

# Neoplasms of the Bowel

## Pre-operative Preparation of the bowel for Surgery:

The bowel is routinely cleaned before bowel surgery or for diagnostic studies such as barium enema or colonoscopy. The aim of this preparation is to:

- Reduce the incidence of contamination of the operative field.
- Guard against bacteremia and septicemia secondary to ischemia-reperfusion syndrome (i.e. bacterial translocation).

Bowel preparation consists of two main categories:

- **Mechanical Preparation** - getting rid of the fecal mass.
- **Chemoprophylactic** - reducing bacterial concentration in fecal residue.

Surgeons use one or both depending on the type of the procedure:

- Barium enema requires only mechanical preparation with a single method.
- Resection of the bowel requires full mechanical preparation plus chemoprophylaxis.

## Mechanical Preparation:

### I- DIET:

- Fasting for 24h prior to the operation (48h preferred).
- Ingestion of clear fluid to maintain hydration.
- I.V. Fluids should be considered in severely dehydrated patient and those with Renal or cardiac disease.

### II- CATHARTICS OR LAXATIVES:

#### a) Mannitol:

A non absorbable sugar, that purges the gut by osmotic force, it has a pleasant taste, disadvantages are:

- Metabolized by bacteria, leading to formation of hydrogen and methane, gases which can explode if electrocautery is used.

- Increase the risk of wound infection as it promotes growth of bacteria.

### b) Polyethylene glycol (PEG):

4L of this osmotically active agent must be ingested within 24h for adequate cleaning. It is not fermented by bacteria.

### c) Castor Oil & Mg Citrate:

Castor Oil (2oz) & Mg Citrate (10oz) are ingested 24 hours before planned procedures.

### d) Bisacodyl Tablets:

Taken 36 hours before the anticipated procedure.

## III- ENEMAS:

Normal Saline or phosphosoda are used to clean the gut the night before the operation.

## IV- ON TABLE LAVAGE:

Used frequently in emergency situations. The appendix is removed and cannula inserted into the stump of the appendix in the cecum, flushing the whole content of the bowel out.

## V- COLOSTOMY:

Temporal (defunctioning) colostomy is frequently applied in left sided bowel surgery.

## VI- PROGRADE LAVAGE:

This is done with a nasogastric tube using water or balanced electrolyte solution.

## Chemoprophylactic:

This is through the use of antibiotics:

- **Intravenous Antibiotics:** I.V. broad-spectrum antibiotics are given in the immediately preoperatively and post operatively.
- **Oral antibiotics:** combination of neomycin with either erythromycin or metranadizole is given.

## Benign neoplasms:

The condition is in general rare, benign neoplasm are associated with different conditions, many of which have a genetic component, the term polyp is frequently being used to denote these tumors, in fact the tem originally means any protrusion of the mucosa in the wall. Not all polyps are tumors. (See table)

Classification of colorectal polyps:		
Neoplastic	Benign	Adenoma
	Malignant	cancroids
		adenocacinoma
Non-Neoplastic	Hamartoma	Juvenile
		Peutz-Jeghers
	Inflammatory	Lymphoid
		Inflammatory
	Miscellaneous	Metaplastic
		Connective tissue polyps

## Adenoma:

Although a being tumor, it is a pre-malignant lesion, exposure of the surface to fecal matter over long time plus the genetic susceptibility are the prime causes for malignant formation. This is more likely to happen if the tumor is more than 1cm in diameter (polyp-cancer sequence).

## PATHOLOGY:

Histological the tumor arises from the glandular epithelium there are classified into 3 types according to there appearance:

- Tubular.
- Tubulovillous.
- Villous.

## CLINICAL FEATURES:

- Usually asymptomatic and discovered accidentally.
- Villous adenomas in the rectum may present with potassium-rich mucus diarrhea, causing hypokalemia.

## MANAGEMENT:

The finding of such tumor requires the following:

- Complete examination of the large bowel to identify other lesions.
- Removal of all lesions.
- Regular follow up.

## Familial Adenomatous Polyposis:

An autosomal dominant condition, related to the ACP gene in chromosome 5. Affects individuals between ages 13 - 30 mainly, some times it may not appear until the fourth decade.

## PATHOLOGICAL FEATURES:

- Occur as multiple lesions which may even affect the stomach, small intestine.
- Is associated with some mesodermal tumors (osteomas, desmoid tumors)
- **Gardner's Syndrome:** FAP associated with Epidermoid cyst.
- Progression to cancer is almost always inevitable (polyp-cancer sequence).

## CLINICAL FEATURES:

There is usually a family history of such condition, the disease is Initially asymptomatic, later the following symptoms may develop:

- Blood per rectum.
- Tenesmus
- Diarrhea.

## DIAGNOSIS AND MANAGEMENT:

Clonscopy and other studies to make the daignosis, prophylactic total colectomy with ileo-anal anastmosis is done to prevent progression to cancer.

## Malignant Neoplasms:

Malignant neoplasms of the large bowel are mainly adenocarcinomas (98%).

## Epidemiology:

They are common in the western world; carcinoma of the colon is the second leading cause of death after carcinoma of the bronchus in the UK.

It develops at any age beyond 20, the peak incidence being in the 6<sup>th</sup> decade and there after.

## Aetiology:

The following factors where suggested as a cause of ca colon:

### A) DIETARY FACTORS:

1. bile salt conversion
2. Low intake of fibers.

Studies showed that high fat intake favors growth of bacteria that converts bile salts into carcinogens, delayed transit time due to low fiber content increases gut exposure to these carcinogens.

### B) ADENOMATOUS POLYPS:

This is responsible for development of most bowel cancers; the sequence of polyp-cancer is almost inevitable.

### C) GENETIC FACTORS:

Apart from FAP, many first degree relatives of patient with adenocarcinoma have a 3 times increased risk for developing cancer, this Hereditary Non-polyposis colon cancer (HNPCC) accounts for 10% of all cases.

### D) INFLAMMATORY BOWEL DISEASE:

Long standing ulcerative colitis and chron's disease carry a significant risk of developing ca colon

## Pathology:

### **MICROSCOPICALLY:**

The tumor is composed of columnar epithelial cells.

### **MACROSCOPICALLY:**

The tumor takes one of 4 forms:

1. Annular.
2. Tubular.
3. Ulcerative.
4. Cauliflower.

Annular is one that gives rise to obstructive symptoms, cauliflower is the least malignant form; the other two more commonly present with bleeding.

### **SYNCHRONOUS & METACHRONOUS LESIONS:**

Up to 3% of patients have more than one tumor (synchronous lesions). A previous colonic neoplasm increases the risk for developing new one (metachronous tumors).

### **DISTRIBUTION:**

Site	%
Anus	2%
Rectum	38%
Sigmoid	21%
Descending	4%
Splenic Flexure	3%
Transverse Colon	5.5%
Hepatic Flexure	2%
Ascending Colon	5%
caecum	12%
Appendix	0.5%

## Spread of Tumor:

Spread is either direct, through lymphatics, blood or transcoelomic. Rarely direct implantation may occur.

### **DIRECT SPREAD:**

From the mucosa through the muscular wall, into the serosal surface of the bowel,

in case of extra-peritoneal part of the bowel, like the rectum it spreads into the fascia and structures contained in it, including the sacral plexus, the bladder and the female uterus or cervix. Perforation and fistulas may occur.

Such spread occurs more commonly with the ulcerative type, annular type tends to cause intestinal obstruction before extensive local invasion occurs.

### **LYMPHATIC SPREAD:**

The nodes draining the bowel are grouped as follows:

- N1 - nodes in bowel wall.
- N2 - Paracolic nodes.
- N3- apical nodes around the superior and inferior mesenteric vessels.

### **HEMATOGENOUS SPREAD:**

Along the portal vein to the liver, metastasis of the liver accounts for 30-40% of deaths. Involvement of kidneys, lungs and bone is very rare.

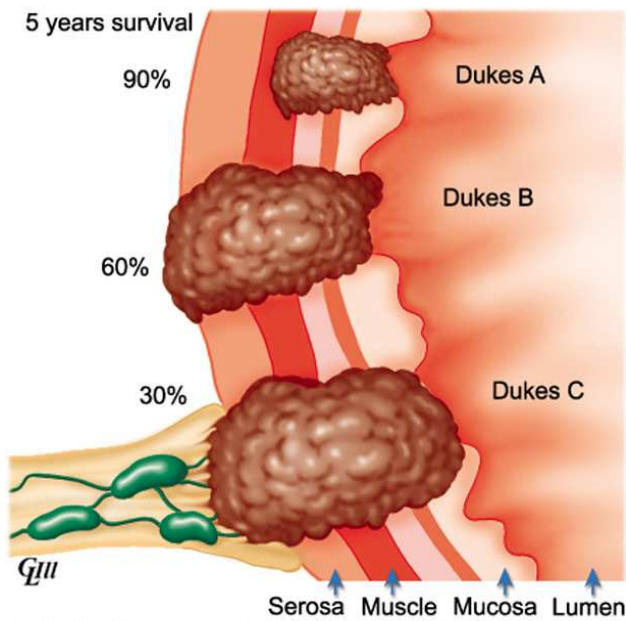
### **DIRECT IMPLANTATION:**

This is usually iatrogenic, as tumor cells are implanted accidentally in large bowel surgery and anal surgery in patient with unsuspected bowel cancer.

## Staging:

This either through modified **Duke's Classification** (originally for rectal tumors) or the TNM

<b>Duke's Staging of colonic carcinoma</b>		
Stage	Description	5-years survival.
Dukes A	Confined to the bowel wall	90%
Dukes B	Through the wall, but not reaching the serosa	60%
Dukes C	Lymphatic involvement	30%
Dukes D	Distant metastasis.	5%



### TNM classification of colonic carcinoma

#### Tumor

T1	Into submucosa
T2	Into muscularis propria
T3	Into peri-colic fat, but not breaching serosa
T4	Breaches serosa, or involving other organ.

#### Nodes

N0	No nodal involvement
N1	1-2 nodes involved
N2	3 or more nodes involved

#### Metastasis

M0	No metastasis
M1	Distant metastasis

#### Lymphatic Invasion

L0	No lymphatic vessels involve
L1	Lymphatics involved

#### Venous Invasion

V0	No vessel invasion
V1	Vessel invasion

#### Residual Tumor

R0	No residual tumor
R1	Margin involved, residual tumor +ve.

## Clinical Features:

### LEFT-SIDED TUMORS:

They are mostly of the annular type, they present earlier than right-sided tumors. May present with intestinal obstruction,

the reasons why obstructive presentations are common in left are:

- The tumor is usually of the annular constricting type.
- The stool is semi-solid or completely solid.
- The diameter of the bowel is smaller on the left.

### Symptoms:

- Pain.
- Alteration of bowel habit.
- Rectal Bleeding
- Palpable lump.
- Distention.
- Tenesmus.
- Bladder symptoms.

**Pain:** is referred to the suprapubic area, with bouts of colicky; a constant ache is suggestive of advanced tumors a colicky pain from the start occurs in sigmoid tumors.

**Alteration in the bowel habit:** patient usually suffer from a long period of irregularity of their bowel habit, with alteration between diarrhea and constipation, passage of loose stool or mucus occurs more with distal lesions.

**Rectal bleeding:** may lead to anemia because it is usually occult. Gross bleeding that is visible is rare (less than 10% of cases) except when the tumor is in the rectum.

**Palpable Lump:** may be felt in the abdomen, by the patient it is not always the tumor; it may be the impacted faeces above it.

**Distention:** with pain, that is usually relieved by passing flatus.

**Tenesmus and bladder symptoms** (lower urinary tract infections, penumaturia, fecal material in urine,...etc) may occur with sigmoid and rectal tumors.

### Clinical Examination:

Signs are often absent; however the following may be noted:

- General signs of malignancy (weight loss, muscle wasting)

- A mass may be felt in the abdomen, bi-manually or per-rectal.
- Abdominal distention.
- Signs of metastasis (jaundice, ascites, hepatomegaly).

### RIGHT-SIDED TUMORS:

They are mainly of the cauliflower type; they tend to be more chronic than left-sided tumor, obstruction rarely occurs as the stool is liquid and the diameter of the bowel is large in the right. Most of the patients have non-specific symptoms of malaise, weight loss, vague abdominal pain and occasionally self detected mass.

#### Clinical Presentation:

Common presentations are:

- Chronic Iron-deficiency Anemia (most common).
- Mass in the right iliac fossa.

Less common (but possible presentations include:

- Acute appendicitis.
- Intussusceptions.

### OTHER POSSIBLE CLINICAL PRESENTATIONS OF LARGE BOWEL CANCER:

- **Epigastric symptoms** similar to those of Ca Stomach can occur if the tumor is in the transverse colon.
- **Hernia**, as the increased intra-abdominal pressure with straining along with weakness of muscles with malignancy may predispose to such condition.
- **Ascites** from carcinomatosis peritonei.
- **Acute Intestinal Obstruction**.
- **Peritonitis** from perforation.

### Investigations:

In elective cases the work up consists of the following:

- Rigid Sigmoidoscopy.
- Flexible Sigmoidoscopy.

- Colonoscopy
- Barium Enema.

In emergency cases a single contrast enema after a rigid Sigmoidoscope, is the investigation of choice.

### SIGMIODOSCOPY:

Used as part of evaluation of all patients presenting with rectal bleeding, it is used in this case to:

- Identify the site of bleeding if present.
- Visualize the tumor and taking a biopsy.
- Biopsy any mucosal abnormality.
- Exclude other causes of rectal bleeding.

### COLONOSCOPY:

It is being used increasingly, the indications for use are:

- Bleeding is a main symptom.
- Doubtful radiological results.
- Patients with known polyps.

### BARIUM ENEMA:

The tumor appears as filling defect that is described as irregular stenosis with sharp shoulders on each side, the so-called "apple core appearance"





## INVESTIGATIONS FOR METASTASIS AND PRE-OPERATIVE PREPARATION:

The following specific investigations may be used:

- CT-scan
- Measurement of tumor markers (CEA).

## Management:

### PRE-OPERATIVE PREPARATION:

Pre-operative preparation for the patients with bowel cancer undergoing colectomy is as following:

- Full Mechanical bowel preparation.
- Antibiotic chemoprophylaxis.
- Thromboembolism prophylaxis.
- Correct anemia.
- Correct electrolytes imbalance.

### Methods for Mechanical bowel Preparation for colonic cancer:

The most common used method is the following:

- Dietary restriction only to fluid for 48 hours prior to surgery.
- Two sachets of Picosalax (sodium picosulphate) are taken 1 day before the operation to purge the colon.

- A rectal wash out may also be necessary.

Alternatively the following can be done:

- Prograde lavage with NG tube.
- On table lavage, during the operation (this is done in emergency cases presenting with intestinal obstruction).

### TEST FOR OPERABILITY:

The abdomen is opened and the tumor assessed for resectability:

- Palpate the liver for secondaries.
- Inspect the Peritoneum, especially pelvic peritoneum for neoplastic implantations.
- Assess the various lymph node groups.
- The tumor's mobility, fixations is not always a sign of advanced disease (e.g. inflammatory cancers).

### THE OPERATIONS:

Surgical resection of the bowel is done; this is followed by radiotherapy in Duke's B and C stages. The site of resection depends on the location of the tumor:

- **Carcinoma of the caecum** – right hemicolectomy.
- **Carcinoma of the hepatic flexure** – extended hemicolectomy (the ascending and transverse colons resected).
- **Carcinoma of the splenic flexure or descending colon** – the resection is from right colon to the descending colon, and sometimes up to the ileum.
- **Pelvic colon** – from the upper third of the rectum to the left colic flexure, including the inferior mesenteric vessels and para-colic lymph nodes (a radical dissection).

### No-Touch (Turnbull) technique:

Manipulating the tumor and mobilization of colon during surgery causes shedding of malignant cells into lymphatics and veins, that's why high ligation of inferior mesenteric vessels and division is made before mobilizing the left-side of the colon, to reduce the incidence of

metastasis and improving the overall survival.

### Role of Chemotherapy:

Although it is known that these tumors are not very sensitive to chemotherapy, recent clinical trials denoted that the results can be improved in Duke's stages B and C using 5-fluorouracil alone or with combination with other agents, protocols are still being developed.

### Inoperable tumors:

The treatment is palliative. De-bulking of the tumor with adjuvant therapy is management of choice, the presence of solitary or localized hepatic metastasis during surgery demands removal, a more advanced and diffuse involvement is treated by chemotherapy.

### Complications of surgery:

#### During Surgery:

- Damage to the duodenum (right hemicolectomy)
- Damage to the spleen (left hemicolectomy)
- Urine leakage and/or ureteral strictures, from damage to the ureter.
- Primary Hemorrhage.

#### Early Post-operative:

- Reactionary Hemorrhage.
- Acute urinary retention.
- Anastomatic complications (leakage & stenosis)

#### Late-Post-operative:

- Damage to sexual function.
- Urinary incontinence.
- Complications of stoma (see info box).

### Info Box: *Complications of colostomy*

- Prolapse.
- Retraction.
- Necrosis of the distal end.
- Stenosis of the orifice.
- Para-Colostomy hernia.
- Bleeding.
- Colostomy "diarrhoea": this is usually an infective enteritis and will respond to oral Metronidazole 200mg three times daily.

### References and Resources:

1. Short practice of surgery - Baily and Love's - 23rd edition.
2. Clinical Surgery - Henry and Thompson.
3. [www.surgical-tutor.org.uk](http://www.surgical-tutor.org.uk)
4. NMS Surgery -
5. An introduction to the symptoms and signs of surgical disease - Norman L. Browse - 3<sup>rd</sup> edition.