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Original Research Article

Comparative study of wound healing following purse-string closure versus conventional linear closure for stoma reversal

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ABSTRACT

Background: Stoma closure is associated with several complications, wound infection being the most common. This study is done to establish that purse string suture closure method for stoma closure is superior to the conventional linear mattress closure and is associated with better wound healing cosmesis.

Materials and Methods: This Prospective randomized controlled study enrolled 80 patients who underwent stoma closure from April 2021 to March 2022 in department of General Surgery in IGIMS, Patna. Patients were divided in two groups inclusive of ileostomy and colostomy based on type of closure technique. Conventional linear closure method was applied to Group A and purse-string technique applied to Group B patients. All Patients were followed regularly upto three months after operation. Rate of infection, pain as assessed by VAS score and satisfaction as assessed by POSAS Score were done.

Results: Purse string Closure had better outcome in terms of wound infection rate and Cosmetic results over a 3 months follow up. Ten patients in Group A and 2 from Group B out of 40 patients had wound infection. Patients with purse-string suture had statistically significant greater satisfaction over 3 months. Medium operative time of Group A was 100 minutes and that of Group B was 98 minutes. There were no significant difference in regards duration of hospital stay was more in Linear Group than Purse String (Group B).

Conclusion: Purse-string closure was associated with better cosmesis and lower infection rate in comparison to Linear conventional closure.

1. Introduction

Following colorectal as well as small intestinal surgery, a temporary diverting stoma such as ileostomy or colostomy is frequently created for the purpose of faecal diversion to protect the anastomotic site.[1] Usually, 8-12 weeks later, the stoma is electively closed, after the catabolic phase that occurs during perioperative period is over, with adequate nutritional build up. Following the closure of the stoma, which is also called stoma reversal, wound infection and scarring at the surgical wound site have been reported as common complications.[1] One of the leading causes of post operative surgical wound infection after closure of the stoma is bacterial colonization in the vicinity of the stoma. This bacterial colonization occurs because of the bowel stoma effluent which contains large number of gut bacteria that comes directly in contact with peristomal skin and remains in contact for long time. Varying degree of surgical wound infection rate from 2% to 41% has been reported across different studies in case of skin closure by

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conventional method which is linear intermittent vertical mattress.[1] To overcome this problem of high rate of surgical site infection (SSI), an alternative method of skin closure, which is purse string suture, has been suggested by several authors during the reversal of the stoma.[2] Purse string sutures allow free drainage of secretions from the wound. Moreover, detection of infection, if any, is early. That is why, lesser incidence of surgical site infection are expected while using purse string suture compared to conventional linear closure method.[3–6] This purse string technique of stoma reversal is also expected to have a smaller size scar.[5,6]

To compare the outcomes of alternative method of skin closure in the form of purse string technique and conventional linear technique, the current study was undertaken.

2. Materials and Methods

This randomized controlled study was carried out in department of General Surgery of IGIMS from April 2021 to March 2022. All consecutive patients who underwent ileostomy or colostomy and later planned for stoma closure irrespective of benign or malignant indications of first surgery were included in the study. Stoma closure was performed by a general surgeon in an elective setup and proper consent was taken before randomization. Those below 12 years of age and those who refused to consent were excluded from the study. Institutional Ethics Committee approval was taken from IGIMS, Patna (1760/IEC/IGIMS/2020 dated 30.09.2020) and the protocol was registered with Clinical Trial Registry of India (CTRI Registration No. CTRI/2021/04/032903).

Two groups were formed, Group A of Conventional linear closure and Group B of purse string closure technique. Each group had 40 patients. Several baseline parameters were taken into account such as age, gender, body mass index and co morbidities. Preoperative Bowel preparation was done with polyethylene glycol electrolyte solution. In linear conventional closure technique layer to layer suturing of fascia of rectus abdominis, subcutaneous tissue and skin was done; whereas in purse string technique fascia of rectus was closed linearly and then skin was closed with absorbable sutures by taking purse string on dermal layer. As antibiotic use in colorectal surgery is a well-established practice that reduces infectious complications (sab), second generation cephalosporin was given 30 mins before incision as a single dose. None of the operation extended for 4 or more hour, hence no repeat dose was needed. Patient was regularly followed up for 3 months. Post operative pain on day 1, 3, 5 and 7 was assessed by visual assessment score (VAS). VAS is used to assess patient satisfaction on a scale of 0-10. 0= no pain, 1-3 = mild pain, 4-6 = moderate to severe pain, 7-9 = very severe and 10 = worst pain possible. Upon 3 months followup POSAS score was done for scar assessment and cosmesis outcome. It includes observer scar assessment and patient scar assessment on a scale of 1-10.

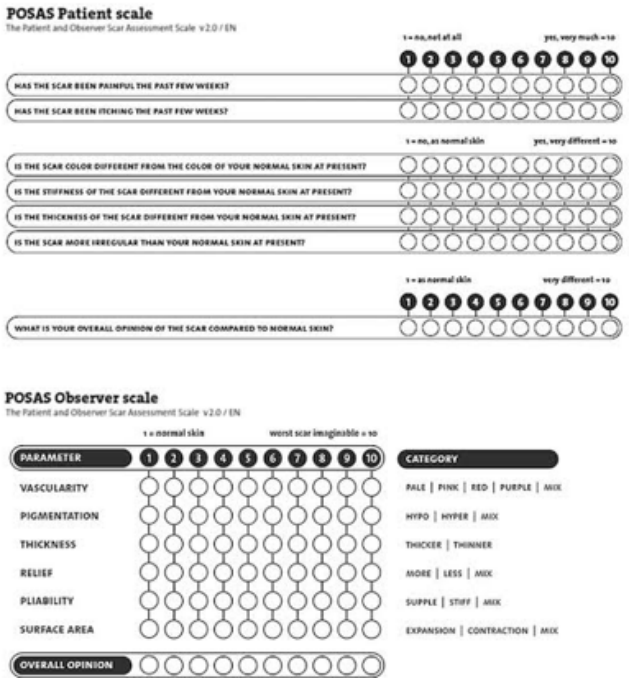

Fig. 1: Posas scale version 2 (English) (reproduced with permission from https://www.posas.nl/)

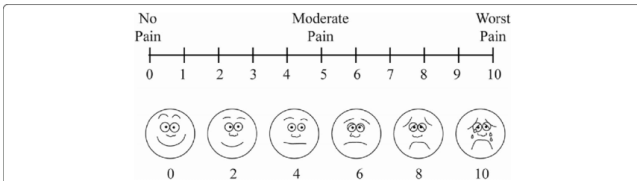

Fig. 2: Vas scale (reproduced with permission from Ghaderi et al.)

3. Results

In this study of 80 subjects GROUP A (Linear Conventional technique) has 40 patients and GROUP B (Purse string suture) has 40 patients. Age difference between the two groups were insignificant

In group A, 10 out of 40 i.e 25% had surgical site infection of which 4 were female and 2 out of 40 i.e 5% in group B had SSI of which 1 was female. The incidence of SSI appears to be more common in patients with linear conventional technique as statistically significant difference is observed between the groups. Gender preponderance cannot be stated due to small number of subjects presenting with SSI. Wound infection was classified according to the center of disease control (CDC) and pus was sent for culture and sensitivity if any discharge noted. It was observed that

Table 1: Demographic characteristics of the patients in two treatment arms

	Group A (n = 40)	Group B (n =40)	P-value
Age (mean± SD)	37±13.71	39±10.22	0.581
Male	25	27	0.667
Female	15	13	0.792
Malignancy	4	4	-
Diabetes	2	3	-
Hypertension	3	3	-
BMI (mean± SD)	19.65± 2.95	20.43± 1.39	0.835
Smoking status	7	5	-

Table 2: Proportion of patients with surgical site infection (SSI) in two treatment arms Chi-square test,

	Group A (n = 40)	Group B(n =40)	Chi-square value	P-value
Incidence of SSI	10	2	6.2745	0.012249*
Male	6	1	-	-
Female	4	1	-	-

* P-value less than 5% is considered significant

the most common organism was staphylococcus species in our setting. Those with SSI had longer hospital stay.

Pain assessment through VAS (Visual assessment score) was equivocal probably because post-operative pain management was done through administering intravenous analgesics and oral NSAIDS. Initially pain rank was significantly less in Group B that Group A (P=0.002) i.e on day 1. While on subsequent period of i.e on 3, 5, 7 day after operation difference of mean pain was not significant.

Table 3: Mean VAS score for pain in two treatment arms over period of hospital stay Mann-Whitney U test,

VAS Score (MEAN±SD)	Group A	Group B	P-value
Day 1	8±2.91	8±2.65	0.651
Day 3	6±2.74	5±1.97	0.086
Day 7	4±3.08	3±2.34	0.048*

*P-value less than 5% is considered significant

Satisfaction was noted to be greater which was statistically significant in patients with purse=string suture. GROUP B had better scar cosmesis, here wound heals by secondary intention and scab formation occurs. After 3 months follow up POSAS Score was done through generalized linear model and results were significantly higher satisfaction rate and better scar cosmesis in group B over group A

Mean Duration of operation was 100 minutes from Group A 98 minutes for Group B.

Table 4: Mean score of satisfaction of patient in two treatment arms Mann-Whitney U Test,

Posas Score (MEAN±SD)	Group A	Group B	P-value
Day 1	27.61	39.56	0.028*
Day 3	29.72	41.12	0.036*
Day 7	36.79	44.87	0.025*
Day 14	39.32	45.62	0.028*
Day 28	42.73	50.96	0.016*
Day 60	45.22	51.24	0.021*
Day 90	45.84	51.89	0.023*

P-value less than 5% is considered significant

4. Discussion

Wound healing is a biological process involving 3 phases of inflammation, proliferation and maturation.[7,8] They may occur simultaneously or overlap each other. Several inflammatory mediators such as cytokines, neutrophils, macrophages are involved. Particularly in scar cosmesis collagen maturation has a significant role to play. SSI is an important issue in stoma closure and is one of the important factors leading to delayed wound healing and poor scar formation. In our study SSI was significantly more in group A that group B. It was in consistency with a recent meta analysis done by LT Li et al. which states purse string suture is associated with lowest SSI risk.[9] Increased rate of SSI in linear conventional closure technique could be due to factors like obesity, co-morbidities such as diabetes mellitus, hypertension, smoking as stated by Masarhi Yamamoto in jan 2018 in a comparative study.[10] Though our study was not truly blindfolded and sample was homogenous, differences were insignificant on these grounds.

In another study of 125 consecutive patients who underwent elective closure of loop ileostomies, patient with post-operative complications had longer hospital stay.[11] In our study we also noted longer hospital stay of patients with SSI. In our study there was higher rate of SSI i.e 25% in linear conventional closure technique group (group A) that purse string closure (Group B) i.e 5%. This was in consistence with another randomized trail published in BJS in oct 2010 by Reid K et al.[12] As far as post surgical scar is considered "POSAS" appears the most comprehensive, taking into account the patient prospective.[13] Ileostomy reversals has a complication rate of 2-33.1% according to a review by Kaidar Person O et al.[14]

In our study mean POSAS Score was more in PSC (Group B). VAS Score were with insignificant difference between the two groups. In the follow up of 3 months none of the patient presented with incisional hernia. Incisional hernia is a late post-operative complication of stoma closure and such prolonged follow-up was beyond the scope of this study so definitive comments could not be made. Limitations of this study were homogenous population and inability to have a long term follow up.

5. Conclusion

In conclusion purse string closure has less SSI in comparison to Linear conventional technique. It has better wound healing and better scar cosmesis and higher patient satisfaction. It can be hence concluded that purse string closure is superior to linear conventional closure technique in stoma reversal.

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None.

8. Conflict of Interest

None.

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