COMPARISON OF CONTINUOUS VERSUS INTERRUPTED X-SUTURING TECHNIQUE FOR ABDOMINAL WALL CLOSURE IN EMERGENCY MIDLINE LAPAROTOMY WOUND

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Date Received:
February 28, 2018
Date Revised:
November 22, 2018
Date Accepted:
November 27, 2018

ABSTRACT

Objective: To compare the effectiveness of continuous versus interrupted X-suturing for abdominal wall closure in patients presented with emergency midline laparotomy wound.

Methodology: A comparative clinical trial was conducted over a period of one year in Surgical D Unit, Lady Reading Hospital, Peshawar. Sample size was 100 (50 in each group). Patients in group A were subjected to continuous suturing repair while patients in group B underwent interrupted X-suturing technique. Patients from both groups were observed for 6-7 days. In post-operative period frequency of burst abdomen was assessed by consultant surgeons. Statistical analysis of the recorded data was done using SPSS version 20.

Results: Male to female distribution in group A was 41 (82%) and 9 (18%) respectively while in group B it was 42 (84%) and 8 (16%) respectively. Overall 42 (84%) patients in group A experienced no burst abdomen as compared to 48 (96%) patients in group B within 1 week post-operatively (p=0.0455).

Conclusion: Interrupted X-suturing technique for midline laparotomy closure in emergency cases was better than continuous closure technique because it was associated with less frequency of burst abdomen within first 1-2 weeks post-operatively.

Key Words: Continuous suturing technique, Interrupted X-suturing, Burst abdomen

This article may be cited as: **Khan AA, Khan N, Qayyum A, Abbasi HJ, Saira. Comparison of continuous versus interrupted X-suturing technique for abdominal wall closure in emergency midline laparotomy wound. J Postgrad Med Inst 2018; 32(4): 390-4.**

INTRODUCTION

Laparotomy wound dehiscence (LWD) is a term used to describe separation of the layers of a laparotomy wound before complete healing has taken place. Other terms used interchangeably are acute laparotomy wound failure and burst abdomen. Acute wound failure may be occult or overt, partial or complete. Overt wound failure follows early removal of sutures leading to evisceration. Occult dehiscence occurs with disruption of musculo-aponeurotic layer beneath intact skin sutures. Wound dehiscence has been noted to occur when a wound fails to gain sufficient strength to withstand stresses placed upon it. The separation may occur when overwhelming forces break sutures, when absorbable sutures dissolve too quickly or when tight sutures cut through tissues[1].

A number of studies have been conducted in the past five years trying to explain how this problem can be overcome. Simek et al[2] describe a technique of their own which they have developed in the last ten years and are currently using to prevent wound dehiscence. This technique involves the use of intraperitoneal resorbable mesh in prevention of postoperative wound dehiscence for any patient they consider at risk. Gislason et al[3] and Fleischer et al[4] independently published results of long term complications of burst abdomen following layered or mass closure of laparotomy wounds. In 1998, Graham et al[5] demonstrated that intrabdominal infections increased wound dehiscence significantly. In the same year Soran et al[6] outlined predictable risk factors as relates to burst abdomen and they recommended certain surgical measures. These measures included control of nausea and vomiting, decompression of distended abdomen, choice of appropriate sutures, control of infection and use abdominal drains. Moreover, experience of surgeon and use of more than two abdominal drains were factors significantly associated with wound dehiscence. A number of studies have been conducted in India which suggest that new interrupted X-technique for abdominal closure after midline laparotomy significant-

ly reduces the risk of burst abdomen[7,8]. Available data in Pakistan regarding comparison of continuous closure and interrupted X-closure for the risk of burst abdomen after emergency midline laparotomy is limited. Aim of the present study was to compare the frequency of burst abdomen in patients having midline abdominal wall closure done with interrupted X-suturing technique and continuous suture technique. The findings of this study may help in reducing the risk of burst abdomen in midline laparotomy wounds.

METHODOLOGY

A comparative clinical trial was conducted from February 2016 to January 2017 in the Department of General Surgery, Lady Reading Hospital, Peshawar, Pakistan. Sample size was calculated based on the study by Srivastava et al[9] who reported 2.17% burst abdomen in the X-sutures and 14.8% in the continuous sutures group. WHO sample size software was used. Confidence level was kept at 95% and power of study at 95%. The calculated sample size was 99. After taking permission from hospital ethical committee, a total of 100 patients (50 in each group) were included in the study. Patients of both genders (18-60 years of age) were included who were operated through midline laparotomy for cute abdomen due to trauma, intestinal perforation and intestinal obstruction. They were operated by same level of surgeon and under same kind of anesthesia. Care was taken for selection bias by properly randomizing and allocation of patients in both groups.

Patients with history of laparotomy and patients with co-morbid conditions such as malignancy, malnutrition, diabetes mellitus, end stage renal disease, cirrhosis of liver, chronic obstructive pulmonary disease and ischemic heart disease were excluded from the study. After informed consent, data were collected from patients in Surgical D Unit of Lady Reading Hospital, Peshawar. Complete history and examination were carried out on patients who were diagnosed as case of acute abdomen and with need of emergency laparotomy. These patients were divided in two groups (A and B). In group A patients after laparotomy the abdominal wound was closed with continuous suturing technique by polypropylene No. 1, while in group B patients the abdominal wound was closed with interrupted X-technique by polypropylene No. 1. All patients were examined for burst abdomen on 1, 2, 3, 4, 5, 6, 7 and 15 postoperative days. When there were no signs of burst abdomen (after 15 postoperative days) the laparotomy wound was considered normal.

Data were entered into SPSS software version 20. Mean ± standard deviation was calculated for quantitative variables such as age. Frequencies and percentages were calculated for qualitative variables such as gender, type of injury and burst abdomen. In both the groups (A and B) burst abdomen was stratified among age, gender and type of injury to see effect modification. Chi-square test was applied for comparison of significance between the two groups keeping P value ≤ 0.05 as significant.

RESULTS

A total of 100 patients with acute abdomen were included in the study. The mean age of group A patients was 48.60 ±12.623 years while mean age of group B patients was 42.06 ±12.466 years. Mean weight was 68.34 ±10.271 kg in group A and 69.66 ±7.356 kg in group B.

In both groups majority of patients were 31-60 years of age. Frequency of males was observed to be high in both the groups as compared to females. Baseline characteristics of both groups are shown in Table 1 .

Frequency of burst abdomen was obsrved to be low among patients of group B (n=2, 4%) as compared to group A (n=8, 16%), with p value of 0.0455. Table 2 shows stratification of burst abdomen with respect to different variables.

Age and gender wise stratification shows that male subjects with 31-60 ages of group B showed highest frequency of no burst abdomen (98%) as compared to group A (85%). Whereas BMI results depict that group B patients having BMI ≤25 shows no burst abdomen (100%). Stratification on basis of type of injury indicates that patients of group B having acute abdomen perforation/obstruction had highest frequency (97%) of no burst abdomen compared to patients of group A (85%).

DISCUSSION

Acute abdomen allocates sign and symptoms of intra-abdominal diseases usually best treated by surgical operation[10,11]. Intestinal perforation, peritonitis, intestinal obstruction, blunt and penetrating trauma to abdomen are the frequent surgical causes of acute abdomen[12]. Patients with acute abdomen may develop fluid electrolyte imbalance, septicemia, anemia and dehydration; and if these pathophysiological processes remains unchecked it can lead to high mortality and morbidity[13]. In majority of cases such as intestinal obstruction, gut perforation, perforation of peptic ulcer, blunt abdominal trauma and penetrating injuries to abdomen, laparotomy is done. The highly recommended method of emergency laparotomy is midline laparotomy[14].

Burst abdomen is a very serious postoperative problem and causes high morbidity and mortality[15]. It has a significant impact on health care cost both for the patient and the hospital. Many risk factors were incriminated in causation of burst abdomen including malnutrition, anemia, hypoproteinaemia, pre and post-operative prolonged steroid therapy, peritonitis, malignancy, jaun-

Table 1: Baseline characteristics of patients in both groups

Characteristics		Group A n (%)	Group B n (%)	P value
Age (Years)	17-30	11 (22)	8 (16)	0.0101
	31-60	39 (78)	42 (84)	
Gender	Male	41 (82)	42 (84)	0.7900
	Female	9 (18)	8 (16)	
Height	5-5.5 ft	34 (68)	35 (70)	0.8138
	5.6-6.0 ft	8 (32)	15 (30)	
Weight	50-60 kg	30 (60)	31 (62)	0.5770
	61-100 kg	20 (40)	19 (38)	
BMI	≤25	32 (64)	31 (62)	1.000
	>25	18 (36)	19 (38)	
Duration of Injury	≤24 hours	27 (54)	26 (52)	1.000
	>24 hours	23 (46)	24 (48)	
Type of Injury	Acute abdomen Perforation/Obstruction	34 (68)	37 (74)	0.5085
	Fire Arm Injuries	16 (32)	13 (26)	

Table 2: Stratification of burst abdomen in group A (continuous suturing) and group B (Interrupted X-suturing technique)

Variables		Burst Abdomen	Group A n (%)	Group B n (%)	Total n (%)	P value
Age (years)	17-30	Yes	2 (18)	1 (12.5)	3 (16)	0.7373
		No	9 (82)	7 (87.5)	16 (84)	
	31-60	Yes	6 (15)	1 (2)	7 (9)	0.0374
		No	33 (85)	41 (98)	74 (91)	
Gender	Male	Yes	6 (15)	1 (2)	7 (8)	0.0446
		No	35 (85)	41 (98)	76 (92)	
	Female	Yes	2 (22)	1 (12.5)	3 (18)	0.5996
		No	7 (78)	7 (87.5)	14 (82)	
BMI	≤ 25	Yes	4 (12.5)	0 (0)	4 (6)	0.3346
		No	28 (87.5)	31 (100)	59 (94)	
	> 25	Yes	4 (22)	2 (11)	6 (16)	0.0419
		No	14 (78)	17 (89)	31 (84)	
Duration of injury	≤ 24 hours	Yes	3 (11)	1 (4)	4 (8)	0.3168
		No	24 (89)	25 (96)	49 (92)	
	> 24 hours	Yes	5 (22)	1 (4)	41 (13)	0.0711
		No	18 (78)	23 (96)	47 (87)	
Type of injury	Acute abdomen perforation/ Obstruction	Yes	5 (15)	1 (3)	6 (8)	0.0692
		No	29 (85)	36 (97)	65 (92)	
	Fire arm injuries	Yes	3 (19)	1 (8)	4 (14)	0.3904
		No	13 (81)	12 (92)	25 (86)	

dice, uremia, prolonged post-operative abdominal distension, cough, the technique of closure and closure material. Wound dehiscence is associated with the method of closure of abdomen and the sutures used. A number of studies have been conducted to assess mystifying variety of closure techniques and suture materials[16,17]. Similalrly, studies conducted for suitable technique of closure of midline laparotomy wound, among which recently studies carried out in India, which shows that risk of burst abdomen considerably decreases by using interrupted X-technique for abdominal closure after midline laparotomy[18-21].

In the present study, all patients in both groups were operated through midline laparotomy wounds. Our results regarding burst abdomen revealed that overall 42 (84%) patients in group A (continuous sutures group) experienced no burst abdomen compared to 48 (96%) patients in group B (interrupted X-sutures group). Whereas 8 (16%) burst in group A (continuous sutures group) and 2 (4%) burst in group B (interrupted X-sutures group) within 1 week post-operatively (p=0.0455).

In our study, interrupted X-sutures group showed that burst abdomen was less frequent in all the studied categories i.e. age, gender, BMI, type of injury and duration of injury, compared to group A. Our findings regarding burst abdomen are in concordance with the study of Kumar et al[21]. They reported 8 cases of burst abdomen in the continuous suture group whereas only one burst abdomen in interrupted X-sutures group. The relative risk in interrupted X-sutures group for burst abdomen was 0.127. Similarly, another study by Srivastava et al[9] reported one burst abdomen (out of 46) in the X-sutures and 8 cases of burst abdomen (out of 54) in the continuous group. Agarwal et al[20] conducted a study and reported 5 cases of burst abdomen in X-suturing compared to 19 in continuous suturing groups, which indicates that interrupted suturing was related with significant reduction in risk of burst abdomen compared with continuous closure. Similar to our findings another study conducted at Rawalpindi (Pakistan) reported 01 (2.5%) case with burst abdomen operated in emergency for acute abdomen by using interrupted X-technique of closure and 4 (10%) burst abdomen cases using continuous technique, no statistical difference was observed among the two groups[22].

However, in the West, many randomized trials have reported equal wound complication rates following the use of interrupted or continuous monofilament fascial closure[23-25]. There are several factors such as cough, wound infection intraperitoneal sepsis and uremia which can increase burst. In such situations and condition we need to apply most effective suturing method to prevent burst.

CONCLUSION

Frequency of post-operative burst abdomen was low in patients undergoing interrupted X-suturing technique compared to continuous suturing technique for the closure of midline laparotomy wound. Therefore, interrupted X-suturing technique for midline laparotomy closure in emergency cases was found better than continuous closure technique.

RECOMMENDATIONS

We recommend that this technique of interrupted X-sutures should be practiced and adopted by our surgeons in emergency laparotomies so that complication of burst abdomen can be minimized.

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CONTRIBUTORS

AAK conceived the idea, planned the study and drafted the manuscript. NK, AQ, HJA and S helped acquisition of data, did statistical analysis and critically revised the manuscript. All authors contributed significantly to the submitted manuscript.