

Comparison of Wound Dehiscence in Interrupted with Continuous Closure of Laparotomy

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ABSTRACT

Aim: To compare the frequency of wound dehiscence in cases of exploratory laparotomy closed by either interrupted or continuous technique.

Study design: Randomized Controlled Study

Place and duration: Surgical Unit I, Jinnah hospital, Lahore from 26-01-2010 to 25-07-2010

Methods: One hundred and sixty patients undergoing laparotomy were registered who fulfilled the inclusion criteria. The allocation of cases to two study groups was settled by random number table. The principal operative technique for Group A was continuous closure and for Group B was interrupted closure. They were observed for 8 days for wound dehiscence.

Results: Out of one hundred and sixty patients, 113(70.62%) had acute abdomen while 47 (29.38%) presented with abdominal trauma. They underwent exploratory laparotomy through midline incision. 11(13.75%) had wound dehiscence in group A while in group B, 2(2.50%) had wound dehiscence.

Conclusion: Interrupted closure of exploratory laparotomy is associated with less risk of wound dehiscence as compared to continuous closure.

Keywords: Interrupted, continuous, wound dehiscence, exploratory laparotomy

INTRODUCTION

Hundreds of laparotomies are performed each year in surgical emergency of Jinnah Hospital, Lahore. Most of these laparotomies are opened through vertical midline incision¹, however, in some cases, though very rare, paramedian & roof top incisions are used.

Midline laparotomy is the most common technique of abdominal incisions because it is simple, provides adequate exposure to all four quadrants, is rapid to open and usually bloodsparing^{1,2}. A major problem after median laparotomy remains the adequate technique of abdominal fascia closure³. Mostly, they are closed with non absorbable prolene suture^{4,5,6} although some prefer delayed absorbable suture^{7,8,9}. There is general agreement that supports a significant benefit in using nonabsorbable suture^{10,11,12,13,14}. These sutures retain tensile strength for the duration of fascial healing¹⁵. Despite increased knowledge concerning wound healing and progress in perioperative and postoperative care over the past few decades, abdominal wound dehiscence has a stable incidence of 5% to 24%^{16,17}.

Closure techniques involve a choice of continuous versus interrupted suture, the size of fascial bites, inter-stitch distance, the length and size of suture used³¹.³¹ The best method of wound closure would be one that provides adequate tensile strength to the incision, remains secure even in presence of

local or systemic infection suture material is well tolerated on a short and long term basis and finally, should be able to be done with expediency³². The continuous suture method is quicker to perform with fewer knots while it has advantage of being a single suture line holding the fascia together and cut through at single point can slacken the entire suturing. The interrupted suture method is thought to have lesser risk of wound dehiscence but with disadvantage of being time consuming and having more risk of stitch sinuses³³.

Anurag Srivastava et al described a significantly lowered risk of wound dehiscence in interrupted abdominal closure demonstrating that of 2.17% in the interrupted group as compared to 14.8% in the continuous group.³⁴ Continuing research into methods of wound closure techniques makes it important for surgeons to stay informed about all types of modern techniques. The value of a particular closure technique may be measured by the incidence of early and late wound complications, and the best abdominal closure technique should be fast, easy, and cost effective, while preventing both early and late complications.

MATERIAL & METHODS

One hundred and sixty cases of exploratory laparotomy fulfilling the inclusion criteria were selected from surgical emergency of Surgical Unit I, Jinnah Hospital, Lahore. Patients were randomly allocated to two groups; group A for continuous

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closure and group B for interrupted closure. The principal technique for group A patients was continuous closure with prolene 1 and for group B was interrupted closure with Smead Jones technique using prolene 1. Patients were evaluated post operatively for 8 days to assess wound dehiscence.

Collected information was entered into statistical package for social scientist SPSS version 11 and analyzed. The variables were Age, Sex and presence or absence of wound dehiscence. Variables obtained were described as simple statistics. The numerical outcomes like age were presented as mean and standard deviation while wound dehiscence (Present /Not Present) was presented as frequency and percentage. Chi-square test was applied on wound dehiscence for comparison of significance between two groups. P value was considered significant if ≤ 0.05 .

RESULTS

Table 1: Mean age of patients in study

	Age of patients
N	60
Minimum	18
Maximum	80
Mean	36.06
St. Deviation	+14.76

Table 2: Age distribution

Age in years	n=	%age
18-20	21	13.13
21-30	60	37.50
31-40	27	16.87
41-50	27	16.87
51-60	12	7.5
61-70	12	7.5
>71	1	0.62

Table 3: Indications of laparotomy in the study (n=160)

Diagnosis	n=	%age
Abdominal trauma	47	29.38
Blunt	16	10
Penetrating	31	19.38
Acute abdomen	113	70.62
Perforation	78	48.75
Obstruction	35	21.87

One hundred and sixty patients were included in the study during the period from 26th Jan 2010 to 25th July 2010. The age of patients ranged between 18 to 80 years with mean age of 36.06. Most of these patients were in third and fourth decade of life. Common presentation in surgical emergency was with TB Abdomen (22.50%), typhoid (20.63%) and duodenal ulcer (11.87%) perforations and firearm injuries (15%). All these patients underwent exploratory laparotomy through midline incision, after

proper assessment and sound diagnosis had been established. 80 patients were treated with continuous closure technique and 80 were treated with interrupted closure method. Burst abdomen was observed in 13.75% (11/80) patients with continuous closure and in 2.50% (2/80) of interrupted closure group. Majority of (7 out of 13) burst abdomens were associated with cases of typhoid and tuberculous intestinal perforations.

Table 4: Proportion of various indications for laparotomy

Diagnosis	n=	%age
Blunt trauma		
Liver trauma	8	5
Splenic trauma	5	3.12
Renal injury	2	1.25
Intestinal perforation	1	0.63
Penetrating trauma		
Firearm injury	24	15.0
Stab wound	7	4.38
Intestinal perforation		
Typhoid perforation	33	20.63
Tuberculous perforation	22	13.75
Duodenal ulcer perforation	19	11.87
Perforated appendix	4	2.50
Intestinal obstruction		
Adhesion obstruction	18	11.24
Tuberculous obstruction	14	8.75
Sigmoid volvulus	2	1.25
Intussusception	1	0.63

Table 5: Frequency of Burst Abdomen (n=160)

Technique	n=	%age
Continuous Closure	11/80	13.75
Interrupted Closure	2/80	2.50

P value; 0.02 i.e., < 0.05 --- significant difference between two groups; Interrupted closure is better than continuous closure.

Table 6: Etiology of wound dehiscence

Etiology	Continuous closure	Interrupted closure
Typhoid perforation	3	1
Tuberculous perforation	2	1
Tuberculous obstruction	2	-
Adhesions/ obstruction	2	-
Firearm injuries	1	-
DU perforation	1	-

DISCUSSION

Apart from disease related and procedure related complications, a common complication of surgery after laparotomy is abdominal fascial dehiscence¹⁸. It might appear either in early post operative period called burst abdomen, or as a late complication referred to as incisional hernia. These patients usually undergo second surgery for secondary fascial closure associated with markedly increased morbidity including high recurrence rates (up to 45%)¹⁵.

The major mechanism of wound rupture is the suture cutting through the fascia, though occasionally it may be due to suture break or slippage of the knot. Continuous suture technique has the benefit of being easier and less time-consuming¹⁹. It is associated with lesser risk of stitch sinuses and stitch granulomas²⁰. However it places the integrity of the entire wound on a single strand and a cut-through at a single point can slacken the entire suturing⁴.

Rubinstein and Russell, using vector analysis of suture tension, showed that for a given force, perpendicular interrupted sutures have the least tension²¹. The figure-of-eight interrupted method deserves special mention. This technique was first developed by Smead in 1900 and popularized later by Jones et al²². Increased tension across the wound is distributed between the two loops in such a way that the wound remains well approximated without the suture cutting through. Interrupted figure-of-eight suturing technique reduces the cut out force, whereas the continuous suture exerts a "hacksaw effect" at the tissue-suture interface and the to-and-fro movements of the suture strand within the tissues act like a Gigli saw, due to varying tension of different parts of the abdominal wall on breathing and movement, gradually causing the suture to cut through the linea alba³⁴.

There is no consensus regarding ideal wound closure after laparotomy²³. Many randomized trials in the West have reported equal wound complication rates following the use of continuous or interrupted monofilament fascial closure^{14,24}. The French multicentre trial, carried out by Fagniez et al, found greater dehiscence risk in the interrupted group, though the difference was significant only in the "contaminated wounds" subgroup. However, the details of the interrupted suturing technique were not described²⁵. As a result abdominal fascia closure is performed according to the surgeon's individual preference rather than according to evidence-based data. The specific technique of interrupted suturing is of crucial importance and either a figure-of-eight (Smead-Jones method or double X method⁴⁵) or double horizontal mattress of Professor Hughes' technique^{19,26} should be employed to provide a secure repair. Three meta-analyses have previously been reported on this same issue^{10,30}. However, they all included only a small number of studies comparing continuous and interrupted methods of suturing, ranging from six to eight. Van't Riet et al included only studies with at least 100 patients and a minimum follow-up of 1 year. Wadstrom and Gerdin, in a clinical review, found that a majority of disruptions occurred between the 6th and 9th day after surgery^{20,27}. Moreover, in the meta-analysis by Hodgson et al, only three out of six studies had used

similar suture material in the two comparison arms. In the meta-analysis by Weiland et al, there were three such studies out of seven, while Van't Riet et al had included only one such study. As a result, they could not perform same-group comparisons like continuous absorbable versus interrupted absorbable, and continuous nonabsorbable versus interrupted nonabsorbable. Meta-analysis by Himanshu Gupta et al was the most comprehensive and up-to-date, including 23 trials. It described a significantly lowered risk of wound dehiscence in interrupted abdominal closure demonstrating that of 2.17% in the interrupted group as compared to 14.8% in the continuous group. Incisional hernias occurred with same frequency with both the techniques³³.

In our set up, patients undergoing emergency laparotomy, with multiple factors adverse to healing, suffered from burst in 8.13% of cases. Different local authors have reported burst abdomen to occur in 5% to 30% of emergency cases^{28,29,30}. 30% burst abdomen was reported in infected cases by Professor Naithani's unit from Allahabad. Malnutrition and diseases like tuberculosis, typhoid and cancer are the main cause. This was illustrated very obviously in our study as most of the dehiscences were observed in patients diagnosed to have tuberculosis or typhoid. Many patients undergoing emergency laparotomy suffer from one of these co-morbid conditions. Peripheral hospitals often keep patients with perforated peritonitis on conservative therapy (antibiotics and even steroids). At laparotomy, we observed profound contamination and sometimes even necrosis of linea alba that does not hold sutures well which cut out with raised intra-abdominal pressure caused by vomiting, coughing.

In our study, there were 11 bursts in the continuous arm of suturing (13.75%) whereas only 2 early dehiscences took place (2.50%) with the interrupted technique, indicating a much lower risk of burst with interrupted method of closure. This difference is clinically and statistically significant. However burst abdomen results from a multitude of factors and the suturing technique is only one of them. Apart from advancing age other confounding agents were the degree of contamination, cough or simultaneous involvement of chest by infection or tuberculosis, anemia etc. We tried to remove these biases by selecting similar groups. Only those cases with contamination were selected from penetrating abdominal injuries to match with cases of acute abdomen having fecal peritonitis. Cough and anemia were treated appropriately with medications or transfusion. These results indicate that our patients seem to do better with interrupted closure techniques and are comparable with other studies^{34,35,36}.

CONCLUSION

Interrupted closure in laparotomy is better than continuous closure in terms of less wound dehiscence/ burst abdomen. However, requirement of increased estimated time and cost of surgery make it unpopular among surgeons. Also, in the long run, stitch sinus formation and irritation of knots to the patient has limited its use.

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