Original Research Article

A Prospective Randomized Study of Comparison between Primary Vs Delayed Primary Skin Closure in Gastro Intestinal Perforation Peritonitis

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Abstract

Introduction: Peritonitis is one of the most common surgical emergencies encountered in day-to-day practice.

Aim: comparison of primary skin closure technique and delayed primary skin closure technique.

Methods: A prospective, randomized, single blinded trial of 60 patients was done in Department of General Surgery at the J.L.N. Medical College & Hospital, Ajmer from August 2021 to Dec 2022. In all the cases a detailed history, physical examination and investigation were done as per proforma.

Results: Demographic profile of our study population in both groups was statistically insignificant. Modified graham patch repair was done in 16 and 14 patients, primary repair was done in 10 and 11 patients, resection & anastomosis was done in 4 and 5 patients in Group PC and Group DPC respectively. Infection was seen in 11 patients of Group PC in comparison to 4 patients in Group DPC (p<0.05).)The mean duration of surgery was 115.17 ± 9.53 min in Group PC and 103.97 ± 7.81 min in Group DPC (p<0.0001). As per Southampton scoring system occurrence of SSI was significantly higher in Group PC as compared to Group DPC (p=0.005). Staphylococcus was the major organism grown in culture, The mean hospital stay was 15.13 ± 3.28 days in Group PC and 11.10 ± 2.09 days in Group DPC, which was significantly longer in Group PC as compared to group DPC (P<0.05).

Conclusion: the strategy of delayed primary wound closure seems to be significantly better than the primary closure in decreasing the rate of SSI without increasing the duration of hospital stay for those patients who had undergone exploratory laparotomy for contaminated wound.

Keywords: Primary Skin Closure, Delayed Primary Skin Closure, Gastro Intestinal Perforation Peritonitis.

Introduction

Peritonitis is one of the most common surgical emergencies encountered in day-to-day practice. The most common kind of peritonitis is secondary peritonitis, which results from the penetration of hollow organs. Although there have been improvements in diagnosis, surgical technique, antimicrobial therapy, and intensive care support, secondary peritonitis remains a potentially fatal surgical emergency that needs to be treated quickly for the best results. If nothing is done, it can lead to a serious bacterial peritonitis, which might lead to toxemia or circulatory collapse and even death.. Following surgery, primary closure (PC) and delayed primary closure (DPC) are popular techniques for closing the skin.[1,2] In contrast to DPC, which operates on the premise of delaying wound closure for three to five days in order to promote healing and the removal of the primary infection of the wound with the use of an appropriate dressing, PC entails the immediate suturing of the lesion. DPC has produced amazing results in terms of minimising contamination in soiled abdominal incisions, but independent research on its effectiveness in treating perforated duodenal ulcers is still lacking.[3,4]

Aim: comparison of primary skin closure technique and delayed primary skin closure technique.

Methods: A prospective, randomized, single blinded trial of 60 patients was done in Department of General Surgery at the J.L.N. Medical College & Hospital, Ajmer from August 2021 to Dec 2022. In all the cases a detailed history, physical examination and investigation were done as per proforma Patients of age between 18-70 years and all patients undergoing exploratory laparotomy for gastro intestinal perforation peritonitis were included and patients with Pregnancy, previously operated patients,

Immunocompromised patients, Patients with diabetes mellitus, Addiction to narcotics, Smoking, Hypertension, Suffering from psychiatric disorders and not willing to give consent were excluded from the study.

After thorough history taking, clinical examination and routine blood investigations, those patients meeting the above criteria and consenting for the study were included in the study. All patients were randomly based on odd even classified into two groups:

- Group A (n=30) – odd group. Primary closure technique was used.
- Group B (n=30) – even group. Delayed primary closure was done.

During surgery pus and abdominal secretions were taken for culture and sensitivity. Abdominal cavities were irrigated with 6 to 8 liters of normal saline. In group A, primary closure of Musculo peritoneal and facial layer was done followed by skin closure with sutures. Sutures were removed on the 15th postoperative day.

However, in delayed primary wound closure (Group B) after closure of fascial layer skin was packed with saline soaked gauze piece. The wounds were dressed for 3 -5 days. Later, on the following days skin was closed with tightening sutures. The sutures were removed after 15 days.

Patients in both the groups were started empirically on third generation cephalosporin and metronidazole and were changed according to culture and sensitivity results. The surgical site infections were assessed using Southampton scoring system on day 3, day 5, day 7, day 10, 2nd week, 3rd week, 4th week as well as within six months of surgery.

Duration of surgery was noted. All patients were followed for early postoperative complications like wound infection and

late complications like wound dehiscence, stitch abscess, stitch sinus, keloid or hypertrophic scar and incisional hernia over the period of six months after the surgery. Postoperatively pain was assessed by VAS score at 6 hours, 12 hours, 24 hours,1 week, 2week, 3 week, 3 months, and 6 months. At the initial level up to 24 hours the pain assessment will be with the use of analgesia. Preoperative and postoperative hospital stay was also noted.

Statistical Analysis

Analysis of data was done using SPSS software for windows (statistical package for social sciences, version 21.0). Categorical variables were summarized in frequency and percentages. Continuous variables were summarized using descriptive statistics such as mean, standard deviation. Statistical tests such as Independent Samples t-test, Chi-Square test, Pearson test for correlation were applied. our resulting p- value of <0.05, lead to rejection of null hypothesis and yielded statistically significant results.

Demographic profile of our study population in both groups was statistically insignificant.

The mean age of the group PC was 42.50 ± 12.36 year and 43.97 ± 15.44 year in group DPC (p=0.685). Male to female ratio was 18:12 in group PC and 16:14 in group DPC (p=0.602). ASA Physical Status I to II ratio was 17:13 in group PC and 18:12 in group DPC (p=0.793). Mean weight was 59.13 ± 10.25 in group PC and 60.90 ± 6.96 kg in group DPC (p=0.437). mean height was 160.60 ± 4.03 in group PC and 158.77 ± 5.90 cm in group DPC (0.216). mean BMI was 24.77 ± 4.52 in group PC and 24.13 ± 4.29 Kg/m^2 in group DPC (p=0.576). Maximum patients in both groups were presented within 6 hour of symptom onset. In Group PC 22 (73.33%) patients and in Group DPC 20 (66.67%) patients presented after 6 hours and 8 patients (26.67%) in Group PC and 10 patients (33.33%) in Group DPC presented within 6 hours. Both groups were comparable in this regard with insignificant p values (p=0.573). (Table-1)

Results

Table 1: Demographic profile and Duration of symptoms

Parameters	Group PC (n=30)		Group DPC (n=30)		p value (significance)
	Mean	SD	Mean	SD	
Age (years)	42.50	12.36	43.97	15.44	0.685 (NS)
Male/Female	18/12		16/14		0.602 (NS)
ASA (I/II)	17/13		18/12		0.793 (NS)
Weight (Kg)	59.13	10.25	60.90	6.96	0.437 (NS)
Height (cm)	160.60	4.03	158.77	5.90	0.216 (NS)
BMI (Kg/m^2)	24.77	4.52	24.13	4.29	0.576 (NS)
Duration of symptoms					
Time	No	%	No	%	P value
$\leq$ 6 Hrs	8	26.67	10	33.33	0.573 (NS)
$\geq$ 6 Hrs	22	73.33	20	66.67	

Values are expressed as mean±SD, ASA= American society of anaesthesiology, NS = non-significant

Peptic perforation was found in 16 and 14 patients, small intestine perforation in 9 and 12 patients, large intestinal perforation in 5 and 4 patients in Group PC and Group DPC respectively. Both groups were comparable in this regard with

insignificant p values (p>0.05). Modified graham patch repair was done in 16 and 14 patients, primary repair was done in 10 and 11 patients, resection & anastomosis was done in 4 and 5 patients in Group PC and Group DPC respectively. Both groups

were comparable in this regard with   insignificant p values (p>0.05). (Table – 2)

Table 2: Comparison of site of perforation and procedure done for repair between both the groups

Site of perforation	Group PC		Group DPC		χ^2 Value	P value (significance)
	No.	%	No.	%		
Peptic perforation	16	53.33	14	46.67	0.267	0.606 (NS)
Small intestine perforation	9	30.00	12	40.00	0.659	0.417 (NS)
Large intestine perforation	5	16.67	4	13.33	0.131	0.718 (NS)
Procedure for repair						
Modified graham patch repair	16	53.34	14	46.67	0.267	0.606 (NS)
Primary repair	10	33.33	11	36.67	0.073	0.787 (NS)
Resection and anastomosis	4	13.33	5	16.66	0.131	0.718 (NS)

Values are expressed as No. and percentages, S= significant, NS= non-significant

Exudation was seen in 15 and 13 patients, pus was seen in 10 and 11 patients, feculent matter was seen in 5 and 6 patients in Group PC and Group DPC respectively. Both groups were comparable in this regard with insignificant *p* values (p>0.05). In respect to postoperative surgical complication Hematoma and chronic pain were present in 3 and 1 patient in Group PC and Group DPC respectively, recurrence was seen in only 2 patients of group PC which were comparable in both groups. Infection was seen in 11 patients of Group PC in comparison to 4 patients in Group DPC which was statistically significant (p<0.05).)The mean duration of surgery was 115.17 ± 9.53 min in Group PC and 103.97 ± 7.81 min in Group DPC. The difference in the mean duration of surgery was significantly higher in Group PC as compared to Group DPC (p<0.0001). (Table – 3)

Table 3: Comparison of visible wound contamination, surgical complication and duration of surgery

Visible wound contamination	Group PC		Group DPC		P value (significance)
	No.	%	No.	%	
Exudative wound	15	50.00	13	43.33	0.605 (NS)
Pus	10	33.33	11	36.67	0.787 (NS)
Feculent matter	5	16.67	6	20.00	0.739 (NS)
Surgical complication					
Hematoma	3	10.00	1	3.33	0.772 (NS)
Infection	11	36.67	4	13.33	**0.037 (S)**
Chronic pain	3	10.00	1	3.33	0.301 (NS)
Recurrence	2	6.67	0	0.00	0.150 (NS)
Duration of surgery (min.)	115.17 ± 9.53		103.97 ± 7.81		<0.0001 (S)

In respect to delayed complications Surgical site infection was seen in 7 patients of Group PC only and fascial dehiscence was seen in 5 patients of Group PC only which was significantly higher in primary closure group. Incisional hernia was seen in 5 and 2 patients of Group PC

and DPC respectively and keloid/hypertrophic scar was seen in only 1patient of Group PC which statistically insignificant (p>0.05). **(Table -4)**

Table 4: Comparison of delayed complication of surgery

Delayed surgical complications	Group PC		Group DPC		χ^2 Value	P value (significance)
	No.	%	No.	%		
SSI	7	23.33	0	0.00	7.925	0.005 (S)
Fascial dehiscence	5	16.67	0	0.00	5.455	0.019 (S)
Incisional hernia	5	16.67	2	6.67	1.456	0.228 (NS)
Keloid/ hypertrophic scar	1	3.33	0	0.00	1.017	0.313 (NS)
Total	18	60.00	2	6.67	60	100

According to Southampton scoring system of surgical site infection. There were 2 patients in grade I and II & 1 patient in Grade III, IV and V respectively. There were only 3 patients with surgical site infection seen in Group DPC. Occurrence of SSI was significantly higher in Group PC as compared to Group DPC (p=0.005). (Table – 5)

Table 5: Comparison of Surgical site infection assessment according to Southampton scoring system between PC and DPC groups

No of patients according to grade	Group PC (n=50)		Group DPC (n=50)		p value
	No.	%	No.	%	
Grade I	2	6.67	3	10.00	0.038 (S)
Grade II	2	6.67	0	0.00	0.301 (NS)
Grade III	1	3.33	0	0.00	0.313 (NS)
Grade IV	1	3.33	0	0.00	
Grade V	1	3.33	0	0.00	

On Comparison of wound/ pus culture between both groups no growth was seen in 19 patients of Group PC and 27 patients of Group DPC which was statistically significant (p=0.015). Growth of microorganism was seen in 7 and insignificant growth in 4 patients of Group PC and 3 patients (p=0.015). Staphylococcus was the major organism grown in culture (3 & 2 patients) followed by E Coli (1 &0 patients), enterococci (1 & 1 patients), klebsiella (1 &0 patients) and mixed (1 &0 patients) in Group PC and group DPC respectively. (Figure -1)
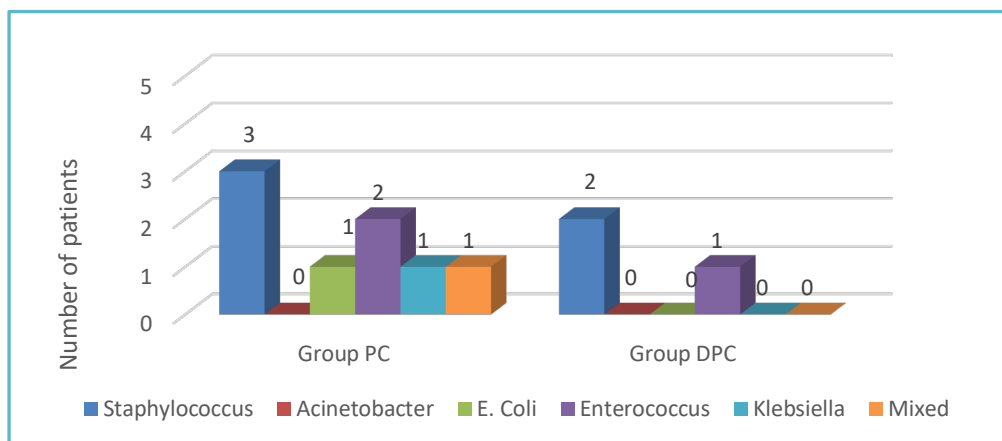

Figure 1: Microbes grown in culture

Both the groups were comparable in terms of mean total leucocyte count at 6hr, 12hr, 1 week, 2 week and 4 weeks postoperatively. (P value >0.05).

The mean hospital stay was 15.13 ± 3.28 days in Group PC and 11.10 ± 2.09 days in Group DPC, which was significantly longer in Group PC as compared to group DPC (P<0.05). There was no significant difference in the mean VAS score between the two groups at all time interval, (P> 0.05) except at 1st week and 2nd week where the difference in mean VAS score was significantly higher in Group DPC as compared to Group PC. The mean duration of requirement of analgesia was 4.13 ± 0.82 weeks in Group PC and 4.07 ± 0.78 weeks in Group DPC which was comparable in both groups (p>0.05).

Discussion

In our study there was no significant difference in demographic profile i.e., both Group PC and Group DPC were comparable with respect to age (42.50 ± 12.36 and 43.97 ± 15.44 years, p= 0.685), sex M/F (18/12 and 16/14, p= 0.602), weight (59.13 ± 10.25 and 60.90 ± 6.96 kgs, p = 0.437), Height (160.60 ± 4.03 cm and 158.77 ± 5.90 cm, p= 0.216), BMI (24.77 ± 4.52 and 24.13 ± 4.29 Kg/m2, p= 0.576) and ASA physical status I/II (17/13 and 18/12, p =0.485) respectively. In our investigation, a slight male preponderance was seen. In our study majority of patients belongs to 20 – 60 years, 27 patients in Group PC And 24 patients in Group DPC.

In the study done by Gupta S et al[5] mean age was patients age was 37.37 ± 11.87 years with male preponderance. Singh V et al[6] also showed that both groups were similar with respect to age and gender as well as indication for surgery.

In our study Hematoma and chronic pain were present in 3 and 1 patient in Group PC and Group DPC respectively, recurrence was seen in only 2 patients of group PC which were comparable in both groups, p>0.05. Infection was seen in 11 (36.67%) patients of Group PC in comparison to 4 (13.33%) patients in Group DPC which was statistically significant (p<0.05). Among the delayed

complications surgical site infection was comparatively higher in Group PC as compared to Group DPC as 7 patients (23.33%) had SSI whereas no patients had SSI in Group DPC (p=0.0050. Fascial dehiscence was seen in 5 (16.67%) patients in Group PC and no patients in Group DPC, P=0.019. Incisional hernia was seen in 5 (16.67%) patients in Group PC and 2 (6.67%) in Group DPC (p=0.228). keloid/hypertrophic scar was seen in only 1 patient in Group PC (p=0.313).

Sashikumar MN et al[7] showed 55.7% infection rate in their study. On comparing primary wound closure and delayed wound closure with respect to rate of wound infection, it was seen that there was a significantly higher rate of infection after primary wound closure as compared to delayed primary wound closure (77.4 vs 34%, p value=0.001).

Incidence of incisional hernia in the Sashikumar MN et al[7] study was 8.5%, with 7.5% in primary suture group and 9.4% in the delayed primary suture group, though not statistically significant. Similarly Aziz et al also showed higher incidence of incisional hernia in primary closure group (25% vs 8%), contrary to the current study.8 The findings could differ since the patients were heterogeneous and underwent different types of surgeries.

According to Southampton scoring system of surgical site infection out of 7 patients in Group PC, 2 patients in grade I, 2 patients in grade II and 1 patient in each of grade III, IV and V respectively whereas in group DPC surgical site infection was of grade I in all 3 patients. In our study out of 7 patients of group PC, all patients were culture positive and 4 patients presented insignificant growth.

Staphylococcus was seen in 3 patients, E. coli in 1, enterococci in 2, klebsiella in 1 and mixed infection was seen in 1 patient in Group PC. In the study done by Singh V et al[6] when compared to delayed closure,

the wound infection rate following primary closure was significantly greater (77.7% vs. 44.4%).

In contrary to our results in the study done by Gupta S et al[5] SSI score in both the groups was evaluated according to Southampton wound Scoring system It was found that Mean SSI score in PC and DPC was comparable (2.67 ± 1.58 vs. 2.0 ± 1.61, P=0.058) with culture growth showing less cases with DPC as compared to PC, however the difference failed to reach statistical significance. The findings were relatively in line with some of the previous studies.[9] Both the PC and the DPC wound/pus cultures were positive, with a statistical closeness between them at 62.22% and 46.67%, respectively.

In our study mean hospital stay was significantly lesser in Group DPC 11.10 ± 2.09 days as compared to Group PC where the mean hospital stay was 15.13 ± 3.28 days, p<0.0001. In the Chiang RA et al[10] study the LOS for each readmission was added to the LOS of the patient's previous admission. There was no readmission in the DPC group. Analyzing the LOS, there was significant difference between both groups (DPC 6.3 ± 0.7 days vs. PC 8.4 ± 0.9 days, p = 0.038).

Conclusion

From our study we concluded that However, DPC is a tedious, cumbersome and invasive task because of its daily routine of wound dressings and late sutures and PC is an easy one-day task with more acceptance to the patients, there was significant reduction in the rates of wound infection when delayed primary closure of contaminated wounds has been followed. Therefore, the strategy of delayed primary wound closure seems to be significantly better than the primary closure in decreasing the rate of SSI without increasing the duration of hospital stay for those patients who had undergone exploratory laparotomy for contaminated wound.

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