

**OUTCOME OF PRIMARY V/S DELAYED PRIMARY CLOSURE IN CONTAMINATED AND DIRTY MIDLINE ABDOMINAL SURGERY.**

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**ABSTRACT**

**Objective:** This study was designed to compare the outcome of primary closure (PC) versus delayed primary closure (DPC) technique in contaminated and dirty midline abdominal surgery in terms of wound infection, wound dehiscence & hospital stay. **Study Design:** Comparative observational study. **Place And Duration:** All units of the General Surgery department of Liaquat University Hospital Hyderabad, for a period of six months from June 2018 to November 2018. **Methodology:** All patients age between 17-80 years of either gender, who underwent exploratory laparotomy through midline abdominal incision and found to have bilious, fecal or purulent fluid in the peritoneal cavity were included in the study. Patients were divided into two groups. Patients in group-A underwent for PC of abdominal wound and patients in group-B were enrolled for DPC. Postoperative wound infection, wound dehiscence and hospital stay were observed. **Results:** A total of 124 patients were included in this study. The mean age of patients was 32.4±15.6 years. Male were 84 (67.7%) and 40(32.3%) were female. The male to female ratio was 2:1. Out of 124 patients, 59 were included in group-A and 65 were placed in group-B. The overall surgical site infection rate was 65.4%. The rate of wound infection is significantly low in patients with DPC as compared to PC ( $P$ -value  $\leq 0.05$ ). 5 patients develop wound dehiscence in group A while none of the patient develop wound dehiscence in group B. Postoperative hospital stay was shorter in group B ( $P$ -value .001) **Conclusion:** Delayed primary wound closure technique is a suitable option for the management of dirty and contaminated abdominal wound. It significantly lowers the rate of surgical site infection as well as fascial dehiscence without increasing the length of hospital stay.

**Keywords:** Primary Closure, Delayed Primary Closure, Midline Abdominal Surgery.

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**INTRODUCTION**

Surgical site infection (SSI) is a common postoperative complication following dirty / contaminated abdominal surgeries. Despite the improvement in surgical techniques and the availability of broad spectrum antibiotics, the incidence of SSI in abdominal surgeries with contaminated and dirty wounds is very high. Wound infection and its sequel like wound dehiscence has significant impact on health resources and cost due to prolong hospital stay, nursing care and drug treatment. Few patients may need multiple surgeries.

There are many risk factors that contribute to the development of SSI like age of patient,

malnutrition, diabetes, smoking, intra-abdominal sepsis, subcutaneous wound depth and surgical techniques<sup>1,2</sup>.

Among all the factors in emergency laparotomy, the type of wound closure is still a strong factor. Majority of the emergency laparotomies are performed through mid-line abdominal incision. However, at the time of wound closure every surgeon has different opinion. Open wound management or non-closure technique has been used for centuries in high-risk wounds. Although this decreases the risk of SSI but its use gradually decline because of its various drawbacks like patient's discomfort and dissatisfaction, escalating cost of dressing,

prolong time to finally close the wound<sup>3,4</sup>. The PC of the wound is the common practice worldwide. In this method after irrigation of abdominal cavity with normal saline, skin is closed at the end of the surgery. Delayed primary closure of the wound, first introduced in World War 1. The purpose of this procedure is to decrease superficial SSI, by reducing bacterial contamination and increasing blood supply and oxygen at the surgical site<sup>5,6</sup>. In this technique after doing peritoneal lavage the deep layers of the wound are closed. Few loose prolene mattress sutures are applied to the skin or keep the skin open which allows soft tissue to drain. Wound is irrigated with bactericidal solution and later on skin is closed, when wound becomes clean. This delay has been found to decrease SSI in contaminated / dirty wounds. However, it needs daily dressing and re-suturing.

The primary wound closure technique is simple since the wound is primarily closed and no additional procedure is necessary. Other suggests delayed primary closure because it is believed to be associated with lower incidence and the associated complications of wound infections, thereby minimizing hospital stay and costs of care.

Delayed primary closure needs daily aseptic dressing which declines a load of anaerobes at wound site but on the other hand, it increases the exposure to aerobic organisms. The randomized controlled trials conducted on the technique of wound closure in contaminated surgeries showed variable results, few are in favor of DPC while others have advocated the technique of PC of the wound. Till now there is no robust data available that suggest the preferred technique for wound closure in contaminated and dirty surgeries. Therefore, we have designed this study to compare the surgical techniques between two groups of patients, one with PC and other with DPC. The primary outcome measures will be surgical site infection, wound dehiscence and length of hospital stay. The findings of this study will be useful to provide a guideline for the closure of the midline contaminated or dirty abdominal wound.

## MATERIAL AND METHODS

This prospective comparative study was conducted on 124 patients with midline abdominal surgery in all units of the General Surgery department of Liaquat University Hospital Hyderabad for a period of six months from June 2018 to November 2018. This study was performed after the approval of the ethical committee of the institute. All patients age 18-70 years, of either gender, with midline abdominal surgery, who underwent exploratory laparotomy and found to have bilious, fecal or purulent fluid in the peritoneal cavity were included in the study. Those patients whose age below 14 years, with comorbidities like chronic hepatitis, diabetic and patients who are on steroid therapy, abdominal malignancy, non-cooperative patients who did not allow and give consent for the study

and Re-do laparotomy during the same admission were excluded. A well informed and written consent was taken from patients or their relatives. Detailed history was taken, thorough clinical examination was performed and relevant investigations were done. Using a convenient sampling methodology, patients were enrolled and assigned in two different groups A and B. All patients with even numbers in group A underwent for primary closure and patients with odd numbers in group B underwent for delayed primary closure. Laparotomy was performed through mid-line incision in all patients. Definitive surgical procedure was performed according to the underlying pathology; peritoneal cavity was washed with 6-8 liters of warm normal saline. For primary closure, mass closure (peritoneum, muscle, rectus sheath) was done with interrupted transverse stitches using proline-1 suture. The skin was closed with interrupted prolene 2/0 suture and the wound was examined after 48 hours. In delayed primary closure, for closing the abdominal wound same procedure was carried out except skin and subcutaneous tissue which were left open and packed with 10% (betadine) iodine soaked gauze. Dressing was changed daily to keep the wound clean. If the wound was clean on the 5th postoperative day, the skin was closed under local anesthesia. Otherwise, wet packing was continued and DPC was done later on. Third-generation cephalosporins along with metronidazole were given in all patients. In both groups, if we found any purulent discharge at the incision site it was sent for bacterial culture. Antibiotics were changed according to the report of culture & sensitivity. Subsequent dressings were done daily. All the patients were closely watched until the wound healed completely. Data regarding surgical wound infection, wound dehiscence and hospital stay, were recorded in predesigned proforma. All the data were entered into SPSS 22.0 version and were analyzed by using the same software. The quantitative data for continuous variables like age & duration of hospital stay was summarized by statistics (mean, median or standard deviation). Simple frequency and the percentage were computed for the gender, causes of surgery and wound infection. Chi, square test was applied where applicable and  $P$ -value  $\leq 0.05$  was considered as significant.

## RESULTS

During the study period, a total of 124 patients, who underwent exploratory laparotomy were included. In the present study, out of 124 patients, primary closure was done in 59 (47.6%) patients, while 65 (52.4%) patients were closed by delayed primary closure technique. The age of the patients ranged from 18 to 70 years with a mean age of  $32.4 \pm 15.6$  years. In this study, out of 124 patients, 84 (67.7%) were males and 40 (32.3%) were females. The demographic features of these patients are shown in **Table 1**. The commonest underlying pathology found at laparotomy was small bowel

perforation 73 (58.8%) followed by duodenal perforation 23 (18.5%). The different causes of pneumoperitoneum are summarized in **Table 2**. Out of 124 patients, 54 patients (43.5%) had smooth post-operative recovery and did not show any sign suggestive of wound complication and were discharged from the hospital. The remaining 70 patients (56.4%) developed wound complications. In PC group A, wound infection was observed in 38 patients (64%) and wound dehiscence was observed in 5 patients (8%). Few skin stitches were removed for free drainage and left for secondary healing. The wound dehiscence was managed by re-laparotomy

under general anaesthesia. Wound was closed by applying tension sutures with proline 1 suture.

In DPC group 27 patients developed wound infection and none of the patients developed wound dehiscence. The outcome of patients following laparotomy in two groups is shown in **Table 3**. There was a statistically significant difference in wound infection between the patients in two groups ( $P$ -value  $\leq 0.01$ ). Regarding hospital stay of patients in two groups the difference was statistically significant; Delayed Primary Closure (7.85±2.3 days) and Primary Closure (10.24±4.7 days);  $P$ -value  $\leq 0.01$ . **Table 4**.

TABLE 1: DEMOGRAPHIC DATA OF STUDY POPULATION (n = 124)		
Variables	Group- A PC(n = 59)	Group- B DPC(n = 65)
Age in years	33.5 ± 14.9	31.4 ± 16.2
Gender		
Male	43 (73%)	41 (63%)
Female	16 (27%)	24 (37%)

TABLE 2: DIFFERENT CAUSES OF PERFORATION IN PRIMARY AND DELAYED PRIMARY CLOSURE GROUPS (n = 124)			
Causes of Pneumoperitoneum	Group – A PC (n = 59)	Group – B DPC (n = 65)	Total (n = 124)
Duodenal perforation	07(11.8%)	16(24.6%)	23(18.5%)
Gastric perforation	05(8.5%)	00	5(4.0%)
Small bowel perforation (mainly typhoid & tuberculosis)	33(56%)	40(61.5%)	73(58.8%)
Perforated appendicitis	08(13.5%)	06(9.2%)	14(11.3%)
Traumatic perforation	06(10%)	03(4.6%)	09(7.2%)

TABLE 3: OUTCOME OF PATIENTS FOLLOWING LAPAROTOMY (n = 124)				
Outcome of patients	Group – A PC N=59	Group – B DPC N=65	Total N=124	P value
Wound infection	38 (64%)	27 (41.5%)	65 (52%)	$\leq 0.01$
Wound dehiscence	5 (8%)	0	5 (4%)	$\leq 0.01$
Discharge without wound complications	16 (27%)	38(58.5%)	54 (43.5%)	$\leq 0.01$

TABLE 4: POSTOPERATIVE HOSPITAL STAY BETWEEN PRIMARY AND DELAYED PRIMARY CLOSURE GROUPS (n = 124)			
Hospital stay(in days)	Group – A PC (n = 59)	Group – B DPC (n = 65)	P value
Mean + SD (Range)	10.24±4.7	7.85±2.3	0.001*
Hospital stay in groups:			
3 to 5 days	5(8.5%)	7(10.8%)	0.56
6 to 10 days	34(57.6%)	53(81.5%)	0.04*
> 10 days	20(33.9%)	5(7.7%)	0.001*

## DISCUSSION

Abdominal wound infection following emergency laparotomy remains one of the major causes of morbidity and mortality. SSI following emergency abdominal surgery has five fold more risk of developing SSI as compare to elective abdominal procedures<sup>7</sup>. It has been estimated that nearly 55% of SSI can be prevented by using appropriate surgical techniques and aseptic wound care<sup>8,9</sup>. A lot of research work has been done to find out the methods which are used to reduce SSI, improve cosmetic outcome, decrease financial burden and decrease hospital stay.

In our study, out of 124 patients, 70 patients (56.45%) develop wound infection. Among 70 patients 42(60%) were males and 28 (40%) were females. Similar findings regarding the gender preponderance has also been reported in various other studies.<sup>7,10,11,12</sup>. Sex difference in skin colonization may be associated with difference in skin thickness, sebum production and skin pH<sup>7</sup>.

The common cause of pneumoperitoneum in patients, who presented to us was small bowel perforation (73 patients 58.8%), followed by duodenal perforation (23 patients 18.4%) and perforated appendix (14 patients 11.3%). In other studies, the common finding during laparotomy was perforated appendix followed by ileal perforation<sup>13,14</sup>.

The overall incidence of wound infection in our study was 56.4%. Our rate of wound infection was comparable with other studies<sup>12,13</sup>. The incidence of SSI was only 16.3% in Alkaaki<sup>7</sup> and 23% in Duttaroy et al.<sup>15</sup> studies. The significant higher rate of wound infection in our population may be because of poor nutritional status and delayed presentation to the hospitals. DPC of dirty abdominal wound has over the time becomes more acceptable due to the decrease in bacterial load and subsequent reduction in wound infection. However, it causes great anxiety and requires regular dressings.

Our results showed decrease wound infection and wound dehiscence in DPC group as compared to PC group 41.5 % vs 72% respectively. This is similar to the findings by Bhadragoudra, who found a 54% wound infection rate in PC and 12% in DPC group<sup>14</sup>. Many other studies shared their experience that wound infection and dehiscence was more common in cases where wound was closed primarily as chances of infection was higher in those cases<sup>10,13,15,16</sup>.

However a randomized clinical trials conducted in England by Aneel Bangu on DPC verses PC techniques on contaminated abdominal surgeries. He conclude that although DPC technique looks to be simpler and attractive option to reduce SSI but his study fail to provide definitive evidence in favour of DPC technique<sup>17</sup>.

Other studies were conducted by Kache and Inyang in paediatric population. According to

author's opinions, PC is more suitable and attractive option as compare to DPC. Furthermore, there was more physical and psychological trauma in DPC groups specially in children, their parents and health workers. They did not found any difference in the length of hospital stay in two groups<sup>18,19</sup>.

However, the randomized control trials by Khan KI and Siribumrungwong B, concluded that SSI between PC and DPC were not significantly different and DPC had longer length of hospital stay than PC, showing the superiority of PC over DPC with no added morbidity and mortality<sup>20,21</sup>.

In our study regarding the hospital stay of the patients in two groups, the difference was statistically significant: DPC (10.24±4.7) and PC (7.85±2.3). Many studies reported increased length of hospital stay in PC group when compared to DPC group<sup>14-16</sup>. Duration of hospital stay has no difference in two groups in Cohnand Siribumrungwong studies<sup>21,22</sup>.

## CONCLUSION:

Delayed primary skin closure is a simple and reliable technique of reducing surgical site infection and its sequel following contaminated and dirty abdominal surgeries without increasing the hospital stay.

**ETHICS APPROVAL:** The ERC gave ethical review approval

**CONSENT TO PARTICIPATE:** written and verbal consent was taken from subjects and next of kin

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