

COMPARISON OF VICRYL VERSUS PROLENE SUTURE IN CLOSURE OF MIDLINE RECTUS SHEATH FOLLOWING ELECTIVE LAPAROTOMY: A RANDOMIZED CONTROLLED TRIAL

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ABSTRACT

OBJECTIVES

This aimed to compare the incidence of wound dehiscence and surgical site infections following midline rectus sheath closure with Prolene and Vicryl sutures after laparotomy.

METHODOLOGY

This prospective, randomized, controlled trial was conducted in the Department of General Surgery at Hayatabad Medical Complex, Peshawar, over 6 months. A total of 152 patients (aged 18–70 years) undergoing elective midline laparotomy were randomly divided into two groups using simple randomization by coin-flip method: Group A (Prolene) and Group B (Vicryl), each consisting of 76 patients. Both groups underwent standardized continuous mass closure with a 4:1 suture-to-wound length ratio. Post-operative follow-up continued for 30 days at post-operative days 7, 14, and 30, to assess wound dehiscence, surgical site infection, and hospital stay. Data were analyzed using SPSS version 23, with $p \leq 0.05$ considered significant.

RESULTS

Wound dehiscence occurred in 4 (5.3%) patients in the Prolene group compared with 10 (13.2%) in the Vicryl group ($p < 0.05$). Surgical site infections were also significantly lower in the Prolene group 11 (14.4%) compared to the Vicryl 25 (32.9%) ($p < 0.05$). The hospital stay was slightly longer in the Vicryl group (7 ± 2 vs 5 ± 2), which was mainly due to post-operative complications ($p < 0.05$).

CONCLUSION

Closure of the midline rectus sheath with Prolene results in significantly fewer cases of wound dehiscence and surgical site infections compared to Vicryl. Prolene may be considered a favorable option for midline laparotomy closure to minimize post-operative complications and improve patient outcomes.

KEYWORDS: Prolene, Vicryl, Midline Laparotomy, Wound Dehiscence, Surgical Site Infection

INTRODUCTION

Laparotomy is one of the most commonly performed operations in general surgery. Opening of the abdomen through the midline is a quick and bloodless preferred approach, especially in emergency laparotomy procedures.^{1,2,3} Closure of the abdomen after laparotomy is a major concern and is associated with some complications. Laparotomy wound dehiscence (LWD), also known as burst abdomen, is a devastating complication after closure of the abdomen.^{4,5} Laparotomy wound dehiscence is defined as the separation of muscle layers or the aponeurotic layer of the laparotomy wound before healing.⁵ Wound dehiscence occurs when wound closure provides insufficient strength to the wound to bear the stress forces.^{5,6} So, when these forces become stronger than the wound strength, it results in wound dehiscence.^{1,7} Major risk factors for wound dehiscence are surgical

site infections, comorbidities, and wound closure technique. However, patient-related factors such as age, gender, BMI, smoking, or alcohol abuse or systemic illnesses also contribute.^{1,7,8} So, the ultimate preventive strategy is an optimal closure technique under the surgeon's control.⁹ Over the last decade, several efforts have been made to determine the gold standard technique for wound closure.³ To develop this, several suturing materials (such as monofilament v/s braided materials, slowly or rapidly absorbable v/s non-absorbable) and suturing techniques (continuous v/s interrupted) were studied.¹⁰ A meta-analysis and multiple studies have demonstrated that a continuous small-bite suturing technique using Prolene significantly reduces wound dehiscence compared to Vicryl in midline laparotomy closure.^{11,12,13} The rationale of this study is to compare post-operative wound dehiscence following closure of the midline rectus sheath with Vicryl and Prolene after elective

laparotomy. Although several international studies have compared different suture materials, data from regional populations remain limited, and surgical practices vary across institutions. Identifying the suture material associated with a lower risk of wound dehiscence will inform surgical decision-making and may help establish standardized best practices. This study aims to evaluate the incidence of wound dehiscence and surgical site infections following closure of the midline rectus sheath with vicryl and Prolene in midline laparotomy.

METHODOLOGY

This prospective, randomized controlled trial (RCT) was conducted at the Department of General Surgery, Hayatabad Medical Complex, Peshawar, over 6 months. The study was approved by the Ethical Review Board (HMC-QAD-F-2019) and conducted in accordance with the Declaration of Helsinki (IREB No. 1680).¹⁴ This trial is registered at ClinicalTrials.gov (NCT07451990), final updated on 4 March, 2026. All patients aged 18 to 70 years undergoing midline laparotomy for various abdominal pathologies were considered eligible for inclusion in the study. Patients with malnutrition or anemia (Hb < 10 g/dL), immunocompromised states or active infections; prior chemotherapy or radiotherapy; pregnancy; or previous midline laparotomy were excluded. The calculated sample size was 152 (76 per group) using WHO sample size calculator for comparison of two proportions with parameters like level of significance (α): 5%, power of the test ($1-\beta$): 80%, expected incidence of wound dehiscence in Prolene group: 6.9%, expected incidence in Vicryl group: 16.9%.¹³ formula for comparing two proportions:

$$n = \frac{\left(\left(Z_{\left(\frac{\alpha}{2}\right)} + Z_{\beta} \right)^2 (p_1(1-p_1) + p_2(1-p_2)) \right)}{(p_1 - p_2)^2}$$

where p_1 and p_2 are the expected proportions of wound dehiscence in the Prolene (6.9%) and Vicryl (16.9%) groups, $\alpha = (p_1 - p_2)/2$, $Z_{1-\alpha/2}$ is the standard normal deviate for a two-sided α of 0.05 (1.96), and $Z_{1-\beta}$ is the standard normal deviate for 80% power (0.84). Patients were consecutively enrolled and then randomly assigned into two equal groups (Group A and Group B) using the flip-coin method. Group A underwent midline rectus-sheath closure with Prolene 1 (polypropylene, non-absorbable monofilament) using a continuous mass closure technique, while Group B had closure with Vicryl 1 (polyglactin 910, absorbable braided) using the same technique. In both groups, a suture-to-wound length ratio of 4:1, with 5 mm spacing, was maintained

according to standard guidelines. Skin was closed with interrupted non-absorbable sutures. standard perioperative care, including the supervision of a senior specialist surgeon, antibiotics, and wound care, was provided to all patients. All patients were followed for 30 days postoperatively through hospital visits or outpatient follow-up at post-operative days 7, 14, and 30. Loss of follow-up excluded the sample from the study. Wounds were examined clinically for dehiscence, which is defined as the separation of wound edges or visible underlying structures or evisceration of abdominal contents. All findings were documented on a structured proforma, and outcomes were analyzed. The primary outcome was the incidence of wound dehiscence within 30 days; associations with demographic and clinical variables, including age, gender, BMI, and comorbidities, were analyzed as secondary outcomes. Surgical site infection (SSI), according to the Centers for Disease Control and Prevention (CDC), is an infection occurring within 30 days after surgery involving the incision or deep tissues at the operative site with purulent discharge, positive culture, local signs of inflammation, or diagnosis by the treating surgeon. Data were analyzed using IBM SPSS version 23.0. quantitative variables, such as age and BMI, were presented as mean $\pm$ standard deviation or median (IQR), depending on normality, as assessed by the Shapiro–Wilk test. These were compared using an independent-samples t-test or a Mann-Whitney U test, where appropriate. Qualitative variables, such as gender and wound dehiscence, were reported as frequencies and percentages. The Chi-square test was applied to compare the incidence of wound dehiscence between the Prolene and Vicryl groups, and a p-value ≤ 0.05 was considered statistically significant.

RESULTS

A total of 152 patients were included, with 76 patients each in Group A (Prolene) and Group B (Vicryl). The eligibility consort flow chart is shown in Figure S1. As shown in Table 1, the mean age was 38.7 ± 11.99 years, and the data distribution was approximately symmetric (skewness-0.049). No age-related differences were observed between Groups A and B, and most participants were aged 31 to 50 years. Among these females, 64.5% were in the Prolene group and 76.3% in the Vicryl group, while among males, 35.5% were in the Prolene group and 23.7% in the Vicryl group. The mean BMI was 23.79 ± 3.48 kg/m², and the distribution was roughly symmetric. In results, both groups were comparable in baseline characteristics, including age, gender, BMI, and comorbidities, as shown in Tables 1 and 2.

Table 1: Baseline Demographic and Clinical Characteristics of Patients in Prolene and Vicryl Groups.

Variable	Group A (Prolene) n = 76	GroupB (Vicryl) n = 76	Total (n= 152)	p-value	
Age (years), mean ± SD	36.1 ± 9.1	39.7 ± 9.5	38.7 ± 11.9	0.083	
Age Categories, years					
<20.	09	07	16	0.462	
21–30	14	14	28		
31–40	13	25	38		
41–50	22	17	39		
Above 50	18	13	31		
Gender					
Male	27 (35.5%)	18 (23.7%)	45 (29.6%)	0.147	
Female	49 (64.5%)	58 (76.3%)	107 (70.4%)		
BMI (kg/m²) (mean ± SD)	20.3 ± 3.0	25.1 ± 8.1	23.7 ± 2.3	0.071	
BMI Categories					
Underweight (<18.5 kg/m²)	02	02	04	0.433	
Healthy Weight (18.5–24.9 kg/m²)	48	51	99		
Overweight (25.0 - 29.9 kg/m²)	21	18	39		
Obesity (30.0 and above kg/m²)	05	05	10		
Diabetes Mellitus					0.064
Yes	10	23	33		
No	66	53	119		
Hypertension					0.298
Yes	16	11	27		
No	60	65	125		
Smoking					0.184
Yes	29	21	50		
No	47	55	102		
Steroid Use					0.398
Yes	08	16	24		
No	68	60	128		
Chronic Anemia					0.093
Yes	19	10	29		
No	57	66	123		

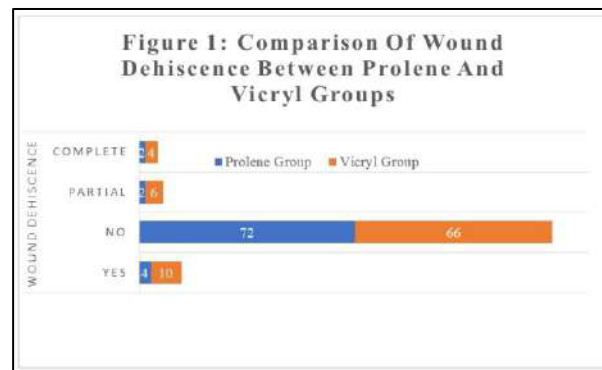
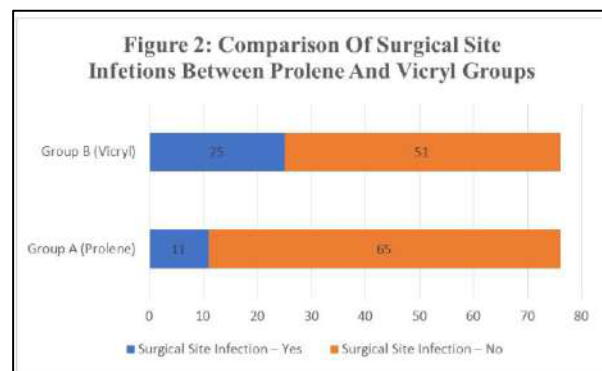
Note: Data are presented as mean $\pm$ standard deviation (SD) for continuous variables (independent sample t-test) and as number (%) for categorical variables (chi-square). Group A (Prolene) and Group B (Vicryl) each included 76 patients. BMI: Body Mass Index.

Table 2: Post-operative Outcomes in Prolene and Vicryl Groups

Outcome	Sub Groups	Group A (Prolene) n = 76	Group B (Vicryl) n = 76	Total n = 152	P-value
Wound Dehiscence	Yes	4(5.3%)	10(13.2%)	14(9.2%)	0.001
	No	72(94.7%)	66(86.8%)	138(90.8%)	
	Partial	2(2.6%)	6(7.9%)	8(5.3%)	
	complete	2(2.6%)	4(5.3%)	6(3.9%)	
Day of Dehiscence	mean $\pm$ SD	5.6 $\pm$ 3.1	8.1 $\pm$ 1.2	7.6 $\pm$ 4.5	0.078
Surgical Site Infection	Yes	11(14.4%)	25(32.9%)	36(23.3%)	0.001
	No	65(85.5%)	51(67.1%)	116(76.6%)	
Length of hospital stay	Number of Days	5 $\pm$ 2	7 $\pm$ 2		0.001

Note: Data are presented as numbers (%) for categorical variables and mean $\pm$ standard deviation (SD) for continuous variables. Wound dehiscence is further classified as partial or complete. Statistical significance was considered at $p < 0.05$.

However, wound dehiscence occurred significantly less often in the Prolene group (5.3%) compared to the Vicryl group (13.2%) ($p = 0.001$). Furthermore, partial and complete dehiscence were less frequent in the prolene group than in the Vicryl group. The mean day of dehiscence was earlier in the Prolene group (5.6 ± 3.1 days) than in the Vicryl group (8.1 ± 1.2 days), though this difference was not statistically significant ($p = 0.078$). The Prolene group showed significantly less wound dehiscence ($p = 0.000$) and fewer surgical site infections (14.5% vs. 32.9%, $p = 0.001$). Although the hospital stay was longer, this was mainly related to managing post-operative complications. Table 2 and Figure 1 and 2, also show that Group A had lower incidence of surgical site infections however the wound dehiscence occurs earlier than Group B. Figure 1 show, wound dehiscence occurred in 5.3% of the Group A and 13.2% of the Group B, with partial dehiscence seen in 2.6% vs. 7.9% and complete dehiscence in 2.6% vs. 5.3%, respectively showing significantly better outcomes with Prolene sutures. Figure 2 shows that surgical site infections occurred in 25 patients in the Vicryl group, compared with 11 in the Prolene group.

**Figure 1: Comparison of Wound Dehiscence between Prolene and Vicryl Groups****Figure 2: Comparison of Surgical Site Infections between Prolene and Vicryl Groups**

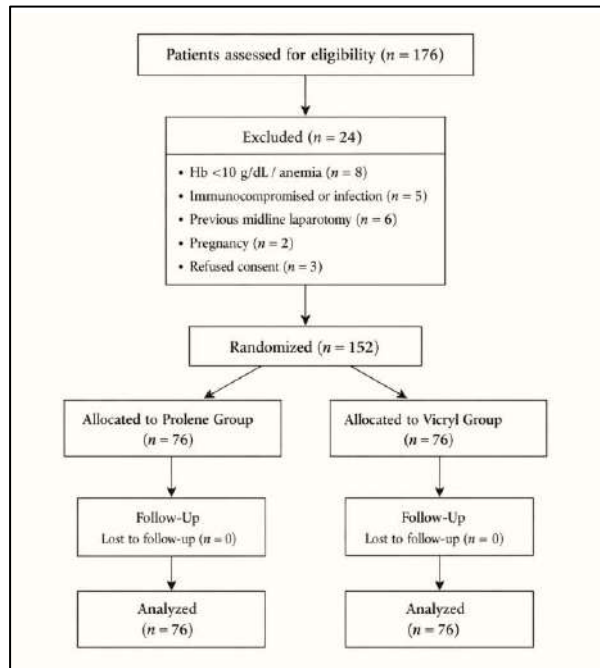


Figure S1: CONSORT flow diagram showing patient selection, randomization, allocation, follow-up, and analysis

DISCUSSION

this study demonstrates that closure of the midline rectus sheath with Prolene is associated with fewer post-operative complications, including wound dehiscence and surgical site infection, compared with Vicryl. These findings align with those of Diener et al., who concluded that continuous suturing with slowly absorbable monofilament sutures and a 4:1 ratio provides optimal strength and lower complications.¹¹ Similarly, Pandey et al. and Fortelny et al. reported lower dehiscence with Prolene (6%) compared to Vicryl (17%).^{12,13} Fortelny et al. also supported the use of continuous small-bite monofilament suturing to reduce post-operative complications.¹² In the present study, the closure was standardized by continuous small bite mass closure with both groups, and a constant ratio of suture length was used, ensuring that the only variable was suture material. This reflects the point distinction between the outcome of using Prolene vs Vicryl when all other operative factors are controlled. Another randomized controlled trial involving 100 patients, in which the incidence of wound dehiscence after Vicryl and Prolene was studied, also supports the findings of this study. The incision was closed by continuous far and near suture technique using polypropylene (Prolene) suture in one group and a synthetic delayed absorbable polyglactin 910 (Vicryl) suture in the other group. There was a significant difference in the incidence of wound dehiscence between the two groups: 6% with Prolene and 17%

with Vicryl. The overall incidence of wound dehiscence was 11.5 % in this study.^{12,13} Several studies support the present findings that Prolene sutures result in fewer wound complications than Vicryl, as in our study. However, other studies, such as those by Zahra et al. and Alam et al., found no significant difference between the two materials, suggesting that surgical technique and infection control may play a greater role than suture type alone.^{6,15} Thus, differences in suture types affect post-operative complications, indicating that meticulous surgical technique, patient comorbidities, and infection control also play important roles in preventing post-operative complications.^{16,17,18} This was a single-center study with a short (30-day) follow-up period and no blinding. Long-term complications, such as incisional hernia, were not assessed. Hernias or wound dehiscence often occur not because the suture material itself breaks, but because the suture pulls through the adjacent edematous, weakened, traumatized tissue during the early healing phases. This is particularly an issue in the metabolically active zone, where proteases break down the native tissue matrix as part of the repair process. We recommend future multicenter studies with extended follow-up to assess long-term outcomes of different suture materials and closure techniques in abdominal wall surgery.

CONCLUSIONS

This study demonstrates that midline laparotomy wound closure with Prolene is associated with fewer post-operative wound complications, including wound dehiscence and surgical site infection, compared to closure with Vicryl suture. Using a standardized continuous small-bite closure with a consistent suture-to-wound length ratio of 4:1 shows that the type of suture, rather than the closure technique, affects outcomes.

CONFLICT OF INTEREST: None

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The authors accept responsibility for all aspects of the work and will ensure that any concerns regarding the accuracy or integrity of any part are properly investigated and resolved.



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