

Original Research Article

Comparison of Continuous Vs. Interrupted Method of Abdominal Fascial Closure in Patients with Septic Peritonitis in Gynecological and Urological Cases - A Randomized Retrospective Trial of 120 Cases

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ABSTRACT

Background: Various randomized studies have evaluated techniques of abdominal fascia closure in elective laparotomies with few studies in emergency laparotomies, but controversy remains, leaving surgeons uncertain about the optimal method of preventing wound dehiscence in peritonitis.

Methods and material: Continuous and interrupted mass closures were compared randomly in 120 patients of septic peritonitis due to gynecological and urological emergencies. Patients were divided into three groups. Group 1 having uterine perforations, Group 2 had post radical cystectomy bowel leak and Group 3 had intraperitoneal bladder perforation following endourological procedures. Each group is further divided into Group c who underwent continuous non-locking closure and Group i with interrupted suture in figure of eight manner. Both methods of closure were performed with non-absorbable polypropylene no.1 suture.

Results: Out of 120 patients, Group 1 constitutes 68 patients (Group 1c =26%, Group 1i =30%), Group 2 had 36 patients (Group 2c =14%, group 2i =16%) and Group 3 had 16 patients (Group 3c =9%, Group 3i =5%). Twenty (33.33%) subjects with continuous closure and eighteen (30%) with interrupted closure had wound infection (p=0.78). Eighteen (30%) patients with continuous closure who had wound infection suffered from wound dehiscence (without evisceration) while four (6.66%) patients with interrupted closure had partial wound dehiscence. The follow up period was 13 months. All the patients with wound dehiscence in continuous closure group ultimately developed incisional hernia with none cases reported in interrupted group. The mean SL: WL ratio was 4.20 in continuous closure and 6.85 in interrupted closure (p=0.000). The continuous suturing was faster than interrupted suturing (p=0.000).

Conclusion: Interrupted emergency laparotomy wound closure reduces the rate of wound dehiscence as compared with continuous wound closure in peritonitis.

Keywords: abdominal fascial closure, continuous, interrupted, non-absorbable suture.

INTRODUCTION

In abdominal surgery it is probably no exaggeration to state that wisely chosen incision and correct method of making and closing such wounds are the factors of paramount importance. Midline laparotomy is the most common technique of abdominal

incisions in both emergency and elective settings because it is simple, provides adequate exposure to all four quadrants, affords quick exposure with minimal blood loss. [1] Method of closure of abdominal wall plays its own significant role in the healing of laparotomy wounds apart from

other factors like, peritonitis, site of incision, the suture material and stress and strain in the post-operative period. Wound dehiscence carries with it a substantial morbidity. In addition, there is an increase in the cost of care both in terms of increased hospital stay, nursing and manpower cost in managing the burst and its complications. Many patients in India have a poor nutritional status and often present late at tertiary centers for definitive management. This makes the problem of wound dehiscence more common and graver in our setting as compared to the west. ^[2]

While a substantial number of randomized studies have been conducted to determine the ideal method, these have been inconclusive or conflicting, and have left many surgeons uncertain about which method should be used. ^[3]

The type of closure may not be so important in elective patients who are nutritionally adequate, do not have risk factors for dehiscence and are well prepared for surgery. However, it may prove crucial in emergency patients especially with peritonitis who often have multiple risk factors for developing dehiscence. ^[4] Very few studies had been conducted on emergency laparotomies in gynecological and urological cases as compared to surgical cases, to determine the ideal technique for midline abdominal fascial closure. Therefore, retrospective data were analyzed to address the incidence of wound dehiscence, wound infection and ideal closure technique after vertical midline laparotomy performed in patients with peritonitis. We compared continuous single layer mass closure with interrupted (figure of eight manner) closure using polypropylene.

MATERIALS AND METHODS

A total of 120 patients presenting to the gynecological and urology ward for emergency laparotomy were enrolled in this study. Three groups were made. In gynecology the reason for exploration were uterine perforation or rupture (group 1,

n=68) due to septic abortion, obstructed labor, post caesarean section and intrauterine devices. In urological cases emergency exploration were done mainly due to post radical cystectomy (RC) bowel anastomosis leak (group 2, n=36) and bladder perforation during endourological procedures (group 3, n=16) which latter presented as peritonitis. Each group is further divided into two groups labelled with suffix C who underwent continuous closure and suffix I in whom interrupted closure was done. The skin and subcutaneous fat was left open for latter closure. The study period ranged from July 2015 to October 2017 at Hind Institute of Medical Sciences, Lucknow.

Patients with the following characteristics were not included in the study.

Exclusion Criteria

1. Patients younger than 15 years of age.
2. Patients who had undergone a previous laparotomy for any condition (or had an incisional hernia or burst abdomen at presentation).
3. Chronic smokers and patients with serious comorbid conditions like uncontrolled diabetics and hypertension.

All patients were given explanation of the study and signed a written consent form. They were randomized to undergo either continuous or interrupted closure of the laparotomy incision. Random sampling with help of computer-generated number was utilized for all consecutive eligible patients undergoing laparotomy in each group.

Continuous closure was performed using no. 1 prolene suture (polypropylene; Ethicon), care being taken to place each bite 1.5 cm from the linea alba edge and successive bites being 1 cm from each other. The edges of linea alba were gently approximated without strangulation with an attempt to keep a suture to wound length ratio of 4:1.

Interrupted closure was performed using no. 1 prolene suture. Large bite was

taken outside-in, 1.5 cm from the cut edge of linea alba. The needle emerged on the other side from inside out 1.5 cm from the edge. Similarly, next throw of suture was taken 1 cm above or below the previous bite. The two ends were tied just tight enough to approximate the edges of linea alba taking care not to include bowel or omentum between the edges. The next suture was placed 1 cm away from the previous one. All cut pieces of suture were kept and later on deducted from the original length of suture in order to get the actual length of suture used. Skin and subcutaneous fat was closed with monofilament non-absorbable suture (nylon) after 5-7 days when wound granulation started.

Each patient was followed up daily for the first 10 days, then on the 14th and 21st post-operative days for hematoma, infection, dehiscence and thereafter on the 3rd, 6th and 12th month for incisional hernia. Patients were stratified according to factors independent of suture technique including age, gender, body mass index, underlying diagnosis, type of incision and patient-related factors.

Statistical analysis

Analyses were conducted using Statistical Package for the Social Sciences (SPSS, Chicago, Illinois, USA) software. Statistical homogeneity was assessed by Pearson chi-square (χ^2) tests and independent sample t tests. $P \leq 0.05$ was considered to be statistically significant.

RESULTS

A total of 120 patients were recruited into the study with 48 males and 72 females. The average age of group 1 sample was 30 yrs., group 2 was 67 yrs. and group 3 was 56 yrs. respectively (Table 1). The underlying causes for emergency exploration in all three groups have been given in Table 1. Intra-operative diagnosis in the continuous suturing groups, respectively, were uterine perforation in 32 patients (26%), post RC leak in 16 (14%) and bladder perforation in 10 (9%). While in interrupted suturing groups 36 patients (30%) had uterine perforation, 20 patients (16%) had post RC leak and 10 patients (5%) had bladder perforation as underlying cause for emergency laparotomy.

Table 1: Patients characteristics

	Group 1 (n=68)		Group 2 (n=36)		Group 3 (n=16)	
	1c	1i	2c	2i	3c	3i
Age (yrs.)	34	26	65	69	54	58
Male: Female	0:32	0:36	14:02	18:02	10:0	5:1
Underlying cause	Septic abortion (n=59) Obstructed labour (n=5) Post caesarian (n=3) Intrauterine devices (n=1)		Post RC Bowel anastomosis leak (n=36)		TURBT (n=12) TURP (n=04)	
TURBT: Transurethral resection of bladder tumour TURP: Transurethral resection of prostate						

Both groups were equal in mean age (51years) and gender ratio. Mean time required for rectus closure show statistical significance ($p=0.000$) in two groups with reported time as 14mins and 28.53 mins, respectively (Table 2).

More suture material was required for interrupted sutures (134.6 cm) when compared with continuous sutures (75.07 cm), when both were inserted 1.5 cm from

the cut edge. The difference was statistically significant ($p=0.000$). SL: WL was considered a more standard parameter to evaluate and compare the amount of suture material used in either technique. Mean SL: WL for continuous and interrupted groups as computed was 4.20 ± 0.66 and 6.85 ± 1.16 , the difference being statistically significant ($p=.000$) (Table 2).

Table 2: characteristics of patients as related to closure technique

	Continuous (n=58)	Interrupted (n=62)	P value
Mean Age (yrs.)	51	52	NS
% male	41.37	37.09	NS
Wound length (cm)	17.73±4.60	19.33±3.78	0.147
Suture length (cm)	75.07±22.80	134.60±40.16	0.000
SL: WL	4.20±0.66	6.85±1.16	0.000
Time taken in closure (mins)	14±4.89	28.53±8.69	0.000
Hospital stay (days)	15.86±8.29	18.13±10.06	0.359

SL: Suture length; WL: Wound length; NS: Not significant

Wound infection in the form of redness and discharge had been found in each group with continuous closure (25.5% - 38.46%) and in (23.5% - 40%) with interrupted closure which was statistically non-significant. These patients were all managed with conservative non-operative treatment (Table 3).

There was a statistically significantly higher incidence of wound dehiscence with continuous closure than interrupted closure in Group 1 patients ($p = 0.045$), thus all requiring secondary suturing (Table 3). In Group 2 patients wound dehiscence also

occurred but the difference was not-significant. The overall incidence of wound dehiscence was high ($n=17$, 14.16%). All the patients with wound dehiscence in Group 1c and one patient from Group 2c ultimately lead to incisional hernia in follow up period.

No significant difference in incidence of wound complications was reported when patients were stratified according to factors independent of suture technique such as age, gender, diagnosis, wound length and hospital stay ($p > 0.05$).

Table 3: wound complications

Complications	Groups	Continuous (n=58)	Interrupted (n=62)	Chi-square test	P value
Redness/discharge	Group 1	12 (38.46%)	8 (23.52%)	1.03	0.308
	Group 2	4 (27.27%)	8 (40%)	0.457	0.499
	Group 3	3(25.50%)	2(28.50%)	0.01	0.92
Wound dehiscence	Group 1	10 (30.76%)	3 (10%)	3.89	0.04
	Group 2	3 (18.18%)	1 (5%)	1.34	0.24
	Group 3	-	-		
Incisional hernia	Group 1	10 (30%)	-	9.83	0.001
	Group 2	1(6%)	-	1.20	0.27
	Group 3	-	-		

DISCUSSION

Abdominal fascial closure has remained a procedure that often reflects a surgeon's personal preference with a reliance on tradition and anecdotal experience despite advances in surgical technique and material. [5] Numerous randomized controlled trials of abdominal fascial closure have failed to determine the ideal technique with finality. Many randomized trials in the West have reported equal wound complication rates following the use of continuous or interrupted monofilament fascial closure. [6-9]

Abdominal wound dehiscence remains a major cause of morbidity following any laparotomy whether elective

or emergency. The burst abdomen is associated with high morbidity of up to 40% and mortality of up to 18% in elderly or malnourished patients in whom a burst represents a final additional insult to their already stressed physiology. [10] Our experience shows that those undergoing emergency operations with multiple factors adverse to healing, suffered from burst in 14.16% of cases. Indian authors have reported burst abdomen to occur in 10% to 30% of emergency cases. [2, 11, 12] 30% burst abdomen was reported in infected cases by Professor Naithani's unit from Allahabad. [2] Protein calorie malnutrition is widely prevalent in the Indian population. The problem gets compounded with the onset of

consuming diseases like tuberculosis, typhoid and cancer. Many patients undergoing emergency laparotomy suffer from one of these co-morbid conditions, detrimental to healing. Rural hospitals and nursing homes often keep patients such patients on conservative therapy (antibiotics and even steroids). At laparotomy we observe profound necrosis of the aponeurotic layers of abdomen in these cases. Such necrotic linea alba does not hold sutures well which cut out with a bout of coughing or sneezing.

In a continuous suturing cutting out of even a single bite of tissue leads to opening of the entire wound. This is the probable explanation for a high prevalence of burst in our group. There were 13 bursts in the continuous arm of suturing (dehiscence risk = 22.41%) whereas only 4 dehiscence took place (dehiscence risk = 6.45%) with the figure of eight technique, indicating a much lower risk of burst with interrupted method of closure (Table 3). This difference is clinically and statistically significant. Results indicate that our patients seem to fare better with interrupted closure techniques. Other Indian authors also report protection from burst by interrupted technique. [2,11]

The continuous suture is associated with a hacksaw effect due to varying tension on different parts of suture due to abdominal wall movements. This results in cutting out of the suture. In case of interrupted suture there is no hack-saw effect hence cut out force is minimal. The low dehiscence in the elective laparotomy group can be explained by the fact that patients do not have any intraperitoneal sepsis, have less abdominal distension, their malnutrition and anemia are corrected prior to surgery and they are operated in a more controlled setting where errors of technique are minimal. [10]

Stitching under minimal tension with 1 cm tissue bites and 1 cm intervals, enables lengthening of the wound in cases of abdominal distension without the stitches cutting through the tissue and with good wound healing. With high SL: WL

(6.85±1.16) in interrupted suturing, we observed a relatively low wound dehiscence (6.66%) in very contaminated patients. We therefore, recommend an optimal SL: WL ratio greater than or equivalent to 6.1 to achieve safe closure of midline laparotomy incisions in perforation peritonitis patients.

Absence of incisional hernia in interrupted group could be attributed due to the fact that only sutures which are nearby to umbilicus had given away, rest keeping the sheath intact. Umbilicus lying in watershed area with comparatively less blood supply and being the point of maximum tension could be possible explanation. This small part of dehiscence could easily be tackled during secondary suturing which was not possible in continuous group.

CONCLUSION

We believe our study adds evidence to the debate regarding which technique is best for abdominal wall closure in emergency Gynecological and urological cases. Though continuous closure is easier to perform, saves operative as well as anesthesia time but the integrity of wound depends upon single suture. In developing countries like India, where such patients are managed in peripheral health setup in suboptimal way before finally referred to tertiary centers for operation, already profound necrosis of apneurotic layers of abdomen has occurred. Such necrotic linea alba does not hold sutures well which cut out with a bout of coughing or sneezing. Thus, wound dehiscence can be reduced in emergency setting using interrupted closure.

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