



Evaluation of continuous v/s interrupted method of abdominal aponeurotic sheath closure in patients with acute perforation peritonitis: A randomized study

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ABSTRACT

Midline incision is the most common technique to access the abdominal cavity in both emergency and elective abdominal conditions. It is simple, gives quick and adequate exposure to all four quadrants with minimal blood loss. The abdominal aponeurosis can be closed by continuous or interrupted sutures after midline abdominal incision. Surgical literature hadn't clearly defined guidelines for method of abdominal aponeurosis closure particularly in emergency settings. The aim of this study is to evaluate outcome of continuous suturing with interrupted suturing of abdominal aponeurosis in emergency laparotomy of acute perforation peritonitis. **Materials and Methods** Fifty adult patients of acute perforation peritonitis admitted in the surgery department of Guru Nanak Dev Hospital & Govt. Medical College, Amritsar were studied and divided into two groups of 25 cases each, randomly in continuous closure and interrupted closure of abdominal aponeurosis with prolene suture no 1. The study duration was 18 months from December 2013 to May 2015. **Results** Continuous abdominal aponeurosis closure is better than interrupted in acute perforation peritonitis because it is fast and economical and wound friendly in terms of lower wound infection, wound dehiscence, burst abdomen, incision hernia and patients felt less wound pain, discomfort and have higher satisfaction index.

Keywords: Acute Perforation peritonitis, continuous Vs interrupted closure, Continuous versus Interrupted abdominal wall closure

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INTRODUCTION

Every surgeon envisages to close abdominal incision securely, without complications such as wound infection, dehiscence, sinuses, and incision hernia.^[1] Laparotomy incisions can be closed by various techniques for example continuous, interrupted, mass and layer by layer closure. The continuous suture technique is expedient, uniformly distributes tension along suture line and takes into consideration the dynamic alterations during abdominal distension. It has a disadvantage of being the solitary suture keeping sheath together. The interrupted suture technique also has been in practice for years, but more time consuming and bringing tension on an individual stitch. Midline laparotomy is the most common technique of abdominal incisions in both emergency and elective settings because it is simple, provides quick and adequate exposure to all four quadrants with minimal blood loss.^[2] Polypropylene monofilament non-absorbable suture is commonly used in infected wounds.

The specific method of abdominal aponeurotic sheath closure for an individual patient is commonly decided by subjective factors mostly surgeon's preference. The differently designed studies in surgical literature have not clearly defined the guidelines for abdominal aponeurotic sheath closure particularly in emergency settings. The objective of this study is to evaluate the outcome of continuous versus interrupted method of abdominal aponeurotic sheath closure in laparotomy of acute perforation peritonitis patients in terms of post-operative wound complications and patient satisfaction.

MATERIALS AND METHODS

Fifty adult patients of acute peritonitis of bowel perforation admitted in the surgery department of Guru Nanak Dev Hospital & Govt. Medical College, Amritsar were studied. They all had midline vertical incision and were divided into two groups of twenty five patients each in continuous and interrupted closure of abdominal aponeurotic sheath. The randomization of the patients was done with computer generated random tables which was informed intra operatively by a nursing attendant. The study duration was 18 months from December 2013 to May 2015. The patients were followed up for six weeks after surgery. Patients of primary peritonitis, severe anaemia (Hb < 8mg/dl), severe renal or liver disease, uncontrolled diabetes, malignancy, on anticancer chemotherapy or steroids, previous laparotomy, Age <18 and >70 year, HBs Ag, HCV & HIV positive were excluded from the study. Patients were first

examined in the surgical emergency ward, where detailed history was recorded, general physical/systemic examination performed and investigated for confirmation of the diagnosis. All patients were given pre-operative dose of broad spectrum antibiotics which were continued in the post-operative period. Exploratory laparotomy and the required closure were performed after noting the findings. The first dressing done after 48 hours of operation and wounds were inspected for signs of infection and dehiscence before each dressing done on every alternate day. All the patients were put on similar antibiotics covering both aerobic and anaerobic bacterial infections. Swab cultures from the wound were sent for microbiological culture and antibiotic sensitivity on evidence of any signs of infection. Patient were then put on most effective antibiotics according to the culture and sensitivity report if they showed any systemic sign of infection (e.g.: fever, sinus tachycardia, raised total leukocyte counts >11000 cells per cubic ml).

Method of Closure:

Non absorbable No. 1 Polypropylene suture was used in both groups for sheath closure.

Group A – (Continuous) The simple running suture passed starting just proximal to the incision till the completion of sheath closure. The bites were taken 1-2cm from the divided sheath edge.

Group B : (Interrupted) Interrupted sutures at a distance of 1-2 cm from the divided sheath edge with a distance of 1cm between two consecutive sutures taking 5-6 squared knots in a single suture tie.

Evaluation Parameters: Following parameters were recorded

a) Time taken to close the fascia: Time of closure was noted from the start to the end of the closure of abdominal fascia.

b) Length of suture material: For continuous closure, suture length was calculated by subtracting the length of suture material remaining at the end of closure from the total length of suture taken at the start of procedure. For interrupted closure, suture length was calculated by subtracting the length of suture material remaining at the end of closure and the suture lengths that were wasted while dividing suture after tying knots from the total length of suture taken at the start of procedure.

c) Suture length to wound length ratio: The length of the suture material used divided by the length of the incision.

d) Wound dehiscence: was defined as post operative missing continuity of the abdominal fascia with bursting open or splitting along sutured lines.

e) Patients satisfaction index: Patients were asked about their satisfaction at the time of discharge in

terms of local wound pain or discomfort into the following three categories: Very satisfied, Satisfied & Not satisfied.

f) Length of hospital stay.
Patients were reevaluated at 2, 4, and 6 weeks after surgery.

Statistical Analysis: For qualitative data, significant difference between means was computed by using t-test. To see significant difference for proportions for qualitative data; chi square and fisher’s exact test was applied. For quantitative data, significant difference between the

means was calculated by ANOVA followed by post-hoc test if the data was normally distributed otherwise Kruskal -Wallis test was applied.

RESULTS

A total of 50 patients divided into two groups of 25 each were operated. Group A and Group B patients underwent continuous and interrupted closure of abdominal aponeurotic sheath respectively. This data was tabulated and statistical analysis done.

Table 1: **Diagnosis**

			GROUP		Total
			Group A	Group B	
DIAGNOSIS	ILEUM	Count	11	9	20
		% within GROUP	44.0%	36.0%	40.0%
	GASTRIC	Count	6	7	13
		% within GROUP	24.0%	28.0%	26.0%
	JEJUNUM	Count	2	4	6
		% within GROUP	8.0%	16.0%	12.0%
	DUODENUM	Count	1	4	5
		% within GROUP	4.0%	16.0%	10.0%
	APPENDIX	Count	2	1	3
		% within GROUP	8.0%	4.0%	6.0%
	COLON	Count	2	0	2
		% within GROUP	8.0%	.0%	4.0%
	CAECUM	Count	1	0	1
		% within GROUP	4.0%	.0%	2.0%
Total	Count	25	25	50	
	% within GROUP	100.0%	100.0%	100.0%	

TABLE 2: SHOWING THE RESULTS OF VARIOUS EVALUATING PARAMETERS

Group	Parameters	Time (min)	Closure (cm)	Wound length (cm)	Suture Length (cm)	SL:WL Ratio
A	Mean	14.84	17.00	72.24	4.29	
	Std. Error of Mean	0.657	0.57	4.446	0.27	
	Median	14.00	15.00	70.00	4.20	
	Std. Deviation	3.287	2.88	22.230	1.38	
	Minimum	10.00	15.00	40.00	2.66	
	Maximum	22.00	25.00	124	8.26	
B	Mean	27.84	20.80	137.80	6.70	
	Std. Error of Mean	1.635	0.85	5.216	0.16	
	Median	25.00	20.00	134.00	6.70	
	Std. Deviation	8.174	4.25	26.082	0.83	
	Minimum	15.00	10.00	75.00	5.20	
	Maximum	43.00	25.00	188.00	8.66	

TABLE 3: SHOWING PERCENTAGE OF COMPLICATIONS

Complications	Wound infection		Wound dehiscence		Suture sinus		Burst abdomen/ Incision Hernia	
	Group A	Group B	Group A	Group B	Group A	Group B	Group A	Group B
Present	5 (20%)	8 (32%)	4 (16%)	6 (24%)	2 (8%)	8 (32%)	0 (0%)	1 (4%)

Wound infection rate, wound dehiscence and suture sinus development, was 20% vs 32%, 16% vs 24% and 08% vs 32% in continuous vs interrupted groups respectively. Statistical significance was present while comparing continuous group with interrupted in terms of development of suture sinuses during follow up, ($p=0.034$; $X^2 = 4.50$) using chi-square test. The incidence of burst abdomen or incision hernia was 0%, and 4.0% in Group A & B respectively at the end of six weeks. [Table 3].

In the two groups A and B age of patients were 38.80 yrs and 31.32 yrs respectively. Majority of the patients were males 45 (90%). Most common diagnosis was of ileum perforation peritonitis with 20 patients among total cases followed by gastric perforation peritonitis in 13 patients, jejunum (6), Duodenum(5), appendix (3), colon(2), caecum (1) [Table No.1]. The mean time taken for closure of sheath in continuous group was about 14.84 minutes and for closure of sheath in interrupted

group was about 27.84 minutes respectively. The difference was statistically significant with $p < .001$; $t = 7.37$ using independent t sample test. Mean length of suture used to close the abdominal aponeurotic sheath in continuous group was 72.24 cm and in interrupted group was 137.80 cm respectively. The difference between the above two techniques in terms of suture length used is statistically significant using independent sample t-test ($t=9.56$; $P < 0.001$). The mean SL: WL for continuous suturing is 4.29 as compared to 6.70 for interrupted suturing. The difference is statistically significant between the above two technique ($t=7.44$; $p < 0.001$) using independent sample test [Table 2]. The mean duration of hospital stay for the continuous and interrupted group was 13.52 days and 15.52 days respectively. Patients were more satisfied in the continuous group than in the interrupted group. The difference being statistically significant ($p < 0.05$; $x^2= 7.54$) using chi – square test. [Table 4].

TABLE 4: SHOWING PATIENT SATISFACTION

Satisfaction index	Wound infection	
	Group A	Group B
Not satisfied	3 (12%)	7 (28%)
Satisfied	8 (32%)	13 (52%)
Very satisfied	14 (56%)	5 (20%)

DISCUSSION

The mean age of the patients in our study was comparable to studies showing most common age group of perforation peritonitis being 30-50 years and 84% were below 50 years [3]. Male majority of the patients in our study was similar to the studies done in the past [4, 5]. Most common pathology found in our study was ileal perforation which is similar to various studies [Table 1]. [6,7] Closure of the sheath time was significantly higher in interrupted group ($p < 0.001$) with continuous group comparable to Richards. [8] The difference of Mean SL: WL for continuous and interrupted groups in our study statistically significant ($p < 0.001$). The mean SL: WL corroborating to Jenkins ideal ratio of 4:1 for continuous [9] and to Varshney et al 6:1 for interrupted group. [10]. In our study SL:WL is 1.56 times more in interrupted group than continuous group [Table 2]. Mean duration of

hospital stay is marginally short in continuous than interrupted group.

Higher percentage of wound infection was present in both groups (26%), 20% (Group A) and 32% (Group B) in our study as compared to 10% to 11% [11] in other studies due to the contamination of incision with gut contents. Wound dehiscence was 20% in our study compared to (32%) of emergency cases. [12-13]. In our study Wound dehiscence was more in interrupted than in continuous group. Indian authors reported burst abdomen in 10-30% of emergency cases. [13] In our study burst abdomen occurred 0% in continuous group and 4% in interrupted group comparable to 14.8% and 2.17% in continuous group and interrupted group. [14] High rates of wound dehiscence in our study can be primarily explained by the fact that our study was conducted in patients undergoing emergency surgery for perforation peritonitis which constitutes

a major source of inevitable faecal contamination and sepsis.

The higher rate of suture sinus formation in our study may be attributed to higher incidence of wound infection, greater SL: WL and to thin build with lesser subcutaneous fat. As a consequence of it the monofilament knot erodes the skin easily leading to the formation of suture sinus. The cumulative incidence of incision hernia in our study was 0.0% in continuous, 4% in interrupted group at 6 weeks of surgery [Table 3] compared to 2-20%.^[15,16]

Statistically significant difference was present in satisfaction of patients in continuous group than in interrupted group ($p < 0.05$) [Table 4]. No data could be found in surgical literature to the best of our knowledge which showed less wound pain with continuous suturing than with interrupted. In our study patients in continuous group experienced less wound pain and were more satisfied than

interrupted suturing probably because of less number of knots and less irritation.^[17,18]

CONCLUSION

Continuous abdominal aponeurotic sheath closure is better than interrupted as it is expedient, fast, economic and wound friendly in because of lower occurrence of wound infection, wound dehiscence, burst abdomen, suture sinus and incision hernia formation. Patients experienced less wound pain and discomfort when sheath was primarily closed in continuous than interrupted manner with higher satisfaction index in continuous suturing. Continuous method thus is the preferred method of suturing for abdominal fascia closure in acute perforation peritonitis emergency laprotomy due to the lower occurrence wound complications and higher patient satisfaction.

Conflicts of interest: Authors have no conflicts of interest to declare.

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