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Original Research Article

Prospective evaluation of early local complications of stoma and their risk factors

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ABSTRACT

Background: Bowel stoma namely ileostomy and colostomy are frequently performed procedure and often associated with complications. Aim of this study was to assess early local complications and association with any risk factors.
Methods: A total of 99 patients undergoing ileostomy or colostomy were analysed prospectively over a period 18 months. Comorbidity, preoperative clinical data, operative time, local complications within 12 weeks and hospital stay were documented. Univariate and multivariate analysis were used to find out any association.
Results: Sixty-four ileostomies and 35 colostomies were analysed in our study. Median age was 55 years in both groups. Nontraumatic bowel perforation (42%) and colorectal malignancy (48.6%) were most common etiology for ileostomy and colostomy formation respectively. 64% of ileostomy and 68% of colostomy had one or more complications. Skin excoriation (31%) was most common complication in ileostomy group and it was stomal prolapse (17%) in colostomy group. Poor stoma care was prevalent in both groups. We found diabetes to have significant association with skin excoriation (p=0.002).
Conclusions: Diabetes was identified as significant risk factor for skin excoriation in ileostomy group. Further long term data and larger population are needed for better evaluation of stomal complication and their risk factors.

Keywords: Stoma, Ileostomy, Colostomy, Complications, Risk factor

INTRODUCTION

Surgical creation of bowel stoma namely ileostomy and colostomy are not uncommon in both elective and emergency situation. In elective condition stomas are created to reduce the complication rate and incidence of a distally made anastomotic leak or to avoid an anastomosis in an unfavorable condition whereas in emergency situation it is often lifesaving as creation of an anastomosis in an adverse environment may be detrimental in future. However all efforts are made to make a temporary stoma as permanent stoma may have a greater social impact and negatively affect the quality of life.

Stoma related complications have been reported from 10-82%.[1-7] Definitely there is significant variability between various centers and the reason for this discrepancy remain unclear.[7] Complications can arise in immediate the postoperative course and are most often technical in nature or it can occur within the first month of surgery are (related to suboptimal ostomy creation or site selection). Late complications are commonly seen in the setting of permanent stomas. It has been reported that complications are less with end ostomies than loop ostomies.[3] Various risk factors such as suboptimal stoma site, obesity, smoking, diabetes mellitus, inflammatory bowel disease and stoma height have been cited as risk factors for stomal complication in numerous studies.[6-9] Involvement of qualified wound ostomy nurse or enterostomal therapist

and ostomy support group can reduce complications and improve psychological adjustment.[10,11]

Though the creation of a stoma is often regarded as a relatively safe and straight forward procedure one must be aware that even with new advances in surgery and technology, stoma-related problems still occur with consistent frequency.

The purpose of the study is to evaluate the various indications of stoma, types of stoma, their local complications and associated risk factors in a tertiary teaching hospital in eastern part of India.

METHODS

This was a single centre prospective observational study conducted by the Department of Surgery, Calcutta National Medical College and Hospital from June 2018 to January 2020. Patients who underwent either ileostomy or colostomy were included in this study. Patients were selected from both emergency and elective department of the hospital. A total 102 patients were prospectively included in this study. Age less than 12 years was an exclusion criterion because patients with this age group were treated by different department. Demographic data, comorbidity, preoperative investigations, indication of bowel ostomies, operative time, hospital stay, postoperative complications and immediate stomal complications within 12 weeks were observed. Pre-operative counseling and marking for appropriate siting of stoma were done by the operating surgeon, as enterostomal therapist/nurse was not available in our hospital. All bowel stoma were created under general anesthesia. Site of the stoma depends on the type of stoma created. Most of the ileostomies were present in right iliac fossa region whereas majority of colostomies were present on left iliac region. Stoma creation in emergency surgeries was performed by resident surgeons with at least 3 years of experience whereas elective stomas were created mostly by consultant surgeon. The stoma fashioning technique was standardized and the surgeons uniformly brought the stomas out through the rectus sheath by splitting it. Patients were evaluated on a daily basis during hospital stay and then at the end of the second week. They were followed up every 2 weeks until closure of the stoma. Temporary stomas were closed within 12 weeks and all complications within this period were recorded and managed accordingly. Patients with permanent stoma were followed till the end of this study. Incidence, nature, and rate of complications were recorded and managed optimally on an outpatient basis and patients were readmitted if indicated.

For purpose of the study skin excoriation was defined in presence of inflammed or excoriated peristomal skin or irritant dermatitis. Stoma was considered to be retracted when it was below the skin surface and required intervention. Prolapse was diagnosed if there was full-thickness protrusion of bowel, increase of stomal size and/or required change of appliance size. Mucocutaneous separation was recorded if any part of the ostomy had detached from the mucocutaneous junction. Necrosis was defined in presence of patchy or extensive discolourisation of stomal mucosa. Parastomal hernia was detected in presence of palpable bulging or defect around stoma. Stomal bleeding was recorded in presence of superficial bleeding from stomal mucosa or mucocutaneous junction. Stenosis was defined as a stricture at the skin or at the fascia level. Peristomal abscess was detected in presence of pus near mucocutaneous junction or stitch abscess or sinus. Intestinal obstruction was diagnosed clinically or radiologically if necessary. Poor stoma care was defined in presence of inappropriate siting or fitting of stoma bag leading to leakage and soiling of dresses. These complications were managed either conservatively or by active surgical intervention as required. Descriptive statistics were used to summarize the data.

The statistical significance of data was evaluated by applying the Pearson's chi-square test or Fischer exact test as necessary and a P value of less than 0.05 was considered statistically significant. Univariate and bivariate logistic analysis were performed through IBM Statistical Product and Service Solutions (SPSS) Version 26.

RESULTS

Total 102 patients were enrolled in this study. Three patients were excluded as two patients expired in immediate postoperative period and another patient had incomplete data. So we analyzed 99 bowel ostomies. Sixty four ileostomies and 35 colostomies were performed in our study period. There were total 60 male and 39 female patients. Male: female ratio was 39:25 and 21:14 in ileostomy and colostomy group respectively. Median age was 55 years in both ileostomy (range 15-77) and colostomy group (range 32-73). All ileostomies were temporary and only 3 colostomies were permanent in nature. Median follow up period was 2.8 months (range 2.5-16).

Most common etiology for ileostomy formation was nontraumatic bowel perforation (42%) whereas colorectal malignancy (48.6%) was most common indication for colostomy formation (Table 1).

Table 1: Indications for stoma.

Indications	Ileostomy (n=64) N (%)	Colostomy (n=35) . N (%)
Abdominal trauma	10 (16)	1 (2.8)
Malignancy	22 (34)	17 (48.6)
Non traumatic bowel perforation	27 (42)	1 (2.8)
Intestinal obstruction	2 (3.1)	12 (34.4)
Perianal fistula	0	2 (5.7)
Inflammatory bowel disease	2 (3.1)	0
Diverticular disease	1 (1.6)	2 (5.7)

In ileostomy group loop ileostomy was most common variety (42.2%) whereas loop colostomy was present in 60% cases. 76.6% ileostomies were created in emergent surgery whereas 54.3% colostomies were created in emergent surgery. Types of stoma and timing of their creation is depicted in Table 2. Diabetes (45.7%) was most common comorbid condition in colostomy group whereas it was hypertension (67%) in ileostomy group, closely followed by obesity (62%).Other comorbidities and preclinical data is given on Table 3.

Table 2: Type of stoma and their timing of creation.

Type of stoma	Emergency	Elective
Ileostomy	49 (76.6%)	15 (23.4%)
Loop (n=27, 42.2%)	20	7
Double barrel (n=24, 37.5%)	24	0
End (n=13, 20.3%)	5	8
Colostomy	19 (54.3%)	16 (45.7%)
Loop (n=21, 60%)	17	4
End (n=14, 40%)	2	12

Table 3: Comorbidities and preoperative clinical data.

Comorbidities	Ileostomy (n=64) N (%)	Colostomy (n=35) N (%)
Diabetes	22 (34.4)	16 (45.7)
Obesity (BMI>30)	40 (62)	12 (34.2)
Pre-existing lung disease	11 (17.2)	12 (34.2)
Smoking	36 (56)	14 (40)
Hypertension	43 (67)	13 (37.1)
Preoperative clinical data		
Anaemia	30 (46.9)	17 (49)
Sepsis	40 (62)	9 (26)
Hypoalbuminaemia	30 (46.9)	15 (43)

Table 4: Stoma related complications.

Complications	Ileostomy (n=41) N (%)	Colostomy (n=24) N (%)
Skin excoriation	20 (31)	2 (5.7)
Prolapse	8 (12)	6 (17)
Mucocutaneous separation	5 (7.8)	1 (2.9)
Parastomal hernia	2 (3.1)	5 (14)
Necrosis	1 (1.6)	2 (5.7)
Bleeding	3 (4.7)	2 (5.7)
Retraction	2 (3.1)	2 (5.7)
Peristomal abscess	2 (3.1)	1 (2.9)
Stenosis	0	4 (11)
Intestinal obstruction	1 (1.6)	2 (5.7)
Poor stoma care	17 (27)	8 (23)

Total 61 complications were observed in 41 patients (64%) in ileostomy group and 35 complications were present in 24 patients (68%) with colostomy. In our study skin excoriation (31%) and poor stoma care (27%) were two most common complications in ileostomy group whereas in colostomy group poor stoma care (23%) and prolapse (17%) were most common complications. Other complications are shown in Table 4.

Mean operative time for ileostomy with and without complication was 114.04 minutes and 110.30 minutes respectively (p=0.889). Mean operative time for colostomy with and without any complication was 126.38 minutes and 127.82 minutes (p=0.677).

When we analysed presence of any or more complications and risk factors in ileostomy group, we found type of stoma to be significantly associated (0.015) with complication (Table 5). However in multivariate logistic regression it did not show any significant association (p=0.987, exp B=0.993). Again we analysed specific stomal complication with each risk factor (Table 6). In univariate analysis skin excoriation was found to be significantly associated with type of ileostomy (p=0.041) and diabetes (p=0.005). Similarly mucocutaneous separation was associated with emergency surgery (p=0.001), loop ileostomy (p=0.024) and diabetes (p=0.044). parastomal hernia and necrosis were significantly associated with indication of surgery. However in multivariate logistic regression revealed only skin excoriation was found to be associated with diabetes (p=0.002) (Table 9).

In colostomy group we did not find any risk factor to be significantly associated with any complications we documented (Table 7). We then analyzed each specific complication with individual risk factor (Table 8). We found indication of surgery was a significant factor for development of stenosis (p=0.007), intestinal obstruction (p=0.014) and poor stoma care (p=0.050). stenosis was also more in end ileostomy group (p=0.019). However in multivariate logistic regression we did not find any of these factors to significantly associated (Table 9). For intestinal obstruction it was not possible for too low number.

One patient needed re-exploration for intestinal obstruction in early postoperative period and other complications are shown in Table 10.

Hospital stay for ileostomy and colostomy group with one or more complication was 9.83 and 11.42 days respectively whereas for stoma without any complication hospital stay was 7.91 and 12.09 days respectively. Hospital stay was not significantly different for those who developed complications (p=0.807 for colostomy group), (p=0.811 for ileostomy group).

Table 5: Risk factor and complication in ileostomy group.

Risk factor	Ileostomy no complication (n=23)	Ileostomy with complications (n=41)	P value
Emergency	20	29	0.220
Elective	3	12	
Indications			0.161
Trauma	4	6	
Malignancy	4	18	
Bowel perforation	14	13	
Intestinal Obstruction	0	2	
IBD	1	1	
Diverticular disease	0	1	
Type			0.015
Loop ileostomy	6	21	
DBI	14	10	
End ileostomy	3	10	
Diabetes	5	17	0.170
Obesity	7	17	0.431
Pre-existing lung disease	4	7	1.000
Smoking	10	18	1.000
Hypertension	10	11	0.267
Anaemia	11	19	1.000
Hypoalbuminaemia	13	17	0.301
Preoperative sepsis	10	14	0.592

IBD=Inflammatory bowel disease; DBI=Double barrel ileostomy

Table 6: Specific ileostomy complications and risk factors (P value in individual box).

	Elective/ Emergency	Indic-ation	Type of stoma	Diabe-tes	Obe-sity	Smo k-ing	PLD	HA	Hyper -tensio n	Anae -mia	Preop-sepsis
Skin Ex.	1.00	0.062	0.041	0.005	0.419	0.281	0.728	0.791	1.0	0.791	1.00
Prolapse	0.079	0.208	0.736	1.00	0.139	0.448	1.00	0.265	0.065	0.713	0.699
MCS	0.001	0.066	0.024	0.044	0.355	1.00	1.000	0.055	1.00	0.055	0.148
PSH	1.00	0.003	0.243	0.542	1.000	0.188	0.316	1.00	1.000	1.00	1.00
Necrosis	0.234	0.001	0.136	1.00	1.00	0.437	1.00	1.00	0.328	0.469	1.000
Bleeding	1.00	0.790	0.577	0.545	1.00	1.00	1.00	1.00	1.00	0.596	1.00
Retraction	0.417	0.558	0.396	1.00	1.00	1.00	0.316	1.00	1.00	1.00	0.524
PSA	1.00	0.726	0.179	0.542	0.524	0.500	1.00	0.494	0.104	0.216	0.137
Intestinal obstruction	1.00	0.360	0.136	1.00	1.00	0.437	1.00	1.00	1.00	1.00	1.00
Poor stoma care	0.517	0.369	0.376	1.00	0.39	1.00	0.463	0.584	0.065	0.396	0.774

PLD=Preexisting lung disease, Skin Ex.=Skin excoriation; MCS=Mucocutaneous separation, PSH=Parastomal hernia, PSA= Peristomal abscess, HA= Hypoalbuminaemia,

Table 7: Risk factor and complication in colostomy group.

Risk factor	Colostomy with no complication (n=11)	Colostomy with any or more complications (n=24)	P value
Emergency	8	11	0.167
Elective	3	13	
Indications			0.159
Malignancy	8	9	
Benign obstruction	2	10	
Others	1	5	

Continued.

Risk factor	Colostomy with no complication (n=11)	Colostomy with any or more complications (n=24)	P value
Type			0.137
Loop colostomy	9	12	
End colostomy	2	12	
Diabetes	5	11	1.000
Obesity	2	10	0.259
Preexisting lung disease	2	10	0.259
Smoking	7	7	0.073
Hypertension	4	9	1.000
Anaemia	8	9	0.075
Hypoalbuminaemia	4	11	0.721
Preoperative sepsis	2	7	0.685

Table 8: Specific colostomy complications and risk factors (p value in individual box).

	Elective/ Emerge-ncy	Indic-ation	Type of stoma	Diabe-tes	Obe-sity	Smok -ing	PLD	HA	Hyper-tension	Anae -mia	Preop-sepsis
Skin Ex.	0.202	0.330	1.000	0.489	0.536	1.000	1.000	0.176	0.519	0.229	0.454
Prolapse	0.666	0.153	0.664	0.379	1.000	0.061	0.391	0.207	1.000	1.000	0.304
MCS	1.000	0.580	0.400	1.000	0.343	1.000	0.343	1.000	1.000	0.486	1.000
PSH	0.347	0.482	0.134	0.347	0.313	0.369	0.313	1.000	0.134	0.658	1.000
Necrosis	0.489	0.325	0.153	1.000	0.111	0.153	1.000	0.176	0.519	0.486	1.000
Bleeding	0.202	0.720	1.000	0.489	0.536	0.153	0.536	0.496	0.131	0.486	1.000
Retraction	1.000	0.099	0.153	0.202	1.000	0.506	1.000	0.176	1.000	0.486	1.000
PSA	0.457	0.325	0.400	1.000	1.000	0.400	0.343	1.000	1.000	0.486	1.000
Stenosis	0.312	0.007	0.019	0.312	1.000	1.000	1.000	1.000	0.134	0.104	0.553
Intestinal obstruc-tion	1.000	0.014	0.506	0.489	0.111	0.506	0.536	0.176	0.519	0.486	0.061
Poor stoma care	0.424	0.050	1.000	1.000	0.402	0.431	0.402	0.246	1.000	0.228	0.162

PLD=Preexisting lung disease, Skin Ex.=Skin excoriation; MCS=Mucocutaneous separation, PSH=Parastomal hernia, PSA= Peristomal abscess, HA= Hypoalbuminaemia

Table 9: Multivariate logistic regression table.

Ileostomy complications	Risk factors	P value	B
Skin excoriation	Type of stoma	0.689	-0.194
	Diabetes	0.002	2.623
Mucocutaneous separation	Emergency surgery	0.999	59.408
	Type of stoma	1.000	-19.570
	Diabetes	1.000	-6.730
Necrosis	Indication	0.999	7.337
Parastomal hernia	Indication	1.000	0.533
Colostomy complications			
Stenosis	Indication	0.999	33.39
	End ileostomy	0.998	107.28
Poor stoma care	Indication	0.971	-0.27

Table 10: Complications other than local complications of stoma.

Clavien Dindo grading	Complications (N)	Details
I	15	Mild wound infection managed in the ward N=10
II	19	Chest infection treated with antibiotics and chest physiotherapy, N=2 Urinary tract infection, N=3 Hypoglycaemia, N=1 Transfusion reaction, N=1 Dyselectrolytaemia, N=12
IIIa	3	Severe wound infection requiring secondary suturing, N=3
IIIb	1	Complete wound dehiscence(burst abdomen), requiring secondary suturing under general anaesthesia, N=1
IVa	1	Reexploration due to obstruction with single organ dysfunction, N=1 (developed acute renal failure, managed conservatively)
IVb	0	Multiorgan dysfunction
V	2	Death of a patient

DISCUSSION

First surgical creation of stoma was done more than 200 years ago. Since then stoma surgery has evolved as a very useful as well as a lifesaving surgery. But it remains a challenge to surgeon in view of very high morbidity rates. In developing countries including India stoma is often created in both emergency and elective situation. Unlike the West most common cause for ileostomy formation was non traumatic bowel perforation, mostly due to typhoid or tuberculosis. Similar result was also shown by Choudhary et al. Delayed presentation, preoperative sepsis, hypoalbuminaemia, poor nutritional status were common factor to prefer a temporary loop or double barrel ileostomy (DBI) instead of primary anastomosis.[6] When some length of small bowel has to be resected due to gangrene or questionable viability, we usually exteriorize the both limb of bowel with same opening making it double barrel ileostomy.[12] It may be noted that all DBI were fashioned in emergency condition. Emergency colostomies (54.3%) were mainly loop transverse or sigmoid colostomy whereas end colostomies were preferred in elective situation. Overall colorectal malignancy was most common causative factor.

In our study overall complication was 65.6% and in ileostomy and colostomy group it was 64% and 68% respectively. When overall complication rate was analysed risk factors, none of the risk factor was statistically significant, but analyzing individual complication with risk factor some trends are noted. Skin excoriation was most common complication in ileostomy group. It ranges from peristomal inflammation to contact dermatitis. We had not experienced any case of pyoderma gangrenosum. Skin complications have been reported 25 to 43% in ileostomy group and 7-20 % in colostomy group.[9,13-16] Skin problem is multifactorial and some authors suggest protuberant stoma to decrease the complication rate.[17,18] In our study we found diabetes to be significantly associated with skin excoriation and double barrel ileostomy showed an increasing trend of skin excoriation. Similar result was also obtained by Arumugam et al.[8] All skin complications were managed by conservative management such as topical therapy and use of better appliances.

Prolapse was present 17% in colostomy group and 12% in ileostomy group. It is reported to be more common with colostomy than ileostomy and incidence is documented from 7-25% in case of loop colostomy.[1,19] Obesity, increased abdominal pressure, large opening have been cited as risk factor, but we found none of the risk factor to be significantly associated.[1,20] But our result should be interpreted with caution due to very low number of patients. Again incidence of prolapse also depends on duration of follow up. We had a short term follow up and severe degree of stoma prolapse was corrected with stoma reversal. Mucocutaneous separation (MCS) in ileostomy group (7.8%) was distinctly associated with emergency surgery (all 5 patients were operated in emergency condition). Again diabetes and loop ileostomy were found to be significantly associated, though in logistic regression none of these factor was found to be significant. MCS is reported up to 27% in early postoperative period technical complication from excessive tension, diabetes, obesity, immunosuppression, cautery use over skin have been implicated as causative factor.[21] In our study all MCS were small and none required operative revision.

Parastomal hernia is sort of incisional hernia that develops through the abdominal wall defect at stoma site. Incidence depends on the method of diagnosis.it was reported up to 39% when it was detected clinically whereas it may reach up to 80% when radiological imaging is included.[23] Risk factors are similar to those for stoma prolapse. In our study we clinically detected parastomal hernia in 14% and 3.1% of colostomy and ileostomy group respectively. Lower percentage of hernia in our study can be explained by short term follow up time. Though indication of surgery may have some influence on development of parastomal hernia, we are unable to find it significant after multivariate regression.

Numerous studies have investigated factors that could have reduce the incidence of parastomal hernia.[1,5,23] One recent metanalysis showed that prophylactic mesh placement during stoma creation reduces the incidence of parastomal hernia.[24] However we had never placed any prophylactic mesh in our study population. One patient with permanent end colostomy developed parastomal hernia and it was managed non-operatively till the end of study period whereas all other patients were treated with stoma reversal.

Necrosis was observed in one patient in ileostomy group and 2 patients in colostomy group. In literature it has been reported up to 20% and factors like emergency surgery, inadequate mobilization, excessive mesenteric traction, small opening in fascia etc. have been cited as risk factors.[3,8,19,25] Indication of surgery was found to associated with ileostomy necrosis (this patient had ulcerative colitis for which subtotal colectomy and end ileostomy was performed). However it would not be judicious to conclude it from our study as number is too small to reach any significant value. All necrosis were patchy in immediate postoperative period and none required stoma revision or reoperation. Superficial bleeding was present in around 5% of cases in both ileostomy and colostomy group. All these complications occurred in immediate postoperative period that resolved with pressure bandage. Bleeding due to stomal abrasion was not observed during follow up period.

Incidence of stomal stenosis is reported from 2 to 15% and this is more common with end colostomy.[19] Poor surgical technique, small trephine size, peristomal abscess, recurrent disease (Crohn's disease), malignancy have been implicated as risk factor in various studies.[5] We observed 4 stomal stenosis in end colostomies (p=0.019) and all of them were created in malignant surgery (p=0.007). But further multivariate analysis did not find it to be a significant causative factor. Krishnamurthy et al have suggested factors like early postoperative mucocutaneous separation and stoma retraction may lead to stomal stenosis. However long term follow up is necessary to document exact incidence of stomal stenosis.5 out of 4 patients we managed three patients with regular dilatation and one patient needed refashioning of stoma.

Peristomal abscess, retraction and postoperative intestinal obstruction were infrequent complications in our study population. We found poor stoma care was present in 27% and 23% of ileostomy and colostomy group. Multiple factor may be associated with it such as poor stoma site, improper application of stoma appliances, and educational level of the patient and lack of enterostomal nurse. Though none of the risk factor or comorbidity was significantly associated, we found that patient with colostomy for malignancy has increasing trend for poor stoma care (P=0.050). Facility of enterostomal nurse is not present in our hospital and very few patients have ability to access them privately. It seems that unavailability of enterostomal nurse has affected the stoma care or standard of care for stoma.

In our study group we did not encounter peristomal varices or pyoderma gangrenosum. We had not considered high output stoma as a local complication of stoma. The fluid and electrolyte change due to stomal output is more systemic and disease oriented problem rather than stoma related local problem. We had a small sample size and short term follow up time. Further follow up study with larger population is needed to verify our obtained result.

CONCLUSION

Diabetes was found to be a significant associated risk factor for skin excoriation in patients with ileostomy. In absence of certified enterostomal nurse, stoma care remains a challenge in our study population. Further long term data and larger population needed for better evaluation of stomal complication and their risk factors.

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