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Original Research Article

A comparative study on surgical site infections after primary closure and delayed primary closure in clean contaminated laparotomy cases

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ABSTRACT

Background: Surgical site infection is a significant cause of post operative morbidity. Timing of skin closure following a surgery and its relation to incidence of infection has been studied. The debate whether primary or delayed primary closure have been around for a long time. The aim of this study is to compare the rate of infection in a laparotomy wound in clean contaminated laparotomy cases after primary and delayed primary closure.
Methods: 132 patients who underwent laparotomy for clean contaminated were selected. Of this primary closure of the skin was done in 66 cases and delayed primary closure at 48 hours were done in the other 66 patients. Wounds were followed up till post op day 7. The results between two groups were compared using chi square test.
Results: two out of 66 cases developed SSI in the delayed primary sutured group whereas 8 out of 66 cases developed SSI in primary suturing group. The results were compared using chi square test and the chi square statistic was 3.8951 and the p value is 0.048428 (<0.05) proving the result significant.
Conclusions: The incidence of surgical site infection in laparotomy wound after a primary closure was higher compared to delayed primary closure in clean contaminated laparotomy wounds and the difference is significant based on statistical evaluation.

Keywords: Clean contaminated wounds, Delayed primary closure, Surgical site infection

INTRODUCTION

Surgical site infections are the third most commonly reported nosocomial infection and they account for approximately a quarter of all nosocomial infections.[1] They have been responsible for the increasing cost, morbidity and mortality related to surgical operations and continue to be a major problem even in hospitals with most modern facilities and standard protocols of preoperative preparation and antibiotic prophylaxis. Surgical site infection rate has varied from a low of 2.5% to a high of 41.9%.[2]

Abdominal incisions should be planned to give adequate access to the operative field, but at the same time to inflict the minimum of damage to the abdominal wall, so that a strong and durable scar results. The midline incision is commonly used in abdominal operations. The decision to close incisional wound depends on the degree of wound contamination at the end of the operation. Postoperatively the number of phagocytic cells reaches a peak, capillary budding is intense at this time, and the number of organisms required to initiate an infection in a surgical incision, progressively increases as the interval of healing increases, up to the fifth postoperative day. Edlich et al, while studying the management of the

contaminated wound found that the optimal time for closure of the contaminated wound without risk of subsequent infection was on the fourth post-wounding day.[3] In this study it was also found that open wounds are resistant to infection on the fourth postoperative day due to greater inflammatory response than closed wounds. Superficial open wounds from contaminated operations have a marked decrease in inflammatory oedema and pain and enhanced formation of granulation tissue than the primarily closed wounds. Open wounds should be dressed with a thin layer of dressing to allow oxygenation and should be maintained moist to encourage healing.[4] Delayed primary skin closure of laparotomy wounds has been shown to have significantly reduced the rates of superficial wound infections. The administration of prophylactic antibiotics is indicated for clean-contaminated and contaminated wounds to reduce the rate of wound infections. Studies have shown that risk of infection in these patients is 10% and 20% respectively when prophylactic antibiotic is given and higher if no prophylactic antibiotic is given.

Though there have been many studies comparing surgical site infection in laparotomy wounds with results usually favouring delayed primary closure in case of contaminated and dirty wounds there has not been many studies comparing the same exclusively in clean contaminates laparotomy wounds. The purpose of this study is to compare the rate of surgical site infection in clean contaminated laparotomy wound closure by primary and delayed primary method and to determine whether there is a significant difference between these techniques

METHODS

The present study included 132 patients who underwent laparotomy and the procedure was a clean contaminated case at government medical college Thrissur. The period of study was from May 2016 to April 2017. The patients underwent random selection regarding primary and delayed primary closure and study subjects were selected until a total on 132 cases with 66 cases in each study group were fulfilled

Inclusion criteria

Only clean contaminated laparotomy cases in which follow up till postoperative day 7 were included in the study

Exclusion criteria

Exclusion criteria were clean, contaminated and dirty laparotomy cases; poor general condition and nutitional status

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 loop continuous sutures. Subcutaneous sutures were not applied. Skin wounds were closed with 2-0 nylon mattress stiches in cases were primary suturing of wound was done. Post operatively 3rd generation cephalosporin was given with metronidazole added in case of hepato biliary and large bowel surgeries for 48 hours. And continued only in case of signs of wound infection.

In case were delayed primary suturing was planned the skin subcutaneous tissue were left open. After washing with betadine saline the wound dressings were applied. The wounds that were left open underwent delayed primary closure at 48 hours under strict asepsis. Both wounds were given wound care and observed till post operative day 7 for signs of wound infection

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 statistically analysed using Chi – square test and the p value was obtained.

RESULTS

The study included 132 patients, which comprised of 81 males and 51 females. The patients age varied between 20 and 81 years with 66 patients in each group Anterior resection and distal gastrectomy were the surgies with highest frequency in the study followed by right hemicolectomy.

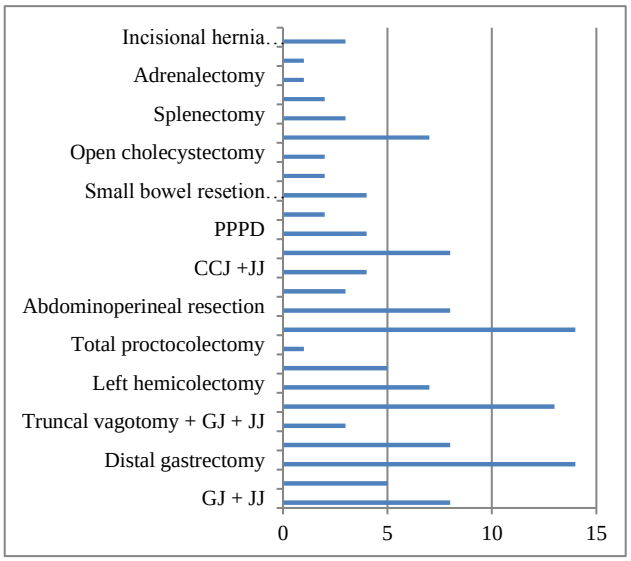

Figure 1: Surgeries included in the study.

Based on the site and system involved colonic surgeries were the commonest followed by gastric surgeries. All surgeries were clean contaminated wounds selected as per the description of the same. Two cases of hysterectomy with RSO was also included in the study.

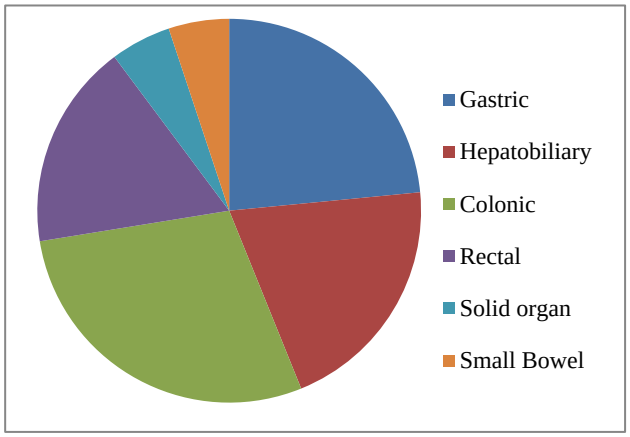

Figure 2: Distribution of the system involved.

Surgeries included all of the GI tract accessible through laparotomy except for lower esophagal surgery.28% were colonic surgeries, 23% were gastric surgeries, 20% were hepatobiliary surgeries, rectal surgeries constituted 17% cases, small bowel and solid organ involving surgeries were 5% each and hysterectomy came to around 2% of cases

In the primary closure group 8 wounds were infected, 5 infected wounds showed serous discharge 2 wounds had purulent discharge and 1 wound had wound dehiscence, whereas in the delayed primary suturing group 2 wounds were infected with purulent discharge from the wound.

The rate of SSI in primary closure group was 12.12% whereas it was 3% in following delayed primary suturing. At the end of the data collection the data was statistically analysed with chi square test.

Table 1: Chi square test.

	Infection	No infection	
Primary closure	8	58	66
Delayed primary	2	64	66
Total	10	122	

The chi square test showed a Chi square statistics of 3.8952 with the p value of 0.048428 showing that the result is significant. Suggesting that delayed primary closure has a lower rate of wound infection compared to primary closure in clean contaminated laparotomy wounds.

DISCUSSION

The prevalence of surgical site infection in case of clean contaminated and contaminated cases are around 10-20% in a setting of adherence to standard surgical technique.

Paul et al, in 1976 found the prevalence of wound infection in primary skin closure of 11.8% compared to 5.8% in delayed primary closure.[6] Olson M et al, found the prevalence of wound infection of 39% in primary skin closure compared to none in open wound treatment.[5] Delayed primary wound closure, for selected clean-contaminated or dirty wounds reduce significantly the rate of wound infection. Scott et al, studied the influence of wound closure on wound healing and found that, delayed primary closure or secondary closure of skin and subcutaneous fat in contaminated laparotomy incisions eliminates the risk of wound infection and incisional hernia.[7] Open wounds stimulate collagen synthesis and improve wound strength. Though it is proven beyond doubt by many studies that the delayed primary closure decreased the incidence of surgical site infection in contaminated and dirty wounds the rationale of the same in clean contaminated cases is still a subject of debate.[8] Forrester found that undisturbed open wounds heal better and dressings may therefore impair. the healing of open wounds by damaging the delicate new cells and capillaries on the wound surface. Therefore unless infected, wound dressings should not be changed.[9]

Table 2: Types of surgical wounds.[5]

Classification	Description	Infection rate%
Clean	Hernia, breast, hip surgeries etc	<2%
Clean contaminated	Elective entry of GI, Gynec, biliary, resp tract	<10%
Contaminated	Gross contamination/ spillage of GI tract, trauma wounds	<15-20%
Dirty	Infected surgery	<30-40%

Some studies in contrast showed that delayed primary closure wounds had an increased rate of infection the probable causes for the same were contamination from the surrounding skin and environment either due to exposure during ward rounds and delayed closure or due to cross infection in surgical wards which might act as confounding factors.[10] In the present study only clean contaminated were included and the results revealed a significant difference in the rate of surgical site infection with a decreased rate in cases with delayed primary closure.

As far as infective flora is concerned many studies have reported *Staphylococcus aurous* as the commonest isolate from the postoperative wound infection. In the our study, *Staphylococcus aureus*, *gram negative bacilli*, *pseudomonas aeruginosa* and *E.coli* were the organisms isolated.[11]

In this study the cases selected were clean contaminated cases and a total of 132 cases were taken and a total of 10 cases of surgical site infection were noted. 2 cases were in the delayed primary group and 8 cases in primary wound closure. Proper sterility and similar wound closure techniques were employed to close the rectus layer. The general conditions and the nutritional status were almost comparable though there was a range of age groups in the study.

Statistical comparison of the rates of infection showed lower rate of infection in delayed primary closure with a p value of 0.048 using chi square test. Authors therefore recommend a delayed primary closure after 48 hours for clean contaminated laparotomy wounds.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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