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Original Research Article

Skin closure after ileostomy reversal: comparative study between conventional linear versus purse-string suturing

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ABSTRACT

Background: Wound infection and scarring are relatively common complication after stoma reversal. Immediate skin closing by conventional linear closure technique is associated with varying percentage of wound infection ranging from 2 to 41%. Delayed skin closure is associated with prolonged healing time and poor scar cosmesis. In order to overcome these problems, an alternative method of skin closure during stoma reversal has been suggested. It involves taking purse-string subcuticular absorbable sutures to close the skin during Ileostomy reversal. Our study is a comparative study between conventional linear skin closure and this alternative form skin closure in stoma closure procedures for the assessment of surgical site infection and scar cosmesis.
Methods: 40 patients were enrolled for the study, divided in two groups, one undergoing purse-string skin closing (n=20) and the other undergoing linear skin closure (n=20) during stoma reversal. All the data was analysed using IBM SPSS version 21.0 taking p value less than 0.05 was taken as level of significance.
Results: Surgical site infections were seen in 3 out of 20 patients in whom purse-string skin closure was done, while it was 9 out of 20 patients in primary linear closure during stoma reversal group. Post-operative pain was found significantly lesser in purse-string group compared to linear closure group on same and first post-operative day. Scar cosmesis was assessed using patient and observer scar assessment scale and was observed better in purse-string group of patients.
Conclusions: Purse-string skin closure is a better alternative surgical option to consider during stoma reversal surgeries as compared to conventional linear closure.

Keywords: Linear closure, Purse-string skin closure, Surgical site infection, Scar cosmesis

INTRODUCTION

A stoma is an artificial opening made in the colon or small intestine to divert faeces and flatus outside the abdomen collected by external appliances[1].A temporary diverting stoma for the purpose of faecal diversion to protect the anastomotic site after small bowel and colorectal surgery is being increasingly used nowadays. Commonly applied temporary diverting stomas are the ileostomy and the colostomy. Advantages of a stoma are that it helps in preventing complications arising out of an anastomotic leak of the distal bowel, like collection of bowel content in the abdomen resulting into formation of collections/abscess, later developing post-operative abdominal distension and peritonitis and gives time for distal anastomosis to heal. Stoma closure is usually be done electively 8-12 weeks later, after the catabolic phase that occurs during perioperative period is over, with adequate nutritional built up. Wound infection and scarring at the surgical wound site are relatively common complication after stoma reversal. One of the leading cause of post-operative surgical

wound infection after stoma reversal is bacterial colonisation in the vicinity of the stoma. This bacterial colonization occurs because bowel stoma effluent which contains large number of gut bacteria comes directly in contact with peristomal skin and remains in contact for long time if stoma appliances are used for the collection of effluents. Hence immediate skin closing by conventional methods (linear intermittent vertical mattress) is associated with varying percentage of surgical wound infection ranging from 2 to 41% across different studies.[2] In order to overcome this problem of surgical site infection, an alternative method of skin closure during stoma reversal has been suggested. It involves taking purse-string subcuticular absorbable sutures to close the skin during ileostomy reversal.[3] Our study is a comparative study between conventional linear skin closure and this alternative form skin closure in stoma closure procedures for the assessment of surgical site infection.

METHODS

Our prospective comparative interventional study was conducted between March 2017-August 2018 at the Department of General Surgery, Netaji Subhash Chandra Bose Medical College And Hospital, Jabalpur. All patients more than 18 years of age on ileostomy or colostomy undergoing stoma reversal, giving informed consent for the alternative procedure and willing for follow-up. A circumstomal incision was given around the ileostomy and stoma loop was separated from anterior abdominal wall using sharp dissection. The ileostomy segment was mobilised and freed completely by careful adhesiolysis. When the stoma loop was difficult to mobilise, it was resected along with margin of fresh bowel for secure bowel anastomosis. Bowel pushed into peritoneal cavity. The rectus and it's fascia was closed using vicyrl 1 round body needle. All the steps till this part of the procedure were done identically in both group of patients. Further, in linear closure (LC) group, skin was closed by vertical mattress technique using Nylon 3-0 cutting body needle and purse-string subcuticular sutures were taken using vicyrl 1-cutting body needle leaving behind an aperture of size approximately 5-10 mm which healed by secondary intention (Figures 1 and 2).

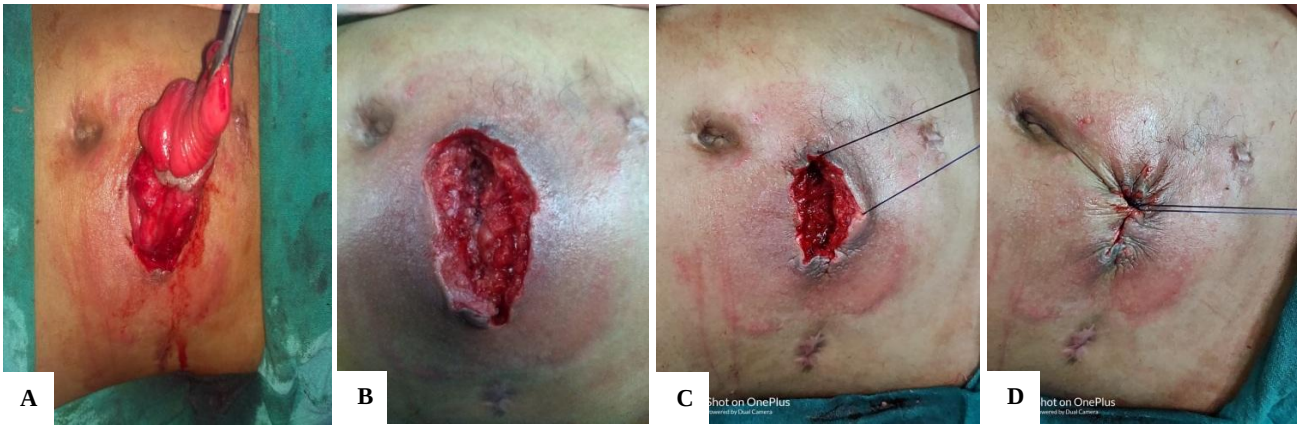

Figure 1 (A-D): Ileostomy skin closure being done by purse-string technique using vicyrl 1-CB.

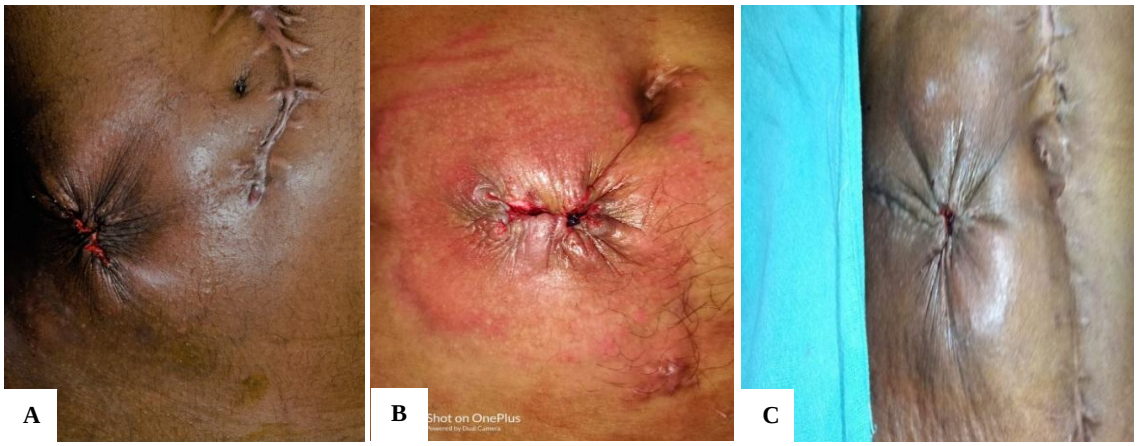

Figure 2 (A-C): Final photograph of different ileostomy closure by purse-string technique, leaving behind central gap for self-drainage of exudative fluid.

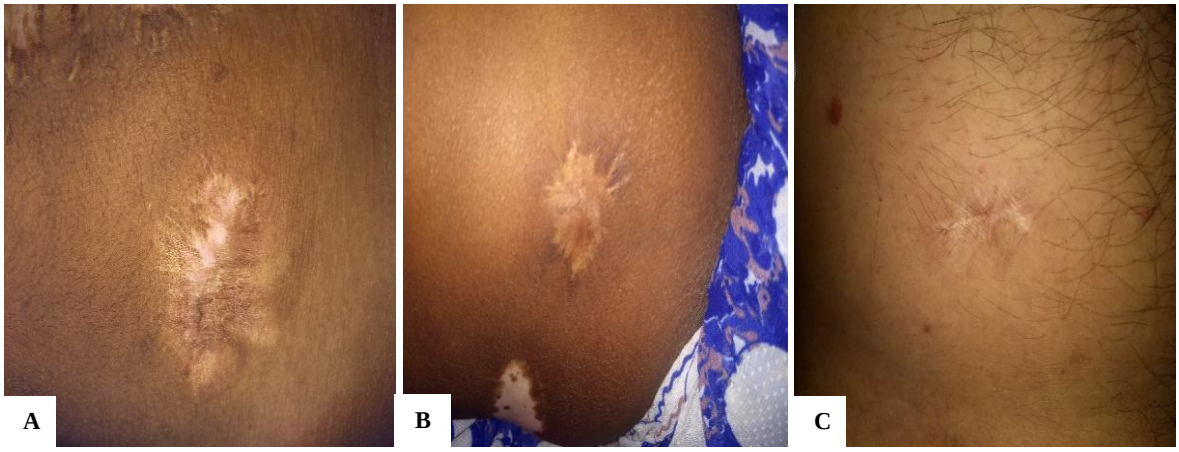

Figure 3 (A-C): Healed scar (PS skin closure).

Patient was kept nil per oral till resumption of bowel activity in the form of bowel sounds and passage of flatus. IV fluids, antibiotics and analgesics are given. Periodic dressing with dry gauze piece was done after cleansing of the wound with normal saline. Patient was encouraged to ambulate, in order to enhance recovery and to drain out any seroma formed beneath the surgical wound. In case of exudative discharge from surgical wound, the fluid was sent for culture and sensitivity. Sutures were removed on 10-14th post-operative day. Patient was followed up for any surgical site infection henceforth on outpatient department basis after discharge (Figure 3). All the data collected was analysed using IBM SPSS software.

RESULTS

Majority of the patients in the study were young males and indication for stoma creation during index study was ileal perforation (Table 1). All demographic variables were comparable in both study groups. Mean operative time in purse string (PS) group was 95 minutes and 110 minutes in LC group (p=0.38). Mean basal metabolic index (BMI) in the PS group was 22.28 and 22.98 in LC group (p=0.61). Pre-operative hemoglobin and albumin were also comparable in both the groups (pre-op HB, PS-10.7, LC-11.3, p value=0.20; pre-op albumin, PS-3.62, LC-3.71, p value=0.55). Post-operative hospital stay in PS group was 12 days and 13 days in PS and LC group comparatively [p value=0.56 (Table 2)]. Two patients went into post-operative intestinal obstruction and were re-operated in PS group. Wound dehiscence was seen in 1 patient in PS group and in 3 patients in LC group, difference was statistically insignificant (p value=0.30, Table 3). Post-operative pain on day 1 was assessed amongst all the patients in both the study group using visual analog scores (VAS). Mean VAS was 4.1 in PS and 5.4 out of total score of 10 in LC group with a p value of 0.02, suggesting statistically significant less post-operative pain around the wound in PS group. However no significant statistical difference was noted in post-operative pain after day 1 onwards (Figure 4). Surgical site infections (SSI) were seen in 3 patients in the PS group and in 9 patients amongst the LC group. This difference was found statistically significant (PS-15%, LC-45%, p value 0.04). All SSIs were superficial grade I and were treated by conservative management. None of the patients in either group developed deep or organ space SSI. Post-operative scar cosmesis was assessed using patient and observer scar assessment scale (POSAS). Mean POSAS score was found to be 24.8 in PS group and 36.4 in LC group with a p value=0.04, suggesting statistically significant difference between the scar cosmesis between the PS and LC group.

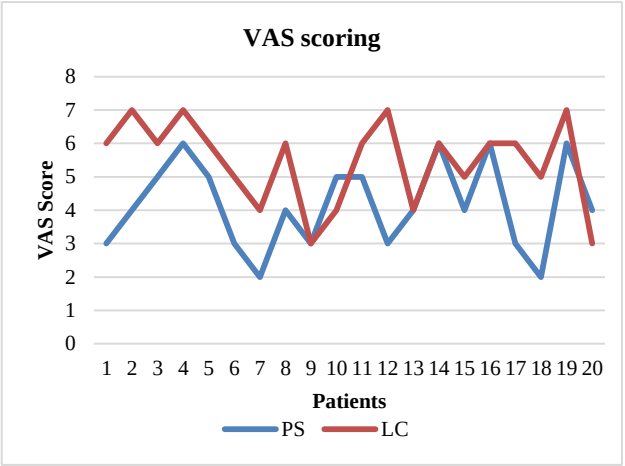

Figure 4: Post-operative pain comparison in PS and LC groups using VAS scale.

Table 1: Indication of stoma during index surgery.

Primary disease	PC	LC	Sum
Ileal perforation	16	15	31
Sigmoid volvulus	2	3	5
Sigmoid Ca	1	0	1
Appendicular perforation	1	0	1
Perineal gangrene	0	1	1
Colonic perforation	0	1	1
Total	20	20	40

Table 2: Comparision between various demographic variables in PS and LC groups.

Demographic variables	PS	LC	P value
Operating time	95 mins	110 mins	0.38
BMI	22.28	22.98	0.61
Age	30	32	0.87
Pre-op albumin	3.62	3.71	0.55
Pre-op HB	10.74	11.3	0.20
Hospital stay	12 days	13 days	0.56

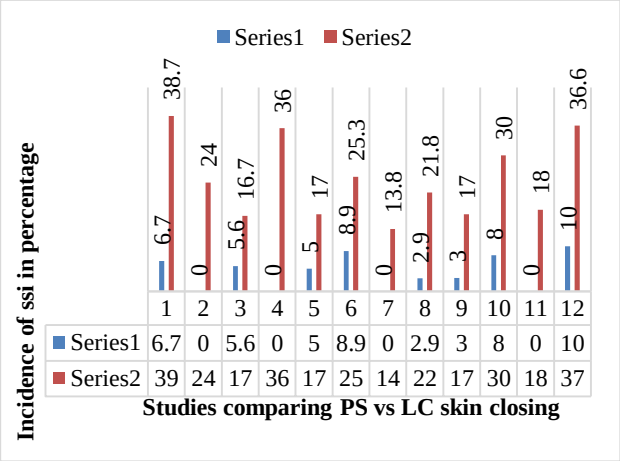

Figure 5: Series 1- SSI incidence in PS closing, Series 2- SSI incidence in linear skin closing.

Table 3: Comparison of incidence of post-operative complications in PS and LC groups.

Post-op complication	PS	LC	P value
Post-op obstruction	2	0	0.15
SSI	15%	45%	0.04
Wound dehiscence	1	3	0.30

Table 4: Parameters assessed in PS and LC group and their p value.

Parameter assessed	PS	LC	P value
SSI	15%	45%	0.04
POSAS score	24.8	36.4	0.04
VAS score	4.1	5.4	0.02

DISCUSSION

Our prospective non-randomised comparative study comparing surgical site infection rates between purse-string and primary linear skin closure during stoma closure was conducted in the Department of Surgery, Netaji Subhash Chandra Bose Medical College and Hospital, Jabalpur during the period March 2017 to August 2018. We did this study in 40 patients randomly divided into two groups consisting of 20 patients each. Both group of patients underwent stoma closure in similar fashion. Mobilisation of the stoma loop, adhesiolysis, resection and anastomosis of bowel loop, reposition into peritoneal cavity and closure of the fascia were common steps done in identical manner in both group of patients. Skin was closed in purse-string manner using absorbable vicyrl 1 cutting body needle in case group and by LC technique using nylon 2-0 cutting body needle. Postoperative complications were defined as complications that developed within 30 days after an ileostomy reversal and that needed additional surgical or medical treatments. Postoperative wound infection was defined according to the standard of the Centers for Disease Control as superficial or deep infection occurring in the surgical wound within 30 days after surgery.[3] Cases in which a purulent discharge was detected in the wound, cases in which bacteria were cultured, or even if bacteria were not cultured, and cases in which pain, flares, or edema was present at the wound were considered to be infected. After discharge, the condition of the wound was monitored at an outpatient department. Monitoring continued every week until the wound was healed up completely. Patients were instructed to report to hospital if there was any sign of wound problem. If there were no problems in wounds, patients were followed up 1, 3, and 6 months after surgery. Healed wound was defined as a wound which required no additional dressing. In regard to the American Society of Anesthesiologists (ASA) score, ASA 1 was defined as normal, and ASA 2 was assigned to patients with mild systemic diseases, ASA 3 to patients with moderate systemic diseases, ASA 4 to patients with severe systemic diseases that threatened life, ASA 5 to moribund patients for whom survival would be difficult regardless of surgery, and ASA 6 to brain death patients. Mean age of the patients in our study was 31 years (PS-30, LC-32, p=0.87). Post-operative pain was assessed using VAS in the immediate post-operative period and on day 1, 3, 5 and 7 post-operatively. A minimum score of 0 (no pain) to maximum score of 10 (worst possible pain) was assigned and patient's response was noted. Post-operative wound scar was assessed using POSAS.[4] This scoring system takes into account parameter viz vascularity, pigmentation, thickness, relief, pliability, surface area. Minimum score given was 1 and maximum score given was 10.1 was considered normal skin and value 10 was considered worst imaginable scar. POSAS score was given out of 60. Assessment was done at 1, 3 and 6 months after stoma reversal.[4] While majority of the patients in our study were young with mean age 31 years and indication for stoma during index surgery was benign disease, most common indication being ileal perforation, indication for stoma in other similar comparative studies have been malignancies-colorectal cancers, Crohn's disease, fecal incontinence with mean age of the patients being higher. Banerjee et al from United Kingdom were the first to use and publish result of PS skin closure in stoma reversal.[5] They performed PS skin closure in over 20 patients using prolene 2-0 and reported no surgical site infections in any of the patients and better scar cosmesis and patient satisfaction. Sutton et al in 2002 reported

similar zero percent wound infection rates in a study conducted over 51 patients using purse-string skin closing technique with prolene-0.[6] Indication for ostomy in majority of the patients were low anterior resection for rectal cancer or colostomy following Hartman's procedure.[8]

Table 5: Randomised controlled trials comparing linear and purse-string skin closing in stoma reversal and their results.

No.	Study	Year	Country	Sample size	Suture material	Result
1	Reid et al[7]	2010	Australia	61 (PS-30, LC-31)	Prolene 1-0	SSI 6.7% in PS vs 38.7 in LC
2	Dusch et al[8]	2013	UK	84 (PS-43, LC-41)	Absorbable	SSI PS-0% LC-24%
3	Lee et al[9]	2011	South Korea	48 (PS-18, LC-30)	Vicyrl 2-0 CB	SSI 5.6% in PS vs 16.7% in LC
4	Camacho et al[13]	2013	Mexico	61 (PS-31, LC-30)	Absorbable	SSI 0% in PS vs 36% in LC
5	Klink et al[14]	2013	Germany	140 (PS-44, LC-96)	Absorbable	SSI 5% in PS vs 17% in LC
6	Yong et al[10]	2014	Korea	157 (PS-78, LC-79)	Nylon 3-0	SSI 8.9% in PS vs 25.32% in LC
7	Yuma Wada et al	2015	Japan	55 (PS-26, LC-29)	PDS 3-0	SSI 0% in PS vs 13.8% in LC
8	Alvandipour et al[18]	2016	Iran	66 (PS-34, LC-32)	Vicyrl 2-0 CB	SSI 2.9% in PS vs 21.8 in LC
9	Sureshkumar et al[17]	2018	India	81 (PS-40, LC-41)	Absorbable	SSI 3% in PS vs 17% in LC
10	O'Leary et al	2017	Ireland	61 (PS-34, LC-27)	Absorbale	SSI 8% in PS vs 30% in LC
11	Marquez et al	2010	USA	78 (PS-61, LC-17)	Absorbale	SSI 0% in PS vs 18% in LC
12	Lodhi et al	2015	Pakistan	60 (PS-30, LC-30)	Prolene 1	SSI 10% in PS vs 36.67% in LC

A number of randomized controlled trials have been conducted since then that has conclusively demonstrated lesser surgical site infection rates and better scar cosmosis in purse-string skin closing during stoma reversal (Table 5).

Reid et al divided a set of 61 patients undergoing stoma reversal into two study groups, one comprising of 30 patients who underwent skin closing by PS technique using prolene 1-0 and the other comprising of 31 patients who underwent skin closing by LC technique.[6] They noted occurrence of SSI in two patients in PS group (6.7%) and 12 cases of SSI in LC group (38.7%). A significantly lesser rate of SSI in PS group seen in this randomized controlled trial (RCT). Dusch et al set of 84 patients into PS group (43 patients) and LC group (41 patients) in his comparative study between two suturing techniques, and concluded that there were no surgical site infection in PS group and 24% incidence in LC group (p-value<0.0004).[8] Lee et al in a study of 48 patients undergoing stoma reversal (PS-18, LC-30) reported that SSI rates were significant low in PS group (5.6%) vs LC group (16.7%).[9] Yong et al have done this comparative study with largest sample size.[10] A total of 157 patient,78 in PS while 79 in LC group underwent comparative study in Korea. Principal indication for stoma in this study was carcinoma rectum and majority of the patients were above 50 years of age. It reported 8.9% SSI rate in PS while 25.32% SSI rate in LC group with a p value <0.01, suggesting significantly lower SSI rates in PS group. Masashi et al from Japan compared data from 5 RCTs dividing 360 patients into comparable groups (PS-212, LC-148).[11] Principal indication for stoma was carcinoma rectum in majority of the patients. They reported 7.8% SSI rates in PS vs 25% SSI rates in LC group (p-value=0.007). McCartan et al did literature search using Embase and Medline from 1966 to 2012 and derived data from 2 RCTs and 4 case control studies.[13] Amongst 403 patients (PS-233 and LC-170), SSI rate was found to be 2.4% in PS group and 29.6% in LC group (p=0.0001, Figure 5).

CONCLUSION

PS skin closure is associated with lesser incidence of SSI, post-operative pain and better scar cosmesis and is a better alternative surgical option to consider during stoma reversal surgeries as compared to conventional LC.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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