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Role of Delayed Primary Skin Closure in Preventing Superficial Abdominal Wound Infections in Peritonitis Patients

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Abstract

Background: The commonest complication encountered postoperatively is wound infection despite the use of prophylactic antibiotics and following meticulous surgical techniques. The rate of surgical site infection is higher in case of contaminated surgeries as compared to elective surgeries.

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

Methods: 50 patients who were above 18 years of age, admitted to our hospital through the emergency department and underwent exploratory laparotomy for perforated viscera, and the intraabdominal collection was included in this study.

Results: The cause of perforation was, 8(32%) cases of perforated appendicitis, traumatic perforation(8), ileal perforation(5) and duodenal perforation(4). In group A 17(68%) patients had wound infection and 10 (40%) had wound infection in group B. The distribution of wound infection in each respective subgroup with p-value. There was significant difference in stitch abscess formation and wound discharge between two groups (p-value< 0.05) i.e., 7(28%) patients of group A, developed stitch abscess while 6 patients developed wound discharge. However, no patient in group B developed stitch abscess and wound discharge. 1(4%) patient developed erythema in group A, while it was none in any patients of group B.

Conclusion: Delayed primary closure is better than primary closure in minimizing wound infection. But all patients who were grouped in delayed primary closure who underwent secondary closure had to stay more in hospital which is not cost-effective

Keywords: Superficial, Peritonitis, Abdominal wound infections, Skin closure

Introduction

The commonest complication encountered postoperatively is wound infection despite the use of prophylactic antibiotics and following meticulous surgical techniques.[1] The rate of surgical site infection is higher in case of contaminated surgeries as compared to elective surgeries. Surgical site infection (SSI) and its associated complications like wound dehiscence, stitch sinuses, incision hernias, hypertrophic scar, and keloid formation are not only a source of discomfort for the patients but also discouraging for the surgeon.[2] These complications prolong the postoperative stay of patient and

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increase the cost of treatment.[3] Primary closure technique of wound closure is simple as wound is closed primarily and no other procedure is widely practiced, there is disagreement among surgeons regarding the preferred technique for wound closure after contaminated surgeries. The rate of abdominal wound infection ranges from 15-70% in contaminated and dirty wounds.[4]

In order to control and reduce the rate of SSI various wound closure techniques and prophylactic measures have been tried by the surgeons but had vague results. The short term and long term complications, morbidity of patients following DPC and PC in peritonitis patients in our hospital have been studied and compared with previous studies. This present study would like to evaluate advantages and disadvantages of each of these techniques with regard to surgical site infections. Primary closure of the wound is the commonly practiced method in which skin is closed after wound irrigation at the end of the procedure.[5]

The role of ergonomics -advantages, disadvantages, duration of hospital stay, subsequent surgeries, expenditure, and morbidity in this study is minimal as this study is being conducted in government hospital.

MATERIALS AND METHODS

Department and Setting: This comparative study was conducted in the department of surgery in all units of Osmania general hospital.

Sample type and size: 50 patients who were above 18 years of age, admitted to our hospital through the emergency department and underwent exploratory laparotomy for perforated viscera, and the intraabdominal collection was included in this study.

Inclusion Criteria: patients of age 16-65 years of age and of both sexes were diagnosed with peritonitis.

Exclusion Criteria: Patients who have been diagnosed with spontaneous bacterial peritonitis and death of patients within 14 days, immunosuppressed like cancer therapy, steroids, diabetes, malnutrition were excluded from the study.

Method of Study: Equal number of patients with the diagnosis of a perforated appendix, ileal perforation, duodenal perforation, and traumatic visceral were randomized into two groups. In the study group (Group A), primary closure technique was used and in group B, delayed primary closure was utilized. During surgery, pus and abdominal secretions were taken for culture and sensitivity. The abdominal cavity was irrigated with 6 to 8 litres of normal saline. In group A, primary closure of the musculo-peritoneal layer was done and closed with prolene. The fascia was closed with proline and the skin was closed with interrupted prolene sutures. The wound was examined 48 hours post-operatively, followed by dressing. The stitches were removed on the 8th day. However, In group B of delayed primary closure, after the closure of Musculo peritoneal layers, the fascia and skin were sutured with loose prolene stitches and packed with iodine soaked gauze piece.

The stitches were removed in the 12th postoperative period. Empirically patients of both groups were given third-generation cephalosporin and metronidazole, these were changed accordingly depending upon thereof culture and sensitivity and continued for at least 10 days. All patients were followed for early postoperative complications like wound infection and late complications like wound dehiscence, stitch abscess, stitch sinus, wound gaping, Data related to causes of perforation and complications of contaminated surgery were collected in preformed format.

Statistical analysis: Data was entered in SPSS(statistical packages for social sciences) version 18 and frequencies, ratios, percentages were drawn for descriptive variables, and chi-square with p-value <0.5 has been calculated to see the significant difference between the two groups.

Observation and Results

Table 1: Distribution based on Gender

Gender	Group A	Group B	Total
Male	24	16	40
Female	1	9	10
Total	**25**	**25**	**50**

Male predominance was seen in both the groups. The Male female ratio of 2:1.

Table 2: Distribution based on Age group

Age Group	Group A	Group B	Total
15 – 20 yrs	2	2	4

Conti..Table 2 : Distribution based on Age group

Age Group	Group A	Group B	Total
21 – 30 yrs	13	11	24
31 – 40 yrs	5	6	11
41 – 50 yrs	4	3	7
51 – 60 yrs	1	3	4
Total	**25**	**25**	**50**

Majority of the patients belonged to the age group of 21 to 30 yrs, followed by 31 to 40 yrs. The Mean age was 33±30 years.

Table 3: Distribution based on causes of peritonitis

Causes of peritonitis	Group A	Group B	Total
Perforated appendicitis	8	8	16
Traumatic perforation	8	8	16
Ileal perforation	5	5	10
Duodenal perforation	4	4	8
Total	**25**	**25**	**50**

The causes of peritonitis was, Perforated appendicitis and traumatic perforation was seen in 32% of the cases each, Ilelal perforation was seen in 20% of the cases and duodenal perforation was seen in 16% of the cases.

Table 4: Distribution based on Causes of perforation

Causes of perforation	Group A n(%)	Group B n(%)	Total n(%)	p-value
Perforated appendicitis	5(62.5%)	4(50%)	9(56%)	0.573
Traumatic perforation	5(62.5%)	3(37.5%)	8(50%)	0.974
Ileal perforation	4(80%)	2(40%)	6(60%)	0.831
Duodenal perforation	3(75%)	1(25%)	4(50%)	0.589
Total	**17(68%)**	**10(40%)**	**27(54%)**	

The cause of perforation was, 8(32%) cases of perforated appendicitis, traumatic perforation(8), ileal perforation(5) and duodenal perforation(4). In group A 17(68%) patients had wound infection and 10 (40%) had wound infection in group B. The distribution of wound infection in each respective subgroup with p-value.

Table 5: Distribution based on Complications

Complications	Group A	Group B	Total	P-value
Stitch abscess	07(28%)	none	07(14%)	0.018
Stitch sinus	none	none	none	-
erythema	01(4%)	none	01(2%)	0.434
Serous discharge	06(24%)	none	06(12%)	0.033
Separation of deep tissue	05(25%)	02(8%)	07(14%)	0.590
Total	**19(76%)**	**02(8%)**	**21(42%)**	

There was significant difference in stitch abscess formation and wound discharge between two groups (p-value< 0.05) i.e., 7(28%) patients of group A, developed stitch abscess while 6 patients developed wound discharge. However, no patient in group B developed stitch abscess and wound discharge. 1(4%) patient developed erythema in group A, while it was none in any patients of group B.

Discussion

SSI can complicate nearly every operative intervention knowledge of the risk of infection, the microbiology of likely infections, and the effective preventive measures are necessary to minimize the potential for this complication in any individual patient SSI continues to be the most common complication following surgical procedures. These infections are the biological summation of several factors: the inoculums of bacteria introduced into the wound during the procedure, the unique virulence of contaminants, the microenvironment of each wound, and the integrity of the patient's host defense mechanisms.[6]

In the entire series, 33 patients developed wound infections. In the primary closure, the group wound infection rate was 54.4% while it was 12% in the delayed primary group. There was a significant difference between the 2 Groups regarding wound infection (p<0.001). This study showed that Delayed primary closure was more suitable for wound management for contaminated or dirty wounds. The most common diagnosis was perforated appendix (27%) followed by ileal perforation (24%), prepyloric (16%), duodenal (18%). And also showed that the mean postoperative 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.

The study conducted by Dutta Roy d, Jitendra j. et al demonstrated SSI developed after incision closure in 23% of patient's infections 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%. The wound infection rate was greater in the pc group than DPC. The duration of the hospital stay and hospital charges was similar between the two groups.

Previous studies	Rate of wound infection	Hospital stay in days
Chiang et al[7]	PC-38.9% DPC-2.9%	PC-6.3 DPC- 8.4
Duttaroy et al[8]	PC42.25 DPC2.57%	PC-18.5 DPC- 13.8
Stephen M.cohn et al[9]	PC-48% DPC-12%	Same hospital stay
Mukthar Ahmad et al[10]	PC-39.2% DPC-6.3%	PC-18.4 DPC-12.5
This study	PC-76% DPC-2% Nil or 0% For SSI (2% in DPC is separation of deep tissue not included in SSI)	PC- 20 +/-5 DPC- 25+/-5

Prevention of SSI can be achieved by several methods. The viable inoculums of bacteria in the wound can be reduced via better preoperative preparation of the surgical site, sound infection-control practice while performing operations and adherence to the principles of preventive antibiotic therapy. Modified surgical the technique can reduce the risk of hematoma, tissue injury, and Foreign bodies within the surgical site amplify the risk of infection for a given level of inoculums. Enhanced oxygen delivery, better core body temperature control, and rigorous blood glucose control in surgical patients are new areas that have the potential to even further reduce the rate of SSI. Although an SSI rate of zero may not be achievable, continued progress in understanding the biology of infection at the surgical site and consistent applications of proven methods of prevention will allow us to further reduce the frequency, cost, and morbidity associated with SSI. Along with broad-spectrum antibiotics and keeping the skin open for a few days to settle down the intra- abdominal infections and then going for secondary closure of skin have brought down the SSI dramatically.

Limitations

- Randomization was not possible due to intension to observe equal number of patients with identical aetiology.
- Sample size was very small with respect to individual group.
- However, the disadvantages of allowing exogenous bacteria such as staphylococci to contaminate the wound in ward before closure have been recognized.

Conclusion

Delayed primary closure is better than primary closure in minimizing wound infection. But all patients who were grouped in delayed primary closure who underwent secondary closure had to stay more in hospital which is not cost-effective, but being government hospitals and patients do have all services free of cost here, there will be less burden on patients. So present study recommends DPC as a preferential mode of skin closure in laparotomy wounds than pc in government setup like because of minimal complications. But in the private sector where ergonomics play a major role in the socio-economic condition of patient DPC proves to be costly, this study would recommend conventional pc for skin closure in laparotomy wounds than DPC in private sector hospitals.

Ethical Clearance: Ethical clearance was obtained from Government Medical College, Nalgonda, prior to the commencement of the study

Source of funding: Self.

Conflict of interest: Nil

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