

# Assessment of Colonic Anastomosis after Surgical Management of Obstructed Left Colonic Cancer Performing Primary Repair with or without Proximal Diversion

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## Abstract

**Background:** Up to 20% of patients with colorectal cancer present with obstruction. The goal of this study was to compare the short-term outcomes of patients with obstructing colon cancer who underwent resection and primary anastomosis with or without proximal diversion.

**Objective:** This study was carried out in Surgery Department of Zagazig University Hospitals from February 2000 to February 2018 to compare the on-table irrigation and primary anastomosis versus proximal diversion with loop proximal diversion.

**Patients and methods:** This study comprised 2525 patients who were divided into 2 groups: Group A included 2322 patients who have undergone on table lavage and primary anastomosis. Group B included 203 patients who have undergone primary anastomosis with proximal ileostomy. In our study, 1431 patients were males and 1094 patients were females. All patients were well prepared and investigated for selection of patients who can be operated. All patients were operated and discharged from the hospital and followed up in outpatient clinic of Zagazig University Hospitals, Surgery department.

**Results:** As regard the age, there was a highly significant difference in the age of the two groups ( $p=0.004$ ) while there was no significance in the sex of the studied groups ( $p=0.61$ ). As regard the tumor location there was no significance ( $p=0.298$ ). The intraoperative time was increased in case of on table irrigation with a significant difference ( $p=0.001$ ). There was also a significant difference in the postoperative hospital stay ( $p=0.001$ ). There was no significance regarding the postoperative complications of the studied groups expect stoma complications in case of diversion ( $p=0.001$ ).

**Conclusion:** On table colonic lavage and primary anastomosis is favored in surgical management of acute obstructed left sided colon cancer in low risk patients while in high risk older patients primary anastomosis with a covering stoma is preferred for fear of leakage and a covering loop ileostomy is preferred than loop colostomy.

**Keywords:** Colorectal cancer; Obstruction; Diversion; Stoma; Complications

## Introduction

Colorectal carcinoma is a common reason for obstruction of the large intestine and about 2% up to 5% of patients with colorectal carcinoma would present with obstruction [1].

Carcinoma arising from the distal side of the colon is more liable to obstruction than the proximal part of the colon [1].

The incidence of left colonic carcinoma was greatly reduced in the past ten years after using colonoscopy [2].

Acute obstructed colon yields dilatation of the bowel with a large amount of fecal matter proximal to the site of obstruction which is a media for bacterial overgrowth and poor blood flow [1].

Surgical emergency in obstructed left colon cancer usually results in a high rate of complications and the survival rate was low [3].

One stage resection and primary anastomosis with on table lavage may be beneficial and helpful in early stages of acute obstructed left colonic carcinoma [4].

Decompression of acute obstructed left colon carcinoma with a stoma and planned curative excision of the tumor is a safer method and yielding multiple of harvest lymph nodes and not many patients are left with a permanent stoma [3].

Fecal diversion using ileostomy is considered a common operative procedure to prevent the complications of colon anastomosis and it is considered the better procedure as it lower the risk of prolapse and its outcome is the same as colostomy [5].

Although loop ileostomy does not decrease the rates of postoperative mortality, it decrease the leakage which once occurs we need to perform urgent operation and it is a low risk surgical procedure but it results in a significant postoperative illness that could affect the quality of patient life [5].

A colostomy procedure is performed to make a temporary stoma for fecal diversion away from the area of the bowel that has been obstructed by the cancer [6].

## Patients and Methods

Fifteen patients of acute left-sided colonic obstruction were included in this work that is carried in emergency unit of Zagazig University hospitals in period from February 2000 to February 2018.

### Inclusion criteria

Patients with acute obstructed left colon cancer confirmed by history, clinical examination and investigations.

### Exclusion criteria

- Extremes of age.
- Sever immunocompromised status.
- End stage organ failure.
- Diversion or bypass only as a result of unresectable lesion.
- Members of familial polyposis coli.

After obtaining a clear informed consent, the patients were randomized into three groups based on the procedure of operation.

**Group A:** (On table lavage and primary anastomosis): In this method resection and primary repair is done without performing a stoma (one stage operation).

**Group B:** (Loop diversion): In this method resection and primary repair is done with covering ileostomy or loop colostomy and the reversal is done later.

## All Patients in this Study were subjected to:

### History taking

- Age, sex, main complaint and special habits.
- Past history of operations or other malignancy
- Family history of Colorectal Carcinoma, familial polyposis or Ulcerative colitis.

### Clinical examination

**General examination:** For detection of signs of anaemia, jaundice, weight loss and/or cachexia, also signs of metastases in chest and bones.

**Abdominal examination:** Looking for signs of abdominal metastases, obstruction or peritonitis.

- Assessment of abdominal contour for ascites, masses and organomegaly.

**Digital rectal examination:** For detection of secondary piles, malignant fistula and assessment of the tumor distance from the anal verge.

### Investigations

#### Laboratory investigations:

- Complete blood picture
- Fasting blood sugar level

- Renal function tests
- Liver function tests and coagulation profile
- Serum electrolytes
- Arterial blood gases
- Tumor markers

#### Radiological investigations:

- **Plain chest X-ray:** For detection of any lesion suggesting lung metastases.
- **Plain erect and supine abdominal X-ray:** For detection and confirmation of bowel obstruction.
- **Abdomino-plevic ultrasound:** For detection of abdominal colonic mass and metastases as focal liver lesion, ascites and/or lymph nodes.
- **Abdomino-plevic CT with contrast:** To evaluate abdominal colonic masses, metastases, especially liver and lymph node involvement and to confirm the ultrasonography data.

### Operations

Operative data were studied including the operative diagnosis, the procedure done, the condition of the gut wall, adequacy of blood supply and faecal contamination. As regard to the technique of anastomosis, vicryl (0.3) was used as standard suture material through two layers (an inner layer of continuous sutures encompassing all layers followed by outer seromuscular layer of interrupted Lembert sutures).

The resection done left hemicolectomy, sigmoidectomy and subtotal colectomy according to the site of the tumor, the condition of the gut wall, the diverting stoma was transverse loop colostomy and loop ileostomy.

All patients were fully resuscitated, evaluated and prepared before the operations by:

- I.V fluids (crystalloids and colloids) to overcome volume depletion and electrolyte imbalance.
- Nasogastric tube on admission to rest bowel and to avoid aspiration with anesthesia.
- Preoperative broad spectrum antibiotic, i.e., 3<sup>rd</sup> generation cephalosporin plus metronidazole at induction of anesthesia.
- Bladder catheter to monitor the urine output adequately.

The patients were placed in supine position with midline exploratory incision, through the exploration was performed to exclude any unsuspected intra-abdominal pathology or evidence of metastatic disease. The patients were then placed in a reverse trendelenberg position and the small bowel is packed to improve exposure.

**For left hemicolectomy:** The descending colon is drawn medially, and the white line of Toldt is sharply incised and extended inferiorly, to the level of rectosigmoid junction and superiorly towards the splenic flexure. The peritoneum at the apex of the mesocolon is incised to allow identification of the left ureter as it crosses the common iliac vessels with gonadal vessels lateral to it.

Next, the splenocolic ligament and pancreaticocolic ligaments are divided, allowing further mobilization; the distal transverse colon is separated from the stomach by ligating the greater omentum outside the gastroepiploic arcade.

The dissection proceeds proximally towards the inferior mesenteric artery and distally in the mesentery, to the level of rectosegmoid junction, the bowel is transected between non-crushing clamps, both ends are inspected and pericolic adipose tissue is removed for at least 1cm in preparation for anastomosis, the vessels are divided, and ligated with 2-0 vicryl sutures.

**For sigmoidectomy:** The sigmoid colon is lifted to visualize the V-shaped mesentery, sigmoid resection is started by making a small opening on the mesenteric aspect at the junction between descending colon and sigmoid colon (Figure 1). The peritoneum is incised to allow identification of the ureter, dissection proceed distally to the level of the rectosegmioid junction, then the bowel is transected between non crushing clamps, both ends are inspected, and the pericolic adipose tissue is removed, sigmoid vessels within the mesentery are identified, divided, and ligated with vicryl 2-0 sutures.

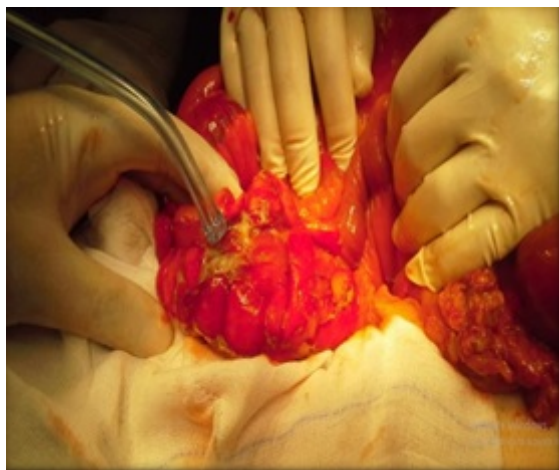


Figure 1: Intraoperative picture showing sigmoid carcinoma.

If resection with end-to-end colonic anastomosis, a two-layer anastomosis can be constructed with inner layer of continuous sutures encompassing all layers using vicryl 3-0 followed by an outer seromuscular layer of interrupted vicryl 3-0 lembert sutures.

If on table lavage is performed, a catheter is applied into the cacum after removal of the appendix and the wash is done using a worm saline and the fecal masses are collected into a sterile bag, then the colon media is safe for primary anastomosis without diversion.

Surgical prophylaxis with cefprozane and Metronidazole was used in all patients and sustained till the fifth post-operative day to make a good cover of antibiotics. All the cases had a midline incision, the left colon was mobilized from posterior abdominal wall and the obstructing mass and left colon was removed. The appendix was removed. A 20F Foley catheter was introduced through the caecum. A suture was secured around the appendicular base to grip the catheter in place and the bowel clamp over the caecum was moved and putted over the distal ileum to stop backward lavage. The balloon of the Foley catheter was filled with 10 ml of water to stop it from sudden drop from the caecum. The distal bowel end was placed over sterile 2 cm anaesthetic tubing and protected with cloth tapes. The distal end of the tube was linked to a large plastic bag on the floor. A 3 L saline bag was then linked to the 20F Foley catheter and was used to irrigate the colon till clear discharge was seen (Figure 2). The colon was manually milked

to enable the rapid emptying of solid fecal material outside the colon. The anastomosis was hand sewn with a single, full thickness layer of vicryl sutures in all patients, the catheter of lavage was then detached and the appendicular stump re-sutured with 2/0 vicryl sutures. All the cases had peritoneal cavity irrigation with warm saline before wound closure. A tube drains to was inserted in all cases. The quantity of saline used ranged between 6-8 L and the intraoperative time was raised by a mean of 60 min (range 50 to 75 min).

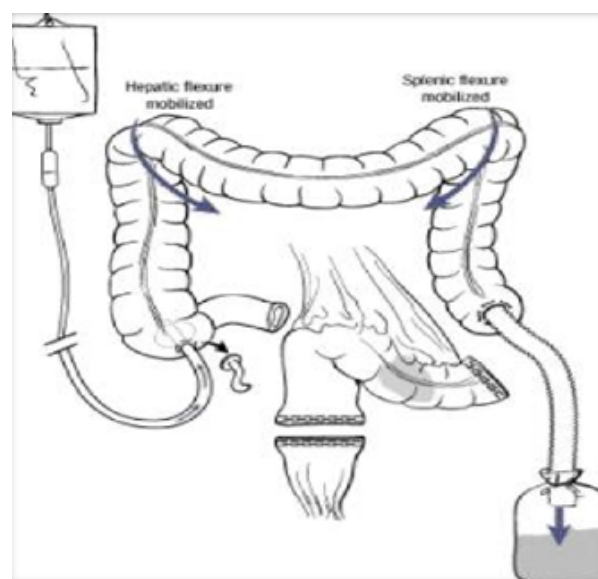


Figure 2: A diagram showing on table lavage.

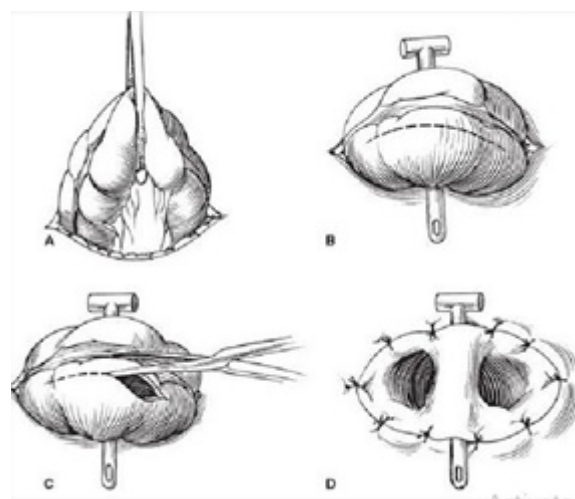


Figure 3: Steps of loop colostomy.

### Loop colostomy

An 8-10 cm transverse incision is made approximately 2.5 cm above the umbilicus over the right half of the rectus sheath. The transverse colon is delivered through the wound and suspended with rubber tube or glass rod.

A small opening is made with the mesentery and plastic T-piece is passed through the defect. The colon is secured to the anterior rectus sheath at four cardinal points with 3-0 vicryl sutures.

The colon is opened transversely along the teniae, the colostomy is secured by taking bites of all layers of the colonic wall and dermis (Figure 3).

### Reversal of loop colostomy

A circumferential incision is made at the mucocutaneous junction then the incision is carried down through the subcutaneous tissue until the wall of the bowel is identified. If necessary, the colostomy edges can be closed together to prevent spillage.

Dissection proceeds until the anterior abdominal fascia is identified. The loop of bowel is dissected free from the anterior abdominal wall, with particular care taken to identify the mesentery to avoid injury. The adhesions between the parietal peritoneum and the colon are divided by gentle dissection. After mobilization, several centimeters of each limb should be exteriorized. If any difficulty is encountered, the fascial opening can be enlarged with particular care to avoid any twisting of the colon limbs. The segment of the colon containing colostomy is resected.

A hand-sewn end-to-end anastomosis is constructed with two layers, the posterior layer of interrupted 3-0 vicryl sutures is placed. Next, an inner posterior row of vicryl 3-0 sutures is placed encompassing all layers of the bowel and converting to Connell sutures for the anterior inversion. The defect in the mesocolon can be closed with either continuous or interrupted 3-0 absorbable sutures, and the segment of the bowel is returned to the abdominal cavity.

### Loop ileostomy

For creation of an end ileostomy, a circular incision approximately 2.5 cm in diameter is made overlying the rectus muscle, blunt dissection is used to divide the soft tissue to the level of the fascia, then cruciate incision is made in the fascia and carried 2 cm in both directions. The rectus muscle fibers are split using the clamps and retractors. Next the posterior sheath is opened with a cruciate incision sufficient to permit passage of two fingers, then the small bowel is brought through this fascial opening using a Babcock clamp until 5 cm of ileum protrudes above the surface, with care taken to avoid twisting the mesentery. The ileum is opened transversely, the ileostomy is secured by taking bites of all layers of the colonic wall and dermis, a stent is placed to prevent retraction of the bowel.

### Reversal of ileostomy

A small cut (incision) will be made by the surgeon around the stoma site to free up the bowel loops used to make the stoma. The surgeon will then join the two ends of bowel back together with either stitches or staples. At the end of the surgery the wound (abdominal wall) is stitched together and the skin is then closed.

In some cases, the surgeon may need to re-open your original wound/scar (laparotomy) in order to facilitate reversal (closure).

Postoperative follow up:

#### Postoperative complications:

**General complications:** such as peritonitis, DVT and chest infections.

**Local complications:** such as wound sepsis, wound seroma, anastomotic leakage, anastomotic disruption and stoma complications.

#### Stoma complications:

- Constipation and obstruction were occurred in both colostomy and ileostomy.
- Diarrhoea: There was a higher incidence with ileostomy and higher incidence of dehydration.
- Retraction: may occur in colostomy and ileostomy.
- Parastomal hernia.
- Prolapse: Colostomies specially transverse are more common than ileostomy.
- Flush stoma: most colostomies are flush and ileostomy should ideally insert and cleaned to reduce the risk of leakage.
- Bleeding edges and granulomas.
- Stenosis: where narrowed and may almost be closed.
- Skin maceration: Specially with ileostomy more than colostomy.

## Results

This study included 2525 patients presented with acute large bowel obstruction due to left sided colon cancer; two groups of patients were randomized according to the operative procedure done to the patient:

#### Group A

On Table lavage and Primary resection: in which lavage of the bowel is done and the tumor resection and bowel obstruction are done simultaneously, it included 2322 patients (92%).

#### Group B

Primary resection with a covering diverting stoma: in which resection of tumor is done, treatment of obstruction and a covering loop ileostomy or transverse loop colostomy is done to reduce the incidence of complications it included 203 patients.

All available data pre- and post-operatively were collected, tabulated and statistically analysed (Tables 1 and 2). The following data were studied.

#### Demographic criteria:

	Group A	Group B	p value
Age	68.4+14.9	65.2+14.7	0.004*
Female gender	1094 (47.1)%	100 (49)%	0.61
Operative time	243±9.84	176.4±12.9	0.001*

**Table 1:** Demographic criteria.

(1) **Age:** There was a significant difference between the age of the three studied groups (p value=0.004).

(2) **Sex:** According to the collected data, there was no significant difference between the three studied groups regarding sex (p value=0.61).

#### Intraoperative:

(1) **Tumor location:** According to the collected data, there was no significant difference between the three studied groups regarding the location of the tumor (p value=0.298).



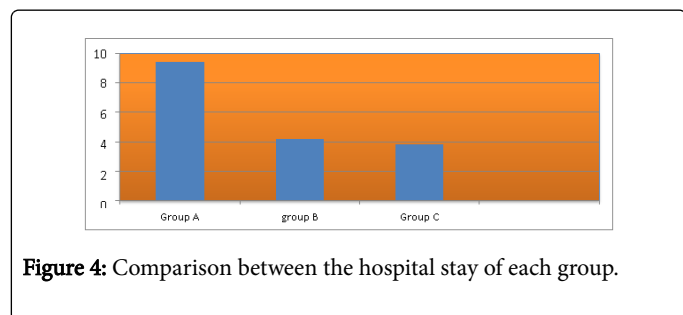
**(2) Intraoperative time:** According to the collected data, there was a highly significant difference between the three studied groups regarding the intraoperative time (p value=0.001).

**Postoperative:**

Complications	Group A (N=2322)		Group B (N=203)		p value
	No	%	No	%	
DVT	53	2.30%	5	2.50%	0.81
Seroma	47	2%	8	3.90%	0.08
Chest infection	102	4.40%	11	5.40%	0.51
Anastomotic leakage	103	4.40%	7	3.40%	0.49
Wound infection	171	7.40%	16	7.80%	0.8
Stoma Complications	0	0%	171	7.40%	0.001*
Hospital stay	9.4	2.3	4.2	0.84	0.001*

**Table 2:** Postoperative.

**(1) Postoperative hospital stays:** According to the collected data, there was a highly significant difference between the three studied groups regarding the postoperative hospital stay (p value=0.001) (Figure 4).



**Figure 4:** Comparison between the hospital stay of each group.

**(2) Postoperative complications:** According to the collected data, there was no significant difference between the three studied groups regarding the postoperative complications (p value>0.05) except stomal complications (p value=0.001).

**Results and Discussion**

Colorectal carcinoma is the third most common malignancy and the third cause of malignancy death in United States of America [7].

Despite the improvement in diagnostic facilities and screening protocols, nearly 20% of the cases present with obstructed colon cancer, mostly from malignant tumors on the left-sided colon [8]. The optimal treatment for obstructing colorectal carcinoma depends on the general state of the patient, the tumor location, and the obstruction degree. Many palliative and curative procedures may be considered. However, primary excision of the tumor is the treatment of choice for the patient as possible [9].

In our study we compare between two groups: on table lavage and primary resection, primary resection with a covering diverting stoma, the last group was without intraoperative colonic irrigation.

In the past decade, primary resection and anastomosis was a popular procedure over Hartman's procedure in low-risk cases [9]. Often, primary resection and anastomosis is covered by a diverting loop ileostomy to prevent the morbidity and mortality associated with anastomotic leakage [10].

However, it has been found that the complication of diverting ileostomy and its reversal may reach 50% and includes anastomotic leakage, intestinal obstruction, wound infection, parastomal herniation, dehydration and readmissions [11].

There is an evidence to suggest that primary anastomosis without diverting proximal stoma in patients with obstructed colorectal carcinoma may minimize the rate of postoperative complications [12].

Shwaartz et al. [13] found that there is a significant difference between primary anastomosis with and without fecal diversion in the age. According to our study, there was also a significant difference in the age of the two groups p value=0.004. As we prefer on table irrigation in younger patients and do diverting stoma in old risky patients for fear of complications.

Ositamo et al. [3] found that there is no significant difference between the three groups according to sex. In our study we found the same according to the three groups (p value=0.343).

Shwaartz et al. [13] found that there is no significant difference between the three groups according to the site of the tumor. In our study we found that sigmoid colon is mostly affected site and there is no significance between the three groups according to the site of the tumor (P=0.298).

Youngki Hong et al. [14] found that the median operation time of on table lavage and primary anastomosis was 200 min in patients with obstruction. In our study, the mean of intraoperative time in group A is 243.4 ± 9.84 min and in group B is 176.4 ± 12.90 min. According to the data we found that on table lavage takes much more time than loop diversion and there is a significant difference between them (p value=0.001).

Wise et al. [15] found that diverting stoma was an independent cause of longer length of stay and hospital readmission within 30 days. In our study the mean of the hospital stay in group A is 9.4 ± 2.3 days which is significant and more than the mean of group B 4.2 ± 0.84 days (p value=0.001) [15].

Shwaartz et al. [13] suggest that proximal diversion in the setting of obstructed colorectal carcinoma may be associated with increased morbidity, specifically higher rates of complications and longer length of hospital stay. The management of patients with obstructed colorectal carcinoma should be based on patient state, surgeon experience and intraoperative findings. However, when performing a primary anastomosis with diversion, we should take into account the significant risk for morbidities. Also they found that patients who underwent primary anastomosis with proximal diversion have significantly higher rates of negative outcomes such as wound sepsis, longer length of hospital stay and 30 day readmission [13]. In our study we found many complications such as DVT, seroma, wound infection, and anastomotic leakage in the three groups and there was no significance in the complications of the three groups (p value>0.05), we found also high rates of complication of stoma in group B such as constipation, obstruction, diarrhoea, parastomal hernia, flush stoma and skin maceration and there is a significant difference between the two groups regarding diarrhoea (p value=0.001).

In early studies, the presence of peritonitis was considered absolute contraindication of primary resection and anastomosis due to high anastomotic leakage rates [16]. However, this concept has been changed by recent studies [17].

Zorcolo et al. [18] found that an anastomotic leakage rate of 5.1% and a wound sepsis rate of 4.5% following primary anastomosis for acute left sided colon carcinoma [18]. In our study, the anastomotic leakage in group A was 103 cases, 7 cases in group B and there was no significant difference between the three groups (p value=0.49). The existence of peritonitis appears no longer to be an absolute contraindication to primary resection and anastomosis. In contrast, the occurrence of adverse systemic factors, hemodynamic instability, immunocompromised patient, and malnutrition can lead to anastomotic leakage [19].

Over the years, many studies have reported on intraoperative colonic lavage via the appendix, terminal ileum or cecum to decompress the fecal content of the colon. These conventional procedures of colonic irrigation are brilliant and time consuming and may decrease the risk of leakage in the operative field [20].

A new method using a colonic lavage device with a double lumen was proposed by Park et al. [14] to compensate for these problems. They reported that the wider lavage catheter would reduce irrigation period.

Leak from anastomotic site is a major complication following resection for colorectal cancer. It may be presented as generalized peritonitis requiring abdominal exploration, when there is marked amount of fluid collection or as a mild leakage detected by contrast radiology [21]. A protective colostomy usually helps to lower the rate of anastomotic leak that required surgical intervention and diminishes the morbidities of such spillage [22]. A proximal or transverse colostomy is often used as a temporary basis for obstructing cancer lesions of the colon [23].

A loop ileostomy is preferred to a loop transverse colostomy in defunctioning a distal colonic anastomosis particularly due to following its closure the blood supply to the distal colon is not compromised, whereas, the marginal artery is potentially at risk when the transverse colostomy is reversed or excised at the time of closure [24].

Primary anastomosis for acute obstructed left colon cancer should only be regarded as indicated in cases where the risk profile is favourable and protective stoma is safe in high risk patients [25]

In acute obstructed left colon cancer, primary anastomosis is advised, where the patient has a low risk condition without associated peritonitis and the tumor mass is local and easily excised and Anastomotic covering by a diverting stoma did not made any advantage [25].

## Conclusion and Recommendations

On table colonic lavage and primary anastomosis is favoured in surgical management of acute obstructed left sided colon cancer in low risk patients while in high risk patients primary anastomosis with a covering stoma is preferred for fear of leakage and a covering loop ileostomy is preferred than loop colostomy.

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