Feasibility and Outcome of Proximal Catheter Ileostomy – A Pilot Study

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ABSTRACT

Background/Aim: Loop ileostomy has high complication rates and causes much patient inconvenience. This study was carried out to evaluate the feasibility and outcome of a proximal catheter ileostomy in place of loop ileostomy in patients treated by intestinal repair and/or resection-anastomosis. Design: Prospective study. Setting: J. N. Medical College Hospital, Aligarh Muslim University, Aligarh, India. Patients and Methods: From November 2006 to November 2009, in all patients treated surgically by primary repair and/or resection-anastomosis of small and/or large bowel, we constructed a catheter ileostomy when a defunctioning proximal protective loop ileostomy was considered advisable. Catheter ileostomy was constructed in the fashion of catheter jejuno-stomy, with postoperative saline irrigation. Results: Catheter ileostomy was performed in 20 patients in the 3-year period. The mean age of the subjects was 28.6 years and the male: female ratio was 1.86:1. Four patients died of septicemia and multiple organ failure unrelated to catheter ileostomy in the immediate postoperative period. Catheter ileostomy started functioning within 48 hours of the operation, and twice-daily irrigation was found sufficient in 81.25% of the surviving patients. Only one patient developed peritubal leak with mild skin excoriation that cleared within 5 days. Another patient with Koch’s abdomen underwent conversion to loop colostomy on re-exploration for postoperative adhesive obstruction. There was no instance of intestinal leak. Ileostomy wounds closed spontaneously within 7–14 days of catheter removal, and none required formal closure. Hospital stay ranged from 12–35 days (mean: 23 days). Conclusions: Catheter ileostomy is effective in protecting intestinal anastomosis/repair; there is minimal morbidity and no catheter-related leak/mortality, and we recommend the procedure.

Key Words: Catheter ileostomy, fecal diversion, proximal ileostomy, tube ileostomy

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demonstration of catheter ileostomy in Crohn disease by Yoshinori in 1982. [10]

PATIENTS AND METHODS

Design
A pilot prospective study was designed to assess the feasibility and outcome of proximal catheter ileostomy in place of defunctioning loop ileostomy in patients treated by primary repair and/or resection anastomosis of small and/or large bowel in emergency as well as elective settings, the intention being to avoid the complications of a loop ileostomy. The study was approved by the Board of Studies and the Committee for Advanced Scientific Research under the Faculty of Medicine of the A.M.U, Aligarh. Ethical Committee approval was also obtained. Informed consent was taken from all study subjects.

Setting
The present study included patients presenting to the J.N. Medical College Hospital, A.M.U., Aligarh, and being surgically treated between November 2006 and November 2009.

Aims and objectives
We aimed to assess the feasibility of constructing a catheter ileostomy using a Foley balloon catheter and to assess its functioning in patients treated surgically by primary repair and/or resection-anastomosis of small and/or large bowel. Catheter ileostomy was constructed when a defunctioning proximal protective loop ileostomy was considered advisable due to presence of one or more of the following intraoperative findings (as recommended by Singh et al. [11] and Ahmad et al. [12]): insecure repair or anastomosis, multiple perforations, matted bowel loops, and grossly unhealthy bowel due to severe edema and inflammation. This study also aimed to evaluate the outcome of protective catheter ileostomy in these patients in terms of mortality and morbidity.

Selection of patients
We included all patients in whom definitive bowel surgery (primary repair and/or resection-anastomosis) was performed along with protective proximal catheter ileostomy.

Exclusion criteria
Patients with a long segment of grossly inflamed, edematous, unhealthy bowel and severe fecal contamination of the peritoneal cavity were not considered for catheter ileostomy. Catheter ileostomy was also not carried out in case of nonavailability of the proper catheter or nonavailability of a surgeon with experience in the procedure.

Technique of catheter ileostomy construction
During laparotomy, after completion of the definitive surgical procedure (primary repair and/or resection-anastomosis), a loop of ileum about 60 centimeters proximal to the ileocecal junction or proximal to the ileal repair/anastomosis was selected for insertion of a Foley balloon catheter (No. 16–28 as per availability). A purse-string suture was first applied and the catheter was inserted through a stab incision. With the catheter tip first directed distally and then proximally, irrigation with normal saline was done to clear the bowel of any luminal residue. Then the catheter tip was kept directed proximally for formal construction of a proximal catheter ileostomy by Witzel’s method in the fashion of the currently well-accepted technique of catheter jejunostomy. [10] Peritoneal cavity was not considered for catheter ileostomy.

The ileostomy bowel was anchored to the anterior abdominal wall by two stitches at the exit site of the ileostomy catheter. The ileostomy catheter was connected to a simple drainage bag. The abdomen was closed by continuous/interrupted polypropylene mass closure sutures, with two tube drains inserted from the flanks – the right one to the hepatorenal pouch and left one down to the pelvis.

The patients were closely observed till discharge from the hospital. Systemic as well as abdominal signs were documented twice a day. The ileostomy catheter and drain(s) were regularly checked for patency and functioning. Catheter irrigation with 10–20 ml of saline was carried out in the morning once daily in all patients to avoid catheter-eye blockage by luminal particulate matter. In case of little/no drainage, with suspicion of catheter blockage, irrigation with 20 ml of saline was carried out in the afternoon and/or evening also.

When the bowel started functioning, the balloon of the ileostomy catheter was deflated completely, and the catheter was kept spigoted for 3 days after return of bowel function and acceptance of oral feeds. The catheter was then strapped to the anterior abdominal wall and was removed on the 21st postoperative day as this much time was thought to be sufficient to secure maturation of the track between the bowel loop and the parietes and thus minimize intraperitoneal leakage.

Follow-up
After discharge from the hospital, all patients were followed up regularly in the surgical outpatient department at 1 week, 3 weeks, 5 weeks, and then monthly for the next 6 months and, thereafter, yearly.

RESULTS

Over a period of 3 years, from November 2006 to November 2009, a total of 360 ileostomies were performed. Out of 360 ileostomies, 340 were formal (open) exteriorization/proximal defunctioning ileostomies (94.44%) and 20 (5.5%) were proximal catheter ileostomies; the latter set of patients formed the body of the present study group.
Among the various reasons for not adopting proximal diversion by catheter ileostomy, the most common reason was peer resistance – the unwillingness of the operating surgeon to opt for this simplistic and rather novel procedure [Table 1].

Patients ranged in age from 14 to 50 years, with a mean age of 28.57 years. Most of the patients (40%) were young (15–20 years). The male/female ratio was 1.86:1 [Table 2]. Preoperative clinical diagnoses included perforative peritonitis (n=10), intestinal obstruction/strangulation (n=7), and penetrating injury of abdomen (n=3). Presenting symptoms in patients who underwent emergency laparotomy (n=17) in the present study were abdominal pain (n=15), distension (n=15), absolute constipation (n=15), acute painful mass of known inguinal hernia (n=1), stab injury (n=1), gunshot injury (n=2). The presenting symptoms in patients who underwent elective laparotomy (n=3) included chronic abdominal fullness/distension (n=3), chronic constipation (n=3), and painless lump in the right iliac fossa (n=2).

Abdominal x-rays findings included free gas under the diaphragm (n=11), distended bowel loops (n=9), and ground-glass appearance (n=11). Abdominal ultrasound revealed free intraperitoneal fluid (n=15) and dilated bowel loops (n=19). Contrast-enhanced CT scan, which was done in a case of gunshot abdomen, revealed vertebral injury and free fluid (blood) in the abdomen. The Widal test was positive in all seven cases suspected of typhoid enteric perforation, with the ‘O’ titer being strongly positive in five cases and weakly positive in two. Among the patients who underwent emergency surgery, mild anemia was present in seven patients and mild leukocytosis in five patients.

Intraoperative findings during elective laparotomy (n=3) included carcinoma of cecum in two patients and stenosing carcinoma of the sigmoid colon in one patient; these patients underwent right hemicolecction and sigmoidectomy, respectively, along with catheter ileostomy. Intraoperative details of the emergency laparotomy (n=17) are given in Table 3.

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**Table 1: Reasons for not performing proximal catheter ileostomy**

| Reasons                                      | n  | Percentage |
|----------------------------------------------|----|------------|
| Peer resistance/reluctance                   | 166| 48.82      |
| Peritoneal reasons                           | 43 | 12.65      |
| Bowel reasons                                | 109| 32.06      |
| Nonavailability of proper catheter           | 12 | 3.53       |
| Nonavailability of expertise                 | 10 | 2.94       |
| Total                                       | 340| 100        |

**Table 2: Age and sex of patients undergoing proximal catheter ileostomy (n=20)**

| Years | Male | Female | Total |
|-------|------|--------|-------|
|       | n    | Percentage | n    | Percentage | n    | Percentage |
| 13–20 | 8    | 40       | 1    | 5          | 9    | 45         |
| 21–30 | 3    | 15       | 0    | -          | 3    | 15         |
| 31–40 | 1    | 5        | 3    | 15         | 4    | 20         |
| 41–50 | 1    | 5        | 3    | 15         | 4    | 20         |
| Total | 13   | 65       | 7    | 35         | 20   | 100        |

**Table 3: Intraoperative details of emergency laparotomy**

| Peroperative findings                                      | Definitive procedures done along with catheter ileostomy | n | Percentage |
|------------------------------------------------------------|---------------------------------------------------------|---|------------|
| Single typhoid ileal perforation                           | Primary closure                                         | 7 | 35         |
| Tuberculous ileocecal mass with proximal ileal perforation | Limited right hemicolecotomy with end-to-end anastomosis | 1 | 5          |
| Multiple ileal and colonic perforations (gunshot)          | Primary closure                                         | 1 | 5          |
| Multiple ileal and rectal perforations (gunshot)           | Primary closure                                         | 1 | 5          |
| Cecal growth* with cecal perforation                       | Right hemicolecotomy with ileo-transverse anastomosis   | 1 | 5          |
| Cecal growth* with right hemicolecotomy with ileo-transverse anastomosis with postoperative anastomotic leak | Re-anastomosis                                          | 1 | 5          |
| Descending colon perforation (stab injury)                 | Primary closure                                         | 1 | 5          |
| Sigmoid perforation (diverticulitis)                       | Primary closure                                         | 1 | 5          |
| Koch’s abdomen with ileocecal mass and obstruction         | Right hemicolecotomy with ileo-transverse anastomosis   | 2 | 10         |
| Strangulated inguinal hernia                               | Ileal resection and anastomosis                          | 1 | 5          |
| Total                                                      |                                                        | 17| 85         |

*Non-Hodgkin lymphoma; *carcinoma
Four patients died in the immediate postoperative period secondary to complications unrelated to the procedure of catheter ileostomy. Within 2 days of the operation, three patients with typhoid enteric perforation died of persistent sepsicaemia and multiple organ failure, which had been present at the time of operation. These three patients were excluded from the study as catheter ileostomy-related problems could not be assessed in them although the ileostomy catheter had started functioning. Another patient with a cecal growth and subacute intestinal obstruction who underwent elective right hemicolecotomy without proximal fecal diversion developed frank anastomotic leak with abdominal sepsis on the fifth postoperative day; this patient was reoperated and repeat anastomosis along with proximal catheter ileostomy was done. He died of fulminating sepsicaemia and respiratory insufficiency on the third postoperative day. Drainage from the ileostomy catheter appeared to be functioning satisfactorily with once-daily irrigation and there were no abdominal features suggestive of re-leak. All these patients who died in the immediate postoperative period from causes unrelated to the catheter ileostomy were excluded from further analysis.

In the majority of the patients (75%), the catheter ileostomy started functioning from the first postoperative day, while in the rest it functioned from the second postoperative day onward. Catheter ileostomy output was 50–400 ml per day (mean 225 ml/day). Twice-daily irrigation was found sufficient in 13/16 surviving patients (81.25%), while one patient (6.25%) maintained catheter patency and adequate drainage with once-daily irrigation. Frequency of irrigation need was not found to be significantly related to the size of the catheter ($P > 0.05$).

Pericatheter leak with mild skin excoriation and infection was observed in one patient (6.25%) who required thrice-daily irrigation to keep the ileostomy catheter (#24 F) patent. This cleared within a few days. No other catheter-related complications were observed in the rest of the patients.

In one patient with Koch’s abdomen with ileocecal mass obstruction and proximal ileal perforation, who underwent limited right hemicolecotomy, catheter ileostomy started malfunctioning from the third postoperative day in spite of repeated saline irrigation. Features of intestinal obstruction soon became evident. Abdominal exploration and adhesiolysis was carried out, along with conversion to formal loop ileostomy.

Emergency laparotomy wounds got infected in five patients – superficial in three patients (18.75%), which cleared within a few days by simple cleaning and dressing, and deep wound infection in two patients (12.5%), which required opening of the wound for free drainage and secondary closure after 1 week. In the present series hospital stay ranged from 12–35 days, with a mean of 23 days. The longer hospital stay was mainly due to the fact that the majority of the patients were from remote rural areas and were reluctant to go home with a catheter strapped to their abdomen.

In all the 16 patients, the ileostomy catheter was removed on postoperative day 21, by which time discharge from the ileostomy wound was minimal and could be managed by once-daily dressing, except in one patient in whom an ileostomy bag was applied for a few days and in whom spontaneous closure was achieved in 14 days. No complications were recorded after catheter removal. After removal of the ileostomy catheter, the ileostomy wound closed spontaneously within 7–14 days (mean: 9 days), and none required formal closure. All patients were followed up for an average period of 24 months (range: 6–36 months).

**DISCUSSION**

Since the first reported use of T-tube ileostomy at Texas Children’s Hospital in 1959 for proximal fecal diversion, several investigators have reported successful outcomes following laparotomy with T-tube enterostomy with irrigation in neonates with unresolved uncomplicated meconium ileus unrelieved by contrast enema [13–18]. This method offered advantages over other surgical techniques in these patients. In 1968, Rehbein and Halsband [19] reported the double-tube technique for the treatment of meconium ileus and small bowel atresia. Recently, Hung et al. [20] and Mathai et al. [21] used tube drainage with success for treatment of intestinal atresia in neonates.

In 1981, Lizarralde [22] used lateral tube ileostomy in 23 of 59 children operated upon for typhoid ileal perforation and reported a success rate of 43.5%. In 2007, Rygl et al. [23] found T-tube ileostomy to be an effective and safe primary repair technique in five extremely low-birth-weight children with localized intestinal damage/perforation.

Use of tube ileostomy in adults is only sparingly reported. In 1985, Hojo [24] utilized tube ileostomy along with total colectomy and ileo-anal anastomosis for familial polyposis coli in seven young patients and had successful outcomes in all. He found that the simple tube ileostomy is as effective as the loop ileostomy and recommended the procedure.

The results of the present study are in full agreement with that reported recently by Chowdri et al. [25] who utilized catheter ileostomy for proximal fecal diversion following distal colorectal surgery in 30 adult patients. They used a three-way Foley balloon catheter for construction of the tube ileostomy. In our study, nonserious complications related to catheter ileostomy were seen in 6.25% of patients, which is...
lower than the 16.7% reported by Chowdri et al.[25] who used a similar technique, and much lower than the 25%–40% reported recently after loop ileostomy.[1,4,5]

There was no intestinal leak/mortality secondary to the catheter ileostomy in the present series, though Chowdri et al.[25] reported intestinal leak and mortality in two patients (6.7%): one of their patients died of septicemia secondary to intestinal leak and the other patient died of pulmonary embolism.

Our findings regarding spontaneous closure of ileostomy wound after catheter removal is in full agreement with those of Rygl et al.[29] and Chowdri et al.,[25] although the time for spontaneous closure was more (7–14 days) in our patients as compared to theirs (1–6 and 3–7 days, respectively). In comparison, loop ileostomy always requires formal closure with significant risk of complications.[1,9] Mak et al.[17] also reported spontaneous closure of the ileostomy wound after catheter removal in all their 20 patients who responded with resolution of their meconium ileus after irrigation through T-tube ileostomy with N-acetyl cysteine or pancreatic enzymes.

Late postoperative intestinal obstruction is a small but definite risk that is due to a bowel loop being anchored to the parietes during construction of the catheter ileostomy. This complication was documented by Chowdri et al.[25] in 16.6% of their patients; all cases settled with conservative management. Mak et al.[17] reported persistent bowel obstruction that required surgery in 3 out of 20 patients (15%) after an average follow-up of 11.5 years. The present study recorded only one instance (6.25%) of early postoperative intestinal obstruction but, on laparotomy, this was found to be secondary to distal adhesions and not related to the catheter ileostomy. Occurrence of small bowel obstruction following loop ileostomy is reported to be 1.2%–14%,[1,2,6]

It is of interest to note that in spite of intermittent saline irrigation catheter blockage occurred in a small percentage of patients in the present study as well as in that of Chowdri et al. This may be a reflection of the presence of high amounts of preoperative particulate luminal residue or thickening of the luminal contents 3–4 days after surgery. As the frequency of irrigation need was found not to be significantly related to the size of the catheter (P>0.05), we strongly feel that low-pressure continuous saline irrigation with a three-way Foley balloon catheter may prove more effective for maintaining catheter patency, and we intend to use this technique in future.

Thus, the present study confirms the hypothesis that catheter ileostomy reduces morbidity and mortality of the ileostomy procedure for proximal fecal diversion.

CONCLUSIONS

Catheter ileostomy is effective and safe in distal intestinal anastomosis/repair; it has minimal complications and avoids the need for a second surgery. It is technically easy to construct, takes less time, and is inexpensive. We recommend greater utilization of this simple procedure in situations where proximal fecal diversion seems desirable.

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