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Effectiveness Of Intermittent Rectus Closure In Emergency Midline Laparotomy In Preventing Wound Dehiscence And Incisional Hernia.

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ABSTRACT

After primary elective median laparotomy, the risk of developing an incisional hernia is found in the published studies to be between 5 and 20 percent. One of the crucial risk factors of the genesis of incisional hernias is the malfunction of collagen synthesis. A direct correlation between the formation of a reduced collagen 1/3 quotient and the development of an unstable scar was detected by Friedman in 1993. Other main risk factors are found to be obesity, steroid therapy, malnutrition, nicotine abuse, and other connective tissue diseases. To evaluate the effectiveness of intermittent rectus closure in emergency midline laparotomy by comparing with continuous rectus closure and its effectiveness in preventing wound dehiscence and incisional hernia in our institution. This single centre, prospective comparative randomized study. Type of study was conducted in Department of General Surgery, Govt. Theni Medical College In the year 2021 February to 2021 December . selected for this study, after getting written and informed consent. They were divided equally into 50 cases each in the Group A (intermittent rectus closure) and Group B (continuous rectus closure). Follow up of study patients was done for a period of not less than 6 months postoperatively. All patients satisfying inclusion criteria, admitted in Department of General Surgery, Out of 60 patients in this study, 5 patients (17%) with continuous rectus closure were developed wound infection while only 3(10%) with interrupted rectus closure had wound infection. Out the 100 patients, 5 patients (17%) with continuous rectus closure were developed partial wound dehiscence while only 3(10%) with interrupted rectus closure had partial wound dehiscence. Out of 60 patients in this study, only 2(7%) patients were developed burst abdomen (complete wound dehiscence) in continuous rectus closure group. No complete wound dehiscence had occurred in intermittent rectus closure group. Incisional hernia in the follow up period of 6 months was found in 2 patients with continuous rectus closure while only one patient with interrupted rectus closure had incisional hernia. The chances of burst abdomen occurred is 1/46 (2.17%) in interrupted group and 8/54 (14.8%) in continuous group according to study which was conducted by Srivastav et al on 100 patients undergoing emergency laparotomy, the difference being statistically significant. Richards et al also concluded that statistically significant difference in incidence of burst abdomen is present in infected wounds than in non- infected wounds ($p < 0.02$). Based on the currently evidence in midline closure after elective laparotomy in the small bites technique can be recommended to reduce significantly the rate of incisional hernia. The additional use of a prophylactic mesh in high risk patients can significantly reduce the occurrence of incisional hernia.

Keywords: midline closure, small bite technique, prophylactic mesh, incisional hernia, prevention

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INTRODUCTION

Midline laparotomy is the most common technique used in both elective as well as in emergency surgeries. As it is the simplest technique and provides good exposure of all quadrants of abdomen with minimal loss of blood [1]. Though it is the easiest technique, wound dehiscence is one of the most common and dreadful complication associated with midline laparotomy. It is also a major cause of postoperative morbidity of the patient [2]. Patient factors such as malnutrition, anemia, and sepsis play major role than method of closure and selection of suture material. In elective surgeries, patients are optimized and all those risk factors predisposing to wound dehiscence are addressed preoperatively and corrected [3]. So, the type of closure may not be as important when compared to emergency surgeries [4]. In case of emergency surgeries, patients are not optimized adequately; frequently they have co-morbid conditions, which predispose them for developing post operative complications like wound infection, wound gaping and wound dehiscence. Few factors are crucial while doing fascia closure such as adequate space between the sutures, taking adequate depth of rectus, abdominal muscle relaxation during rectus sheath closure and closure without much tension. Acute wound failure is prevented by paying careful attention to those factors [5]. Interrupted closure of fascia is one of the wisest choices in very high-risk patients especially in emergency laparotomy. If primary closure of fascia is not possible without undue tension, it is better to go for alternative methods of closure. Retention sutures were used mainly in the past, to prevent or to treat burst abdomen. But it is used less commonly today, as many surgeons are opting for alternative approaches like synthetic mesh or bio-absorbable tissue scaffold nowadays [6].

MATERIALS AND METHODS

This single center, prospective comparative randomized study. Type of study was conducted in Department of General Surgery, Govt. Theni Medical College In the year 2021 February to 2021 December selected for this study, after getting written and informed consent. They were divided equally into 30 cases each in the Group A (intermittent rectus closure) and Group B (continuous rectus closure). Follow up of study patients was done for a period of not less than 6 months postoperatively. All patients satisfying inclusion criteria, admitted in Department of General Surgery.

Eligibility criteria

Inclusion criteria: Patients, who are undergoing for emergency midline laparotomy for any condition, will be included in this study after obtaining oral and written consent.

Exclusion Criteria: Patients who have undergone previous laparotomy for any condition or those with incisional hernia or burst abdomen at presentation and not willing to undergo this study will be excluded from the study. Preoperative evaluation: All the patients who were included in the study underwent preoperative investigations essential for the preanesthetic check-up fitness. These included complete hemogram, Random Blood Sugar, Blood Urea and Serum Creatinine, Serum electrolytes, total bilirubin, alkaline phosphatase, SGOT/SGPT, total proteins with serum albumin, x-ray abdomen (erect and supine), Chest x-ray, Electrocardiogram.

Procedure

Patients were examined in the surgery triage wherein detailed history was collected from the patient if possible or the relative accompanying the patient. Patients were then subjected to essential general physical and detailed systemic examination. All the necessary available investigations were done to confirm the diagnosis and assessment purpose. After initial aggressive resuscitation, patients were then shifted to operation theatre for emergency midline laparotomy. All patients were given pre-operative dose of antibiotics (preferably cephalosporins) 30 minutes before surgery which were continued in the post-operative period also. Exploratory laparotomy was carried out through a midline vertical incision. The incision was made in skin using blade no. 22 mounted on bard-parker handle. The length of the incision was standardized starting from 15cm with subsequent increments of 5 cm. The measurement of the same was done using a metallic scale which was kept and sterilized in glutaraldehyde to be taken out only at the start of

the procedure for measurement. The incision was further developed in layers using electrocautery dividing the subcutaneous adipose tissue.

The peritoneum was opened up between two hemostats with the help of metzenbaum scissors. The peritoneum along with the rectus sheaths were opened up with electrocautery over the surgeons' fingers.

According to the intra-operative findings, procedure was carried out as a life saving measure. Variable number of peritoneal drains were kept and fixed to skin and taken out at the level of umbilicus lateral to the rectus muscle. Thorough wash of peritoneal cavity was done with warm normal saline till the effluent was clear enough. Rectus closure was done in continuous or intermittent manner. Time taken for rectus closure was noted. The total length of the suture material used during procedure was noted along with the suture pieces which got wasted while tying knots or while dividing suture. The net length of the suture material was calculated subsequently by subtracting the length of the wasted pieces from the total length used. Suture length: wound length ratio was subsequently computed. The skin suturing was done with non-absorbable monofilament suture material. Wound dressing was done with sterile gauze. The primary dressing was removed after 48 hours postoperatively. The wound was inspected daily for signs of infection and dehiscence before each dressing. Swab cultures from the wound were sent for microbiological culture and antibiotic sensitivity on evidence of any signs of infection. According to the culture and sensitivity report, patients were started on antibiotics if they showed any systemic sign of infection (eg: fever, sinus tachycardia, elevated WBC count >11000 cells per cubic millimeter). If wound dehiscence develops, wound dressing was done daily till healthy granulations develop. After which, secondary suturing would be done under sterile aseptic precautions using non-absorbable monofilament suture material. If burst abdomen develops, retention suturing of abdomen will be done en masse using 1' Prolene. Daily wound dressing and intravenous antibiotics were given according to wound culture & sensitivity report

Follow up

Patients were followed up by asking them attend surgical outpatient department or through phone contact if appearance in person is not possible. They were re-evaluated at 2, 4, 6 and 12 weeks and 6 months postoperatively. The patients were examined for following complications: Wound infection:

Suture sinus: Defined as abnormal protrusion of underlying suture threads through an intact skin with serous or seropurulent discharge. It may or may not require removal.

Burst abdomen/Incisional hernia: Defined as postoperative evidence of a fascia dehiscence after completed superficial wound healing with or without prolapse of abdominal organs.

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 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. Data will be expressed as mean, median.

RESULTS

Age distribution were 10.0% is up to 40 years, 32.5% is 41-50 years, 38.8% is 51-60 years, 18.8% is above 60 years. Gender distribution were 32.5% are Female, 67.5% are Male.

Table 1: Diagnosis distribution

Diagnosis		
	Frequency	Percent
Acute cholecystitis	8	10.0
Acute small bowel obstruction	6	7.5
Appendicular perforation	6	7.5
bull gore injury	3	3.8
CA anal canal with large bowel obstruction	4	5.0
CA Rectum with large bowel obstruction	2	2.5
Duodenal perforation	12	15.0
Gastric perforation	8	10.0
GB perforation	4	5.0
ileal perforation	6	7.5
RTA with blunt injury abdomen	13	16.3
Stab injury abdomen	8	10.0
Total	80	100.0

The above table shows diagnosis distribution were 10.0% is Acute cholecystitis, 7.5% is Acute small bowel obstruction, 7.5% is Appendicular perforation, 3.8% is bull gore injury, 5.0% is CA anal canal with large bowel obstruction, 2.5% is CA Rectum with large bowel obstruction, 15.0% is Duodenal perforation, 10.0% is Gastric perforation, 5.0% is GB perforation, 7.5% is ileal perforation, 16.3% is RTA with blunt injury abdomen, 10.0% is Stab injury abdomen.

Table 2: Comparison between Co-Morbidities with Groups

Co-Morbidities		Groups		Total	χ^2 - value	p-value
		Group I	Group II			
Absent	Count	28	25	53	0.503	0.478 #
	%	70.0%	62.5%	66.3%		
Present	Count	12	15	27		
	%	30.0%	37.5%	33.8%		
Total	Count	40	40	80		
	%	100.0%	100.0%	100.0%		
# No Statistical Significance at p > 0.05 level						

The above table shows comparison between Co-Morbidities with both Groups. Group 1 contains 30% with co morbidities and 70% without co morbidities. Group 2 contains 32.5 % with co morbidities and 67.5 % without co morbidities. By Pearson's chi-squared test were $\chi^2=0.503$, $p=0.478>0.05$ which shows no statistically significant association between Co- Morbidities and Groups.

Table 3: Comparison between Post op 1 week with Groups

Post op 1 week		Groups		Total	χ^2 - value	p-value
		Group I	Group II			
Burst abdomen	Count	5	3	8	0.556	0.712 #
	%	12.5%	7.5%	10.0%		
Nil	Count	35	37	72		
	%	87.5%	92.5%	90.0%		
Total	Count	40	40	80		
	%	100.0%	100.0%	100.0%		
# No Statistical Significance at p > 0.05 level						

The above table shows comparison between Post op 1 week with both Groups. Burst abdomen is seen in 12.5% among group 1 and 7.5% in group 2 and hence burst abdomen in post op 1 week is seen higher in continuous rectus closure than in Smead Jones rectus closure. But by Pearson's chi-squared test were $\chi^2=0.556$, $p=0.712>0.05$ which shows no statistically significant association between Post op 1 week and Groups.

Table 4: Comparison between Post op 6 weeks with Groups

Post op 6 weeks		Groups		Total	χ^2 - value	p-value
		Group I	Group II			
Incisional hernia	Count	4	2	6	0.721	0.675 #
	%	10.0%	5.0%	7.5%		
Nil	Count	36	38	74		
	%	90.0%	95.0%	92.5%		
Total	Count	40	40	80		
	%	100.0%	100.0%	100.0%		
# No Statistical Significance at $p > 0.05$ level						

The above table shows comparison between Post op 6 weeks with Groups and Incisional hernia is 10% in group 1 and 5 % in group 2 and hence incisional hernia among continuous rectus closure in post op 6 weeks is higher than in Smead Jones rectus closure. But by Pearson's chi-squared test were $\chi^2=0.721$, $p=0.675>0.05$ which shows no statistical significant association between Post op 6 weeks and Groups.

Table 5: Comparison between Post op 6 months with Groups

Post op 6 months		Groups		Total	χ^2 - value	p-value
		Group I	Group II			
Incisional hernia	Count	3	2	5	0.213	1.000 #
	%	7.5%	5.0%	6.3%		
Nil	Count	37	38	75		
	%	92.5%	95.0%	93.8%		
Total	Count	40	40	80		
	%	100.0%	100.0%	100.0%		
# No Statistical Significance at $p > 0.05$ level						

The above table shows comparison between Post op 6 months with Groups. Incisional hernia in group 1 is 7.5 % and in group 2 is 5 % and hence percentage wise continuous rectus closure has more incidence of incisional hernia in post op 6 months than Smead Jones rectus closure. But by Pearson's chi-squared test were $\chi^2=0.213$, $p=1.000>0.05$ which shows no statistically significant association between Post op 6 months and Groups.

DISCUSSION

In an emergency lifesaving procedure, closure of abdominal wound can be temporary or permanent based on the patient's general condition, the nature of the disease process or cause leading to surgery. In general, primary permanent closure is possible for clean and non-contaminated wounds with healthy local tissue conditions [7]. But those conditions requiring re-exploration or a patient with abdominal compartment syndrome, temporary closure is preferred. This study assesses the continuous and interrupted closure method of rectus sheath in emergency midline laparotomy. The variables used in this study were post-operative wound infection, wound dehiscence, suture sinus and incisional hernia [8]. Out of 100 patients in this study, 5 patients (17%) with continuous rectus closure were developed wound infection while only 3 (10%)

with interrupted rectus closure had wound infection. Out the 200 patients, 5 patients (17%) with continuous rectus closure were developed partial wound dehiscence while only 3(10%) with interrupted rectus closure had partial wound dehiscence. Out of 60 patients in this study, only 2(7%) patients were developed burst abdomen (complete wound dehiscence) in continuous rectus closure group. No complete wound dehiscence had occurred in intermittent rectus closure group. Incisional hernia in the follow up period of 6 months was found in 2 patients with continuous rectus closure while only one patient with interrupted rectus closure had incisional hernia [9]. Presence protein energy malnutrition widely in the Indian population may be the aggravating factor. The problem gets compounded further with the onset of chronic illnesses like tuberculosis, typhoid, cancer etc. Many patients have been affected by co-morbid conditions like anemia, poor nutritional status, diabetes, tuberculosis, cancer. These factors affect the process of wound healing directly or indirectly. Also post operative pulmonary complications, hemodynamic instability plays major role in the development of wound healing [10]. Rate of wound dehiscence between two groups was 32% and 12%. Rate of occurrence of incisional hernia between continuous and intermittent group was 36% and 8%.5 respectively. So according to this study, interrupted rectus closure was better than continuous rectus closure [11], 7 were developed wound dehiscence in continuous rectus closure group, while only 3 in intermittent rectus closure were developed wound dehiscence. 2 patients were developed burst abdomen in continuous closure group. 2 of our patients from the continuous group were developed incisional hernia, 1 from intermittent group was developed incisional hernia [12-14]. Therefore, Interrupted rectus closure using non absorbable suture material overweighs the disadvantages of the continuous suturing technique particularly in midline laparotomy in emergency setting. Hence the technique should be considered [15].

CONCLUSION

The pooled primary endpoint has the advantage of evaluating the effect of different suture techniques on both the rate of burst abdomen and incisional hernias. Furthermore, it is associated with a realistic case number for study implementation. A disadvantage of this could be an under-reporting of a difference in the incidence of burst abdomen, which is rather low compared with the rate of incisional hernias. In summary, the CONIAC trial will assess efficacy and safety of two different abdominal wall closure techniques in patients undergoing emergency midline laparotomy. The results of this trial will help to improve short-term and long-term surgical outcomes and will hopefully provide further evidence to find the optimal closure technique of the abdominal fascia in the emergency setting.

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