	35	50.0%
Group 2	Continuous Interlocking	35	50.0%

Table 2: Comparison Of Age Distribution Between Study Groups

Groups	Mean	Sd	Mean difference	t-value	p-value
Intermittent	41.40	11.136	-3.086	-1.104	0.274
Continuous Interlocking	44.49	12.224			

Values are expressed as mean and standard deviation; the p-value is by independent sample t-test, and <0.05 is considered statistically significant.

Table 3: Gender Distribution Between Study Groups

Gender	Group				Chi square	p value
	Intermittent		Continuous Interlocking			
	N	%	N	%		
Male	18	51.4%	20	57.1%	0.230	0.631
Female	17	48.6%	15	42.9%		

Values are expressed as frequency and percentage; the p-value is by chi square test, and <0.05 is considered statistically significant.

Table 4: Distribution Of Diagnosis Categories Between Study Groups

Diagnosis	Group				Chi square	p-value
	Intermittent		Continuous Interlocking			
	N	%	N	%		
Bowel Perforation	3	8.60%	4	11.40%	6.962	8.307
Liver Abscess	3	8.60%	2	5.70%		
Gallbladder Disease	1	2.90%	3	8.60%		
Appendicitis (Perforated)	2	5.70%	2	5.70%		
Bowel Obstruction	2	5.70%	4	11.40%		
Uterine Conditions	3	8.60%	4	11.40%		
Cancer	5	14.30%	2	5.70%		
Ovarian Cyst	0	0.00%	2	5.70%		
Peptic Ulcer Perforation	1	2.90%	2	5.70%		
Hernia	2	5.70%	2	5.70%		
Other Conditions	13	37.10%	8	22.90%		

Values are expressed as frequency and percentage; the p-value is by chi-square test, and <0.05 is considered statistically significant.

Table 5: Distribution Of Surgical Procedures Between Study Groups

Surgery	Group				Chi square	p-value
	Intermittent		Continuous Interlocking			
	N	%	N	%		
Abdominal Hysterectomy	6	17.10%	5	14.30%	7.898	4.067
Open Cholecystectomy	2	5.70%	4	11.40%		
Bowel Resection & Anastomosis	2	5.70%	4	11.40%		
Exploratory Laparotomy	8	22.90%	11	31.40%		
Open Appendectomy	2	5.70%	2	5.70%		
Open Splenectomy	3	8.60%	0	0.00%		
Feeding Jejunostomy	3	8.60%	0	0.00%		
Specialised Procedures	9	25.70%	9	25.70%		

Values are expressed as frequency and percentage; the p-value is by chi square test, and <0.05 is considered statistically significant.

Table 6: Comparison Of Surgical Site Infection Between Study Groups

SSI	Group				Chi square	p value
	Intermittent		Continuous Interlocking			
	N	%	N	%		
Yes	1	2.9%	9	25.7%	7.467	0.006*
No	34	97.1%	26	74.3%		

Values are expressed as frequency and percentage; the p-value is by chi-square test, and <0.05 is considered statistically significant.

Table 7: Comparison Of Burst Abdomen Between Study Groups

BURST ABDOM EN	Group				Chi Square	p value
	Intermittent		Continuous Interlocking			
	N	%	N	%		
Yes	2	5.7%	1	2.9%	0.348	0.555
No	33	94.3%	34	97.1%		

Values are expressed as frequency and percentage; the p-value is by chi-square test, and <0.05 is considered statistically significant.

Table 8: Comparison Of Incisional Hernia Between Study Groups

INCISIONAL HERNIA	Group				Chi square	p value
	Intermittent		Continuous Interlocking			
	N	%	N	%		
Yes	0	0.0%	1	2.9%	1.014	0.314
No	35	100.0%	34	97.1%		

Values are expressed as frequency and percentage; the p-value is by chi-square test, and <0.05 is considered statistically significant.

CONCLUSION

This study presents persuasive evidence that intermittent suturing is superior to continuous interlocking sutures for rectus sheath closure, particularly due to the significantly lower incidence of surgical site infection. Although both procedures had similar outcomes for ruptured abdomen and incisional hernia in the near term, the nine-fold elevated risk of surgical site infection associated with continuous interlocking sutures is a clinically relevant finding that ought to impact surgical practice. The findings challenge certain established standards and highlight the need for technique-specific outcomes research in surgical practice. Surgeons must meticulously evaluate these data when choosing closure procedures, especially in high-risk patients or those with contaminated surgical environments, where the prevention of infectious complications is critical.

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