SKIN CLOSURE IN LAPAROTOMY; DELAYED VERSUS PRIMARY CLOSURE PERFORMED FOR GENERALIZED PERITONITIS

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ABSTRACT: Objectives: The aim of this study was to record the outcome of healing in laparotomy wounds, managed by delayed versus primary skin closure in terms of hospital stay, major and minor wound infection. **Design and Duration:** Quasi experimental study from September, 2006 to March, 2007. **Setting:** Surgical floor of Allied Hospital, (Punjab Medical College) Faisalabad. **Methodology:** Detailed data of each patient including presentation, operative findings, procedure performed, post operative outcome was entered on a specially designed proforma. The main outcome measures found significant were major and minor wound infection, time of presentation and advancing age and hospital stay. **Results:** Sixty patients underwent exploratory laparotomy through vertical abdominal incision during Sep.2006 to Mar.2007. Skin wound of the first thirty patients (group A) were left open and closed on 4th day while that of next thirty patients (group B) closed primarily. Out of sixty patients ten patients developed major wound infection leading to wound dehiscence (16.66 %). Four belonged to group A(13.33%) and six belonged to group B(20 %) ($p<0.05$). In advancing age the infection rate was significantly high in the same group ($p <0.01$). Regarding hospital stay of patients of two groups the difference was statistically significant. Group A (mean=7.77, std. dev=2.029 and std. error of mean=0.370). Group B (mean=10.30, std. dev=4.822 and std. error of mean=0.880). Regarding age the difference was not statistically significant between two groups. Group A (mean 30.47, std. dev=10.099 and std error of mean=1.844). The data was analyzed using SPSS 17 Chi-square test was used to test the significance between qualitative variable, $p<0.05$ was considered significance. **Conclusions:** No matter how advanced new wound closure techniques are, wound infection is the single most important factor for wound dehiscence and it can be decreased by using delayed skin closure technique and meticulous post-operative monitoring and care.

Key words: Wound dehiscence, Infection, Delayed closure.

INTRODUCTION

Generalized peritonitis is easy to diagnose, but causes are legion. Up to a point identifying the precise cause is irrelevant, because a laparotomy is mandatory[1]. Disruption of abdominal surgical wounds is one of the common causes of early re-laparotomy. Abdominal wound failure is defined as failure of the incision to heal and to maintain a normal abdominal wall anatomy. It can be divided into acute and chronic. Wound dehiscence is an acute wound failure. It has an incidence of 2 percent and an associated mortality of 25 percent[2]. It ranges from superficial breakdown of skin with intact deeper musculo-aponeurotic layers to a complete failure of wound and an exposure of viscera i.e. burst abdomen[3]. Closure of abdominal wounds passes through various stages of closure in layers to single layer closure. There is evidence that in many cases, wound failure after abdominal wall closure is dependent on the surgeon[4]. Lord Monihyne rightly said "never judge a surgeon unless you see how he closes abdomen"[5]. There are certain factors responsible for the burst abdomens, which are beyond one's control. Many such factors like anemia, jaundice, uremia, diabetes, hypoalbuminemia, chronic obstructive pulmonary disease, advanced malignancy, steroid use, obesity, wound infection and emergency surgery have been defined[6,7]. Wound infection is the most important single factor in the development of burst abdomen and incisional hernia[8]. The optimal technique for closing a midline incision is a mass closure with a non-absorbable or slowly absorbable mono-filament suture using a suture length: wound length ration of4:1[9,10]. To highlight the importance and precisely learn this idea, we started a quasi-experimental study in September 2006 according to a protocol. In March 2007 after six months we had completed the first phase of the study. This study had helped us to define the better management policy for dirty abdominal wounds and we had come up with better solution of the problem. This will certainly reduce the incidence of major wound infection leading to abdominal

wound dehiscence so that associated mortality and morbidity in the form of prolonged hospital stay, increased economic burden on the health care resources can be reduced.

MATERIALS AND METHODS

Sixty patients fulfilling the inclusion criteria admitted through emergency were taken. Diagnosed cases of peritonitis between twenty and fifty years of age belonging to either sex group presenting in emergency department of Allied Hospital, Faisalabad were included in study. All patients with iatrogenic perforations and spillage localized peritonitis, patients above fifty and below twenty years of age or patients with co morbid factors like jaundice, ischemic heart disease, diabetes and immunosupperession were excluded from study. Diagnostic criteria were: On history, pain abdomen worse on movement. On examination, tachycardia, guarding, rigidity of abdominal wall, absent or reduced bowl sounds. On investigations raised total leukocyte count, free air under diaphragm and free fluid in peritoneal cavity. Demographic variables like age, sex and socioeconomic status were recorded along with history and clinical examination. All patients were explained about risks and benefits of procedure and written informed consent was taken. They were kept nothing by mouth and resuscitation was done with Ringer lactate and blood transfusion were needed until adequate urine output (0.5 ml/kg/hr) was obtained. Patients were divided into two groups by non probability purposive sampling technique. First thirty patients were sampled for delayed skin closure and given the name group A. Next thirty patients were sampled for primary skin closure and named group B. After resuscitation and giving prophylactic antibiotics patients underwent exploratory laparotomy through midline incision. The obvious sources of contamination were dealt with accordingly. Closure of linea alba was done by mass closure technique using no.1 monofilament polypropylene suture. Skin wound of patients included in group A was closed on fourth post-operative day by delayed closure technique while that of group B by primary skin closure technique. Patients in both groups were evaluated for hospital stay, major and minor wound infection on basis of history, examination and investigations and findings were recorded on the proforma.

Patients were followed up to 15th post-operative day which was the end point of study.

RESULTS

Sixty patients underwent exploratory laparotomy through vertical abdominal incision during Sep.2006 to Mar.2007. Out of sixty patients ten patients developed major wound infection leading to wound dehiscence (16.66 %). Four belonged to group A(13.33%) and six belonged to group B(20 %) ($p < 0.05$). General wound condition of patients from both groups is depicted in Table I.

Table-I. Post-operative Wound Condition, n=60

Patient Groups	Wound Infection	No. of Patients	%age
Group A	Minor wound infection	13	21.67
	Major wound infection	04	6.67
Group B	Minor wound infection	15	25
	Major wound infection	06	10

Among these ten patients five were belonging to subgroup of typhoid, tuberculosis and appendicular perforation ($p < 0.005$). Three came out of firearm, stab abdomen and blunt trauma abdomen, subgroup ($p<0.01$). Two resulted from duodenal and gastric perforations. 28 patients developed minor wound infection (46.66%), most of them were typhoid and tuberculous gut perforations ($p<0.05$). Among these 28 patients 13 were from group A (43.33%) and 15 from group B(50 %) ($p < 0.05$).

According to time of presentation, patients with early presentation from peritonitis and delayed presentation are compared on the basis of post-operative wound condition in Table-II A and II-B.

Table-III A and 3B shows the outcome of patients according to different age groups and clearly depicts that advancing age has poor outcome regarding wound infection in both the groups.

Regarding hospital stay of patients of two groups the difference was statistically significant. Group A (mean=7.77, std. dev=2.029 and std. error of

Table-II A. Early presentation and post-operative wound condition.

Group A: Delayed closure (15)			Group B: Primary closure (16)		
Post-op wound	**No. of cases**	**%age**	**Post-op wound**	**No. of cases**	**%age**
Major wound infection	02	13.33%	Major wound infection	02	12.5%
Minor wound infection	04	26.66%	Minor wound infection	07	43.75%

Table-II B. Late Presentation and Post-operative Wound Condition.

Group A: Delayed closure (15)			Group B: Primary closure (14)		
Post-op wound	**No. of cases**	**%age**	**Post-op wound**	**No. of cases**	**%age**
Major wound infection	02	13.33%	Major wound infection	04	36.36%
Minor wound infection	09	53.33%	Minor wound infection	08	45.45%

p=0.408
p value >0.05

Table-III A: Group A (Delayed Closure) Wound Infection According to Various Age Groups

Age group	No. of cases (n)	Major wound infection		Minor wound infection	
		No. of cases	**%age**	**No. of cases**	**%age**
20-30 years	19	01	5.26	07	36.84
31-40 years	03	01	33.33	01	33.33
41-50 years	08	02	25	05	62.5
Total	30	04	-	13	-

Table-III B: Group B (Primary Closure) Wound Infection According to Various Age Groups

Age group	No. of cases (n)	Major wound infection		Minor wound infection	
		No. of cases	**%age**	**No. of cases**	**%age**
20-30 years	16	01	6.25	07	31.5
31-40 years	06	02	33.33	03	50
41-50 years	08	03	37.5	05	62.5
Total	30	06	-	15	-

mean=0.370). Group B (mean=10.30, std. dev=4.822 and std. error of mean=0.880).

DISCUSSION

The discussion on abdominal wound dehiscence is as old as the history of modern operative surgery. Surgeons have always been keen in finding the factors leading to this disaster. The clinical study of wound healing is complicated considerably by the fact that it is uncommon for any factor to exist in isolation and it may be difficult, indeed, to determine which factor is of greatest importance in a particular case[11]. Intrinsic strength of the

wound is zero at first postoperative day and increases gradually with the passage of time. The support of sutures must be maintained for sufficient time so that normal functional and structural continuity is restored[12]. If the support system fails before the functional and structural integrity is regained then the wound edges break apart. In recent years there has been considerable drop in the incidence of burst abdomen in many reports, a result of spread in popularity of mass closure technique usually combined with the use of non absorbable suture material and with closely placed, wide bites of abdominal wall[13]. The reported incidence of wound dehiscence varies from 0.2% to 3% of abdominal wounds[14].

Local literature reveals quite high incidence in the range of 3% to 8%[15] The incidence in our study (16.66%) raises many questions as maximum effort was made to use the technique and suture material as described with the lowest incidence[16,17]. Probably the reason behind this is all our patients were operated in emergency theatre. Various studies have described emergency surgery as risk factor wound dehiscence[18], Probably considering closure of the wound by inexperienced surgeons in a hurry as the cause. Risk of wound infection increases with advancing age which is shown in our study regardless of which technique was chosen for abdominal closure. Same results were depicted in a local study[19] and an international study[20] as well. Regarding the post operative hospital stay, although most surgeons have their own estimate, nowhere in the literature is this convincingly substantiated. Cruse, in following 40,662 consecutive operations prospectively, claimed that a post operative wound infection added 9.1 days to his patients' stay and estimated that this resulted in an added hospital expense of $910. No mention was made of how the figures were obtained[21]. Similar results were shown in our study with more detailed analysis of patients from Group A (Delayed Closure) and Group B (Primary Closure) showing that increased hospital stay was noted in patients with primary closure done initially. One limitation of the study was the difficulty in analyzing the use of antibiotics, because antibiotics were used not only for serious underlying intra-abdominal infections, where the duration and type of antibiotics in part depended on the clinical response in each patient, but also for a variety of concomitant indications (e.g., pneumonia, line sepsis).

CONCLUSIONS

Although the incidence of abdominal wound infection and dehiscence have markedly reduced over the years but the condition has not been eliminated from the list of complications of abdominal surgery. Prevention is the best way of managing the condition. Major wound infection is the single most important factor for wound dehiscence, whereas, delayed presentation of intra abdominal catastrophe and established peritonitis are major contributors to major wound infection. A strategy of delayed primary closure of dirty abdominal wounds, when clinically appropriate, appears to decrease the incidence of wound infection without increasing the length of hospital stay.

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