



Original Article

## COMPARATIVE STUDY OF DELAYED PRIMARY CLOSURE VERSUS PRIMARY CLOSURE OF SKIN IN CONTAMINATED AND DIRTY ABDOMINAL WOUNDS/ INCISION

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### ABSTRACT

**Background:** It is still a matter of debate whether delayed primary closure (DPC) of contaminated abdominal incision reduces surgical site infection compared with primary closure (PC). The rate of wound infection for dirty abdominal wound is approximately 40%, but the optimal method of wound closure remains controversial. **Aims and objectives:** To determine whether delayed primary skin closure of contaminated and dirty abdominal wounds reduces the rate of surgical site infection (SSI) compared with primary skin closure. **Method:** Patient diagnosed as acute peritonitis and posted for exploratory laparotomy during the period of October 1 2013 to September 1 2015 were included. The study was conducted at Shri B M Patil Medical College and Hospital, Bijapur. In this series a total of 100 patients were included and were divided in two groups. Each group had 50 patients. For primary closure group, wounds were closed with monofilament interrupted suture. For Delayed primary closure, skin and subcutaneous tissue are left open and packed with 10% (betadine) povidone iodine soaked gauze, which was changed daily to prevent excessive collection of exudates. The outcome of wound was assessed on post-operative days. **Result:** In this entire series, wound infection developed after incision closure was 33%. The primary group had a higher rate of wound infection 54% and delayed primary closure was 12% ( $P < 0.001$ ) and longer length of hospital stay 19.4 days in primary closure group and 16.5 days in delayed primary closure group ( $P < 0.002$ ). **Conclusion:** Laparotomy wound complications are multifactorial, it depends on many factors. A strategy of DPC of dirty abdominal wound, clinically appears to decrease the rate of wound infection, when compared with PC without increasing the length hospital of stay.

### KEYWORDS

PC- Primary closure, SSI- surgical site infection, DPC- delayed primary closure.

## INTRODUCTION

Surgical site infections are common following the abdominal surgeries. Centre for disease control has found 45% SSI incidence in abdominal surgeries with contaminated wounds. SSI causes morbidity with additional risk of mortality and also impact on health resources and cost through increased hospital stay, repeated surgeries, nursing care cost and drug treatment.<sup>[1,2]</sup> Despite of major improvement in antibiotics, better anesthesia, superior instruments, early diagnosis of surgical problems and better post-operative care but still surgical site infection (SSI) do occur.

The occurrence of SSI, wound dehiscence, incisional hernia are common following primary closure of skin in dirty / contaminated wounds.<sup>[3,4,5,6]</sup> Disadvantage of primary closure is increases the length of hospital stay and thereby increase in the cost. By delaying the closure of skin in contaminated wounds, and we can reduce SSI. It has better prognosis

compared to primary closure. Advantage: there is no specialized equipment required, easy procedure, it allows the soft tissue to drain, it reduces the no. of colonic bacteria, and particularly anaerobes in contaminated wounds. Thus it would be helpful to reduce SSI.

### AIMS AND OBJECTIVES OF THE STUDY

To determine whether delayed primary skin closure of contaminated and dirty abdominal incisions reduces the rate of surgical site infection (SSI) compared with primary skin closure.

### MATERIAL AND METHODS

#### SOURCE OF DATA

This study was undertaken in surgical units of Shri. B.M. Patil Medical College, Hospital and Research Centre, Bijapur.

During the period of October 1, 2013 to September 1, 2015. A total of 100 patients were studied. Out of 100 patients 50 were in Primary Closure group and 50 were in Delayed Primary closure group cases.

#### METHOD OF COLLECTION OF DATA

The patients admitted in B.L.D.E.U.'s Shri. B. M. Patil Medical College Hospital Bijapur attending surgical OPD who underwent exploratory laparotomy were studied. Details of patient were recorded including Clinical History, Clinical Examination, and Investigation.

#### INCLUSION CRITERIA

All diagnosed cases of peritonitis, who underwent exploratory laparotomy and found to be contaminated intra operatively were included in this study from the period of October 1, 2013 to September 1, 2015. Perforated appendicitis, perforated hollow viscous, ileostomy closure, trauma and intra-abdominal abscess / other peritonitis, Patients > 18 years of age were included.

#### EXCLUSION CRITERIA

Immuno compromised patients

Abdominal Malignancy.

#### SAMPLE SIZE

A total of 100 patients were selected for present study. They were divided into two groups (n=50)

Following statistical tests were used to compare the results.

- Diagrammatic presentation.
- Mean  $\pm$  S D

#### PREOPERATIVE PARAMETERS ASSESSED

Age, Sex, Duration of symptoms, WBC on Admission.

Risk factors – Diabetes mellitus,

Obesity (body mass index > 30kg/m<sup>2</sup>)

Malnutrition (clinical observation of muscle wasting or albumin (< 2.5 g/dl)

Cardiovascular diseases

#### Procedure

Patients underwent laparotomy procedure for acute peritonitis during surgery. Turbid ascites was cultured and peritoneal lavage was performed with warm saline until clear effluent restored. Drain was placed in the pelvis and anastomotic site through a separate incision in the abdominal wall. Peritoneum, muscle and fascia were closed in layers.

For primary closure, wounds were closed with monofilament interrupted suture for delayed primary closure, skin and subcutaneous tissue are left open and packed with 10 % (betadine) povidone iodine soaked gauze, which was changed daily to prevent excessive collection of exudates. If the wound appears clean on post-operative day 5<sup>th</sup> it was closed under local anesthesia. Otherwise wet packing is continued and (delayed primary closure) DPC is done on later date. The presence of purulent discharge at the incision site in both cases was sent for bacterial culture.

#### INTRAOPERATIVE FINDING

- Contamination of wound
- Gangrenous changes
- Grossly inflamed
- Perforation of hollow viscera

In the entire series, the patients who developed wound infection in primary closure group and delayed primary group were observed. The wounds of these patient were opened by removing the skin stitches only and managed by open technique with a daily Betadine soaked packing.

#### STATISTICAL ANALYSIS

All characteristics were summarized descriptively. For continuous variables, the summary statistics of N, mean, standard deviation (SD) were used. For categorical data, the number and percentage were used in the data summaries.

Chi-square ( $\chi^2$ ) test were employed to determine the significance of differences between groups for categorical data. For continuous data, the differences of the analysis variables were tested with the t-test. If the p-value is > 0.05, then the results were considered to be not significant. Data were analyzed using SPSS software version 16.

#### RESULTS

A total of 100 patients, 76 male and 24 female included in this study. (Figure 1).

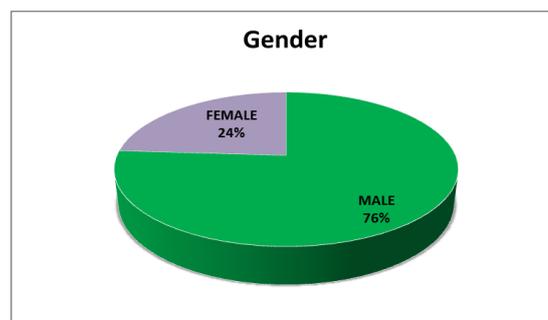


Figure 1. Percentage Distribution of Gender

The mean age of the patients was 50 $\pm$ 5 years with the range of 18 to 65 years. There were 25 (25%) patients in range of 15 to 25 years, 44(44%) patients were in the range of 26 to 50 years and 26(26%) patient were in the range of 51 to 65 years, more than age of 65 years were 9.

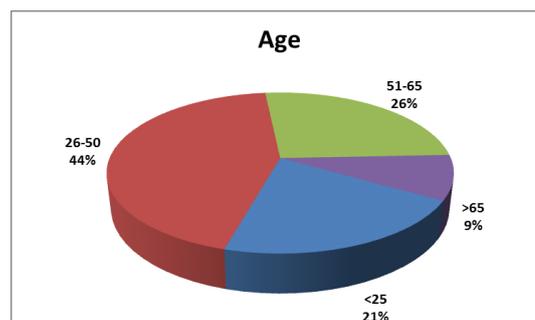
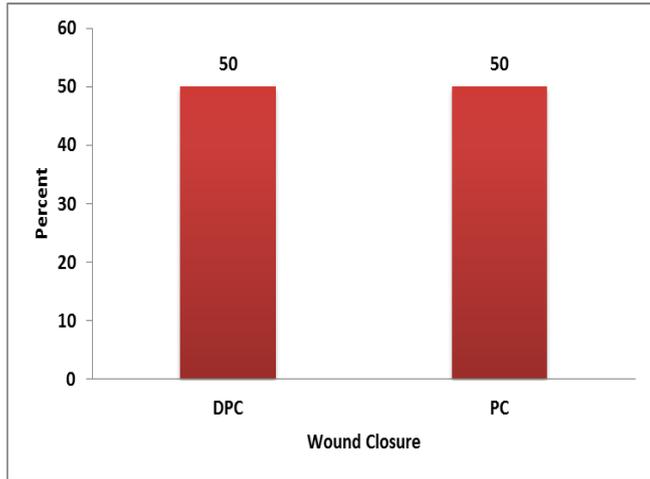


Figure 2. Percentage Distribution of Age

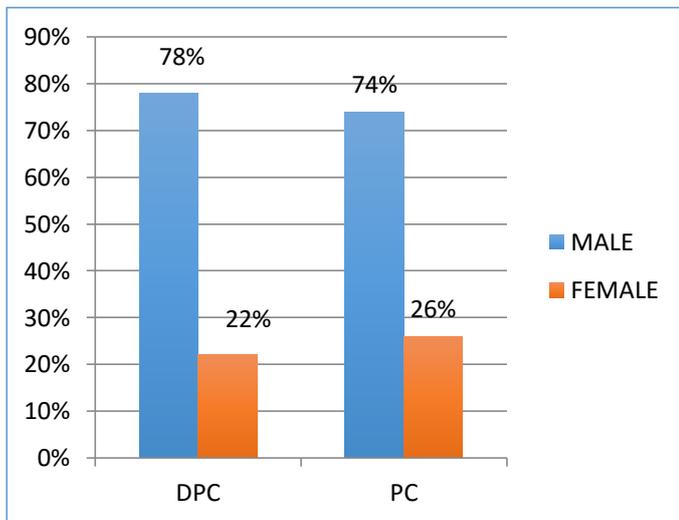
The patients were divided into two equal groups primary closure and delayed primary closure group.



**Figure 3. Percentage Distribution of Type of Wound Closure**

In primary closure (PC) group, of 50, 37 were male and 13 were female.

In delayed primary closure (DPC) group, of 50, 39 were male and 11 were female.

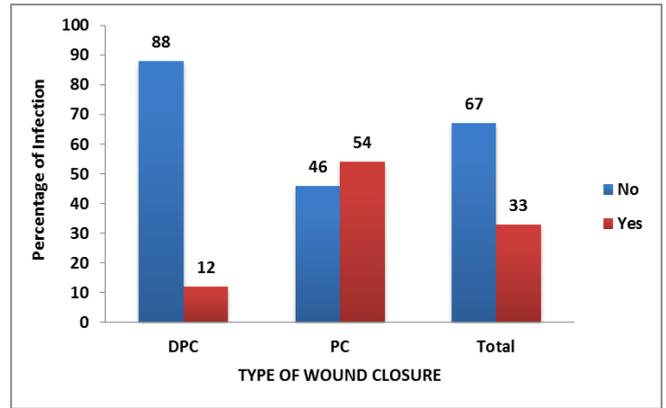


**Figure 4. Distribution of Type of Wound Closure by Gender.**

From both the groups 33 patients developed wound infection. In primary closure group, wound infection was observed in 27 patients (54 %). The wounds of these patient were opened by removing the skin stitches only and managed by open technique with a daily Betadine soaked packing, out of 27 patients, 19 underwent secondary closure and 8 of 27 patients were left open for healing by secondary intention.

In delayed primary closure group, wound infection was observed in 6 patients (12.00%). Forty four (44) patients wound healed without any infection. Infected wound in this group were opened by removing skin stitches and subjected to healing by secondary intention.

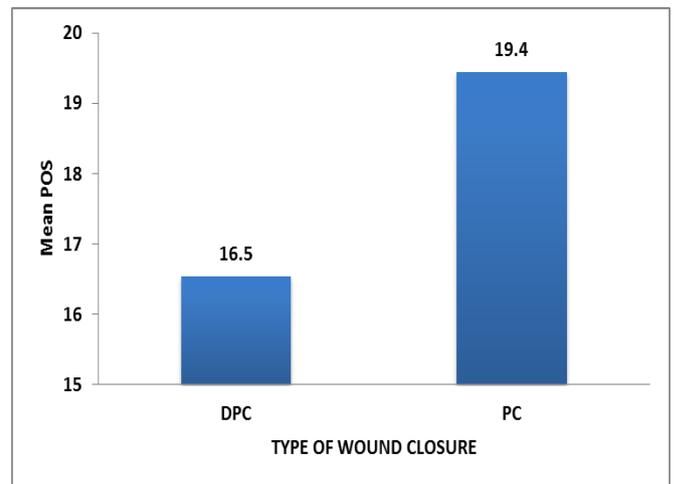
There was a significant association between wound infection and type of skin closure (delayed primary closure 12.00% vs primary closure p<0.000)



**Figure 5. Distribution of Type of Wound Closure by SSI**

The mean post-operative stay, 16.5±5 days were seen in delay primary closure group and 19.4±5 days were in primary group,

There was significant association between post-operative stay (POS) and Surgical Site Infection (SSI) (p<0.002).



**Figure 6. Duration of POS**

**Organism Isolated from SSI**

Out of hundred patients the most common organism cultured from the wounds were E.coli (13) klebsiella (17), pseudomonas (21), staph. aureus (9) coagulase negative staphallococci (4)and sterile (36) enterococci (4).

**Table 1. Percentage of Distribution of Organisms**

Organisms	Percentage
E.coli	13
Klebsiela	17
Staph.aureus	9
Coagulase negative staphylococci	4
Enterococci	4
Sterile	36

**DISCUSSION**

Open wound management of contaminated wound is a practical measure that has been used for centuries.<sup>[7]</sup>The use of delayed primary closure was popularized by military

surgeons particularly anaerobes contaminating to the wound.<sup>34</sup>

However, the disadvantages of allowing exogenous bacteria such as staphylococci to contaminate the wound in ward before closure has been recognized.<sup>[7]</sup>

In the entire series, 33 patients developed wound infection. In primary closure group wound infection rate was 54.4% while it was 12 % in delayed primary group. There was significant difference between 2 groups regarding wound infection ( $p < 0.00$ ). Our study showed that delayed primary closure was more suitable for wound management for contaminated or dirty wound.

In our study the most common diagnosis was perforated appendix (27%) followed by ileal perforation (24%), prepyloric (16%), duodenal (18%). And also showed that the mean post-operative stay was  $16.5 \pm 5$  in delayed primary group and  $19.4 \pm 5$  in primary group  $p < 0.002$ . There is a significant association between type of wound closure and length of hospital stay.

Study conducted by Duttaroy D D, Jitendra J .et al demonstrated SSI developed after incision closure in 23% of patients infection were significantly more common in the primary group (42.25% vs 2.57% for DPC;  $p = 0.00375$ ) and also mean length of hospital stay were longer after PC (18.52 days than DPC 13.86 days) Stephen M .Cohn, Giovanni Giannottia et al Demonstrated that in DPC group wound infection rate was 12%, in PC group was 48%. Wound infection rate was greater in the PC group than DPC. Length of the hospital stay and hospital charges were similar between two groups.<sup>[8,9]</sup>

Mukhtar Ahmad ,Kishwar Ali, Humera Latif, et al conducted study on 158 patients , 56 (35.4%) male and 102 (64.6%) female were included in their study .In entire series, 36 (22.8%) patients developed wound infection .There was a significant association between wound infection and type of closure (Delayed primary closure 6.3% vs. Primary Closure 39.2%,  $p < 0.000$ ). Concluded that DPC is the optimal management strategy in case of perforated appendicitis as it decreases the incidence of wound infection.<sup>[10]</sup>

Chiang RA, Chen SL, Tsai YC. Conducted study on Delayed primary closure verses primary closure for wound management in perforated appendicitis: a prospective randomized controlled trial. Showed that, in entire series, wound infection developed after wound closure in 21% of the patients. The PC group had a higher incidence of wound infection (38.9% vs. 2.9%,  $p < 0.001$ ) and longer length of hospital stay (8.4 days vs. 6.3 days,  $p = 0.038$ ). Concluded that DPC is the optimal management strategy for perforated appendicitis wounds. Significantly reduces the wound infection rate and length of stay.

Factors affecting SSI, according to CDC are extremes of age, poor nutritional status, presence of diabetes, obesity, steroid use, a coincident infection or Colonization and a dysfunctional immune system.<sup>[11,12]</sup> The patient with more than 50 years of age had more complication ( $P$  value  $< 0.05$ ).

**Table 2. Comparison of result with other studies**

Serial no	Studies done by	Delayed primary group	Primary group
1	Duttaroy D D et al	2.57%	42.25%
2	Stephen M Cohn et al	12%	48%
3	Mukhtar Ahmad et al	6.3%	39.2%
4	Chaing RA et al	2.9%	38.9%
5	Our study	12%	54.4%

## CONCLUSION

Laparotomy wound complications are multifactorial, it depends on many factors. A strategy of DPC of dirty abdominal wound clinically appears to decrease the rate of wound infection, when compared with PC without increasing the hospital length of stay.

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