

Is Interrupted suture technique superior to Continuous suturing for rectus closure in Class IV (Dirty-Infected) Abdominal Wounds?

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Abstract:

Background: Class IV or Dirty wounds are old traumatic wounds with retained devitalized tissue and those that involve existing clinical infection or perforated viscera. Dirty abdominal wounds have a higher incidence of wound dehiscence or 'Burst Abdomen' especially in the presence of poor fascial approximation. Since there are no studies on rectus closure techniques in dirty abdominal wounds, we tried to compare the two commonly used techniques of rectus closure and assess the outcome.

Materials and Methods: In this prospective randomized controlled study, 97 patients undergoing closure of midline laparotomy wounds were randomly allocated into 2 interventional groups based on the technique of rectus closure, Group C (Continuous suturing) and Group I (Interrupted suturing). Rectus closure time, Length of Hospital stay, and wound complication rates were compared between the groups.

Results: The mean length of hospital stay and the wound complication rates including for dehiscence, infection rate, and seroma formation were statistically not significant between the two groups. However the time for rectus closure was significantly lower in Group C as also the rate of stitch granulomas.

Conclusion: Rectus closure with Interrupted sutures was not superior to continuous sutures in the closure of dirty midline abdominal wounds.

Key Word: Rectus closure; Interrupted; Continuous; Dirty wounds; Abdominal wounds.

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I. Introduction

The anterior abdominal wall is the gateway to most of the gastrointestinal, urogenital and vascular structures and hence is commonly breached to access these viscera. The anterior abdominal wall not only shields the abdominal viscera but also aids in breathing and respiratory movements. Hence a strong fascial closure is mandatory after any surgical access in this region. A major implication of this is Burst Abdomen which is often attributed to inappropriate fascial closure technique.

Studies on traumatic wounds led to a wound classification system^{[1][2]} which predicted the risk of infection based on the anatomic area, the pathology and the aseptic techniques used

Class IV or Dirty wounds^{[1][2]} are old traumatic wounds with retained devitalized tissue and those that involve existing clinical infection or perforated viscera. This definition suggests that the organisms causing postoperative infection were present in the operative field before the operation. Class IV wounds are a special category in abdominal wounds – they are more likely to be infected, often have preexisting sepsis and multiorgan dysfunction, are more likely to be emergency laparotomies, and quite often have raised intra abdominal pressure from inflammation and ileus – all contributing to higher incidence of wound dehiscence or 'Burst Abdomen' more so in the presence of poor fascial approximation

Two often studied and compared methods of rectus closure are the continuous and interrupted techniques. The interrupted suture technique^{[3][4]} is hypothesized to have better wound strength especially in the setting of infection since loosening of one suture does not jeopardize the entire wound.

The aim of the present study is to know whether the interrupted suturing technique offers any additional benefit when compared to the continuous suturing technique with respect to the time taken for suturing, the time to recovery (length of hospital stay) and the rates of wound complications.

II. Material And Methods

This prospective comparative study was carried out on patients presenting to the Department of General Surgery at Gandhi Hospital, Musheerabad, Secunderabad between August 2008 and July 2009. A total 97 subjects were selected for this study.

Subjects & selection method: The study population consisted of patients who underwent exploration with a midline laparotomy at the Department of General Surgery at Gandhi Hospital with indications which would classify the abdominal wounds as dirty.

Patients were randomized into two interventional groups, after informed consent, depending on the technique of rectus sheath (fascial) closure

Group C (N=62 patients) – Continuous suture method;

Group I (N=35 patients) – Interrupted closure group

Inclusion criteria:

1. Patients requiring midline laparotomy and
2. Surgical wound classification of Class IV

Exclusion criteria:

1. Severe anemia
2. Severe Hypoproteinemia
3. Chronic illnesses like chronic liver disease or kidney diseases
4. Previous midline laparotomies
5. Pregnant women;
6. Diabetic and immunocompromised patients
7. Chronic respiratory ailments like COPD, Asthma or active pulmonary Kochs
8. Patients lost to follow up or expired during treatment

Procedure methodology:

After written consent and preoperative workup and resuscitation, patients were taken for surgery under anaesthesia. Exploratory laparotomy and procedure was performed as per the aetiology. After the procedure, closure of the abdominal wound was done. In Group C, continuous suturing of the rectus sheath was done using No. 1 Loop prolene, anchored through the loop on one end of incision, followed by continuous suturing with intermittent locking and finally tying the Aberdeen knot at the other end (Figures 1A & 1B). In Group I, the rectus sheath was sutured in an interrupted fashion using No.1 prolene, employing either horizontal mattress or figure-of-eight (cross) sutures (Figure 2).



Figure 1A: Continuous Suturing in action continuous suturing



Figure 1B: Aberdeen knots at the end of

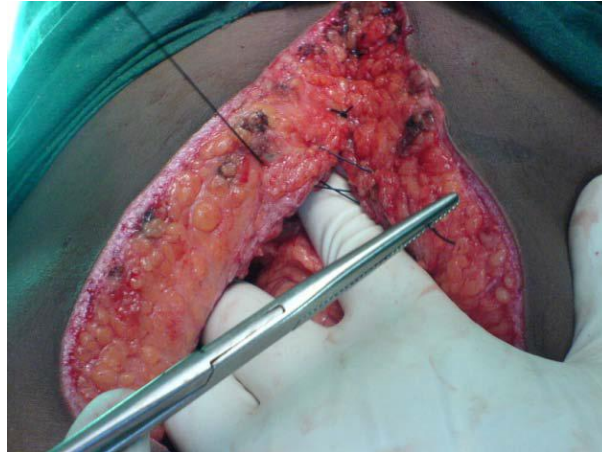


Figure 2: Interrupted sutures

Drains were placed wherever necessary. Skin was sutured with non absorbable sutures

Postoperatively, wounds were examined after 48 hours and then every second day till suture removal or discharge. Patients were followed up at 10 days, 3 weeks, 6 weeks and 3 months postoperatively. Complications, if any were noted. In the event of wound dehiscence, the wounds were managed by dressings or resuturing depending on the extent of dehiscence and other complications.

Parameters that were recorded for analysis in each group included the operative time for closure of rectus sheath, the length of hospital stay, wound complications viz., wound infection, wound dehiscence (partial or complete), Seromas (or Hematomas) and stitch granulomas (or sinuses).

Statistical analysis

Student's *t*-test was used to ascertain the significance of differences between mean values of two continuous variables and confirmed by nonparametric Mann-Whitney test. Chi-square and Fisher exact tests were performed to test for differences in proportions of categorical variables between two or more groups. The level of $p < .05$ was considered as the cutoff value for significance.

III. Result

The age and sex distribution of the study is detailed in Table no 1 and Table no 2. Both groups were comparable.

Table no 1: Age distribution of the two study groups

	Mean (in years)	Median (in years)	Standard Deviation	Range (in years)	t- test*
Group C (n=62)	36.79	35	14.44	14-78	$t(95) = 0.982$ $p = .164$ Not significant
Group I (n=35)	40	35	17.13	12-76	

*confirmed by Mann-Whitney U Test

Table no 2: Sex Distribution

	No. of Males	No. of Females	Total	$\chi^2(1, N=97) = 0.67,$ $p = .413$ not significant at $p < .05^*$
Group C	52	10	62	
Group I	27	8	35	
Total	79	18	97	

*confirmed with Fisher Exact Test

Both groups were analyzed for the time taken for closure of the rectus sheath during surgery. Group C had a significant reduction in time taken to close the rectus sheath (Table no 3)

Table no 3: Operative time for Rectus sheath closure

	Mean (in minutes)	Median (in mts)	Standard Deviation	Range	t-test
Group C (n=62)	18.24	16	4.39	14-29	$t(95) = 8.125$ $p\text{-value is } < .00001^*$ SIGNIFICANT
Group I (n=35)	24.71	24	2.24	18-28	

*confirmed by Mann Whitney U Test

There was no significant difference in the length of hospital stay between the two groups (Table no 4)

Table no 4: Length of Hospital Stay

	Mean (in days)	Median (in days)	Standard Deviation	Range	t-test
Group C (n=62)	12.05	10	8.01	5-45	t(95) = -0.115 p = .454 Not Significant at p-value <.05
Group I (n=35)	12.26	9	9.52	7-54	

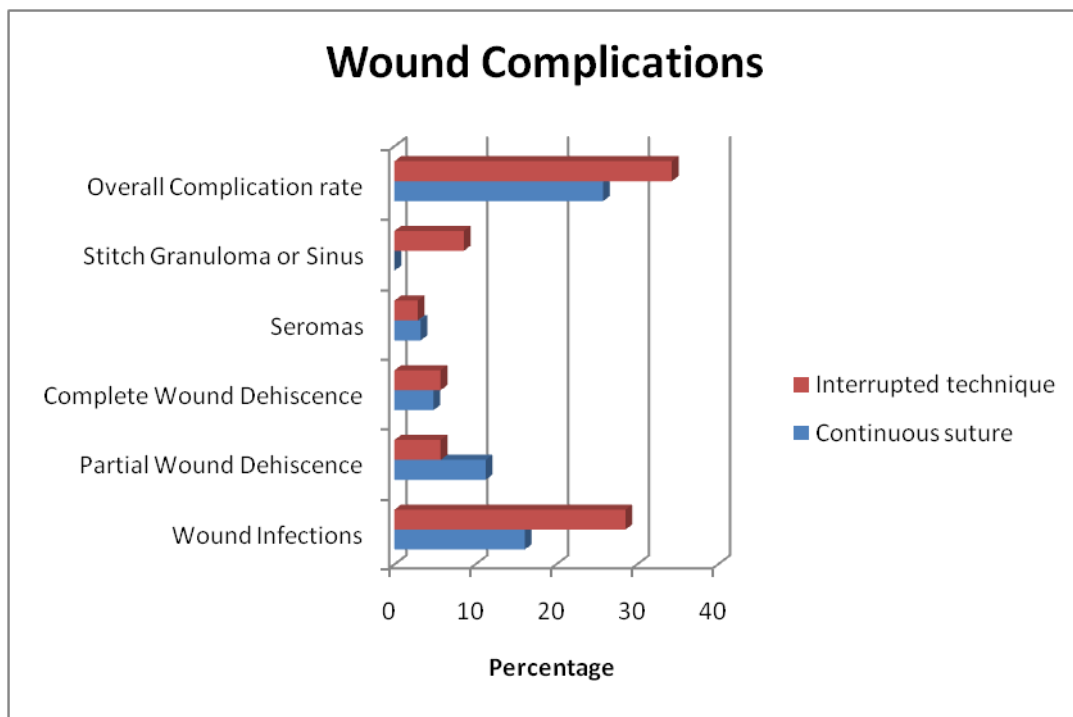
COMPLICATIONS:

16 patients in Group C and 12 patients in Group I reported wound related complications. The list of complications and their reported incidence is given in the table below

Table no 5: Wound Complications

	Group C (n=62)	Group I (n=35)	X ² test value (value with Yates correction)	p value (p value with Yates correction)	
Wound Infection	10 (16.12%)	10 (28.57%)	2.116 (1.42)	.415 (.23)	not significant at p<.05
Wound Dehiscence (Total)	10 (16.12%)	4 (11.43%)	0.40 (0.11)	.527 (.74)	not significant at p<.05
Partial Dehiscence	7 (11.29%)	2 (5.71%)	0.826 (0.29)	.363 (.585)	not significant at p<.05
Complete Dehiscence	3 (4.83%)	2 (5.71%)	0.0351 (0.08)	.85 (.77)	not significant at p<.05
Seroma	2 (3.23%)	1 (2.86%)	0.0101 (0.26)	.919 (.61)	not significant at p<.05
Stitch Granuloma	0 (--)	3 (8.57%)	0.0444*	--	significant at p<.05
Overall Complications	16 (25.80%)	12 (34.29%)	0.783 (0.425)	.376 (.51)	not significant at p<.05

*Fisher Exact Test value



The overall wound complication rate was slightly higher in Group I (34.29% Vs 25.8%). While Seromas and partial wound dehiscences were more common in Continuous suture group, Stitch granulomas, complete wound dehiscences and wound infections were more common in the Interrupted suture group. However, except Stitch granulomas, none of the complications showed statistically significant difference between the groups.

IV. Discussion

Proper closure of rectus sheath plays an important role in the prevention and management of wound complications. Specially, wound complications are high in dirty class IV abdominal wounds^{[5] [6]}. Very few studies on rectus closure concentrated on these subgroup of patients with higher risk of wound complications, although there are a number of studies on rectus closure favoring either the continuous suture^{[7][8][9]} or interrupted suturing^{[3][4][10]}. We tried to study if one technique (Interrupted) is superior to the other technique (continuous) in this scenario (i.e., dirty abdominal wounds)

We did not find any statistically significant difference in the length of hospital stay, the overall complication rate, wound dehiscence rates or rate of wound infections between the two groups.

On the contrary there was a significant increase in the rectus closure time in Group I (Interrupted closure). Also, there was a significantly increased incidence of stitch granulomas and sinuses in the Interrupted technique group.

V. Conclusion

Interrupted closure of rectus sheath is not superior to continuous closure in dirty abdominal wounds. On the contrary it increases the closure time (and rate of stitch granulomas and sinuses), hence not recommended, specially, in emergency surgeries.

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