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Comparative Study of Delayed Primary Closure Versus Primary Closure of Contaminated Skin Incision in Exploratory Laparotomy for Intra Abdominal Severe Sepsis

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Abstract: ***Background**: It was thought that whether delayed primary closure (DPC) of contaminated abdominal incision reduces surgical site infection compared with primary closure (PC). The rate of wound infection for contaminated abdominal wound is approximately 2.6% to 42%, 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. To observe and collect data compare and contrast tabulated data to draw the conclusion about dressing, use of of antibiotics, patients compliance and tolerance. **Method**: In this Prospective study Patient diagnosed as acute peritonitis and posted for exploratory laparotomy during the period of April 1st, 2022 to May 1st, 2023 were included. The study was conducted at Narendra Modi Medical College and LG Hospital Maninagar Ahmedabad. 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 gauge, which was changed daily to collect exudates and give antisepsis to wound. The wound was observed and assessed in post operative period and outcome was drawn. **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 16.5days in delayed primary closure group (P<0.002). **Conclusion**: Laparotomy wound complications are multifactorial, it depends on many factors. A strategy of Delayed Primary closure of contaminated abdominal wound, clinically appears to decrease the rate of wound infection, when compared with Primary Closure without increasing the length hospital of stay.*

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

1. Introduction

Surgical site infections are common following the contaminated abdominal surgeries. Centre for disease control has found from 2.6% to 42% 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. [1, 2] Despite of major improvement in antibiotics, better aenesthesia, superior instruments and developed surgical techniques, 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 contaminated wounds. [3, 4, 5, 6] 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. Advantages are 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 observe and collect data compare and contrast tabulated data to draw the conclusion about dressing, use of antibiotics, patients compliance and tolerance.

2. Material and Methods

Source of Data

This study was undertaken in surgical units of Narendra Modi Medical College and LG Hospital Maninagar Ahmedabad During the period of April 1st 2021 to May 1st 2022. 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 LG Hospital Maninagar Ahmedabad 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 April 1st, 2021 to May 1st 2022. Perforated appendicitis, perforated hollow viscous, ileostomy closure, trauma and intraabdominal 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 S D

Preoperative Parameters Assessed
Age, Sex, Duration of symptoms, WBC on Admission.
Risk factors – Diabetes mellitus,
Obesity (body mass index > 30kg/m2)
Malnutrition (clinical observation of muscle wasting or albumin (< 2.5 g/dl) Cardiovascular diseases

3. Procedure

Patients underwent laparotomy procedure for acute peritonitis during surgery. All patients were given pre - operative antibiotic prophylaxis. Surgical site was prepared on the preoperative day and pinting and draping was done with betadine. The linea alba in all the cases were closed with no 1 PDS simple interrupted sutures. Subcutaneous sutures were not applied. Turbid ascites free fluid 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. Post operatively cephalosporins with metronidazole antibiotics were given.

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 gauge, which was changed daily. If the wound appears clean on postoperative day 7th it was closed under local anesthesia with strict asepsis. Otherwise wet packing is continued and delayed primary closure is done on later date. Wound infection was diagnosed in cases of discharge, serous or purulent from wound, collection or dehiscence. In case of signs of wound infection pus swab was taken and sent for culture and sensitivity and treated with appropriate antibiotics based on culture & sensitivity and wound infection was treated with drainage and cleaning and dressing. The rates of surgical site infection following primary and delayed primary closure were obtained on POD 7 and the results were analysed.

Intraoperative Finding

- 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 socked 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.

4. Results

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

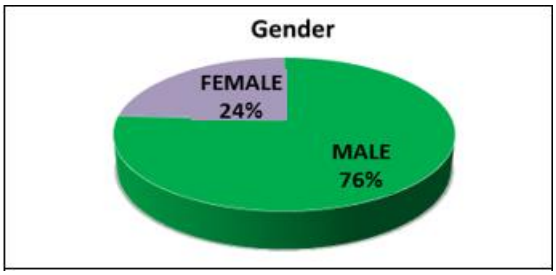


Figure 1: Percentage Distribution of Gender

The mean age of the patients was 50±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.

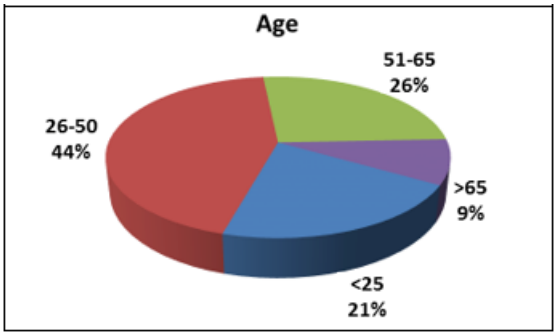


Figure 2: Percentage Distribution of Age

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

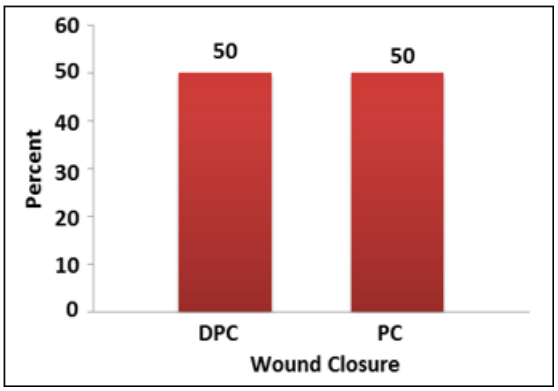


Figure 3: Percentage Distribution of Type of Wound Closure

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

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

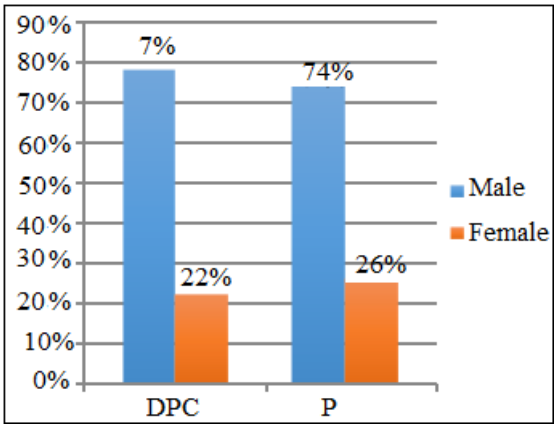


Figure 4: Distribution of Type of Wound Closure by Gender.

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 socked 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)

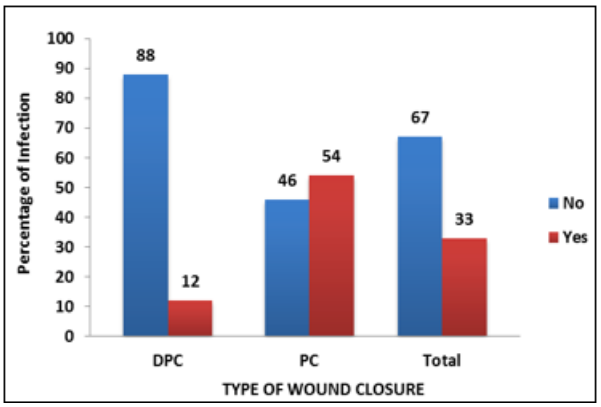
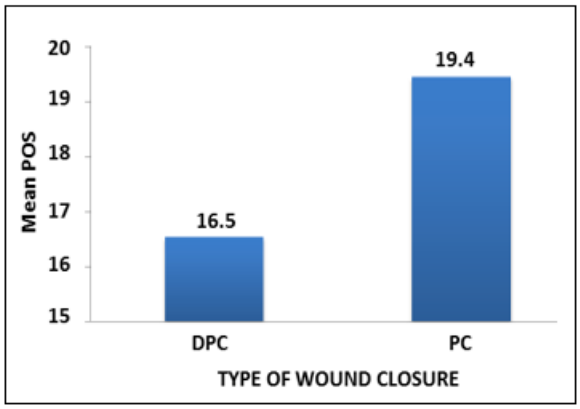


Figure 5: Distribution of Type of Wound Closure by SSI

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).



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 staphallococi (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

5. Discussion

Open wound management of contaminated wound is a practical measure that has been used for centuries. [7] The use of delayed primary closure was popularized by military surgeons particularly anaerobes contaminating to the wound.

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

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 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 ±5 in delayed primary group and 19.4±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. [8, 9]

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. [10]

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. [11, 12] 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	6.30%	39.20%
4	Chaing RA et al	2.90%	38.90%
5	Our study	12%	54.40%

6. 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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