



COMPARATIVE EVALUATION OF WOUND HEALING AND POSTOPERATIVE COMPLICATIONS USING 1-0 VICRYL VERSUS 1-0 PROLENE FOR RECTUS SHEATH CLOSURE

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ABSTRACT

Background: The closure of the rectus sheath is essential in abdominal procedures to guarantee wound integrity, promote optimal healing, and avert problems such as wound dehiscence or incisional hernia. The choice of suture material profoundly affects postoperative results.

Aim: This study aimed to compare wound healing and postoperative complications associated with 1-0 Vicryl and 1-0 Prolene sutures for rectus sheath closure in midline laparotomy.

Materials and Methods: A prospective comparative study was conducted on 60 patients undergoing elective midline laparotomy at a tertiary care center. The patients were randomly divided into two groups of 30 each. Group A underwent rectus sheath closure using 1-0 Vicryl, while Group B was closed with 1-0 Prolene. Standard surgical and aseptic techniques were followed in all cases. Postoperative assessment was done on days 3, 7, and 30, and subsequently at 3 and 6 months. Parameters assessed included postoperative pain, local wound infection, seroma or hematoma formation, wound dehiscence, and development of incisional hernia. Data were analyzed using appropriate statistical tests, and p-values <0.05 were considered significant.

Results: The average age of patients in the Vicryl group was 44.6 ± 12.3 years, while in the Prolene group it was 46.1 ± 11.7 years, with no significant demographic disparity. Postoperative pain levels were marginally elevated in the Prolene group throughout the initial postoperative phase. The occurrence of wound infection was 10% in the Vicryl group and 13.3% in the Prolene group, indicating no statistically significant difference. Seroma development was observed in 6.6% of Vicryl cases and 10% of Prolene cases. Partial wound dehiscence occurred in 2 cases (6.6%) within the Vicryl group and in 3 cases (10%) within the Prolene group. At the six-month follow-up, one instance of incisional hernia (3.3%) was documented in the Vicryl group, but two instances (6.6%) were noted in the Prolene group. Wound healing was acceptable in both groups, exhibiting identical complication rates; however, Vicryl demonstrated somewhat superior tissue integration and reduced postoperative pain.

Conclusion: Both 1-0 Vicryl and 1-0 Prolene are efficacious materials for rectus sheath closure, exhibiting comparable rates of wound healing and postoperative complications. Vicryl exhibited superior patient comfort and reduced postoperative pain, whilst Prolene provided extended tensile strength.

KEYWORDS: Prolene, Rectus Sheath Closure, Suture Material, Vicryl, Wound Healing.

Introduction

The closure of the abdominal wall is a crucial step in every laparotomy, as the integrity of the wound directly affects postoperative healing and long-term prognosis[1]. The closure of the rectus sheath during abdominal wall repair is particularly significant as it imparts primary tensile strength to the wound[2].

A secure and efficient closure of the rectus sheath mitigates severe consequences, including wound dehiscence, abdominal rupture, and incisional hernia, all of which can substantially elevate patient morbidity, extend hospital stays, and increase healthcare expenditures. Therefore, the choice of suitable suture material is essential for achieving optimal wound healing and reducing postoperative problems[3,4].

Suture materials vary in their physical and biological characteristics, including tensile strength, elasticity, tissue reactivity, and absorption profile, all of which affect the healing process. An optimal suture material must preserve appropriate tensile strength until the wound attains sufficient intrinsic strength, limit tissue reactivity, facilitate ease of handling, and yield a cosmetically acceptable scar[5]. Historically, various materials—both absorbable and non-absorbable—have been employed for rectus sheath closure, with persistent discourse concerning which offers the optimal equilibrium between strength and biocompatibility[6].

Polyglactin 910 (Vicryl) is a synthetic, braided, absorbable suture made from a copolymer of glycolide and lactide. It offers dependable tensile strength in the initial stages of recovery and is entirely dissolved through hydrolysis after around 60 to 90 days[7]. Vicryl elicits minimal tissue response and is recognized for its flexibility, knot stability, and ease of manipulation. Its absorbable characteristics eradicate the prolonged existence of a foreign entity, perhaps enhancing comfort and diminishing the likelihood of chronic sinus development or suture-associated infection[8]. Concerns have been expressed about the potential for wound gaping or hernia formation if the suture's tensile strength diminishes prior to sufficient collagen deposition in the healing area.

Conversely, polypropylene (Prolene) is a monofilament, non-absorbable synthetic suture recognized for its superior tensile strength, smooth tissue passage, and infection resistance[9]. Prolene maintains its strength indefinitely, offering enduring mechanical support to the healing wound. Its non-absorbable nature renders it a persistent foreign body, perhaps resulting in discomfort, chronic agony, or the creation of a suture sinus. Moreover, the monofilament configuration, although beneficial in reducing bacterial adherence, might complicate knot tying due to its propensity to slip[10,11].

Despite extensive research, a universal agreement on the optimal suture material for rectus sheath closure remains elusive. The decision frequently relies on the surgeon's

expertise, patient characteristics, and the particular surgical circumstances. In sterile, elective laparotomies, it is crucial to balance enduring support with minimum tissue response. This study seeks to offer evidence-based recommendations on the appropriate suture material for enhancing healing and reducing complications in abdominal surgeries by evaluating two frequently utilized suture materials under analogous situations.

Aims and Objectives

To compare wound healing and postoperative complications associated with 1-0 Vicryl and 1-0 Prolene sutures for rectus sheath closure in midline laparotomy.

Materials and Methods

This prospective comparative study was carried out in the Department of General Surgery, Sree Mookambika Institute of Medical Sciences, Kulasekharam, over a period of 12 months. A total of 60 patients undergoing elective midline laparotomy for various benign and malignant conditions were included in the study. Patients were randomly allocated into two equal groups of 30 each using a computer-generated randomization sequence.

- **Group A:** Rectus sheath closure with 1-0 Vicryl (absorbable suture)
- **Group B:** Rectus sheath closure with 1-0 Prolene (non-absorbable suture)

All patients were operated on by experienced surgeons following uniform surgical principles to minimize inter-operator variability.

Inclusion Criteria

1. Patients aged between 18 and 65 years.
2. Patients undergoing elective midline laparotomy for gastrointestinal, gynecological, or other intra-abdominal procedures.
3. Patients who provided informed written consent for participation in the study and follow-up.

Exclusion Criteria

1. Emergency laparotomy cases.
2. Patients with diabetes mellitus, chronic steroid use, immunosuppression, or malnutrition.
3. Patients with pre-existing wound infections or sepsis.
4. Patients who did not consent to follow-up.

All surgeries were performed under strict aseptic precautions by experienced surgeons following uniform operative protocols to ensure consistency. After completion of the intra-abdominal procedure, the rectus sheath was identified and closed using the assigned suture material. In both groups, a continuous suturing technique was used, maintaining uniform bites of approximately 1 cm from the wound edge and 1 cm apart, ensuring a suture-to-wound length ratio of 4:1. This technique was adopted to provide even tension distribution and adequate wound support without causing

ischemia at the wound margins. The subcutaneous tissue was irrigated with normal saline, and the skin was closed with interrupted 2-0 nylon sutures in all patients. Standard sterile dressings were applied at the end of the procedure.

Postoperative management was similar in both groups. All patients received intravenous antibiotics for the first 48 hours, followed by oral antibiotics for five days, along with analgesics for pain relief. Dressings were changed on the third postoperative day, and wounds were inspected for signs of infection, seroma, or hematoma.

Skin sutures were removed between the eighth and tenth postoperative day. Patients were reviewed at regular intervals—on postoperative days 3, 7, and 10, and subsequently at 1 month, 3 months, and 6 months—to assess wound healing and detect any complications such as wound infection, seroma formation, hematoma, wound dehiscence, or incisional hernia. Postoperative pain was evaluated using a Visual Analogue Scale (VAS) on postoperative days 1, 3, and 7.

Data were collected prospectively using a predesigned proforma, which included demographic details, clinical findings, operative data, and postoperative observations. All data were compiled in Microsoft Excel and analyzed using SPSS software version 25.0.

Continuous variables such as age, pain scores, and duration of hospital stay were expressed as mean $\pm$ standard deviation and compared between groups using the Student's t-test. Categorical variables were expressed as frequencies and percentages, and analyzed using the Chi-square test or Fisher's exact test. A p-value less than 0.05 was considered statistically significant.

Observation and Results

The mean age was 44.6 ± 12.3 years in the Vicryl group and 46.1 ± 11.7 years in the Prolene group, with no significant difference ($p = 0.58$). Age and gender distributions were comparable between groups, with males comprising 60% and 53.3% in the Vicryl and Prolene groups, respectively ($p = 0.61$) (Table 1).

Table 1: Age and gender distribution of patients

	Vicryl (n=30)	Prolene (n=30)	p value
Age (years)			
18–30	6 (20%)	5 (16.7%)	0.58
31–45	10 (33.3%)	11 (36.7%)	
46–60	9 (30%)	10 (33.3%)	
>60	5 (16.7%)	4 (13.3%)	
Mean $\pm$ SD	44.6 ± 12.3	46.1 ± 11.7	
Gender			
Male	18 (60%)	16 (53.3%)	0.61
Female	12 (40%)	14 (46.7%)	

Table 2: Postoperative Pain (VAS Scores)

Postoperative Day	Vicryl (Mean $\pm$ SD)	Prolene (Mean $\pm$ SD)	p-value
Day 1	5.8 ± 1.0	6.3 ± 1.2	0.04*
Day 3	4.2 ± 0.9	4.6 ± 1.0	0.09
Day 7	2.1 ± 0.8	2.3 ± 0.9	0.52

Table 3: Postoperative Complications

Complication Type	Vicryl (n=30)	Prolene (n=30)	p-value
Wound Infection	3 (10%)	4 (13.3%)	0.69
Seroma Formation	2 (6.6%)	3 (10%)	0.64
Hematoma Formation	1 (3.3%)	1 (3.3%)	1.00
Wound Dehiscence	2 (6.6%)	3 (10%)	0.64
Incisional Hernia	1 (3.3%)	2 (6.6%)	0.55

Table 4: Mean Duration of Hospital Stay

Parameter	Vicryl (n=30)	Prolene (n=30)	p-value
Mean Hospital Stay (days) $\pm$ SD	8.3 ± 1.6	8.7 ± 1.8	0.38 (NS)

The mean operative time for rectus closure was slightly shorter in the Vicryl group (13.4 ± 2.1 minutes) when compared to Prolene group (14.2 ± 2.3 minutes), but the difference was statistically insignificant ($p=0.19$). Patients in the Prolene group experienced significantly higher pain on the first postoperative day ($p<0.05$), although pain differences equalized by the seventh day (Table 2).

Both groups showed comparable rates of postoperative complications. The Vicryl group had a slightly lower overall complication rate (23.3%) than the Prolene group (30%), but the difference was statistically insignificant ($p>0.05$). No major wound disruption or mortality was recorded in either group (Table 3).

The mean postoperative hospital stay was slightly shorter in the Vicryl group, though the difference was not statistically significant ($p>0.05$) (Table 4).

Discussion

The current study examined the results of rectus sheath closure with 1-0 Vicryl and 1-0 Prolene in 60 patients who had elective midline laparotomies over a duration of 12 months. The demographic distribution of both groups was equivalent, so excluding potential confounding effects of age or gender on postoperative results. The average age was 44.6 ± 12.3 years in the Vicryl group and 46.1 ± 11.7 years in the Prolene group, with a male predominance observed in both groups (60% vs. 53.3%, respectively).

Postoperative pain was somewhat elevated in the Prolene group during the initial postoperative phase, exhibiting a mean VAS score of 6.3, in contrast to 5.8 in the Vicryl group ($p = 0.04$). Nonetheless, this discrepancy diminished by day 3 and day 7, suggesting that initial discomfort associated with Prolene is temporary and likely due to its non-absorbable, monofilament properties.

The occurrence of postoperative problems was similar between the groups—7 (23.3%) in the Vicryl group compared to 9 (30%) in the Prolene group ($p = 0.56$). The incidence of wound infection, seroma, hematoma, and partial wound dehiscence exhibited no statistically significant variations, indicating that both materials ensure secure and successful fascial closure. One patient (3.3%) in the Vicryl group and two patients (6.6%) in the Prolene group developed incisional hernias, underscoring the clinical equivalence of both sutures in preserving long-term wound integrity.

The absorbable, braided structure of Vicryl, which provides improved pliability, less tissue irritation, and simpler handling, may account for the somewhat lower complication rate and decreased early pain in the Vicryl group. In contrast, Prolene, being a non-absorbable monofilament, maintains enduring tensile strength, which could be beneficial for individuals with a heightened risk of wound dehiscence or delayed healing.

The average hospital stay was 8.3 ± 1.6 days for the Vicryl group and 8.7 ± 1.8 days for the Prolene group, with no significant wound complications or death, so affirming the safety of both suture types for routine clinical application in elective laparotomy.

These results were consistent with earlier studies that compared absorbable and non-absorbable sutures for abdominal closure. Sayeed B et al.[12] documented enhanced wound healing and improved aesthetic results with non-absorbable sutures, ascribed to their enduring tensile strength and diminished loss of wound support during the healing process. Rao S et al.¹³ reported that Prolene resulted in reduced scarring and superior color compatibility with surrounding skin, but Vicryl Rapide was more cost-effective, necessitated no suture removal, and decreased hospital duration.

Mahmood F et al.[14] noted no significant differences in inflammation, scarring, or overall complication rates between absorbable and non-absorbable materials. Their study indicated an overall complication rate of 9.4%, with infection as the predominant occurrence (4.9%), succeeded by wound dehiscence (2.7%) and train tracking (2.3%). Although Vicryl Rapide exhibited marginally fewer problems, these variations were not statistically significant, indicating that both suture types function well when employed in suitable surgical circumstances.

Nikhil M et al.[15] found that early postoperative pain scores were comparable between groups; however, at one week and three months postoperatively, individuals in the Vicryl group reported significantly reduced pain scores. This discovery substantiates the idea that absorbable sutures may provide enhanced postoperative comfort owing to their flexibility and less foreign body retention.

Moledina M et al.[16] reported similar overall complication rates with Prolene (24.7%) and Vicryl (29.7%), with marginally elevated incidences of granuloma and suture infection in the Vicryl cohort, potentially attributable to its braided composition. Gupta D et al.[17] determined that Prolene was linked to a reduced incidence of wound dehiscences and overall morbidity, highlighting its enduring tensile stability, especially in patients with delayed healing. The authors highlighted that the enduring mechanical stability of Prolene ensures a robust closure, especially beneficial for high-tension wounds or in individuals experiencing delayed wound healing due to comorbidities like diabetes or malnutrition.

The findings of this study support the current literature indicating that both absorbable (Vicryl) and non-absorbable (Prolene) sutures are efficacious for rectus sheath closure, yielding similar postoperative results. The decision between the two may thus be influenced by surgeon preference, patient comfort, financial factors, and particular clinical

conditions.

Conclusion

Minor postoperative problems were experienced by Vicryl and Prolene groups with no statistically significant differences. Postoperative discomfort was somewhat elevated in Prolene patients but subsided after a week, although overall wound healing and duration of hospital stay were similar across groups. Vicryl's absorbable and flexible characteristics enhance patient comfort, while Prolene delivers robust long-term tensile strength. Both sutures are dependable, with selection customized based on surgeon preference and patient-specific considerations.

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Conflicts of Interest

There are no conflicts of interest.

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