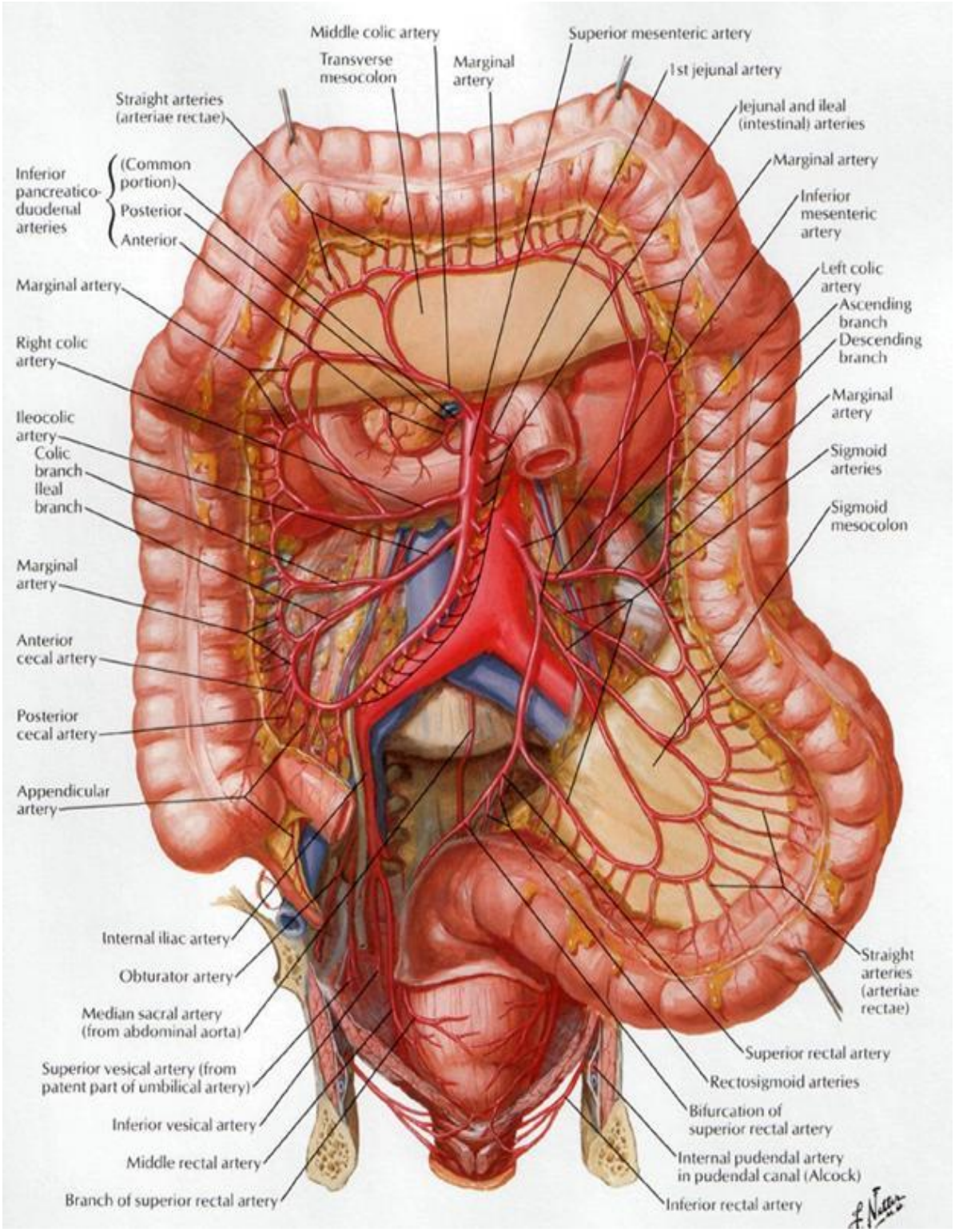
Colo-rectal Carcinoma

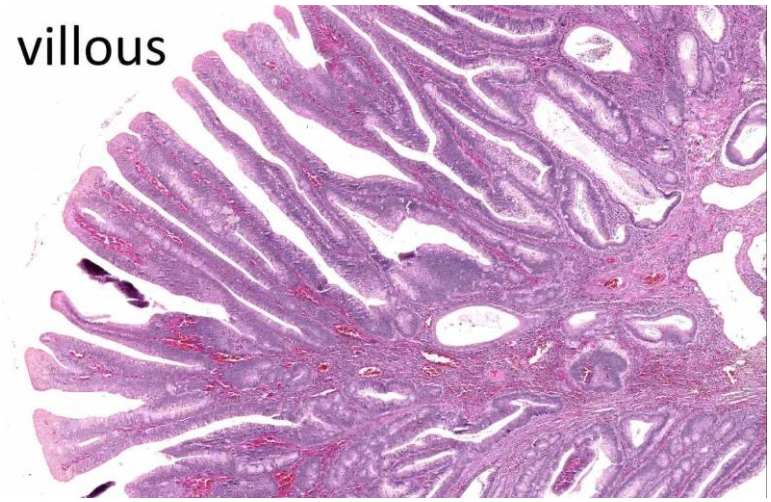


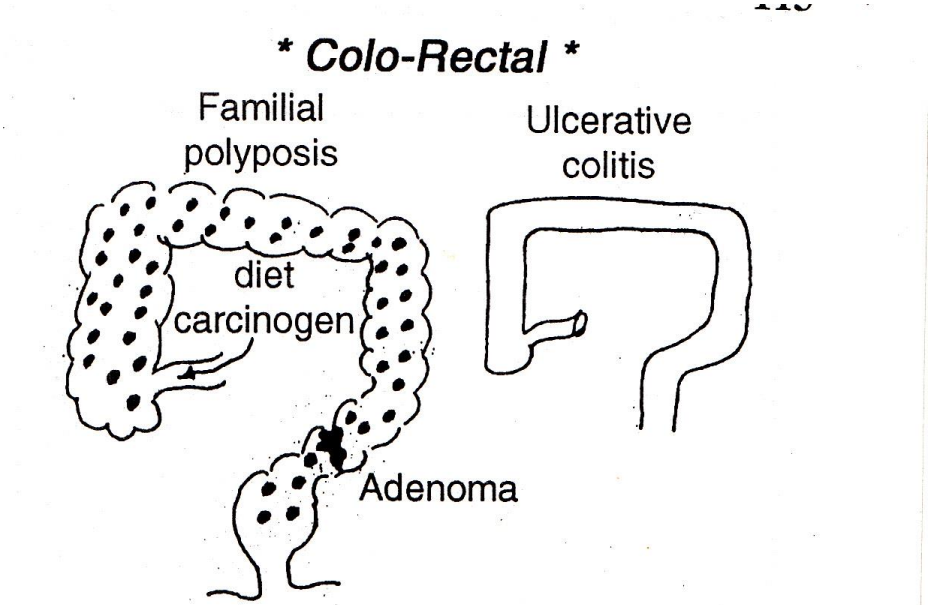
★ Incidence :

- **More in males above 50 years & more in black race .**
- **Rectal** carcinoma may occur in young age **, around 30 years .**
- Carcinoma of right colon is more in females

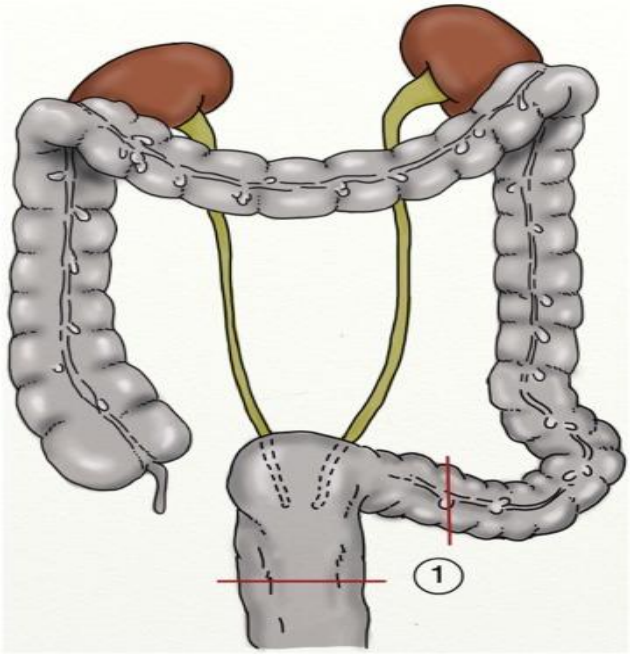
★ **Predisposing factors : Bilharziasis** of colon is **not** precancerous

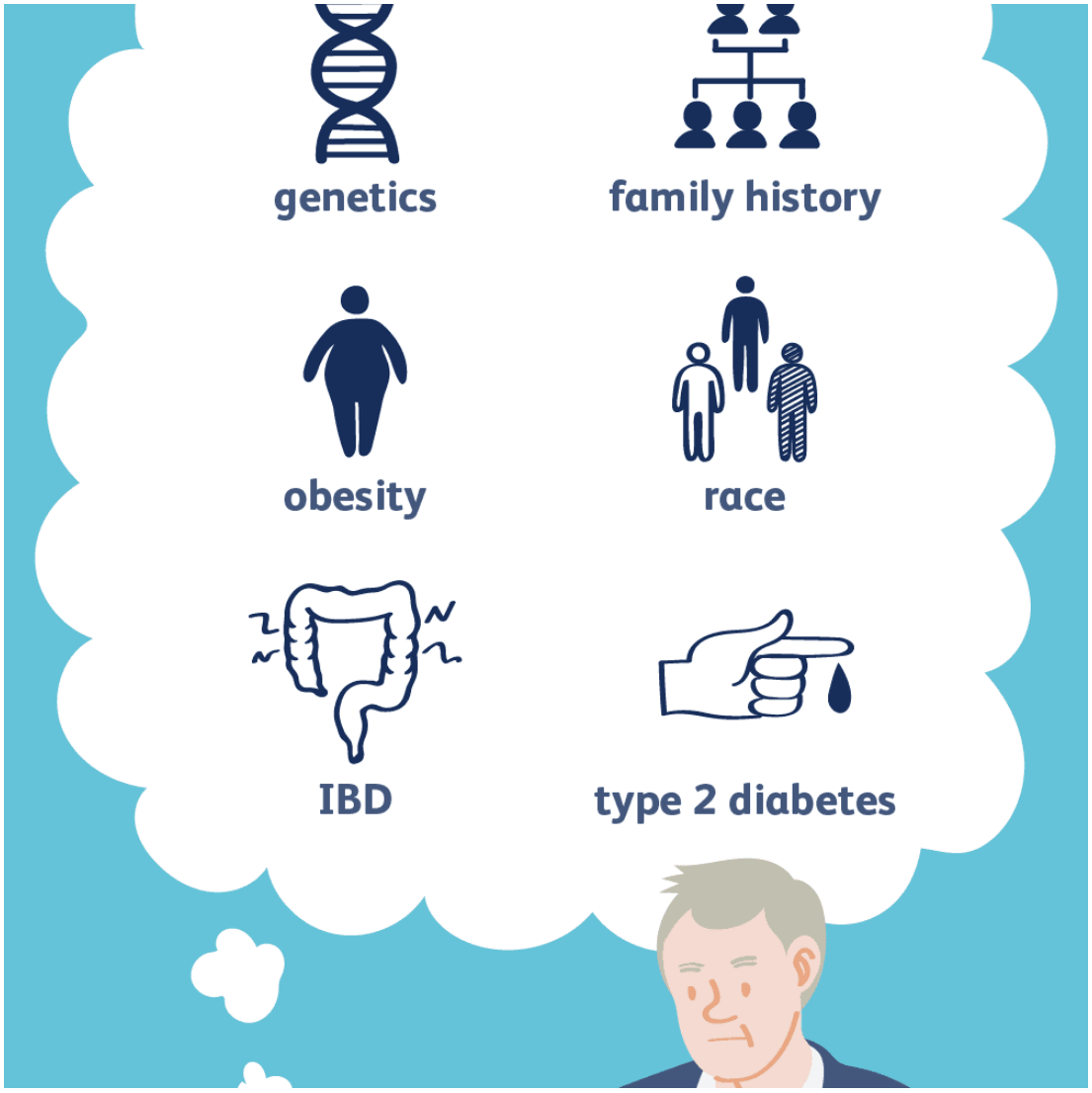
1. ***Obesity & diabetes .***
2. Colorectal carcinoma in **first degree relatives**
3. ***Genetic*** : genetic mutation in mucosa → dysplasia → adenoma → carcinoma .
4. ***Benign tumors*** of colon: as solitary villous adenoma . All types of carcinoma of colon propably commence as a benign adenoma.
5. ***Familial polyposis :***
   - The risk is **100 %** in untreated cases .
   - Carcinoma develops particularly in **villous adenomas larger** than 2 cm .
6. ***Gardner's syndrome :***
   - It is a type of familial polyposis coli with GIT polypi , osteomas of mandible & skull and desmoid tumor of anterior abdominal wall .
7. ***Ulcerative colitis.***
8. ***Chemical carcinogens.***
9. ***Smoking & alcohol***
10. ***Low fibres , high animal protein & fat diet.***
11. ***Uretero-colic implantation .***





Uretero-colic Implantation





★ **Pathology :**

I) Site :

- **2/3** of colo-rectal cancer in **rectum & *sigmoid colon***
- **Caecum 10%**.
- ***Multifocal*** tumour occurs in **5%**

II) Gross picture : It may be one of the following forms :

a. Proliferative type:

- It form a bulky fungating cauliflower mass with ulceration, necrosis, hge & infection .
- This is commonest in the right colon & ampula of rectum .

b. Ulcerative type:

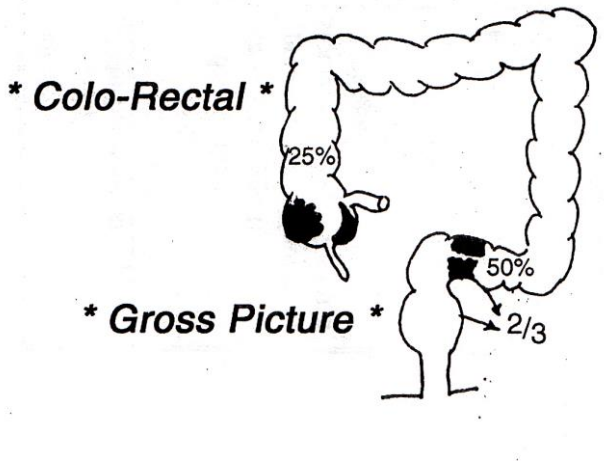
- The ulcer show features of malignancy, (describe it).
- This is commonest in the right colon & ampula of rectum .

***c.* Annular stricture type:**

- The **commonest** type in upper part of **rectum** & ***sigmoid colon***

d. Colloid type :

- The wall of the colon is infiltrated by malignant tissue containing gelatinous substance .



III. Microscopic picture:

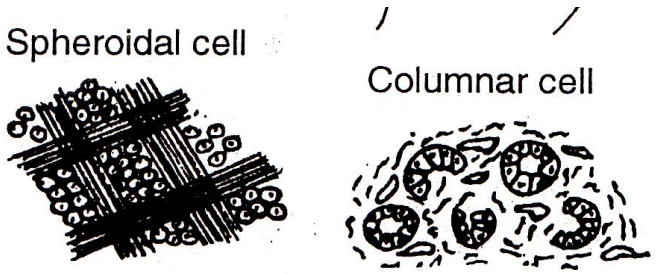
A- Adenocarcinoma :

- **95% of cases with colo-rectal carcinom** . It is one of the followings types :

a. ***Columnar cell adenocarcinoma:*** malignant cells are arranged in complete or incomplete irrigular acini.

b. ***Spheroidal cell carcinoma:*** groups of spheroidal cells are separated by variable amount of fibrous tissue.

c. ***Colloid or mucoid carcinoma:*** it is an adenocarcinoma with excess mucin in the cells, acini and tissue spaces.



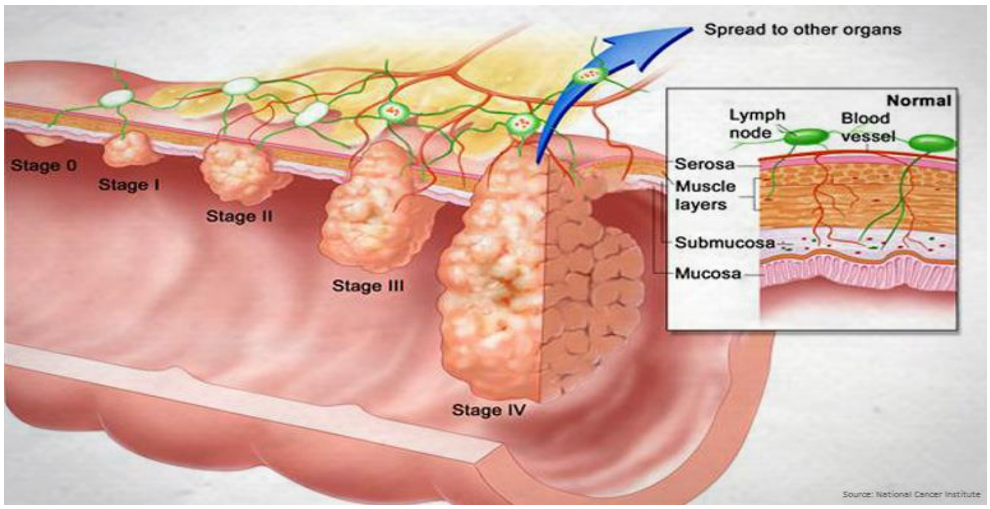
** Microscopic Picture **

B- Squamous cell carcinoma :

- 5% **, usually in the** lower 1/3 of the rectum .
- It may be **spread** from carcinoma of the lower ½ of **anal canal or** due to squmous **metaplasia .**

IV . Staging : TNM system

- ***T : Primary tumour***
  - **T is :** Tumor localized to the mucosa above the basement membrane .
  - **T1 :** Tumor invades the lamina propria, muscularis mucosae, or submucosa .
  - **T2 :** Tumor invades the musculosa .
  - **T3 :** Tumor invades the subserosa .
  - **T4 :** Tumor invades serosa or adjacent structures .
- **N : regional lymph node metastasis**
  - **N0 :** No regional lymph node metastasis
  - **N1 : 1-3** regional lymph node metastasis
  - **N2 : 4** or more regional lymph node metastasis
- **M : distal metastases .**
  - **M0 :** No distal metastases .
  - **M1 :** presence of distal metastases .



★ Complications :

I. Spread :

A) Direct spread :

- ♦ ***Intra-mural spread :*** Infiltration of thickness of the wall of the colon or rectum **mainly circumferential** than longitudinal spread beyond palpable edge of the tumor.
- ♦ ***Extra-mural spread :*** To the surrounding structures (small intestine , abdominal wall , greater omentum .... etc.).
  - In cancer rectum **anterior spread** in male to the urinary bladder , prostate & seminal vesicles is delayed due to presence of fascia of Denonvillier . In female , anterior spread occurs to the vagina .
  - In cancer rectum **posterior spread** to the sacrum is delayed due to presence of Waldayer's fascia.

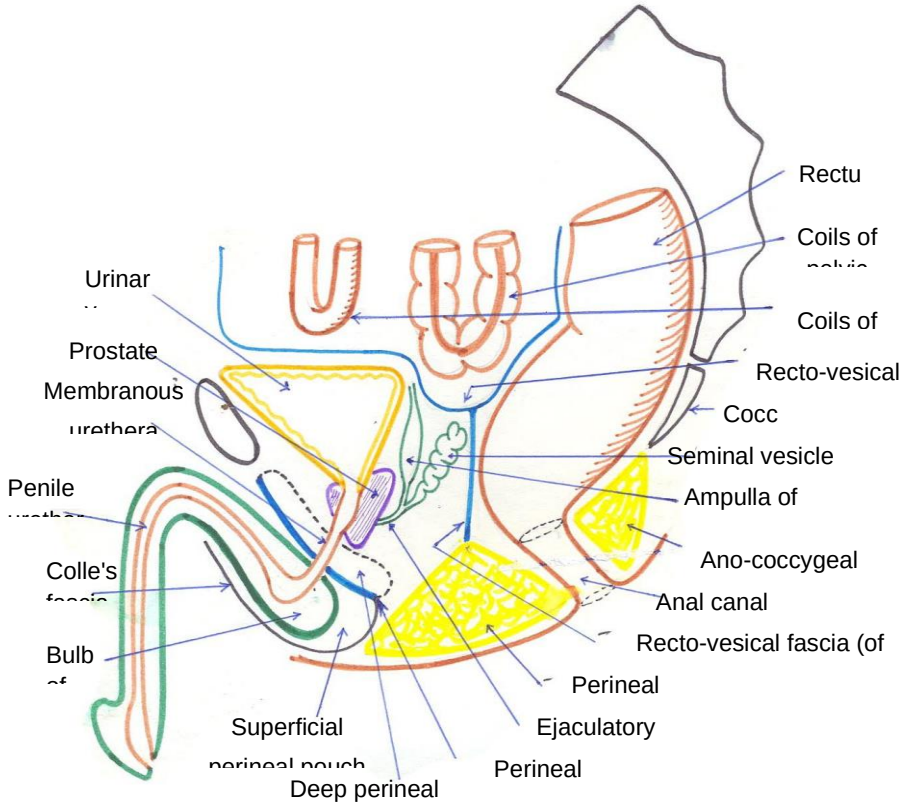
B) ***Lymphatic spread*** **:** By permeation and embolization to.

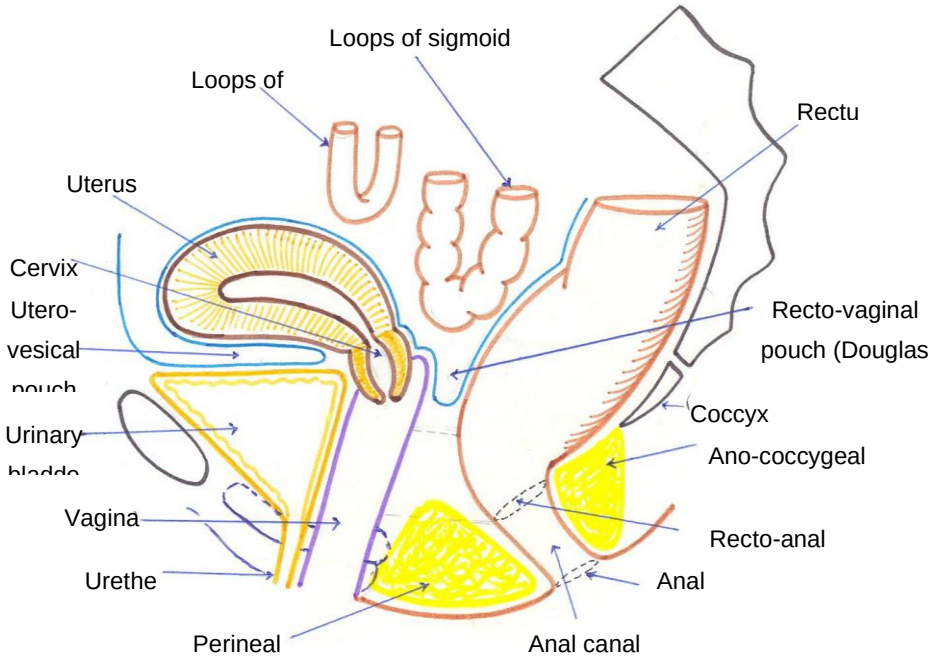
- ♦ **In cancer colon**: ***Epicolic*** L.Ns. (on wall of colon)→ ***Para-colic*** L.Ns. (along marginal artery)→ ***Intermediate colic*** L.Ns. (along colic branches of superior & inferior mesenteric arteries

) → ***central*** L.Ns. (on the superior or inferior mesenteric lymph nodes along the corresponding arteries) →

- **In cancer rectum**: to the ***para-rectal*** L.Ns. (around the rectum) then spread occur in 2 directions.

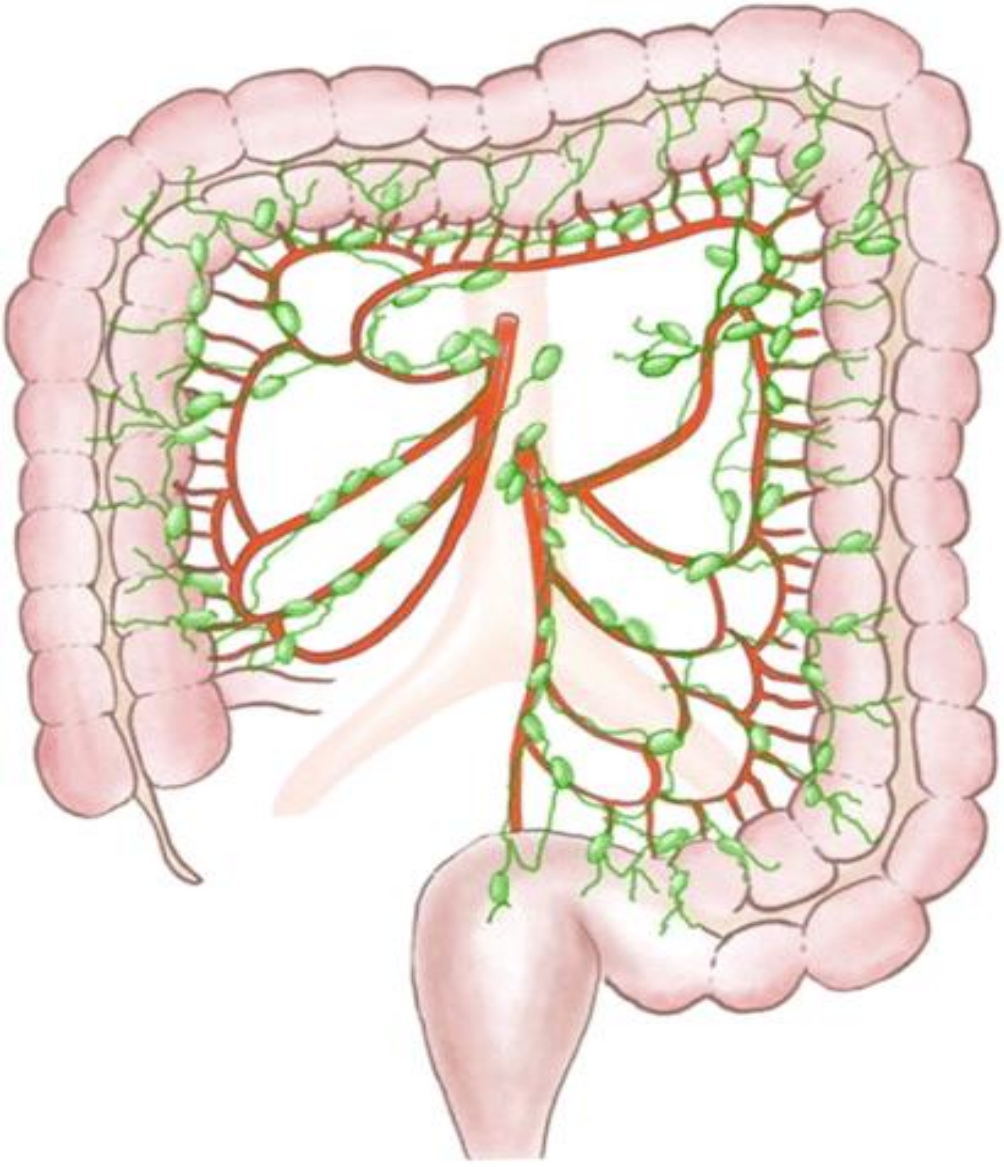
Sagittal section in Male Pelvis:

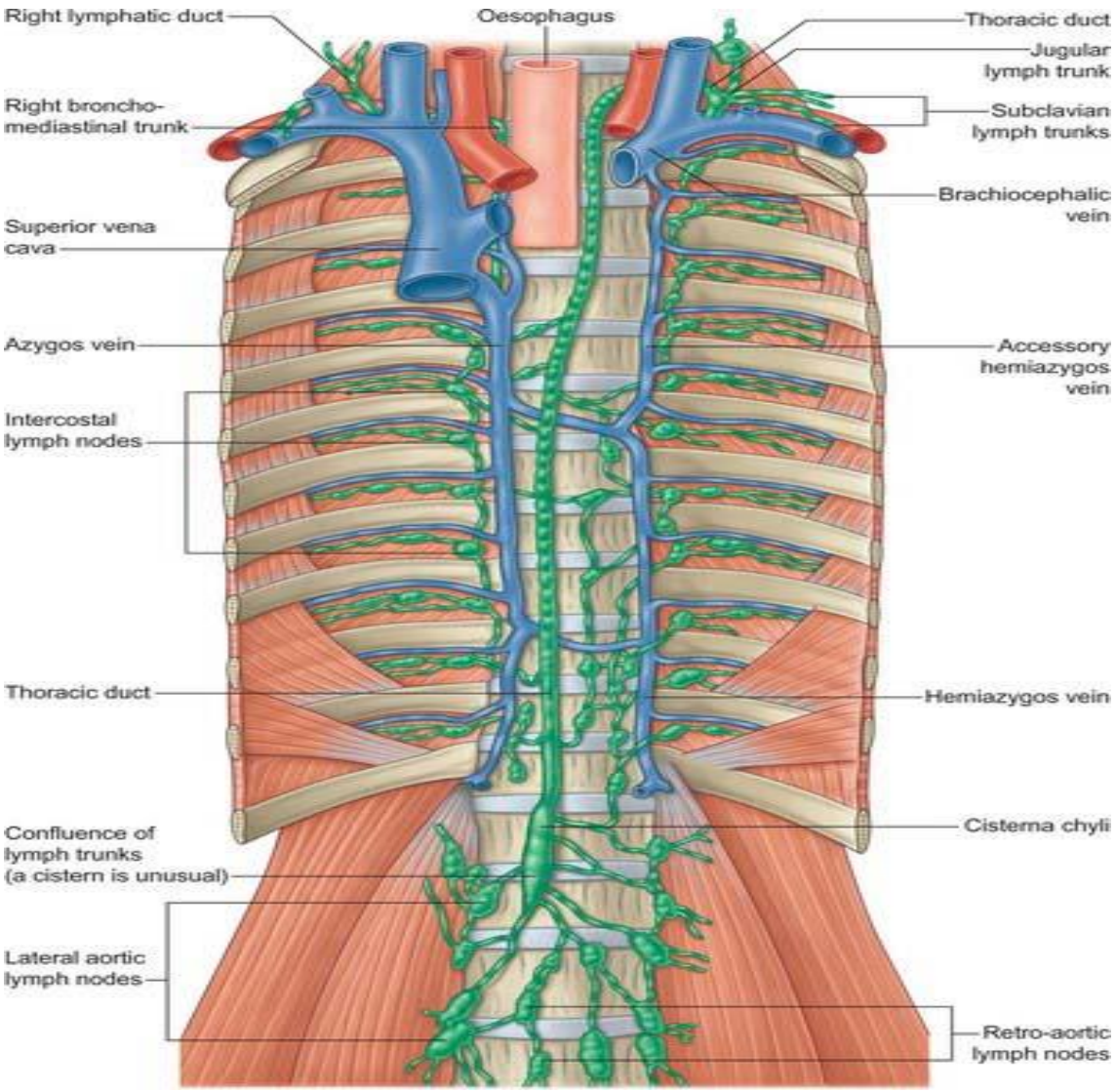




- From upper 2/3 of rectum → to ***superior rectal*** L.Ns. → ***inferior mesentric*** L.Ns.
- From lower 1/3 of rectum → to ***middle rectal*** L.Ns. → ***internal iliac*** L.Ns.→ common iliac & para-aortic L.Ns

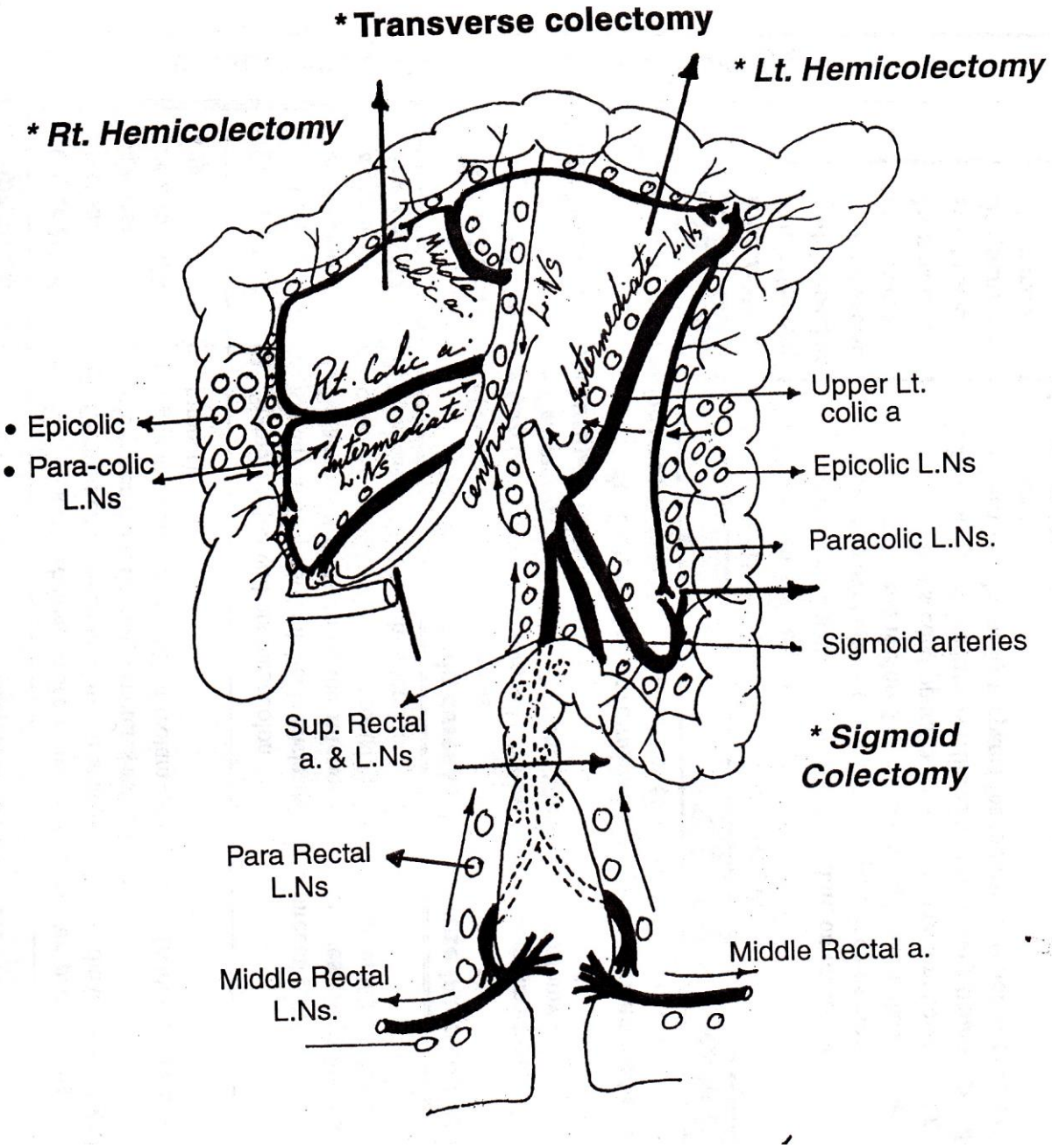
♦ ***From above mentioned lymph nodes*** lymphatic spread pass to gastrointestinal lymph truck → Cysterna chyli→ thoracic duct → ***left supraclavicular*** lymph nodes (Virchow's gland) (positive **Tourosie's sign**).

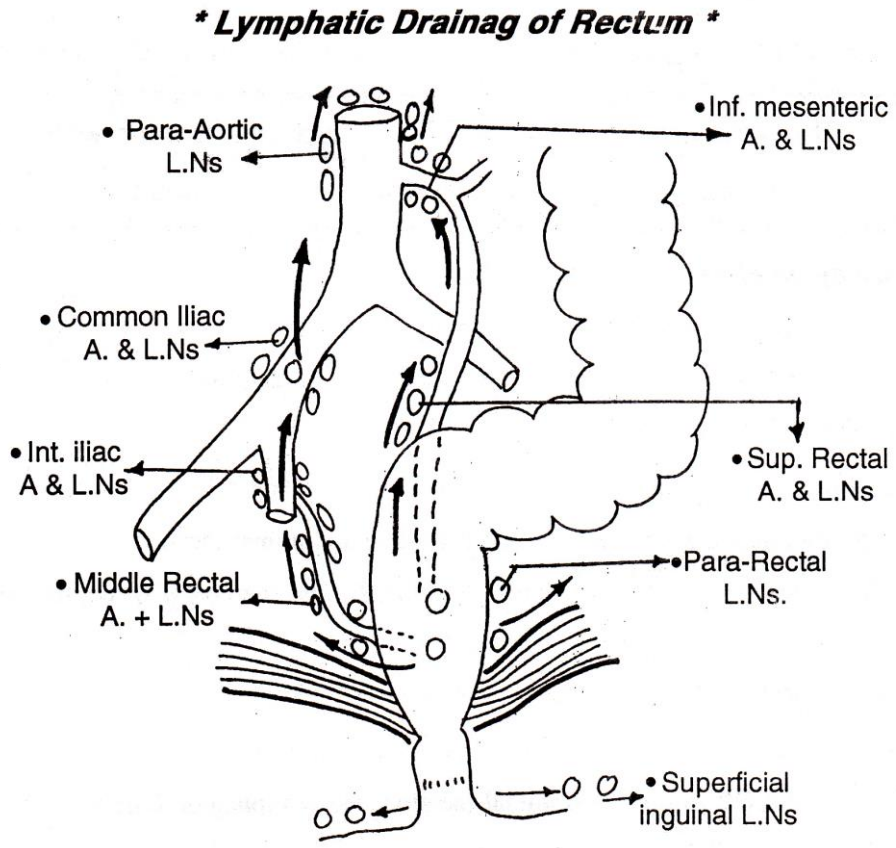




Virchow's gland &

positive Tourosie's sign


* Transverse colectomy
* Lt. Hemicolectomy
* Rt. Hemicolectomy
Middle Colic a.
Rt. Colic a.
Intermediate L.Ns
Central L.Ns
Intermediate L.Ns
• Epicolic
• Para-colic L.Ns
Upper Lt. colic a
Epicolic L.Ns
Paracolic L.Ns.
Sigmoid arteries
Sup. Rectal a. & L.Ns
* Sigmoid Colectomy
Para Rectal L.Ns
Middle Rectal a.
Middle Rectal L.Ns.

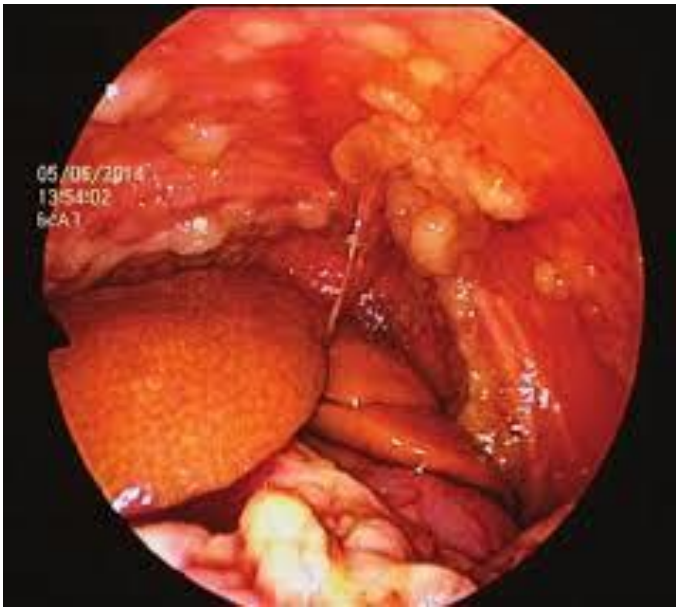


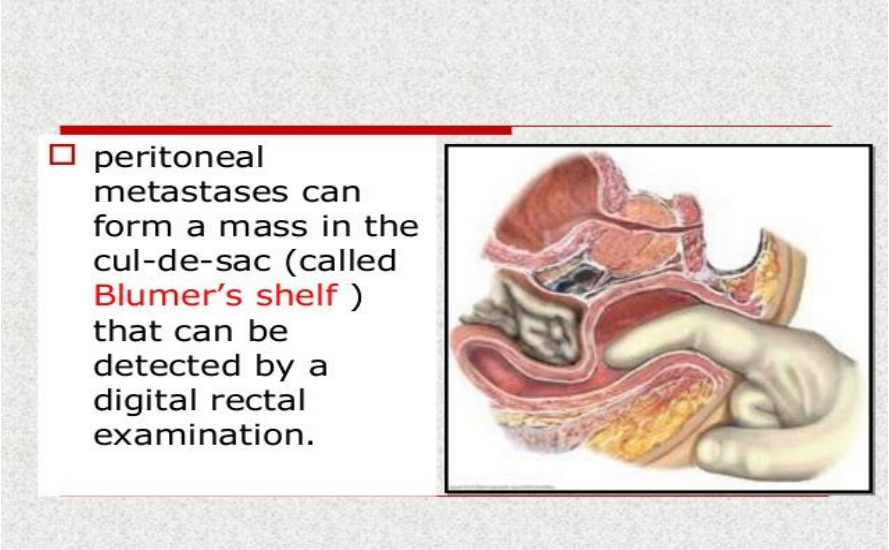
C) *Blood Spread : (2L + 2B or LBLB)*

- Mainly to the liver via portal circulation, rarely to lungs, bones, brain via systemic circulation.

D) Trans-peritoneal Spread :

- By seeding → malignant ascites, Krukenberg's tumour (malignant cells implanted on the ovaries → bulky tumour), nodules in the Douglas pouch known as **Blumer's shelf** , omentum and parietal peritoneum.





II. ***Bleeding****:* per rectum usually mild .

II. ***Obstruction:***

- ***Very rare in cancer righ Colon*** (wide lumen & fluid stool) except tumor enchroching on ileo-caecal valve and ***very common in cancer left colon & upper part of rectum*** (narrow lumen, stenotic tumour & solid stool).
- ***Chronic*** intestinal obstruction is more common but **acute on top of chronic** obstruction due to faecal impaction may occur

IV. *Perforation*: Is usually gradual → pericolic abscess, enterocolic or vesicocolic fistula.

V. Pulmonary complications , infections , Anaemia , cachexia and death.

> ★ In **cancer rectum** only , **secondary pile** may occur due to infiltration of superior rectal vein .

★ Clinical picture:

I)Symptoms :

A) Carcinoma of right colon:

1. **Anorexia , anaemia & athenia:(3A)**
   - The patient looks pale, feels tired, weak & unexplained loss of weight with anorexia.
   - Any old patient with progressive unexplainable anaemia should be suspicious for malignancy.
2. **Dyspepsia:** Vague right abdominal discomfort , anorexia, vomiting and indigestion .
3. There may be recurrent **attacks of colicky pain** in the right iliac fossa and **diarrhea** (hyperperistalsis to get ride of the tumor).
4. **Mass group:** There may be a palpable mass in the right iliac fossa.
5. **Intestinal obstruction** is very rare due to wide lumen and fluid content of the caecum. It occurs if the tumor obstruct the ileo-caecal valve.
6. **Complication group:** i.e features of metastases e.g jaundice malignant ascites, Krukenbeg's tumor, Troisier's sign (enlarged left supraclavicular L.Ns.).

B) In Carcinoma of left colon & rectum :

	Carcinoma of left colon	Carcinoma of rectum
1. Bleeding per rectum: ▪ **Uaually slight**	▪ Common	▪ ***The earliest and most constant symptom.*** ▪ In any patient above 25 years, presenting with bleeding per rectum, ***cancer rectum must be excluded*** , even in presence of piles.
2. Altered bowel habits.	▪ The commonest presentation	▪ **Progressive conistipation** is common in upper rectal cancer.
	a. Stricture type → ***progressive constipation***.	b.**Tenesums**, sense of incomplete defecation, with passage of blood, mucous & necrotic material → ***spurious diarrhea*** (usually in ampula of rectum)
3. **Large intestinal obstruction**	▪ Usually **chronic** obstruction with **progressive constipation**, abdominal distension, colics and borborygmi. ▪ **Acute on top** of chronic obstruction often follows fecal impaction → **absolute** constipation .	
4. **Abdominal swelling**	▪ It is very rare. If a mass is felt, it is usually the feces impacted above the stricture	
5. **Abdominal Pain**	▪ Late, due to I.O, sciatica, spread to the surrounding organs	

III. *Examination:*

a) General: for jaundice, anaemia, cachexia, Virchow's glands & distal metastases.

b) Abdominal:

1. ***Abdominal Swelling*** : may be felt in carcinoma of **right colon** as hard, irregular ill-defined mass in the right iliac fossa. It is at first mobile and later on become fixed.
   - D.D.: ***appendicular mass*** by the long duration & absence. of toxaemia & tenderness.
2. Enlarged, hard, nodular & tender liver. (***liver metastases)***
3. Malignant ascites.
4. ***Abdominal masses*** (enlarged L.Ns & peritoneal nodules).
5. ***P-R and P-V examination***:
   - It may show pelvic deposits .
   - In cancer rectum it allows palpation of lesions that lie within 10 cm of anal verge as a hard induration.
6. Features of **distal metastases**: (mention).

★ **D.D :**

- ***Cancer right colon :*** mass in the right iliac fossa .
- ***Cancer left colon & rectum :*** Other causes of bleeding per rectum, intestinal obstruction .

★ **Investigations :**

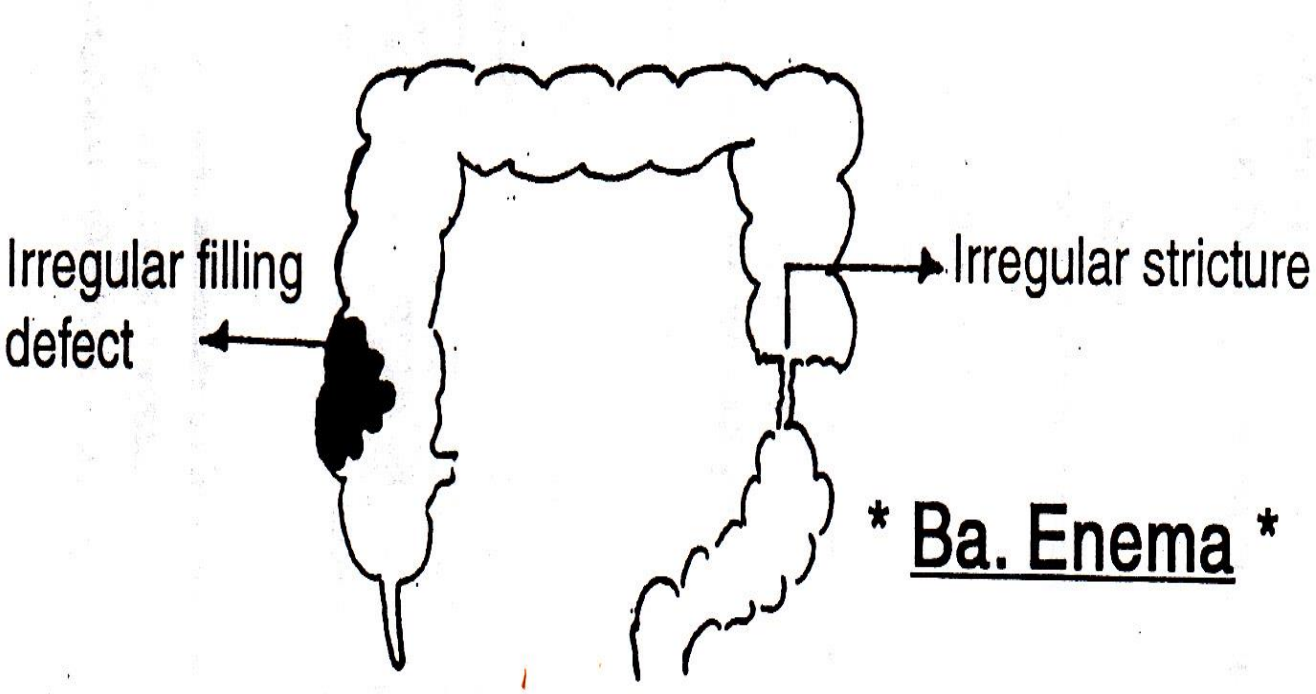
I) Laboratory investigations*:*

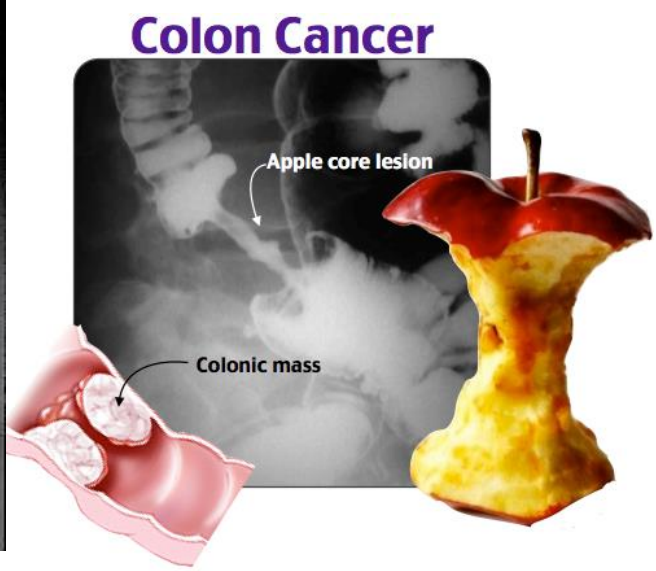
1. ***Occult blood in stool*** : usually positive .
2. ***Blood picture*** : usually show microcytic hypochromic anaemia.
3. **Tumor markers** : CEA , not specific , to evaluate **response** to treatment and **follow up** of the patient .

II) Radiological investigations :

1. ***Barium enema*** : may show
   - ♦ **Cancer right colon : Persistent** irregular filling defect

- **Cancer left colon : Persistent** irregular stricture (apple core appearance) with shouldering and moderate proximal dilatation
- Show **multifocal** tumors .





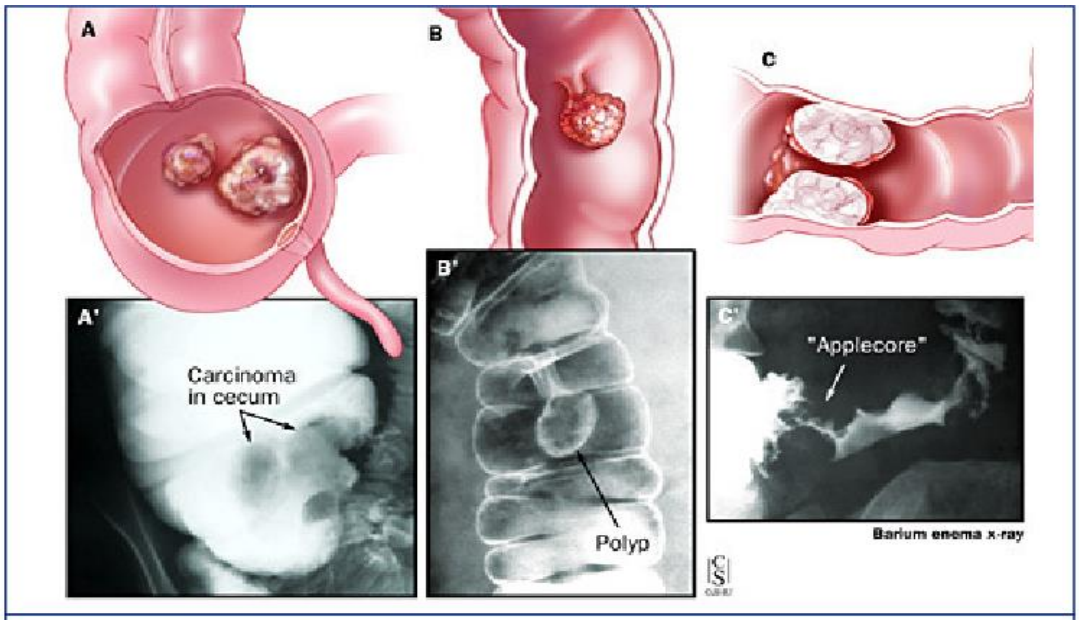


Figure 8. Colon cancer. A, Carcinoma in the cecum; B, pedunculated polyp; C, apple core lesion; A', B', C', corresponding barium enema x-rays

2. ***U/S & endoscopic transrectal U/S (TRUS) is very important to*** detect the depth of invasion , local extent of the tumor and lymph nodes enlargement .
3. ***C.T. scan*** & **MRI** of abdomen and pelvis .
4. ***Rectal protocol MRI*** for accurate staging show depth of invasion , local extent of the tumor and lymph nodes enlargement
   - They determine the need for preoperative chemoradiotherapy .
5. **PET scan**.
6. A **PET scan and CT** scan may be done at the same time. This is called a **PET-CT** for accurate preoperative staging.

III) Colonoscopy with biopsy from any suspicious areas , are the **most important** investigaions.

IV) **Diagnostic laparoscopy with biopsy**

V) Investigations to detect metastasis. (Mention in any malignancy)

1. Plain x-ray : chest & bone to detect lung & bone metastases .

2. U/S of lung & abdomen .

3. CT & MRI for brain , bone , chest & abdomen .

4. Radioactive isotopic scan of lung , liver , bone & brain .

5. **PET-CT scan**

6. **Diagnostic laparoscopy with biopsy .**

★ **Prognosis :**

- **Depends on staging ,**degree of differentiation , depth of infiltration , presence of lymph node metastases , infiltration of surrounding structures or distal metastases .

★ Treatment :

I) Cases without acute obstruction :

A) Operable cases without acute obstruction: (potentially curable)

- **Features:-** (Mention as any malignancy)
- **Aim :** ***Radical resection*** of the following structures in continuity followed by restoration of ***bowel continuity .***
  - Primary **tumor** with safety margin .
  - **Lymphatic** drainage with the related **peritoneum** and **blood vessels** (ligation & division of these vessels at their origin from superior & inferior mesenteric vessels) and consequently the whole part of **bowel supplied** by the removed vessels .
- **Preoperative preparation** of colon : (**Empty & clean** colon)
  - Non residue diet for **4 days** before the operation .
  - Enemas & mild laxatives for **3 days** before the operation .
  - Neomycin & flagyl **2 days** before the operation .

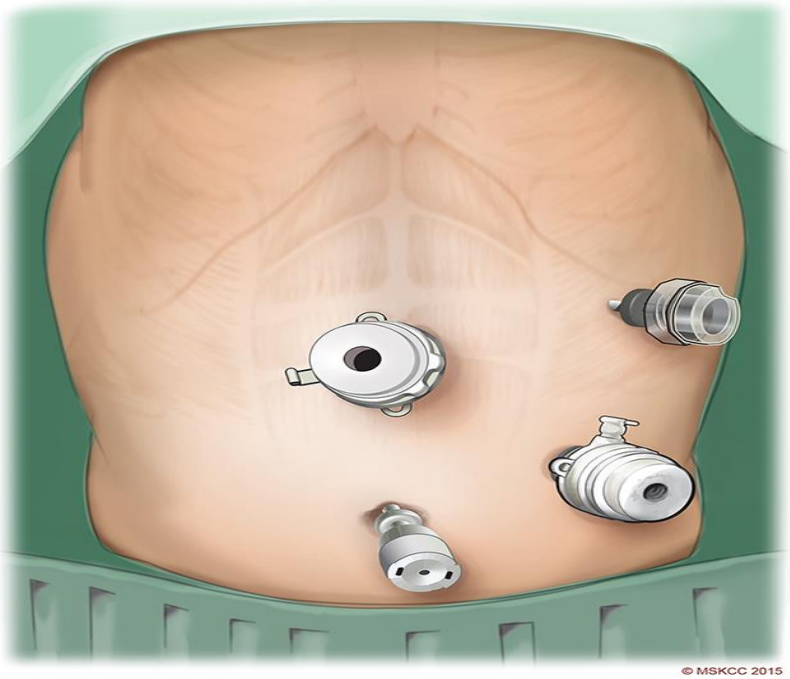
♦ Methods :

- Elective surgery by **laparoscopic** (best and popular nowadays), open or robotic (usually not available) approach.

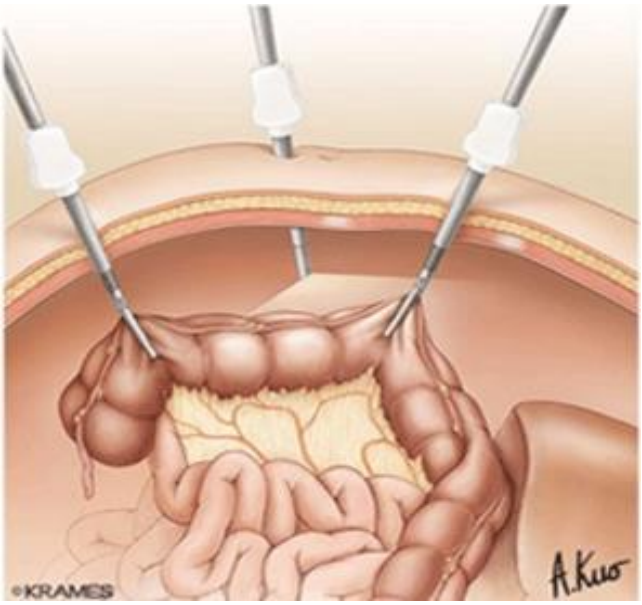
Site & operation	Removed structures	Restoration of bowel continuity
Caecum → right hemi-colectomy	Terminal 10 inches of ileum , caecum , ascending colon, hepatic flexure , right 1/3 of transverse colon , ileocolic & right colic vessels from their origin with related peritoneum and lymph nodes .	**End to end ileotransverse anatstomosis**
Transverse colon→ transverse colectomy	Transverse colon , hepatic & splenic flexures , tanansverse mesocolon , grearer omentum , middle colic vessels from their origin and related lymph nodes .	**End to end anatstomosis of colon .**
Descending colon → left hemi-colectomy	Left 1/3 of transverse colon , splenic flexure , descending colon , upper left colic vessels from their origin with the related lymph nodes and related peritoneum .	**End to end anatstomosis of colon .**
Ascending colon or Hepatic flexure → extended right hemi-colectomy	right hemi-colectomy + ligation of middle colic vessels , removal of right 2/3 of transverse colon with the related lymph nodes & peritoneum .	**End to end ileotransverse anatstomosis**
Splenic flexure → extended left hemi-colectomy	Left hemi-colectomy + ligation of middle colic vessels , removal of left 2/3 of transverse colon with the related lymph nodes & peritoneum .	**End to end anatstomosis of colon .**
Sigmoid colon → sigmoid colectomy	Sigmoid colon , sigmoid mesocolon containing sigmoid vessels from their origin and related lymph nodes .	**End to end anatstomosis of colon .**

- **Adjuvant post-operative radiotherapy & chemotherapy**: if + ve nodes or + ve margins.

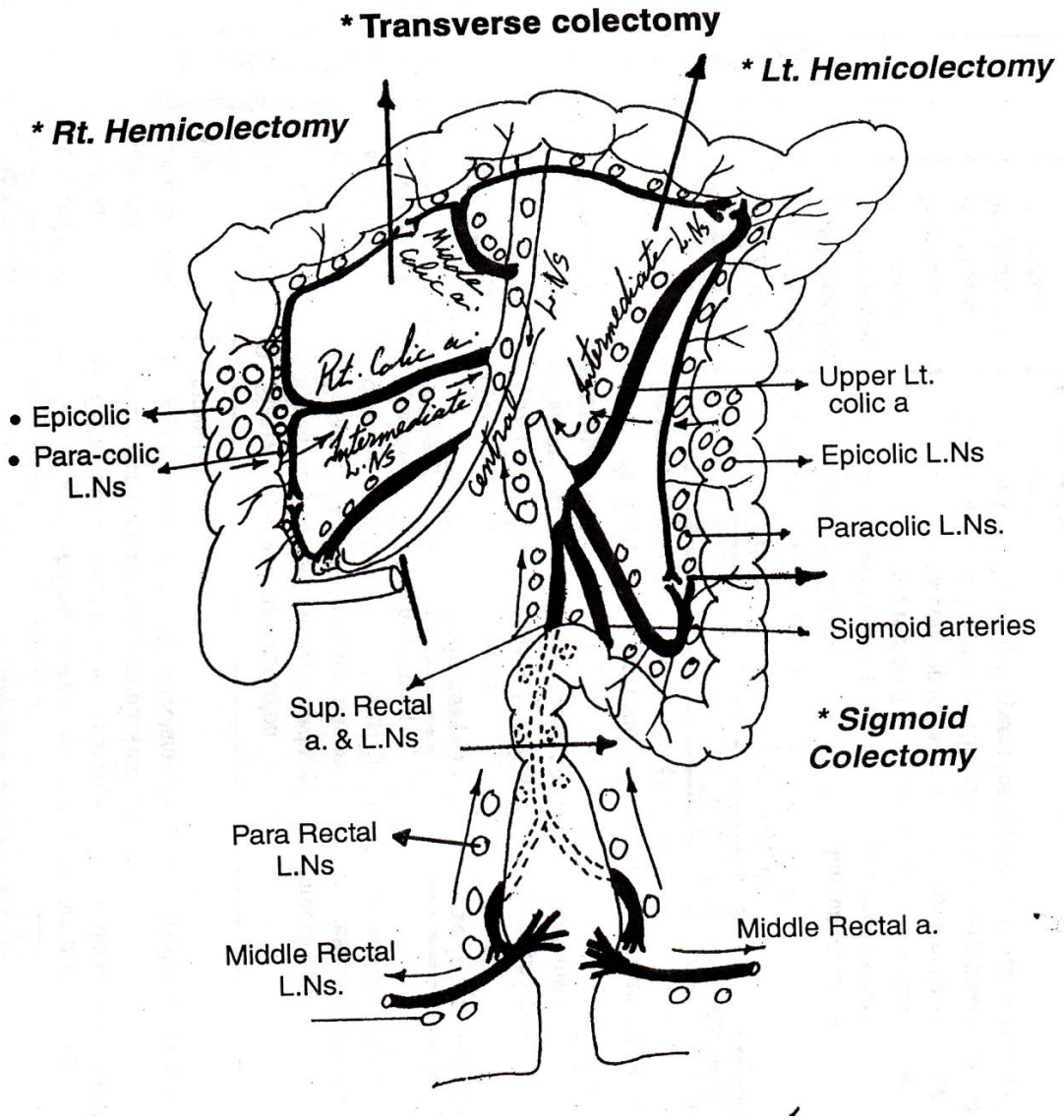
⁎ **Carcinoma of rectum : Neoadjuvant chemotherapy and radiotherapy** for all cases with T3 or T4 or +ve nodes on imaging (TRUS OR rectal MRI).		
Upper 2/3 of rectum → anterior resection (also called abdominal resection with sphincter preservation or Dixon's operation)	▪ Ligation & division of inferior mesenteric vessels below the origin of upper left colic vessels with removal of : 1. Sigmoid colon with its mesocolon . 2. Divide the rectum 2cm below the tumour with removal of upper part of rectum . **3.** Related lymph nodes and related peritoneum	**End to end anatstomosis** between the descending colon & remaining distal rectal stump using staper device introduced from the anus .
Lower 1/3 of rectum → abdomio-perineal resection (Mile's operation)	1. Ligation and division of the inferior mesenteric vessels (below the upper left colic artery), middle and inferior rectal vessels together with the L.Ns. along them. 2. Sigmoid colon with its mesocolon . 3. Rectum in the perirectal fascia enclosing the pararectal L.Ns. **4.** Anal canal with all ischiorectal fat surrounding it .	**Permanent terminal left iliac colostomy**
▪ The abdominal part of Mile's operation can be done by **laparoscopic approach .** ▪ **Indications** of Mile's operation **:** it should be done if the **tumor is 2 cm or less from the anorectal junction , sphincter involvement or aggressive tumor .**		

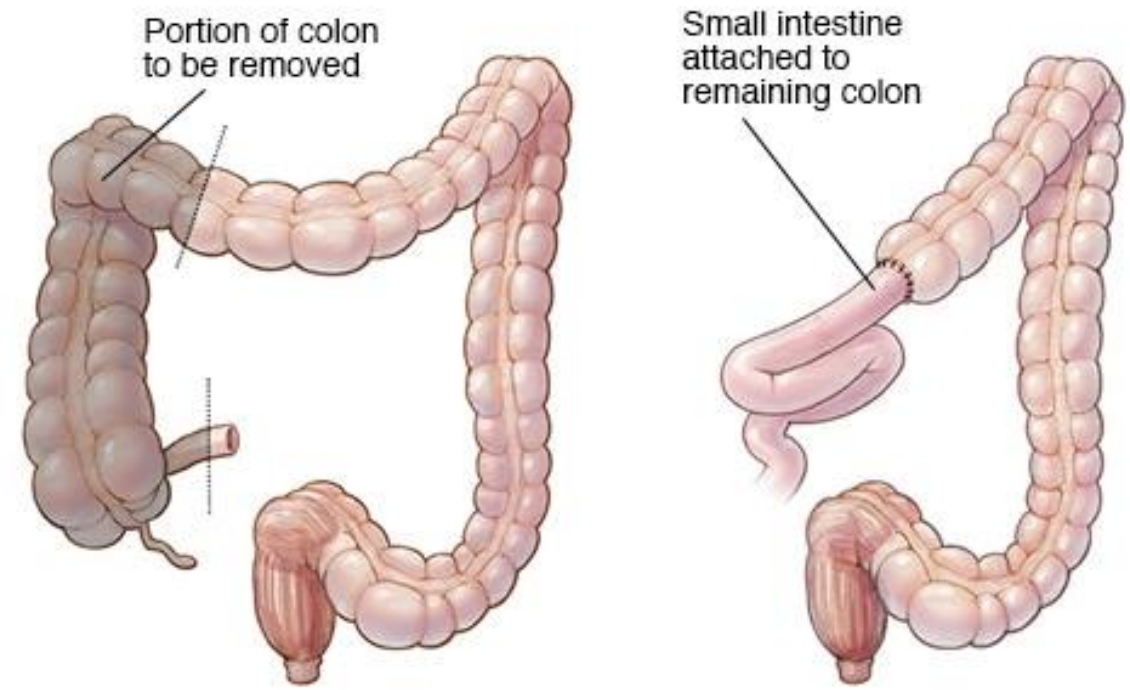


Source: Shane Y. Morita, Charles M. Balch, V. Suzanne Klimberg, Timothy M. Pawlik, Mitchell C. Posner, Kenneth K. Tanabe: *Textbook of Complex General Surgical Oncology*: www.accesssurgery.com

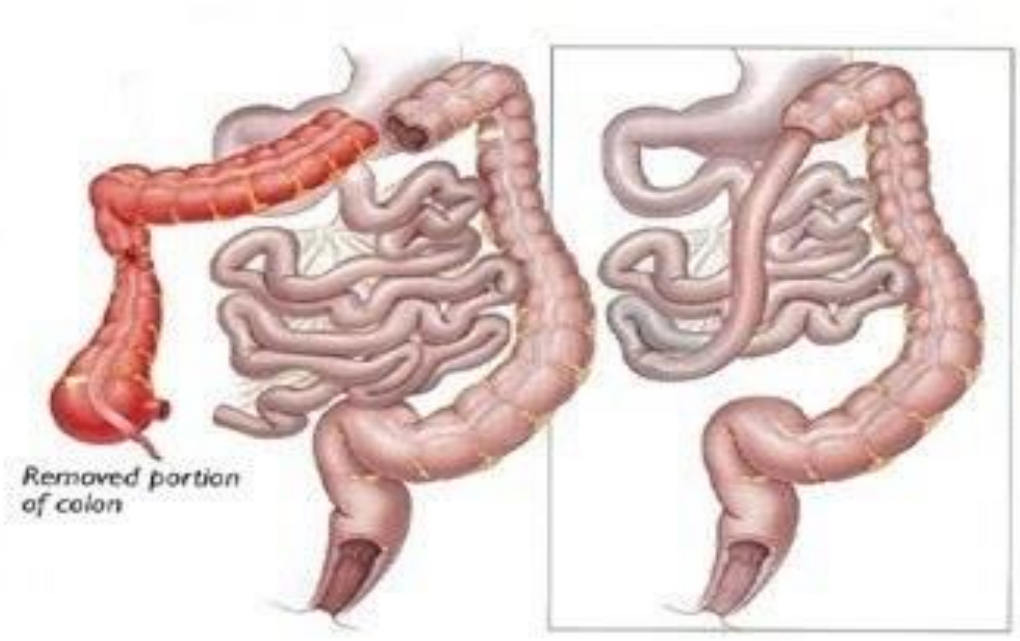


★ Laparoscopic colectomy

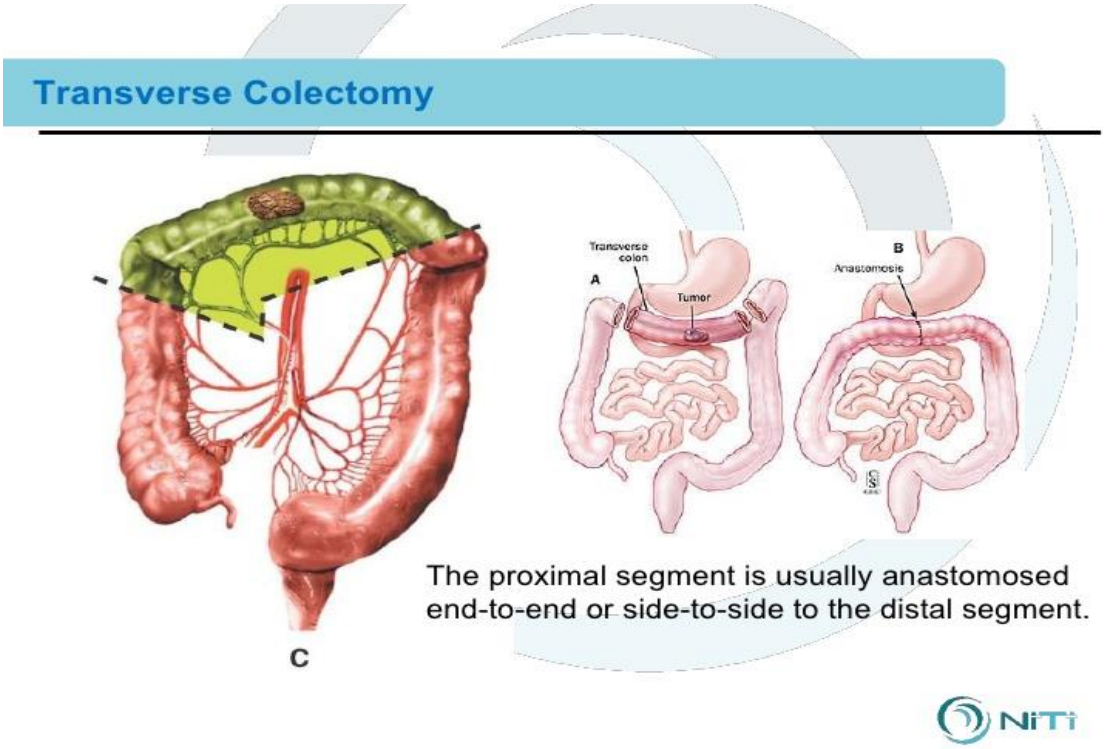


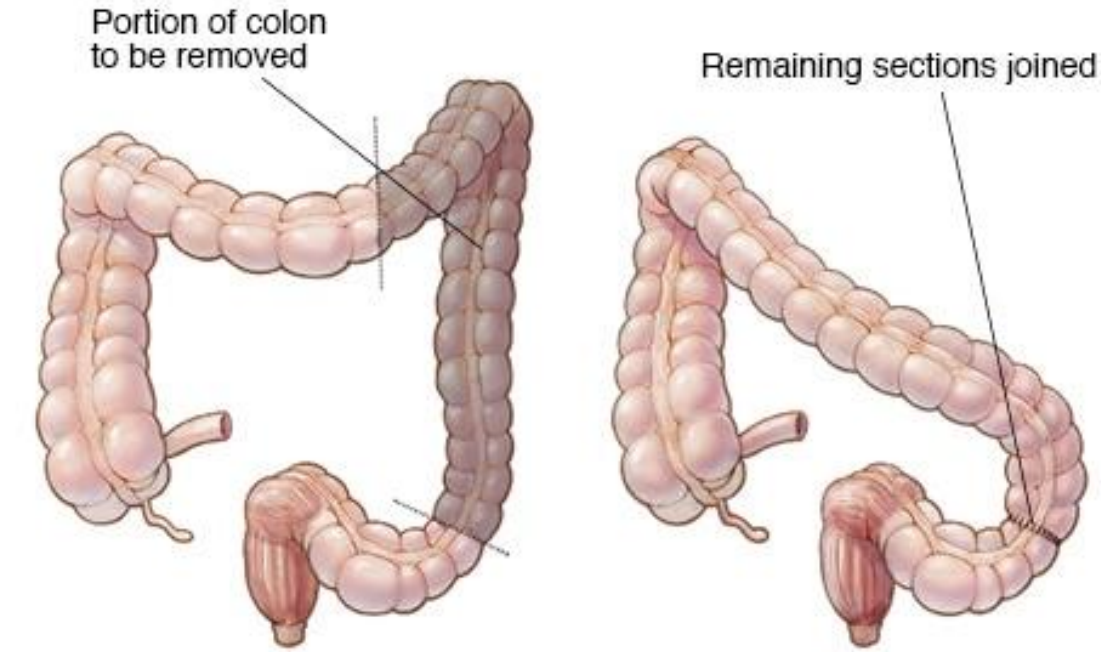


★ **Right hemicolectomy with ileotransverse anastomosis**

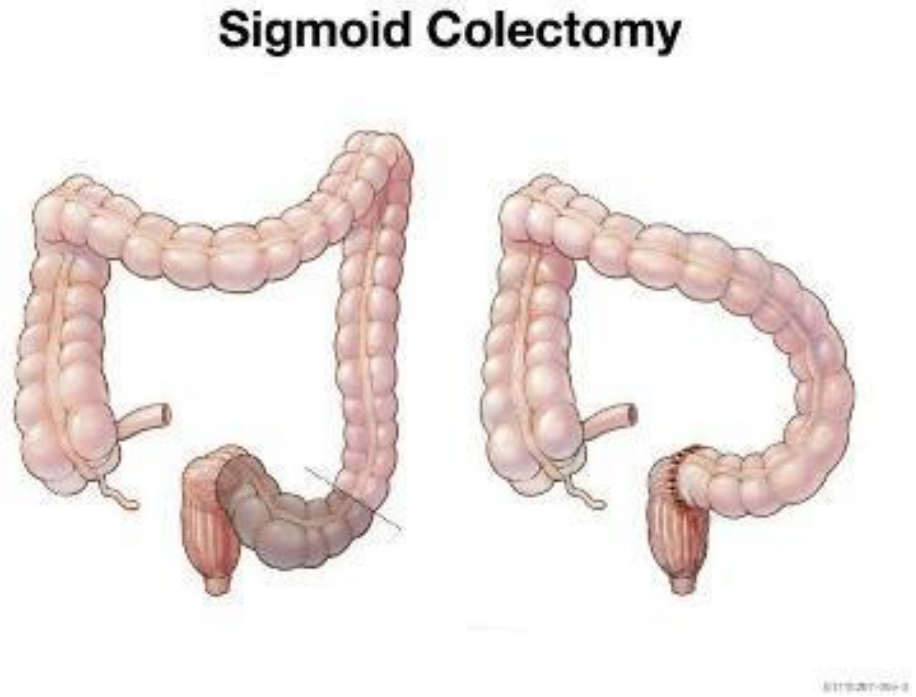


★ **Extended right hemicolectomy with ileotransverse anastomosis**



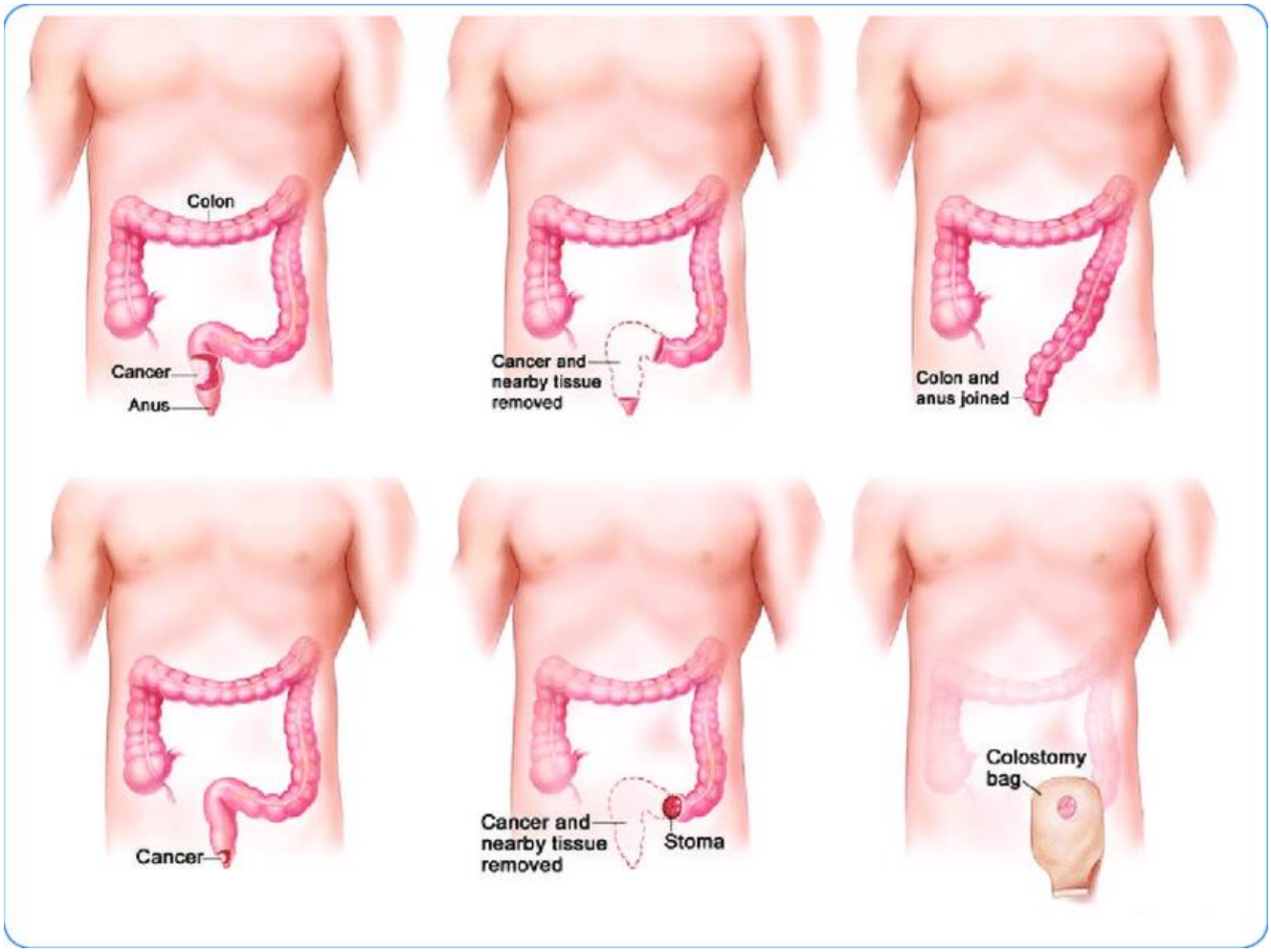


★ **Left hemicolectomy**

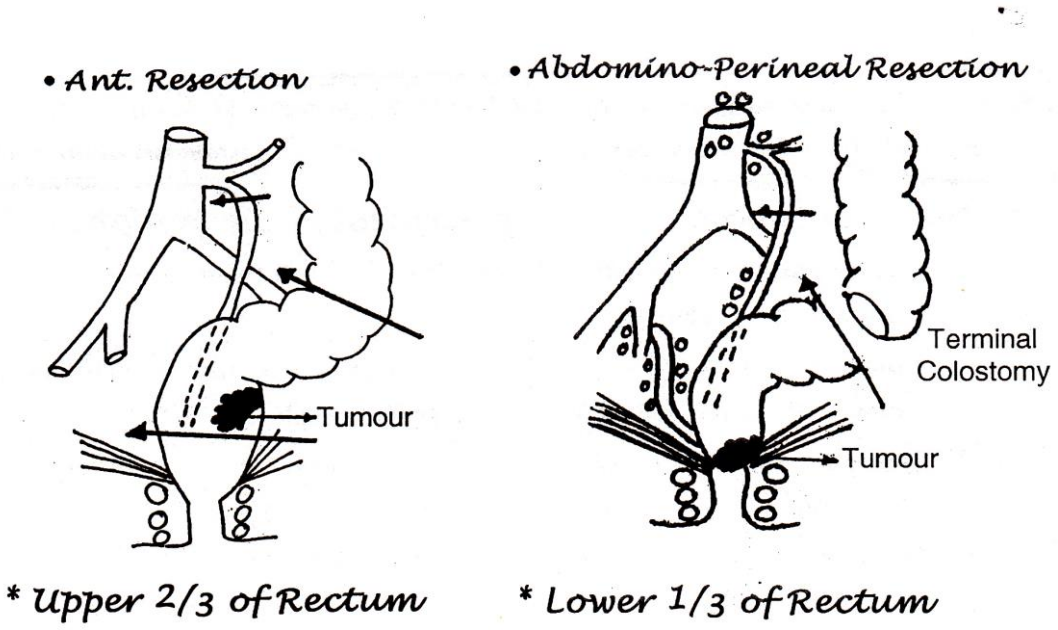


★ **Circular stapler used in abdominal resection**

⋆ Anterior resection



⋆ Abdomio-perineal resection



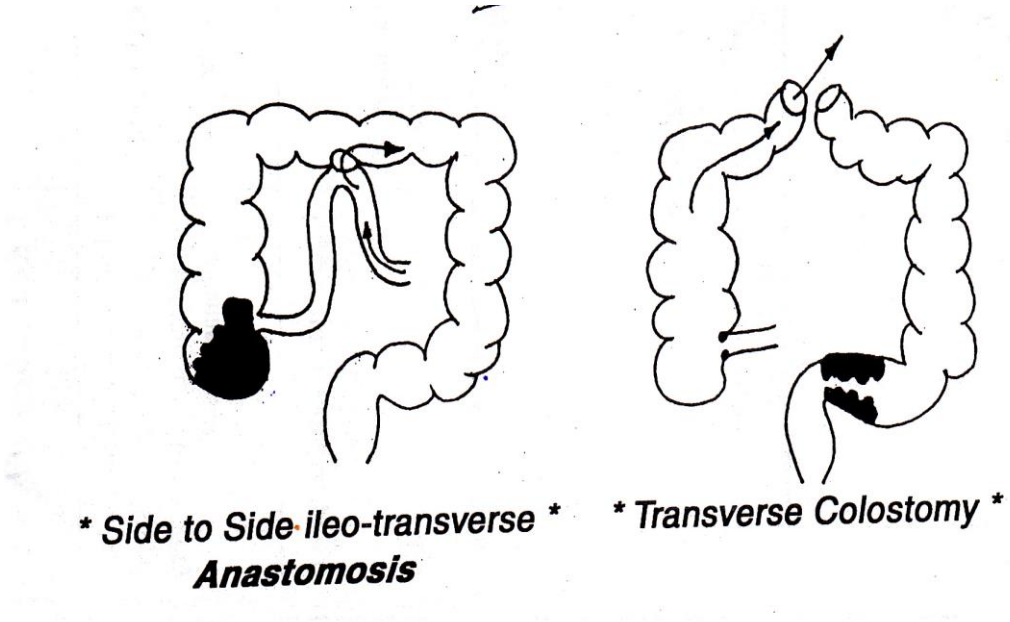
B) Inoperabale cases without acute intestinal obstruction :

1-Resectable: Palliative excision and anastomosis.

2- Irresectable:

- ***Carcinoma of right colon*:** side to side ileo-transverse anastomosis.
- ***Carcinoma of left colon***: Permanent transverse colostomy (to avoid obstruction).

3-Palliative chemotherapy & radiotherapy.



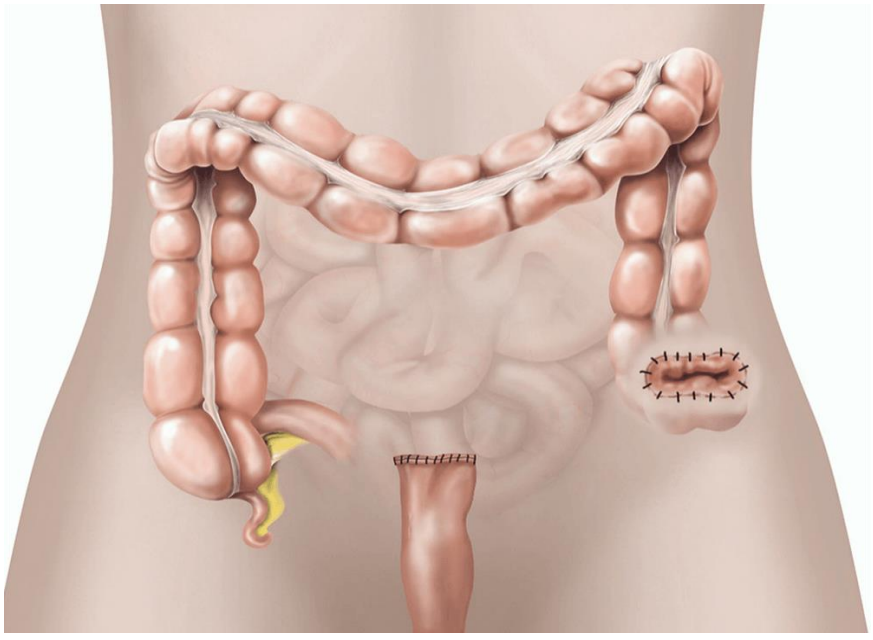
* Side to Side ileo-transverse * ***Anastomosis***

* Transverse Colostomy *

II) Colorectal carcinoma with acute intestinal obstruction :

- ***Preoperative preparation*** (see IO) followed by **urgent laparotomy**

	Right colon	Left colon & rectum
Resectable	**Right hemicolectomy with immediate ileo-transverse anastomosis.**	**▪ 2 options are available :** **1. Hartmann's procedure:** • ***Resection*** **(radical or palliative depending on operability)** • **The *proximal end* is opened as a temporary colostomy.** • **The distal end is closed by sutures & replaced in the abdomen.** • ***Later on,*** **a second operation is needed to restore bowel continuity.** ***2. At first,*** **the obstruction is relieved by temporary transverse colostomy then Later on, the patient is prepared for elective radical resection with restoration of bowel continuity in the same sitting.**
Irresectable	**side to side ileo-transverse anastomosis.**	**Palliative permanent transverse colostomy.**



Hartmann's procedure


Transverse colostomy