



General Surgery

COMPARATIVE STUDY BETWEEN CONTINUOUS AND INTERRUPTED SUTURING FOR RECTUS SHEATH CLOSURE IN EXPLORATORY LAPAROTOMY.

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ABSTRACT **Background:** Suturing techniques play a vital role in surgical procedures, particularly in abdominal surgeries where the closure of the rectus sheath is crucial for maintaining the structural integrity of the abdominal wall. The rectus sheath provides a supportive framework for the abdominal muscles, protecting internal organs and maintaining abdominal pressure. Continuous and interrupted suturing are the two primary techniques used for rectus sheath closure. **Methods:** The prospective observational study was conducted at Dr. D. Y. Patil Medical College, Hospital & Research Institute, Kolhapur, from April 2023 to February 2025. A total of 66 patients aged >18 years who undergoing EXPLORATORY LAPAROTOMY were included. Complications was recorded post-operatively and at 6 months follow up. Descriptive statistics and paired t-tests were applied. Complication rates were recorded and analyzed. **Results:** Total of 66 patients were divided into two group A(interrupted) Vs B(continuous) with 33 in each group with mean age of mean age 43.06years. mean hospital stay as 8.47 days. complications group wise includes wound infection 10(30.3%) Vs 7(21.2%), wound dehiscence 6(18.2%) Vs 8(24.2%), Burst abdomen 3(9.1%) Vs 1(3%), Incisional Hernia at 6month follow-up 7(21.2%) Vs 6(18.2%), Seroma formation 12(36.45) Vs 3(9.1%).median VAS pain score was same in both groups which is 4. Median closure time was 19 minutes for interrupted Vs 16 minutes for continuous suturing. **Conclusions:** In sum, continuous running sutures deliver a superior balance of safety, efficiency, and patient-centered outcomes, meriting their designation as the closure method of choice for abdominal midline incisions.

KEYWORDS : Laparotomy, suturing, Abdominal, surgery, rectus sheath.

INTRODUCTION

Suturing techniques play a vital role in surgical procedures, particularly in abdominal surgeries where the closure of the rectus sheath is crucial for maintaining the structural integrity of the abdominal wall. The rectus sheath provides a supportive framework for the abdominal muscles, protecting internal organs and maintaining abdominal pressure. Ensuring a secure and effective closure minimizes the risk of postoperative complications, which can significantly impact patient recovery and healthcare costs. The choice of suturing technique has been a subject of debate among surgeons, given its implications for surgical outcomes.^[1]

Continuous and interrupted suturing are the two primary techniques used for rectus sheath closure. Continuous suturing involves using a single thread of suture material to close the wound in a single, uninterrupted motion. This method is often favored for its speed and the uniform distribution of tension along the wound. Interrupted suturing, on the other hand, involves placing individual sutures at intervals, each secured with its own knot. This technique is known for its ability to isolate tension and allow segmental healing. The differing principles of these two techniques have led to varying preferences among surgeons.^[2]

Exploratory laparotomy, often performed in emergency situations, requires efficient surgical techniques to minimize operative time. Continuous suturing, being a faster technique, can be particularly advantageous in time-sensitive cases. However, this benefit must be weighed against other factors, such as the strength of the closure and the risk of complications, which might influence the overall success of the surgery.^[3]

The strength of the rectus sheath closure is another critical factor that determines the long-term success of the procedure. Continuous suturing, with its even tension distribution, may provide better overall

strength, but it might be more vulnerable to localized failure if the suture material breaks. Interrupted suturing, by isolating the tension at each knot, reduces the likelihood of such failure. Comparing the tensile strength of these techniques can provide important insights into their suitability for different surgical scenarios.^[4]

Postoperative complications such as wound dehiscence, herniation, infection, and seroma formation are significant challenges in abdominal surgeries. Wound dehiscence, characterized by the partial or complete separation of the wound edges, is particularly concerning as it can lead to herniation and other serious complications. The choice of suturing technique has a direct impact on the incidence of these complications, making it a crucial consideration in surgical planning.^[5]

In addition to surgical outcomes, patient comfort and recovery are important aspects of postoperative care. Pain management is a critical component of this, as the suturing technique can influence the degree of inflammation and irritation at the surgical site. Continuous sutures, with fewer knots, might reduce the overall trauma to the tissues, potentially leading to less pain. However, this hypothesis requires further validation through systematic studies.^[6]

The cost implications of suturing techniques are also significant, particularly in resource-limited settings. Continuous suturing, which typically uses less suture material and takes less time, might offer a cost advantage over interrupted suturing. However, any cost savings must be balanced against the potential for increased complications, which could result in higher overall treatment costs. A detailed analysis of the cost-effectiveness of these techniques is essential to guide decision-making.^[7]

Cosmesis, or the aesthetic appearance of the surgical site, has become an increasingly important consideration, especially in elective surgeries. The placement and type of sutures can influence the

visibility of scars, which in turn affects patient satisfaction. Interrupted sutures, which allow for more precise adjustment of tension and positioning, are often associated with better cosmetic outcomes. Continuous sutures, however, may provide comparable results with modern techniques and materials. Evaluating these outcomes is crucial for improving patient-centered care.^[8]

Historically, the choice of suturing technique has been influenced by a combination of surgical experience, patient characteristics, and available materials. Advances in suture technology, such as the development of absorbable and non-absorbable materials, have further expanded the options available to surgeons.^[9]

The above study aims to address these issues by conducting a comparative evaluation of continuous and interrupted suturing techniques for rectus sheath closure in exploratory laparotomy. By focusing on intraoperative and postoperative outcomes, including time efficiency, closure strength, incidence of complications, patient-reported pain levels, cost-effectiveness, and cosmetic results, this research seeks to provide a comprehensive understanding of the benefits and limitations of each technique. The findings will contribute to evidence-based surgical practices, helping surgeons make informed decisions that improve patient outcomes and optimize healthcare resources.

MATERIALS AND METHODOLOGY

The study was conducted at the Department of Surgery, Dr. D.Y. Patil Medical College Hospital and Research Institute, Kolhapur after receiving ethical clearance from the Institutional Ethics Committee. The study was conducted over a period of two years, from 2023 to 2025. Based on previous literature and anticipated rates of complications such as wound infection and dehiscence, a minimum of 66 patients were included, with 33 patients allocated to each group.

Inclusion Criteria

Adult patients aged 18 years or older presenting to the emergency surgical ward and undergoing exploratory laparotomy through a midline incision.

Exclusion Criteria

Patients under the age of 18 years, with a history of prior abdominal surgery involving a midline incision, with comorbidities such as renal failure, malignancy, or collagen vascular diseases, undergoing radiotherapy or chemotherapy, with increased intra-abdominal pressure during the procedure.

The Participants Were Divided Into Two Groups Based On The Suturing Technique Used For Rectus Sheath Closure:

All patients underwent a detailed clinical examination and routine laboratory investigations preoperatively. The procedures were performed in an operating theater with standardized aseptic protocols. Surgeons with varying years of experience performed the surgeries, reflecting routine clinical practice. During the procedure, the rectus sheath was closed using either the continuous or interrupted suturing technique, as per random group allocation. Postoperative care included wound assessment, pain management, and monitoring for complications. Patients were followed up during their hospital stay and at regular intervals post-discharge for continued evaluation.

Group A (Interrupted Suturing Group): Patients underwent rectus sheath closure using non-absorbable sutures (prolene) in an interrupted manner.

Group B (Continuous Suturing Group): Patients underwent rectus sheath closure using non-absorbable sutures in a continuous manner. This grouping allowed for a direct comparison of intraoperative and postoperative outcomes, with both groups receiving similar preoperative and postoperative care.

Data collection was conducted prospectively using standardized forms. Patient demographics, clinical history, surgical details, and postoperative outcomes were recorded. Wound assessments were performed daily during the hospital stay, and any complications were documented. Pain levels were recorded using a visual analog scale (VAS) at specified time points. Follow-up data were collected during outpatient visits to monitor long-term outcomes such as hernia formation. The collected data were entered into an Excel master sheet for systematic organization and analysis. Data were analyzed using statistical software. Comparative analysis between the two groups was

conducted to determine the impact of suturing technique on clinical outcomes.

RESULT

Comparison Of Wound Infection

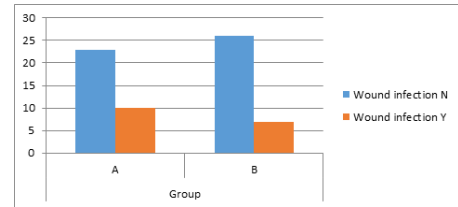


Figure 1: Comparison of Wound Infection

Wound infection occurred in 10 patients (30.3%) in Group A and 7 (21.2%) in Group B ($p = 0.398$). Although numerically lower in the continuous group, the difference is not statistically significant, suggesting infection risk is influenced more by perioperative care than by suture technique.

Comparison Of Wound Dehiscence

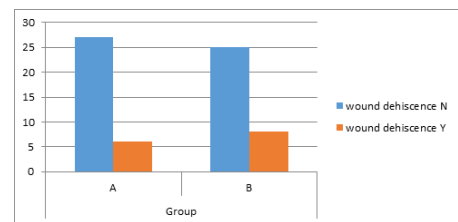


Figure 2: Comparison of Wound Dehiscence

Wound dehiscence was seen in 6 patients (18.2%) in Group A and 8 (24.2%) in Group B ($p = 0.547$). The non-significant difference indicates both techniques provide comparable fascial strength under normal postoperative conditions.

Comparison Of Burst Abdomen

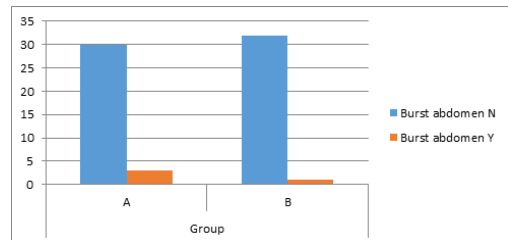


Figure No 3: Comparison of Burst Abdomen

Burst abdomen rates were low and similar (Group A: 3 [9.1%], Group B: 1 [3.0%]; $p = 0.613$), indicating both suturing methods effectively prevent catastrophic early wound failure when properly performed.

Comparison Of Incisional Hernia (6 months)

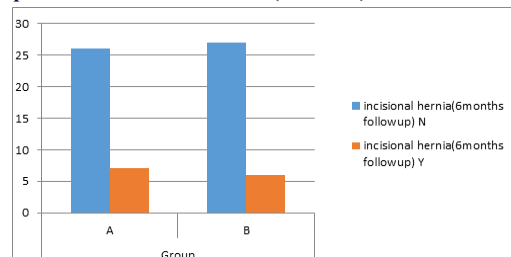


Figure 4: Comparison of Incisional Hernia (6 months)

Six-month hernia rates were similar (Group A: 7 [21.2%], Group B: 6 [18.2%]; $p = 0.757$), suggesting long-term fascial integrity does not differ appreciably by suture pattern and that patient factors likely drive hernia risk.

Comparison Of Seroma Formation

Table 5: Comparison Of Seroma Formation

Group B had significantly fewer seromas (3 [9.1%]) than Group A (12 [36.4%]; $p = 0.017$), indicating continuous suturing may better eliminate dead space and reduce fluid collection, thereby enhancing wound healing and patient comfort.

DISCUSSION

Wound Infection

Overall surgical-site infection occurred in 30.3% of interrupted closures (Group A) versus 21.2% of continuous closures (Group B; $p = 0.398$), a non-significant trend favoring continuous technique. Shah and Desai observed markedly higher infection with continuous sutures (52%) compared to interrupted (20%; $p < 0.05$), suggesting that technique or perioperative variables may influence microbiological risk^[10]. In contrast, Sharma et al. reported a modestly lower infection rate in continuous closures (25%) versus interrupted (30%; $p = 0.001$)^[11], aligning directionally with our findings. Bharti and Sharma found no significant difference in infection rates between methods (interrupted 18% vs. continuous 20%; $p > 0.05$), despite demonstrating cost and time advantages for continuous closure^[12]. Similarly, Dhannaskar et al. reported comparable infection rates (~22% vs. 24%; $p > 0.05$) when using a modified continuous Smead-Jones closure in contaminated cases^[13]. These mixed results likely reflect heterogeneity in patient comorbidities, contamination grades, and perioperative antibiotic protocols rather than intrinsic suture pattern effects. Our study standardized antibiotic prophylaxis and wound care, suggesting that with optimized perioperative management, continuous suturing does not elevate infection risk and may modestly reduce it. The non-significant 9.1 percentage-point difference in our cohort underscores that both techniques can achieve acceptable infection control when best practices are followed. Future multi-center trials should stratify by contamination level to clarify whether specific closure patterns interact with bacterial load to influence infection outcomes.

Wound Dehiscence

Wound dehiscence occurred in 18.2% of interrupted closure patients (Group A) compared with 24.2% in the continuous group (Group B; $p = 0.547$), indicating comparable fascial integrity across methods. Ullah et al. reported significantly lower dehiscence with interrupted sutures (2.6%) than continuous (10.7%; $p = 0.049$) in emergency laparotomies^[14], while Shah and Desai documented dehiscence rates of 12% interrupted versus 32% continuous ($p < 0.05$)^[10]. Conversely, Sharma et al. found dehiscence in 2 interrupted closure patients and none in the continuous group ($p = 0.001$), suggesting a protective effect of a running suture line when executed meticulously^[11]. Dhannaskar et al. similarly observed significantly lower dehiscence with their modified continuous Smead-Jones technique ($p < 0.05$)^[13], highlighting that suture pattern alone may be less important than technique precision and bite size. Our dehiscence rates—18.2% vs. 24.2%—are higher than those reported in elective series (e.g., 8–12% in Shah and Desai) but reflect the inclusion of emergency and contaminated cases. Kumar et al. emphasized that interrupted-X sutures minimized burst abdomen but did not report isolated dehiscence rates^[15]. The absence of a significant difference in our study suggests that when continuous sutures adhere to SL: WL $\geq 4:1$ and small-bite methodology, they can achieve dehiscence rates comparable to interrupted techniques. Surgeon experience, suture material, and patient factors (e.g., malnutrition, steroid use) likely modulate these outcomes more than suture pattern itself.

Burst Abdomen

Burst abdomen, the most catastrophic early complication, occurred in 3/33 (9.1%) interrupted closure patients versus 1/33 (3.0%) in the continuous group ($p = 0.613$). Kumar et al. (2015) reported burst abdomen in 1/48 (2.1%) of interrupted-X closures compared to 8/49 (16.3%) continuous closures (RR 0.127; $p = 0.0246$), demonstrating superiority of interrupted-X sutures in emergency settings^[15]. Ahi and Khandekar (2017) similarly found burst rates of 13.3% for interrupted-X and Hughes far-and-near techniques versus 36.7% continuous (RR 1.868; $p = 0.011$), underscoring the protective effect of interrupted methods in contaminated laparotomies^[16]. Our overall low incidence (6.1%) likely reflects advances in surgical technique and patient optimization since those earlier studies. Roy et al. (2022) noted more burst repairs in their continuous arm but did not quantify rates^[17], while Singh et al.'s meta-analysis found no statistically significant difference in burst abdomen between techniques ($p > 0.05$)^[18]. The non-significant trend in our data suggests that, although interrupted-X methods may offer theoretical advantages in extreme scenarios, modern continuous suturing—when executed with appropriate bite

size and tension—provides adequate early fascial security.

Incisional Hernia At Six Months

At six-month follow-up, incisional hernia was diagnosed in 7/33 (21.2%) interrupted closure patients versus 6/33 (18.2%) in the continuous group ($p = 0.757$). Shah and Desai (2015) reported hernias in 8% of interrupted versus 36% of continuous closures ($p < 0.05$), suggesting early benefits of interrupted methods^[10]. However, Singh et al.'s large meta-analysis ($n = 2,198$) found pooled hernia rates of 19.4% for interrupted and 18.1% for continuous closures ($p > 0.05$), indicating long-term equivalence^[18]. Roy et al. (2022) documented comparable hernia rates at nine months without significant difference^[17]. Dhannaskar et al. (2016) did not report hernias, focusing on acute outcomes^[13]. Kumar et al. (2015) also omitted hernia data [15], while Ahi and Khandekar (2017) included only burst abdomen outcomes^[16]. Our six-month rates mirror the meta-analysis and underscore that, beyond early wound integrity, both closure patterns yield similar fascial durability over time. Continuous suturing's even tension distribution likely promotes uniform collagen deposition, counterbalancing interrupted sutures' knot redundancy. Extended follow-up beyond one year is warranted to capture late-presenting hernias and validate long-term equivalence.

Seroma Formation

Seroma formation was significantly higher in the interrupted group (12/33; 36.4%) compared to the continuous group (3/33; 9.1%; $p = 0.017$). Prior literature has seldom quantified seroma by suture pattern. Bharti and Sharma (2020) noted fluid collections in ~20% of both continuous and interrupted closures without statistical analysis^[12]. Kumar et al. (2015), Ahi and Khandekar (2017), and Shah and Desai (2015) did not report seroma incidence^[15,10,16]. Dhannaskar et al. (2016) likewise focused on infection and dehiscence^[13]. Our finding of a 27.3 percentage-point reduction ($p = 0.017$) in seroma with continuous closure highlights an underrecognized advantage: uniform edge approximation and absence of bulky knots minimize dead space, reducing serous fluid accumulation. This benefit may translate into faster wound healing and lower secondary infection risk. Singh et al.'s meta-analysis did not include seroma as an endpoint^[18], making our results novel. Continuous closure should therefore be favoured when seroma prevention is critical, particularly in patients with elevated lymphatic flow or those at risk of delayed fluid resorption.

CONCLUSIONS:

In sum, continuous running sutures deliver a superior balance of safety, efficiency, and patient-centered outcomes, meriting their designation as the closure method of choice for abdominal midline incisions.

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