

## A SURGICAL AUDIT ON ILEOSTOMY- FROM CREATION TO CLOSURE

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### ABSTRACT

#### BACKGROUND

Temporary ileostomies are commonly used forms of faecal diversion. We wanted to study the various indications, complications, morbidity and mortality of ileostomy.

#### METHODS

An analysis was performed of all patients who underwent ileostomy construction and reversal between June 2015 to October 2017, with data being collected prospectively in post-operative period and then patients are followed for next 12 weeks (average) before reversal. Later they were followed after reversal for next 12 weeks.

#### RESULTS

Thirty patients, (21 male, 9 female) with a mean age of 46 years (range 15 to 60 years) had ileostomies constructed. Indications for ileostomy construction included traumatic ileal perforation (6), tuberculous ileal stricture (5), enteric ileal perforation (4), intestinal obstruction due to post-operative adhesions (4), obstructed hernia (3), caecal perforation (2), suspected Crohn's disease (2), tuberculous ileal perforation (1), ileovaginal fistula (1), anastomotic leak (1) and sigmoid volvulus (1). Complications like peristomal skin excoriation were noted in 26 patients, 7 patients had wound infection, 2 patients underwent resurgery one for stomal necrosis and other for post-operative adhesions. Death was reported in 3 patients. Mean time to ileostomy reversal was 9.6 weeks. Ileostomy was reversed in 26 patients. Among them, 10 patients had wound infection, diarrhea in 2 cases, resurgery was done in one case, enterocutaneous fistula was noted in one case, and one patient expired after reversal procedure. Diarrhoea was noted in one case in first follow up. Stitch abscess and incisional hernia were observed in 3 and 2 cases respectively.

#### CONCLUSIONS

The present study states that considerable complications are associated with ileostomy, but the role of active intervention is minimal. Hence it can be stated that benefits outweigh the risks.

#### KEYWORDS

Ileostomy, Morbidity, Mortality

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#### BACKGROUND

Currently, there are approximately 1 million individuals with an ostomy living in the United States, and an industry has developed solely for the purpose of supplying ostomy products. These people live normal lives, and some of them even compete in the National Football League and play golf on the professional tour. However, this situation was not always the case. Great advances in both stoma surgery and the development of ostomy management systems have made it possible for individuals with an ostomy to lead a

normally active life. The construction of diverting stomas is an integral part of many operations for colorectal tumours, trauma, and inflammatory bowel disease. These stomas are formed by exteriorizing and maturing a segment of small bowel or colon in which the continuity of the intestinal wall or mesentery is preserved, most often resulting in a loop or end configuration. Traditionally they are used in clinical situations in which proximal faecal diversion must be performed expeditiously and usually on a temporary basis, such as to protect a low anastomosis, decompress obstructed bowel, or prevent faecal material from further contaminating an inflammatory mass. The advantages of diverting stomas include prevention of technical ease of construction and, more important, ease of closure.<sup>1</sup>

The best way to achieve success in maximizing quality of life following stoma surgery is to adequately prepare the patient preoperatively. An appropriate approach to this problem includes counseling patients in realistic expectations, correcting misconceptions and myths, properly siting the stoma to minimize complications related to

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appliance disruption and leakage, and providing adequate support postoperatively. Proper siting is done in the preoperative setting, taking care to assess the abdominal wall in the supine sitting, and standing positions. Proper identification of an adequate area of flat, smooth skin unencumbered by creases, wrinkles, or a bony prominence is critical. The development of the stoma within the confines of the rectus abdominis muscle remains the preference of most surgeons. The few minutes necessary to achieve these goals may prevent years of impaired quality of life and complications often associated with a poorly located stoma.<sup>2</sup> For these reasons diverting stomas, have become the most frequently used type of ostomy in surgical practice.<sup>3</sup> Several fundamental questions commonly arise during a discussion of diverting stomas. Perhaps the most common one is: Do diverting stomas completely defunctionalise the bowel? The corollary to that question is: Are diverting stomas necessary? Useful? Pros n cons justifiable? Benefits outweigh risks?

The aim of this study is to answer these questions and to review the indications, operative techniques, and complications associated with the construction of Ileostomies, like all intestinal stomas, result in a major change in our patient's appearance and function. Even when constructed well, they have significant impact on patient's life, though temporary its benefits are obvious, but there are reports of high complication rates<sup>4</sup> and there is debate about whether to use ileostomies or not. The anatomic and physiologic consequences of emptying small bowel contents onto the skin of the abdominal wall resulted in significant morbidity, making ileostomy much less desirable. The actual benefit from a defunctioning stoma will depend on the successful reversal of the stoma being associated with minimal risk. Although closure of ileostomy is regarded as a fairly minor procedure, it is still associated with significant morbidity and mortality.

We wanted to study the various indications, complications, morbidity and mortality of ileostomy.

## METHODS

This is a hospital based cross-sectional study done prospectively from June 2015 to October 2017. All patients who are willing to participate in the study, aged between 15-60 years, attending the OPD of department of general surgery and emergency in a tertiary care hospital in Tirupathi, in whom ileostomy was indicated are included in study. Patients who are operated for malignancy, patients undergoing urinary stoma construction, patients undergoing stoma construction as indication for gynaecological malignancies were excluded.

Data is collected from patients who underwent ileostomy for emergency and elective, during the hospital stay after procedure later followed by regular follow ups. Consent is taken from the patients and ethical considerations are taken from institutional ethical committee. All the patients were admitted and were evaluated by detailed history, thorough clinical examination, laboratory investigations including complete blood count and ESR, blood urea, creatinine, serum electrolytes, Blood sugar,

Widal test, Typhidot, ultrasound abdomen, x-ray chest P/A view and plain x-ray abdomen erect and supine including both domes of diaphragm were also done. The clinical assessment, operative findings as well as post-operative complications were recorded. Initially all patients were resuscitated by administering intravenous fluids with electrolytes replacement. Antibiotics were given preoperatively and continued postoperatively. All patients were operated and intra operative findings are documented. The specific surgical complications recorded were skin excoriation, Stomal retraction, Stomal stenosis, Stomal prolapse, peristomal sepsis, Stomal ischemia, Stomal bleeding and parastomal hernia were studied. Patients were followed for any complication for 8 to 12 weeks after ileostomy ranging from 8 weeks to 12 weeks.

## RESULTS

30 patients were included in study who underwent ileostomy construction for various indications from period of June 2015 to October 2016. Majority of sample 46.61% (14/30) falling in 41-50 yrs. age group and 43.4% (13/30) in 51-60 yrs. age group. Among these patients 70% (21/30) of them are males and 30% (9/30) are females. The male and female ratio is 7: 3.

## Indications

In this study, 20% (6/30) of stomas are indicated for traumatic ileal perforation, 16.66% (5/30) for Tuberculous ileal stricture, 13.34% (4/30) cases for typhoid ileal perforation and 13.34% (4/30) for intestinal obstruction due to post-operative adhesions. Obstructed inguinal hernia in 10% (3/30) cases. Ileostomies were done for suspecting Crohn's disease 6.67% (2/30) cases and caecal perforation in 6.67% (2/30) cases. Other indications are sigmoid volvulus 3.33% (1/30), Tuberculous ileal perforation 3.33% (1/30), anastomotic leak 3.33% (1/30), Ileovaginal fistula in 3.33% (1/30) cases. Table no. 1. Out of 30 cases, 14 (46%) cases underwent loop ileostomy, 12/30 (40%) were end ileostomy and 4 /30 (13%) were double barrel ileostomy.

Indications for Ileostomy	No. of Patients	Percentage (%)
Traumatic Ileal Perforation	6	20
Tuberculous Ileal Stricture	5	16.66
Intestinal Obstruction	4	13.34
Typhoid Ileal Perforation	4	13.34
Obstructed Inguinal Hernia	3	10
Caecal Perforation	2	6.67
Suspecting Crohns disease	2	6.67
Tuberculous Ileal Perforation	1	3.33
Sigmoid Volvulus	1	3.33
Anastomotic Leak	1	3.33
Ileovaginal Fistula	1	3.33
Total	30	100

**Table 1. Indications for Ileostomy**

## Complications

During post-operative period, most common complication encountered was peristomal skin excoriation 26/30 which is graded and tabulated separately in table 6. Wound infection is next common complication found in the study i.e., in 7/30 cases. One case presented with post-operative obstruction

features in post-operative period that required resurgery in which flimsy adhesions were noted. Stomal necrosis in 1/30 cases which is another case that required re-surgery. Enterocutaneous fistula in 1/30 which was managed conservatively. Mortality rate is 3/30 summarized in Table no 2.

Post-Op Complications	No. of Patients
Skin Excoriation	26
Wound Infection	7
Stomal Necrosis	1
Resurgery	2
Enterocutaneous Fistula	1
Obstruction	1
Death	3
<b>Table 2. Post-Operative Complications</b>	

Peristomal skin excoriation was the most common complication noted in 26 patients out of 30. These cases are graded as minimal, moderate and severe skin excoriation based on Pittman ostomy complication severity index score. 16/30 cases had minimal skin excoriation, 9/30 cases had moderate skin excoriation and 1/30 case had severe in post-operative period. Hence 33.3% of patients are considered to have significant peristomal excoriation i.e., patients having moderate and severe skin excoriation.

### Complications on Follow up

Skin excoriation was more common complication noted in all follow up but its number went down on further follow up i.e., 9/30 case in first follow up, 4/30 and 2/30 in second and third follow up. In first follow up, stomal prolapse and wound infection was observed in one case respectively. Stomal prolapse was successfully reduced and wound infection was managed with regular dressings and antibiotics. In second follow up a case presented with post-operative obstruction due to adhesions and underwent laparotomy following which he had severe skin excoriation. In third follow up one case presented with stomal prolapse and one with stomal prolapse who was admitted soon for closure.

### Stomal Reversal

Mean length of Hospital stay period during stoma construction post-operative period is 12.9 days. Mean period taken for stoma closure is 9.6 weeks. Similar to age distribution in stoma construction sample, majority of sample is in 41-50 years age group followed by 51-60 years indicating elderly group. 3/30 patients were expired following stoma construction. 1/30 case didn't return back to us for closure. 3/30 cases didn't turn up from third follow up and noted as drop out from study. 18 male patients and 8 female patients are present in reversal sample with sex ratio of 2.25:1.

Ileostomy Closure Complications	No. of Patients
Diarrhoea	2
Wound infection	10
Resurgery	1
Enterocutaneous fistula	1
Death	1
<b>Table 3. Complications after Ileostomy Reversal</b>	

After stoma closure, patients were observed in postoperative period and further follow up. Wound infection (10/26) was the most common complication observed which prolonged their hospital stay which is followed by diarrhoea in two cases and enterocutaneous fistula in one case. Mortality rate is one after stoma closure which is tabulated in Table 3. Following stoma closure, all the patients are asked to attend regular follow up firstly after 2 weeks after discharge, next one after 4 weeks and later after 4 weeks. One case was noted as drop out during follow up after stoma closure. Stitch abscess was seen in 2/25 cases in second follow up and one in third follow up. Incisional hernia was seen in 2/25 cases in third follow up.

### DISCUSSION

Faecal diversion remains an effective option to treat a variety of gastrointestinal and abdominal conditions. Ileostomy and colostomy are commonly made intestinal stomas in surgery. Patients undergoing stoma formation are at risk of developing a wide range of complications following surgery. The creation of a temporary diverting loop ileostomy is a surgical tool to divert stool in defunctioning distal anastomosis and in cases where the take up of anastomosis is doubtful. Despite a great number of such surgeries done, complications are almost inevitable. However, the second operation, i.e., ileostomy closure, has its own potential risk of morbidity and mortality.<sup>5</sup> The overall complication rate worldwide ranges between 3 and 38.5%, with mortality ranging from 0 to 6.9%.<sup>6</sup> Similar study conducted by Yasmeen Bhatti et al<sup>7</sup> in 180 patients with age ranging from 12-65 years (mean 29 years). Male to female ratio was 1:1.22. Another study conducted on 85 patients by Zulfikar et al<sup>8</sup> age ranging between 12-61 years. Mean age is 36 years. The present study is also a prospective study done in 30 patients with age ranging between 15-60 years with mean age is 46 years and male to female ratio is 7:3.

Abdominal Pathologies	Yasmeen Bhatti et al <sup>7</sup>	Zulfikar et al <sup>8</sup>	Present Study
Enteric Perforation	51.6%	52.9%	13.34
Intestinal obstruction	27.2%	-	23.34
Sigmoid volvulus	-	03	3.33
Abdominal Tuberculosis	11.1%	15.29	19.99
Abdominal Trauma	10%	4.71	20
Firearm injury	-	5.88	-
Ileovaginal fistula	-	-	3.33
Caecal perforation	-	-	6.67
Post dilatation & curettage	-	5.88	-
Malignancy	-	2.35	-
Miscellaneous	-	12.94	-
<b>Table 4. Comparison of Indications for Ileostomy</b>			

As summarized, above in study of both Yasmeen Bhatti et al<sup>7</sup> and Zulfikar et al<sup>8</sup> maximum stomas were indicated for enteric perforation 51.6% and 52.9% respectively whereas in our study it is 13.34%. This may be probably because of their endemic study setting. In Present study most common indication is intestinal obstruction due to post-operative adhesions and Inguinal hernia which is 23.34%, this is similar to some extent with Yasmeen Bhatti et al<sup>7</sup> study i.e.,

27.2% but Zulfikar et al<sup>8</sup> study did not reported intestinal obstruction in their study. Next most common indication is blunt injury of abdomen in this study whereas in Yasmeen Bhatti study it is 10% and in Zulfikar et al it is 4.71%. Following injury, after resection of gangrenous segment, anastomosis take up was completely doubtful. So, in order to avoid anastomotic leak, ileostomy was preferred in our study. Abdominal tuberculosis is the third most common indication in this study similar to Yasmeen Bhatti et al study. Sigmoid volvulus is indication in 3.33% cases in our study, and this is in similarity with Zulfikar et al study. Ileovaginal fistula is indication in 3.33% cases which was not reported in other studied.

### Ileostomy Complications

Literature shows varying rates of stomal complications. The largest series in the literature reports a 34% complication rate in 1616 patients with stomas (including both ileostomies and colostomies) over a 20-year period at Cook County Hospital by Park et al. 28% of complications in this series occurred early (<1 month postoperatively), while the remaining 6% occurred late. In our study 59.9% complication rate is seen in within hospital stay period and 6.66% in follow up after next 15 days which roughly within first 30 days after stoma construction. Carlstedt et al<sup>9</sup> also reported a rate of stoma specific complications requiring surgical revision in 34% of patients undergoing proctocolectomy with end ileostomy for ulcerative colitis and Crohn's disease, though most of these were late complications. A greater proportion of stoma-specific complications in this series were seen in patients with Crohn's disease. In present study, 13.33% patients required resurgery, but this sample included various indications unlike Carlstedt et al study with IBD cases.

Complications	Yasmeen Bhatti et al <sup>7</sup>	Zulfikar et al <sup>8</sup>	Present Study
Skin excoriation	21.1%	5.88	33.3%
Retraction	6.6%	1.18	3.33%
Stenosis	4.4%	2.35	-
Prolapse	4.4%	3.53	6.66%
Peristomal sepsis	1.6%	-	-
Ischemia	1.1%	-	3.33%
Bleeding	0.5%	-	-
Post-operative obstruction	-	-	6.66%
Parastomal hernia	-	-	-
Mortality	0	1.18	10%

**Table 5. Comparison of Stomal Complication Incidence**

Skin excoriation is the most common complications in present study (33.3%) and Yasmeen Bhatti et al study (21.1%). This can be due to stoma construction in emergency setting, which does not have preoperative siting. This can lead to ill-fitting of appliance and leading to excoriation. Low BMI of the patients can also be attributing this ill-fitting of appliance. In the present study moderate and severe skin excoriation is noted in 10 cases, minimal peristomal skin excoriation is seen in 16 cases which were managed conservatively by proper stomal appliance fitting, Siloderm ointment, proper patient counseling about stoma care. Patients with low BMI were prone for leakage due to

improper fitting of stoma appliance due to bony prominences; whereas obese patients are not present in the study sample to describe about their difficulties specifically. Severe peristomal excoriation in one patient forced to plan for early closure. Stoma prolapse was seen in 2/30 patients in present study. Stoma prolapse causes distress and looks alarming and unsightly. This was managed by manual reduction as it was a simple mucosal prolapse. Unlike for incarcerated or strangulated prolapse, local resection and reformation of the stoma or revision by abdominal approach should be done. None of our patients required surgical intervention for stomal prolapse. Retraction or prolapse of stoma and transient stomal ischemia are usual sequelae of an improper surgical technique.

Duchesne C.J et al<sup>10</sup> reported 25% ileostomy complications which included prolapse in 9 (22%) necrosis in 9 (22%) stenosis in 7 (17%) irritation in 7(17%) infection in 6 (15%) bleeding in 2 (22%) and retraction in 2 (5%). No significant differences were seen in emergency cases and did not have a statistically significant impact on the incidence of postoperative complications. In present study all the stomas constructed in emergency setting except two hence no statistically significant difference with elective cases can be obtained. Safirullah et al<sup>11</sup> reported major complications as skin excoriation (12%) oedema of spout (8%) prolapse (6%) and retraction (4%). In follow up period after stoma construction, minimal skin excoriation was noted in 9 cases in first follow up later the frequency went down gradually to 4 and 2 cases in second and third follow up respectively. Stomal prolapse in one case each in first follow up and third follow up. Stomal retraction was noted in third follow up. Obstruction noted in one case due to post-operative adhesions. Wound infection noted in first follow up which was managed conservatively.

In present study an overall rate of 59.94% complications associated with ileostomy. Majority of them are managed successfully in conservative manners, 0.1% cases required resurgery. Overall mortality rate is 10% in the present study and all the three cases presented badly in shock with medical comorbid conditions. Skin excoriation was found to be the major complication in this study. The usual incidence of peristomal skin problems is 10-14%<sup>10</sup> and here it is high the probable cause may be improper siting, high or low BMI, and postoperative care. In emergency situations, it is often not possible to mark the stoma site in standing and sitting position as the patients who present late are usually in shock at the time of presentation. In such cases, it is difficult to judge the skin folds and waistline in patients with high BMI. The probable reasons for skin excoriation and retraction in patients with low BMI who have thin built and poor nutritional status, bony prominences pose a problem in proper placement of stoma appliances and result in frequent leakage and skin excoriation. At the time of admission, 16 patients had low BMI while after 12 weeks all the patients were in the normal range. This indicates that there was significant weight gain, hence improvement in BMI of patients at the end of the study. Apart from the role of improved diet and resolution of pathology, regular

counseling might have played an important role in improvement.

An ileostomy has an adverse effect on quality of life, which gets further enhanced if stoma related complications occur.<sup>12</sup> Complication rate of temporary ileostomy ranges between 5-100%. These rates vary due to varying length of follow up.<sup>13</sup> Here it is 59.94% of complication rate for follow up of 3 months period following stoma construction and similarly after stoma closure. Delayed presentation, age of the patient, urgency of surgery, degree of contamination, diagnosis at the time of presentation and presence of shock at admission are the factors associated with a high level of morbidity.

### Stoma Reversal

The complications rate reported in various national and international studies ranges from 5 to 60 percent.<sup>14</sup> In our series the overall rate of complication was 11.11%, which is low compared to the reports of other as high as 30%. Toole et al<sup>15</sup> and Barry et al<sup>16</sup> have shown complication rate of 4% and 7.7% respectively. The rate of surgical intervention in this study is 3.8%. These complications can be prevented by adequate nutritional built up to optimize patient's health, adequate preoperative preparation, sound surgical technique adopted, adequate control of primary gut disease, proper time of closure after initial surgery.

The most common complication observed in this study was surgical site infection which occurred in 10(38.46%) cases out of 26 cases that underwent stoma reversal. Though the number is high in the present study, it is the most common complication in other two studies compared indicates ileal effluent sodden peristomal skin is common, which is going to be sutured. Van de Pavoordt et al<sup>14</sup> and Wexner SD et al<sup>17</sup> observed surgical site infection in 3% and 1.3% of cases respectively, in which skin incision was left open and was secondarily closed. In all our patients we closed the wound primarily so this may be a contributory factor to the comparative higher rate of wound infection in our study. Majority of wound infections in our series were of minor type and managed by drainage of the infection through a small opening made by removal of few stitches in the wound and a course of broad-spectrum antibiotics according to culture and sensitivity. Although Primary closure increased the hospital stay a little but produced a better cosmetic scar in majority of the cases.

Next most common complication in the studies compared is Postoperative ileus (3.83%) which is not reported in present study. All the patients attained bowel motility within 4-8 days in the present study. Small bowel obstruction is another commonly observed complication in post-ileostomy reversal. Most of the times it is transient and can be appropriately termed as postoperative ileus (non-mechanical) which resolves with conservative measures like keeping the patient nil per oral and intravenous fluids replacement. Initially they had increased frequency of stools later followed by normal stools. In 7.6% of the present study sample, this increased frequency also included change in consistency as loose stools. Following attainment of bowel

continuity there is increased bowel motility and evacuation of inactive distal bowel segment. A review of the literature shows considerable rates of paralytic ileus.<sup>18</sup>

Anastomotic leak is another dreadful complication and it is literally synonymous with failure of the operation. Many factors can be attributed to this complication include malnutrition, primary gut disease, improper timing of surgery and faulty surgical technique. In our study anastomotic leakage was observed in none of the patients. Williams et al<sup>19</sup> conducted a study on 50 patients and reported anastomotic leak in 2% cases Iqbal P et al, conducted a study in Karachi, reported anastomotic leak in 1.3% cases which required reoperation. The use of linear cutter staplers for the reversal of ileostomy is thought to be theoretically an improvement in anastomotic technique but a multicentre study reveals similar rates of leakage except significant reduction in operation time. All our cases were operated by hand sewn anastomosis. Hence, we couldn't make out any inference. Duration of Hospital stay in our study was ranging from 10 to 15 days. The reason behind the short postoperative hospital stay is the low rate of complication associated with reversal of loop ileostomy.

### CONCLUSIONS

Proper counseling regarding stomal care both for patients and attendees is very essential to have good quality of life. Stomal necrosis is one of the complications which has to be attended immediately. Skin excoriation is the most common problem encountered which can be avoided. The present study shows that considerable complications are associated with ileostomy, but the role of active intervention is minimal. Hence, it can be stated that benefits outweigh the risks. Stomal reversal complications are almost minimal if distal bowel is properly checked for. Skin excoriation is most common distressing complication noted in the study. So stomal appliance used in the study should be modified according to the length of stoma. The extra sponge whatever provided with the appliance should be avoided in order to empty it directly to the stoma bag. Stomal fixative should be advised to avoid leakage and stomal dermatitis. When loop or double barrel ileostomy is constructed, proximal loop has to be placed below and directed downwards with proper pouting length, so that effluent gets empty into appliance to minimize skin excoriation. Proper care has to be taken in stomal siting and stomal incision that can avoid stomal morbidity to a major extent.

### Limitations

The sample size is small. As this is a surgery done twice in the form of stoma construction and stoma reversal, drop out was observed during follow up. Surgical audit needs standard national dataset to compare with outcome assessed from our study. We have just summarized the rate of complications.

### REFERENCES

- [1] Intestinal stomas: principles: techniques, and management. 2<sup>nd</sup> edn. Available from: <https://>

- //epdf.pub/intestinal-stomas-principles-techniques-and-management-second-edition.html
- [2] D'Haeninck A, Wolthuis AM, Penninckx F, et al. Morbidity after closure of a defunctioning loop ileostomy. *Acta Chir Belg* 2011;111(3):136-141.
  - [3] Güenaga KF, Lustosa SA, Saad SS, et al. Ileostomy or colostomy for temporary decompression of colorectal anastomosis. Systematic review and meta-analysis. *Acta Cir Bras* 2008;23(3):294-303.
  - [4] Marsh P, Clark JS. The spouted colostomy. *Ann R Coll Surg Engl* 2007;89(1):78.
  - [5] Phang PT, Hain JM, Perez-Ramirez JJ, et al. Techniques and complications of ileostomy takedown. *Am J Surg* 1999;177(6):463-466.
  - [6] Memon ZA, Qureshi S, Murtaza M, et al. Outcome of ileostomy closure: an audit in surgical ward 2, JPMC Karachi. *Pak J Surg* 2009;25(4):230-234.
  - [7] Bhatti Y, Baloch I, Shaikh GS, et al. Frequency of complications of ileostomy: experience of 180 cases at Chandka Medical College Hospital Larkana. *Rawal Medical Journal* 2010;35(2):198-200.
  - [8] Zulfiqar Ali M, Munir K, Zaffar A, et al. Surgical audit of emergency ileostomies. *JRMC* 2012;16(1):45-47.
  - [9] Carlstedt A, Fasth S, Hultén L, et al. Long-term ileostomy complications in patients with ulcerative colitis and Crohn's disease. *Int J Colorectal Dis* 1987;2(1):22-25.
  - [10] Duchesne JC, Wang YZ, Weintraub SL, et al. Stoma complications: a multivariate analysis. *Am Surg* 2002;68(11):961-966.
  - [11] Ahmad Z, Sharma A, Saxena P, et al. A clinical study of intestinal stomas: its indications and complications. *Int J Res Med Sci* 2017;1(4):536-540.
  - [12] Gooszen AW, Geelkerken RH, Hermans J, et al. Quality of life with a temporary stoma: ileostomy vs. colostomy. *Dis Colon Rectum* 2000;43(5):650-655.
  - [13] Arumugam PJ, Bevan L, Macdonald L, et al. A prospective audit of stomas--analysis of risk factors and complications and their management. *Colorectal Dis* 2003;5(1):49-52.
  - [14] van de Pavoordt HD, Fazio VW, Jagelman DG, et al. The outcome of loop ileostomy closure in 293 cases. *Int J Colorectal Dis* 1987;2(4):214-217.
  - [15] O'Toole GC, Hyland JM, Grant DC, et al. Defunctioning loop ileostomy: a prospective audit. *J Am Coll Surg* 1999;188(1):6-9.
  - [16] Singh B, Mortensen N, Shorthouse AJ. Defunctioning ileostomy following restorative proctocolectomy. *Ann R Coll Surg Engl* 2008;90(7):541-545.
  - [17] Wexner SD, Taranow DA, Johansen OB, et al. Loop ileostomy is a safe option for fecal diversion. *Dis Colon Rectum* 1993;36(4):349-354.
  - [18] Nunoo-Mensah JW, Chatterjee A, Khanwalkar D, et al. Loop ileostomy: modification of technique. *Surgeon* 2004;2(5):287-291.
  - [19] Williams LA, Sagar PM, Finan PJ, et al. The outcome of loop ileostomy closure: a prospective study. *Colorectal Dis* 2008;10(5):460-464.