ORIGINAL RESEARCH

Effect of Various Co-Morbidities on Abdominal Wound Dehiscence after Midline Laparotomy

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ABSTRACT

Background: Wound dehiscence is defined as separation of all layers of incision. It may be partial or complete. Partial when one or more layers have separated but either the skin or the peritoneum is intact. Complete when all layers of the abdominal wall have opened apart and this may or may not be associated with evisceration of viscus. The study aimed to find out and record the etiological factors for Burst abdomen.

Materials and Methods: This study was prospective, randomized and comparative study conducted on 120 patients undergoing midline laparotomy in the Department of General Surgery, Kalinga Institute of Medical Sciences over a period of 1 year. Patients were selected who require midline laparotomy either as emergency or elective procedure. 120 patients who were divided into two groups 60 each by sealed envelope method and they were randomized into Group 1 and Group 2. The patients in Group 1 underwent closure of rectus sheath with conventional continuous closure technique and in Group 2 underwent closure with interrupted X suture technique. A total of 60 patients were included in each group.

Results: In this study, there were 44% males and 15% females in Group -1 while there were 49% males and 12% females in Group 2. In group 1, mean age was 48.03 years and SD ± 16.15. In group 2, mean age was 46.44 years and SD ± 15.68 In Group 1, out of 60 patients wound dehiscence occurred in 22 cases while in Group 2, out of 60 patients wound dehiscence occurred in 9 cases. In Group 1, 17 patients were anemic, 5 patients were diabetics, 18 patients had uremia, 44 patients had hypoalbuminemia and 49 patients had chest infection. In Group 2, 11 patients were anemic, 7 patients were diabetics, 17 patients had uremia, 41 patients had hypo¬albuminemia and 34 patients had chest infection.

Conclusion: Wound dehiscence rate is more in emergency midline laparotomies as compared to elective cases. Besides technique of closure, various factors like malnutrition, cough, intra-peritoneal sepsis, wound infection, wound gaping, abdominal distension are significant predictors of burst abdomen.

Keywords: Wound Dehiscence, Wound Infection, Laparotomy.

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INTRODUCTION

Abdominal wound dehiscence (burst abdomen, fascial dehiscence) is a severe postoperative complication, with mortality rates reported as high as 45%.1 The incidence, as described in the literature, ranges from 0.4% to 3.5%. 2 Dehiscence of the wound after abdominal surgery is a serious complication that continues to plague the surgeon and threaten the patient. Burst abdomen is an inescapable responsibility of the surgeon who made the wound. Dehiscence is the disruption or breakdown of a wound.[3]

It may range in magnitude from a failure of the deeper portions of the abdominal incision to unite, unrecognized in the postoperative course but resulting in a dramatic "burst abdomen" or evisceration in which dehiscence of the wound occurs suddenly and is accompanied by protrusion of abdominal contents, usually bowel, through the disrupted Wound.[4] Sometimes it may present as incisional hernia later. Significant wound dehiscence occurs in approximately 1% of all aparotomies.[5] The incidence of wound disruption is correspondingly greater in a series of patients with various predisposing factors.[6]

Disruption can take place at any time in the postoperative period but most often occurs between the fifth and twelfth postoperative days. In patients with healing problems the disruption may occur much later. It may occur shortly after the skin sutures have been removed. In about half the cases disruption will be heralded by the appearance of a serosanguinous discharge on the dressing. If this occurs before the seventh day, it may be considered pathognomonic of dehiscence.[6]

Usually such a complication implies inadequate preoperative treatment, improper postoperative management, wound infection and poor surgical technique. Frequently, burst abdomen occurs because of the nature of the disease. Urgent need for operative intervention may preclude satisfactory preoperative preparation of the patient. Drainage of abscess or perforation of viscus may result in continuous and unavoidable contamination of wound. Burst abdomen is defined as separation of all layers of incision. It may be partial or complete. Partial when one or more layers have separated but either the skin or the peritoneum is intact. Complete when all layers of the abdominal wall have opened apart and this may or may not be associated with evisceration of viscus.[7]

When an abdominal wound gape open or disrupts, a condition called burst abdomen / wound dehiscence /wound disruption / post-operative eventuation occurs. It is a morbid complication of surgery. Usually encountered above the age of 60 years and common in males, can be partial or complete. Prognosis of this condition becomes worse with delayed diagnosis and increasing age.[8]

In a few patients, the disruption is violent and sudden, with protrusion of the intestines through the wound onto the surface of the abdomen.9 Appropriate treatment at the bedside includes protecting the intestines with sterile towels, promptly administering a narcotic, intravenously if possible, and immediately taking the patient to the operating room. This type of disruption has long been associated with a substantial mortality rate, but most often, death is a result not of the disruption but of the underlying conditions that caused it. The most frequent complications after disruption and restore of a wound are a generalized peritonitis or a pulmonary complication.[10]

These should be anticipated and appropriate preventive measures taken. Some patients experience and describe a tearing sensation preceding the disruption. When such an event is described by an extremely obese patient and there is no surface evidence of the disruption, an oblique soft tissue roentgenogram of the abdominal wall may help to establish the diagnosis by showing gas in intestinal loops trapped in the deep subcutaneous tissues.[8]

MATERIALS & METHODS

This study was prospective, randomized and comparative study conducted on 120 patients undergoing midline laparotomy in the Department of General Surgery, Kalinga Institute of Medical Sciences over a period of 1 year. Patients were selected who require midline laparotomy either as emergency or elective procedure. 120 patients who were divided into two groups 60 each by sealed envelope method and they were randomized accordingly.

Inclusion Criteria

a) Patients aged 18-75 years, requiring laparotomy

b) Gender: Both male and female.
c) Patients who require surgery with midline incision either as emergency or elective procedure.
d) All patients giving written informed consent for enrollment in study.

Exclusion Criteria

a) Patients below 18 years and above 75 years.
b) Patients aged 18-75 years with immuno-compromised state, on Chemotherapy / immunotherapy, long term steroids.
c) Patients who died within 10 days following midline laparotomy
d) Patients undergoing Re-Laparotomy.

Group-A: Closed by suturing the rectus sheath using Polydioxanone suture 1-0 (PDS) in conventional continuous layer suturing technique.
Group-B: Closed by suturing the rectus sheath using Polydioxanone suture 1-0 (PDS) in interrupted –X suture technique.

Method of Collection of Data:
Pre-Operative Evaluation:
Study procedure: Closure of midline abdominal wound by Continuous layer suturing technique with polydioxanone No 1 (PDS) suture.

Pre-Operative Evaluation

The patients were assessed preoperatively with clinical history, physical examination, biochemical and radiological evaluations. A detailed Performa was filled with the following details:

1. Details of patient age, sex, address, CR No., Date of Admission, Date of discharge.
2. Brief History
3. General Physical Examination
4. Details of Operative Procedure
   a) Date of surgery
   b) Operation
   c) Indication
   d) Findings
   e) Closure Technique

Patients included in the study undergone following investigations:

1. Complete Haemogram: Hemoglobin (HB), Total Leucocyte Count (TLC), Differential Leucocyte count (DLC), Platelet Count.
2. LFT and Serum Proteins.
3. Renal Function Test: Blood Urea, Serum Creatinine.
4. Serum Electrolytes: Sodium (Na+), Potassium (K+), Chloride (Cl-).
5. Chest X-Ray (PA View)
6. Abdomen X-Ray (AP View in Erect and Supine Position)
7. Ultrasound Abdomen/CT
8. Electrocardiography (ECG)

Intra-Operative Technique

After parts painted and draped, midline incision was given and abdomen was opened in layers. Once the pathology dealt, abdominal drains placed rectus sheath was closed either by continuous or interrupted X suture technique by PDS 1-0 RB as per group allocation. 34

Suture Material
PDS 1-0 Round body was used in both groups.

Technique of Continuous closure
Continuous Closure Technique: Continuous closure, performed using PDS 1-0 RB, care being taken to place each bite 1.5-2 cm from linea alba edge with successive bites being placed 1 cm from each other. The linea Alba was gently approximated without strangulation.

Interrupted X-Closure
Interrupted X-closure performed using PDS 1-0 RB as large bite being taken outside as 2 cm from the cut edge of linea alba. The needle emerged on other side from inside out diagonally 2 cm from the edge and 4 cm above or below the first bite. This strand subsequently crossed or looped around the free end of suture and continued outside in diagonally at 90^{o} to the first diagonal. The two end tied just tight enough to approximate the edge of linea alba taking care not to include omentum or bowel between the edges. This created two X like crosses- one on the surface and another deep to linea alba. The next X- suture placed 1 cm away from the previous one. Henceforth, in a 14 cm long wound, 3 X-sutures was applied.

Post-Operative evaluation:
In post-operative period, patients examined daily, kept nil per oral and on par-enteral fluids till bowel recover and assessed for the following parameters:

a) Cough
b) Discharge
c) Abdominal Distension
d) Drain output
e) Wound Gaping
f) Wound Dehiscence
g) Anemia

Broad Spectrum antibiotic coverage was given and changed as per culture sensitivity of wound discharge. Daily dressing was done.
In asymptomatic patients with no wound infection, gaping and wound dehiscence, skin sutures removed on 10^{th} post-operative day.

Follow up: Regular follow up done up-to 7^{th}, 10^{th} and 14^{th} day. During follow up above mentioned parameters assessed.

Statistical Analysis
The present study was carried out in a randomized prospective manner and statistical analysis of the data done at the end of the study using appropriate statistical tests depending upon the variables. Quantitative data was presented as mean and range as appropriate. For normally distributed data, mean was compared using T-test. For discrete categorical data, number and percentage were calculated. Chi-Square tests or Fisher's exact tests were applied for categorical data. All statistical tests were two sided. A p value of <0.05 was considered to indicate statistical significance.

RESULTS
In this study, there were 45 males and 15 females in Group -1 while there were 49 males and 11 females in Group 2. This data when analyzed by the Chi-Square test, gave a p value of

0.0649 which was not significant which means that both Groups were comparable with respect to the sex distribution of the patient. [Table 1].

Table 1: Gender distribution of Study Participants

Variables		Group 1	Group 2	P-Value
Gender	Male	45	49	0.0649
	Female	15	11	

Table 2: Age distribution of Study Participants

Variables		Group 1	Group 2	P-Value
Age	Mean age	48.03±6.15	46.44±5.68	0.67
Wound dehiscence	Yes	22	9	0.00001
	No	38	51	

In group 1, age of the patients varied from 18–75 years with a mean age 48.03 years and SD ± 6.15. In group 2, age of the patients varied from 18-75 years with a mean age of 46.44 years and SD ± 5.68. On analysis by the student T-test, it shown that the age variation between the two groups was statistically insignificant with a p value of 0.67. Thus, both the groups were comparable with respect to the age distribution of the patients. [Table2]
In Group 1, out of 60 patients wound dehiscence occurred in 22 cases while in Group 2, out of 60 patients wound dehiscence occurred in 9 cases. The difference of wound dehiscence in two groups was statistically significant. [Table2].

Table 3: Various Co-Morbidities among study participants

	Anemia (Hb<10 mg/dl)	Diabetes Mellitus	Uremia (>50 mg/dl)	Hypoalbuinemia (< 3.5 mg/dl)	Chest Infection
Group 1	17	5	18	44	49
Group 2	11	7	17	41	34
Total	28	12	35	85	83

In Group 1, 17 patients were anemic, 5 patients were diabetics, 18 patients had uremia, 44 patients had hypoalbuminemia and 49 patients had chest infection. In Group 2, 11 patients were anemic, 7 patients were diabetics, 17 patients had uremia, 41 patients had hypoalbuminemia, 34 patients had chest infection. [Table3].

Table 4: Association of various co-morbidities with Wound Dehiscence

Pre-Operative Parameters		Wound Dehiscence				Total	P-Value
		Yes		No			
		Frequency	%	Frequency	%		
Technique of Closure	Group 1	19	32.00	41	68.00	60	0.00001
	Group 2	4	06.00	56	94.00	60	
Anemia	Group 1	9	50.00	8	50.00	20	0.06
	Group 2	6	15.38	5	84.62	13	
Hypo-Albuminemia	Group 1	18	37.33	26	60.00	44	0.0001
	Group 2	4	8.96%	37	91.04	41	
Uremia	Group 1	7	35.00%	11	65.00	18	0.07
	Group 2	2	10.53%	15	89.47	17	
Diabetes	Group 1	0	0.00	5	100.00	5	0.0001

Mellitus	Group 2	0	0.00	7	100.00	7	
Leukocytosis	Group 1	17	46.34	21	53.66	38	0.0002
	Group 2	3	11.11%	27	88.89	30	
Cough	Group 1	24	43.55	32	56.45	56	0.0001
	Group 2	3	10.26%	31	89.74	34	
Emergency Procedure	Group 1	25	28.89	60	71.11	85	0.0001
	Group 2	5	6.38	85	93.62	90	

Presence of cough at time of hospital admission and early post-operative period was analyzed as a predictor in outcome of burst abdomen. Out of 120 cases 61 (50.50%) presented with cough or developed cough in early post-operative period. In Group 1 out of 56 patients, 43.55% (24) patients having cough developed wound dehiscence and in Group 2 out of 34 patients, 10.26% (3) patients had cough and developed wound dehiscence. On analysis Chi-Square Test, it showed that variation between the two groups was statistically significant with a p value of 0.0001.

In this study out of 120 patients, the surgical site infection and wound gaping was present in 51 (42.5%) patients. Out of 51, 23 (44.7%) patients developed wound dehiscence in post-operative period. On statistical analysis, the p value on Fisher Exact test was 0.00001. Thus, surgical site infection was a highly significant predictor of wound dehiscence.

Abdominal distension is associated with burst abdomen. In this study, abdominal distension was present in 13 (15%) patients. Out of 13 patients who developed abdominal distension, 5 (40%) patient had abdominal wound dehiscence in post-operative period. Out of 90 patients who did not had abdominal distension, only 14 (15.29%) patients developed wound dehiscence. On statistical analysis, the p value on Chi-Square was 0.001. Thus, abdominal distension was a highly significant predictor of wound dehiscence.

Type of procedure i.e. emergency or elective procedure is associated with burst abdomen. In this study 110 (92%) patients operated in emergency and 10 (8%) operated in elective setting. 20 (19%) developed wound dehiscence. 25 (84.21%) developed wound dehiscence in emergency procedure and 5 (15.78%) patients developed wound dehiscence in elective procedure.

DISCUSSION

Abdominal wound dehiscence defined as postoperative wound separation that involves all the layers of abdomen wall. Dehiscence of an abdominal wound may be partial or complete. We found that wound infection was a risk factor for both endpoints. This has been suggested in several reports previously, however, conflicting results have also been presented.[9] Ahi KS et al.[10] could not find such a relationship. They did, however find that prophylactic antibiotics reduced the risk for wound dehiscence. Our study also indicated the importance of preventive measures against wound infection.

This study adds new information about the incidence of wound dehiscence. This wound complication has not previously been identified by review of medical records from both elective and emergency surgery, which may explain why the incidence of wound dehiscence was higher than the literature gave reason to expect.[11]

According to previously published studies the technique used at closure of midline abdominal incisions affected the rates of incisional hernia.[12] In 2010, the routine to calculate and document the suture quota had not yet been fully adopted at all 4 hospitals that participated in this study. However, we did not find that documentation of the details of suture technique, regarding wound and suture length, influenced the rate of wound dehiscence or incisional hernia. Since we do not know which technique was actually used when documentation of

suture quota was lacking in the medical records, the results of this study do not contradict the results of previous studies.

High BMI has previously been reported to be associated with a significant increase in complication rates within 30 days after colorectal cancer surgery.[13] In bariatric surgery a preoperative dietary regimen is routinely used to ensure weight loss in order to decrease perioperative complications.[14] Whether this routine also decreased wound dehiscence and incisional hernia is still unclear.

The strengths of our study lie in the population basis and the large cohort, the fact that the cohort was consecutive including both elective and emergency operations, the short inclusion time and the long follow-up period. It has previously been found that it is important to monitor incisional hernias at least 3 years after surgery, as short-term follow-up could underestimate the incidence.[15] The endpoints were defined before retrieval of data and we used a specific clinical record form (CRF).

The study design has certain limitations, the most important being the retrospective data retrieval from medical records. Using a small bites suture technique rather that a large bites technique has previously been reported to affect the incidence of incisional hernia.[16] Our study could not consider aspects of the suture technique other than the suture quota since we were restricted to the information given in the medical records. Another limitation was that the patients were not specifically examined for the occurrence of an incisional hernia during the follow up, and the only incisional hernias recorded were those noted in the medical records. The incidence we found may thus be lower than the actual incidence. However, the rate corresponded to previous reports of clinically relevant incisional hernias.[17]

CONCLUSION

Wound dehiscence rate is more in emergency midline laparotomies as compared to elective cases. Besides technique of closure, various factors like malnutrition, cough, intra-peritoneal sepsis, wound infection, wound gaping, abdominal distension are significant predictors of burst abdomen. Patients with these risk factors require more attention and in presence of these factors, the risk of abdominal wound dehiscence can be reduced considerably by using interrupted X-suture technique

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