# Comparison of Purse String Versus Conventional Closure of Ileostomy Skin Wounds

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*Abstract-* **Background-** Ileostomy closure is common surgical procedure done in most center across the globe. The aim of the study was to compare the purse string(PS) versus conventional linear closure(CLC) of ileostomy skin wounds in the incidence of Surgical Site Infection (SSI) following the stoma reversal. The secondary aim was to compare the cosmetic outcome following the two techniques, and also to identify other factors (such as duration of the operation and the postoperative stay, medication and complications) that might affect wound healing.

**Methodology**- An open, single center randomized controlled study was conducted at P.G.I.M.E.R., Dr.R.M.L. Hospital, New Delhi from November 2014 to January 2016.A total 31 cases were enrolled and divided into two groups according to the stoma closure technique: PS group (n=16) and the CLC group (n=15). Short-term outcomes were tabulated including surgical site infection and long-term outcomes were compared with patient satisfaction scale.

**Result-**SSI occurred in 5 of 31 patients (16.13%) and was more frequent in the CLC group than in the PS group (5/15 = 33.33% vs. 0/16 =0%, P=0.018). The mean patient satisfaction score was higher in the purse string group 20(range,14-24) vs. the conventional linear closure group 16.9 (range,13-21), P>0.05. The mean value of healing time for PS group is 23.94 days and for CLC group is 25.13 days (p>0.05).

**Conclusion**-Based on this study PS closure of ileostomy showed comparable outcomes in term of wound infection rate to those of CLC, however in terms of cosmesis there was greater patient satisfaction. Thus PS closure could be a good alternative to CLC.

*Index Terms*- stoma reversal, surgical site infection, purse string, patient satisfaction

## I. INTRODUCTION

Ileostomy is derived from two Greek words, *eilos* (twisted bowel)[1] and *stoma* (mouth)[2], literally translated to mean a hole in the twisted part of the bowel, i.e. the ileum. An ileostomy is a procedure in which the small intestine is fixed to the anterior wall of the abdomen so that the digestive waste bypasses the large intestine and exits the body through an opening created artificially called as a stoma. Depending upon the reason for the surgery, it may be temporary or permanent. A stoma can be created to provide diversion to intestine contents for both emergency and elective procedures.

Ileostomy closure is a synonym for ileostomy reversal or ileostomy takedown procedure. These terms imply that the patient with a stoma still has a complete digestive tract that can be restored to its original shape and function.

Morbidity in a patient after ileostomy closure is, however, not negligible, with the most common complication being surgical site infection (SSI)[35], having a reported incidence ranging from 0 to 41 percent[3,4,5]. This morbidity on individual patients leads to a slower return to normal day to day activity and can result in significantly increased costs for healthcare providers, including extra stay in hospital, increased use of antibiotics and other products, and added nursing costs in the society. PS was found to be better for reducing incidence of SSI.[6,7]

Banerjee[8] described a method of wound closure after ileostomy take down that appeared to have a lower SSI rate as compared to the conventional linear closure. Sutton et al refined this method and performed a short series of successful SSI-free closure.

Banerjee's method, was coined as the 'purse-string' closure, which involves mobilizing the stoma by making an incision at the mucocutaneous junction around its whole circumference. The stoma is then released from the subcutaneous fat and fascia layers, closed and returned into the abdomen. The fascial layer is closed and a purse-string suture is then taken in the subcutaneous layer, and approximation done. The resulting small defect in the skin is left open which can be loosely packed with a gauze. If a non-absorbable suture is used, then it needs to be removed approximately 2 weeks after reversal. The purse-string technique therefore is a combination of the concept of leaving the wound open to provide drainage and minimize SSI, while at the same time providing wound apposition to decrease the time for healing of wound.

Reid et al.[9] reported that a randomized prospective study done on 61 patients who had undergone ileostomy reversal by dividing them into groups in which wound closure had been performed by conventional linear skin closure (n = 31) and those in which purse-string skin closure had been performed (n = 30). In the purse-string skin closure group, SSI was 6.7% (2 cases), which was significantly less as compared to those with the linear skin closure group (38.7%, 12 cases).

## II. METHODS

All patients who came to RML Hospital for ileostomy reversal from November 2014 to January 16 were considered for

the study. Data for the study was collected after an informed consent by patients. The sample size was determined by using a mathematical formula for dichotomous variables according to proportion. The study was approved by the Ethics Committee of the hospital.

## III.   OPERATIVE TECHNIQUE

As the *linear skin closure* technique, an elliptical incision was made around the ileostomy, and after releasing the ileostomy from the abdominal wall, a simple closure, resection and hand-sewn end-to-end anastomosis, or a resection and stapled side-to-side anastomosis was done depending on the choice of the surgeon. Afterwards, a layer-to-layer linear closure of the fascia of the rectus abdominis muscle, subcutaneous tissues, and the skin was done.

As the *purse-string skin closure* technique, a circumferential incision was made around the stoma, and adhesiolysis and anastomosis was performed as in the linear skin closure technique. Linear closure of the fascia of the rectus abdominis muscle was done. Subcutaneous tissues were closed. Purse-string suture was taken on the dermal layer with absorbable sutures and skin approximated.
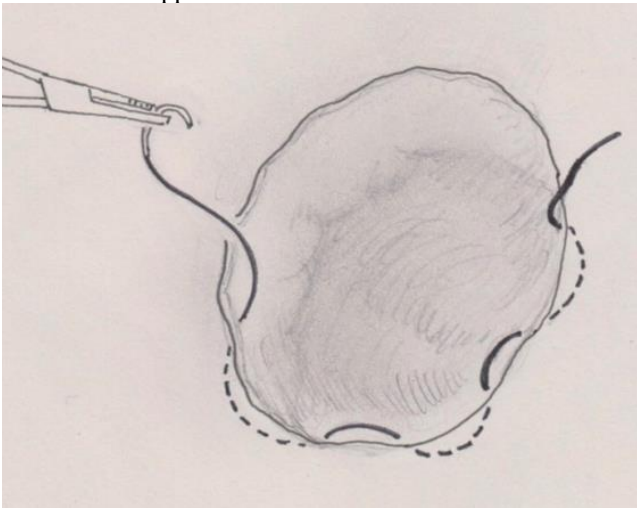


**Figure 1: Illustration showing the operative procedure for the purse-string closure.**

**Short term variables:**
- surgical site infection (SSI)
- purulent discharge
  - culture
  - signs & symptoms of infection

The incision site was assessed on day 1, day 3 and at the time of discharge by the surgeon at time of hospitalization, and after discharge patients were assessed in the surgery OPD on 10th day, 01 month and 03 months after the procedure.

Evidence of wound infection (cellulitis, induration, purulent discharge) was noted and if infection was present, wound was all opened in its full length at the bedside to allow it to drain and packed with sterile gauze daily until completely healed.

Wound cultures were not performed routinely and antibiotics were not routinely used. Dressing change was continued after discharge of patient at his/her home.

**Long term variables:**

To quantify the patient's satisfaction with their ileostomy site scar and overall wound healing, a scoring system was developed. Patients were contacted by phone and answers to a standard questionnaire noted Factors which were assessed included patients' satisfaction with appearance of the scar, expectations regarding the scar, level of postoperative pain, time of wound healing, difficulty of wound care, and limitation of activity. A score of 1 to 5 was assigned for each factor, with the higher scores indicating better results.

Accordingly, an overall final score of 6 to 30 was possible, with 6 representing the worst outcome and 30 representing the best possible outcome.

**Patients satisfaction:**

Patient wound healing satisfaction scale which was on the basis of-

a)   Cosmetic aspect

b)   Patient's expectation

c)   Post- op pain

d)   Time of healing

e)   Wound care

f)   Return to normal activity

## IV.   STATISTICAL ANALYSIS

Categorical variables were presented in number and percentage (%) and continuous variables were presented as mean ± SD and median. Normality of data was tested by Kolmogorov-Smirnov test. The non-parametric test was used when the normality was rejected.

Statistical tests were applied as follows-

1. Quantitative variables were compared using Unpaired t-test/Mann-Whitney Test (when the data sets were not normally distributed.) between the two groups.

2. Qualitative variables were compared using Chi-Square test /Fisher's exact test.

A p value of $<0.05$ was considered statistically significant.

**Figure 2: Purse-string wound closure.**



**Figure 4: purse -string closure-10th day after closure of the ileostomy.**



**Figure 3: Purse-string final wound.**



**Figure 5: conventional linear closure- 10th day after closure of ileostomy.**

**Figure 6: purse-string closure- 3 month after closure of the ileostomy**



**Figure 7: conventional linear closure- 3 month after closure of the ileostomy.**

**Table II-Patient characteristics (n=31)-**

| [1]   Characteristics | CLC (n=15) | PS (n=16 ) | P – value |
|---|---|---|---|
| Age, years | 36.73(19-54) | 36.75(19-57) | 0.908 |
| Sex | | | |
| Male:female | 8:7 | 12:4 | |
| Body mass index (kg/m$^2$) | 23.27(15-30) | 22.56(16-29) | 0.552 |
| ASA score | | | 0.064 |
| I | 9 | 11 | |
| II | 2 | 5 | |
| III | 4 | 0 | |
| Pre-operative albumin | 4.07(3.4-4.9) | 4.07(3.6-4.8) | 0.977 |
| Pre-operative co-morbidities | | | |
| Diabetes | 2 | 0 | 0.226 |
| Cardiovascular disease | 0 | 0 | |
| COPD | 5 | 1 | 0.083 |
| Steroid use | 0 | 0 | |
| Alcohol use | 1 | 0 | 0.484 |
| Smoking | 3 | 4 | 1.000 |
| Liver disease | 0 | 0 | |

All the continuous variables are expressed as mean. CLC- conventional linear closure, PS-   purse string, ASA-American Society of Anesthesiology, COPD- chronic obstructive pulmonary disease.

**Table III-variation related to stoma closure-**

| Variable | CLC (n=15) | PS (n=16) | P-value |
|---|---|---|---|
| Mean time of primary surgery to stoma closure(days) | 108.6(94-124) | 104.75(94-119) | 0.206 |
| Mean duration of hospital stay (days) | 5.53(4-8) | 5.25(4-7) | 0.464 |
| Mean operative time (min) | 101.33(70-144) | 101.0(72-132) | 0.812 |
| Wound length (cm) | 5.8(4-8) | 0.59(0.5-1.0) | < 0.0005 |
| Time of complete healing (days) | 25.13(21-32) | 23.94(19-32) | 0.365 |
| Surgical site infection | 5(33.33%) | 0 | 0.018 |

## V.  RESULTS-

Study comprised of 31 patients. Mean age of the patients was 36.74 years (range,19 -57). 11 were female (35.48 %) and 20 (64.52 %) were male. Mean interval between creation of ileostomy and ileostomy closure was 106.68 days (range,94 -124). Mean BMI at the time of ileostomy closure was 22.91 (range,15-30). Mean duration of hospitalization was 5.39 days (range, 4-8).

**Short term outcomes-** CLC was performed in 15 patients (48.39 %) and PS in 16 (51.61%). There were total 15 patients in CLC group, out of which 5 patients (33.33 %) had SSI. There was no SSI found in PS group. The infection rate was statistically significant (p = 0.018) for both groups. Mean value of wound length (cm) for CLC group was 5.8 and 0.59 for PS group which was statistically significant (p < 0.0005). All wounds were healed at the time of second visit in the department. There were no statistically significant differences of age, sex, BMI, ASA score, operative time, duration of hospital stay, healing time, post-op complications and the time of primary surgery to stoma closure between PS and CLC group.

**Long term outcomes-**

21 out of the 31 (67.74 %) study patient completed the patient's satisfaction questionnaire.  Mean values of satisfaction score for CLC group was 16.9 (range 13 to 21) and for group PS, it was 20 (14 to 24).  PS group patients reported higher scores for all the questions. However, there was no statistically significant difference between the questions for both group (p > 0.05).

## VI.  DISCUSSION

Based on the method of closure technique used, the SSI rates varies from 0 % to 41 %. Primary linear closure, secondary delayed closure, and purse-string closure have been introduced as different methods for closure of stoma. In our randomized controlled trial, the SSI rate was 33.33% after CLC, and there was no incidence of SSI in the PS group.

Several studies have been reported on the rate of SSI following ileostomy closure with primary wound closure, partial wound closure, purse-string closure and open wound treatment for secondary healing[3,5,10,11.]

In our study, there were no significant difference of age, sex, BMI, and American Society of Anesthesiology (ASA) scores.

In a retrospective study by, Marquez et al.[12] comparing primary closure with PSS, demonstrated a lower rate of SSI in the PSS group (n = 17) compared with the CLC group (n = 61). In contrast, in a retrospective study by, Vermulst et al.[5] found no difference in the incidence of SSI following different skin-closure techniques. However, they analyzed the SSI rates following colostomy and ileostomy takedown, which to an extent limits the interpretation of the data [5]. Milanchi et al. published prospective, nonrandomized data comparing surgical site infection following different stoma-closure techniques and demonstrated SSI rates of 40% in a DS group and 0% in a PSS group[11]. In 2010 a study by Reid et al.[9] through a randomized controlled trial of 61 patients comparing PSS with DS gave results that were comparable with the findings of the present study with an SSI rate of 39% in the DS

group compared with 7% in the PSS group (P = 0.005) [9]. In a study by Sutton et al. there was no case of SSI in 52 patients, all of them underwent a PSS type of closure. The 7% infection rate in the PSS group in the study of Reid et al. may be due to a difference in the way of fashioning the PSS, with only a very small opening of few millimeters, remaining. Our concept is to leave an opening between 0.05 to 1.0 cm, which allows better drainage of fluid and more thorough showering postoperatively. In our randomized controlled trial, the SSI rate was 33.33 % after CLC, and no SSI occurred in the PS group.

Lee JR et al [13] reported that, the median value of hospitalization period of the purse-string skin closure group was 7 days as compared to 11 days in conventional linear closure group, which was statistically significant (p<0.001); nonetheless, it is difficult to consider it as being superior due to the difference in the wound closure techniques. Dusch N et al [14] reported that, the mean length of post-operative hospital stay was similar in both groups (6.0 ± 4.1 days for the PS group vs 6.0 ± 3.4 days for the CLC group, P = 0.40). In our study, mean value of hospital stay (days) for CLC group is 5.53 and it was 5.25 for PS group which was statistically insignificant (p = 0.46).

**Long term outcomes-** On closing of skin with purse-string method, the long scars that are formed with conventional linear skin closure are avoided. Milanchi et al [11] reported that, mean patient satisfaction score was higher in the PS group (18.4, range 11 to 25) than the CLC   group (15.9, range, 8 to 24, p>0.05). Although individual factor scores were consistently higher in the PS group than CLC group. Patients were happier and satisfied in PS group, but the difference was statistically not significant. Dusch N et al[14] reported that, there were no statistically significant differences in cosmetic outcome between the two groups. Wada et al[15] reported a better cosmesis in PS group comparison to CLC group. Sang II Yoon[16] reported that, according to result of questionnaire, PS group patients had higher score for all the questions. However, the only statistical difference was expectations regarding the scar (p=0.044). In our study, 21 out of the 31 (67.74 %) patients completed the patient satisfaction questionnaire. Mean value of satisfaction scale for CLC group is 16.9 (range 13 to 21) and for group PS, it was 20 (range 14 to 24). PS group patients reported higher scores for all the questions. However, there was no statistical difference between the questions for both the groups (p > 0.05).

## VII.  CONCLUSION

The following conclusions were drawn:

1. Purse-string closure of ileostomy skin wounds can eliminate the risk of wound infection.

2. There is no significantly difference between healing time in both methods (PS and CLC).

3. Little additional nursing care was needed for patients undergoing PS closure, and patients were satisfied after having purse-string closure.

From our study, it may be recommended that PS as a method for eliminating wound infection after ileostomy closure, and also emphasize its superior cosmetic results and higher patient satisfaction.

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