

A Prospective Study Comparing Continuous Versus Interrupted Suture Techniques in Midline Abdominal Wound Closure

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ABSTRACT

Introduction: Wound closure after midline laparotomy is an essential part of surgery to produce a healthy and a strong scar. There is an alternative interrupted method of closure as compared to conventional continuous method of closure. Many comparative studies have shown different outcomes. So, we wanted to evaluate the outcome of different techniques in our setting. **Aim:** To compare the outcome of Interrupted abdominal closure and continuous abdominal closure in midline laparotomy wound. **Methods:** This was a prospective comparative study conducted in the Department of Surgery of Nepalgunj Medical College Teaching Hospital, Kohalpur, Banke, Nepal for a duration of 1 year. A total of 60 patients were selected randomly to receive either continuous or interrupted abdominal closure in midline laparotomy wound. Wound was evaluated in terms of wound discharge, infection and wound dehiscence. **Results:** The mean age of the patients was 38.38 years. Most commonly, the patients presented with duodenal ulcer perforation with peritonitis. The average time taken for abdomen closure in group A (16.77 minutes) was significantly less as compared to group B (27.77 minutes). The average cost of sutures for group B (Rs 1322.97) was higher than that of sutures for group A (Rs 1118) with p value of <0.01. Wound infection and incidence of burst abdomen were similar in both groups after one month, suture sinus was seen in three patients of group A and four patients of group B (p = 1.0). Incisional hernia was seen in one patient of group A and in none of the patients of group B at three month's follow-up (p = 1.0). **Conclusion:** Continuous technique of midline laparotomy wound closure is better in terms of time required for wound closure and costing of suture materials, while showing no difference in terms of wound infection, burst abdomen and late wound complications.

Keywords: Abdominal closure, Continuous technique, Interrupted technique, Midline laparotomy

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INTRODUCTION

Midline laparotomy incision provides adequate exposure to all four quadrants, allows rapid exposure with minimal blood loss and is simple, so it is the most prevalent technique to open the abdomen in both emergency and elective settings.¹ However, its drawbacks are comparatively increased incidence of postoperative wound dehiscence and incisional hernia as compared to other incisions.^{2,3,4}

The elite technique of wound closure would be the one that approximates the tissue in such a way that normal healing mechanisms can occur under optimal circumstances. The technique should provide adequate tensile strength to the incision until the wound is healed and remains secure even in the presence of local or systemic infection, and should be the one in which suture material is well tolerated on a short and long-term basis. The technique should be able to be done

with expediency.³ Different methods for closure of laparotomy wounds have been used in the past. The abdomen closure has been done in terms of continuous versus interrupted closure, single layer versus mass closure and absorbable versus non absorbable sutures.⁴ The selection of material for closing the abdominal fascia should be made with the knowledge of what is known about fascial healing and the physical properties of suture material (strength, durability, ease of handling, and resistance to infection).⁵ The advantage of continuous suturing technique is that it provides equally distributed tension across the suture line and is more expedient, but its disadvantage is that it has a single suture holding the fascia together. The interrupted suturing technique has been used with success in the past, but its drawback is that it is tedious and there is a need of isolating tension to each individual stitch.³

Studies carried out in the past have shown non uniform results regarding the risk of burst abdomen between continuous

and interrupted methods.^{6,7,8} The selection of technique for abdominal closure may not be very important in elective laparotomies with adequate nutritional status and with no other risk factors for burst abdomen, but in a developing country like Nepal, many patients in emergency conditions present with malnutrition and prolonged intraperitoneal sepsis which are the risk factors for burst abdomen. Hence, it is important for us to determine the optimal technique for abdominal closure in our group of such patients.⁷

METHODS

This prospective comparative study was conducted in Department of Surgery, Nepalgunj Medical College Teaching Hospital, Kohalpur, Banke, Nepal for a duration of 1 year from July 2018 to June 2019. A total of 60 cases (30 cases in each group) undergoing emergency laparotomy were included.

Ethicon’s prolene (polypropylene) number 1 round body was used in all patients. The method of abdomen closure for each case was determined by the next sequence number from a randomization chart and the patients were divided into two groups. Group A consisted of patients whose wound was closed by continuous closure technique and Group B, whose wound was closed using interrupted abdominal closure technique.

The abdomen was closed in a single layer using Polypropylene number 1 in both groups. In Group A suture was placed at least 1.5 cm away from the fascial edge and a distance of 1 cm was kept in between each suture. A strand of suture was started at the end of the incision placing the knots underneath the fascia, and then the sutures were run towards each other and tied in the middle of the incision.³ In Group B, suture was placed at least 1.5 cm away from the fascial edge and a distance of 1 cm was kept in between each suture. Here, Smead-Jones far-far, near-near technique was used.³ In both the techniques, sutures were tied such that the fascial edges well approximated but not crushed together.³ The length of the wound, number of suture packs used and time consumed (in minutes) for closure were recorded intra-operatively. Wound was evaluated for erythema, swelling, serous discharge, infection, separation of edges and wound dehiscence postoperatively. If wound discharge was present, it was sent for culture and sensitivity. Early wound complications like serous discharge, partial wound dehiscence (dehiscence of skin and subcutaneous tissue with intact musculoaponeurotic layer), wound infection and burst abdomen were observed until the patients were discharged. Patients were called in for follow-up after one month and after three months of discharge to look for late wound complications like suture sinus formation and incisional hernia. The data so collected was analyzed using IBM SPSS (Statistical Package for the Social Studies) version 21. Student’s T test, Chi-square test and Fisher’s exact test were applied for statistical significance with p value of <0.05.

RESULTS

The age of the patients ranged from two years to 72 years with mean age of 38.38 years (SD ±18.97). In group A the youngest patient was aged two years and the oldest was 72 years, with a mean age of 36.23 years (SD ±20.88). Group B had a three years old patient as the youngest and 68 years old patient as the oldest with mean age of 40.53 years (SD ±16.92). The most common age group was 40-50 years with 11 patients (18.3%) and the least common was >70 years with two patients (0.03%).

Both groups were comparable in terms of age distribution (p = 0.385).

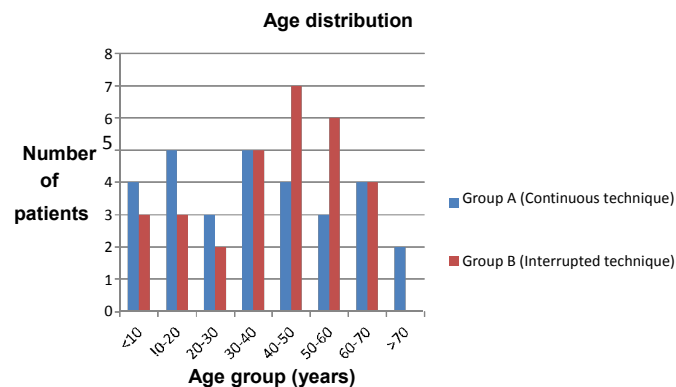


Figure 1: Age distribution (years)

Most commonly, patients presented with hollow viscus perforation with peritonitis. Out of 60 patients, 26 patients (43.33%) had duodenal ulcer perforation, six patients (10%) had appendicular perforation, six patients (10%) had traumatic small bowel perforation, four patients (6.66%) had sigmoid volvulus, four (6.66%) had small bowel volvulus and four (6.66%) patients had adhesive bowel obstruction.

The time taken for abdomen closure using continuous technique (16.77 min) showed statistically significant difference over interrupted technique (27.77 min) with p value of <0.01.

Group	N	Mean time taken for abdomen closure	Std. Deviation
Group A (Continuous technique)	30	16.77 min	±2.096
Group B (Interrupted technique)	30	27.77 min	±3.773

Table 1: Time taken for wound closure (minutes)

The average cost of sutures for group B (interrupted technique) was NRs 1322.97. Its cost was significantly higher than that of sutures for group A (continuous technique) whose average cost was NRs 1118 with p value of <0.01.

There were no early wound complications in 15 (50%) patients of group B and 17 (56.6%) patients of group A.

In group A, five (16.7%) patients had serous discharge while six (20%) patients in group B had serous discharge (p = 0.739).

In group A, five (16.7%) patients had partial wound dehiscence (superficial skin and subcutaneous tissue dehiscence with intact musculoaponeurotic layer) while seven (23.3%) patients had partial wound dehiscence in group B ($p = 0.519$).

In group A, three (10%) patients had burst abdomen while two (6.7%) patients in group B had burst abdomen ($p = 1.0$).

Wound Complication	Abdomen Closed With		Total
	Continuous Technique Group A	Interrupted Technique Group B	
Serous Discharge	5	6	11
Partial Wound Dehiscence	5	7	12
Burst Abdomen	3	2	5
No Complication	17	15	32
Total	30	30	60

Table II : Early wound complications

Five (16.7%) patients of group A had wound infection and six (20%) patients of group B had infected wound with p value of 0.739. At one month follow up, suture sinus was seen in three (10%) patients of group A and four (13.3%) patients of group B ($p=1.0$). At three month's follow up, suture sinus was seen in one (3.3%) patient of Group A and two (6.7%) patients of group B ($p=1.0$). Incisional hernia was seen in only one (3.3%) patient in group A ($p = 1.0$).

Wound at One Month	Abdomen Closed With		Total
	Continuous Technique Group A	Interrupted Technique Group B	
Suture Sinus	3	4	7
No Wound Complication	27	26	53
Total	30	30	60

Table III : Wound complications at one month

Wound at Three Months	Abdomen Closed With		Total
	Continuous Technique Group A	Interrupted Technique Group B	
Suture Sinus	1	2	3
Incisional Hernia	1	0	1
No Wound Complication	28	28	56
Total	30	30	60

Table IV : Wound complications at three months

DISCUSSION

Wound closure after midline laparotomy is an essential part of surgery to produce a healthy and a strong scar. In the present study, the time taken for abdominal wound closure was significantly less with the use of continuous technique (16.77 min) as compared to interrupted technique (27.77 min). Study by Richards et al. showed similar result in which they

randomized 571 patients and found out that the abdominal wounds could be closed by continuous suture in approximately half the time required for placing interrupted sutures (20 vs. 40 minutes).³

The cost of suture Ethicon's Prolene (polypropylene) no.1 round body used in this study is Rs 559 per suture. In this study, the cost of continuous abdominal closure (group A) was cheap compared to interrupted abdominal closure (group B). Almost single extra suture was required in interrupted abdominal closure for longer incisions. Since the abdomen was closed with continuous technique using two prolene sutures, which were started at both ends of the incision and then tied in the middle, the cost of the continuous suturing was the cost of two sutures. On the other hand, interrupted closure technique required two to three sutures for abdominal closure. Other studies by Fagniez et al⁹ Gislason et al¹⁰ and Dhamnaskar et al.¹¹ concluded that continuous closure was preferable to interrupted closure in midline abdominal closure because it was more economic and expedient. Early wound complications were present in nearly half of patient population. However, the incidence of wound infection was statistically insignificant between the groups. While Karwasara et al. in their study, found out that interrupted closure group had more wound infection compared to continuous technique (28% vs. 16%).⁴

Hodgson et al¹² Shashikala et al¹³ and Peponis et al¹⁴ showed that wound infections were not statistically different between the two methods of abdomen closure. Incidence of wound infection rate was considerably high in our study than in other studies. It may be because our study was done exclusively in emergency cases and were of type IV wounds.

Worldwide incidence of wound dehiscence after midline laparotomy ranges from 0.9% to 36.7%.^{3,4,6,14,15} Burst abdomen was present in 8.33% of the patients in this study. Burst abdomen was seen in 10% of group A patients and 6.67% of group B patients.

There are studies for example by Akmal et al. showing better results with abdominal closure in continuous fashion.⁶ Other proponents mention interrupted closure technique to be better as far as wound dehiscence is considered.⁷ Similarly, Peponis et al. found out that wound dehiscence in interrupted suturing vs. continuous suturing was 2.7% vs. 2.4% respectively ($p = 1.0$).¹⁴ As far as late wound complications are concerned, there is no uniform agreement as to which technique is better.

Hodgson et al. in their study concluded that abdominal fascial closure with a continuous non absorbable suture had a significantly lower rate of incisional hernia.¹² While, Gupta et al. in their study, found out that the incisional hernias occur with the same frequency with both the interrupted technique of laparotomy wound closure and the continuous technique.¹⁶

LIMITATIONS

There are few limitations to this study. The sample size is small. Incidence of incisional hernia could not be studied properly in our study as the study of incidence of incisional hernia requires longer duration of follow-up, but the patients do not come for longer follow-up. The wound complications are higher in our study because only emergency cases were taken, hence this result cannot be considered for elective cases.

CONCLUSION

Continuous technique of midline laparotomy wound closure is better in terms of time required for closure and costing of suture material, while showing no difference in terms of wound infection, burst abdomen and late wound complications.

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