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Comparison of Suture Technique (Interrupted vs Continuous) with respect to Wound Dehiscence

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Abstract

Background: *Wound dehiscence/burst abdomen is a very serious postoperative complication associated with high morbidity and mortality. It has a significant impact on health care cost both for the patient and the hospital. Abdominal wound dehiscence is the major cause of morbidity following any laparotomy whether elective or emergency. The aim of the study was to compare wound dehiscence between the patients underwent two different suture technique of rectus sheath closure.*

Material and Methods: *In our study total 480 subjects with perforation peritonitis who were operated through midline incision were included. They were divided into 2 groups 240 subject in each group:1) Test (interrupted suture) and2) Control group (continuous suture) group. In test group the abdominal closure was done by interrupted suture technique while in control group abdominal closure was done by continuous suture technique. Patients were followed up and wound dehiscence/burst abdomen was assessed at day 3, 7 and 1 month postoperatively.*

Results: *The mean age in group 1 was 49.60 years while in group 2 was 49.02 years. In both the groups male sex was predominant (78.3% and 75.8%). Most common diagnosis was peptic perforation followed by illeal perforation in both the groups. Incidence of wound dehiscence was significantly less in group 1 (7.9%) compared to group 2 (19.5%) and most of wound dehiscence occurred at 7th day postoperatively in both the groups.*

Conclusions: *The conclusion of our study is that rectus sheath closure by interrupted suture is better than continuous suture in terms of wound dehiscence.*

Introduction

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)

One of the most common and major complication associated with the closure of midline laparotomy is wound dehiscence which is a major cause of postoperative morbidity.

Wound dehiscence is defined as partial or complete postoperative separation of abdominal wound closure. It is the parting of the abdominal musculo aponeuroticlayers of surgical wound. Either the surface layers separate or the whole wound splits open. The full thickness dehiscence occurs when there is no skin healing together with that of the aponeurotic layers. It presents a mechanical failure of wound healing of surgical incision.

Acute wound failure also known as wound dehiscence, wound disruption, burst abdomen, evisceration and eventration. Abdominal wound dehiscence/Burst abdomen is a common complication of emergency laparotomy in our set up. Wound dehiscence carries with it a substantial morbidity.

The occurrence of sudden disruption of the abdominal laparotomy wound is a major disaster in the life of patients who have undergone an operation upon abdominal viscera. There is increase in the cost of care both in terms of hospital stay and man power in managing the burst abdomen and its complications.

The prevalence of wound dehiscence has varied with time and geographical location. It is recorded to be 1-3% in most centres[2-5] coming to the Indian scenario, prevalence is reported to range from 10-30%[6-8] for emergency cases and 0-5% for elective cases.

Wound dehiscence is affected by many factors e.g. By local factors and systemic as well as pre, intra, and post operative factors.[9-14] The sight of intestine and other viscera through the laparotomy wound is a major psychological blow to a patient and his/her surgeon alike, associated with high morbidity and mortality rate[9-17]even in the era of sophisticated and intensive care.

Wound dehiscence may or may not be associated with evisceration of intra abdominal organs; if associated mortality rate reaches up to 30%.[9]

Many patients in India have a poor nutritional status and the presentation of patients with peritonitis is often delayed. This makes problem of wound dehiscence/Burst abdomen more common.[6] It's prevention is therefore important in preventing morbidity and mortality and reducing preventable expenditure.

One of the factors affecting wound dehiscence is the technique of suture used and also the type of suture used.[6] This factor may not be as important in the elective patient as they are nutritionally adequate, therefore are not at increased risk for dehiscence, however it plays a crucial role in emergency patient who have multiple risk factors for developing dehiscence.[18] The average postoperative day of dehiscence is about 7, but it may occur from 1 to 30 days, 90% of all cases presents before 15th post operative day.[19]

The current opinion in the western centres for closure of midline incision is towards running mass closure of abdomen in both emergency and elective setting as there is no significant difference reported between the two in most studies.[20-27]

The choice may not be so important in the elective patient as they are nutritionally adequate, therefore are not at increased risk for dehiscence, however it plays a crucial role in emergency patient who have multiple risk factors for developing dehiscence [28] and strangulation of the sheath is the last nail in precipitating wound dehiscence.

Interrupted suture technique was developed to circumvent the problem of cutting out effect of a continuous suture.

Continuous suture has always been regarded to compromise the bloodsupply as compared with the interrupted technique. Therefore interrupted closure has been used to advantage in the situations where blood supply is precarious e.g. colon and oesophagous.

Numerous studies have been conducted evaluating a variety of closure techniques and suture materials[29-32] but in our setup patients present with malnutrition and sepsis hence it is imperative for us to ascertain safest method of closing

abdomen. The present study was undertaken to assess the proportion of burst abdomen in post midline laparotomy patients, using Interrupted suture versus Continuous suture technique in sheath closure.

Material and Methods

This present study was a hospital based randomized, interventional comparative analysis of two different suture techniques. A total of 480 patients undergoing midline laparotomy for perforation peritonitis at S.M.S. Hospital, Jaipur were recruited randomly (through the chit box method) after taking written informed consent and were equally divided into 2 groups, study group (interrupted suture) and control group (continuous suture). Cases of ileostomy, colostomy and with pre-existing severe co-morbid condition like severe renal and liver disease, uncontrolled diabetes, malignancy and patients on anticancer chemotherapy or steroids and patients who had previous laparotomies through midline incision were excluded.

Continuous closure

Continuous closure was done using PDS 1 suture RB (roundbody) care being taken to place each bite 1.5 to 2 cm from the linea alba edge and successive bites being 1 cm from each other. The edges of linea Alba was gently approximated without strangulation with an attempt to keep a suture to wound length ratio of 4:1.

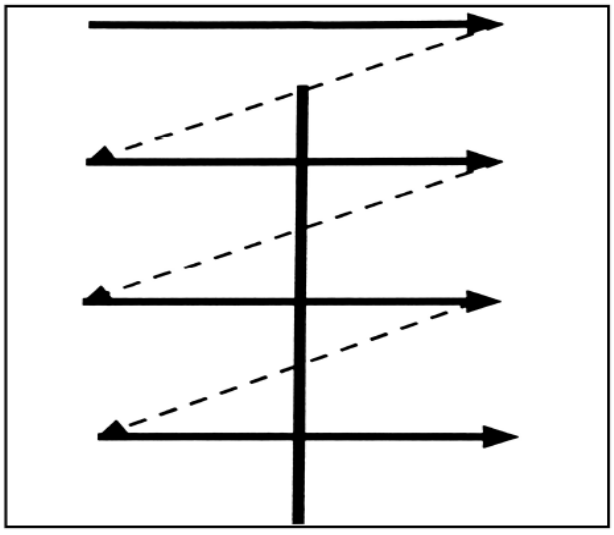

Figure 1 showing the continuous sheath closure

Interrupted closure

Rectus sheath was closed with an interrupted suture pattern, using a single PDS no. 1 strand. The sutures were taken at 1 cmfrom the wound edge and placed at 0.7- to 1.5-cm intervals with 4-5 knots in each suture.

Figure 2 showing the interrupted sheath closure

Main outcome

- Postoperative complications like wound infection and wound dehiscence/burst abdomen
- Postoperative hospital stay

The postoperative complications were ascertained by consultant surgeon. Patients were followed up to 1 month. Wound infection was assessed on 7th postoperative day. Wound dehiscence/burst abdomen was assessed at day 3, 7 and 1 month postoperatively.

Results

The mean age of the patients was 49.31 years (SD = 14.66) with a median of 33 years. The age ranged from 18 to 70 years.

There was 188(78.3%) male and 52(21.6%) female patients in group 1 while 182(75.8%) male and 58(24.1%) female patients in group 2.

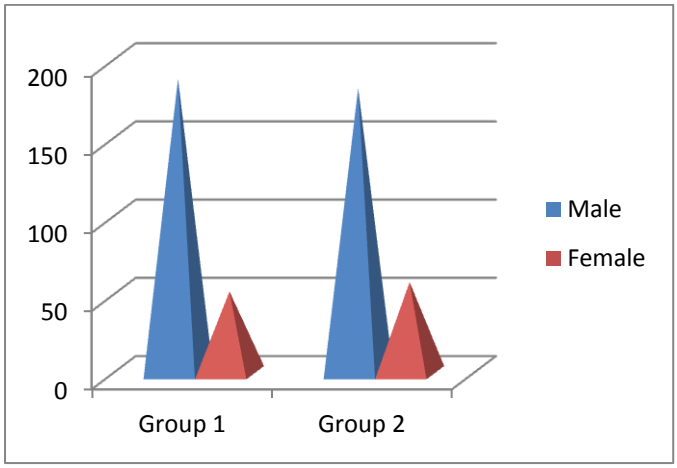

Figure 3 Sex wise Distribution of Patients in the Study

Table 1 shows diagnosis wise distribution of the patients in both the groups. Most common diagnosis in both groups was peptic perforation (40.5% in group 1 and 45% in group 2) followed by illeal perforation.

Table 1 Diagnosis wise Distribution of Patients in the Study

Diagnosis	Group 1	Group 2
Peptic perforation	97(40.5%)	108(45%)
Illeal perforation	63(26.4%)	61(25.4%)
Colonic perforation	12(5%)	10(4.2%)
Rectal perforation	2(0.8%)	3(1.3%)
Cecal perforation	9(3.8%)	5(2.1%)
Appendicular perforation	58(24.2%)	53(22.1%)
Total	**240**	**240**

Table 2 Incidence of Wound Infection

Wound Infection	Group 1	Group 2	P value
Present	36(26.3%)	71(29.6%)	
Absent	204(73.7%)	169(70.4%)	0.00012
Total	**240**	**240**	**480**

Table 2 shows incidence of wound infection in two groups. 36 patients of group 1 whereas 71 patients of group 2 had wound infection. The p value was 0.00012 suggesting statistically significant difference between the two groups.

Table 3 Occurrence of Wound Dehiscence / Burst Abdomen

Wound Dehiscence / Burst Abdomen	Group 1	Group 2	P value
3rd Day	2(0.8%)	5(2%)	
7th Day	15(6.2%)	39(16.2%)	0.0002
1st Month	2(0.8%)	3(1.2%)	
Total	**19(7.9%)**	**47(19.5%)**	**66**

Table 3 shows occurrence od wound dehiscence in both the groups. Total 66 patients suffered from wound dehiscence out of which 19 patients were in group 1 while 47 patients were in group 2. Both groups had total 240 patients. Group 1 patients underwent interrupted suture closure, wound dehiscence occurred in 2 patients (0.8%) at 3rd day, 15 patients (6.2%) at 7th day and 2 patients (0.8%) at 1 month. Group 2 patients underwent continuous suture closure, wound dehiscence occurred in 5 patients (2%) at 3rd day, 39 patients (16.2%) at 7th day and 3 patients (1.2%) at 1 month. There was significant difference in occurrence of wound dehiscence in favour of interrupted suture technique. Wound dehiscence mostly occurred at 7th day postoperatively in both the groups.

Table 4 Postoperative hospital stay wise Distribution of Patients

Postoperative hospital stay	Group 1	Group 2	P value
Mean ± SD	**8.63 ± 2.1**	**9.1 ± 2.8**	**<0.001**

Table 4 shows significantly lesser postoperative stay in group 1 (interrupted suture) compared to group 2 (continuous suture) with a p value of <0.001.

Discussion

The specific technique used in closure of the abdominal fascia for the individual is frequently based on nonscientific factors. Because of difficulties arising from differently tailored study designs, the surgical literature has not clearly demonstrated an optimal technique to close abdominal fascia, especially in emergency settings.

Wound dehiscence/burst abdomen is a very serious postoperative complication associated

with high morbidity and mortality. It has a significant impact on health care cost both for the patient and the hospital.

Abdominal wound dehiscence is the major cause of morbidity following any laparotomy whether elective or emergency. Theoretically two factor may be concerned in the causation of burst abdomen, either the intra abdominal pressure is too great or the wound is too weak. However the intra abdominal pressure is frequently not within surgeons control but wound must be made sufficiently strong to withstand this pressure.

During the postoperative period a wound must depend for its strength on following things

1. Cohesion of the healing tissue
2. The bandage and dressing
3. Suture

Immediately after operation wound must depends on entirely on suture and dressing

In our study total 480 subjects were included. They were divided into 2 groups 240 subject in each group:

1) Test (interrupted suture) and

2) Control group (continuous suture) group

Those patients grouped in test group there abdominal closure was done by interrupted suture technique. Those patients grouped in control group their abdominal closure was done by continuous suture technique.

The mean age of the patients was 49.60 years in group 1 (interrupted group) while 49.02 years in group 2 (continuous group). No significant difference was observed according to mean age among the groups ($p>0.05$) ascompared to study done by Chandra Shekhar Agrawal et al (2012). The mean age of the patients was 37.05 years in continuous group. The mean ageof the patients was 36.46 in interrupted group and in the study done by waellofty et al (2009), it was 43.12 years in interrupted arm and 42.44 years in continuous group.

Mean age in both the group was found out to be similar to another recent study done in India.[33]

Male predominance similar to our study has been observed in majority of the studies in past.[34,35]

Most common diagnosis in both groups was peptic perforation (40.5% in group 1 and 45% in group 2) followed by illeal perforation.

Wound infection rates in the two groups 1 and 2 were 26.3%, and 29.6% respectively which was statistically non significant. The total wound infection rate was 27.9%. Wound infection rate has been found to be present in 3-10% patients undergoing clean elective surgeries. Similarly, higher incidence of infection (14%) was also present in a study by Gislason et al which also included high proportion of emergency operations (32%).[36] Cruse and Foord found in a retrospective survey a wound infection rate of (40%) among 2,093 dirty wounds but they did not specify how skin closure was performed.[37] Stone et al also reported a similar incidence of wound infection (14%) in emergency laparotomy in retrospective study whereas the same was reduced to 2% and 11% in trauma patients with negative and positive laparotomy in the prospective study.[38] No significant difference was observed in the wound infection rate between the continuous and interrupted closure by Sahlin et al (10% in continuous and 11% in interrupted).[39]

The wound infection was not found to be statistically affected by the technique employed. No statistically significant difference in wound infection rates was observed with either technique between non-absorbable suture material.[40-42]

There is lack of data about the persistence of wound infection while comparing the above two techniques and sutures. Wound infection rate was found to be considerably higher than in other studies because our study included patients undergoing clean- contaminated or contaminated surgeries.

In our study, we found lower rate of wound dehiscence/burst abdomen in group 1 (interrupted group – 7.9%) in comparison to group 2 (continuous group – 19.5%). Further management of this complication required regular aseptic dressing and secondary suturing.

In our study there were 47 cases of burst abdomen out of total 240 in continuous group (group 2) and

only 19 burst abdomen out of total 240 subjects in interrupted group (group 1). There was statistically significant difference in occurrence of wound dehiscence in favour of interrupted suture technique same as inthe study done by Chandra Shekhar Agrawal et al (2012) RR for burst abdomen with continuous method as "reference" category and interrupted method as "exposure" category was 0.280 (95 % CI 0.135–0.584; P = 0.0003).Our study shows that interrupted suture technique is better than continuous suture in preventing burst abdomen.

Total 66 patients (13.7%) suffered from wound dehiscence this higher rate of burst abdomen in our study can be primarily explained by the fact that our study was conducted in patients undergoing emergency surgery for peritonitis which constitutes a major source of sepsis. Richards et. a1. also concluded that statistically significant difference in incidence of burst abdomen is present in infected wounds than in non-infected wounds ($p<0.02$).[43] Maximum wound dehiscence occurred at 7th day in both the groups.

The mean duration of hospital stay was significantly lower in group 1 (interrupted group) compared to group 2 (continuous group) due to less early complications in group 1 patients.

This was the limitation of our study that we did not consider the effect of anemia, hypoxia, malnutrition and intraperitoneal sepsis on early as well as late complications after laparotomy which was found to be significant in study done by Chandra Shekhar Agrawal et al (2012).

We are conscious that the results of the present study are influenced by several limitations. The first limitation regards the population of the study: the sample size is small, and moreover, we analysed the patients with different causes of perforation peritonitis subsequently surgeries done by different surgeons. Another important limitation is that we did not take care of other risk factors in development of both early and late complications after surgery.

It is necessary to follow the study population further till 6 months or 1 year post laparotomy to get more accurate results regarding late complications like incisional hernia.

Conclusions

The conclusion of our study is that rectus sheath closure by interrupted suture is better than continuous suture in terms of wound dehiscence and lesser duration of postoperative hospital stay. Although long follow up duration is needed to evaluate late complications like incisional hernia.

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