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Original Research Article

Role of Prophylactic Retention Sutures in Midline Laparotomy in High-Risk Patients for Wound Dehiscence

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Abstract:

Background: Abdominal wound dehiscence is a serious postoperative complication associated with significant morbidity and mortality, with an incidence ranging from 0.4% to 3.5% and mortality rates between 10% and 45%. Despite advancements in surgical techniques, the incidence of wound dehiscence remains a critical concern. This study evaluates the role of prophylactic retention sutures in high-risk patients undergoing midline laparotomy to prevent wound dehiscence.

Materials and Methods: A prospective case-control study was conducted at King George Hospital, Visakhapatnam, from July 2020 to January 2022, involving 100 patients aged 20-70 years who underwent emergency midline laparotomy. Patients were randomized into two groups: the case group received prophylactic retention sutures (n=49), and the control group underwent conventional closure (n=51). Data collection included daily wound assessments, ultrasonography, and monitoring for postoperative complications such as wound infection, incisional hernia, reoperation, and hospital stay duration.

Results: The study found that wound dehiscence occurred in 8.16% of patients with prophylactic retention sutures compared to 25% in the control group ($p<0.05$). Wound infection rates were 20.4% in the retention suture group and 45% in the control group ($p<0.05$). Incisional hernia incidence was 4.08% with retention sutures and 7.8% without. Reoperation rates were 4% in the retention suture group versus 11% in the control group. The mean postoperative hospital stay was 11.16 days for retention sutures and 9.8 days for conventional closure. Pain assessment revealed significantly higher pain scores on postoperative day 5 in the retention suture group.

Conclusion: Prophylactic retention sutures significantly reduce the incidence of wound dehiscence and other related complications in high-risk patients undergoing midline laparotomy. Despite increased postoperative pain, the clinical benefits outweigh the drawbacks, making retention sutures a valuable preventive strategy for wound dehiscence in high-risk patients.

Keywords: Abdominal wound dehiscence, prophylactic retention sutures, midline laparotomy, postoperative complications, wound infection, incisional hernia.

Introduction

Abdominal wound dehiscence (AWD) is one of the most serious surgical complications, characterized by the separation of the margins of a closed surgical incision, which may or may not expose underlying tissues or organs. This condition is associated with significant morbidity and mortality, with an incidence of 0.4% to 3.5% following major abdominal surgeries and mortality rates ranging from 10% to 45% [1].

The consequences of AWD include increased mortality, delayed hospital discharge, readmission, further surgeries, delayed adjuvant treatment, inferior aesthetic outcomes, and diminished psychosocial well-being. Several risk factors contribute to AWD, including demographic factors, comorbid illnesses, and surgical techniques [1]. Despite numerous advances in surgical techniques, the incidence of AWD has not significantly decreased in recent years [1-4]. Various closure techniques have been proposed to prevent AWD, with some authors advocating for the use of prophylactic retention sutures. Retention sutures are recommended to reduce fascial disruption in vulnerable cases, such as those involving mass closure of the abdominal wall [5,6].

This study aims to evaluate the effectiveness of prophylactic retention sutures in high-risk patients undergoing midline laparotomy to prevent AWD.

Specifically, it examines the incidence of AWD in patients receiving retention sutures compared to those undergoing conventional abdominal closure and assesses the association of postoperative complications, including wound dehiscence, incisional hernia, wound infection, and postoperative hospital stay, in these patient groups.

Material and Methods

Study Population

The study was conducted on patients aged 20-70 years who were admitted to King George Hospital, Visakhapatnam. The study population included patients who were admitted through casualty and underwent emergency abdominal surgery.

Sample Size: A total of 100 patients were included in the study.

Study Setting: The study was conducted at King George Hospital, Visakhapatnam.

Study Duration: The study was conducted over a period of 2 years and 2 months, from July 2020 to January 2022.

Study Design: This was a prospective case-control study.

Methodology

Patients were informed about the aims and objectives of the study, and detailed informed written consent was obtained before their inclusion in the study. Relevant history was collected during hospitalization, and appropriate investigations were conducted using standard procedures. Patients admitted for emergency midline laparotomy with two or more risk factors for wound dehiscence were randomized and categorized into case and control groups. Patients who died within 2 weeks after surgery were considered lost to follow-up since most facial dehiscences occur within this period. The types of surgeries categorized included malignancy resection, gastrointestinal obstruction, trauma, and miscellaneous.

Surgical Technique

In the control group, the fascia was sutured continuously using a running 1-0 Prolene string placed 1 cm from the edge of the linea alba with 1-cm intervals. The running suture was locked intermittently every 5 cm to divide the long continuous suture into multiple smaller sections. Subcutaneous tissue was not sutured, and the skin was closed using interrupted nylon sutures.

In the case group, the fascia was sutured using the same technique as the control group. However, retention sutures were added using a 1 nylon string every 10 cm, encompassing 5 cm of the skin, subcutaneous tissue, rectus muscle, and abdominal fascia (except peritoneum) on each side. The first retention suture was placed 5 cm above the lower end of the incision and repeated every 10 cm towards the upper part of the incision. All fascia closures were performed by the same surgeon.

Data Collection

1. The occurrence of wound dehiscence (primary outcome) was assessed daily through precise examination of the wound. Digital examination of wound depth was performed to evaluate the integrity of the fascia when wound disruption and secretions were observed. Ultrasonography with a 7.5 MHz probe was used to assess the fascia when clinical findings were inconclusive.
2. Other postoperative outcomes assessed included evisceration, need to reoperate due to wound dehiscence, wound infection (based on clinical findings approved by microbiological culture), postoperative pain, length of postoperative hospital stay, occurrence of incisional hernia, and post-dehiscence in-hospital mortality.
3. Retention sutures were removed 3 or 4 weeks postoperatively when loose and bore no strain. Patients were followed for a median of 5 months.

Inclusion Criteria

1. Patients aged 20-70 years.
2. Patients who provided valid informed consent.
3. Adult patients who underwent midline laparotomy with two or more of the following risk factors:
    - Age over 60 years
    - Emergency laparotomy
    - Diabetes mellitus
    - Poor nutritional status (hypoalbuminemia)
    - Intra-abdominal infection
    - Malignancy
    - Anemia
    - Chronic pulmonary disease
    - Clinical jaundice
    - Hemodynamic instability (BP < 90 mm Hg)

Exclusion Criteria

1. Patients unwilling to participate in the study.
2. Patients below 20 years or above 70 years.
3. Patients who underwent midline laparotomy without any of the mentioned risk factors.

Data Analysis

Descriptive statistics were used to present the postoperative complications. The Chi-square test was used to determine the association between retention sutures and postoperative complications.

The data and results of statistical analysis were presented in terms of demographic variables,

clinical variables, and comparisons of postoperative complications between the suturing techniques.

Results

Data Analysis and Study Findings: Data were collected from 100 patients, out of which 49 patients underwent prophylactic retention sutures, and 51 underwent conventional abdominal closure. Descriptive statistics were used to present postoperative complications. The Chi-square test was used to determine the association between retention sutures and postoperative complications.

Distribution of Demographic Variables

Table 1: Age Distribution

Age Group	No. of Cases (N=100)	Wound Dehiscence
<20	1	0
21-30	10	1
31-40	18	3
41-50	24	5
>50	47	8

In this study, most patients were in the age groups >50 years and 41-50 years, comprising around 80% of the cases.

Table 2: Gender Distribution

Gender	Total	Wound Dehiscence
Male	72	11
Female	28	6

Most subjects in the study were males (72%).

Distribution of Clinical Variables

Table 3: Cause of Surgery

Cause	Cases	Wound Dehiscence
Sigmoid Volvulus	10	3
Blunt Injury	13	2
Perforation	35	5
Obstruction	34	4
Intussusception	4	0
Rupture Liver Abscess	4	1

Most cases were due to obstruction, around 50% of cases, often presenting with abdominal distension.

Distribution of Risk Factors

Table 4: Diabetes Mellitus

Diabetes Mellitus	No. of Cases	Cases with Wound Dehiscence
Present	22	13
Absent	78	4

Table 5: BMI

BMI (kg/m2)	No. of Cases	Cases with Wound Dehiscence
<35	92	10
35 and more	8	4

Majority of the cases showed that diabetes mellitus had more cases prone to wound dehiscence (around 50% of cases), and BMI also indicated that 10% of cases developed wound dehiscence.

Table 6: Wound Dehiscence

Prophylactic Retention Sutures	No. of Patients	Wound Dehiscence
Present	49	4 (8.16%)
Absent	51	13 (25%)

Around 8% of patients developed wound dehiscence in the retention suture group, whereas 25% developed wound dehiscence in the conventional closure group.

Table 7: Wound Infection

Wound Infection	Cases	Wound Infection
Prophylactic Retention Sutures	49	10 (20.4%)
Without Prophylactic Retention Sutures	51	23 (45%)

There were more cases (around 45%) that developed wound infection without retention sutures compared to 20% with retention sutures.

Table 8: Incisional Hernia

Cases	Incisional Hernia	Incidence
Prophylactic Retention Sutures	49	2
Without Prophylactic Retention Sutures	51	4

Around 4% developed incisional hernia with retention sutures compared to 7.8% with conventional closure.

Table 8: Reoperation

Cases	Reoperation
Prophylactic Retention Sutures	49
Without Prophylactic Retention Sutures	51

Table 9: Association of Suturing Techniques with Post-Operative Complications

Complications	Retention Sutures (N=49)	Without Prophylactic Retention Sutures (N=52)	Chi-Square
Wound Infection	YES: 10 (20%)	YES: 23 (45%)	0.001201
	NO: 39 (80%)	NO: 28 (55%)	
Wound Dehiscence	YES: 4 (8%)	YES: 13 (25%)	0.002303
	NO: 45 (92%)	NO: 38 (75%)	
Incisional Hernia	YES: 2 (4%)	YES: 4 (8%)	0.23366
	NO: 47 (96%)	NO: 47 (92%)	
Reoperation	YES: 2 (4%)	YES: 6 (11%)	0.060
	NO: 47 (96%)	NO: 45 (89%)	

The above table demonstrates the complications observed with retention sutures and normal abdominal closure in high-risk patients for wound dehiscence. The differences are statistically significant for wound infection and wound dehiscence in prophylactic retention sutures compared to normal closure in high-risk patients (p-value <0.05).

Pain Assessment

Among the patients with prophylactic retention sutures, the mean pain score on POD 5 was higher compared to patients without prophylactic retention sutures, with a p-value <0.001.

Conclusion

Prophylactic retention sutures significantly reduce the incidence of wound dehiscence and postoperative complications such as wound infection and incisional hernia in high-risk patients undergoing midline laparotomy.

However, there is an increased incidence of postoperative pain associated with retention sutures. Proper patient selection and surgical technique are crucial to maximizing the benefits of retention sutures in preventing wound dehiscence.

Discussion

Abdominal wound dehiscence (WD) is a critical postoperative complication, with an incidence ranging from 0.4% to 3.5% after major abdominal surgeries and associated mortality rates between 10% and 45% [1]. Despite advancements in surgical techniques, the incidence of WD remains largely unchanged (1-4). This study aimed to assess the efficacy of prophylactic retention sutures in preventing WD among high-risk patients undergoing midline laparotomy.

Demographic and Clinical Variables

In this study, the mean age of patients was 49.8 years, with a significant proportion of patients aged over 50 years. Older age is a known risk factor for impaired wound healing, contributing to higher WD rates. Additionally, 72% of the patients were male, aligning with other studies indicating a higher prevalence of WD in males due to factors

like higher incidence of emergency surgeries and comorbid conditions [5].

Risk Factors for Wound Dehiscence

Diabetes mellitus and obesity were identified as significant risk factors for WD. In our study, 50% of patients with BMI >35 kg/m² developed WD [5]. Similarly, 36.3% of diabetic patients developed WD (6). However, some studies have reported diabetes and obesity as non-independent variables for WD [6].

Prophylactic Retention Sutures and Wound Dehiscence

The incidence of WD was significantly lower in patients with prophylactic retention sutures (8.16%) compared to those without (25%), with a p-value of 0.00016. This finding aligns with other studies demonstrating the protective effect of retention sutures in high-risk patients [6,7,8].

Wound Infection and Other Complications

The incidence of wound infection was lower in patients with retention sutures (20.4%) compared to those without (45%), with a statistically significant p-value of 0.002. This suggests that retention sutures may help reduce the risk of wound infection, potentially by maintaining better wound integrity and reducing contamination. In our study, 4% of patients with retention sutures developed incisional hernia, compared to 7.8% without, indicating a trend towards reduced hernia rates with retention sutures, although this difference was not statistically significant (p=0.23366). Reoperation rates were also lower in the retention suture group (4%) compared to the control group (11%), although this difference did not reach statistical significance (p=0.060). The reduced need for reoperations further supports the efficacy of retention sutures in preventing WD and its associated complications [7].

Pain and Patient Discomfort

One of the concerns with retention sutures is the potential for increased postoperative pain and patient discomfort. The use of a more effective analgesic regimen, such as patient-controlled anesthesia, could potentially mitigate this issue [8,9].

Conclusion

Prophylactic retention sutures significantly reduce the incidence of WD and associated complications such as wound infection and incisional hernia in high-risk patients undergoing midline laparotomy. While there is an increase in postoperative pain, the benefits of reduced WD and related complications may outweigh the drawbacks. Proper patient selection, surgical technique, and management of modifiable risk factors are crucial for optimizing outcomes with retention sutures. Further studies with larger sample sizes and longer follow-up periods are warranted to confirm these findings and refine the use of retention sutures in clinical practice.

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