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Original Article

"Comparison of Purse String Closure Versus Primary Linear Closure with Closed Suction Wound Drain Following Ileostomy Stoma Reversal in Terms of Stoma Site Infection and Cosmetic Outcomes"

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ABSTRACT

Objective: To compare "purse string closure" versus "primary linear closure with closed suction wound drain" following ileostomy stoma reversal in terms of stoma site infection and cosmetic outcomes.

Study Design: Quasi-experimental study

Place and Duration of Study: Department of General Surgery, Combined Military Hospital Rawalpindi, Pakistan from May 2022 to Feb 2023.

Methodology: Patients who were scheduled to be operated on elective list for the reversal of their ileostomy stoma were included in the study. Patients were randomly divided into "purse string closure" group (Group-A) and "primary linear closure with closed suction wound drain" group (Group-B). Patients were called for physical follow up on day 30 after the surgery to assess them for presence of "stoma site infection" and "cosmetic outcome".

Results: Mean age of our study pool was 30.76±8.09 years. There were 68(72.30%) male participants while remaining 26(27.70%) participants were female. Composite frequency of stoma site infection in our study was 7(7.40%). Frequency of stoma site infection in Group-A was 1(2.12%) while in Group-B it was 6(12.76%), (p = 0.049). median POSAS score in Group-A was 2.00 (1-4) while in Group-B, median POSAS score was 3.00 (2-4), (p = 0.004).

Conclusion: Purse string closure technique for reversal of ileostomy is a better alternative to primary linear closure with application of closed suction drain on the operative wound, both in terms of stoma site infection as well as cosmetic outcome.

Keywords: Infection, Ileostomy Reversal, Primary Linear Closure, Purse String Closure, Stoma.

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INTRODUCTION

A wide variety of intestinal injuries require exploration including intestinal trauma, infectious perforation, bowel obstruction due to fecal matter. The small bowel is the organ that is more prone to injury than colon [1]. After a patient has suffered intestinal obstruction, perforation or injury, the usual methods for determining the extent of bowel injury include X-rays of the abdomen, abdominal ultrasound, peritoneal lavage, computed tomography and exploratory laparoscopic surgery [2,3]. Once a diagnosis is made, immediate management involves exploration of the abdominal cavity to physically determine as well as repair the damaged part and forming a temporary stoma to avoid potentially life threatening complications[4]. However, there are multiple complications that are associated with the stoma itself including infection of the stoma site, retraction of the formed stoma and/or necrosis of the formed stoma which can result in high rates of post-surgical morbidity and even higher risk of failure of procedure and re-operations [5]. A number of patient factors as well as external factors related to care prior to, during and after the surgery, the technique by which skin is closed, how much sterility of the surgical environment is ensured and care of the wound after the surgery, all affect the risk of infection[6].

Stoma infection is common and is linked to higher costs for medical care, higher rates of hospitalization and higher rates of prescription of drugs which may contribute to higher risk of developing surgical morbidity, poor cosmetic outcomes and lower quality of life.[7] To prevent this one important technique is choosing an appropriate technique for closing the skin after reversal of stoma surgery. For this purpose multiple techniques have been introduced including "purse string closure" and "primary linear closure with closed suction wound drain" but consensus has not yet been established to

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decide best possible technique of skin closure, with studies favoring one over the other and vice versa.[8]

Based on this we aimed to conduct this study with the objective of comparing "purse string closure" against "primary linear closure with closed suction wound drain" for reversal of ileostomy stoma to find out best technique of skin closure to minimize the frequency of developing infection of the stoma site as well as ensuring an encouraging and favorable cosmetic outcome to improve the overall quality of life and satisfaction level of the patient.

METHODOLOGY

We conducted this study (IERB approval certificate number: 353) on the patients presenting at the outdoor surgical department of Combined Military Hospital, Rawalpindi, Pakistan from May 2022 till Feb 2023. The sample size was calculated by utilizing WHO sample size calculator by assuming level of significance of 10%, power of the test 80%, anticipated frequency of stoma site infection in "purse string closure" group of 2.9% and anticipated frequency of stoma site infection in "primary linear closure with closed suction wound drain" of 21.8% [9]. Our calculation gave us a sample size of 94 [47 patients in each group]. All of our patients followed up with us during the study period. Formula that was used to determine the sample size was.[10]:

$$n = \frac{\left\{ z_{1-\alpha/2}\sqrt{2\bar{P}(1-\bar{P})} + z_{1-\beta}\sqrt{P_1(1-P_1)+P_2(1-P_2)} \right\}^2}{(P_1 - P_2)^2}$$

In order to be selected for being part of this study we set a strict inclusion and exclusion criteria.

Inclusion Criteria: Patients aged more than eighteen years, both male or female gender, scheduled to be operated on elective list for the reversal of their ileostomy stoma were included in the study.

Exclusion Criteria: Patients who fulfilled any of the following criteria: coagulation disorders, immune compromised state, diabetes, steroid use due to any autoimmune or rheumatological condition, patients who were on chemotherapy for any malignancy, patients who did not complete the follow up and those who had any other additional surgery were excluded.

Patients were selected by using non-probability consecutive sampling technique. Once the study pool was selected, all the baseline characteristics of included participants including their age and gender were documented. After that patients were randomly divided into two equal groups by writing their medical registration number on a paper lottery and then picking up lottery paper one by one. Group-A included 47 patients who underwent "purse string closure" while Group-B included 47 patients who underwent "primary linear closure with closed suction wound drain".(Figure 1)

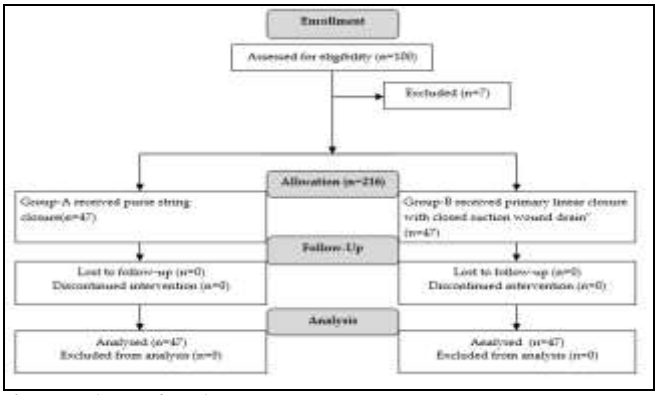

Figure-1: Phases of Study

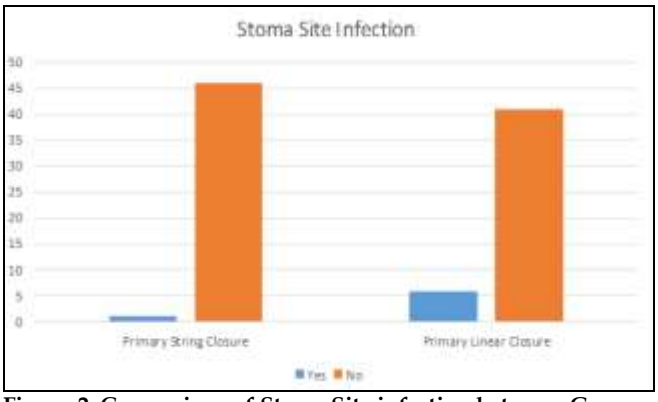

Figure-2: Comparison of Stoma Site infection between Groups

It was made sure that all the surgeries were performed by same surgical team. For performing the ileostomy reversal, after ensuring sterile conditions and appropriate anesthesia, an incision was made in the elliptical fashion around the stoma so that the loop of ileum could be released. After that another cut was made which was of spindle shape with a small margin of about one to two millimeters from ileostomy in both the groups followed by end-to-end anastomosis and closure of fascia. However, for closing the skin in purse string closure group Vicryl 0/2 sutures were used and the skin was closed by using sub-cuticular technique while in "primary linear closure with closed suction wound drain, Prolene 3/0 sutures were used and the skin was closed using interrupted suture technique.

Once surgery was completed, all patients were given appropriate care in the ward till their discharge from the hospital. Patients were followed up after surgery through telephonic consultation till 29th post-operative day and were called for physical follow up on day 30 after the surgery to assess them for presence of stoma site infection and cosmetic outcome. Stoma site infection was defined as presence of pus or any discharge at the stoma site, which is accompanied by pain, fever, raised white blood cell count (> 11000), swelling and erythema.[11] To assess the cosmetic outcome, patient component of Patient and Observer Scar Assessment Scale (POSAS) was used.[12] To assess the score, we first asked all six questions from the patient and documented the patient reported score of each component (from 1-10; with 10 being worst). After that we added the component score and divided that score with 6 to achieve a composite score ranging from 1-10 (in round figures). Lower the score better was the cosmetic outcome.

Data was analyzed by using Statistical Package for Social Sciences (SPSS) 22.00. To check whether the data was normal or non-normal, Shapiro-Wilk test 13 was used which showed that age was normal data while POSAS score was non-normal data. Quantitative data was represented using mean with standard deviation and the median (IQR). Qualitative data was represented by using percentage and frequency. Chi square test (for qualitative variables),unpaired t-test (for normalvariables) and Mann whitney U test (for non normalvariables) were applied and $p \leq 0.05$ was taken as significant.

RESULTS

The study included 94 patients [47 patients in "purse string closure" group (Group -A) and 47 in "primary linear closure with closed suction wound drain" group (Group -B)]. The mean age of whole study pool was 30.76±8.09 years, there were 68(72.30%) male participants while remaining 26(27.70%) participants were female.

The mean age of the patients between the two groups was analyzed using independent t-test. The mean age in "purse string closure" group was 31.55 ± 8.19 years while in Group-B mean age was 29.97±7.99 years, (p = 0.348). In Group-A (n = 47), frequency of male patients was 35(74.47%) and of female patients was 12(25.53%) while in Group-B (n = 47), 33(70.21%) were male patients while 14(29.79%) were female patients, (p = 0.645). This comparison of baseline characteristics between the two groups is exhibited in Table-I below:

Composite frequency of stoma site infection in our study was 7(7.40%). The frequency of stoma site infection between "purse string closure" group (Group-A) and "primary linear closure with closed suction wound drain" group (Group-B) was analyzed using Chi-square test. The frequency of stoma site infection in "purse string closure" group was 1(2.12%) while in "primary linear closure with closed suction wound drain" group it was 6(12.76%), (p = 0.049). This is represented in Figure 2 below:

The median POSAS score in "purse string closure" group was 2.00 (1-4) while in "primary linear closure with closed suction wound drain" group median POSAS score was 3.00 (2-4), (p = 0.004). It is summarized below in Table-II

Table-I: Comparison of Baseline Characteristics among Groups (n = 94)

Characteristic	Group-A Purse string closure group (n = 47)		Group-B Primary linear closure group (n = 47)		*p*-value
Age (Years)	31.55 ± 8.19		29.97 ± 7.99		0.348
Gender	Male	Female	Male	Female	0.645
	35 (74.47%)	12 (25.53%)	33 (70.21%)	14 (29.79%)	

Table II: Comparison of POSAS Score Between Groups (n=94)

Variable	Group-A Purse string closure group (n = 47)	Group-B Primary linear closure group (n = 47)	*p*-value
Median POSAS Score	2.00 (1-4)	3.00 (2-4)	0.004

DISCUSSION

This study primarily compared "purse string closure" and "primary linear closure with closed suction wound drain" techniques with special focus on these two variables that dictate the surgical outcome. Purse string closure technique for reversal of ileostomy was found to be a better alternative to primary linear closure with application of closed suction drain on the operative wound, both in terms of stoma site infection as well as cosmetic outcome. Injuries to the small bowel are the third most prevalent type of injury. It has been reported that among all injuries, small intestinal perforation is not that common and is present in just 0.06% and 0.08% of emergency admissions for trauma care, respectively.[14,15] Technique for closing the skin after

the reversal of stoma is an important parameter that has proven impact on the surgical outcome in terms of frequency of infection at the site of stoma as well as patient satisfaction in terms of cosmesis.[16,17] In our study, there was no significant variation of mean age between the patients of both study groups. In our study, male patients were much more than female patients. This may be due to the fact that abdominal trauma and subsequent bowel injury is more common in men than in women.[18] However, gender difference was not significant statistically.

In terms of infection rate of the stoma site was much higher in study group where "primary linear closure with closed suction wound drain" technique was used as compared to group in "purse string closure" was performed. This difference in the frequency of stoma site infection was significant. This was the case in studies conducted by O'Leary *et al.*[19] and Bains *et al.*[20] both of which reported that significant difference was observed between these two techniques in terms of frequency of infection of the stoma site. However, this was not the case in the study conducted by Lee *et al.*[21] who reported that this difference was insignificant statistically. Additionally, the overall frequency of stoma site infection in "primary linear closure with closed suction wound drain" was quite low which was also reported by Hong *et al.*[22] In terms of cosmetic outcome, we observed that significantly better cosmesis was attained with "purse string closure" technique. This was congruent with what was observed in a study conducted by Bains *et al.*[20]

Purse string closure technique for reversal of ileostomy, based on the findings of our study, appears as a better alternative to primary linear closure with application of closed suction drain on the operative wound, both in terms of stoma site infection as well as cosmetic outcome. However, we recommend that further studies should be conducted in this regard to decide best possible technique for closure of skin after reversal of stoma that provides most favorable surgical outcome.

CONCLUSION

Purse string closure technique for reversal of ileostomy is a better alternative to primary linear closure with application of closed suction drain on the operative wound, both in terms of stoma site infection as well as cosmetic outcome.

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

MDY & KM: Data acquisition, data analysis, critical review, approval of the final version to be published.

MS & WU: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

MI & UN: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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