Original Article

Delayed Primary Wound Closure versus Primary Wound Closure - A Dilemma in Contaminated Abdominal Surgeries

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ABSTRACT

INTRODUCTION: **Majority of emergency surgeries are performed through midline laparotomy wound; however when it comes to the closure of midline wound surgeons deploy various options. Technique of Primary closure of the wound is simple and cost effective as no other procedure is required. However, some surgeons favor technique of delayed primary closure because of decreased frequency of wound infection.**

OBJECTIVE: **The purpose of our study was comparison of primary wound closure technique and delayed primary wound closure techniques with respect to rate of wound infection and other complication associated with wound infection like wound dehiscence, stitch sinuses, incisional hernias.**

PATIENT AND METHOD: **This comparative study carried out among fifty patients who underwent midline exploratory laparotomy for perforated abdominal viscera in Surgical Unit I of Civil hospital Karachi. Patients were divided into two groups. The sample size was calculated using significance level of 0.05 and power of 80% for difference in wound infection rates in the two groups. All patients of both genders; in each group; who underwent emergency laparotomy having identical pathologies were taken in account. Patients with co-morbid were excluded. In the study group (Group A), primary closure technique was used and in group B, delayed primary closure was utilized. All patients were followed for post-operative wound complications.**

RESULTS: **In our study male to female ratio was 2:1 and the mean age was 33±10 years. Wound healed normally with no signs of infection in 23(46%) out of 50 patients. The overall infection rate was considerably low in delayed closure group (40%) when compared to the primary closure group which was 68% ($p<0.05$). There was significant decrease in other complication related to wound infection like stitch abscess formation and wound dehiscence in delayed closure group ($p- < 0.05$).**

CONCLUSION: **Our results demonstrate that the delayed primary closure technique is a better technique with low frequency of wound infection and other related complications when compared with primary wound closure technique.**

KEY WORDS: **Contaminated abdominal surgery, wound closure, wound complications, wound infection.**

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INTRODUCTION

The commonest complication encountered post-operatively is wound infection despite the use of prophylactic antibiotics and following meticulous surgical techniques. The rate of surgical site infection is higher in case of contaminated surgeries as compared to elective surgeries. Surgical site infection (SSI) and its associated complications like wound dehiscence, stitch sinuses, incisional hernias, hypertrophic scar and keloid formation are not only a source of discomfort for the patients but also discouraging for the surgeons[1-3]. These complications prolong the post-operative stay of patient and increase the cost of treatment[4,5].

In order to control and reduce the rate of SSI various wound closure techniques and prophylactic measures have been tried by the surgeons but had vague results.[6-8]

Primary closure of wound is the commonly practiced method in which skin is closed after wound irrigation at the end of the procedure[9-11]. However, some surgeons prefer delayed primary closure (DPC) technique, which includes irrigation of the contaminated wound followed by closure of the deeper layers of wound and applying loose mattress sutures to skin with prolene. Wound is closed after three to five days of daily dressing with bactericidal solution.

Primary closure technique of wound closure is simple

as wound is closed primarily and no other procedure is required and is widely practiced.[6-8] Delayed primary closure is recommended by others as it is thought to be associated with lower frequency of wound infection and its associated complications thus reducing hospital stay and cost of the treatment.[12,13] Regular dressings in DPC decrease the load of anaerobes at wound site but increase the exposure to staphylococci[14.] Hence there is a disagreement among surgeons regarding the preferred technique for wound closure after contaminated surgeries[9-11]. The randomized controlled trials conducted on technique of wound closure in contaminated surgeries , showed variable results. Few are in favor of delayed primary closure while others have advocated the technique of primary closure of wound after irrigation.

The purpose of our study was comparison of primary wound closure technique and delayed primary wound closure techniques in relation to rate of wound infection and other complication associated with wound infection.

MATERIAL AND METHOD

This comparative study was conducted in the department of surgery unit I, civil hospital Karachi, from August 2013 to September 2014. 50 patients who were above 18 years of age, admitted in our surgical unit through emergency department, and underwent exploratory laparotomy for perforated viscera and intra-abdominal collection were included in this study. Patients with previous laparotomy, patients with past history of intra-abdominal collection, abdominal surgery for any other reason, and patients on steroids were excluded from study. Equal number of patients with the diagnosis of perforated appendix, ileal perforation, duodenal perforation and traumatic visceral were allotted to two groups. In the study group (Group A), primary closure technique was used and in group B, delayed primary closure was utilized. During surgery pus and abdominal secretions were taken for culture and sensitivity. Abdominal cavity was irrigated with 6 to 8 liters of normal saline.

In group A, primary closure of musculo-peritoneal layer was done and closed with prolene. Fascia was closed with prolene and skin was closed with interrupted prolene sutures. The wound was examined 48 hours post-operatively, followed by dressing. The stitches were removed on 8th day. However, In group B of delayed primary closure, after closure of musculoperitoneal layers, the fascia and skin were sutured with loose prolene stitches and packed with povidone-iodine soaked gauze piece. The wound was dressed daily for 3 to 5 days followed by tightening of the suture. The stitches were removed on 12th postoperative period. Empirically patients of both groups were given third generation cephalosporin and metronidazole, these were changed accordingly depending upon the result of culture and sensitivity and continued for at least 10 days. All patients were followed for early post-operative complications like wound infection and late complications like wound dehiscence, stitch abscess, stitch sinus, keloid or hypertrophic scar and incisional hernia over the period of six months after the surgery.

Data related to causes of perforation and complications of contaminated surgery were collected in pre-formed pro forma.

Data was entered in SPSS version 18 and frequencies, ratio, percentages were drawn for descriptive variables and chi- square with p value <0.5 has been calculated to see the significance difference between two groups.

RESULTS

Mean age was 33±10 years with a male to female ratio of 2:1. Both groups have 25 patients each with 8 (32%) cases of perforated appendicitis, similar number with traumatic abdominal injuries, and rest with intestinal perforation. (Table I)

In group A 17(68%) patients had wound infection and 10 (40%) had wound infection in group B. The distribution of wound infection in each respective subgroup with p-value is shown in Table II.

There was significant difference in stitch abscess formation and wound dehiscence between two groups (p value< 0.05) i.e. 7(28%) patients of group A, developed stitch abscess while 6 patients developed wound dehiscence. However, no patient in group B developed stitch abscess and wound dehiscence. 1(4%) patients developed keloid in group A, while it was none in any patients of group B. The difference infrequency of incisional hernia, was statistically insignificant between both groups. (Table III)

TABLE I: CAUSES OF PERFORATION

Cause of Peritonitis	Group A	Group B	Total
Perforated appendicitis	8	8	16
Traumatic perforation	8	8	16
Ileal perforation	5	5	10
Duodenal perforation	4	4	08
Total	**25**	**25**	**50**

TABLE II: WOUND INFECTION

Cause of Perforation	Wound Infection		Total n(%)	P-Value
	Group A n(%)	Group B n(%)		
Perforated appendicitis	5(62.5%)	4(50%)	9(56%)	0.573
Traumatic perforation	5(62.5%)	3(37.5%)	8(50%)	0.974
Ileal perforation	4(80%)	2(40%)	6(60%)	0.831
Duodenal perforation	3(75%)	1(25%)	4(50%)	0.589
Total	**17(68%)**	**10(40%)**	**27(54%)**	

TABLE III: POST INFECTIVE COMPLICATIONS

Complications	Group A	Group B	Total	P-Value
Stitch Abscess	07(28%)	none	07(14%)	0.018*
Stitch sinus	none	None	none	-
Keloid / hypertrophic scar	01(4%)	none	01(2%)	0.434
Wound dehiscence	06(24%)	none	06(12%)	0.033*
Incisional hernia	05(25%)	02(8%)	07(14%)	0.590
Total	**19(76%)**	**02(8%)**	**21(42%)**	

p-value < 0.05

DISCUSSION

Our results showed, comparatively decreased rate of wound infection and post infective complications in the delayed primary closure group. This fall in wound infection rate in patient with DPC technique has been attributed to increased oxygenation in open wound and repeated dressing with bactericidal solution. [16,17].
Nevertheless, technique of primary closure is tolerated better and is cosmetically more acceptable to the patient. While delayed primary closure technique having open wound requires dressing for 3-5 days before closure of wound [20]. Some researcher proposed that administrating broad spectrum antibiotics post-operatively to patient with perforated appendicitis, the contaminated wounds can be closed primarily without significant rise in wound infection rates[21].
In literature, primary and delayed primary closure techniques are mostly compared in patients with perforated appendicitis. Chiang and colleagues compared wound infection rate and hospital stay in seventy patients with perforated appendicitis after randomized into two groups i.e. primary versus delayed primary closure[18]. They found significant reduction in the rate of wound infection (2.9% versus 38.9%) in the delayed closure group. In their study two re-admissions were noted due to wound infection in primary closure group versus no re-admission in the delayed closure group, the length of hospital stay was also decreased (6.3 versus 8.4 days) in the delayed closure group. Chatwiriyacharoen from Thailand in their study compared the two techniques in 44 pediatric cases of perforated appendicitis. Eight (18.18%) patients developed wound infection, 2 (9.1%) had wound infection in primary wound closure group and 6 (27.3%) in DPC group[19]. In our study, the difference between the two groups of perforated appendicitis was 62.5% in group A versus 50% in group B.
However, in contrast to the studies discussed, our study compares wound infection and its associated complications of primary closure and DPC in patients with perforated viscera and abdominal trauma with midline approach.
We were able to find a limited number of studies that have compared infective wound complications in primary versus delayed primary technique on contaminated abdominal surgeries and controversy persist regarding the best technique. Duttaroy and colleagues compared the wound infection rate using both techniques of wound closure in patients with visceral perforation and abdominal trauma[13]. Patients were randomized for either primary closure or and DPC. Infections rates were significantly reduced in the delayed closure group (42.5% versus 2.7%), a finding consistent with result of current study. Moreover, they observed more cases of wound dehiscence in patients with primary closure (25%) as opposed to patients with DPC (2.7%), which is also comparable to finding in our study. Similar results were also shown by Cohn

while comparing the two techniques of primary versus delayed primary closure after dirty abdominal surgeries[22]. A recent meta-analysis of abdominal trauma patients undergoing damage control laparotomy concluded that technique of primary closure resulted in higher rate of wound infections when compared with DPC[23].

This study has few limitations. Randomization was not possible due to intension to observe equal number of patients with identical etiology. Sample size was very small with respect to individual group. Long follow-up needed to know frequency of incisional hernia was not possible in public sector hospital.

CONCLUSION

Although results showed that delayed primary closure technique is better option than primary wound closure with respect to frequency of wound infection, however randomized controlled trials with long follow up would provide a better insight.

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