International Journal of Science and Research (IJSR)
ISSN: 2319-7064
Impact Factor 2024: 7.101

A Comparative Study Between Continuous and Interrupted Suturing for Abdominal Wound Closure in Exploratory Laparotomy

Siddhant Sarawat[1], Mansi Modi[2], Madhubala Gaur[3], Arun Kumar[4], Bhaskar Kumar[5]

Abstract: ***An essential surgical technique that is frequently used to treat a variety of abdominal disorders and for diagnostic purposes is exploratory laparotomy. Closing abdominal wounds properly is essential to reducing complications and fostering the best possible recovery. These include the type of suture, whether continuous or interrupted; choosing one over the other affects both the immediate surgical outcome and long-term issues such as wound dehiscence, infections, and hernias at the location of the incision. Aim and Objective: The primary aim of this study was to compare the continuous and interrupted suturing techniques for abdominal wound closure following exploratory laparotomy. The study focused on the objective to compare the intra-operative suture length used and the time taken for closure in continuous and interrupted suturing techniques. Methodology: This prospective interventional study was conducted on 72 patients undergoing emergency exploratory laparotomy at GS Medical College and Hospital, Pilkhuwa. Two groups of 36 patients each were randomly assigned to undergo continuous or interrupted sutures. Suture length and closure time were evaluated as intraoperative parameters. Chi-square tests, t-tests, and p-values were used in the statistical analysis to determine significance. Results: This research concluded that with the use of continuous suturing method the closure time was less than the interrupted suturing method and the total amount of suture material used also less. The width of the scars was also greater in the continuous suturing group, and also patients who had wound dehiscence, 77.7 % of the continuous suturing group as compared to the interrupted suturing group 22.2 %. Conclusion: Continuous and interrupted suturing techniques each have their own advantages and are chosen based on surgical needs. Continuous suturing saves time and materials, especially in emergencies, while interrupted suturing offers better long-term outcomes like reduced wound rupture and smaller scars. Clinicians should consider factors such as urgency, aesthetics, and complication risks when selecting the appropriate technique.***

Keywords: Continuous method, Interrupted method, Wound dehiscence, Wound infection, Surgery.

1. Introduction

Exploratory laparotomy is a critical surgical procedure that allows for both the diagnosis and treatment of abdominal conditions, with midline laparotomy being the preferred technique due to its simplicity and direct access to the entire abdominal cavity with minimal blood loss. Surgeons have several options for closing laparotomy wounds, including continuous or interrupted suturing, single-layer or mass closure, and the use of absorbable or non-absorbable sutures. In continuous closure, a single line of thread is used, while interrupted closure involves separate individual stitches [1] . Surgeons have various methods available for closing the abdominal fascia, but there is no universal agreement on the optimal suture material or technique. The choice often depends on individual surgeon training and institutional practices, with many surgeons adhering to familiar methods and showing reluctance to try alternatives [2]. Although numerous studies and meta-analyses have investigated wound closure techniques, the findings remain inconsistent. Some analyses favor the interrupted technique, while others support the continuous approach, indicating a lack of consensus within the scientific community despite significant research efforts. The continuous suturing technique offers several advantages, including faster wound closure and fewer knots, which reduce the risk of sinus tract formation. It is widely used, as studies report no significant differences in complication rates compared to interrupted suturing. However, interrupted suturing has demonstrated specific benefits, such as reducing the risk of abdominal wound dehiscence. Complications related to wound closure can result from surgical errors, inappropriate suture material, high intra-abdominal pressure, infection, or tissue necrosis. Therefore, the selection of a suturing technique should consider both procedural factors and patient-specific risks [3-6] . This study was conducted to evaluate and compare the performance of continuous and interrupted sutures for midline incision closure in emergency laparotomy cases

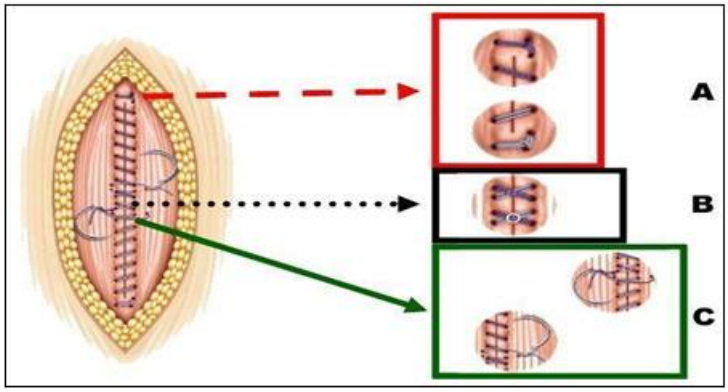


Figure 2: Principles of continuous abdominal wall closure. A Anchorage of the suture cranially/caudally outside the

incision B Intersection of the loops in the middle of the incision C Knotting of each loop *Images reprinted with courtesy of Mrs. B. Wiehn, BBD Aesculap, Tuttlingen Germany*
Sources: https://bmcsurg.biomedcentral.com/articles/10.1186/1471-2482-5-3

2. Material & Methods

Study design: The study was carried out on patients of 18-65 years who were admitted in the emergency department for a midline laparotomy operation.

Place of the study: This study was carried out in the Department of General Surgery, GS Medical College and Hospital at Pilkhuwa in the state of Uttar Pradesh.

Study design: Comparative Interventional Study.

Study population: The study involved all the patients who received an emergency exploratory laparotomy through a midline incision in this institute during the study period.

Duration of Study: July, 2023 to December, 2024

Sample size: This study, conducted over 15–18 months in the Department of General Surgery at GSMCH, Hapur, involved 72 patients. Of these, 36 underwent continuous suturing, while the remaining 36 underwent interrupted suturing.

Suture Type: Polypropylene No 1 Round Body

Sample size calculation: Sample size was determined using the principle of comparing means between two independent samples via an online calculator by Rollin [http://www.stat.ubc.ca/~rollin/stat/ssize/n2.html]. A pilot study on six patients showed mean suturing times of 28 minutes (interrupted) and 26 minutes (continuous), with a standard deviation of 3.0. Using 80% power, alpha 0.05, and 1:1 allocation to detect a 20% difference, the required sample size was 36 per group. This ensured adequate precision for comparing suturing techniques in exploratory laparotomy.

Inclusion crieteria:
This study includes all patients aged 18 to 65 years presenting to the emergency surgical ward for exploratory laparotomy via midline incision, with informed consent obtained.

Exclusion criteria: Exclusion criteria included patients with previous midline abdominal surgery, re-exploration cases, or those lost to follow-up. Patients having concomitant conditions such as diabetes, renal failure, cancer, chemotherapy, radiation therapy, or collagen vascular disease were also not included.

3. Methodology

This prospective comparative interventional study was conducted on patients who underwent emergency exploratory laparotomy via midline incision at GSMCH, Hapur over a period of 15 to 18 months. Each patient was closely monitored intraoperatively for the type of sutures used, the suturing technique, the length of suture material, the distance between suture bites, and the time required to close the abdominal wound. A separate proforma was maintained for each case to record all relevant details. In cases with discharge, pus culture and sensitivity tests were performed. The duration of hospital stay for both groups was also recordedAll postoperative complications were statistically analyzed in terms of percentage, and final conclusions were drawn based on the observations and data collected throughout the study.

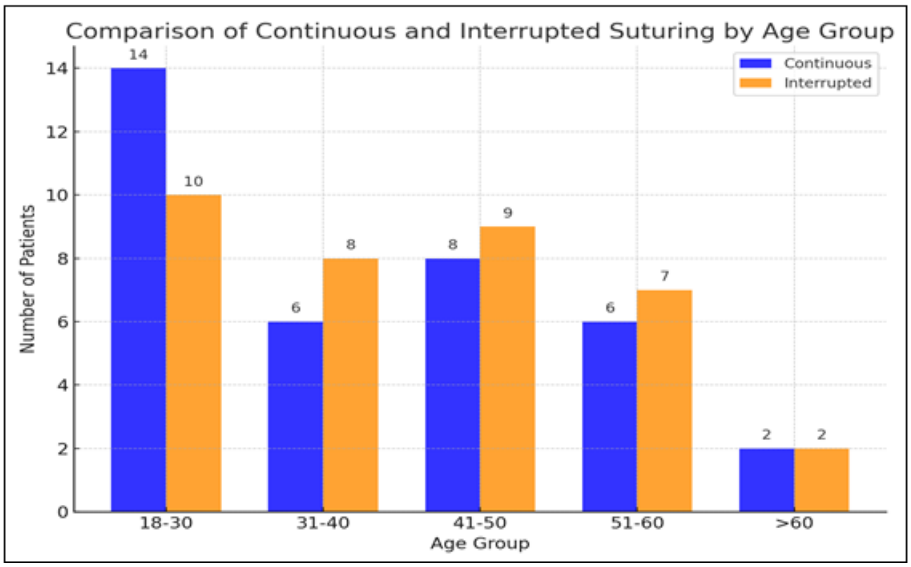
Statistical Analysis:
Data analysis was conducted on an ITT basis using IBM SPSS Statistics version 28 (IBM Inc.). Quantitative data were presented as mean ± SD for normally distributed variables and as median [25th–75th IQR] when not normally distributed (Shapiro-Wilk's test $P<0.05$). Outliers were identified using box plots. Paired t-test and chi-square test were used for hypothesis testing, with significance set at $P<0.05$ to reduce Type I error.

4. Results and Observations

Table 1: Distribution of study subjects according to age

Age Group	Continuous	Interrupted	Total
18-30	14 (58.33%)	10 (41.67%)	24 (33.33%)
31-40	6 (42.86%)	8 (57.14%)	14 (19.44%)
41-50	8 (47.06%)	9 (52.94%)	17 (23.61%)
51-60	6 (46.15%)	7 (53.85%)	13 (18.06%)
>60	2 (50.00%)	2 (50.00%)	4 (5.56%)
Total	**36 (50.00%)**	**36 (50.00%)**	**72 (100.00%)**

χ^2 value: 1.09, P value: 0.896



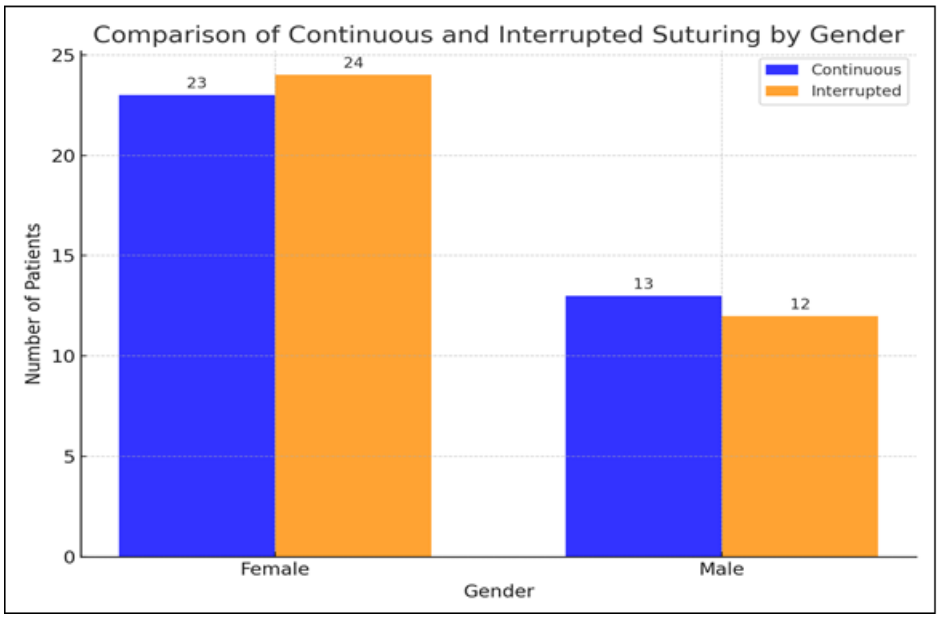
Graph 1: Distribution of study subjects according to age

Table 1 shows the age-wise distribution of patients undergoing continuous and interrupted suturing for abdominal wound closure in exploratory laparotomy. Across all age groups, suturing techniques were almost evenly applied, with a slight variation in middle age groups. Notably, patients over 60 had an equal distribution (50%) of both techniques. The chi-square value of 1.09 and P = 0.896 indicate no significant association between age and choice of suturing method.

Table 2: Distribution of study subjects according to gender

Gender	Continuous	Interrupted	Total
Female	23 (48.94%)	24 (51.06%)	47 (65.28%)
Male	13 (52.00%)	12 (48.00%)	25 (34.72%)
Total	36 (50.00%)	36 (50.00%)	72 (100.00%)

χ^2 value: 0.0613, P value: 0.804

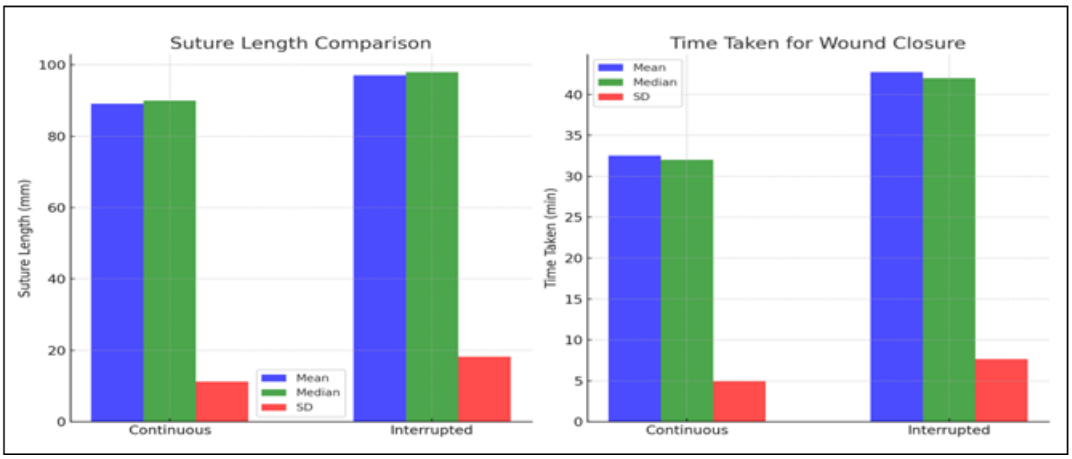


Graph 2: Distribution of study subjects according to gender

The distribution of suturing methods by gender among patients undergoing exploratory laparotomy is displayed in **Table 2.** Males received 52.00% continuous and 48.00% interrupted suturing, whilst females had 48.94% continuous and 51.06% intermittent suturing. In general, both methods were applied equally by men and women. The chi-square result (χ^2 = 0.0613, P = 0.804) shows that there is no link between suturing technique and gender.

Table 3: Descriptive statistics of Suture Length and Time Taken for Abdominal Wound Closure (min)

	Suturing Technique	N	Mean	Median	SD	IQR	25th Percentile	75th Percentile	P-Value
Suture Length	Continuous	36	89.15	90	11.2	21.5	82	102	0.0465
	Interrupted	36	97.1	98	18.25	26	87.5	112	
Time Taken for	Continuous	36	32.5	32	4.95	5.5	28	33.5	<0.0001
Closure (min)	Interrupted	36	42.75	42	7.65	9.5	36.5	46	

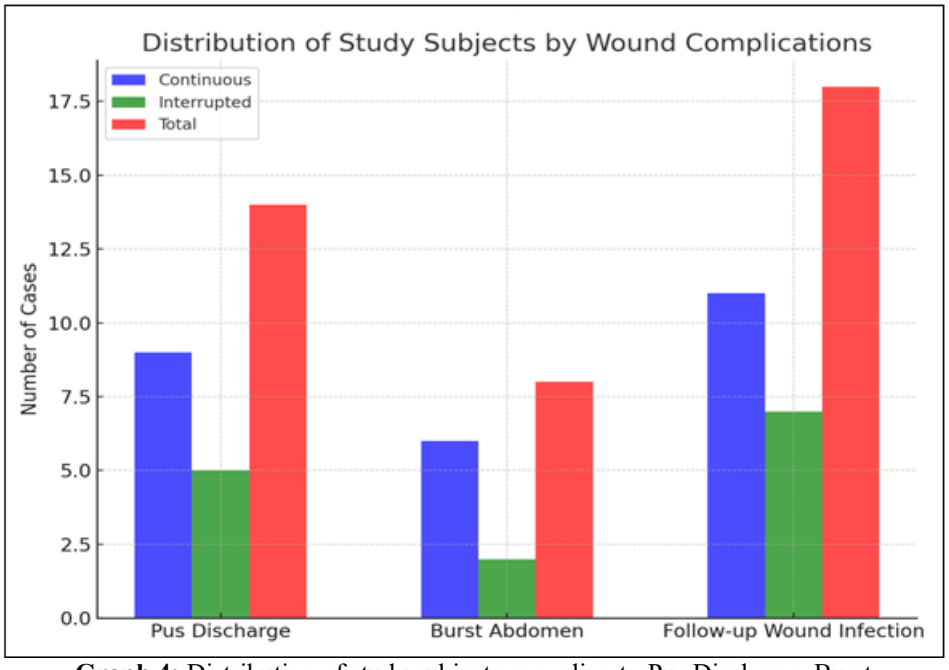


Graph 3: Descriptive statistics of Suture Length and Time Taken for Abdominal Wound Closure (min)

The comparison of suture length and closure time between continuous and interrupted suturing techniques reveals that continuous suturing is both more economical and time-efficient. The average suture material used was significantly lower in the continuous group (89.15 cm ± 11.2) compared to the interrupted group (97.1 cm ± 18.25), with median values of 90 cm and 98 cm, respectively. The interquartile range (IQR) was also smaller for continuous suturing (21.5 cm vs. 26 cm), indicating less variation in usage. This difference was statistically significant (P = 0.0465). Regarding closure time, continuous suturing was notably faster, with a mean time of 32.5 minutes (SD: 4.95) versus 42.75 minutes (SD: 7.65) for interrupted suturing. The median closure times were 32 minutes and 42 minutes, respectively, and the IQR further highlighted lower variability in the continuous group (5.5 minutes vs. 9.5 minutes). The highly significant p-value (<0.0001) confirms this finding. These results align with the study's objectives, highlighting continuous suturing as a preferable technique due to its reduced material consumption and superior time efficiency.

Table 4: Distribution of study subjects according to Pus Discharge, Burst Abdomen and Follow-up Wound Infection

Parameter	Category	Continuous (n=36)	Interrupted (n=36)	Total (N=72)	χ^2 and P-Value
Pus Discharge	Yes	9	5	14	χ^2=2.85, p=0.091
	No	27	31	58	
Burst Abdomen	Yes	6	2	8	χ^2=3.00, p=0.083
	No	30	34	64	
Follow-up Wound Infection	Yes	11	7	18	χ^2=2.68, p=0.103
	No	25	29	54	
Total		36	36	72	



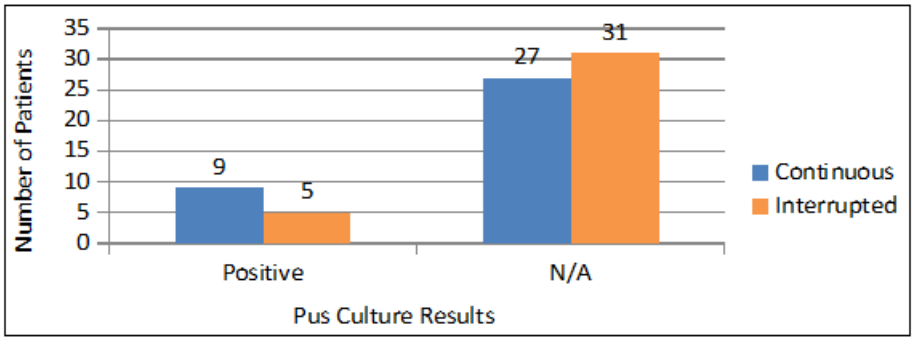
Graph 4: Distribution of study subjects according to Pus Discharge, Burst Abdomen and Follow-up Wound Infection

The distribution of post-operative wound complications—namely pus discharge, burst abdomen, and follow-up wound infection—shows numerical differences between continuous and interrupted suturing methods, though none reach statistical significance. Pus discharge occurred in 25% of patients in the continuous group versus 13.9% in the interrupted group (χ^2 = 2.85, p = 0.091), while burst abdomen was observed in 16.7% of continuous and 5.6% of interrupted cases (χ^2 = 3.00, p = 0.083). Follow-up wound infections were also more frequent in the continuous group (30.6%) compared to the interrupted group (19.4%), with χ^2 = 2.68 and p = 0.103. These results indicate that although the continuous suturing method appears to be associated with slightly higher rates of certain complications, the differences are not statistically significant. Therefore, neither suturing technique can be conclusively favored over the other based solely on post-operative complication rates. This highlights the importance of considering additional factors such as patient health status, surgical technique, and wound care practices when selecting the optimal suturing method for abdominal wound closure.

Table 5: Distribution of study subjects according to Pus Culture Results

Pus Culture Results	Continuous	Interrupted	Total
Positive	9 (64.28%)	5 (35.71)	14 (19.44)
N/A	27 (46.55)	31 (53.44)	58 (80.55)
Total	36 (50.00%)	36 (50.00%)	72 (100.00%)

χ^2 value: 1.42, P value: 0.233



Graph 5: Distribution of study subjects according to Pus Culture Results

Table 5 shows that 19.44% of patients had a positive pus culture—64.28% from the continuous group and 35.71% from the interrupted group—while 80.55% had no available results. Among those without pus culture, 46.55% were from the continuous group and 53.44% from the interrupted group. The chi-square value (χ^2 = 1.42, p = 0.233) indicates no significant difference between the two methods. Thus, both suturing techniques appear comparable in infection risk based on pus culture outcomes.

5. Discussion

The current investigation, titled **"COMPARATIVE STUDY BETWEEN CONTINUOUS AND INTERRUPTED SUTURING FOR ABDOMINAL WOUND CLOSURE IN EXPLORATORY LAPAROTOMY,"** was a prospective, interventional study conducted at the Department of General Surgery, GS Medical College and Hospital, Pilkhuwa, Uttar Pradesh. Comparing the effectiveness of continuous and interrupted suturing procedures for closing abdominal wounds after emergency exploratory laparotomy was the main goal. Key surgical outcomes were the focus of this study, including post-operative outcomes like wound complications and healing patterns, as well as intra-operative variables like suture length and closure time.

In Table 1, patient distribution across age groups revealed no significant preference for either suturing technique based on age. For instance, in the 18–30 age group, a higher proportion underwent continuous suturing (58.33%), whereas the 31–60 age range showed a slight inclination toward interrupted suturing. Among patients over 60, both techniques were used equally. Statistical analysis using the chi-square test (χ^2 = 1.09, p = 0.896) indicated no significant association between age and the choice of suturing method. These findings are consistent with prior research, such as Richards and Balch et al. (1983)[7], who also found no age-related influence on suture selection in laparotomy cases. While Gupta and Srivastava et al. (2008)[8] proposed that age-related changes in tissue elasticity could affect suture choice, this study did not find statistically significant evidence to support that claim. Hence, it can be concluded that both continuous and interrupted suturing techniques are applicable across all age groups. Table 2 presents the gender distribution of patients undergoing continuous and interrupted suturing techniques, revealing that gender does not influence the choice of suturing method. Among female patients, 48.94% underwent continuous suturing and 51.06% had interrupted suturing, whereas among male patients, 52% received continuous and 48% received interrupted sutures. The chi-square (χ^2) value of 0.0613 and p-value of 0.804 confirm the lack of a statistically significant relationship between gender and suturing technique. These findings are consistent with previous studies, including those by Zabd-ur-Rehman et al. (2013)[9], both of which concluded that gender has no bearing on the suturing method used. Although Agrawal et al. (2010)[10] hypothesized that differences in body composition or hormonal profiles might influence surgical outcomes by gender, this was not evident in the current study's sample, reinforcing that suturing choice is not gender-dependent. Statistically significant differences were observed when comparing the average suture length and time required for wound closure between the two techniques. The mean suture length used for continuous closure was 89.15 cm, compared to 97.1 cm for interrupted suturing (p = 0.0465), supporting the conclusion that continuous suturing is more economical in material use. This

aligns with findings by Richards and Balch et al. (1983)[7] and Fagniez and Marie et al. (1985)[11] and, who both noted reduced suture consumption with continuous techniques. Additionally, the mean wound closure time was significantly shorter with continuous suturing (32.5 minutes) compared to interrupted suturing (42.75 minutes), with a p-value of 0.0001. This confirms the findings of Murray and Blaisdell et al. (1978)[12], who emphasized the time efficiency of continuous suturing in emergency surgical cases. While some studies like Weiland and Bay et al. (1998)[13] argue that continuous suturing may not always be faster in patients with compromised tissue quality, this study found it consistently more efficient under standard surgical conditions. These findings highlight the advantages of continuous suturing in terms of both time and resource optimization without compromising closure quality.

Postoperative complications were further analyzed in Tables 4 , focusing on wound infection and wound dehiscence. Infection rates were slightly higher in the continuous group (57.14%) compared to the interrupted group (42.86%), but the difference was not statistically significant ($\chi^2 = 0.355$, $p = 0.551$). This supports the findings of Rahman et al. (2013)[14] and Sharma et al. (2020)[15], who found no significant variation in infection rates between suturing techniques. Although Agrawal and Tiwari et al. (2014)[10] reported lower infection rates in the continuous group due to shorter closure times, the current study emphasizes that postoperative infections are influenced more by patient-specific factors, surgical environment, and postoperative care than by the suturing technique alone. Regarding wound dehiscence, the continuous group showed a higher frequency (77.7%) compared to the interrupted group (22.2%), with a p-value of 0.074—approaching statistical significance. These results echo those of Zabd-ur-Rehman et al. (2013)[9], who also observed a lower dehiscence rate in interrupted closures. While continuous suturing offers notable advantages in speed and material efficiency, the slightly elevated dehiscence rates suggest that interrupted sutures may be more reliable in maintaining wound integrity, particularly in high-risk cases. Although the current study did not find statistically significant differences, there was a noticeable trend indicating that continuous suturing may be associated with a higher risk of wound dehiscence and postoperative complications. Moreover, the rate of pus discharge was higher in the continuous suture group (25%) compared to the interrupted group (13.9%), with a p-value of 0.091. Similarly, the incidence of burst abdomen was also greater in the continuous group (16.7%) versus the interrupted group (5.6%), though not statistically significant ($p = 0.083$). Follow-up wound infections were more prevalent in the continuous group (30.6%) compared to 19.4% in the interrupted group ($p = 0.103$). These results align with findings from Shashikala et al. (2018)[16], who also observed increased complications with continuous suturing, albeit without statistical significance. The study by Agrawal and Tiwari et al. (2014)[10] similarly supports the notion that while continuous suturing is faster, it does not necessarily reduce postoperative complications. This suggests that factors such as patient health, surgical environment, and postoperative care may have a more profound influence on complications than the suturing method itself.

The evaluation of pus culture results, as detailed in Table 5, reinforces previous trends observed in postoperative wound complications. Among patients with positive pus cultures, 64.28% belonged to the continuous suturing group, while only 35.71% were from the interrupted group. Despite this numerical trend, statistical analysis ($\chi^2 = 1.41$, $p = 0.233$) confirmed no significant association between suturing technique and the likelihood of a positive pus culture. These findings align with those of Shashikala et al. (2018)[16] and Rahman et al. (2013)[14], who also found no significant difference in infection rates between the two techniques. While Diener and Voss et al. (2010)[17] observed a lower infection rate with continuous sutures in elective surgeries, the variation is more likely attributed to controlled environments rather than the suturing method itself. The current results, along with broader literature, underscore that factors such as patient characteristics, surgical hygiene, and post-operative care are more influential than the suture technique in preventing infections.

In conclusion, continuous suturing exhibited benefits in terms of shorter closure times and less material consumption, but it also revealed greater (albeit statistically insignificant) incidence of problems like infection and wound dehiscence. When long-term wound integrity and aesthetics are important, interrupted suturing may be more appropriate because it requires more time and suture length but may also result in fewer problems. The equal use of both approaches by age and gender groups suggests that the decision should be tailored to the patient's characteristics and the clinical setting. In the end, this study highlights how crucial it is to customize suturing techniques in order to maximize both short-term surgical effectiveness and long-term patient outcomes. It also calls for additional extensive, randomized trials to confirm these results and establish best practices for closing abdominal wounds.

6. Conclusion

The present study, titled "COMPARATIVE STUDY BETWEEN CONTINUOUS AND INTERRUPTED SUTURING FOR ABDOMINAL WOUND CLOSURE IN EXPLORATORY LAPAROTOMY," evaluated the effectiveness of continuous versus interrupted suturing techniques based on intra-operative suture length, wound closure time. Conducted at the Department of General Surgery, GS Medical College and Hospital, Pilkhuwa, the study found that while both techniques are safe and effective, each has distinct advantages and limitations. Continuous suturing was more time-efficient and cost-effective, making it preferable in emergency settings requiring rapid closure, but it was associated with a slightly higher rates of early postoperative complications like wound dehiscence, pus discharge, and burst abdomen—though these differences were not statistically significant.. Conversely, because interrupted suturing may tolerate greater wound tension and encourage homogeneous tissue approximation, it provided better cosmetic results and possibly improved structural integrity. The study also demonstrated the adaptability of both techniques across a range of populations by confirming that patient age or gender had no bearing on the choice of suturing technique. The greater proportion of positive pus cultures in the

continuous group highlights the significance of careful aseptic procedure and postoperative care, even if infection rates were generally comparable. These results highlight the need to integrate long-term healing potential and patient-specific considerations including comorbidities and intraoperative circumstances into surgical decisions, which should take into account more than just procedural speed. In order to further evaluate these tendencies and improve clinical decision-making aimed at attaining both effective treatments and long-lasting, complication-free recoveries, the study ultimately recommends larger, longer-term randomized controlled trials.

References

[1] Murtaza B, Saeed S and Sharif MA. Postoperative complications in emergency surgery versus elective laparotomy at a peripheral hospital. J Ayub Med Coll Abbottabad. 2010;22(3):42-47.
[2] Anthimidis G, Gregoriou M, Stavrakis T, Vasiliadou K,Lyras I, Ioannidis K, et al. New-fangled slowly-absorbable versus non-absorbable sutures for abdominal fascial closure have the goals towards an advantageous suture been met Surgical Science 2013;4(6):32282.
[3] Hodgson NC, Malthaner RA, Ostbye T. The search for an ideal method of abdominal fascial closure: a meta-analysis. Ann Surg2000; 231:436–42.
[4] Srivastava A, Roy S, Sahay KB, et al. Prevention of burst abdominal wound by a new technique: a randomized trial comparing continuous versus interrupted X-suture. Ind J Surg2004;66: 19–27.
[5] versus interrupted X-suture. Ind J Surg2004;66: 19–27.
[6] Riou JP, Cohen JR and Johnson H. Factors influencing wound dehiscence. Am J Surg. 1992;163(3):324-330.
[7] Richards J, Balch C. Time efficiency of continuous versus interrupted sutures in abdominal closure. J Surg Res. 1983;34(4):365-70.
[8] Gupta R, Srivastava S. Effect of suturing technique on postoperative hernia and wound complications: a meta-analysis. J Gastrointest Surg. 2008;12(4):637-42.
[9] Zabd-ur-Rehman M, Khan M, et al. A randomized controlled study of wound dehiscence in exploratory laparotomy using interrupted versus continuous sutures. J Pak Med Assoc. 2013;63(6):758-61.
[10] Agrawal CS, Tiwari P, Mishra S, Rao A and Hadke NS. Interrupted abdominal closure prevents burst: randomized controlled trial comparing interrupted-X and conventional continuous closures in surgical and gynecological patients. Ind J Surg. 2014;76(4):270-276.
[11] Fagniez R, Marie B. Continuous versus interrupted sutures for midline abdominal incisions: a prospective study. Br J Surg. 1985;72(4):325-9.
[12] Murray J, Blaisdell B. Comparison of synthetic absorbable continuous sutures and interrupted sutures for fascial closure. Ann Surg. 1978;187(2):224-7.
[13] Weiland DE, Bay R. Incidence of hernia formation with different suture techniques. Am J Surg. 1998;176(6):610-4.
[14] Rahman M, Rahman S, et al. Comparison of wound infection rates between interrupted and continuous sutures. J Surg Res. 2013;183(2):426-30.
[15] Sharma, Prashar, Gandotra. Study comparing interrupted X sutures with continuous sutures for midline laparotomy. Interrupted X sutures were more effective in reducing wound dehiscence. Indian J Med Sci, 2020.
[16] Shashikala, Shashikala. Comparative study of continuous vs. X-interrupted sutures for mass closure of midline laparotomy wounds in emergency cases. Continuous sutures had lesser time for closure, but X-interrupted sutures reduced wound dehiscence. Int Surg J. 2018 May;5(5):1753-1757.
[17] Diener MK, Voss S, et al. Continuous versus interrupted sutures for abdominal wall closure: a meta-analysis. Ann Surg. 2010;251(3):552-7.