

Effect of retention sutures for prevention of abdominal wound dehiscence after laparotomy in high risk patients (A prospective study)

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ABSTRACT

Background: Wounds and their management are fundamental to the practice of surgery. Surgical wound dehiscence after laparotomy remains a serious complication. To evaluate the effect of prophylactic retention sutures in patients with a high risk for wound dehiscence who underwent midline laparotomy.

Patients and methods : One hundred fifty(150) cases were randomized to form two groups with 75 patients each: a prophylactic group by using retention sutures and a non prophylactic group. A central randomization for both hospitals was performed. Two patients in the non prophylactic group and three patients in the prophylactic group

In the non prophylactic(control) group Standard midline incision and continuous mass closure technique was used in each case using a running looped 1/0 nylon string located 1 cm from the edge of the linea alba. In the prophylactic group, the fascia was sutured using the same technique as the non prophylactic group; however, retention sutures were added using a 1/0 nylon string every 10 cm and contained 5 cm of the skin, subcutaneous tissue, rectus muscle, and abdominal fascia (except peritoneum) on each side. All fascia closures were performed by two attending surgeons who adhered strictly to the protocol. Occurrence of abdominal dehiscence was assessed daily by precise examination of the wound.

Results: The incidence of abdominal wound dehiscence was 3 patients (4%) in the prophylactic group and 10 patients (13.3%) in the control (non prophylactic) group (P = 0.007) therefore it is significant

Conclusion: Our conclusion that prophylactic retention sutures can decrease the incidence of abdominal wound dehiscence but although there is decrease incidence of postoperative evisceration, wound infection and postoperative pain, there was no significant difference.

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INTRODUCTION

Surgical wound dehiscence after laparotomy remains a serious complication. It presents a mechanical failure of wound healing of surgical incisions. Surgical incisions stimulate the healing process which in reality is a complex and continuous process with four different stages: Hemostasis, inflammation, proliferation, and maturation [1]. During hemostasis, platelets aggregate, degranulate and activate blood clotting. The clot is degrading, the capillaries dilate and fluids flow to the wound site, activating the complement cascade. Macrophages, lysis of cells and neutrophils are a source of cytokines and growth factors that are essential for normal wound. The surgeon's task is to minimize the adverse effects of the wound, remove or repair damaged structures and harness the process of wound healing to restore function. General surgeons make various abdominal incisions. Disruption of abdominal surgical wound is one of the common causes of early relaparotomy [3]. Till recent, however, it has been a subject little understood with little known about its exact etiopathogenesis, there was little a surgeon could do to take preventive steps [4]. Abdominal wound dehiscence or burst abdomen is one of the most serious postoperative complications and is associated with high morbidity and mortality. It occurs with an incidence of 0.4% to 3.5% after major abdominal surgeries with a related mortality of 10% to 45% [5]. Despite advances in operative techniques and risk control methods

during recent years, the incidence of WD remains high [6,7]. Surgeon expertise, type of incision, suturing material, surgical site infection, nutritional status, persistent cough, abdominal distension, leakage of pancreatic enzyme, anemia, obesity, diabetes, jaundice, old age, emergent operation, particular procedures such as colon surgery, and late wound healing due to malignancy have all been suggested to predispose patients to abdominal wound dehiscence. Some of these factors are unavoidable [5,9,10,11]. The retention sutures are one of the recommended techniques for reducing disruption of fascia in vulnerable reoperated cases. However, considering the associated pain and morbidity, no benefits have been observed that justify the use of retention sutures as a routine method [12-17].

AIM OF THE STUDY

To evaluate the effect of prophylactic retention sutures in patients with a high risk for wound dehiscence who underwent midline laparotomy.

PATIENTS AND METHODS

This prospective study was carried out in Al-shatra general hospital and Al-hussain teaching Hospital, Department of Surgery between December 2011 to November 2013.

patients selection

This prospective randomized controlled double-blinded clinical study by using sealed envelopes to be with or without prophylactic retention sutures, by a coordinator who was not involved in the research process. The list was concealed from

investigators throughout the study. all patients gave informed consent. During the period of study, patients included who undergoing midline laparotomy, 10-cm surgical incision minimum, and having at least one of the following preoperative risks factors for abdominal dehiscence poor nutritional status (clinical cachexia or hypoalbuminemia); emergent surgery; intra-abdominal infection; malignancy; use of corticosteroids in the last year; uremia; hemodynamic instability (BP <90mmHg); hemoglobin <10 mg/dL ;abdominal distension (due to ascites or prolonged ileus);chronic pulmonary diseases; clinical jaundice (total bilirubin >3 mg/dL); diabetes mellitus; and age >60 years[10,18-27].Patients younger than 12 years and those with an incision length of <10 cm were excluded from the study.

One hundred fifty(150) cases were randomized to form two groups with 75 patients each: a prophylactic group by using retention sutures and an non prophylactic group. A central randomization for both hospitals was performed. Two patients in the non prophylactic group and three patients in the prophylactic group died within 2 wks of surgery due to causes unrelated to abdominal dehiscence and were excluded from the study. Therefore 145 patients were evaluated (there were 72 cases with prophylactic group, and 73 cases without prophylactic sutures ,control group).Indications of surgery were categorized as GIT malignancy , Intestinal obstruction, GIT bleeding, intra-abdominal sepsis, trauma, and miscellaneous.

Table (1)General characteristics of the patient groups with and without prophylactic retention sutures.

Characteristic	prophylactic group	Nonprophylactic group	P VALUE
Sex f/m	20/52	19/54	0.766
Age(years)	13-80	13-70	0.682
Number of risk factors	2 _ 1.5	2.4 _ 1.2	0.822
Length of incision(cm)	20+6.3	20+5.6	0.306
Duration of operation (min)	60-140	60-140	0.119
Indications of laparotomy:			
Intestinal obstruction	10(13.5%)	8(10.9%)	0.237
Trauma	31(42.6%)	29(39.5%)	0.306

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Intraabdominal infection	15(20.3%)	17(23.1%)	0.814
Malignancy	7(9.8%)	5(6.8%)	0.245
Gastrointestinal bleeding	3(4.1%)	4(5.4%)	0.326
Miscellaneous	34/50	37/49	0.163

The p value is > 0.05, the differences between two groups are insignificant.

Methods

All patients underwent general anesthesia, following intubation the patient was prepared and draped in the standard fashion. In the non prophylactic(control) group Standard midline incision and continuous mass closure technique was used in each case using a running looped 1/0 nylon string located 1 cm from the edge of the linea alba with 1-cm intervals. Subcutaneous tissue was sutured by interrupted sutures of 3/0 vicryl and skin was closed using interrupted suture of 3/0 nylon. In the prophylactic group, the fascia was sutured using the same technique as the non prophylactic group; however, retention sutures were added using a 1/0 nylon string every 10 cm and contained 5 cm of the skin, subcutaneous tissue, rectus muscle, and abdominal fascia (except peritoneum) on each side. All fascia closures were performed by two attending surgeons who adhered strictly to the protocol. Occurrence of abdominal dehiscence was assessed daily by precise examination of the wound. When wound disruption and/or secretions were observed, digital examination

of wound depth was performed to evaluate the integrity of the fascia. When the clinical findings were not conclusive, we performed ultrasonography to assess the fascia. Other postoperative outcomes included evisceration, need to reoperate due to abdominal wound dehiscence, wound infection (based on clinical findings), postoperative pain, length of postoperative hospital stay, and post-dehiscence in-hospital mortality. Postoperative pain was measured using the visual analog scale (VAS, 0-10 scale) by nurses masked to the patient group. Retention sutures were removed 3 or 4 wks postoperatively when they were loose. The statistical analysis was performed by the statistical software SPSS (version 14 for Windows) using the χ^2 test. For the comparison of variables the Mann-Whitney U test was applied to compare the variables between the prophylactic and non prophylactic subjects. The results were considered significant at $P < 0.05$.

Results

one hundred fifty patients were subjected to midline laparotomy due

different causes included in our study, with 75 patients in each group. Two patients in the nonprophylactic group and three patients in the prophylactic group died within two weeks of surgery due to causes unrelated to abdominal wound dehiscence and were excluded from our study. so 72 patients underwent prophylactic retention sutures and 73 patients considered as control non prophylactic group. General characteristics of the patient groups 1, types of surgeries, length of surgical incision, number of risk factors and durations of operations are summarized in Table 1. As Table 1 shows, no statistically significant differences were observed between the two groups of patients ($P > 0.05$). preoperative risk factors for abdominal wound dehiscence in each not show any statistical differences (Table 2, Figure 1) The incidence of abdominal wound dehiscence was 3 patients (4%) in the prophylactic group and 10 patients (13.3%) in the control (nonprophylactic) group ($P = 0.007$) therefore it is significant. Abdominal evisceration occurred in 1 patient (0.7%) in the prophylactic group compared to 2 patients (2.7%) in the nonprophylactic group ($P = 0.51$). Wound infection occurred in 12 (15.8%) and 10 patients (13.8%) in the prophylactic and nonprophylactic groups, respectively ($P = 0.371$), all these result considered as non

significant statistically (Table 3, Figure 2). The pain scores were not significantly different between two groups ($P > 0.05$), for the prophylactic group, postoperative pain, measured on VAS, was 7.4 ± 1.6 on the first day, 6.2 ± 1.8 on the second day, 4.5 ± 1.7 on the third day while, for the nonprophylactic patients, postoperative pain was 7.3 ± 2.3 on the first day, 5.8 ± 2.0 on the second day, 4.1 ± 1.2 on the third day (Table 3, Figure 2) Reoperation after abdominal wound dehiscence was performed to manage wound dehiscence in all these patients except for one patient in the prophylactic group that was managed conservatively. The fascia of this patient was partially disrupted in the epigastrium, but only the preperitoneal fat was exposed; therefore, it was managed by frequent change of dressing and through secondary healing. Total hospital mortality, post dehiscence deaths and postoperative hospital stay did not show statistically significant differences (Table 3, Figure 2). One post-dehiscence death in the prophylactic group was due to sepsis. Three post-dehiscence mortalities in the nonprophylactic group were due to myocardial infarction, heart failure and renal failure, and pulmonary embolism

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Table (2). Preoperative risk factors of prophylactic and “non- prophylactic” group.

Distribution of Preoperative Risk factors of abdominal dehiscence					
Risk factors	Nonprophylactic group	%	prophylactic group	%	P value
Age>60years	30/72	44.8%	32/73	45.8%	0.907
jaundice	10/72	14.3%	13/73	17.3%	0.525
Diabetis	12/72	15.6%	8/73	10.8%	0.234
uremia	2/72	2.7%	4/73	4.7%	0.684
Hb<10 g/dl	36/72	50.2%	35/73	49.3%	0.541
Emergency laparotomy	29/72	39.3%	32/73	43.8%	0.479
Maliganacy	40/72	56.3%	35/73	49.3%	0.484
Corticosteroid use	2/72	2.6%	4/73	5.4%	0.378
Abdominal distention	13/72	17.7%	14/73	19.5%	0.763
Intraabdominal infection	19/72	25.9%	21/73	27.7%	0.795
Unstable hemodynamic state	5/72	5.9%	6/73	7.7%	0.636

The p value is > 0.05, the differences between two groups are insignificant .

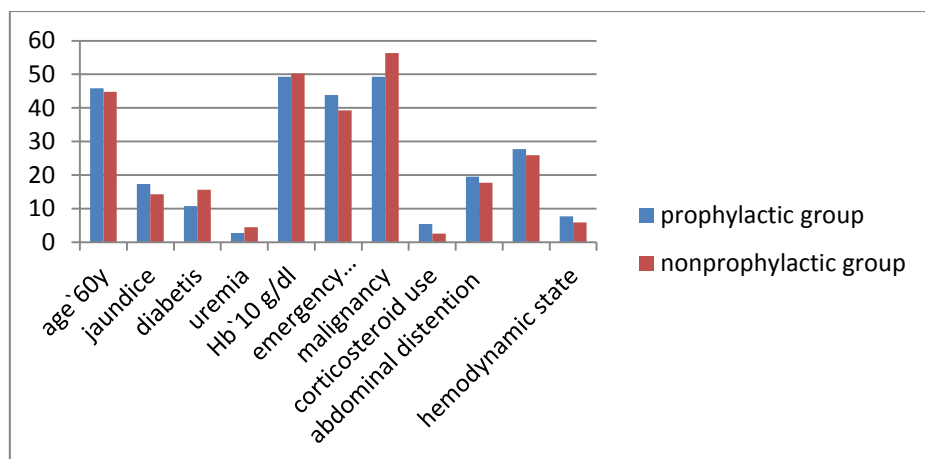


Fig (1).show incidence of risk factors in both group

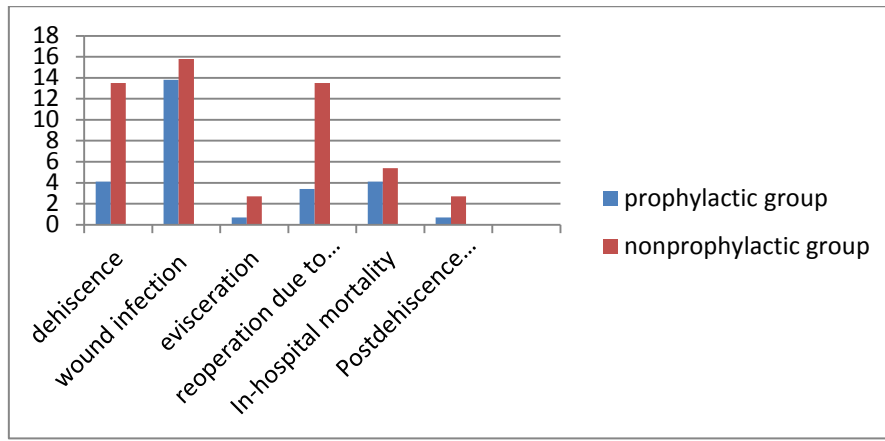


Fig (2).show incidence of postoperative outcome of both group

Table (3)Postoperative fellow up and complications in each group

Outcome	prophylactic group	%	Nonprophylactic group	%	P value
Dehiscence	3/72	4.1%	10/73	13.5%	0.007
Wound infection	10/72	13.8%	12/73	15.8%	0.371
Evisceration	1/72	0.7%	2/73	2.7%	0.51
VAS 1 st day	7.3 _ 2.3		7.4 _ 1.6		0.939
VAS 2 nd day	5.8 _ 2		6.2 _ 1.8		0.090
VAS 3 rd day	4.1 _ 1.2		4.5 _ 1.7		0.078
Postoperative hospital stay (d)	21.3 _ 6.9		20.4 _ 5.6		0.332
Reoperation due to wound dehiscence	2/72	3.4%	10/73	13.5%	0.003
In-hospital mortality	3/72	4.1%	4 /73	5.4%	0.785
Postdehiscence mortality	1 /72	0.7%	2/73	2.7%	0.622

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Discussion

The discussion on the subject of abdominal wound dehiscence is as old as the history of modern operative surgery. The peri-operative mortality and long term morbidity associated with the condition need medical surgical pre-ventive measures to be taken. Abdominal wound dehiscence is a devastating incident that can cause pain, mental distress, infectious complications, and financial burdens for the patient, as well as complications including evisceration and reoperation [6,8,9,13, 28]. Surgeon expertise, type of incision, suturing material, surgical site infection, nutritional status, persistent cough, abdominal distension, leakage of pancreatic enzyme, anemia, obesity, diabetes, jaundice, old age, emergent operation, particular procedures such as colon surgery, and late wound healing due to malignancy have all been suggested to predispose patients to abdominal wound dehiscence. Some of these factors are unavoidable [5,13,10,29,30]. Different surgical techniques for closing the wound should be carefully considered [31]. Suture materials are of great importance in providing sufficient strength and influencing adverse events [7]. Some authors have proposed The application of thick or retention sutures as a preventive strategy to eliminate or reduce the occurrence of wound dehiscence[25,30,32-34] Retention sutures have already been shown to reduce the rate of WD after surgery [6,14,15,30], and their use has also been suggested as a treatment choice

for managing fascial dehiscence [5,35]. However, due to the subsequent pain, postoperative discomfort, and skin maceration, routine application of this technique has not been well accepted. Considering the controversies involved in using this method for the prevention of abdominal wound dehiscence, our study included only patients at a high risk for developing abdominal wound dehiscence who would benefit the most from prophylactic retention sutures. Complications such as intestinal damage [13,16,36], skin maceration and cutting lesions[37,38,16,36], surgical site infections, and patient pain or discomfort [6,27] prohibit the surgeons from performing this technique. However, in the presence of a high possibility for developing abdominal wound dehiscence due to the accompanying conditions, the benefits of retention sutures may outweigh the disadvantages and the technique should be considered. However, in the presence of a high possibility for developing abdominal wound dehiscence due to the accompanying conditions, the benefits of retention sutures may outweigh the disadvantages and the technique should be considered. abdominal wound dehiscence can be prevented by certain strategies, such as using a vacuum assisted closure in patient with compromised healing or using tension free mesh techniques in order to reduce the tension of the abdominal wall[39]. Zhamak Khorgami et al., in a study with a large sample

size, reported a lower rate of incidence for abdominal wound dehiscence when retention sutures are used at the time of wound closure. They suggested that the selection of patients from the high-risk population is essential for raising the benefits against the costs of preventive approaches[40]. In contrast, Hubbard and Rever concluded there were no advantages in applying retention sutures for the prevention of abdominal wound dehiscence [41]. Our study showed a lower incidence of abdominal wound dehiscence in prophylactic group in which just 3 from 72 cases develop wound dehiscence in contrast to nonprophylactic group in which 10 from 73 cases develop dehiscence which significant . The cases for this study were selected from high-risk patients (two or more risk factors) and the findings would suggest that this method, as a preventive strategy, benefits such a population. The decreased incidence of abdominal wound dehiscence in our study is in line with some other studies. Goligher et al., suggested that reinforcing the routine methods of closure with retention sutures or application of a wire suture would result in fewer cases of dehiscence. However, we should note that the incidence of dehiscence in our study (8.8%) was higher compared to others due to enrolling high-risk patients [42].

Evisceration, post operative wound infection ,mortality rate and post operative pain were less frequent in the prophylactic group, but this finding lacks statistical significance and is not conclusive given the small number of events. Our findings suggest, patient selection among the high risk population with multiple risk factors for abdominal wound dehiscence is a prudent approach to apply retention sutures as a prophylactic routine for prevention of abdominal wound dehiscence. With such a treatment approach, the risks of developing dehiscence would outweigh the complications. limitation of our study was the small sample of cases of laparotomies in patients with risk factors of abdominal wound dehiscence. Furthermore, the short follow-up period for observing the development of incisional hernia should be replaced by a much longer period to assess development of incisional hernia

Conclusion

Our conclusion that prophylactic retention sutures can decrease the incidence of abdominal wound dehiscence but although there is decrease incidence of post operative evisceration ,wound infection and post operative pain , there was no significant difference.

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