

COMPARATIVE STUDY OF DIFFERENT METHODS OF WOUND CLOSURE FOLLOWING STOMA TAKEDOWN (LINEAR PRIMARY SUTURE / DELAYED PRIMARY INTENTION / SUBCUTICULAR PURSE STRING SUTURE)

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ABSTRACT

Introduction: Stoma is a surgically created intestinal opening on anterior abdominal wall. Its common forms include colostomy and ileostomy. History of stomas dates back to 1710 when Littre of Paris made first ventral colostomy for imperforate anus. After World War I a mortality rate of 60% due to primary repair of colonic injuries dropped to 30% in World War II due to the introduction of colostomy. Ileostomy gained popularity for ruptured appendix and appendicular abscess.

Aims: To compare the different methods of wound closure following stoma takedown in terms of superficial surgical site infection (SSI), to study other patient related factors like age, gender, nutritional status & other comorbidities which might be involved in developing complications at stoma takedown site and to study complications at stoma takedown site, other than SSSI, like abnormal wound healing & poor cosmesis, and their rates of occurrence in different wound closure methods.

Materials and Methods: This study was a prospective, observational, institution based, cross-sectional study. Ninety patients fulfilling the inclusion criteria and not having any exclusion criteria, from department of General Surgery of Bankura Sammilani Medical College and Hospital during the period of 1st November 2019 to 31st October 2020 were selected.

Result: In our study, patients with end colostomy (Hartmann's procedure) have got the maximum count (22 out of 90; 24.44%), just followed by those with loop ileostomy (21 out of 90; 23.33%). Patients having loop or double barrel stoma (61 out of 90; 67.78%) had only one stoma-site post-operative wound as they didn't require separate laparotomy for reversal. On the other hand, patients with end colostomy (Hartmann's procedure) and end ileostomy with colonic mucous fistula at separate site (total 29 out of 90; 32.2%) required laparotomy for reversal.

Conclusion: It can be concluded that in a stoma takedown operation, use of purse-string technique during skin closure leads to decreased incidence of superficial surgical site infection at stoma closure site, in comparison to Linear primary suture & Delayed primary intention technique.

Keywords: Stoma, SSSI, Wound Closure and appendicular abscess.

INTRODUCTION

Stoma is a surgically created intestinal opening on anterior abdominal wall. Its common forms include colostomy and ileostomy. History of stomas dates back to 1710 when Littre of Paris made first ventral colostomy for imperforate anus ¹. After World War I a mortality rate of 60% due to primary repair of colonic injuries dropped to 30% in World War II due to the introduction of colostomy. Ileostomy gained popularity for ruptured appendix and appendicular abscess. Shock, marked blood loss, significant faecal contamination, associated injuries, time till presentation and multiplicity of injury are widely accepted factors favouring stoma formation than primary repair which leads to significant mortality and morbidity owing to friable tissue that cannot hold a suture.

The number of abdominal stomas made each year is declining in UK and west where indications for faecal diversion include inflammatory bowel disease, familial adenomatosis polyposis, colorectal cancer, non gastrointestinal obstructing tumors, pelvic sepsis, trauma, diverticulitis, fistula, ischemic bowel disease, radiation enteritis, pseudomembranous enterocolitis, fecal incontinence and paraplegia but in developing countries it is still a common occurring for infective etiologies. Stoma actually serves the purpose of decompression, lavage, diversion and exteriorization in the set of odds and can be temporary or permanent. Major indications of ileostomy include diffuse bowel pathology that precludes primary anastomosis like gross peritonitis, intestinal obstruction, radiation enteritis, ischemia and inflammatory bowel diseases and rectal causes. A temporary ileostomy often is used to protect an anastomosis that is at risk of leakage e.g. anastomosis low in rectum, in an irradiated field or in immunocompromised or malnourished patients ².

Stoma formation causes social, domestic and many physiological upsets. But after the indulgence of stoma therapist and better nursing care and better stoma appliances alleviated these problems to greater extent and improved the quality of the patient's life. Stoma has various complications like bleeding, retraction, prolapsed, parastomal hernia and stenosis. Surgical site infection is one of the most common complications that can occur after stoma closure. Reports have described differences in the incidence of wound infection depending on the skin closure technique, but there is no consensus on the ideal closure technique for a stoma wound. Takedown of temporary stoma is considered as a contaminated operation.

Penrose drainage tube was used under subcutaneous tissue to prevent infection rate ³. Delayed primary intention method showed lower risk of infection but cosmetic outcomes are less than desirable. Purse string suture method was reported to be better for controlling infection rates and also cosmetic outcomes are preferable.

Despite various studies there is no conclusive data regarding efficacy of a particular method of wound closure following stoma takedown. Surgical site infection is still a significant problem in stoma takedown operations. Whether or not the skin should be closed primarily is still debated in existing literature. Although the risk of SSI can be reduced by Delayed primary closure of wound, cosmetic outcomes are less than desirable.

AIMS AND OBJECTIVE

- 1) To compare the different methods of wound closure following stoma takedown in terms of superficial surgical site infection (SSI).
- 2).To study other patient related factors like age, gender, nutritional status & other comorbidities which might be involved in developing complications at stoma takedown site.
- 3).To study complications at stoma takedown site, other than SSSI, like abnormal wound healing & poor cosmesis, and their rates of occurrence in different wound closure methods.

MATERIALS AND METHODS

4.1 STUDY DESIGN:

The study was a prospective, institution based (single center), observational and Cross-sectional Study.

4.2 STUDY SETTING AND TIMELINES:

All patients undergoing stoma takedown (reversal) operation within specified time limit will be studied.

4.3 PLACE OF STUDY:

IPD of Department of General surgery and Department of microbiology of Bankura Sammilani Medical college and hospital, Bankura, West Bengal, India, which is a tertiary care centre, catering districts of Bankura, Purulia, Medinipur and Burdwan.

4.4 PERIOD OF STUDY:

18 months, of which 16 months allotted for recruitment one month for result analysis and one month for writing the report.

4.5 STUDY POPULATION:

The study population will comprise of (minimum 90) patients, satisfying the criteria mentioned below. They will be considered into the study at general surgery department of Bankura Sammilani Medical College and Hospital, Bankura. The facilities, expertise & the necessary infrastructures are available in this hospital.

4.8 INCLUSION CRITERIA FOR CASE GROUP:

All the cases with temporary stoma below 70 years of age scheduled for stoma takedown (reversal) operation at surgical unit of this hospital will be taken for study.

4.9 EXCLUSION CRITERIA:

- a. Patients of age above 70 years.
- b. Patients having existing dermatitis or eczema.
- c. All patients documented to have a past history of
 - Chronic renal failure
 - Diabetes mellitus
 - Musculoskeletal disorders e.g. Rheumatoid Arthritis, Osteoarthritis, Ankylosing spondylitis.
- d. Patients with personal history of smoking.
- e. Patients with history of prolonged immobilization.
- f. History of corticosteroids or other immunosuppressant drug use – past/recent.

RESULT AND DISCUSSION

ANALYSIS OF RESULT:

This study was a prospective, observational, institution based, cross-sectional study. It was carried out to compare the three different techniques of skin closure (i.e. Linear primary suture, Delayed primary intention & Subcuticular purse string suture) following stoma takedown operation. Ninety patients fulfilling the inclusion criteria and not having any exclusion criteria, from department of General Surgery of Bankura Sammilani Medical College and Hospital during the period of 1st November 2019 to 31st October 2020 were selected.

AGE & SEX DISTRIBUTION OF PATIENTS:

Out of total 90 patients, 61 patients are male and 29 patients are female. So male-female ratio is almost 2:1. As per the exclusion criteria of the study 69 years is taken as the upper age limit of the patients. No exact lower age limit has been decided. The youngest patient included in the study was aged 10 years. All patients were distributed in six age groups, as shown in table 1. Maximum number of female patients (9 out of 29; 31%) is in the age group of 30-39 years. Maximum number of male patients (15 out of 61; 24.6%) is in the age group of 40-49 years. Higher age group has comparatively lower number of patients. In the age group of 60-69 years there are only 6 patients (male-5, female-1).

Marquez TT et al⁴ in their study took 78 patients. 61 patients were in 'primary closure' (PC) group and 17 were in 'Approximating purse-string closure' (APS) group. Mean age of PC group was 47.5 years with a range of 17 to 76 years. Mean age of APS group was 50.3 years with a range of 25 to 71 years. p value for age was 0.48. Male-female ratio was 34:27 in PC group and 11:6 in APS group. p value for sex was 0.59.

Sang II Yoon et al⁵ in their study took 48 patients. 34 patients were in 'circumferential purse-string approximation' (CPA) group & 14 patients were in 'primary linear closure' (PC) group. Mean age of CPA group was 57.9 years with range of 32 to 78 years. Mean age of PC group was 58.35 years with range of 29 to 76 years. Male-female ratio was 21:13 in CPA group and 11:3 in PC group.

Tiwari D et al⁶ in their study took 40 patients. 20 patients were in 'purse-string' (PS) group & 20 patients were in 'linear closure' (LC) group. Mean age of PS group was 30 years, while that of LC group was 32 years with p value of 0.87.

DISTRIBUTION OF PATIENTS ACCORDING TO TYPES OF STOMA THAT WERE REVERSED:

In our study, patients with end colostomy (Hartmann's procedure) have got the maximum count (22 out of 90; 24.44%), just followed by those with loop ileostomy (21 out of 90; 23.33%). Patients having loop or double barrel stoma (61 out of 90; 67.78%) had only one stoma-site post-operative wound as they didn't require separate laparotomy for reversal. On the other hand, patients with end colostomy (Hartmann's procedure) and end ileostomy with colonic mucous fistula at separate site (total 29 out of 90; 32.2%) required laparotomy for reversal.

DISTRIBUTION OF PATIENTS ACCORDING TO TYPES OF SKIN CLOSURE TECHNIQUES:

Three types of skin closure techniques were used at stoma takedown site viz. Linear primary suture (LPS), Delayed primary intention (DPI) & Subcuticular purse string suture (PS). Choice of technique was randomly selected by the operating surgeon. We found that, most of cases (60 out of 90; 66.67%) LPS was done. DPI & PS were done in 18 & 12 cases (20% & 13.34%) respectively. Clearly at stoma takedown site LPS has been more preferred technique than DPI or PS.

OCCURRENCE OF SURGICAL SITE INFECTION (SSI):

It was found that, out of 90 patients 18 patients developed SSI. Percentage of patients with SSI is 20%. This result is in well accordance with that obtained in various reports. As discussed in page no.1, Closure of stoma is considered as a contaminated operation. The rate of superficial surgical site infection is 2 – 31 % across different studies.

DISTRIBUTION OF OCCURRENCE OF SSI IN DIFFERENT SKIN CLOSURE TECHNIQUES:

We observed that, not a single case of SSI occurred in patients with purse string closure of stoma wound i.e. in PS group. Out of 18 cases of SSI, 16 cases (88.89%) occurred in patients with linear primary closure of stoma wound i.e. in LPS group. Rest 2 cases of SSI (2 out of 18, 11.11%) occurred in patients with delayed primary closure of stoma wound i.e. in DPI group. Out of 60 patients in LPS group, 16 cases of SSI occurred with a percentage of 26.67%. In DPI group, out of 18 patients, there were 2 cases of SSI (11.11%). These data are relatable with those obtained in some recent studies. No patient presented a SSI after purse- string closure in 52 patients in a study done by Sutton et al. (38). In a recent study, Milanchi et al. (3) compared 24 patients treated with a purse-string closure to 25 patients treated with primary closure. They also found no SSI in the purse string closure group compared to 40% SSI in the primary closure group. Sang II Yoon et al (37) in their study found 3 cases of SSI among 48 patients (6.3%), with all 3 cases in PC (i.e. primary closure) group & none in CPA (i.e. purse-string) group (3/14 [21.4%] vs. 0/34[0%], p=0.021). Tiwari D et al. (42) in their study found 9 cases (out of 20; 45%) of SSI in LC (linear closure) group & 3 cases (out of 20; 15%) in PS (purse string) group [p=0.04].

G Lahat et al. ⁷ in their study took 40 patients. Patients were randomly & equally distributed in primary closure & delayed closure groups. Total number of SSI was 6 (15%) out of which 4 were in primary closure group (20%) & 2 were in delayed closure group (10%).

ORGANISMS ISOLATED FROM SSI SITE:

In our study, Escherichia coli was the most commonly (5 out of 18; 27.78%) isolated bacteria from the wound swab obtained from the SSI site, followed by Staphylococcus aureus (4 out of 18; 22.22%). Klebsiella oxytoca & Pseudomonas aeruginosa were isolated from 3 & 2 (16.67% & 11.11%) SSI sites respectively. Enterococcus faecalis was obtained from one SSI site. No organism could have been isolated from 3 (16.67%) SSI sites.

RELATIONSHIP BETWEEN DIFFERENT SKIN CLOSURE TECHNIQUES AND PATIENT SATISFACTION SCORE

Likert 5 point scale was used to find out patient satisfaction score. Six statements were put in relation to patient satisfaction parameters and five points were given to each of statements ranging from 'strongly disagree' to 'strongly agree'. Patients were requested to put a tick against a point for each statement as per their choice. So the patient satisfaction score ranged from 6 to 30.

We found that, six score groups were created viz. scores <15; 15-17; 18- 20; 21-23; 24-26 & ≥ 27 . Maximum number of patients (42 out of 90; 46.67%) was in fifth group i.e. in score range 24-26, followed by 21 patients (23.33%) in sixth group i.e. in score range ≥ 27 . This result shows that 70% of patients had opted for higher satisfaction scores (>23). Lower score groups (i.e. first four groups) had gradually decreasing number of patients.

Patients with purse string closure of stoma wound (i.e. PS group) had maximally (6 out of 12; 50%) opted for score ≥ 27 . 11 patients in PS group (91.67%) had opted for score >23 . Patients with linear primary closure of stoma wound (i.e. LPS group) had maximally (30 out of 60; 50%) opted for score range 24-26. 20% of patients (12 out of 60) in LPS group had opted for score range ≥ 27 , where 30% (18 out of 60) had opted for lower score groups. Patients with delayed primary closure of stoma wound (i.e. DPI group) also had maximally (7 out of 18; 38.89%) opted for score range 24-26. 16.67% of patients (3 out of 18) in DPI group had opted for score range ≥ 27 , where 44.44% (8 out of 18) had opted for lower score groups. In both LPS & DPI groups, lower score groups (i.e. first four groups) had gradually decreasing number of patients.

COMPARISON OF OTHER VARIABLES WITHIN THE GROUPS:

Patients' BMI, duration of operation and interval between stoma creation & reversal are the other variables taken in the study. As for BMI, patients are categorized into underweight (<18.5), normal (18.5 – 24.9), overweight (25 – 29.9) & obesity class I (30 – 34.9). As for duration of operation, patients are categorized into four groups (minutes), viz. <80 , 80-120, 121-150 & >150 . Similarly, for time interval between stoma creation & reversal, patients are categorized into three groups (weeks), viz. 15-24, 25-34 & 35-44.

Mean duration of surgery were 95 & 110 minutes in PS & LC groups respectively [$p=0.38$].

CONCLUSION

From our study, it can be concluded that in a stoma takedown operation, use of purse-string technique during skin closure leads to decreased incidence of superficial surgical site infection at stoma closure site, in comparison to Linear primary suture & Delayed primary intention technique. Patient satisfaction is also more in cases of purse-string technique than in cases of Linear primary suture & Delayed primary intention technique.

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Table: Distribution of patients according to the types of stoma that were reversed (n=90)

Types of stoma	Numbers	Percentage
Loop ileostomy	21	23.33
Double barrel ileostomy	15	16.67
End ileostomy with colonic mucous fistula as double barrel	9	10
End ileostomy with colonic mucous fistula at different sites	7	7.78
Loop colostomy	12	13.33
Double barrel colostomy	4	4.44
End colostomy (Hartmann's procedure)	22	24.44
TOTAL	90	100

Table: Distribution of occurrence of Surgical Site Infection (SSI) in different skin closure techniques (n=90)

Skin closure techniques	SSI	No SSI	TOTAL	Percentage of SSI
Linear primary suture (LPS)	16	44	60	26.67
Delayed primary intention (DPI)	2	16	18	11.11
Subcuticular purse string suture (PS)	0	12	12	0
TOTAL	18	72	90	20

Table: Organisms isolated from Surgical Site Infection (SSI)

Organisms isolated from SSI	Number of cases	Percentage
Staphylococcus aureus	4	22.22
Escherichia coli	5	27.78
Pseudomonas aeruginosa	2	11.11
Klebsiella oxytoca	3	16.67
Enterococcus faecalis	1	5.56
No growth	3	16.67
TOTAL	18	100

Table: Relationship between different skin closure techniques and patient satisfaction score

Patient satisfaction score (out of 30)	Number of patients (percentages in bracket)			
	Linear primary suture (LPS)	Delayed primary intention (DPI)	Subcuticular purse string suture (PS)	TOTAL
<15	2 (3.33)	1 (5.56)	0 (0)	3 (3.33)
15 – 17	3 (5)	1 (5.56)	0 (0)	4 (4.44)
18 – 20	6 (10)	3 (16.67)	0 (0)	9 (10)
21 – 23	7 (11.67)	3 (16.67)	1 (8.33)	11 (12.22)

24 – 26	30 (50)	7 (38.89)	5 (41.67)	42(46.67)
27 or more	12 (20)	3 (16.67)	6 (50)	21(23.33)
TOTAL	60 (100)	18 (100)	12 (100)	90(100)