Risk Factors of Wound Dehiscence After Laparotomy and the Role of Prophylactic Retention Sutures

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ABSTRACT :

BACK GROUND :

(laparatomy wound dehiscence) is a serious postoperative complication which is associated with high morbidity and mortality rates.

OBJECTIVE:

To evaluate abdominal wounds dehiscence in term of risk factors and to assess the role of prophylactic retention suture in prevention of wound dehiscence.

PATIENTS AND METHOD:

Prospective study done in the General Surgical unit of Al–Imamain Alkadhmain medical city on 167 patients with 20 patients underwent prophylactic retention suture, from the 1st of July 2013 to the 1st of July 2015.and to know the effect of different factors on incidence of wound dehiscence.

RESULTS:

The number of wound dehiscence cases was 19 patients out of whole total 167 patients which represent 11.38%. Wound infection was present in 63 patients out of 167 patients (37.2%) and 19 patients out of 63 patients (30.2%) developed wound dehiscence. The other risk factor was chest complication which was present in 76 patients out of 167 patients (45.5%). and 17/76 patients (22.4%) developed wound dehiscence. Smoking was present in 92/167 patients, anemia was present in 80/167 patients and 13/80 patients (16.3%) developed wound dehiscence. Age > 50 years was present in 53/167 patients and 10 /53 patients (18.9%) developed wound dehiscence. steroid usage found in 17/167 patients and 5/17 of them patients (29.4%) developed wound dehiscence, and jaundice was present in 8/167 patients and two/8 patients (25%) developed wound dehiscence. Prophylactic retention sutures were done for 20 patients all of them were male with generalized peritonitis and emergency cases. 19 patients were anemic. 18 patients were smokers and 15 patients were above 50 years of age; from these 20 patients only one patient who had all listed risk factor developed wound dehiscence after prophylactic retention suture wound inspected from 2nd post-operative day on word

CONCLUSION:

Post-operative wound dehiscence rate in the surgical unit of Al–Amamain Alkadhmain medical city is 11.38% and that wound infection, emergency operations and compromised immunity, are factors which increase the rate of wound dehiscence; and prophylactic retention sutures is a valuable maneuver to reduce it.

KEY WORDS: burst abdomen, prophylactic retention suture.

INTRODUCTION:

Wound dehiscence is a serious postoperative complication which is associated with high morbidity and mortality rates. Wound dehiscence is not uncommon complication especially following emergency laparotomies. It affects the patients by increasing distress and risk of morbidity; the attendants by increasing the cost of treatment; the surgeons for whom it is a disturbing reality; and the hospital resources by increasing the health care cost due to prolonged hospital stay, It is an end result of multiple causes, some of which may be unavoidable[1].

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The increased use of damage control strategies and the recognition of abdominal compartment syndrome (ACS) have obviously saved lives [2].Likewise, the development of intensive care and selective use of re-laparotomies apparently improve survival in cases of severe abdominal sepsis. Improved survival may lead to an increased number of patients with burst abdomen [3].

Open abdomen causes lateral retraction of the abdominal musculature, and if proper closure is not achieved, the condition will result in a giant ventral hernia. Lateral displacement of the abdominal musculature leads to disequilibrium of the truncal muscles and, frequently, to chronic back pain. Additionally, the bowels beneath the

thin layer of skin are vulnerable to trauma and fistula formation. A ventral hernia after open abdomen has been reported to affect negatively the patient's quality of life [4].

Several methods have been developed to overcome the sequel of open abdomen. In the vacuum-assisted fascial closure (VAC) technique, negative pressure is used to close the fascia. Recently, the VAC technique has been combined with fascial sutures [5] and with a human a cellular dermal matrix implant. In the retention suture techniques, the closing force is transmitted by different suture constructions. Newly described, a method of using a gradually tightened continuous retention suture for fascial closure. Nowadays, they initially use VAC, but apply the continuous retention suture technique if the VAC technique does not result in direct closure. A case series treated with such continuous retention suture method is described in many other studies [6]

Clinical features of burst abdomen include: a serosangunious (pink) discharge from the wound is a forerunner of disruption in 50% of cases. It is the most pathognomonic sign of impending wound disruption and it signifies that the intraperitoneal contents are lying extra peritoneally. Patients often volunteer the information that they "felt something give way". If skin sutures have been removed, omentum or coils of intestine may be forced through the wound and will be found lying on the skin. Pain and shock are often absent. It is important to note that there may be signs and symptoms of intestinal obstruction[7].

Prophylactic retention suture: there has been great interest in devising methods to prevent the burst abdomen[8]. A primary prophylactic measure designed to reduce tension on wound edges involves the use of retention sutures. When first described by Reid in 1933, retention sutures were silver wire sutures placed with wide tissue bites through all layers of the abdominal wall and tied just tightly enough to allow approximation of tissue. Today, retention sutures are made of heavy, non-absorbable synthetic material large monofilament nylon sutures placed at intervals within the standard closure and often include an added buttress device for skin protection can serve as retention sutures.[9].

AIM OF THE STUDY:

To evaluate abdominal wounds dehiscence in term of risk factors in our locality and to assess the role of prophylactic retention suture in prevention of wound dehiscence.

PATIENTS AND METHODS:

All male and female patients (167) undergoing laparotomy by vertical or transverse abdominal incisions for various causes (elective & emergency) were included without selection in this study.

This prospective, descriptive and interventional case study was conducted in the third floor/ department of general surgery, Al–Imamain Alkadhmain medical city over 2 years from 1st of July. 2013 to 1st of July 2015.

All laparotomies (elective & emergency) were done under General anesthesia through vertical or transverse incisions. Antibiotics were started as part of preoperative treatment in all patients presented with acute abdomen in the emergency and elective cases. The operating team is the same for all cases who was consisted of four seniors and six residents.

Post operatively, each patient was examined for the presence or absences of any wound infection, and signs of wound dehiscence.

Examination of wound usually started at the 2nd post-operative day in the surgical ward, recording the presence of discharge like pus or serosangunious fluid .

Twenty patients were selected for prophylactic retention suture and they had all the risk factors and these factors include generalized peritonitis, smoking, anemia, age > 50 years, male gender and all these cases were emergency operations.

After emergency laparotomy and peritoneal Lavage and drainage; the peritoneal layer of the abdomen was closed by using absorbable suture material .and the fascial layers of the abdomen were closed layer by layer by using non absorbable number 1 nylon suture in continuous pattern and this supported by retention sutures which placed at about 5cm intervals to support the standard closure with use of rubber tubes as buttress to protect the skin.

Then wound inspected from the 2nd postoperative day for any signs of wound dehiscence We started to remove every other stitch at the 14th day and all the retention

Stitches removed at the 21stday. We used P value to know the statistical significance using Chi square method

RESULTS:

A total of 167 laparotomies for emergency and elective causes were included in this study. With age range between 9-70 years old, mean age of the patients was (32.4 year old), 127 patients were males and 40 patients were females with male to female ratio 3.2:

The majority of cases explored through midline laparotomy incision 139 patients (83.4%) and other 12 patients (6.8 %) cases through paramedian incision and 16 patients (9.7%) opened through right and left subcostal incisions. The total emergency laparotomies were 110 patients (65.87%) and the distribution of indication for emergency laparotomies were as follows; bullet injury of the abdomen in 28 patients (25.5%) with multiple organ injuries, multiple shell injury of the abdomen in 22 patients (20%), large bowel obstruction (colorectal tumors) in 13 patients (11.55%), perforated duodenal ulcer account for 11 patients (10%) , perforated appendicitis account for 10 patients (9.14%), 5 patients (4.85%) were due to small bowel obstruction (adhesive obstruction), perforated gastric ulcer account for 4 patients (3.6%) (2 of these cases were due to malignant ulcer, Blunt trauma (all of them were solid organ injuries) was the cause in 3 patients (2.7%), stab wound account for 3 patients (2.7%), perforated typhoid ulcers in the terminal ileum (all patients had generalized peritonitis) were present in 3 patients (2.7%), acute pancreatitis was the cause in 2 (1.8%) patients, GB empyema account for 2 patients (1.8%), ischemic bowel in 2 patients (1.8%), ruptured hydatid cyst of the liver account for 1 patient (0.9%) and lastly intraperitoneal pelvic abscess following previous laparotomy account for 1 patient (0.9%), as shown in table 1.

Table 1: Indications for emergency and elective laprotomies in the 167 patients included in the study.

Emergency laprotomy			Elective laprotomy		
Indications	No.	%	Indications	No.	%
Bullet injury	28	25.5	Open cholecystectomy	10	17.6
Shell injury	22	20	CA colon	9	15.8
Large bowel obstruction	13	11.55	CA stomach	6	10.5
Perforated duodenal ulcer	11	10	Splenectomy	6	10.5
Perforated appendicitis	10	9.14	Hydatid cyst of Liver	5	8.8
Small bowel obstruction	5	4.85	Obstructive Jaundice	5	8.8
Perforated gastric ulcer	4	3.6	Closure of ileostomy	4	7
Blunt Trauma	3	2.7	Closure of colostomy	4	7
Stab wound	3	2.7	Enterocutaneous fistula	3	5.3
Perforated terminal ileum	3	2.7	Liver abscess	3	5.3
Acute pancreatitis	2	1.8	Pancreatic pseudo cyst	1	1.7
GB empyema	2	1.8	Subphrenic abscess	1	1.7
Ischemic bowel	2	1.8			
Ruptured hydatid cyst liver	1	0.9			
Intraperitoneal pelvic abscess	1	0.9			
Total	110	100	Total	57	100

Fifty seven (34.13%) laparotomies were elective laparotomies for various pathologies: open cholecystectomy account for 10 patients (17.6%), Carcinoma of the colon account for 9 (15.8%) patients, carcinoma of the stomach account for 6 (10.5%) patients, splenectomy (due to thalassemia major or ITP with hypersplenism)was the indication for laparotomy in 6 (10.5%) patients , the percent for hydatid cyst of the liver was 5 (8.8%), obstructive jaundice was found in 5 (8.8%) patients (3 were due to common bile duct stones and other 2 cases were due to the CA head of pancreas), closure of ileostomy in 4 patients (7%), closure of temporary colostomy in 4 patients (7%), enterocutaneous fistula in 3 patients (5.3%) , liver abscess in 3 patients (5.3%); pancreatic pseudocyst in 1 patient (1.7%), and sub phrenic abscess in 1 patient (1.7%), as shown in table 1.

Out of total 167 Laparotomies 19 patients (11.38%) developed wound dehiscence, 17 patients (10.18%) developed wound dehiscence after emergency surgeries, and 2 patients (1.2%) developed wound dehiscence after elective surgeries. the patients that developed wound dehiscence were 15 males (78.9%) and 4 Females (21.1%). The choice of incision was selected according to the preoperative diagnosis or suspicion. The patients that been explored through midline incision distributed as follows 13 patients through extended midline laparotomy and two patients through lower midline laparotomy for perforated terminal ileum and one patient with upper midline for perforated duodenal ulcer. The three patients that been explored through lower right Paramedian incision had perforated appendix and the preoperative diagnosis was uncertain.

Methods of wound closure: all laparotomies that were complicated by wound dehiscence were closed by continuous mass closure using nylon No.1 loop, in19 patients (100%) and no patients were closed by interrupted closure.

The risk factors for developing wound dehiscence were: wound infection which occurred in 19 patients, chest complication which was present in 17 patients, smoking was present in 14 patients, anemia (Hb< 10 mg\dl) was present in 13 patients, postoperative ileus was present in 13 patients, age > 50 years was present in 10 patients, post-operative vomiting was present in 10 patients, malignancy present in 5 patients developed wound dehiscence, steroid usage present in 5 patients, obesity (body mass index above 30) was present in only 4 patients, malnutrition was present in 4 patients, jaundice was present in 3 patients, all the above risk factors with the exception of jaundice were statistically significant (P value < 0.05), as shown in table 2.

Table 2: Distribution of risk factors in the whole samples (167 bpatients) and in the 19 patients with wound dehiscence.

Risk Factor	Whole samples (167 patients)	wound dehiscence (19 patients)	P value
	No.	No.	
Wound infection	63	19	0.0254
Chest complication	76	17	0.0236
Smoking	92	14	0.0214
Hb< 10mg/dl	80	13	0.0225
Postoperative ileus	57	13	0.0242
Age > 50 years	53	10	0.0241
Post-operative vomiting	79	10	0.0235
Malignancy	41	5	0.0224
Steroids	17	5	0.0345
Obesity(BMI above 30)	23	4	0.0324
Malnutrition	22	4	0.0325
Jaundice	4	3	0.065

Six patients (31.58%) developed wound dehiscence at 8th postoperative day, 5 patients (36.32%) developed wound dehiscence at 6th postoperative day, 4 patients (21.05%) developed wound dehiscence at 7th postoperative day and 4 patients (21.05%) developed wound dehiscence at 5th postoperative day, as shown in table 3.

Table 3: Time of occurrence of wound dehiscence.

Post-operative day	No. of cases	%
5th	4	21.05%
6th	5	26.32%
7th	4	21.05%
8th	6	31.58%
Total	19	100%

Prophylactic retention suture were used in 20 patients from the total laparotomies (167) laparotomy, the selection of these patients depend on the history, age, sex, smoking, pre operative haemoglobine level, and the findings during operation. All selected patients were had severe peritonitis and 4 patients had perforated appendix, 4 patients had perforated duodenal ulcer, 3 patients had bullet injury with fecal peritonitis, 2 patients with multiple shell injury to the abdomen and small and large bowel injury, 3 patients had delayed intestinal obstruction and peritonitis. All patients had emergency laparotomy after stabilization of general condition of the patients. All selected cases (20) were males. Anemia which is an important risk factor was present in 19 patients. Smoking also contribute to impairment of wound healing was present in 18 patients. From these 20 patients only one patient developed wound dehiscence in spite of using prophylactic tension suture.

DISCUSSION:

There are two basic events seen in wound dehiscence which are decreased wound strength

and increased collagenolysis, most commonly due to infection.

The rate of wound dehiscence in our study is 11.38%, which is much higher if compared to several studies mentioned in western literature comparable to what reported by Hanif[3].which in our study male to female ratio who developed wound dehiscence is3.2: 1 male predominance has been mentioned in many studies [1, 4].

Hampton and Hanif showed ratio to be 2: 1[2, 3].this higher male predominance ratio explained by the fact that most of our cases are trauma and males are exposed to outdoor injuries more than females.

Risks of wound dehiscence increase in old age patients, ten of our patients with dehiscence were above the age of 50 years.

Hanif also showed advanced age in 50% of cases [3]

Moore et al also observed advanced age as a risk factor [5].

Wound dehiscence rate was observed to be 15.45% in emergency (17/110), and 3.5% in elective laparotomies (2/57), which is similar to that reported by Hanif[3].This difference of wound dehiscence rates between elective and emergency laparotomies is statistically significant (P < 0.05). Mulier et al [7].Reported 6.4% and 2.6% rate of wound dehiscence in emergency and elective laparotomy respectively

In our study the incidence of wound dehiscence is high due to many reasons can be attributed to contaminated operations in emergency cases (bowel injuries , perforated viscous) as well as the delay in presentation of the patients to the hospital or misdiagnosis and their sequels like septicemia , fluid and electrolytes disturbance .

Second factor, which can also play a major role in developing wound dehiscence, is lack of experience and knowledge of proper closure by the residents who did the closure who are first and second year board candidates in mass injuries.

Technical errors can be avoided by using non absorbable sutures making secured surgical knots, taking deep tissue bites (1cm or more from wound margin), and 1cm apart with suture length ratio of 4:1.

Serosangunious fluid discharge prior to wound dehiscence was present in 63% of our cases with wound dehiscence other workers have also reported this discharge in 23% [8].to 48% [9].

Two out of 19 patients with obstructive jaundice had wound dehiscence in our study: one had malignant obstructive jaundice & second have benign obstructive Jaundice this is in accordance with some of the studies [10] .however, no such relation was seen by Hanif and Eddy et al[3, 11].

In our study, wound infection was found in all 19 cases with dehiscence(means 100 %). Miller etal also reported wound infection in 97% in cases of wound dehiscence [12].

Overall rate of wound infection was 63/167 (37.7%) patients. Among then 19 (30.2%) patients develop wound dehiscence. The wound infection rate in emergency laparotomies was 26/110 (23.6%) while it was 4/57 (7%) in elective laparotomies. This statistically significant (p< 0.05).

Anemia (hemoglobin below 10mg/dl at presentation) was found in 13 patients with dehiscence, but was also observed in other cases that showed normal healing response. So, anemia alone cannot be significant risk factor but co-existence of other factor is necessary to give rise to wound dehiscence.

Malnourishment was present in 22 (18.2%) patients; 4 of them developed wound dehiscence. On admission 33 to 65% of all hospital patients are somewhat malnourished as mentioned by other study [13,14].

In study by Cothren et al 41% males and 38% females were obese, while 12.5% of females also showed low hemoglobin level [15].

A similar pattern was also noted by Nizami from Karachi [16] .Koniaris et al suggested that maintenance of normal food intake up till the time of surgery is of importance in preventing impairment of wound healing response [17] .

According to a study reported by Miller et al, hypoproteinemia, nausea, vomiting, fever, wound infection, abdominal distension, type of suture material, presence of 2 or more abdominal drains and surgeon's experience were factors significantly associated with wound dehiscence [13] .

The number of patients with wound dehiscence increased with an increase in the number of risk factors, reaching 100% for patients with 8 or more risk factors.

The risk factors of wound dehiscence can be predicated early and their number can be decreased before and after surgery by an experienced surgeon, leading to a lowered incidence of wound failure.

During our study we identify many patients with peritonitis and other risk factors and we did prophylactic tension suture for 20/167 (12%) patients, only one patient developed burst abdomen. Superficial wound infection was noticed in 4 patients; however, the wounds healed in a reasonable course of time, without

requiring removal of the retention nylon sutures [4]

CONCLUSION:

- The most common predictors (risk factors) for burst abdomen are surgical site infections and emergency operations.
- The incidence of burst abdomen is high with attendant poor outcome, but identifying the predictors may influence early institution of preventive measures.
- Prophylactic retention suture has a good place in reducing the risk of wound dehiscence in many patients with peritonitis and other risk factors.

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