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Comparison of Wound Infection after Reversal of Loop Ileostomy in Linear versus Purse-String Skin Closure of Stoma Site

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ABSTRACT

Introduction: Loop Ileostomy is a surgical procedure which is done to divert intestinal contents away from distal bowel to allow healing of the distal anastomosis and also for the relieve of obstruction in emergency situations. Reversal is done through local stoma site via linear closure technique as the standard procedure. Surgical site infection is the most commonly occurring & morbid complications of this technique and it can be reduced if closure is done by Purse string method. The aim of this study was to determine the more effective method of the two in terms of post-op surgical site infection.

Material & Methods: This Randomized Controlled Trial was conducted for six-month duration in Benazir Bhutto Hospital, Rawalpindi. Reversal patients presenting in outdoor-department were included and allocated randomly into either Purse-String closure group or linear skin closure group. Follow-up was done for thirty days and wound infection was identified by presence of purulent discharge from incision site. Organisms were isolated from fluid culture or tissue culture from the wound or abscess.

Results: We included a total of 90 patients in this study. 45 patients were randomly alloted to each group. The two groups were matched for various entry parameters. Wound infection was observed among 27(60%) in the linear closure group whereas 12(26.7%) in the purse-string group developed wound infection. This difference was statistically significant.

Conclusion: Given the low rate of associated wound infection, purse string closure of stoma reversal is recommended to be the preferred procedure for ileostomy reversal.

Key words: Loop Ileostomy, Linear closure, Purse string closure, Wound infection.

Authors' Contribution:
[1,2]Conception; Literature research; manuscript design and drafting; [3,4,5] Critical analysis and manuscript review; [6,7,8] Data analysis; Manuscript Editing.

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Introduction

Intestinal stoma construction is a common procedure which is a surgically formed opening of the intestines onto the surface of the body. Stoma formation can be temporary or permanent. A temporarily formed stoma is used for the management of a spectrum of colorectal diseases such as malignancy , inflammatory bowel disease, bowel perforation and fistulae and also considered the standard mode of treatment in patients undergoing resection of part of bowel where primary anastomosis is unable to be done. The main purpose of stoma creation is to lead the intestinal contents away from distal bowel so that a distally formed meticulous anastomosis can heal and to prevent leakage or fistula formation as well as to relieve any obstruction in emergency. Reversal of a loop ileostomy reversal is typically done from 8 to 12 weeks after it is made, allowing sufficient time for recovery from the preceded changes.[1]

The reversal Is done usually through local stoma site. Morbidity of stoma revers is reported to be quite low. The associated complications are reported in 2-41% of the pateints.[2] These include anastomotic breakdown and subsequent leakage, obstruction, post operative hernia, wound infection and nonsurgical complications. Surgical Site infection (SSI) is the most common complication associated with SR and the reported incidence varies widely, from 2-40%.[3] Exposure to skin flora is considered to be involved in the pathophysiology of infection. This wound infection has a great impact on the patients' life such as prolonged the hospital stay, increasing cost of treatment but can progress to septicemia and long-term complications leading to delay in return to normal life.4 It is the second most common hospital acquired infection accounting for 21.5% of all such infections.[5] The treatment of surgical site infection requires wound care and, in some cases, antibiotics. However, the cosmetic results are not satisfactory and the healing time is prolonged.

Different techniques of wound closure post reversal are described with variation in SSI rate. However, no common consensus is found for the best method of wound closure. The commonly employed methods fall in two categories i.e. primary closure and secondary closure. Among secondary closure, are various subtype e.g. wounds left open, delayed secondary suturing, partial wound closure and purse string closure.[6] In primary linear closure (LC) wound edges are approximated and closed in linear fashion. Healing by this option is rapid, avoids long healing time and requires less dressings. However, there is an increased chance of wound infection rate in primary group; this might be because of retention of bacterial contamination in closed superficial wound space.

Purse-string closure (PSC) of wound is a form of secondary closure. Wound is left open and becomes natural drainage pathway avoiding wound infection. This wound closes with granulation tissues until skin is epithelialized and defect closed. Sureshkumar reported significantly less surgical site infection & better cosmesis after secondary closure.[7] However frequent dressings are needed which increase the cost & burden of work. In previous studies wound infection was found in 3.1- 5.4% of patients, whose wound was closed by purse-string as compared to 20.2-22.8 of patients by conventional linear method, similar findings noted in a meta-analysis. [8-9]

The purpose of this study is to determine the effective method which carries less infection rate and better overall post-operative outcome.

Methodology

This study was a randomized controlled trial conducted at Surgical Department, Benazir Bhutto Hospital Rawalpindi over a duration of 6 Months. Blinding of the surgeons was not possible, however the data collecting doctors were blinded from the procedure performed. The two groups were matched for various entry parameters. 90 patients

were included and the power of the study was set at 95%. Patients were randomly allocated into group A – Purse string closure or Group B – Conventional linear closure by lottery method. All patients between 20-60 years of age presenting in surgical OPD were included. Exclusion criteria was set as patients with immunosuppression, malignancy, debilitating medical illness, distal loop obstruction, Tuberculosis, Diabetes and cirrhosis. Standard guidelines were followed in the pre-operative preparation of each case & prophylactic pre- and post-op antibiotics were administered. The surgery was performed by senior registrars & discharge was scheduled for 7th post-op day with stitch removal at 10-14 post-op day. Patients were followed at 10, 20th and 20th post-op day for wound infection. Wound infection was identified as presence of any one of the following:

1) purulent discharge from incision site, 2) organisms isolated by obtaining culture of fluid or tissue from wound, 3) abscess formation confirmed by ultrasound. Approval was obtained from the hospital ethical committee & informed consent was obtained from the patients. A specialized proforma was used for data collection and statistical analysis was done via IBM SPSS Version 23. Chi square test was applied and the p value calculated was calculated. P value of less than 0.05 was considered statistically significant.

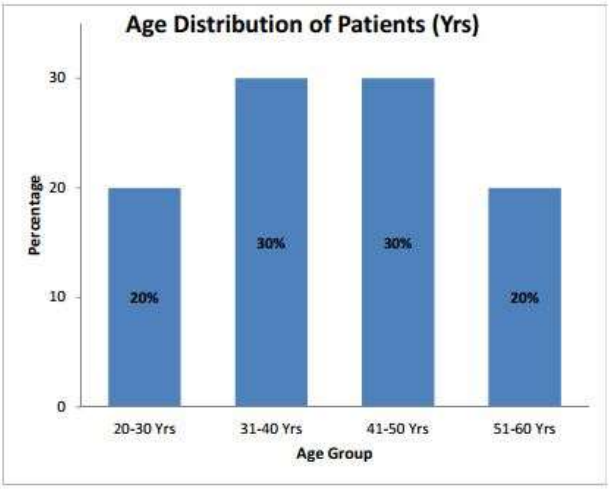
Results

We included a total of 90 patients in the study. 45 patients were randomly assigned to each group by lottery method. Wound infection was observed among 27(60%) in the linear closure group whereas 12(26.7%) in the purse-string group developed wound infection. This difference was statistically significant.

90 patients were included in this study. 48.9% patients were males (n=44) and 51.1% (n=46) were females, with slight female predominance. Age range was 20 to 60 years with mean age of 40.30 years. Maximum number of patients was in 31-50 age group.

Table I : Gender Distribution in study groups

		Gender		Total
		Male	Female	
Group	Group A	22	23	45
	Group B	22	23	45
Total		44	46	90



Each study group was allocated 45 patients. Both had comparable gender ratio and age proportion. (table 1) (Figure 1)

In Purse string Group (Group A) 26.7% patients (n=12) developed infection at ileostomy wound site whereas 73.3% (n=33) had no infection at wound site. While in linear closure group (Group B) 60% of patients (n=27) developed infection at ileostomy wound site whereas 40% patients (n=18) had no infection with p value of
0.003.

Discussion

Loop ileostomy is a frequently performed surgical procedure in gastrointestinal surgery in which an opening is created in ileum and is extracted out as a stoma from the abdomen. The distal ileum is usually

used and objective is to cause diversion of intestinal contents. Multiple indications for the surgery exist including but not limited to congenital disorders, inflammatory bowel disease, distal anastomosis, large bowel obstruction and trauma. It is a temporary procedure and usually reversed after 4 months through local stoma site by primary anastomosis. Reversal of loop ileostomy comprises many complications including small bowel obstruction, anastomotic leakage and wound infection at ileostomy site which is the most common complication with an incidence of up to 40%.[10]

Surgical site infection is a preventable but exhaustive complication effecting patient's general well-being and associated cost of treatment. If neglected, it can progress to sepsis and overshadow the very primary pathology itself that indicated the stoma formation. Centers for Disease Control and Prevention (CDC) defines SSI as infection related to an operative procedure that occurs at or near the surgical incision within 30 days of the procedure, or within 90 days if prosthetic material is implanted at surgery.[11] it has been reported that over one-third of the postoperative deaths are related to SSI. It is imperative that every effort is made to avert this morbid & potentially fatal complication.

There are several methods described in literature for closure of the skin wound at stoma site like linear (primary) closure, delayed primary closure, secondary closure and purse string closure (PSC) to achieve minimal wound infection rate but no method has found to attain superiority over the other.[12] Thus, there is no common consensus regarding wound closure technique in terms of infection rate. While common practice dictates closure of the wound with primary or linear closure technique, this is associated with an infection rate of up to 20%.[13] Ileostomy closure is a type of contaminated surgery due to spillage of intestinal contents containing microorganisms at stoma site, thus carrying an increased risk of SSI. Therefore, certain studies have shown that if wound is left open to heal by secondary intention, the rate of wound infection is comparatively less.

Purse-string technique for closure of ileostomy wound was described first time by Banerjee in 1997, it recommends the placement of circumferential suture into the dermis of skin along the wound margins which allows uniform tension throughout the wound edges and the wound had complete healing in >90% of the patients within 8 weeks.[14] PSC (Purse-string closure) has also been used to close small skin defects or as partial closure of larger circular wounds after skin cancer excision.[15] Purse-string closure of the wound is a form of secondary closure in which wound remains partially open with a small defect allowing formation of granulation tissue over which epithelialized skin regenerates. The defect serves as a natural drainage pathway, thus avoiding wound infection.

It was evident from our study that PCS is a better technique to close ileostomy wound in terms of infective complications. Various publications are available regarding Purse-string wound closure which mirror our results. A recent study resembling ours was conducted by Reid et al.[8] They enrolled total 61 patients. Two out of thirty patients (6.66%) developed infection in PSC group while twelve out of thirty-one patients (38.7%) developed infection in LC group, the difference was statistically significant. Similarly, in another study conducted by Milanchi et al,[16] it was established that PSC was safe and more effective having significantly lower incidence of wound infection post reversal and additionally had better cosmetic results. Milanchi included 49 patients out of which 24 patients underwent PSC and 25 patients underwent the latter. No wound infections occurred in the PSC group compared to 40% wound infection rate observed in the primary LC group with P value of 0.002.

However certain contradictory studies propose that there is no significant difference between these two techniques regarding wound infection. Lahat et al[13] compared primary closure with delayed primary closure and showed, decreased incidence of wound

infection in primary closure group. 40 patients were included and reported wound infection in 10% patients whose wound was closed primarily compared to 20% with delayed closure. Similarly hospital stay is same in patients of both groups.

A study was conducted in Pakistan by Munir Ahmad et al[9] which found that incidence of wound infection in Linear closure was in 11.7% of patients and 10% of patients in Purse string wound closure with a difference not statistically significant. Conjunctionally Murtaza et al [17] reported the same results. He reported infective rate of 16.9% in primary closure group than 4.2% in open group. Thus risk of wound infection was 5.8 times greater in wounds that were closed primarily.

Suh et al [18] compared the two techniques in terms of postoperative wound infection as well as pain pattern and found significantly less incidence of infection rate of 0% in patients of PSC vs. 11.39% in conventional LC group with P value of 0.003. While there was no difference in postoperative pain between these two groups. Lee et al[19] suggested that purse-string skin closure after a loop ileostomy reversal had comparable outcomes, in terms of wound infection rates, to those of linear skin closure. Also, PSC showed cosmetically better results than LC of wound. 48 patients were included in this study & wound infection was found to be 16.7% in patients in Linear closure group vs 5.6% patients in purse-string group. While the median hospital stays were 11 days in LC group and 7 days in PSC group with P value < 0.001.

Camacho et al [20] in his comparison reflected our findings substantially by noting an infective rate of 36.6% in patients in LC group and no wound infection in PSC group. His p-value being P < 0.0001. Healing time was also significantly reduced in the PSC group being 3.8 weeks in contrast to 5.9 weeks in the linear closure group. Lastly, but most significantly he noted that 70% of the patients with purse-string closure were satisfied with their outcome in comparison with 20% in the linear closure group (p = 0.0001).

Overall, it can be inferred that PSC is not only reliable in terms of SSI but additionally has a better profile concerning duration of hospitalization, cosmesis & pain-pattern. These findings are pertinent not only regarding patient satisfaction but the total cost-effectiveness imparted by the aversion of utilization of hospital resources for wound care & secondary surgical interventions.

Conclusion

Purse string closure of stoma site after reversal of Loop Ileostomy is a safe & efficacious modality and showed better results in terms of wound infection rate to those of linear wound closure. A significantly greater number of patients achieved satisfactory healing without infection and better cosmetic results. Given the low rate of associated wound infection, purse string closure of stoma reversal is recommended to be the preferred procedure for ileostomy reversal. Thus,

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