Long Cases in
GENERAL SURGERY

Salient Features

- The book is primarily intended for MBBS students and will be a quick revision for exam-going postgraduates
- Provides the complete knowledge about the history to be asked in the long cases for examinations and points out all the examination aspects
- Contains more than 50 diagrams and illustrated photographs, which make the readers to understand easily
- Includes a lot of tables and boxes with important points needed for the examination time
- The book being handy makes it easier for the readers to carry it to the wards and outpatient departments
- Thoroughly revised and updated with latest points from various journals and latest textbooks.

R Rajamahendran is a well-known author among the students. He has written about a handful of other books Short Cases in General Surgery, Clinical Cases in OBG, FMGE–Nutshell Series in Surgery, Clinical Cases in Pediatrics and KONCPT TNPG Block Buster. He completed his MS general surgery in 2007 and he was the best outgoing postgraduate from Kilpauk Medical College, Kilpauk, Chennai, Tamil Nadu, India. He completed MRCs in 2008, FMAS from GEM Hospital, Coimbatore, Tamil Nadu, India in 2009. He is the Founder of KONCPT PG Medical Coaching Center, Chennai, Tamil Nadu, India which has branches in Chennai, Nagercoil, Tirunelveli and Tuticorin with the main center at Villupuram. He is a faculty in ADR Plexus, Karol Institute of Medical Sciences (KIMS), Chennai, Tamil Nadu, India, Global Institute of Medical Sciences and Faculty in China–Zhengzhou Medical University.
Long Cases in GENERAL SURGERY

2nd Edition

R Rajamahendran
MS MRCS (Edinburgh) FMAS FAGE Dip Lap
MCh (Surgical Gastroenterology)
General, GI and Laparoscopic Surgeon
Founder and Faculty
KONCPT PG Medical Coaching Center
Chennai, Tamil Nadu, India

Foreword
B Sathya Priya
Dedicated to

My Teachers, Friends, Parents and my beloved students of Kilpauk Medical College and My dear friend Late Dr S Karthikeyan, MD (Anesthesia), he lives in our lives
Foreword to the Second Edition

It gives me immense pleasure to write the foreword for the book *Long Cases in General Surgery* written by Dr R Rajamahendran.

I am proud of Dr R Rajamahendran, who did his post-graduation in my unit in the Department of General Surgery, Kilpauk Medical College, Kilpauk, Chennai, Tamil Nadu, India. I still appreciate and tell my postgraduates of today about his systematic management of his studies and his work at the ward.

His another book *Short Cases in General Surgery* was widely read by the undergraduates and postgraduates.

In his present book, the second edition of *Long Cases in General Surgery*, he has added important topics like Obstructive Jaundice and Peripheral Vascular Diseases for undergraduate and postgraduate students.

I wish him grand success in all his endeavors in his future life.

B Sathya Priya
MS
Assistant Professor and Senior Civil Surgeon
Department of General Surgery
Kilpauk Medical College
Kilpauk, Chennai, Tamil Nadu, India
Foreword to the First Edition

It is with considerable pleasure and delight that I am writing the foreword to the *Long Cases in General Surgery* by Dr R Rajamahendran.

He has been associated with me for the past nine years as medical student. He has ventured to bring out a good readable volume in its best contents and outcome for exam-going undergraduate students. The unique feature of the book is the crispy nature of chapters, then long cases presentation.

The author must be congratulated for his efforts to present the book to the medical students which provides them up-to-date guidance with personal and individual emphasis on the preparation for clinical examinations.

I wish Dr Rajamahendran all the success.

D Amudan
MS (General Surgery)
Assistant Professor
Department of General Surgery
Thoothukudi Medical College
Thoothukudi, Tamil Nadu, India
Preface to the Second Edition

I am happy to see the extensive response of the first edition of my book *Long Cases in General Surgery* by the undergraduates and postgraduates. The mega hit of the first edition compelled me to make the second edition with utmost care and with recent updates. I had worked with my best efforts to make the second edition reach the needs of the students completely.

The book includes all the recent updates with added cases on Obstructive Jaundice and Peripheral Vascular Diseases which are very important for postgraduates. I made standard references for all the quotes and added more tables and color photographs than the first edition.

When I wrote the first edition, my aim was to bring a “complete impact” about the cases that the students must not go for other reference books for any other details. That is the reason for the success of the book, when I enquired the students. In this second edition, I followed the same principle with more and more viva questions, illustrations and photographs.

The aim of the book is, when students enter the examination hall, they should know all the possible questions that can be asked by various examiners in each and every case.

I am happy to inform the students that the *Short Cases in General Surgery* by me will cover the topics which are not covered in this book. I thank to the students who are about to make the second edition also a great success in future.

*Only beaten gold turns into an excellent ornament*

So, friends kindly do not hesitate to point out the mistakes in the book. Kindly mail your feedback about the book to minnalraja@hotmail.com.

Also, I request students to join in Facebook forum *Final MBBS and MS General Surgery Discussion* created by me in which you can get clarified about your doubts by a team of surgical specialists.

All the best for your examinations.

R Rajamahendran
When I was studying for my final year examination, I found that although many theory books were excellent in all aspects yet clinical case discussions were not sufficient. So it compelled me to pen down the various clinical points and the relevant theory of the major examination cases, which are the deciding criteria for practical examinations.

I started collecting points from various books, materials and clinical discussions of all professors from various colleges and made a complete study material. Many of my friends and juniors who studied those materials encouraged me to produce it in a book form, which made me bring it to you as Long Cases in General Surgery. I hope it will help you to go to the practical examination hall with confidence.

Friends, kindly send your suggestions and opinions to my e-mail: minnalraja@gmail.com.

All the best for your examinations.

R Rajamahendran
I have to start my acknowledgment for M/s Jaypee Brothers Medical Publishers (P) Ltd, New Delhi, India and Mr Jayanandan, (Chennai Branch), who introduced me into the field of book writing and made me a renowned author. So far, I have written five books in different publications for medicos, all the credit will go to only M/s Jaypee Brothers Medical Publishers (P) Ltd, New Delhi, India.

- I take this opportunity to thank my teachers first, who tuned me to a Surgeon:
  - Dr Gunaseelan MS, Retired Director of Surgery, Madras Medical College, Chennai, Tamil Nadu, India
  - Dr PK Baskaran MS, Retired Professor, Government Kilpauk Medical College, Kilpauk, Chennai, Tamil Nadu, India
  - Dr Suresh DA MS, Professor of Surgery, Vellore, Tamil Nadu, India
  - Dr Sathya Priya MS, Assistant Professor of Surgery, Kilpauk Medical College, Kilpauk, Chennai, Tamil Nadu, India
  - Dr Kannan MS, Associate Professor of General Surgery, Chengalpet Medical College, Chengalpet, Tamil Nadu, India
  - Dr Ramalakshmi MS, Professor of Surgery, Chengalpet Medical College, Chengalpet, Tamil Nadu, India
  - Dr Suresh MS, Associate Professor of Surgery, Chengalpet Medical College, Chengalpet, Tamil Nadu, India
  - Dr Varatharajan MS, Professor of Surgery, Chengalpet Medical College, Chengalpet, Tamil Nadu, India
  - Dr Srinivasan MS, Professor of General Surgery, Villupuram Medical College, Villupuram, Tamil Nadu, India
  - Dr Chitra MS, Associate Professor of Surgery, Villupuram Medical College, Villupuram, Tamil Nadu, India
  - Dr Vijayarukumar MS, Associate Professor of Surgery, Villupuram Medical College, Villupuram, Tamil Nadu, India
  - Dr Usha MS FRCs, Professor of Surgery, Government Royapettah Hospital, Chennai, Tamil Nadu, India
  - Dr Afee Asma MS, Associate Professor of Surgery, Government Royapettah Hospital, Chennai, Tamil Nadu, India

- I would like to give special thanks to Professor Dr G Raja Billy Graham MS, Professor and Head, Department of General Surgery, Chengalpet Medical College, Chengalpet, Tamil Nadu, India, for all his support and motivation.

- I would like to give sincere thanks to my ward friends, who worked with me in postgraduate days:
  - Dr Kumaresch MS MRCS, Registrar, United Kingdom
  - Dr Princess Buelah MS, Assistant Professor, Government Royapettah Hospital, Chennai, Tamil Nadu, India
  - Dr Aravind Kapali, Senior Resident, All India Institute of Medical Sciences (AIIMS), New Delhi, India
I would like to thank my dear colleagues at this stage for their adjustments in doing duties and routine ward works:
- Dr Sankaralingam MS, Assistant Professor, Government Chengalpet Medical College, Chengalpet, Tamil Nadu, India
- Dr P Venkateshwar MS, Registrar, Government Villupuram Medical College, Villupuram, Tamil Nadu, India
- Dr Baskaran MS, Assistant Professor, Government Villupuram Medical College, Villupuram, Tamil Nadu, India
- Dr Lakshmibady MS, Assistant Professor, Government Villupuram Medical College, Villupuram, Tamil Nadu, India
- Dr Rajapandi MS, Assistant Professor, Government Villupuram Medical College, Villupuram, Tamil Nadu, India
- Dr Ramesh MS, Assistant Professor, Government Villupuram Medical College, Villupuram, Tamil Nadu, India
- Dr Karthik Muthlampet MS, Assistant Professor, Government Villupuram Medical College, Villupuram, Tamil Nadu, India.

I would like to thank all my undergraduate and postgraduate students, for their constant support and motivation throughout my career.

Nothing ends if we fail to thank our friends, who always stand with us in any situation. I would like to thank my best friends Dr Raja Rajan MS MCh (Urology), Stanley Medical College, Chennai, Tamil Nadu, India and Dr Antan Uresh Kumar MS FMAS, Assistant Professor, Government Villupuram Medical College, Villupuram, Tamil Nadu, India, Tamil Nadu Government Doctors Association (TNGDA), District Secretary and my business partner. It is with their strong support, I progress in my life.

I would like to mention a word of thanks to all my friends—Dr Vijay Anand Dch, Dr Dhanasekar MD, Dr Mahendran MD (Anes), Dr Manoj, Dr Gunasekaran MCh (Plastic), Dr CRK Balaji MS ENT, Dr Tele (Elango) Dch, Dr Gowtham MCh (Urology), Dr Priyadarshini Dch, Dr Preetha, Dr Kanchana MD OG, Dr G Karthik (D Ortho), Dr Naveen Choudhry (MS Ortho), Dr Jaya Sai Sekar MS DNB (Urology), and many others I might have missed due to lack of space.

I would like to end my acknowledgment with my wife Dr Shanthi and my little angels Saadhana and Raja Hansa. They miss me a lot in my busy life but they still love me the most in this world.
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Complaints of:

- Dull-aching and continuous pain in right hypochondrium
  - Enlarged liver stretches parietal capsule (Glisson’s capsule of liver)
- Loss of weight, appetite, asthenia, weakness
- Jaundice—mild, nonprogressive and not associated with pruritus.

History with Regard to Primaries

- Stomach: History of persistent vomiting with or without blood
- Pancreas (Body and tail): History of severe backache (due to carcinoma pancreas infiltrating the retroperitoneal nerve plexuses)
- Periampullary carcinoma: History of jaundice with itching
- Colorectal carcinoma: History of constipation and bleeding per rectum
- Carcinoma breast: History of lump breast or discharge
- Malignant melanoma: History of wide excision of moles

General Examination

- Anemia (Carcinoma stomach, colon)
- Jaundice (Periampullary carcinoma)
- Bilateral pedal edema (Inferior vena-caval obstruction by enlarged liver)
- Spine tenderness (Metastasis from breast, prostate, bronchus, kidney, etc.)
- Absent testis in scrotum (Seminoma of undescended testis).

Examination of Abdomen

Criteria for Liver Secondaries

- Both lobes enlarged
- Sharp lower border
- Nodular surface
• Hard consistency
• Umbilication (central necrosis of a nodule).

**Evidence of Primaries**

• Epigastric mass stomach, transverse colon
• Palpable gall bladder—periampullary carcinoma
• Distended colon with feces—carcinoma colon/rectum
• Undescended testis—seminoma
• Evidence of amputation of digit/limb (or) wide excision of mole—malignant melanoma
• Carcinoma breast.

**Per Rectal Examination**

**Position of patient:**

• Sim’s position (left lateral position)
• Knee elbow position
• Dorsal position (lying supine with knees flexed)
• Lithotomy position.

**Procedure:**

• Get the consent from the patient
• Good lubricant is used
• Painful spasm of anal sphincter is confirmatory of hidden fissure.

**Look for the following:**

**Intraluminal**

Normal—feces
Abnormal—polyp, carcinoma, blood, pus

**Intramural**

Normal—sphincter muscles, anorectal angle
Abnormal—carcinoma, leiomyoma

**Extramural**

Normal—Perianal structures (Enlarged prostate or fibroid uterus)
Abnormal—abscess

**Bloomer’s shelf:** Metastatic deposits in pouch of Douglas:

• After withdrawal, finger is examined for mucus, pus, blood, abnormal faces
• Internal hemorrhoids cannot be palpated by per rectal examination unless it is thrombosed.

**Diagnosis**

**Hepatomegaly:** Probably secondaries liver, the primary probably in the descending colon (History of constipation, bleeding per rectum)

**INVESTIGATIONS**

**Basic investigations:**

• Hemoglobin
• Total count, differential count, erythrocyte sedimentation rate
• Blood urea, sugar
• Serum creatinine, electrolytes
• Blood grouping and typing.
Liver Secondaries

Diagnostic investigations:

- Liver function tests:
  - SGOT
  - SGPT
  - Serum bilirubin
  - Serum alkaline phosphatase
  - Prothrombin time.

- Ultrasound abdomen:
  - To confirm the diagnosis
  - To know the surface (hypo-or hyperechoic nodule)
  - Umbilication of nodules
  - Porta hepatis
  - Level of extrahepatic biliary obstruction
  - Minimal fluid
  - Pelvic deposits
  - Growth in colonic flexures
  - Detect enlarged lymph nodes—portal, celiac group
  - Seminomas of undescended testis.

- CT scan abdomen (Figs 7.1A and B): If you have found the primary, no need to prove the liver swelling is secondary, otherwise take USG guided biopsy to prove it is secondary (Vim Silverman’s needle for liver biopsy).

Investigations to find primary:

- Esophagoscopy
- Upper gastrointestinal endoscopy
- Sigmoidoscopy
- Colonoscopy
- Barium meal follow through
- Double contrast barium enema.

If primary is not yet found:

- Bronchoscopy for bronchogenic carcinoma
- Acid phosphatase for carcinoma prostate
- Ophthalmoscopic examination to find malignant melanoma choroid.

Occult blood test: Guaiac test, benzidine test, orthotolidine test. Monoclonal antibody test against hemoglobin (most specific).

Figs 7.1A and B: Liver secondaries on CT scan
Liver function tests:
- Serum bilirubin: 5 to 17 micromol/L (conjugate bilirubin <5 y mol/L)
- SGOT: 10 to 40 IU/L
- SGPT: 10 to 40 IU/L
- Gamma-glutamyl transaminase: 10 to 40 IU/L
- Alkaline phosphatase: 40 to 120 IU/L
- Prothrombin time: 12 to 16 seconds

Colonic Study

Length of:
- Anal canal: 4 cm
- Rectum: 12 cm
- Sigmoid colon: 37 cm
- Descending colon: 25 cm
- Transverse colon: 50 cm
- Ascending colon: 12 cm
- Cecum: 6 cm
- Appendix: 7.5 to 10 cm
- Small intestine: 6 meters
- Duodenum: 10 inches

Length of Each Study
- Per rectal examination—8 cm (up to lower 1/3rd rectum)
- Proctoscopy—12 cm
- Sigmoidoscopy—60 cm (Flexible); 18 cm (Rigid type)
- Colonoscopy—160 cm.

DISCUSSION

- Types of liver secondaries:
  - Precocious
  - Synchronous
  - Metachronous.

<table>
<thead>
<tr>
<th>Precocious</th>
<th>Synchronous</th>
<th>Metachronous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before primary tumor presents secondary manifests</td>
<td>Both primary and secondary present together</td>
<td>Primary treated already, secondary occurs now</td>
</tr>
<tr>
<td>Carcinoid tumor, rectal cancer</td>
<td>Carcinoma stomach</td>
<td>Malignant melanoma of choroid</td>
</tr>
</tbody>
</table>

- Liver metastasis is through:
  - Hematogenous:
    - Portal vein (Intestine)
    - Hepatic artery
  - Lymphatic spread
Liver Secondaries

- Contiguous from gallbladder:
  - The most common liver malignancy: Secondaries
  - The most common liver benign tumor: Hemangioma.

**Primary may arise from:**
- Colon
- Stomach
- Breast
- Prostate
- Lung
- Malignant melanoma
- Pancreas
- Carcinoid tumor
- Ovary
- Testis

Good prognosis: Colon carcinoma and carcinoid tumor

**Hepatocellular Carcinoma**

**Etiology:**
- Hepatitis 'B' virus,
- Hepatitis 'C' virus
- Oral contraceptive pills
- Aflatoxin
- Alcohol, smoking
- Diabetes mellitus.

**Clinical features:**
- Males; >50 years age; alcoholics.
  **On examination:**
  - Tender hepatomegaly
  - Irregular surface
  - Hard consistency
  - Vascular mass (Thrill palpable).

**Metastasis through:**
- Direct: Diaphragm
- Lymph: Virchow's node
- Blood: Malignant pleural effusion and hemoperitoneum.

**Specific investigations:**
- Alpha fetoprotein level:
  - 100 IU (Suggestive)
  - 1000 IU (Diagnostic)

**Increased alpha fetoprotein:**
- Hepatoma (HCC)
- Carcinoma stomach
- Carcinoma pancreas
- Embryonal cell carcinoma of testis
- Hepatoblastoma

- **CT arterial portography:** Venous phase shows 'tumor blush' (highly vascular).
TREATMENT

- Resection of the liver segment (confined to one segment)
- Systemic chemotherapy (Intravenous doxorubicin)
- Intra-arterial embolization
- Radiotherapy.

Indications for Resection

- The surgical approach should remove the known cancer with a 1 to 2 cm margin of unaffected liver tissue.
  - One lobe or segment involved
  - Rest of liver must be normal—so cannot do in a cirrhotic patient going for hepatocellular carcinoma
  - No metastasis.

Milan’s Criteria for Liver Transplantation for HCC

- One nodule < 5 cm
- Two or three nodules all < 3 cm
- No gross vascular invasion
- No extrahepatic spread.

Differences between:

<table>
<thead>
<tr>
<th>Primary hepatoma (Hepatocellular carcinoma)</th>
<th>Secondaries liver</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Less common</td>
<td>1. More common</td>
</tr>
<tr>
<td>2. Usually solitary (any lobe)</td>
<td>2. Both lobes affected</td>
</tr>
<tr>
<td>3. Irregular</td>
<td>3. Nodular, umbilicated</td>
</tr>
<tr>
<td>4. Excess vascularity; bruit or thrill</td>
<td>4. No bruit or thrill</td>
</tr>
<tr>
<td>5. No evidence of any primary</td>
<td>5. Evidence of primary</td>
</tr>
<tr>
<td>6. Round edge</td>
<td>6. Sharp edge</td>
</tr>
<tr>
<td>7. Tender</td>
<td>7. No tender</td>
</tr>
<tr>
<td>8. Upper border not enlarged (left 5th ICS)</td>
<td>8. Upper border enlarged</td>
</tr>
</tbody>
</table>

Treatment for Secondaries Liver

- Surgery is best modality if possible
- Most of the time it is inoperable.

Indications for Surgery in Secondary Liver

- Only if you are planning for curative resection of primary
- Metastatic nodule confined to one lobe
- Number of nodules less than or equal to three
- There should not be any chronic liver disease.
Liver Secondaries

1. Carcinoma stomach with liver secondaries
   1. Palliative gastrojejunostomy if vomiting is present

2. Periampullary carcinoma with secondaries
   2. Palliative cholecystojejunostomy to relieve jaundice

3. Carcinoma colon/carcinoid tumors
   3. Resect the primary tumor and solitary metastasis in liver is also resected

4. Malignant melanoma: Stage III
   4. Chemotherapy: Dacarbazine

**Chemotherapy**

5-Fluorouracil (5-FU): 500 mg for 5 days  
(28 days cycle for few cycles)  
if the primary is found in the GIT.

**Other Modalities**

- **Hepatic artery ligation:**
  - Though portal vein is 60 percent supply, hepatic artery ligated because tumor secondaries receive blood supply through hepatic artery.  
  - Not done now-a-days because:  
    - All the area supplied by that artery will go for necrosis and form abscess.  
    - Collaterals will form to supply secondary tumor.

- **Transarterial embolization:**
  - Coiled silver wire  
  - Gelfoam sponge are used.

- **Transarterial chemoembolization (TACE):** Makes the particular site ischemic and deliver the drug at tumor site.

- **Percutaneous ethanol injection:** For small secondaries.

- **Targeted radiotherapy:** One form of brachy therapy.

- **Radiofrequency ablation by percutaneous method.**

- **Cryotherapy.**

**DISCUSSION**

**Cancer Colon and Rectum**

**Precancerous Lesions**

- Familial polyposis coli  
- Ulcerative colitis  
- Adenomatous polyp  
- Crohn’s disease  
- Hamartomatous polyp.

**Pathological Types**

- Annular  
- Tubular  
- Ulcerative  
- Proliferative  
  \{ Common in ascending colon  
  \} Common in descending colon
Incidence of Colonic Carcinoma (Fig. 7.2)

Most common sites:
- Rectum (38%)
- Sigmoid colon (21%)
- Cecum (12%)
- Transverse colon (5.5%)
- Ascending colon (5%)
- Descending colon (4%)
- Hepatic flexure (2%)
- Splenic flexure (3%)
- Anus (2%).

**Histology:** Columnar cell adenocarcinoma.

**Right sided growth:** Ulcerative or proliferative type growth:
- Anemia
- Asthenia
- Pain
- Mass in right iliac fossa
- Melena
- Not goes for obstruction usually.

**Left sided growth:** Annular or tubular growth:
- Progressive constipation
- No mass
- Altered diarrhea and constipation
- Frank bleeding per rectal
- Early morning spurious diarrhea.

**Duke’s Classification**
- A- Cancer confined to bowel wall
- B- Cancer penetrates bowel wall
  - B1- Partially penetrated the muscularis propria
  - B2- Fully penetrated the muscularis propria
- C- Involvement of lymph nodes.
Astler Coller Further Divided the C
C1- Tumor that invaded lymph nodes but did not penetrate the entire wall
C2- Tumor that invaded lymph nodes and penetrated the entire wall.

Modified Duke’s Classification (Fig. 7.3)
This classification included all the above with:
D- Distant metastasis

Investigations
- Sigmoidoscopy
- Flexible sigmoidoscopy
- Colonoscopy (Figs 7.4A and B)
- Double contrast barium enema
- Ultrasonogram for liver metastasis
- CT-scan abdomen
- Carcinoembryonic antigen (CEA): Diagnostic if >1000 IU.

Fig. 7.3: Modified Duke’s staging

Figs 7.4A and B: Proliferative growth on colonoscopy
Long Cases in General Surgery

**Treatment**
- Carcinoma cecum/right side colon: Right hemicolectomy (Fig. 7.5)
- Carcinoma transverse colon: Extended right hemicolectomy/transverse colectomy
- Carcinoma left colon: Left hemicolectomy (Fig. 7.6).

**No Touch Technique of Turnbull**
Early division of blood vessels supplying the involved colon before resection can slightly improve the number of curative operations.

**Adjuvant Therapy**
- Injection 5-fluorouracil
  - 500 mg rapid IV daily
  - for 5 days
- Tablet levamisole 500 mg tds for 3 days in every 2 weeks for 1 year.

**Cancer Rectum**

**Premalignant conditions:**
- Adenomas
- Papillomas
- Ulcerative colitis
- Crohn's disease
- Polyps.
HISTOLOGY

- Adenocarcinoma (columnar celled)
- Colloid carcinoma.

Pathological Types (Fig. 7.7)

- Annular: Rectosigmoid junction
- Polypoidal: Ampulla of rectum
- Ulcerative: Growth in transverse direction
- Diffuse infiltrating: Develops from ulcerative colitis (poor prognosis).

SPREAD OF CARCINOMA

- Local spread:
  - Occurs circumferentially
  - Takes ‘6’ months for 1/4th circumference and ‘18’ months for whole rectal circumference to be involved.

Penetrates:

- Anteriorly—prostate, bladder
- Posteriorly—ureter
- Laterally—sacrum or sacral plexus
- Downwards—rare (occurs in anaplastic carcinomas)

- Lymphatic spread:
  - Exclusively in upward direction
  - First halting place is ‘Pararectal nodes of Gerota’

- Venous spread:
  - Liver (34%)

Fig. 7.7: Morphological types of rectal cancers
Long Cases in General Surgery

- Lungs (22%)
- Adrenals (11%).
- **Peritoneal spread**: Ascites.

**CLINICAL FEATURES**

- **Bleeding**: Earliest and most common symptom
- Sense of incomplete evacuation
- Tenesmus (painful straining)
- Early morning spurious diarrhea: Accumulation of mucus overnight in ampulla of rectum
- Bloody slime: Blood stained mucus
- Constipation: Annular type growth
- Loss of weight and appetite.

**Treatment**

- Try for sphincter saving operation as much as possible
- Provide a distal margin clearance of 2 cm
- Aim is for curative resection
- Palliative resection is worthwhile though there are secondaries in liver.

**Anatomy of rectum and anus (Fig. 7.8):**

- To know the treatment of rectal cancers you should know a few points about rectum and sphincter anatomy.
- To preserve the normal continence we should preserve the puborectalis sphincter muscle
- This muscle is located at anorectal junction
- Length of anal canal = 4 cm

![Fig. 7.8: Anatomy of the rectum and anal canal](image-url)
Liver Secondaries

Rectum = three parts (upper, middle and lower 1/3rd each 4 cm)
So when you give distal clearance of 2 cm you will damage the sphincter in lower third rectum cancers hence we opt for APR in lower 1/3rd
But you can well preserve the sphincter in upper and middle 1/3rd cancers hence we do anterior resection.

I. **Upper 1/3rd growth:** ‘Anterior resection’ (Figs 7.9A to D)
   i. Wide resection of bowel with its lymphatics followed by end-to-end anastomosis
   ii. Sphincter saved

II. **Middle 1/3rd growth:** Low anterior resection’ with distal 2 cm clearance
   i. Sphincter can be saved by mobilization
   ii. Staplers had made the continuity more feasible (Figs 7.10A and B)
   iii. If sphincter cannot be preserved do abdominoperineal resection.

III. **Lower 1/3rd growth:** ‘Abdominoperineal resection’—Mile’s procedure (Figs 7.11 and 7.12)
   i. Trendlenberg lithotomy position
   ii. Two surgeons.

**Abdominal Surgeon**
- Rectum is mobilized
- Total mesorectal excision
- High proximal ligation of inferior mesenteric lymphovascular pedicle.

**Perineal surgeon:** Mobilizes the anus and lower rectum. Clamps applied at the proximal colon to avoid transluminal dissemination.
Figs 7.10A and B: Circular stapler in anterior resection

Fig. 7.11: Specimen of abdominoperineal resection (APR)
Structures Removed
- Growth with entire rectum and anal canal
- Pararectal nodes
- 2/3rd sigmoid colon
- Mesocolon
- Inferior mesentric artery with lymphovascular pedicle
- Muscles and peritoneum of pelvic floor
- Perianal skin, part of ischiorectal fossa
  - Followed by permanent end colostomy at left iliac fossa
  - Irrigation of colonic or rectal lumen; with canceridal solution like 1 percent cetrimide prevents recurrence.

Radiotherapy
Intracavity irradiation.

Chemo/Immunotherapy
- 5-Fluorouracil
- Levamisole
- Folinic acid.

Inoperable Cases
- Hartmann's operation
- Temporary loop colostomy.
Hartmann’s Operation

Emergency procedure for left side colon obstructions where we do left side colostomy and closure of distal stump followed later after **6 weeks** by definitive procedure (Figs 7.13A to C).