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Original Research Article

A study to compare abdominal wall closure with interrupted vs. continuous sutures using polydioxanone in patients undergoing emergency exploratory laparotomy

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ABSTRACT

Background: Wound closure in emergency surgeries can be done either by interrupted or by continuous sutures with each having its own advantages and disadvantages. In this paper we shall try to compare the advantages and adverse effects of both these methods of wound closure.
Methods: A prospective comparative study involving 50 patients undergoing emergency laparotomies was conducted in Department of General Surgery, MMIMSR, Mullana from October 2022 to April 2024 (18 months). We compared two abdominal wall closure techniques using polydioxanone (PDS), patients, aged 18-75 years, were alternatively assigned to one of two groups: Group I received interrupted PDS sutures, while Group II received continuous PDS sutures. Postoperatively, pain and complications like infections were observed and analysed statistically.
Results: In our study, we compared abdominal wall closure techniques in emergency exploratory laparotomy patients. The mean age was similar in the two groups, 43.68 years vs 43.08 years respectively in group I and II. Wound infection occurred in 44% of patients in the interrupted suture group and 60% in the continuous suture group, with a significant difference favouring the interrupted method. The mean wound closure time (33.24 vs 18.32 minutes) and post operative pain were more in the interrupted suture group as compared to the continuous suture group.
Conclusions: The interrupted suturing method proved to be more effective in preventing complications, it did require more time to perform. However, after thoroughly reviewing the available data, no definitive evidence was found to support the superiority of either techniques.

Keywords: Continuous sutures, Emergency laparotomy, Interrupted sutures

INTRODUCTION

Emergency laparotomy surgeries are vital in general surgery for treating acute abdominal conditions that require immediate intervention, such as traumatic injuries, gastrointestinal perforations, and intra-abdominal haemorrhage.[1,2] These urgent surgeries have a significantly higher mortality rate-five times greater-compared to high-risk elective surgeries, with complications occurring in about fifty percent of cases. Abdominal wall closure techniques are crucial for maintaining abdominal integrity, minimizing postoperative complications, and improving patient outcomes. Traditional closure methods include continuous and interrupted sutures.[3,4] Continuous sutures offer advantages such as uniform tension distribution, better wound healing, and cost-effectiveness, but they also carry risks, including potential wound dehiscence

due to reliance on a single suture. Interrupted sutures, though more time-consuming and material-intensive, provide redundancy, reducing the risk of wound dehiscence as multiple sutures support the closure.[5] Both methods have drawbacks, including discomfort, infection, and hernia formation, with variations in technique and suture material further affecting outcomes. Postoperative complications such as wound infections and incisional hernias are common, particularly with midline incisions.[6] The choice of suture technique, material, and method is crucial for optimizing surgical results.

Polydioxanone (PDS), a monofilament absorbable suture known for its extended tissue presence and reduced infection risk, offers potential benefits.[7] This research aims to fill this gap by comparing the efficacy of interrupted versus continuous PDS sutures in emergency exploratory laparotomies, seeking to improve surgical outcomes and patient care in these critical settings.

METHODS

Study design

A prospective comparative study involving 50 patients undergoing emergency laparotomies.

Study place

The study was conducted in Department of General Surgery, MMIMSR, Mullana, and Ambala.

Study duration

The study duration was from October 2022 to April 2024 (18 months).

Study was started only after taking Ethical approval from the institutional ethic committee, MMIMSR. We compared two abdominal wall closure techniques using Polydioxanone (PDS) The surgeries were performed by the same group of surgeons. All consecutive patients aged 18-75 years, willing to be part of the study and undergoing emergency laparotomies through midline were enrolled in the study. Cases of previous laparotomies through midline incisions, requiring ileostomy, colostomy, severely anaemic (Hb<8gm%) and diabetic (HbA1c >7.65%) were excluded from the study. They were subsequently alternatively assigned to one of two groups, group I received interrupted PDS sutures, while group II received continuous PDS sutures. Pre-operative evaluations included comprehensive assessments, routine hematological and biochemical investigations, imaging and consideration of comorbidities.

Technique of interrupted suture (Group I)

PDS no 1 was used taking interrupted sutures at a distance of 1 cm from the divided edge with a distance of 1 cm between the two consecutive sutures taking 5-6 squared knots in a single suture tie (figure 1).

Technique of continuous suture (Group II)

PDS no 1 was used in a simple running technique starting just proximal to the incision edge. The bites were taken 1 cm from the divided edge with a distance of 1 cm between the two consecutive bites in a non-interlocking manner and was closed using Aberdeen knot at the other end of the incision (figure 1).

During surgery, the time taken to close the wound and number of suture packs used was recorded. Postoperatively, pain and complications like wound infection, dehiscence (partial and complete) and duration of hospital stay was noted.

Statistical analysis

At follow up visits, patients were observed for incisional hernia. These parameters were carefully recorded and entered into excel sheet. For deriving results Epi Info version 7.2. Qualitative variables were expressed in terms of frequencies, proportions and 95% CI while continuous variables were expressed in terms of mean and standard deviation. To find statistical significance of association appropriate parametric or nonparametric test of significance was used (chi square/ t-test /ANOVA etc). Probability value (p value) < 0.05 was taken as statistically significant.

RESULTS

Mean age of the patients of the interrupted suture group and continuous suture group was 43.68 years and 43.08 years respectively and was not found to be statistically significant. In our study, patients undergoing emergency laparotomies were divided into two groups based on the suture technique used-interrupted and continuous. Among the interrupted suture group, the most common conditions were acute intestinal obstruction and ileal perforation, each occurring in 20% of patients, followed by duodenal and gastric perforations, each seen in 16% of patients.

Appendicular perforation, strangulated hernia, and jejunal perforation were observed in 12%, 12%, and 4% of patients, respectively. In the continuous suture group, ileal perforation was the most frequent condition, affecting 36% of patients, followed by acute intestinal obstruction (20%), duodenal perforation (12%), and gastric perforation (12%). Appendicular perforation and jejunal perforation were less common, occurring in 8% and 4% of patients, respectively (Table 1).

Mean wound closure time among patients of the interrupted suture group was 33.24 minutes and was significantly larger in comparison to the patients of the continuous suture group (18.32 minutes) (Table 2). Among the patients of the interrupted suture group, two

packs of sutures (1 pack, 90 cm) were used in 80 percent of the patients while one pack of suture was used in 20 percent of the patients. Among the patients of the continuous suture group, one pack of suture was used in all the patients. Significantly shorter suture length and use of lesser number of suture packs was associated with patients of the continuous suture group (Table 3). Mean duration of hospital stay was 11.4 days among the patients of the interrupted suture group which was significantly lower in comparison to patients to the continuous suture group (17.2 days) (Table 4).

Table 1: Age distribution of patients.

Diagnosis	Interrupted suture group		Continuous suture group	
	Number	Percentage	Number	Percentage
Acute intestinal obstruction	5	20	5	20
Appendicular perforation	3	12	2	8
Duodenal perforation	4	16	3	12
Gastric perforation	4	16	3	12
Ileal perforation	5	20	9	36
Jejunal perforation	1	4	1	4
Strangulated hernia	3	12	2	8
Total	25	100	25	100
P value	0.112			

Table 2: Comparison of wound closure time.

Wound closure time (minutes)	Interrupted suture group	Continuous suture group
Mean	33.24	18.32
SD	7.25	5.44
P value	0.0001 (Significant)	

Table 3: Comparison of number of suture packs used.

Number of suture packs used; 1 pack: 90 cm	Interrupted suture group		Continuous suture group	
	Number	Percentage	Number	Percentage
1 pack	5	20	25	100
2 packs	20	80	0	0
Total	25	100	25	100
Mean	1.8		1	
SD	0.41		0	
P value	0.023 (Significant)			

Table 4: Duration of hospital stay.

Hospital stay (days)	Interrupted suture group	Continuous suture group
Mean	11.4	17.2
SD	4.01	7.58
P value	0.0012 (Significant)	

Table 5: Incidence of wound infection at different time intervals.

Wound infection	Interrupted suture group		Continuous suture group		P value
	Number	Percentage	Number	Percentage	
Present	11	44	15	60	0.048
Absent	14	56	10	40	
Total	25	100	25	100	

Table 6: Incidence of wound dehiscence.

Wound dehiscence	Interrupted suture group		Continuous suture group		P value
	Number	Percentage	Number	Percentage	
Present	1	4	6	24	0.041*
Absent	24	96	19	76	
Total	25	100	25	100	

Table 7: Incidence of complete wound dehiscence/burst abdomen.

Complete wound dehiscence	Interrupted suture group		Continuous suture group		P value
	Number	Percentage	Number	Percentage	
Present	1	4	3	12	0.822
Absent	24	96	22	88	
Total	25	100	25	100	

Among the patients of the interrupted suture group, wound infection was seen in 44 percent of the patients while among the patients of the continuous suture group, wound infection was seen in 60 percent of the patients; on comparing, significant results were obtained (Table 5). Partial wound dehiscence was seen in 4 percent of the patients of the interrupted suture group while it was seen in 24 percent of the patients of the continuous suture group. On comparing significant results were obtained (Table 6).

Complete wound dehiscence/burst abdomen was seen in 4 percent of the patients of the interrupted suture group and in 12 percent of the patients of the continuous suture group. On comparing, non-significant results were obtained (Figure 2, Table 7).

Figure 2: Complete wound dehiscence/burst abdomen.

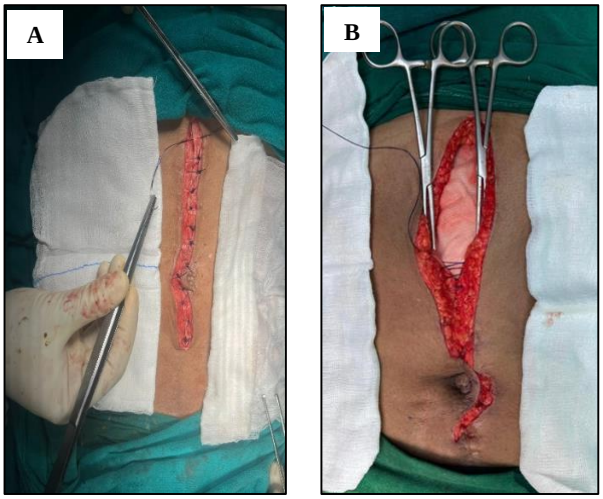

Figure 1: (A) Interrupted suture; (B) continuous suture.

Suture sinus was absent in patients of the interrupted suture group while it was present only in one patient of the continuous suture group; on comparing, the results were found to be statistically non-significant.

Figure 3: Incisional hernia in group B.

Incisional hernia was seen in one patient each among interrupted suture group and continuous suture group (Figure 3). Mean postoperative pain as assessed by VAS among patients of the continuous suture group and

interrupted suture group was 4.3±1.5 and 4.9±1.3 respectively. Non-significant results were obtained while comparing the postoperative pain among the patients of the two study groups.

DISCUSSION

Abdominal wall closure after emergency exploratory laparotomy is crucial for patient outcomes and recovery. The choice between interrupted and continuous sutures, particularly when using Polydioxanone (PDS), is a subject of ongoing debate and research. These procedures are commonly performed to address various intra-abdominal issues, often in patients with significant physiological imbalances and comorbidities.[8] The method of abdominal wall closure can greatly influence wound complications, postoperative discomfort, and long-term recovery. Despite its importance, there is limited robust evidence comparing the effectiveness of interrupted versus continuous sutures in emergency laparotomies, especially when PDS is used as the suture material.

In our study mean age of the patients of the interrupted suture group and continuous suture group was 43.68 years and 43.08 years respectively. Sharam G et al, in a similar study reported the mean age of the patients of the continuous and interrupted suture group to be 36.75 years and 38.37 years respectively.[9] Mean wound closure time among patients of the interrupted suture group was 33.24 minutes and was significantly more in comparison to the patients of the continuous suture group (18.32 minutes). In a similar study conducted by Sharma AC et al, mean wound closure time among patients of the interrupted suture group was 31.6 minutes and was significantly higher in comparison to the patients of the continuous group (17.3 minutes).[10]

Mean postoperative pain as assessed by VAS among patients of the continuous suture group and interrupted suture group was 4.3 and 4.9 respectively. Nonsignificant results were obtained while comparing the postoperative pain among the patients of the two study groups. Similar findings have been reported in the past literature. In a similar study conducted by Rahman M et al, authors also reported non-significant difference while comparing the VAS among patients of the continuous suture group and interrupted suture group.[11]

This study provides valuable insights into the effectiveness of different abdominal wall closure techniques in emergency exploratory laparotomy. The findings suggest that while the interrupted suture method with PDS may result in a longer closure time, it is associated with a lower incidence of wound infections compared to the continuous suture method. These results highlight the importance of carefully selecting the closure technique based on patient needs and surgical context. Further research is recommended to explore long-term outcomes and refine strategies for optimizing patient care in emergency surgical settings.

Limitations of the study, lesser sample size was our major limitation, lack of stratification of the result based on the indication of the emergency surgery was not done.

CONCLUSION

The interrupted suturing method proved to be more effective in preventing complications, it did require more time to perform. However, after thoroughly reviewing the available data, no definitive evidence was found to support the superiority of either techniques.

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