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Conventional Dressing versus Early Exposure of Wound after Major Abdominal Surgeries

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Abstract: The management of surgical wounds may be planned to leave the wound exposed, and there is no need for its covering. On the other hand, the management of surgical wounds still involves the use of dry dressings, such as conventional gauze. The study compares between conventional dressing versus early exposure of wound after major abdominal surgeries. Design: quasi-experimental research design was utilized. Setting: This study was conducted in general surgery departments at Mansoura University Hospital. Subject: Eighty two male and female adult patients under major abdominal surgeries divided into conventional group and early exposure group. Tools: Two tools were used; Interview Questionnaire Sheet, and Wound Observation and Follow up Sheet. Results: The present study revealed significant improvement of wound healing in early exposure group than conventional group. Conclusion: There were improvement of wound healing for patients with early exposure surgical wound than patients with conventional dressing after major abdominal surgeries and there were statistically significant correlation between average score of wound healing and characteristics of studied patients. Recommendations: Replication of the study on a large sample and in different hospital settings for generalization of results.
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1. Introduction

Surgical wounds are considered healthy wounds that result from an incision during surgery, which is a planned and expected event [1]. Laparotomy is a common procedure in United Kingdom, with approximately 30,000 to 50,000 performed annually [2]. Nurses are actively involved with the surgical patient during the perioperative and postoperative period in order to achieve wound healing [3]. The goals of surgical wound management are to enhance the healing process, restore function to the area and prevent surgical site infection [4].

After wound cleansing, a decision has made in relation to wound dressing. Following to careful assessment findings, the appropriate dressing materials are determined as well as dressing technique and then applied on the surgical wound [5]. On the otherwise, wound can be treated by leaving them to air. This method is not only helping in wound healing but also saves time in wound care and dressing change for surgeon and nurse and decreases the economic cost for patients [6].

Aim of the study:

The study aimed to compare between conventional dressing versus early exposure of wound after major abdominal surgeries.

Research hypothesis:

1- There will be an improvement of wound healing for patients with early exposure wound than patients with conventional dressing.

2- There will be statistically significant correlation between average score of wound healing and characterizes of studied patients.

2. Subjects and Method

Research design:

Quasi-experimental research design has been used to carry out this study.

Setting:

This study was conducted in the general surgical departments at Mansoura University Hospitals (MUH).

Subjects:

A Purposive sample of 82 patients was included from the previously mentioned settings through three months duration from the beginning of December 2018 to the end of February 2019. The total study sample was assigned to two equal groups; 41 patients in each group, conventional group (control) who receive a surgical routine care and wound dressing according to hospital policy and early exposure group (study) who receive surgical routine care according to hospital policy with early exposure of surgical wound.

Inclusion criteria:

Patients with major abdominal surgeries aged between 20 to 60 years, with closed surgical wound, from both genders and agreed to participate in the study.

Exclusion criteria:

Patients with chronic immunocomprised disease, laparoscopic, plastic surgery and tissue loss.

Tools of the Study:

The data of this study were collected using the following tools:

Tool I: An interviewing questionnaire sheet: was designed by the researcher after reviewing the relevant literature, this tool consisted of two parts:-

Part I: demographic data sheet which included code number, age, sex and duration of hospital stay.

Part II: Clinical data sheet which included pre, intra and postoperative clinical data:

Preoperative data which included smoking habits, surgical history, body mass index, laboratory investigations, surgical site preparation and prophylactic antibiotic.

Intraoperative data which included duration of surgery, wound closure technique, type of suture material for each abdominal wall layer and type of drain.

Postoperative data which included type of operation done, wound type, duration of antibiotic administration, and method of dressing (conventional or exposure).

Tool II: Wound Observation and Follow up Sheet: was adapted from [7] and modified by researcher after reviewing the related recent national and international literature include [10] [34] [38] in English form to assess wound healing and determine wound infection. This data was collected by the researcher in 3rd, 5th day of operation and day of suture removal.

Scoring system:

Each item in this tool given score. The total average score of wound healing ranged from zero to 24 degree, in case of satisfactory wound healing (total average score 5 or less) or disturbed wound healing (total average score more than 5).

Operational design:

Includes the preparatory phase, ethical consideration, validity and reliability, pilot study and fieldwork.

Preparatory phase:

Extensive review of the current national and international literatures related to the research title was done using textbooks, articles, and magazines. An informed consent was taken from the study sample before inclusion in the study.

Ethical consideration:

Ethical approval was taken from Ethical Committee of Faculty of Nursing. At the time of data collection, an agreement was taken from each participant after a clear and adequate explanation of the purpose of the study and its importance for them. All relevant ethical aspects were considered to ensure the privacy and confidentiality of the data collected during the study. Patients were emphasized voluntary participation and the right to refuse to participate in the study and to withdraw at any time.

Validity and Reliability

The tools were tested for content- related validity by a panel of five experts from nursing and medical field staff members - Mansoura University and necessary modifications were done accordingly.

Reliability was measured to evaluate whether all items on the study tools measure the same variable, and how well the used items fit together conceptually. The reliability of the study tools was tested by Cranach's Coefficient Alpha to measure the internal consistency of tool ($r = 0.814$) for tool II.

Pilot study:

The pilot study was conducted on 8 patients (10% of the sample size) fulfilling the research criteria to assess the clarity, feasibility, correctness and applicability of the study tools; time needed for answering the questionnaire sheets and the necessary modifications was done prior to data collection. Those patients were excluded from the main study.

Implementation phase:

During this phase, each patient of both groups was interviewed individually for four times. Firstly, the researcher makes an interview before operation for elective surgery and after operations for emergency surgery to collect demographic data, preoperative, intraoperative data and post-operative data. Secondly, the researcher began to make surgical wound assessment after dressing removed for the studied patients, to be in the third day of operation while the surgical wound of early exposure group was left uncovered and routine dressing for conventional group. Thirdly, the researcher started second assessment for the surgical wound in fifth day

of operation for the studied patients while the surgical wound of early exposure group was been left uncovered. Fourthly, the same wound observation and assessment occurred in day of suture removal.

When signs of wound infection were observed during hospitalization, wound culture was done to confirm sepsis and patients exit from the study. For patients who had their wounds exposed and developed wound sepsis, the wound was dressed conventionally to get out from following up. According to [8] local signs of wound sepsis are considered the only indicators of infection.

Evaluation phase:

It is the last phase that focuses on evaluating the surgical wound healing in studied groups.

Statistical analysis:

The data was entered and analyzed using IBM-SPSS Statistics for Windows, version 20.0 (SPSS, Chicago, IL). The given graphs were constructed using SPSS. Qualitative data was expressed as frequency and percentage. Quantitative continuous variables were presented as mean ± SD and student's t test was used to comparison two groups. The threshold of significance (P- value) is fixed at 5%.

3. Results

Table 1. Demographic characteristics of studied patients

This table shows distribution of the studied patients according to their demographic characteristics. In relation to age, their ages ranged from 20 to 60 years old with mean age (43.20 ± 9.05 - 42.88 ± 11.74) years of studied groups respectively. Moreover, more than half (51.2% - 53.7%) of patients in two groups were male respectively.

Table 1. Demographic characteristics of studied patients

Characteristics	Conventional group (41)		Exposure group (41)			Significance test
	No	%	No	%		
Age (years)						
20- 30- 40- 50-60 Mean± SD	3 12 15 11 43.20±9.05	7.3 29.3 36.6 26.8	7 11 9 14 42.88±11.74	17.1 26.8 22.0 34.1	$\chi^2 = 3.503$, T=0.137,	P0.320 P0.891
Sex						
Males Females	21 20	51.2 48.8	22 19	53.7 46.3	$\chi^2 = 0.049$,	P0.825

*Statistically not significant at p > 0.05 *X^2: chi- square test *t test: student's t test

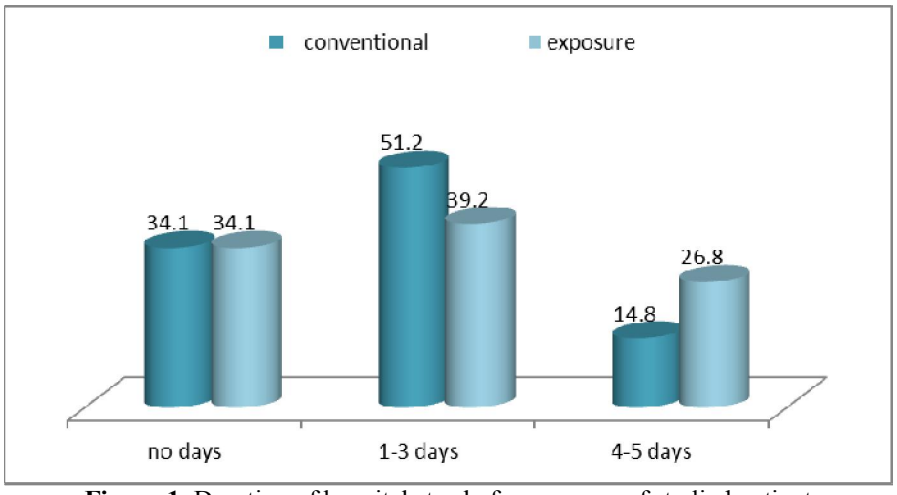

Figure 1. Duration of hospital stay before surgery of studied patient

This figure shows distribution of studied patients according to duration of hospital stay before surgery, ranged from 0 to 5 days. It is observed that, more than one third (34.1%) of patients in conventional group didn't stay in the hospital before surgery, while more than half (51.2%) stayed from (1-3) days in the hospital before surgery and 14.8% stayed from (4-5) days. These percentages were not

significantly differences in study group being (34.1%- 39.1%- 26.8%) respectively.

Table 2. Pre and intra operative data of studied patients

This table shows pre and intra- operative preparation of studied patients. Regarding to smoking habit, nearly to two third (61.0 %) of patients in control group and more than three quarters (75.6 %) of patients in study group were non-smokers. Besides, there were more than half (63.4% - 51.2%) of studied patients with no history of abdominal surgery respectively. Concerning body mass index, more than half (58.5% - 61%) of patients in two groups were obese respectively. while all studied patients take prophylactic antibiotic through last hour before surgery. Concerning to bathing, more than half (51.4% - 58.5%) of patients in two groups take shower before operation respectively. In relation to shaving, all patients had done shaving and more than half (58.5%) of them had done at night before surgery with no statistically significant differences between two groups in these items ($p > 0.05$). Regarding duration of surgery, there were (61.0% – 75.6%) of studied patients take more than two hours in duration of surgery respectively, with no statistically significant difference between the two groups ($p > 0.05$).

Table 2. Pre and intra operative data of studied patients

Variables	Control group (n= 41)		Study group (n= 41)			Significance test
	No	%	No	%		
Habits						
Smokers **Non smokers**	16 25	39.0 61.0	10 31	24.4 75.6	$\chi^2 = 2.027$,	P0.154
History of abdominal surgery						
Yes **No**	15 26	36.7 63.4	20 21	48.8 51.2	$\chi^2 = 1.251$,	P0.264
Body Mass Index (BMI)						
Normal **Overweight** **Obese**	3 14 24	7.3 34.1 58.5	7 9 25	17.1 22.0 61.0	$\chi^2 = 2.707$,	P0.258

Variables	Items	Conventional group (41)		Exposure group (41)			Significance test
		No	%	No	%		
Prophylactic antibiotics							
	Yes No	41 00	100.0 00.0	41 00	100.0 00.0		
Bathing							
	Done Not done	21 20	51.4 48.6	24 17	58.5 41.5	$\chi^2 = 2.121$	P0.145
Hair							
	Done Not done	41 0	100 00.0	41 0	100 00.0		
Time of shaving							
	At night On table	24 17	58.5 41.5	24 17	58.5 41.5		
Duration of surgery							
	≤ two hours >two hours	16 25	39.0 61.0	10 31	24.4 75.6	$\chi^2 = 2.027$	P0.154

Table 3. Post-operative surgical data of studied patients

This table illustrates post- operative surgical data of studied Patients. It is observed that more than half (65.7%) of studied patients with elective operation and more than half (51.2% - 56.1%) of them with clean wound respectively. Regarding type of drain, the majority (92.7% – 90.2%) of studied patients used nilaton drain respectively. According to duration of antibiotic intake, there were nearly to half of studied patients take antibiotic from 3-5 days and another half take from 7-10 days with no statistically significant differences between these items ($P0 > 0.05$).

Table 3. Post-operative surgical data of studied patients

Variables	Items	Conventional group (41)		Exposure group (41)			Significance test
		No	**%**	**No**	**%**		
type of operation							
	Elective	27	65.7	27	65.7		
	Emergency	14	34.1	14	34.1		
Type of wound							
	Clean	21	51.2	23	56.1		
	Clean & contaminated	13	31.7	10	24.4	$\chi^2 = 0.550$,	P0.760
	Contaminated	7	17.1	8	19.5		
Presence of drain							
	Yes	41	100.0	41	100.0		
	No	0	00.0	0	00.0		
Type of drain							
	Redivac	3	7.3	4	9.8	FET,	P1.00
	Nilaton	38	92.7	37	90.2		
Antibiotic intake							
	Yes	41	100.0	41	100.0		
	No	0	00.0	0	00.0		
Duration (days)							
	3-5	20	48.8	22	53.7		
	7-10	20	48.8	19	46.3	$\chi^2 = 1.121$,	MEP0.517
	11-14	1	2.4	0	0.00		

*Statistically not significant at p > 0.05 * X^2: chi- square test *FE test: Fisher exact test

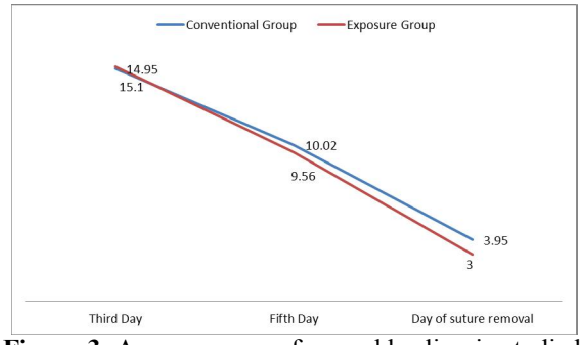

Figure 3. Average score of wound healing in studied groups on third day, fifth day and day of suture removal

This figure illustrate the average score of wound healing of studied groups in 3rd,5th and day of suture removal. It was observed there were improvement in average score of wound healing of studied groups with highly statistically significant difference between two groups at day of suture removal (P0.000)**.

Table 4 shows**.** Relation between average score of wound healing and characteristics of patients in conventional group on 3rd, 5th and day of suture removal.

This table shows the relation between average score of wound healing and characteristics of patients in conventional group at 3rd, 5th and day of suture removal. It appears that patients in age group from (20 - 40) years old were improved wound healing than patients in age group from (40 - 60) years old with statistically significance difference on day of suture removal at (P0.002)*. In relation to smoking habit, average score of wound healing improved in non- smokers' patients than smokers' patients in 3rd, 5th and day of suture removal.

Additionally, patients with normal weight were improved wound healing than overweight and obese patients in 3rd, 5th and day of suture removal. Moreover, wound healing improved in elective operations than in emergency operations with statistically significant differences on 3rd and 5th day at (P0.047 - P0.025)* respectively. Finally, average score of wound healing improved in clean wound than in clean contaminated and contaminated wound with highly statistically significant difference in 3rd day at (P0.001)** and statistically significant difference on 5th day at (P0.005)*.

Table 4. Relation between average score of wound healing and characteristics of patients in conventional group at 3rd, 5th and day of suture removal

Characters	Items	No		Third day		Fifth day		Suture removal day
				Mean ± SD		**Mean ± SD**		**Mean ± SD**
Age (years)								
	20-	3		13.00 ± 1.73		8.67 ± 0.58		3.50 ± 1.00
	30-	12		15.50 ± 2.02		8.83 ± 2.08		3.87 ± 0.80
	40-	15		15.53 ± 3.23		10.67 ± 3.09		4.00 ± 0.35
	50-60	11		15.73 ± 1.74		10.81 ± 1.94		4.54 ± 0.69
Significance test								
			F = 2.010,	P0.129	F = 2.006,	P0.130	F = 5.902,	P0.002*
Smoking habit								
	Smokers	16		15.44 ± 1.96		10.75 ± 2.49		4.19 ± 0.75
	Non smokers	25		14.64 ± 2.02		9.56 ± 2.48		3.80 ± 0.65
Significance test								
			t = 0.969,	P0.338	t = 1.495,	P0.143	t = 1.760,	P0.086
BMI								
	Normal	3		14.67 ± 1.53		9.33 ± 2.08		3.67 ± 0.58
	Overweight	14		15.43 ± 2.24		9.93 ± 2.79		3.93 ± 0.62
	Obese	24		15.58 ± 2.84		11.92 ± 2.46		4.88 ± 0.74
Significance test								
			F = 0.592,	P0.538	F = 0.423,	P0.658	F = 1.754,	P0.187
Type of operation								
	Elective	27		14.29 ± 2.56		9.29 ± 1.99		3.96 ± 0.75
	Emergency	14		15.88 ± 2.34		11.06 ± 2.88		3.94 ± 0.66
Significance test								
			t = 2.028,	P0.047*	t = 2.327,	P0.025*	t = 0.076,	P0.940
Type of wound								
	Clean	21		13.72 ± 2.55		9.20 ± 1.82		3.75 ± 0.72
	Clean & cont	13		15.34 ± 1.78		9.86 ± 2.58		4.14 ± 0.77
	Contaminated	7		17.01 ± 1.32		12.31 ± 3.08		4.520± 0.44
Significance test								
			F = 7.050,	P0.001**	F = 5.001,	P0.005*	F = 2.106,	P0.159

*Statistically not significant at p > 0.05 *statistically significant at p < 0.05* * Statistically highly significant at p < 0.001***t test: student's t test*FE test: Fisher exact test

Table 5. Relation between average score of wound healing and characteristics of patients in exposure group at 3rd, 5th and day of suture removal

This table represents relation between average score of wound healing and characteristics of patients in exposure group at 3rd, 5th and in day of suture removal. It is obvious that patients in age group from (20 – 40) years old improved wound healing than age group (40 – 60) with statistically significant differences at 5th day at (P0.054)*. Additionally, wound healing was improved in non-smokers' than smokers' patients with statistically significant differences in 3rd day at (P0.026)*. Moreover, wound healing improved in normal weight patients than in overweight and obese patients with statistically significant differences on 5th day (P0.002)*.

In relation to type of operation, wound healing improved in elective operations than in emergency operations on 3rd, 5th and day of suture removal. Also, wound healing improved in clean wound than in clean contaminated and contaminated wound with statistically significant difference on 3rd day at (P0.002)*, day of suture removal at (P0.024)*and highly statistically significant difference on 5th day (P0.000)**

Table 5. Relation between average score of wound healing and characteristics of patients in exposure group at 3rd, 5th and day of suture removal

Characters	Items	No	Third day		Fifth day		Suture removal day (36)	
				Mean ± SD		**Mean ± SD**	**No**	**Mean ± SD**
Age (years)								
	20-	7		14.43 ± 3.26		7.57 ± 4.61	6	2.67 ± 0.87
	30-	11		14.63 ± 2.25		9.27 ± 1.85	11	2.82 ± 0.75
	40-	9		15.50 ± 2.69		10.57 ± 1.16	9	3.11 ± 1.05
	50-60	14		15.56 ± 1.61		10.71 ± 2.92	13	3.23 ± 0.73
Significance test								
			F = 0.576,	P0.634	F = 2.891,	P0.054*	F = 0.885,	P0.458
Smoking habit								
	Smokers	10		16.50 ± 1.51		11.00 ± 2.75	10	3.10 ± 0.58
	Non smokers	31		14.64 ± 2.37		9.10 ± 3.46	29	2.96 ± 0.91
Significance test								
			t = 2.313,	P0.026*	t = 1.582,	P0.122	t = 0.439,	P0.663
BMI								
	Normal	7		15.00 ± 2.94		8.29 ± 4.27	5	2.89 ± 1.30
	Overweight	9		16.11 ± 1.96		11.22 ± 3.03	9	3.00 ± 0.60
	Obese	25		16.76 ± 2.24		12.20 ± 2.48	25	3.20 ± 0.81
Significance test								
			F = 1.136,	P0.332	F = 7.067,	P0.002*	F = 0.218,	P0.805
Type of operation								
	Elective	27		14.88 ± 2.85		9.04 ± 2.82	24	2.96 ± 0.69
	Emergency	14		15.25 ± 1.92		10.29 ± 3.99	15	3.07 ± 1.03
Significance test								
			t = 0.495,	P0.624	t = 1.178,	P0.246	t = 0.393,	P0.696
Type of wound								
	Clean	23		14.17 ± 2.25		7.91 ± 2.48	23	2.74 ± 0.75
	Clean & cont	10		15.50 ± 1.93		10.50 ± 1.41	9	3.00 ± 0.24
	Contaminated	8		16.97 ± 1.87		12.11 ± 2.67	7	3.75± 0.92
Significance test								
			F = 5.967,	P0.002*	F = 11.786,	P0.000**	F = 3.550,	P0.024*

*Statistically not significant at p > 0.05 *statistically significant at p < 0.05*
* Statistically highly significant at p < 0.001** *t test: student's t test
*FE test: Fisher exact test

4. Discussion

In relation to age, the findings revealed that more than half of studied patients ranged between 40 and < 60 years old with mean age (43.20 ± 9.05) and (42.88 ± 11.74) years in study groups respectively. This may be due to risk for acute abdominal diseases as appendicitis and cancer colon increase by age. This study result come in agreement with [9] who reported that the mean age of patients in their study were 43.6 years and [10] mentioned that the mean age of patients in their study were 43.3 years. However, this result disagrees with [11] who found that the age of patients undergoing major abdominal surgery in their sample more than 60 years old.

In the present study, men were more than half of the studied patients. This finding agrees with the results of [12] [13] reported that more than half of the studied patients were male. Moreover, contradicting this result the study conducted by [9] who reported that the majority of the studied patients were female. In addition, [14] stated that the ratio of men and women in each group were comparable. This difference may be due to variation in the study setting.

Concerning the duration of stay in hospital before surgery, the study result revealed that more than half of patients in conventional group and more than one third of patients in early exposure group stayed from 1 to 3 days in hospital before surgery for surgical preparation. This finding agrees with the result of [15] who emphasized that pre-operative admission time was less than 48 hours before surgery. This result also comes consistent with [10] who mentioned that the average stays in hospital before surgery from 1 to 5days. In addition, [16] who reported that the average duration of pre-operative hospital stay 4.31 days in their study.

By looking at smoking, in the current study nearly two third of the studied patients were a non-smoker. It is positive element in improving surgical

wound healing and it is related to nearly to half of studied patients were females. This was congruent with the study of [27] that summarized that nearly to three quarter of their participants were a nonsmoker in them study. Conversely, the study of [16] summarized that more than half of the studied patients were smokers.

According to history of abdominal surgery, the present study illustrate that more than half of the studied patients hadn't a previous history of abdominal surgery. This result is agree with [17] who mentioned that more than three quarters of studied sample with no a previous history of abdominal surgery.

Related to body mass index, more than half of the studied patients in the present study were obese. It is age's disease and related to sedentary life style. This is in harmony with [36] whose results reveled that half of the studied patients were obese. In contrast, [23] whose study showed that less than half of studied patients were obese and [27] who stated that 11% of their study was obese.

Moreover, the current study showed that all studied patients take prophylactic antibiotic before surgery while patients requiring surgery need preoperative prophylactic antibiotics. This finding agrees with the results of [17] which indicated that more than three quarters of participants take preoperative prophylactic antibiotics. Also, [18] reported that all studied patients administered of antimicrobial prophylaxis witch play a significant role in the prevention of all SSIs in their study. This coincided with [19] who revealed that all studied patients administered prophylactic antibiotic in his study. Moreover, [20] supported also these results in their study.

As regard to pre- operative shower of studied patients, the result of the present study showed that more than half of the studied patients' taken shower before operation with a disinfecting soap. This result is in accordance with [21] who reported that all studied patients take shower before surgery with soap. In addition, [16] whose study concise that more than half of the studied patients take preoperative showers with a disinfecting soap, this decreased the cutaneous bacterial load.

In the present study, more than half of studied patients were shaved site of operation at night before surgery. This finding is supported by [16] who reported that the three quarters of the cases were shaved at 12 hours before the operation. Conversely, this result is in disagreement with a previous study conducted in Oman by [22] mentioned that when it is necessary to remove hair pre-operatively, it should be removed immediately before surgery, and preferably by clipper or depilation cream. Avoid using a razor pre-operatively in order to reduce SSIs.

According to duration of surgery, the results of this study appeared that more than half of conventional group and more than three quarters of exposure group taken more than two hours in duration of surgery. This result may be due to complexity of operations. This result consistent with [23] said that more than three quarter of studied patients take more than two hours in surgery duration. Also, [9] reported that the mean operative time was 145.2 minutes. As well as, [24] mentioned that mean of operation duration was 130.47±50.48 in them study. On the other hand, the finding comes in contrast with the study done by [25] which indicated that nearly to three quarter of studied patients take less than two hours in duration of surgery.

As regard to type of operation, the results of the present study showed that more than half of studied patients with elective operation. This result is in accordance with [13] who mentioned that there were nearly to three quarter of elective operations in his study. In contrast, [25] who represent that nearly to three quarter of studied patients had done emergency operations.

By looking to type of wound, there were more than half of the studied patients in the current study with clean wound. This result accordance with [14] reported that nearly total patients with clean surgical wounds into their study. But on the contrary, the study had carried by [26] who clarified that half of the studied patients with clean contaminated wound. And, [25] documented that nearly half of the studied patients with contaminated wound.

All studied patients in the current study administered antibiotics after surgery and half of them administered from three to five days. It is due to patients who require surgery need antibiotics. This result is in accordance with [17] concluded that more than three quarter of patients in their study take antibiotics after surgery. Also, the study conducted by [27] summarized that nearly to half of studied cases continued intake antibiotics postoperatively till 5 days that contaminated and dirty cases.

Regarding days of wound observation follow up to assess wound healing and clinical signs of infection, the present study followed wounds of studied patients in 3rd, 5th and day of suture removal. Usually all wound infections happen on day 5 after surgery, and it's safe to suspect a staph infection due to the commonality of it. Of the rarer types of infections, Group A strep is seen on day 2 and clostridium usually is seen on day 3 [28]. This study is supported by [14] who mentioned that wounds were assessed after 6 and 24 hours, and on the third

and fifth postoperative days for clinical signs of infection and dehiscence.

Concerning to clinical signs of infection through three times of wound observation, the incidence of edema in wound and surrounded area was more than three quarter of studied patients on fifth day with statistically significant between two groups. This result agree with [29] [30] clarified that the hemostasis and inflammatory phase take about five days after incision and signs of inflammation that occur are response to an injury as erythema, edema, pain, heat and decrease function.

As regard to rate of infection, the present study showed that rate of infection in exposure group 12.2% while there were five patients with surgical wound infected at fifth day and in conventional group 7.3% while there were three patients with surgical wound infected at fifth day. This finding supported with the result of [31] who reported that the infection rate is lowered to 11% in exposure technique that keeps the wound dry to form a crust. Moreover, it reduces the discomfort of wound dressings and allows easy wound inspection than occlusive dressing 20% after abdominal surgeries.

In relation to duration of staying in inpatient units, the study results showed that more than two third of studied patients still in hospital from 1 to 2 weeks that may be due to complexity of operations that lasting more than two hours and need long time in wound healing. This finding supported with the result of [32] which indicated that more than half of their studied sample stayed in hospital from 10 – 15 days in their study. Also, this result comes in agreement with [9] who demonstrate that the median postoperative hospital stay was 2 days for patients without SSI, compared to 13 days for those with SSI.

Concerning the average score of wound healing in 3rd, 5th and day of suture removal, the present study revealed that rate of healing was better in exposure group than conventional group with statistically significance in day of suture removal. It is in the same line with [33] who reported that no evidence to suggest that any dressing significantly reduced the risk of developing a surgical site infection as compared to leaving the wounds exposed or using alternative dressings.

In this regard, the results of [34] who in the line with the current study, as they concluded that there were no statistically significant differences between the early dressing removal group through 48h and delayed dressing removal group after 48h in the proportion of people who developed superficial surgical site infection within 30 days. In the same direction, the results of the current study correspond with another study in Japan by [35] who finding that the incidence of wound infection is higher in gauze dressing and more expensive cost than occlusive hydrocolloid dressing after abdominal surgeries. Moreover, this result is consistent with [7] who represent that the incidence of surgical site infection was observed in the conventional group than in the exposure group, although the difference was not statistically significant.

The present study showed that patients in the age group (20- 40) years old were improved surgical wound healing than in age group from (41 >60) years old in studied groups with statistically significance on day of suture removal in conventional group and on 5th day in exposure group. Infection rate increased in old age due to reduced host defense related to low immunological and nutritional status. These results agree with [12] who reported that the mean age of incidence of wound infection is 45 years and wound infection is more in elderly > 60 years. Also, [26] [10] mentioned that the SSI rate increased with increasing age linearly.

Concerning to relation between average score of wound healing and smoking habits, the present study showed, there were improvement in wound healing in non- smokers' than smokers' patient in studied groups with statistically significance on third day of exposure group. Smoking decreases oxygen delivery as a result of arterial spasm which delayed wound healing. This result is in accordance with [12] [27] who reported that the incidence of wound infection is more in smokers than nonsmokers with statistically significance. And, [16] who found that among factor that delay wound healing and increase the infection rate is cigarette smoking, which increases the postoperative infection rate 5-fold.

For the relation between average score of wound healing and body mass index, the current study revealed that there was improvement in wound healing with normal body weight than obesity in studied groups with statistically significant in fifth day of exposure group. This result in the same line with [12] reported that the incidence rate of wound infection in obesity patients were more than in non-obesity with statistically significance. Moreover, the results of this study were found consistent with the findings of [36] who mentioned that the wound complications are significantly associated with obesity patients more than non-obesity patients who undergoing abdominal surgery. Also, [37] stated that morbidly obese patients were more likely to develop SSIs than normal weight patients.

Moreover, the relation between average score of wound healing and type of operation, the present study revealed that the wound healing was improved in elective operations than emergency operations in studied groups with statistically significant in third and fifth day in conventional group. It is in the same

line with [9] reported that in emergency surgery was increased the risk of SSI fivefold compared to elective surgery. In addition, the study conducted by [27] who revealed that development of superficial SSI in emergency surgery cases was significantly higher than elective surgery. Taken together, the results correspond with the finding of the study conducted by [26] who confirmed that the risk of SSI to be less in elective surgeries than the emergency surgeries with statistically significant. Moreover, [10] observed that the incidence of infection was higher in emergency than elective surgeries.

As regard to relation between average score of wound healing and type of wound, the present study show there was improvement in wound healing in clean wound than clean contaminated and contaminated wound in studied groups with statistically significant in third, fifth day in conventional group and in all days in exposure group. This result is in agreement with [12] who reported that the incidence of wound infection in contaminated wound is more than in clean contaminated and clean wound. In addition, [26] supported also this result. Also, [10] stated that the incidence of SSI was minimum in clean wounds followed by clean contaminated, contaminated and maximum in dirty wounds.

Conclusion

Based on the finding of this research, there were improvement of wound healing for patients with early exposure surgical wound than patients with conventional dressing after major abdominal surgeries and there were statistically significant correlation between average score of wound healing and characteristics of studied patients.

Recommendations

Replication of the study on a large sample and in different hospital settings for generalization of results.

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