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COMPARATIVE ANALYSIS OF SINGLE-LAYERED THROUGH-AND-THROUGH CLOSURE VERSUS MASS CLOSURE TECHNIQUES IN EMERGENCY MIDLINE LAPAROTOMY FOR PERITONITIS: A PROSPECTIVE STUDY

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Abstract

This prospective study aims to evaluate the outcomes of single-layered through-and-through closure versus mass closure techniques in emergency midline laparotomy surgeries for peritonitis. A total of 100 patients diagnosed with acute peritonitis who underwent midline laparotomy were enrolled in the study, with 50 patients receiving single-layered closure and 50 receiving mass closure. The primary outcomes measured included postoperative complications, wound infection rates, and hospital stay duration. Secondary outcomes included pain scores and cosmetic results assessed at follow-up visits. The results indicated a significant reduction in wound infection rates in the single-layer closure group (10% vs. 30%, $p < 0.05$). Additionally, the average hospital stay was shorter in the single-layer group (5.2 days vs. 7.4 days, $p < 0.01$). Pain scores were also lower in the single-layer group at the 24-hour postoperative mark. The study concludes that single-layered through-and-through closure is a more effective and safer technique compared to mass closure in emergency midline laparotomies for peritonitis, leading to fewer complications and a quicker recovery for patients.

Keywords: Midline laparotomy, peritonitis, single-layer closure, mass closure, surgical outcomes

Introduction

Peritonitis, an inflammation of the peritoneum, can result from various causes, including perforated viscera, pancreatitis, and biliary pathology. Emergency midline laparotomy is often required for definitive surgical intervention in cases of acute peritonitis. The choice of closure technique post-laparotomy has significant implications for patient outcomes, particularly regarding wound complications, recovery times, and overall morbidity (1).

Traditionally, mass closure (also known as continuous closure) has been widely employed in midline laparotomies, where the peritoneum, fascia, and skin are closed in a single layer. This technique aims to minimize surgical time and reduce the incidence of abdominal compartment syndrome. However, it may be associated with higher rates of wound complications, including infections and dehiscence (2).

In contrast, single-layer through-and-through closure involves closing the peritoneum and fascia separately, which may provide better support to the abdominal wall and potentially lower the rates of complications (3). Several studies have suggested that single-layer closure may result in reduced postoperative pain, shorter hospital stays, and fewer instances of wound infections compared to mass closure techniques (4, 5).

Despite these observations, the clinical community remains divided on the optimal closure technique, and many surgeons continue to favor mass closure based on its historical prevalence and perceived simplicity. This comparative study aims to provide clarity on the efficacy of single-layered through-

and-through closure versus mass closure techniques in emergency midline laparotomies performed for peritonitis.

By analyzing postoperative complications, wound infection rates, and recovery times, this study seeks to contribute valuable insights into surgical practices for managing acute peritonitis, ultimately improving patient outcomes and healthcare efficiency.

Aim and Objectives:

Aim:

To compare the outcomes of single-layered through-and-through closure versus mass closure techniques in emergency midline laparotomy surgeries for peritonitis.

Objectives:

1. To assess the rates of postoperative complications and wound infections between the two closure techniques.
2. To evaluate hospital stay duration and pain scores in patients following either closure method.

Materials and Methods:

This prospective comparative study was conducted over a period of 12 months at a tertiary care hospital. A total of 100 patients diagnosed with acute peritonitis and requiring emergency midline laparotomy were included in the study. Patients were randomly assigned to receive either single-layer through-and-through closure (n=50) or mass closure (n=50) at the discretion of the surgical team.

Inclusion Criteria:

- Adults aged 18 years and older with a clinical diagnosis of acute peritonitis.
- Patients requiring emergency laparotomy for any cause of peritonitis.

Exclusion Criteria:

- Patients with a history of previous abdominal surgery.
- Those with underlying chronic illnesses that could affect wound healing (e.g., diabetes, immunosuppression).
- Patients who opted out of the study or were unable to provide informed consent.

Postoperative assessments were performed to evaluate wound complications, including infections and dehiscence, along with pain levels using a visual analog scale (VAS) at 24 hours and 48 hours post-surgery. The length of hospital stay was recorded for all patients.

Statistical analyses were conducted using SPSS software, with significance set at $p < 0.05$.

Results:

Table 1: Comparison of Postoperative Complications

Complication	Single-Layer Closure (n=50)	Mass Closure (n=50)	p-value
Wound Infection (%)	5 (10%)	15 (30%)	0.041
Dehiscence (%)	1 (2%)	4 (8%)	0.36
Total Complications (%)	6 (12%)	19 (38%)	0.016

Table 2: Postoperative Outcomes

Outcome Measure	Single-Layer Closure (n=50)	Mass Closure (n=50)	p-value
Average Hospital Stay (days)	5.2 ± 1.2	7.4 ± 1.5	0.001
Pain Score (24 hrs, VAS)	3.0 ± 1.0	4.5 ± 1.2	0.001
Pain Score (48 hrs, VAS)	2.5 ± 0.8	3.5 ± 1.0	0.001

Description:

The results demonstrate a statistically significant reduction in wound infection rates and hospital stay duration in the single-layer closure group compared to the mass closure group. Pain scores

were consistently lower in the single-layer group at both 24 and 48 hours postoperatively.

Discussion:

The findings of this study support the hypothesis that single-layer through-and-through closure techniques yield better postoperative outcomes compared to mass closure in emergency midline laparotomies for peritonitis. The significant reduction in wound infection rates observed in the single-layer group is consistent with previous literature, which suggests that separating the layers during closure can reduce tension and promote better healing at the wound site (6, 7).

Wound infection is a common complication following laparotomy, significantly impacting patient recovery and healthcare costs (8). Our results align with those reported by authors who have shown that single-layer closure techniques can decrease the incidence of such complications, likely due to enhanced tissue oxygenation and reduced bacterial colonization (9).

Moreover, the average length of hospital stay was notably shorter in the single-layer closure group. This finding is particularly relevant in a healthcare environment where minimizing hospital stay can lead to reduced healthcare expenditures and improved resource utilization (10). Additionally, lower pain scores at 24 and 48 hours postoperatively suggest that single-layer closure may facilitate a more comfortable recovery, potentially decreasing the need for postoperative analgesia and enhancing patient satisfaction (11).

While this study provides valuable insights, several limitations must be acknowledged. The sample size, although adequate for preliminary comparisons, may benefit from further expansion to validate these findings. Additionally, a single-center study may limit the generalizability of the results to broader clinical practice. Future research should consider multicenter trials to strengthen the evidence base surrounding closure techniques in this context (12).

In conclusion, the results of this study advocate for the adoption of single-layer through-and-through closure techniques in emergency midline laparotomy for peritonitis. By demonstrating fewer complications, shorter hospital stays, and enhanced patient comfort, this closure method may represent a significant advancement in surgical practice for managing acute abdominal conditions.

Conclusion:

In summary, this study highlights the benefits of single-layer through-and-through closure over mass closure techniques in emergency midline laparotomies performed for peritonitis. Patients treated with single-layer closure experienced significantly fewer wound infections, shorter hospital stays, and lower pain levels, indicating a more favorable recovery trajectory. Given these findings, we recommend the implementation of single-layer closure techniques as a standard practice in emergency surgeries for peritonitis, ultimately aiming to improve patient outcomes and optimize surgical care.

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