

Gastrointestinal Stoma-Ileostomy and Colostomy

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Gastrointestinal stoma is an external communication constructed between intestine and abdominal wall in situations in which diversion of or decompression of the bowel lumen is needed [1-7]. The indication for formation of GI stoma may be temporary or permanent. Broadly, in children, the causes can be categorized as: 1) For feeding purpose (a wide variety of ways e.g. Roux-en-Y jejunal loop brought directly to abdominal wall), for proximal diversion to provide defunctioning (in case of potentially dangerous anastomotic leak or in several other acquired causes as perineal trauma, gangrenous bowel etc), for purpose of decompression or evacuation (as for intestinal atresia, Hirschsprung's disease, bowel dysmotility etc) and even for permanent reason as for antegrade irrigation. Most stomas are formed in ileum or colon. Congenital causes are by far, the more common indications for creation of stoma in pediatric age group and include intestinal atresia, high anorectal anomalies and Hirschsprung's disease [7]. Acquired indications include necrotizing enterocolitis, bowel perforation, severe perineal traumas and to protect distal anastomosis (coloanal anastomosis of pull through procedures). Colostomy may also be beneficial for fecal diversion prior to resection of large congenital or acquired intrapelvic masses.

Formation of temporary intestinal stoma remains one of the most commonly performed surgical procedure. The stoma is an important temporizing measure and these are incontinent diversion. Though stoma formation may be done in routine setting, more often than not, it is a measure for covering up an emergency situation, more common being where primary intestinal anastomosis is not feasible due to prevailing unfavorable condition of the patient. Fortunately, the need for permanent diversion in children are rare, specially with respect to creation of ileostomy and colostomy and includes either pelvic tumour, anorectal malformation with poor continence prognosis as in extensive sacral anomalies and for severe colonic inertia.

Types of stoma

They are classified based on [7]:

- a) **Site:** Colostomy: Ascending, transverse, sigmoid: Site of stoma may differ with indications but can predict the outcome for minor complications. E.g. in ileostomy stool is liquid to semiliquid consistency and contains proteolytic enzymes; thus there is an increased fluid requirement and requirement for wearing of an appliance and skin barrier. Creams: In the same manner more proximal colonic intestinal stoma are associated with semi-liquid stool consistency; while distal stoma as sigmoid colostomy- is associated with formed stool consistency and there is no change in fluid requirements. Also that bowel regulation is possible with irrigations and/or diet and directs the need for appliances and barriers.
- b) **Style of intestinal stoma:** 1) Loop stoma: It is a type of temporary large stoma where loop of bowel is brought to abdominal surface and opening created in anterior wall of bowel to provide fecal diversion. One stoma with a proximal (drains stool) and distal (drains mucus) opening and an intact posterior wall that separates the two openings. The loop is sutured to the abdominal wall and held in place with a plastic rod for 7 - 10 days. 2) End stoma: One stoma this is formed from the proximal end of the

bowel with the portion of the GI tract either removed (permanent) or sewn closed (Hartmann's pouch) and left in the abdominal cavity and stoma. 3) Double barreled or divided stoma: Bowel is surgically severed and two ends are brought out onto the abdomen as two separate stomas. The proximal end is the functional stoma. The distal end is nonfunctioning, called a mucus fistula. 4) Chimney: Bringing out an intestinal end which is part of anastomosis.

- c) Duration of stoma:** Temporary or permanent: GI stoma is considered to be temporary if it is required for smaller duration to overcome a specific condition with an intention to reverse it once that purpose is served; for example, in a subject with Hirschsprung's disease while staging the repair. On the other hand, permanent stoma may be made in patients with life-long morbid condition as with pelvic tumors or the subjects with anorectal malformations with high likelihood of neurogenic bowel on account of multiple sacral anomalies.

Immediate post-operative considerations [7,8]: The stoma should be at least 1.5 cm from the skin level. Mucosa must be moist, rose to brick red as pale may indicate anemia. Blanching, dark red or purple indicates inadequate blood supply to the stoma or bowel from adhesions, low flow states, or excessive tension on the bowel at the time of construction; whereas black indicates necrosis. Stoma should be assessed and color documented every 8 hours. The stoma pouches are better applied in bigger children once stoma has started functioning.

General Considerations: The intestinal stoma may have a long lasting effect on psychology of the child and family [7-9]. The effect of a stoma and its complication on physical and emotional development and growth is an additional consideration in children. Unfortunately this seemingly simple procedure is associated with multiple complications, the incidence of which varies from 6% - 96% in different series [1-3]. The types of complications range from minor (peri-stomal skin excoriation, stomal bleeding, superficial sloughing of stoma and edema) to major (wound infection, bowel eviscerations, wound dehiscence, stomal bleeding/retraction/stenosis/prolapse and parastomal hernia) etc. Hence there is need to apply skin barrier cream as zinc oxide, karaya gum etc and to protect stoma for injuries. These may be noted early in post-operative period (defined as occurring within 30 days of surgery) or may present later [8-15]. There is need to be watchful of fluid intake and avoidance of motility enhancing agents, supplementation of vitamins which are likely to be affected by loss of intestinal segment.

These stomal complications may be major or minor based on the need of active surgical intervention to circumvent them [11]. The incidence of stomal complications have been reported variably between 6% - 96%. In one of the largest series in recent literature with long term follow up, Nastro, *et al.* reported a major complication rate of 46.4% [2]. Pearl, *et al.* reported a complication rate of 25.9% in 610 subjects undergoing stoma creation [12]. Few complications are more specific to a particular type of stoma. For example, Prolapse is commoner with loop stomas than with divided stoma; the latter are more associated with wound infection due to obvious reasons.

Stomal complications: An overview

A brief description, causes and management of GI stoma related complications is described below:

Vascular compromise may be leading to relatively trivial consequences as mucosal sloughing or to infarction and intestinal necrosis mainly due to inadequate collateral arterial circulation or due to interruption of segmental arterial supply of the involved segment. In addition, venous outflow obstruction may lead to significant venous congestion and compromised bowel perfusion, which may also lead to necrosis of the stoma. The incidence of early stomal necrosis due to vascular compromise ranges from 2.3 to 17% [15-17].

Many-a-times this complication may result due to anatomical variation in the blood supply and collaterals of bowel segment. Some authors advocate that the complication may be best avoided by dividing and preparing bowel in advance before bringing the limb of intestine through the abdominal wall area gets demarcated. At times, the tightness of the abdominal wall trephination or its closure may compromise the arterial supply of stoma. An excessive pulling on bowel loop in an endeavor to get tension-free colostomy can some-

times compromise its blood supply. Other possible sources of vascular compromise are inadvertent division of the marginal artery and inadequate collateral circulation from the middle colic vessels. Excessive trimming of epiploic fat or mesentery from the stapled end of bowel to be exteriorized should be avoided, as this may lead to localized distal ischemia. In order to prevent occurrence of mesenteric ischemia either an end loop configuration or enlarging abdominal wall trephination can be done. Recognition of mucosal ischemia can be identified by dark or grey colour of mucosa. However, changes in serosa may be visible in case of severe ischemia and can be identified by the nature of serosal bleeding on scratching the serosa [15-17].

Venous congestion of stoma may result either due a tight abdominal wall trephination or due to excessive tension on bowel mesentery and may present as stomal edema or by presence of purplish serosal spots on stomal limb. This may cause mucosal sloughing. If prompt attention is not paid to relieving stomal edema it can cause progress and compromise arterial supply too causing necrosis of the stoma. However, timely action as warm compresses in post-operative period can restore good blood circulation and mucosal healing. In case of suspicion of a doubtful stomal vascular status at the end of surgery should lead to its revision before completion of surgery or it will lead to sequelae as muco-cutaneous separation, stenosis and stricture. If noticed in post-operative period and there is failure to respond to conservative management, re laparotomy is required.

Retraction of stoma: Most often a sequel of compromised blood supply, generally on account of excessive traction on bowel limb though it may be associated with use of certain drugs as corticosteroids [15-17]. This complication is associated with subcutaneous, sub-fascial and even peritoneal contamination and sepsis. In latter situation relaparotomy and stoma revision is required. In milder case the main problem is that of finding a seal between stoma and the surrounding which can increase the chances of peristomal skin excoriation. In such situation, excision of stomal devitalized tip, advancing of bowel limb and resuturing of bowel limb to skin is done.

Peristomal skin irritation: The incidence of this complication is higher for ileostomy due to a higher output of more liquid and caustic nature of effluent rather than for colostomy where output is more solid [18,19]. Peristomal skin irritation and dermatitis result not only from that caused by effluent but also from the effect of the appliances applied. Allergy to skin barrier cream and tapes also contribute to peristomal irritation. One important step to prevent peristomal irritation is to have snugly fitting peristomal appliance

Peristomal infection and abscess: Colonization of peristomal skin and perioperative seeding of the wound culminate in peristomal wound infection that can lead to formation of abscess [15-17]. Infected hematoma or infected suture granuloma can also lead to formation of abscess. Such abscesses lead to significant morbidity and generally requires drainage of the abscess. Very often than not it may lead to formation of bowel fistula.

Peristomal herniation: It generally results mainly due to technical errors i.e. failure to fix the bowel limb to fascia and causing herniation of bowel loops along the loop brought out as stoma. There could be a lump alongside the loop which may sometimes be painful. This complication requires re-laparotomy to identify the sac and its contents, reduce the herniated contents and achieve closure of the neck of the sac and fascia. Also it requires that due precautions be observed to judiciously decide the size of abdominal wall trephination to avoid this complication.

Technical errors: Apart from above stated complications there could be technical errors while siting, fixing the stoma and creating mucocutaneous anastomosis [20,21].

Prolapse of stoma: This complication is commoner with loop ileostomy and generally involves the distal limb. It more frequently involves the comparatively more mobile part of the intestine [22,23]. One of the mechanisms stated for this complication is the reverse intussusception of the distal limb of loop ileostomy. One of the mechanisms for causing ileostomy prolapse may be due to reverse intussusception of the distal limb of bowel.

Risk factors for stomal complications

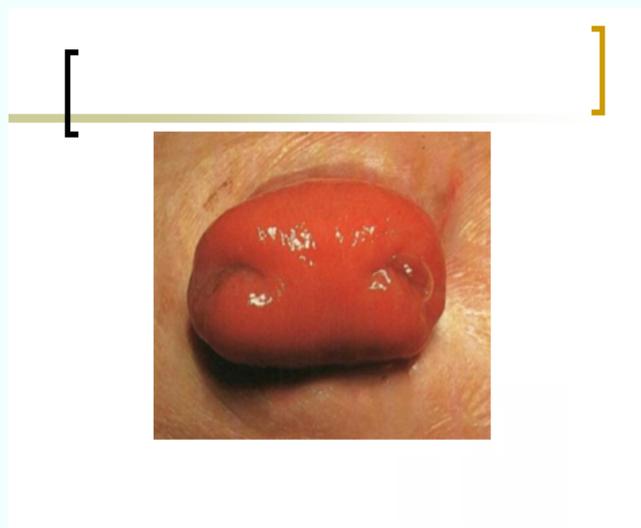
Many risk factors that predispose a patient to develop complications have been proposed, including patient, operation and disease-specific issues [5,14]. Patient-specific parameters include age, gender, body mass index (BMI), nutritional status, American Society of Anesthesiologists (ASA) status, and corticosteroid use [6]. Both malnourished subjects as well as those with high BMI have been identified to be the risk factors for stomal complications in different clinical settings. A low serum albumin has been associated with post-surgical complications in earlier studies which is quite reasonable to contemplate. Operation-specific risk factors generally have included emergency versus elective surgery (hemodynamic instability and relative inexperience of residents is a frequent finding in emergency setting) and the presence of advanced bowel pathology and abdominal sepsis. Though stomal complications were more frequent with ileostomies than with colostomies, most studies affirmed that emergency stoma formation was associated with the highest complication rates.

Nutritional status of the patient undergoing stoma formation can be assessed by serum albumin and BMI. Critical illness alters the distribution of albumin in body compartments as well as changes its rates of synthesis and degradation. The serum albumin concentration decreases early in the course of a critical illness and does not increase again until the recovery phase of the illness. Gibbs., *et al.* reported in the regression models that albumin level was the strongest predictor of mortality and morbidity for surgery. In the developing countries the predictors of stomal complications such as anemia, serum albumin and indicators of sepsis have not been specifically studied and these could be the strong variables associated with poor outcome due to their high prevalence levels in these countries [24].

Results of Study

In the recent study on predictors of stomal complications (ileostomy, colostomy) in a tertiary centre of North India, three factors emerged to be the most important predictors of major complications (unpublished data). These were a low serum albumin (< 2.5 mg/dl), American Society for Anaesthesiologists ASA < 2 and emergency surgeries. The other factors that emerged to be important for predicting the complications were clinical signs of sepsis, raised CRP and operative finding of abdominal sepsis also were statistically significant for causing major complications but did not emerge out to be significant on multivariate analysis using logistic regression.

In short though considered to be a relatively simple surgery, creation and care of hassle free stoma is a surgical challenge and many factors dictate the successful outcome of this surgery.



Loop ileostomy

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