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Surgery

A Study to Compare the Outcome of Primary versus Delayed Primary Closure of Skin in Contaminated and Dirty Laparotomy Wound

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Original Research Article

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Abstract: Surgical site infections are common following the abdominal surgeries. Centre for disease control has found 45% SSI incidence in abdominal surgeries with contaminated wounds. This is still a matter of debate whether delayed primary closure of skin in contaminated and dirty abdominal laparotomy wound is superior to primary closure to reduce morbidity of surgical site infection or not. This study is done to compare Primary closure and Delayed primary closure of skin in contaminated and dirty abdominal wound to find whether delayed primary closure reduces the rate of morbidity and hospital stay as compare to primary closure or not. This study was a prospective randomized controlled trial, which was conducted in Surgical Unit 6, the Upgraded Department of General Surgery, SMS Medical College & attached hospitals during the period of May 2016 to April 2017. Sample size was calculated to be 30 subjects for each of two groups. Patients were undergo laparotomy procedure for acute Peritonitis were included in this study. During surgery peritoneal lavage was performed For primary closure, wound's skin was closed with monofilament interrupted suture. For delayed primary closure, skin and subcutaneous tissue were left open and packed with 10 % povidone iodine (betadine) soaked gauge, which were changed daily to prevent excessive collection of exudates. First dressing was changed after 48 hours and incision site was closely examined. There was a significant association between wound infection and type of skin closure (delayed primary closure 13.33% vs primary closure 53.33% ($p<0.003$). The mean post-operative stay, 7.1 days were seen in delay primary closure group and 8.93 days were in primary group. Delayed primary skin closure may represent a simple, reliable, and potentially cost-effective way of reducing SSI following abdominal surgery with contaminated or dirty wounds.

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

INTRODUCTION

Surgical site infections (SSIs), remains one of the most common adverse event that occur with hospitalized surgical patients or after outpatient surgical procedures despite many advances in preventive techniques. When assessed actively and prospectively, it has been found to affect as many as 45% of patients [1]. Furthermore, without active post discharge surveillance, up to 79% of SSI will be missed [2]. The method of skin closure has been implicated as an important risk factor [3]. Delayed primary closure (DPC) and Primary closure (PC) are two commonly used methods, but there is no consensus as to the optimal method.

When the skin and subcutaneous tissue are primary closed, space between sheath and skin provide a very good environment for bacteria to grow and multiply which results in wound infection. If skin and subcutaneous tissue is left open for 3-5 days, bacteria are not able to multiply and cause wound infection because favorable environment for bacterial multiplication is not present. In 2-3 days concentration of phagocytic cells (macrophages), fibroblast and platelet are increased on wound site, if skin and subcutaneous tissue is closed at this time leads to superior healing and decreased chance of infection. This study compares primary closure with delayed primary closure of wound in patients undergoing contaminated and dirty laparotomy wound, to find out the best technique of skin closure.

AIMS AND OBJECTIVES

- To compare Primary closure and Delayed primary closure of skin in contaminated and dirty abdominal wound/ incision under the following points:
    a) Wound infection
    b) Wound dehiscence
- To find whether delayed primary closure of contaminated and dirty abdominal wound reduces the rate of morbidity and hospital stay as compare to primary closure.

MATERIALS AND METHODS

The study was a prospective randomized controlled trial, which was conducted in Surgical Unit 6, the Upgraded Department of General Surgery, SMS Medical College & attached hospitals during the period of May 2016 to April 2017. Patients were chosen according to inclusion and exclusion criteria.

Inclusion Criteria

- Patients with contaminated abdominal and dirty wounds (perforated appendicitis, perforated hollow viscous, trauma, intra-abdominal abscess etc.) at the time of surgery
- 2. Age >18 years
- 3. Giving consent for undergoing study

Exclusion Criteria

Patients having known risk factors influencing wound healing
a) Anemia
b) Jaundice
c) Diabetes mellitus
d) Steroid therapy

One controlled group included 30 cases and other study group included another 50 cases.

From the patients fulfilling the inclusion parameters, without any exclusion meriting features, a detailed history consisting of patient particulars, postal and telephonic contact number were noted as per the proforma. The chief complaints of the patients were taken down and examination performed. A written informed consent was obtained. Patients were undergo laparotomy procedure for acute Peritonitis. During surgery peritoneal lavage was performed with warm saline until clear effluent restored. Drain was placed in abdominal cavity through a separate incision in the abdominal wall. Peritoneum, muscle and fascia were closed in layers.

For primary closure, wound's skin was closed with monofilament interrupted suture. For delayed primary closure, skin and subcutaneous tissue were left open and packed with 10 % povidone iodine (betadine) soaked gauge, which were changed daily to prevent excessive collection of exudates. First dressing was changed after 48 hours and incision site was closely examined for pain, tenderness, redness, swelling, discharge and local temperature.

The wound appears clean on post-operative day 5th, was closed under local anesthesia. Otherwise wet packing was continued and delayed primary closure was done on a later date. The presence of purulent discharge at the incision site in both cases was sent for bacterial culture.

STATISTICAL ANALYSIS

All data were descriptively summarized. For categorical data, number and percentage w and for continuous data, mean and standard deviation were used. Significance between groups was obtained by using Chi square test. If the p value is <0.05, then results are considered to be significant.

RESULTS

A total of 60 patients, 48 males and 12 females were included in this study.

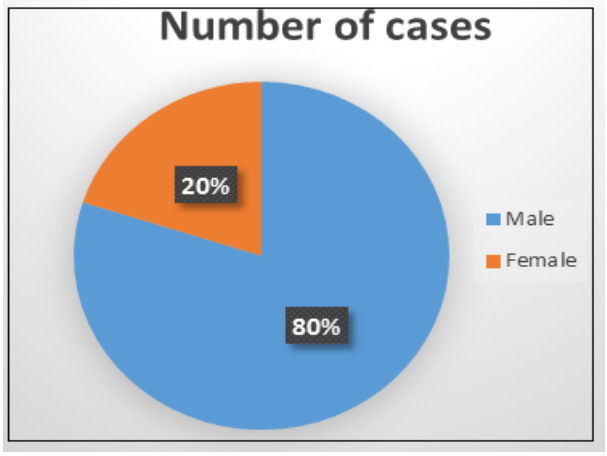

Fig-1: Distribution of Cases According to Gender

The mean age of the patients was 43.067 years with the range of 19 to 86 years. There were 16 (27%) patients in range of 21 to 30 years, 12 (20%) patients were in the range of 41 to 50 years, 10 (17%) patients

were in the range of 51 to 60 years, 8 (13%) patients were in range of 31- 40, patients more than age of 60 years were 9.

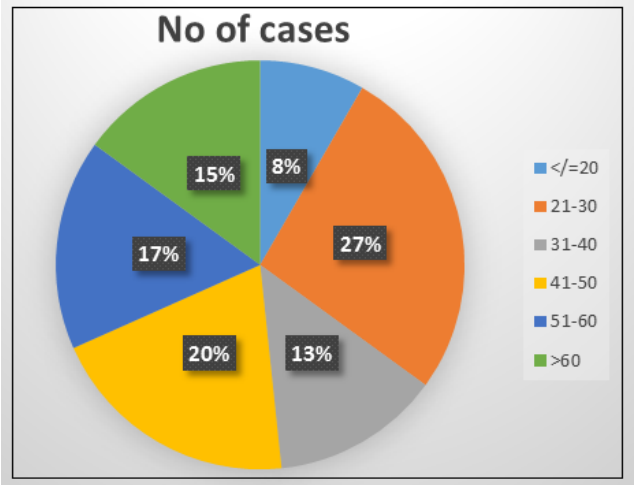

Fig-2: Distribution of Cases According to Age

Peptic perforation comprises 52% of all cases of peritonitis and enteric perforation patients were 25% in our study. Rest of the cases were of peritonitis with different etiology like appendicular peritonitis (8%), traumatic perforation (10%) and Meckel's Diverticulum Perforation (3%).

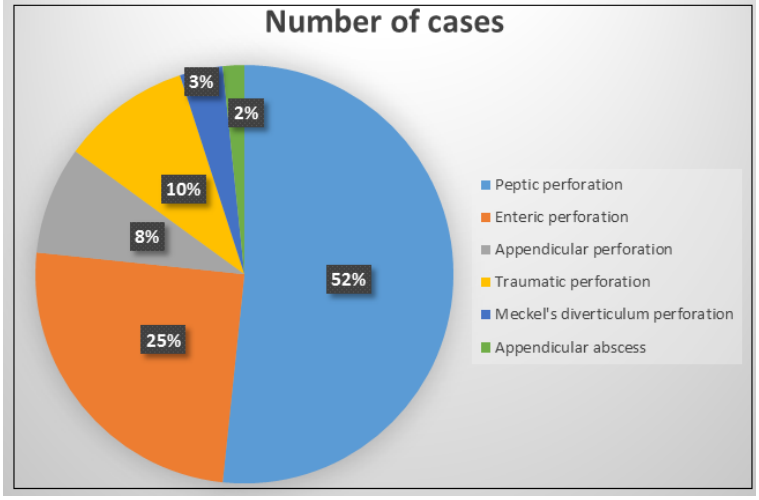

Fig-3: Distribution of Cases According to Etiology

From both the groups 20 patients developed wound infection. In primary closure group, wound infection was observed in 16 patients (53.33%.). In delayed primary closure group, wound infection was observed in 4 patients (13.33%). Twenty-six patients wound healed without any infection in delayed primary closure group.

The mean post-operative stay, 7.1 days were seen in delay primary closure group and 8.93 days were in primary group, the hospital stay was decreased by 1.82 days in delayed closure group.

Total 25% cases suffered from major complication. Incidence of major complication in delayed closure group was 6.67% and in primary closure group was 43.33%.

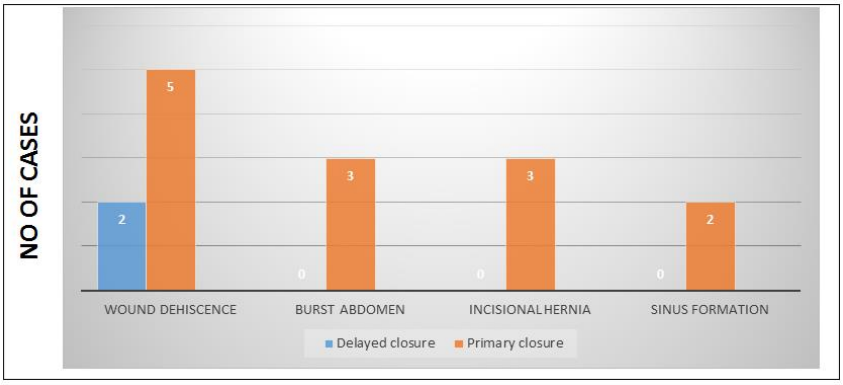

Fig-4: Incidence of Major Complications in Both Groups

The most common organism cultured from the infected wound was E. coli.

Finding a reliable method to reduce SSI following abdominal surgery is an international research priority. Surgical site infection carries significant morbidity and financial cost and, when assessed prospectively and accurately, affects more patients than previously thought. These measures include surgical hand preparation, appropriate antibiotic prophylaxis, and postponing of an elective operation in the case of active remote infection.

Delayed primary skin closure is accepted as the optimal method to treat wounds of war [4]. The simplicity and effectiveness of this wound care policy has led some to extrapolate the technique to contaminated surgical wounds. However, the disadvantages of allowing exogenous bacteria such as staphylococci to contaminate the wound in ward before closure has been recognized [5].

Total 60 cases were enrolled in the study. In the entire series, 20 patients developed wound infection. In primary closure group wound infection rate was 53.33% while it was 12.33% in delayed primary group. There is a significant association between wound infection and type of skin closure. (Chi-square=9.075, Degree of freedom=1, P value= 0.003). This study showed that delayed primary closure was more suitable for wound management for contaminated or dirty wound.

The mean post -operative stay was 7.1 in delayed primary group and 8.93 in primary group. There was a non-significant association between type of wound closure and length of hospital stay. (Chi-square=0.085, Degree of freedom=1, P value= 0.771). Average stay for all cases in study was 8.1 days.

Peptic perforation comprises 52% of all cases of peritonitis and enteric perforation patients were 25% in our study. Rest of the cases were of peritonitis with different etiology like appendicular peritonitis (8%), traumatic perforation (10%) and Meckel's Diverticulum Perforation (3%). Wound infection was seen in 13.33% cases in delayed primary closure in comparison to 53.33% cases in primary closure. Total infection rate was 33.33%.

In this study seven cases had wound dehiscence. Out of these 7 cases, 4 cases were of peptic perforation with severe intra abdominal contamination and 2 cases were of enteric perforation. Wound dehiscence was seen in 6.67% cases of delayed primary closure in comparison to 16.67% cases of primary closure.

In our series, only three cases (5%) of burst abdomen was seen. All cases of burst abdomen were seen in primary closure (10%) and there was no case of burst abdomen in delayed closure. Three patients developed incisional hernia in an average follow up of 2 months. All three cases were from primary closure.

In delayed primary closure group, major complications were observed in 2 patients (6.67%); in primary closure group, major complications were observed in 13 patients (43.33%). (Chi-square=8.889, Degree of freedom=1, P value= 0.003).

Study conducted by Duttaroy D D, Jitendra J .et al demonstrated SSI developed after incision closure in 23% of patient, infection was significantly more common in the primary group (42.25%vs 2.57%for DPC; p=0.00375) and also mean length of hospital stay was longer after PC (18.52 days than DPC 13.86 days) [6].

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 [7].

Mukhtar Ahmad, Kishwar Ali, Humera Latif *et al*., conducted study on 158 patients, 56 (35.4%) males and 102 (64.6%) females 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< 0.001). Concluded that DPC is the optimal management strategy in case of perforated appendicitis as it decreases the incidence of wound infection [8].

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 [9].

Open wound therapy does several things to stimulate wound healing, the four major benefits of this therapy is as follows

- **Protection** — by closing the wound delayed primarily a closed wound environment is produced as compared to secondary intension healing. This beneficial in that it protects the wound from external contaminations.
- **Blood flow** — Tissue surrounding wound are characterized by the localized collections of interstitial or third space fluid similar to the "zone of stasis" classically described with burn injuries.
- **Decrease bacterial load** — Concomitant with the rise in blood flow and removal of stagnant wound fluid, which is a fantastic medium for organisms, bacterial load is reduced.
- **Increased granulation tissue proliferation** — The increase in rate of granulation tissue formation of wounds treated with delayed primary closure is significantly higher than the rates reported for human growth factors and saline dressing treated wound.

CONCLUSION

We concluded that delayed primary closure is a sound incision management technique that should be utilized for contaminated and dirty abdominal incision. It significantly lowers the rate of superficial SSI as well as fascial dehiscence, overall complication rate and reduces the hospitalization.

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