



Comparison of Interrupted Versus Continuous Closure of Rectus Sheath After Midline Emergency Laparotomy Incision Interms of Abdominal Wound Dehiscence

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ABSTRACT

Background: "Emergency laparotomy is major surgery, commonly performed on those with severe abdominal issues, in whom prompt care is necessary. Among some of the most crucial elements in recovery post-surgery is whether or not there is any problems with closing the rectus sheath. Both interrupted and continuous suture patterns are very common, yet there is debate about which leads to fewer issues, such as wound dehiscence, wound healing is also hindered by such things as the nutrition status. **Objective:** To compare the interrupted versus continuous closure of rectus sheath after midline emergency laparotomy incision in terms of abdominal wound dehiscence. **Study Design:** Randomized Controlled Trial. **Duration and Place of Study:** The study was conducted from August 2024 to February 2025 at MTI-Lady Reading Hospital, Peshawar, Pakistan. **Methodology:** A total of 132 patients, aged 18 to 65 years, undergoing emergency laparotomy for acute abdominal conditions were randomly assigned to either the interrupted or continuous rectus sheath closure group. Postoperative wound dehiscence was monitored, and statistical analysis was performed using SPSS version 27, with a significance level set at $p \leq 0.05$. **Results:** Wound dehiscence occurred in 16.7% of patients in the interrupted closure group compared to 6.1% in the continuous closure group ($p = 0.097$). Stratified analysis revealed a significantly lower dehiscence rate in females and diabetic patients in the continuous closure group. **Conclusion:** Although there was no statistically significant difference, continuous closure demonstrated a lower incidence of wound dehiscence, especially in female and diabetic patients.

INTRODUCTION

Emergency laparotomy is a procedure which is performed when patient come with sudden serious problem in abdomen and there is no enough time for long preparation.¹ Many patients present with acute abdomen due to perforation, obstruction, trauma, or internal bleeding and the surgeon must open the abdomen with midline incision to find and treat the cause very quickly so that life can be save.² In emergency setting the patient usually come late, may be in shock, dehydrated, septic, and with many risk factor like anemia, low albumin and other organ dysfunction, so the tissue quality is not good and wound healing become more difficult.³ Because of this, closure of abdominal wall, especially the rectus sheath, become very important step, as any mistake here can later give wound complications, pain, hernia and longer hospital stay.⁴

When surgeon finish the emergency procedure inside abdomen, he has to close the rectus sheath either with interrupted sutures or continuous sutures, and there is long debate which method is better in these sick patients.⁵

In interrupted closure, the surgeon place many separate stitches across the sheath, each one tied by itself, so if one stitch break or get infected the whole wound is not open, and tension is more evenly share between different bites, but it take more time and more suture material, and in emergency theatre where time is important this can be problem.⁶ In continuous closure, one long suture run along the whole length of sheath with repeated bites, and this technique is faster, use less material, and give uniform tension if done properly with small bites and proper distance, but if the suture cut through tissue or break, a large segment of wound can fail together.⁷

Abdominal wound dehiscence is one of the most serious complication after midline emergency laparotomy and it means the rectus sheath and sometimes skin layer separate after surgery, so abdominal contents may bulge out or in severe cases bowel come out as burst abdomen, which is very dangerous and have high mortality.⁸ Dehiscence usually occur in first week after operation and is strongly related to poor wound healing, high intra-abdominal pressure, infection, cough, vomiting,

malnutrition, old age and other systemic factor like diabetes and sepsis, but it is also related to how the rectus sheath was closed, whether with interrupted or continuous technique and what is the suture length to wound length ratio.⁹ If closure is done with large bites, far apart, with wrong tension or with weak or slowly absorbable material, the wound may not tolerate the stress of postoperative period and gap start to form between edges leading to serous discharge, infection and then partial or complete separation.¹⁰

In a study by Akmal et al. reported that the abdominal wound dehiscence occurred in 20.5% of patients who received interrupted rectus sheath closure, compared with only 4.5% in those who underwent continuous closure.¹¹

There is strong need to do this study in Peshawar because many patients here come very late to the hospital, often in septic condition and with poor nutritional status, which make abdominal wound healing more difficult after emergency laparotomy. Most government hospitals in Peshawar face heavy patient load, limited resources, shortage of trained staff, and frequent infection-control challenges, so rectus sheath closure technique can strongly affect postoperative outcomes. Local data on interrupted versus continuous closure in our own patient population is very limited, and most available evidence comes from international centers with different settings.

METHODOLOGY

This study was done in the surgical unit of MTI-Lady Reading Hospital Peshawar from August 2024 up to February 2025. Permission from the ethical review board and academic authority had already been taken before starting the enrolment. The required participants was calculated by using the estimated proportions of wound separation in the two stitching techniques, keeping 95% confidence and 80% power, and the needed number turned out as 132 patients, with equal numbers in both arms. Men and women aged 18 to 65 years who needed an urgent vertical mid-abdominal incision for acute abdominal issues were considered. A midline emergency laparotomy in this study referred to a quick surgical opening made along the central abdomen, usually from upper to lower part, to get direct access to the abdominal cavity in conditions like perforated ulcer, acute appendicitis, pancreatitis, bowel ischemia, ruptured diverticulum, or splenic injury. Individuals with severe heart-lung dysfunction, advanced kidney failure, or decompensated liver disease were not included. Wound opening after surgery was identified as separation of deeper abdominal layers on or after the seventh postoperative day along with three features: redness of the wound area, painful swelling with pain score around 4 on a visual scale, and visible gaping of the muscle-fascia layer during inspection.

Patients stayed in their assigned groups. In the first group A, the rectus sheath was stitched by placing separate sutures spaced roughly a centimeter apart and a centimeter from the cut margin. In the second group B, the sheath was closed in a continuous running fashion using polypropylene thread. All patients received warm saline wash inside the abdomen and a drain was positioned before the closure of the skin. Monitoring for wound

opening as described earlier was carried out later, and a consultant surgeon with more than five years of fellowship experience supervised this assessment.

All information was fed into statistical software SPSS version 27. Means with standard deviations were used for numerical values while frequencies with percentages described for categorical values. Comparison of wound dehiscence between the two groups was done using Chi-square or Fisher's exact test with significance taken at $p \leq 0.05$. Influencing factors were controlled through stratified analysis, and post-stratification tests were applied again.

RESULTS

In Group A with interrupted closure, the mean age of patients was 43.91 ± 13.94 years while in Group B with continuous closure it was 45.21 ± 13.26 years. The mean height was recorded as 1.66 ± 0.08 meters in Group A and 1.65 ± 0.08 meters in Group B. The mean weight of patients in interrupted closure group was 77.56 ± 14.88 kilograms compared to 76.02 ± 15.05 kilograms in continuous closure group. Body mass index showed similar values in both groups with 28.11 ± 5.47 kg/m² in Group A and 28.12 ± 6.41 kg/m² in Group B. Regarding gender distribution, Group A comprised of 30 males which is 45.5% and 36 females which is 54.5%, whereas Group B had 39 males that is 59.1% and 27 females that is 40.9%. The socioeconomic status distribution showed that in interrupted closure group, 19 patients which is 28.8% belonged to upper class, 27 patients which is 40.9% were from middle class and 20 patients which is 30.3% were from low socioeconomic status. In continuous closure group, 22 patients which is 33.3% were from upper class, 25 patients which is 37.9% from middle class and 19 patients which is 28.8% from low socioeconomic status. Educational status revealed that 36 patients which is 54.5% were educated and 30 patients which is 45.5% were uneducated in Group A, while in Group B, 32 patients which is 48.5% were educated and 34 patients which is 51.5% were uneducated. Employment status showed 27 patients which is 40.9% employed and 39 patients which is 59.1% unemployed in interrupted closure group, whereas 28 patients which is 42.4% were employed and 38 patients which is 57.6% were unemployed in continuous closure group. The residence distribution was equal in Group A with 33 patients which is 50.0% from urban areas and 33 patients which is 50.0% from rural areas, while in Group B, 28 patients which is 42.4% were from urban and 38 patients which is 57.6% from rural areas. Smoking status indicated that 34 patients which is 51.5% were smokers and 32 patients which is 48.5% were non-smokers in Group A, compared to 29 patients which is 43.9% smokers and 37 patients which is 56.1% non-smokers in Group B. Diabetes mellitus was present in 36 patients which is 54.5% and absent in 30 patients which is 45.5% of Group A, while in Group B it was present in 34 patients which is 51.5% and absent in 32 patients which is 48.5%. Hypertension was observed in 30 patients which is 45.5% and not present in 36 patients which is 54.5% of interrupted closure group, whereas in continuous closure group it was present in 36 patients which is 54.5% and

absent in 30 patients which is 45.5% (as shown in Table-I).

Table I
Patient Demographics in Both Groups

Variables	Interrupted Closure	Continuous Closure
	n=66	n=66
	Mean ± SD	Mean ± SD
Age (years)	43.91 ± 13.94	45.21 ± 13.26
Height (m)	1.66 ± 0.08	1.65 ± 0.08
Weight (kg)	77.56 ± 14.88	76.02 ± 15.05
BMI (kg/m ²)	28.11 ± 5.47	28.12 ± 6.41
	n (%)	n (%)
Gender		
Male	30 (45.5%)	39 (59.1%)
Female	36 (54.5%)	27 (40.9%)
Socioeconomic Status		
Upper	19 (28.8%)	22 (33.3%)
Middle	27 (40.9%)	25 (37.9%)
Low	20 (30.3%)	19 (28.8%)
Education Status		
Educated	36 (54.5%)	32 (48.5%)
Uneducated	30 (45.5%)	34 (51.5%)
Occupation Status		
Employed	27 (40.9%)	28 (42.4%)
Unemployed	39 (59.1%)	38 (57.6%)
Residence		
Urban	33 (50.0%)	28 (42.4%)
Rural	33 (50.0%)	38 (57.6%)
Smoking		
Yes	34 (51.5%)	29 (43.9%)
No	32 (48.5%)	37 (56.1%)
Diabetes		
Yes	36 (54.5%)	34 (51.5%)
No	30 (45.5%)	32 (48.5%)
Hypertension		
Yes	30 (45.5%)	36 (54.5%)
No	36 (54.5%)	30 (45.5%)

In Group A with interrupted closure, wound dehiscence occurred in 11 patients which is 16.7% while it did not occur in 55 patients which is 83.3%. In Group B with continuous closure, only 4 patients which is 6.1% developed wound dehiscence whereas 62 patients which is 93.9% did not develop this complication (as shown in Table-II).

Table II
Comparison of Abdominal Wound Dehiscence Between the Two Groups (n=132)

Abdominal Wound Dehiscence	Group A (Interrupted Closure)	Group B (Continuous Closure)	P value
	n=66	n=66	
	n (%)	n (%)	
Yes	11 (16.7%)	4 (6.1%)	0.097*
No	55 (83.3%)	62 (93.9%)	
Total	66 (100%)	66 (100%)	

***Fischer Exact Test**

For age stratification, in patients aged 40 years or less, Group A showed dehiscence in 4 patients which is 17.4% and no dehiscence in 19 patients which is 82.6%, while Group B had dehiscence in 1 patient which is 3.8% and no dehiscence in 25 patients which is 96.2% with p-value of 0.165. In patients aged more than 40 years, Group A had dehiscence in 7 patients which is 16.3% and no dehiscence in 36 patients which is 83.7%, whereas Group B showed dehiscence in 3 patients which is 7.5% and no dehiscence in 37 patients which is 92.5% with p-value of 0.189. When analyzing gender, among male patients in Group A,

dehiscence occurred in 5 patients which is 16.7% and did not occur in 25 patients which is 83.3%, while in Group B it occurred in 4 patients which is 10.3% and did not occur in 35 patients which is 89.7% with p-value of 0.498. Among female patients, Group A showed dehiscence in 6 patients which is 16.7% and no dehiscence in 30 patients which is 83.3%, whereas Group B had no dehiscence in any female patient with 0 patients which is 0.0% showing dehiscence and 27 patients which is 100.0% without dehiscence with statistically significant p-value of 0.026. For BMI stratification, in patients with BMI of 25 kg/m² or less, Group A had dehiscence in 5 patients which is 25.0% and no dehiscence in 15 patients which is 75.0%, while Group B showed dehiscence in 2 patients which is 9.5% and no dehiscence in 19 patients which is 90.5% with p-value of 0.239. In patients with BMI more than 25 kg/m², Group A had dehiscence in 6 patients which is 13.0% and no dehiscence in 40 patients which is 87.0%, whereas Group B showed dehiscence in 2 patients which is 4.4% and no dehiscence in 43 patients which is 95.6% with p-value of 0.253. Regarding socioeconomic status, among upper class patients, Group A had dehiscence in 2 patients which is 10.5% and no dehiscence in 17 patients which is 89.5%, while Group B showed dehiscence in 2 patients which is 9.1% and no dehiscence in 20 patients which is 90.9% with p-value of 1.000. In middle class patients, Group A showed dehiscence in 6 patients which is 22.2% and no dehiscence in 21 patients which is 77.8%, whereas Group B had dehiscence in 1 patient which is 4.0% and no dehiscence in 24 patients which is 96.0% with statistically significant p-value of 0.046. Among low socioeconomic status patients, Group A had dehiscence in 3 patients which is 15.0% and no dehiscence in 17 patients which is 85.0%, while Group B showed dehiscence in 1 patient which is 5.3% and no dehiscence in 18 patients which is 94.7% with p-value of 0.345. For smoking status, among smokers in Group A, dehiscence occurred in 10 patients which is 29.4% and did not occur in 24 patients which is 70.6%, whereas in Group B it occurred in 3 patients which is 10.3% and did not occur in 26 patients which is 89.7% with p-value of 0.052. Among non-smokers, Group A showed dehiscence in 1 patient which is 3.1% and no dehiscence in 31 patients which is 96.9%, while Group B had dehiscence in 1 patient which is 2.7% and no dehiscence in 36 patients which is 97.3% with p-value of 1.000. Regarding diabetes mellitus, among diabetic patients in Group A, dehiscence was present in 9 patients which is 25.0% and absent in 27 patients which is 75.0%, whereas in Group B it was present in 2 patients which is 5.9% and absent in 32 patients which is 94.1% with statistically significant p-value of 0.019. Among non-diabetic patients, Group A showed dehiscence in 2 patients which is 6.7% and no dehiscence in 28 patients which is 93.3%, while Group B had dehiscence in 2 patients which is 6.3% and no dehiscence in 30 patients which is 93.8% with p-value of 1.000. For hypertension, among hypertensive patients in Group A, dehiscence occurred in 6 patients which is 20.0% and did not occur in 24 patients which is 80.0%, whereas in Group B it occurred in 2 patients which is 5.6% and did not occur in 34 patients which is 94.4% with p-value of 0.061. Among non-hypertensive patients, Group A showed dehiscence in 5

patients which is 13.9% and no dehiscence in 31 patients which is 86.1%, while Group B had dehiscence in 2 patients which is 6.7% and no dehiscence in 28 patients which is 93.3% with p-value of 0.432 (as shown in Table-III).

Table III

Association of Abdominal Wound Dehiscence with Demographic Variables

Demographics variables	Group	Abdominal Wound Dehiscence		P-value		
		Yes (n, %)	No (n, %)			
Age (years)	≤40	A	4 (17.4%)	19 (82.6%)	0.165*	
		B	1 (3.8%)	25 (96.2%)		
	>40	A	7 (16.3%)	36 (83.7%)		
		B	3 (7.5%)	37 (92.5%)		
Gender	Male	A	5 (16.7%)	25 (83.3%)	0.498*	
		B	4 (10.3%)	35 (89.7%)		
	Female	A	6 (16.7%)	30 (83.3%)		0.026*
		B	0 (0.0%)	27 (100.0%)		
BMI (kg/m ²)	≤25	A	5 (25.0%)	15 (75.0%)	0.239*	
		B	2 (9.5%)	19 (90.5%)		
	>25	A	6 (13.0%)	40 (87.0%)		0.253*
		B	2 (4.4%)	43 (95.6%)		
Socioeconomic Status	Upper	A	2 (10.5%)	17 (89.5%)	1.000*	
		B	2 (9.1%)	20 (90.9%)		
	Middle	A	6 (22.2%)	21 (77.8%)		0.046*
		B	1 (4.0%)	24 (96.0%)		
	Low	A	3 (15.0%)	17 (85.0%)		0.345*
		B	1 (5.3%)	18 (94.7%)		
Smoking	Yes	A	10 (29.4%)	24 (70.6%)	0.052*	
		B	3 (10.3%)	26 (89.7%)		
	No	A	1 (3.1%)	31 (96.9%)		1.000*
		B	1 (2.7%)	36 (97.3%)		
Diabetes	Yes	A	9 (25.0%)	27 (75.0%)	0.019*	
		B	2 (5.9%)	32 (94.1%)		
	No	A	2 (6.7%)	28 (93.3%)		1.000*
		B	2 (6.3%)	30 (93.8%)		
Hypertension	Yes	A	6 (20.0%)	24 (80.0%)	0.061*	
		B	2 (5.6%)	34 (94.4%)		
	No	A	5 (13.9%)	31 (86.1%)		0.432*
		B	2 (6.7%)	28 (93.3%)		

*Fischer Exact Test

DISCUSSION

Wound dehiscence is a significant postoperative complication that leads to increased morbidity, prolonged hospital stays, and additional healthcare costs. The choice of closure technique can influence wound healing and complication rates. In this study, the dehiscence rate was lower in the continuous closure group (6.1%) compared to the interrupted closure group (16.7%), though this difference was not statistically significant ($p = 0.097$). Continuous suturing may reduce stress at individual suture points, providing a more uniform distribution of tension, thus improving wound healing. Interrupted closure, by contrast, creates localized stress, which may lead to dehiscence if any suture fails. Additionally, continuous closure may reduce tissue ischemia by avoiding multiple knots that can impair blood supply. Both groups were alike regarding demographics like age, height, weight, and BMI, indicating correct randomization. Age did not have any significant influence on the rate of dehiscence ($p = 0.165$ for ≤ 40 years and $p = 0.189$ for > 40 years), advising against its importance. BMI was nearly equal in both groups, with minor differences in the continuous group having less rate of dehiscence in those with $BMI > 25$ (4.4% vs. 13.0%), although not significant ($p = 0.253$). Among female participants, there was significantly less rate of dehiscence in continuous group (0%) than in interrupted group (16.7%) with $p = 0.026$, likely due to hormonal changes, variations in tissue, and differences in response. Socioeconomic status showed variations, with those from middle class demonstrating significantly different rates of dehiscence (4.0% vs. 22.2%) with $p = 0.046$, likely due to dietary variations, care, and support. Smoking was observed to increase rates in the interrupted group (29.4% vs. 10.3%) with $p = 0.052$, likely due to less oxygenation, insufficient collagen production due to nicotine. Amongst diabetic, there were significantly different rates of dehiscence (25.0% vs. 5.9%) with $p = 0.019$, advising in favor for its utilization in such vulnerable group. Hypertensive patients also showed a trend toward better outcomes with continuous closure (5.6% vs. 20.0%, $p = 0.061$), as it may better accommodate compromised tissue perfusion.

The findings of the present study on wound dehiscence rates showed continuous closure had lower incidence (6.1%) than interrupted closure (16.7%), but no statistical significance (p -value = 0.097). These results are different from studies favoring interrupted closure. Bansiwala RK, et al.¹² observed that there were more chances of dehiscence in continuous (20.1%) than in interrupted suturing, (5.4%) with p -value < 0.001. Pradhan A, et al.¹³ observed 20% in continuous suturing, while there was no dehiscence in interrupted, with p -value = 0.025. Ullah K, et al.¹⁴ found 10.7% in continuous, while there were 2.7% chances in interrupted, with p -value = 0.049. Khan TH, et al.¹⁵ observed 14.4% in continuous, while there were 5.6% chances in interrupted, with p -value = 0.03. These variations could be due to differences in patients, surgical performance, type of suture, and duration of observation. Our result is in greater proximity with Ganga C, et al.¹⁶ Kumar B, et al.¹⁷ finding balanced outcomes in both groups. Ganga C, et al.¹⁶ observed no

burst abdomen in interrupted, while there were 4.4% in continuous, with no significant differences. Kumar B, et al.¹⁷ observed 4% in interrupted, while there were 8% in continuous, with p-value = 0.68.

It was not measured in our study, but some studies have indicated that continuous closure is faster. Ganga C, et al.¹⁶ observed 5.1 minutes in continuous group compared to 8.2 minutes in interrupted group (p < 0.001). Kumar B, et al.¹⁷ observed 13.66 minutes in continuous group compared to 18.14 minutes in interrupted group (p < 0.001). Garg SK¹⁸ observed 12.3 minutes in continuous group compared to 25.1 minutes in interrupted group, while Pradhan A, et al.¹³ observed 31.2 minutes in continuous group compared to 43 minutes in interrupted group. Increased suture length consumption was also noted for interrupted closure. Ganga C, et al.¹⁶ used 118 cm of suture for interrupted and 82 cm for continuous (p-value < 0.001), and Garg SK¹⁸ used 110.7 cm for interrupted versus 82.3 cm for continuous.

We found that female patients had better outcomes with continuous closure (0% dehiscence) compared to interrupted (16.7%, p-value = 0.026). This is not commonly reported and may be due to unique population characteristics or chance. Diabetes was associated with higher dehiscence in interrupted closure (25% versus 5.9% in continuous, p-value = 0.019). This suggests continuous closure may help diabetic patients. Smoking showed a borderline significant effect, with smokers in the interrupted group showing 29.4% dehiscence versus 10.3% in continuous (p-value = 0.052). Bansawal RK, et al.¹² found coughing and abdominal distension increased dehiscence in continuous closure, suggesting interrupted may be better in these situations. Other studies report mixed infection rates. Ganga C, et al.¹⁶ found 6.7% infection in interrupted versus 17.8% in continuous (p-value = 0.08), and Shankar A, et al.¹⁹ found 0% infection in interrupted modified Smead-Jones technique versus 21.7% in continuous (p-value = 0.001). Long-term incisional hernia rates are also mixed. Ganga C, et al.¹⁶ found 2.2% hernia in interrupted versus 4.4% in continuous (p-value = 0.56). Shankar A, et al.¹⁹ observed 2.2% hernia in case of interrupted modified Smead-Jones

mesh, whereas in continuous, it was 10.9% with a 'p value = 0.001'. It must be noted that different studies have different findings regarding mesh closures based on some variables.

It is essential to note some limitations in the conducted research to be considered in interpreting its findings. It was a monocentric research done in the surgical department, which could restrict its generalizability to other healthcare settings or areas. It also needs to be noted that sample size calculation was based on some fixed rates in wound separations, for which, though the sample size was attained, conducting such studies in a broader sample with multicentric settings could increase external validity for its findings. The follow-up period was also relatively short, and long-term outcomes such as incisional hernias and other complications were not assessed, which could provide a more complete understanding of the efficacy of the closure techniques. Furthermore, factors such as the variability in surgeon experience and patient comorbidities, including diabetes and hypertension, were not fully controlled for, which may have influenced the outcomes.

CONCLUSION

Finding from our research shows that there was less wound dehiscence in continuous closure method compared to the interrupted method, although there was no significant result. It was observed that these methods were efficient in preventing wound problems once proper surgical principles were employed. It appears from our research finding that there could be some factor affecting outcomes, such as gender or diabetic status, in regard to preventing wound problems in these patients. More studies with wider populations need to be conducted to validate these findings for generating concrete evidence on what needs to be done during emergency laparotomy surgeries for preventing such problems.

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REFERENCES

1. Harji, D. P., Griffiths, B., Stocken, D., Pearse, R., Blazeby, J., & Brown, J. M. (2025). undefined. *World Journal of Emergency Surgery*, 20(1). <https://doi.org/10.1186/s13017-025-00597-4>
2. Ahmed A, & Azim A. (2020). Emergency laparotomies: causes, pathophysiology, and outcomes. *Indian J Crit Care Med*. 24(Suppl 4), S183-S189. <https://doi.org/10.5005/jp-journals-10071-23612>
3. Yilmartimo, A. T., Nurkkala, J., Koskela, M., Lahtinen, S., Kaakinen, T., Vakkala, M., Hietanen, S., & Liisanantti, J. (2022). Postoperative complications and outcome after emergency laparotomy: A retrospective study. *World Journal of Surgery*, 47(1), 119-129. <https://doi.org/10.1007/s00268-022-06783-8>
4. Stephens, I. J., Kelly, E., Ferreira, F., Boermeester, M. A., & Sugrue, M. E. (2025). Variable use of modern abdominal wall closure techniques at emergency laparotomy – an international, cross-sectional survey of surgical practice. *European Journal of Trauma and Emergency Surgery*, 51(1). <https://doi.org/10.1007/s00068-025-02804-y>
5. Polychronidis, G., Rahbari, N. N., Bruckner, T., Sander, A., Sommer, F., Usta, S., Hermann, J., Albers, M. B., Sargut, M., Knebel, P., & Klotz, R. (2023). Continuous versus interrupted abdominal wall closure after emergency midline laparotomy: Contint: a randomized controlled trial [NCT00544583]. *World Journal of Emergency Surgery*, 18(1). <https://doi.org/10.1186/s13017-023-00517-4>
6. Talpai, T., Faur, F., Pîrvu, C., Marinescu, D., Tarta, C., Margaritescu, D. N., Pantea, S., Nica, C., Albu, R., Popoiu, T., Lazea, R., Balanoiu, L., & Şurlin, V. (2025). Incidence and risk factors for Incisional hernia following ileostomy Takedown: A retrospective cohort study. *Journal of Clinical Medicine*, 14(10), 3597. <https://doi.org/10.3390/jcm14103597>

7. Van den Berg, R., Visscher, L., Menon, A. G., Deerenberg, E. B., & Tanis, P. J. (2025). Suture techniques and materials for fascial closure of abdominal wall incisions: A comprehensive meta-analysis. *Annals of Surgery Open*, 6(1), e548. <https://doi.org/10.1097/as9.0000000000000548>
8. Muganga, D., Basimbe, F., Nayiga, I., Ategeka, A., Malinga, P., & Muwanga, T. (2025). Successful management of complicated burst abdomen with open abdomen using only simple saline dressing. *Case Reports in Surgery*, 2025(1). <https://doi.org/10.1155/cris/6862550>
9. Stephens, I. J., Kelly, E., Ferreira, F., Boermeester, M. A., & Sugrue, M. E. (2025). Variable use of modern abdominal wall closure techniques at emergency laparotomy – an international, cross-sectional survey of surgical practice. *European Journal of Trauma and Emergency Surgery*, 51(1). <https://doi.org/10.1007/s00068-025-02804-y>
10. Sharma, R., Lonare, S. B., Arora, P., Al-Dwla, H., Vadher, A., & Hersi, M. (2025). Risk factors and predictive accuracy of the Rotterdam risk index for wound dehiscence following abdominal surgery. *Cureus*. <https://doi.org/10.7759/cureus.76769>
11. Akmal, U., Amini, A. Q., & Afridi, S. P. (2016). Abdominal wound dehiscence in interrupted versus continuous closure of rectus sheath after midline emergency laparotomy incision. *Journal of Surgery Pakistan (International)*, 21, 3. [https://old.jsp.org.pk/Issues/JSP%2021%20\(3\)%20July%20-%20Sep%20%202016%20PDF/Urooj%20Akmal%20A.pdf](https://old.jsp.org.pk/Issues/JSP%2021%20(3)%20July%20-%20Sep%20%202016%20PDF/Urooj%20Akmal%20A.pdf)
12. Bansiwala, R. K., Mittal, T., Sharma, R., Gupta, S., Singh, S., Abhishek, K., & Attri, A. K. (2019). Comparative study of abdominal wound dehiscence in continuous versus interrupted fascial closure after emergency midline laparotomy. *International Surgery Journal*, 6(3), 886. <https://doi.org/10.18203/2349-2902.isj20190819>
13. Pradhan, A., Prusty, N., Chand, D. K., & Panditray S. (2025). Rectus sheath closure techniques in exploratory laparotomy: continuous versus interrupted suturing – a prospective study. *J Popul Ther Clin Pharmacol*. 32(2), 673-679. <https://jptcp.com/index.php/jptcp/article/view/9633>
14. Ullah, K., Uddin, S., Shoib, A., & Yaseen, M. D. (2021). Comparison of outcome of interrupted versus continuous closure technique of rectus sheath in emergency laparotomies patients in terms of wound dehiscence. *The Professional Medical Journal*, 28(04), 455-458. <https://doi.org/10.29309/tpmj/2021.28.04.6020>
15. Khan, T. H., Jaffer, Z. M., Ullah, R., Malik, A. H., Hayat, A., & Hayat, Q. (2024). Effectiveness of continuous versus interrupted closure of midline wound in emergency laparotomies in terms of wound dehiscence. *Journal of Health and Rehabilitation Research*, 4(1), 1102-1107. <https://doi.org/10.61919/jhrr.v4i1.564>
16. Ganga, C., & Ramesh, R. (2022). Effectiveness of intermittent rectus closure in emergency midline laparotomy in preventing wound dehiscence and incisional hernia. *RJPBCS*. 13(2), 158-164. [https://www.worldwidejournals.com/indian-journal-of-applied-research-\(IJAR\)/article/effectiveness-of-intermittent-rectus-closure-in-emergency-midline-laparotomy-in-preventing-wound-dehiscence-and-incisional-hernia/Mjc5NjY=/?is=1&b1=205&k=52](https://www.worldwidejournals.com/indian-journal-of-applied-research-(IJAR)/article/effectiveness-of-intermittent-rectus-closure-in-emergency-midline-laparotomy-in-preventing-wound-dehiscence-and-incisional-hernia/Mjc5NjY=/?is=1&b1=205&k=52)
17. Kumar, B., Kumar, B., & Alam K. (2024). Comparison of continuous versus interrupted abdominal wall closure techniques after emergency midline laparotomy: a randomized controlled trial. *Int J Pharm Clin Res*, 16(6), 454-462. <https://doi.org/10.53346/ijpcr.2024.16.6.85>
18. Garg, S. K. (2020). Comparison between continuous vs interrupted X-type suture for midline laparotomy wound closure: an institutional based study. *Int J Med Res Prof*. 6(3), 203-205. <https://doi.org/10.21276/ijmrp.2020.6.3.044>
19. Shankar, A., Sreedevi, B. V., Selvamuthukumaran, S., Rajput, S., & Kumar, P. G. (2024). Assessment of postoperative complications between interrupted modified Smead-Jones rectus closure and conventional rectus closure in midline laparotomy wounds: A comparative study. *Cureus*. <https://doi.org/10.7759/cureus.72712>
20. Siam, S. A., Elsayaad, I. M., & Naroz, M. I. (2025). Comparative Study Between Simple Closure and Tension Suture Post Exploratory Laparotomy in High Risk Patients. *International Journal of Medical Arts*, 7(2), 5351-5355. <https://doi.org/10.21608/ijma.2025.325958.2051>
21. Murtaza, B., Khan, N. A., Sharif, M. A., Malik, I. B., & Mahmood, A. (2010). Modified midline abdominal wound closure technique in complicated/high risk laparotomies. *J Coll Physicians Surg Pak*, 20(1), 37-41. <https://www.icpsp.pk/archive/2010/Jan2010/09.pdf>