CLINICAL SURGICAL CASE MANUAL

2nd Edition

Kanchana Sundaramurthy

A Comprehensive Treatise for Students, Teachers and Practitioners

Clinical Surgical Case Manual concentrates on the clinical cases commonly encountered in postgraduate surgical examinations. Clinical examination and discussion are given in detail for each of the cases. Some of the chapters end with a section on frequently asked questions (FAQs), which the examining candidates will find very useful. Illustrations and diagrams, algorithms and tables are given at appropriate places. The references are from most standard textbooks of surgery and some of the portions of the journal articles are evidenced by the author or author. This book is divided into surgeries with some important references included in the appendix. This book is essential in the training of undergraduate medical students and the residents in the various surgical specialties.
Clinical Surgical Case Manual
A Comprehensive Treatise for Students, Teachers and Practitioners

Second Edition

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Dedicated to
My son Durgaprasad for his immense patience and help in bringing this book into reality
Preface to the Second Edition

Medical science is ever changing and ever evolving. New research, new trials and new discoveries are made.

Some of the chapters in this book are expanded to include this new information. Some pictures and tables have been added to aid the examination-going candidates.

Two entire chapters have been added—Perforation of Hollow Viscus and Principles of General Oncology, which are both useful in examination as well as in clinical practice.

The fact that second edition is coming out is itself a demonstration of the support given to the first edition. I hope this second edition serves as much as the first edition, if not more in aiding the examination-going surgical candidates as well as the surgical practitioners.

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Preface to the First Edition

This book is brought out as a comprehensive study of surgical clinical cases, their presentation and management options. This is not a textbook of surgery. It is meant to be used by the students in preparation for postgraduate clinical examination, by the surgical teachers before clinical teaching sessions, by the examiners of various postgraduate surgical examination as well as by the practitioners of surgery as an aide.

In studying this book, if the postgraduate student and the surgical practitioner gets a clear picture of the surgical condition facing him and ways to manage it, the purpose of writing this book is more than satisfied.

At the end of some of the chapters, a section on frequently asked questions is added, to help the examination-going candidate face his/her examiner confidently. This book also contains tips on good performance in theory, clinical and viva voce examinations, so that the candidate who follows these tips has that crucial edge over the others. It is my sincere hope that the exam-going candidates find this book a priceless possession for their clinical preparation and surgical practitioners for their day-to-day management of cases.

The chapters of this book cover topics like skin, vascular, head and neck surgery, breast, gastroenterology, hepatobiliary surgery and urology.

Your comments and suggestions for improvement are welcome. Kindly address them to kan_sundar@yahoo.co.in

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Tips for Exam-Going Candidate

TO THE EXAM-GOING CANDIDATE

1. Before facing any examination, be it theory or clinical or viva, it is desirable to plan for the answers you are going to give. Your answers should attract the examiner in a unique way and that will make him sit up and notice you.
2. A theory answer should have a plan in the first page, which tells the examiner what he is going to read in the next few pages. The plan should consist of the broad side headings and classification.
3. Confine the short note to two pages. Diagrams and flow charts tell the examiner what you want to convey much more effectively than volumes of written pages.
4. During clinical examination, see that you are the speaker and the examiner is the listener. Do not allow it to be the other way round.
5. Lead the examiner to the points you want to tell him rather than the points, which he/she wants to ask you.
6. Act as the consultant discussing the case with a colleague rather than the student facing a barrage of questions.
7. During viva voce, radiology interpretation is given weightage. Always start with the most obvious abnormality in the radiology film and then proceed to describe the rest of the film.

TIPS ON WRITING THEORY ANSWERS

1. Do not write what is not asked. For example, when etiopathology is asked, writing about management is unnecessary.
2. When you are asked to write about clinical features, always start with history and clinical examination.
3. When you are asked to write about management, write investigations and treatment.
   a. In investigations, include history and clinical examination, as this is the first investigation done by the clinician.
   b. In treatment, in addition to treatment of the condition, enumerate the complications and mention the treatment of complications.
4. When you are asked to write about epidemiology, include incidence and prevention, as well as spread in case of malignancy.
5. Always start your answers with introduction and end with conclusion.

BROAD PLAN FOR THEORY ANSWERS

Incidence
- Geographical area
- Age
- Sex
- Pattern of disease
- Areas affected

Etiology
- Congenital
- Traumatic
- Inflammatory
- Infective:
  - Bacterial
  - Viral
  - Fungal
- Autoimmune
- Degenerative

Pathology
- Macroscopic appearance
- Microscopic appearance
- Spread:
  - Direct:
    » Along bowel wall:
    - Horizontal
    - Vertical
    » Adjacent organs
  - Intraluminal
  - Intracavitary
  - Lymphatic
  - Bloodstream:
    » Distant metastases
    » Miliary spread
    » By invasion or embolic spread

History
- Name, age, sex, geographical area
- Complaints, duration of each
- Sequence of events
• Past history is medical/surgical
• Family history
• Personal history—smoking, alcohol, diet, occupation
• Menstrual history in female.

Clinical Examination
• General examination:
  – Build
  – Nourishment
  – Pallor
  – Icterus
  – Cyanosis
  – Clubbing
  – Lymphadenopathy
  – Pedal edema
  – Anasarca
  – Cachexia
  – Hydration
  – Gait.
• Local site:
  – Inspection
  – Palpation
  – Percussion
  – Auscultation
  – Measurement
  – Movement.

Investigations
• Blood:
  – Hematology
  – Coagulation
  – Biochemistry
  – Smears.
• Microbiology—cultures
• Radiology:
  – X-ray
  – Contrast X-ray
  – Ultrasound
  – CT/MRI
  – Nuclear scan.
• Pathology
  – FNAC/Trucut
  – Histopathology.

Treatment
• Change of lifestyle by counselling
• Medical treatment:
  – Preoperative
  – Postoperative
• Surgical treatment.

Complications
• Course of the disease (if untreated)
• Postoperative complications
• Treatment of complications
  – Medical
  – Surgical.

Prognosis
• Percentage survival
• Prognostic factors:
  – Patient factors
  – Disease factors
• Prognostic index.
Intestinal Obstruction

• Common surgical emergency.

**FUNCTIONS OF INTESTINAL BACTERIA**

• Metabolism of fecal sterols, releasing short chain fatty acids that are an important food source for colonocytes.
• Metabolism of fecal bile acids, fat soluble vitamins and vitamin B12.
• Breakdown of complex carbohydrates and organic matter leading to the formation of carbon dioxide, hydrogen and methane gases.

**CLASSIFICATION OF INTESTINAL OBSTRUCTION**

• Mechanical or paralytic:
  – Simple:
    » Luminal:
      - Foreign body.
      - Fecaloliths: 8%.
      - Gallstones.
      - Bezoars.
      - Parasites.
      - Polypoidal tumors.
    » Intrinsic:
      - Adhesions.
      - Inflammatory stricture: Tuberculosis, Crohn’s disease: 15%.
      - Tumors: 10%–15%.
    » Extrinsic:
      - Adhesions: 60%–80%.
      - Hernias: 15%–20%.
      - Volvulus.
      - Intussusception.
  – Bands.
  – Inflammatory/neoplastic masses.
    – Strangulating: 16%.
• Partial or complete.
• Dynamic or adynamic.
• Pseudo-obstruction: 5%.
• Others: 6%.

**DYNAMIC**

• Classification of mechanisms:
  – Mechanical obstruction to lumen:
    » Obturation of lumen:
      - Meconium.
      - Intussusception.
      - Gallstones.
      - Impactions:
        ◊ Fecal.
        ◊ Barium.
        ◊ Tricho- and phyto-bezoars.
        ◊ Mass of worms.
    » Lesions of bowel:
      - Congenital:
        ◊ Atresia and stenosis.
        ◊ Imperforate anus.
        ◊ Duplications.
        ◊ Meckel’s diverticulum.
      - Traumatic.
      - Inflammatory:
        ◊ Regional enteritis.
        ◊ Diverticulitis.
        ◊ Chronic ulcerative colitis.
      - Neoplastic.
      - Miscellaneous:
◊ Potassium-induced stricture.
◊ Radiation stricture.
◊ Endometriosis.

» Lesions extrinsic to bowel:
  - Adhesive band constriction or angulation by adhesion.
  - Hernia and wound dehiscence.
  - Extrinsic masses:
    ◊ Annular pancreas.
    ◊ Anomalous vessels.
    ◊ Abscesses and hematomas.
    ◊ Neoplasms.

» Volvulus.
  - Inadequate propulsive motility:
    » Neuromuscular defects:
      - Megacolon.
      - Paralytic ileus:
        ◊ Abdominal:
          › Intestinal distension.
          › Peritonitis.
          › Retroperitoneal lesions.
        ◊ Systemic:
          › Electrolyte imbalance.
          › Toxemias.
      - Spastic ileus:
    » Vascular occlusions:
      - Arterial.
      - Venous.

• Can be acute, chronic or acute-on-chronic.
  - Acute:
    » Usually in small bowel.
    » Central, severe colicky abdominal pain.
    » Early vomiting.
    » Central abdominal distension.
    » Constipation.
  - Chronic:
    » Usually in large bowel.
    » Lower abdominal colic followed by absolute constipation.
    » Late distension involving periphery.
  - Acute on chronic:
    » Spreads from large bowel and involves small bowel.
    » Pain and constipation followed by general distension and vomiting.

ADYNAMIC

• Peristalsis ceases:
  - Paralytic ileus.
  - Mesenteric vascular occlusion.

• Three types of ileus:
  – Adynamic/inhibition ileus.
  – Spastic ileus:
    » Heavy metal/lead poisoning.
    » Porphyria.
  – Ischemic ileus.

• Paralytic ileus:
  – Intestine fails to transmit peristaltic waves.
  – Sympathetic over activity is thought to be the cause.
  » Failure in neuromuscular mechanism.
  » Postoperative.
  » Infective:
    - Peritonitis.
    - Typhoid.
    - Tuberculosis.
  » Reflex:
    - Following fracture spine.
    - Following retroperitoneal hemorrhage.
  » Uremia.
  » Hypocalcemia.
  » Drug induced: Tricyclic antidepressants.

Cecal tenderness is to be examined for at regular intervals, as it is still possible for even a functionally obstructed colon to dilate to a point of cecal rupture.
A laparotomy may still be required; the procedure of choice is cecal exteriorization as tube cecostomy is unsatisfactory.

CHARACTERS ACCORDING TO LOCATION

• High small bowel:
  – Minimal distension.
  – Few or no fluid levels on X-ray.
  – Early, profuse vomiting with rapid dehydration.

• Low small bowel:
  – Central distension.
  – Many short, central fluid levels on X-ray.
  – Severe pain.
  – Delayed vomiting.
  – Dehydration is postponed for several days.

• Large bowel:
  – Early and pronounced distension, maximal in the flanks.
  – X-ray:
    » Proximal colon and cecum are distended.
    » Peripheral, long fluid levels (until ileocecal valve gives way).
    » Minimal pain.
    » Late vomiting.
    » No dehydration.
• Gas is not seen in the intestinal lumen below the level of obstruction—valuable indication of obstruction.

PATHOLOGY

• Intestine above the level of obstruction:
  – Vigorous peristalsis:
    » Endeavors to overcome the obstruction.
    » From 48 hours to several days.
    » The more distal the obstruction, longer the duration of peristalsis.
  – Increasing distension causes peristalsis to become feeble and feeblener until it ceases.
  – Intestine becomes flaccid and paralyzed.
  – Dilated loops of small intestine are defined as those larger than 3 cm in diameter; the proximal colon is considered dilated when the diameter reaches 8–10 cm and the sigmoid colon 4–5 cm.
  – As the intestine dilates, the volume increases as the square of the radius.
    » Thus, the volume of a meter of intestine of 2 cm diameter approximates to 300 mL.
    » This will increase to 1300 mL if the same segment dilates to a diameter of 4 cm.
  – Intestinal dilation may be absent, especially in the duodenum because as it distends, it decompresses proximally into the gastric reservoir.
  – Thus, a dilated, fluid-filled stomach is distinctly abnormal in a patient who has not ingested food or drink within the previous 2 hours.
  – Factors causing distension:
    » Gas:
      - Swallowed atmospheric air: 68% (nitrogen is the major component and is poorly absorbed).
      - Diffusion of nitrogen from the blood into bowel lumen: 22% (due to the gradient produced by formation of ammonia and hydrogen sulfide due to bacterial fermentation, which reduce the partial pressure of nitrogen).
    » Fluid:
      - Ingested fluid + digestive juices:
        ◦ 8,000 mL/24 hours.
        ◦ Above pylorus: 4,000 mL:
          » Saliva: 1,500 mL.
          » Gastric juice: 2,500 mL.

• Intestine below the point of obstruction:
  – Normal peristalsis and absorption for 2–3 hours until the residue is passed onwards.
  – Empty intestine then becomes immobile, contracted and pale.
• Unreleased obstruction:
  – Viability of bowel is affected.
  – Toxic substances enter the body.
• In released obstruction:
  – Toxic substances may pass on to bowel below and get absorbed.
  – Leads to gram-negative endotoxemia and death.
  – To avoid this:
    » Intestinal decompression before and during operation.
    » Prophylactic antibiotic cover.

ACUTE INTESTINAL OBSTRUCTION

• Clinical features:
  – Pain:
    » Sudden onset.
    » Increasingly severe, colicky and intermittent.
    » Localized mainly at the umbilicus.
  – Vomiting:
    » In jejunal obstruction, occurs with each attack of pain.
    » In ileal obstruction:
      - Occurs with first attack of pain.
      - Subsides.
      - Ultimately, copious, forcible, oft-repeated vomiting:
        ◦ First vomit: Partly digested food.
Next: Entirely of mucoid fluid.
Then: Yellow/green from regurgitated bile.
Finally: Feculent.

Distension:
» Early: Slight or absent.
» Ileal obstruction:
  - Central distension + vasoactive intestinal peptide (VIP) + borborygmi.
  - Turbulent bowel sounds coinciding with an attack of colic is characteristic.

Constipation:
» Complete obstruction:
  - Distal contents are evacuated.
  - Followed by absolute constipation.
» Partial obstruction—no constipation:
  - Richter’s hernia.
  - Gallstone obstruction.
  - Mesenteric vascular occlusion.
  - Obstruction associated with pelvic abscess.

Causes of acute colonic obstruction:
» Mechanical:
  - Malignant:
    - Primary or recurrent colorectal carcinoma.
    - Gynecological malignancy.
    - Peritoneal carcinomatosis.
  - Benign:
    - Common:
      ◊ Acute diverticulitis.
      ◊ Inflammatory strictures.
      ◊ Volvulus.
    - Rare:
      ◊ Fecal impaction.
      ◊ Adhesional.
      ◊ Hernias.
      ◊ Ischemic stricture.
      ◊ Intussusceptions.
      ◊ Foreign body.
  - Functional:
    ◊ Acute colonic pseudo-obstruction.

Radiological diagnosis:
» Scout films with patient standing and lying down.
» In chronic obstruction—preceded by enema.

Gas shadows:
» Jejunum, ileum and colon have characteristic appearance and can be distinguished:
  - Jejunum: Valvulae conniventes that pass from antimesenteric to mesenteric border spaced regularly.
  - Ileum: Characterless.
  - Cecum: Rounded shadow in right iliac fossa.
» Small intestinal obstruction: Relatively straight segments that lie more or less transversely (step ladder pattern).
» Large intestinal obstruction: Haustrations pattern.

Fluid levels:
» Infants < 2 years: Few fluid levels are normal.
» Adults: Two inconstant fluid levels are normal:
  - Duodenal cap.
  - Terminal ileum.
» It takes some time for gas to separate from fluid, so fluid levels appear after gas shadows.
» In terminal ileal obstruction, large number of fluid levels.

Water-soluble contrast examination is of limited value because:
» They are hypertonic and draw the fluid in from the intravascular and extravascular spaces.
» So they further distend the bowel and may add to the intravascular fluid deficit in the patient.

Barium is not used in colonic obstruction because it may become inspissated, causing an impaction that may convert a partial to a complete colonic obstruction; contrary to popular misconception, this is not a risk in the small intestine.

Computed tomography (CT):
» Common error is to assume that loops on more caudal images are ileal and more proximal images are jejunal.
» As the bowel loops dilate, they will align themselves along the axis of small bowel mesentery: Therefore, jejunal loops may appear in the pelvis and ileal loops in the upper abdomen (most often right upper quadrant).

Computer-aided diagnosis:
» To determine, which components of the clinical data are more predictive of small bowel obstruction.
» To assist in the management of small bowel obstruction.
» In the prediction of strangulating small bowel obstruction, this is superior to clinical diagnosis per se.

Diagnostic accuracy:
» Simple small bowel obstruction: 85%.
» Viable strangulation: 82%.
» Non-viable strangulation: 97%.
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• Treatment:
  – The overlapping sequence of events in managing the patients with intestinal obstruction should be investigation, resuscitation and operation.
  – Four measures:
    » Gastrointestinal or gastroduodenal suction:
      - Can be done for up to 6–8 hours when strangulation is ruled out and obstruction is in the small intestine.
      - Advantages:
        ◊ Diminution of size of distended coils facilitates surgery.
        ◊ Highly toxic intestinal contents aspirated before operation, saves patient from toxic absorption after relief of obstruction.
    » Fluid and electrolyte replacement:
      - Up to 3.5 liters of isotonic saline required, if there is severe dehydration.
      - Intake/output chart compiled and patient’s requirement calculated.
      - Rate of fluid administration:
        ◊ By monitoring central venous pressure (CVP).
        ◊ Fluids may be given rapidly as long as CVP remains below 10–12 cm of water.
        ◊ The end point of volume replacement is indicated by a sudden rise in CVP.
        ◊ Other guides are:
          › Return of skin turgor.
          › Hourly rate of urine output.
    » Relief of obstruction—usually surgical:
      - The sun should never rise and set on a (complete) small bowel obstruction.
    » Antibiotics to prevent complications.
      - Immediate endoscopic placement of long intestinal tube in partial small bowel obstruction is possible.
  • The timing of operation depends on three factors:
    – Duration of obstruction (severity of fluid, electrolyte and acid-base abnormalities).
    – Opportunity to improve vital organ function.
    – Consideration of the risk of strangulation.
  • Indications for early operation:
    – Obstructed, strangulated and external hernia.
    – Internal intestinal strangulation.
    – Acute/Acute-on-chronic obstruction.
    – Many elderly patients die because of reluctance to operate at an early stage; the high mortality of old people is partly due to fatal hesitation on age grounds.

• Indications for primary laparoscopy:
  – Relief of obstruction secondary to adhesions or incarcerated hernias.
  – Foreign body removal.
  – Bypass procedures for malignant and benign disease causing obstruction.
  – Resection for appendicitis or Meckel’s causing obstruction.
  – Operation can be completed laparoscopically in most patients (70%–87%).
  – Best results are in those patients with either a non-resolving partial small bowel obstruction or early, acute small bowel obstruction, before the abdomen becomes moderately distended.
  • Intraoperative emptying of bowel can be done by stripping the contents proximally to allow discharge via nasogastric (NG) tube. This method avoids contamination of the peritoneal cavity.
  • For bowel viability, fluorescein technique, when used correctly, identifies those segments of bowel that will ultimately survive:
    – Intravenous (IV) injection of fluorescein.
    – Illumination of the bowel wall with a Wood’s light.
      If there is uniform fluorescence: Good vascular perfusion.
      If there is lack of fluorescence: Irreversible ischemia.
      If there is patchy distribution of fluorescence: Either resection or second-look procedure.
  • Electronic contractility meter:
    – Monitors the ability of bowel to contract.
    – Experimental.
  • A second-look laparotomy or laparoscopy, 18–48 hours after the initial procedure is another approach; it is most useful and clearly indicated in a patient whose systemic condition deteriorates following initial operative assessment, because of the intestines’ particular vulnerability to the vasoconstriction, hemodynamic response to shock, sepsis and other forms of severe physiologic stress.
  • Large bowel obstruction:
    – Usually acute-on-chronic variety.
    – Usually due to carcinoma or diverticulitis.
    – Colonoscopy should be avoided because of the risk of perforation.
  • For a terminally ill patient with malignant small bowel obstruction, parental nutrition combined with a percutaneous endoscopic gastrostomy offers the advantage of terminal care at home.
STRANGULATION

- Due to interference with blood supply.
- Could be due to:
  - Tight hernia, band and intussusception.
  - Mesenteric vascular occlusion.
- Steps to strangulation:
  - Compression of veins:
    » Blue and congested bowel.
    » Increased edema at the point of obstruction.
  - Compression of arteries:
    » Peritoneal coat loses its glistening appearance.
    » Mucus membrane becomes ulcerated.
    » Imminent gangrene.
  - Hypotension:
    » Due to loss of blood volume into the congested segment.
    » In short segment strangulation: Insignificant loss.
    » In long segment strangulation: Life-threatening shock.
  - Distension:
    » Initially, only in the strangulated segment, especially only venous impairment exists.
    » When gangrene is imminent: Retrograde thrombosis along mesenteric vein tributaries leads to distension both proximally and distally to strangulated segment.
  - Transmigration of bacteria and toxins:
    » Through the devitalized intestinal wall.
    » Causes peritonitis and gram-negative shock.
    » Strangulation of external hernia is less lethal, because transmigration is confined to hernial sac.
- Clinical features:
  - Acute obstruction + shock.
  - Metabolic acidosis.
  - Generalized abdominal tenderness and rigidity.
  - There is always tenderness over an intra-abdominal strangulated coil.
  - Rebound tenderness is a distinctive sign of strangulation.
- Early signs:
  - Colicky pain that becomes continuous.
  - Parietal pain at a localized site.
  - Localized tenderness, rebound tenderness and guarding.
  - Tender mass.
- Late signs:
  - Toxemia.
  - Plain X-ray:
    » Widening of adjacent loops of bowel.
    » Thumb-printing and loss of mucosal pattern.
    » Gas in the bowel wall, mesenteric and portal veins.
    » Free intraperitoneal gas.
  - Biochemical evidence:
    » Increase in:
      - Serum amylase.
      - Inorganic phosphate.
      - Hexosaminidases.
      - Intestinal fatty acid binding protein (I-FABP).
      - Serum d-lactate.
  - Computed tomography findings:
    » Beak-like narrowing.
    » Mesenteric edema/vascular engorgement.
    » Moderate to severe wall thickening.
    » Intramural air: Pneumatosis.

Figs 41.1A and B: Ischemic ileitis due to strangulating small bowel obstruction (For color version, see Plate 4)
• Closed loop obstruction:
  – Specifically in carcinoma of colon, which has obstructing growth distally and ileocecal valve proximally.
  – If unrelieved, causes stercoral ulceration, gangrene and perforation.

POSTOPERATIVE INTESTINAL OBSTRUCTION

• Early (first 5 days):
  – Non-strangulating cause:
    » Anastomotic edema.
    » Adhesive fibrinous matting with distension and kinking of bowel loops.
• Late (beyond 7 days):
  – Organized bands or abscess.
  – May be strangulating.

ACUTE INTESTINAL OBSTRUCTION IN NEWBORN

• Incidence:
  – 1 in 2,000 births.
  – Congenital anomalies of heart and great vessels is frequently associated.
• Causes:
  – Congenital atresia/stenosis:
    » Duodenum: 33%.
    » Jejunum: 15%.
    » Ileum: 25%.
    » Ascending colon: 10%.
    » Multiple sites: 17%.
  – Volvulus.
  – Meconium ileus.
  – Hirschsprung’s disease.
• Duodenum:
  – Causes:
    » Atresia/stenosis.
    » Midgut volvulus.
    » Bands.
    » Annular pancreas.
  – Clinical features:
    » Persistent vomiting from birth in complete obstruction ± bile (depending on site).
    » Distension absent; visible gastric peristalsis present.
  – X-ray:
    » Stomach and upper duodenum distended.
    » Double stomach appearance.
• Ileum:
  – Vascular supply decreases very early leading to gangrene and perforation.
  – Child born with distension or occurs within 24 hours.
  – Vomit contains bile and meconium.
  – Radiology is of no help because fluid level occurs in late and advanced stage.
• Arrested rotation:
  – Cecum is present in left hypochondrium.
  – Peritoneal band from cecum to right side of the abdomen and across the second part of duodenum (transduodenal band of Ladd).
• Midgut volvulus:
  – Clinical and radiological features are similar to arrested rotation.
  – But more catastrophic.
  – Dehydration occurs more rapidly.
• Meconium ileus:
  – Neonatal manifestation of mucoviscidosis.
  – Impissated meconium + viscid mucus from the pancreas.
  – X-ray: Distended small bowel with no fluid levels.
  – Pathognomonic test:
    » Place a piece of exposed radiologic film into a bowl of vomitus and leave for half an hour.
    » If trypsin is present in vomitus, it digests the gelatin of the X-ray film.
  – Gastrografin enema may sometimes disperse the obstructing meconium and relieve the condition.

• Acute intussusception:
  – Proximal gut invaginated into the distal causes:
    » Polyps.
    » Papilliferous carcinoma.
    » Submucosal lipoma.
    » Meckel’s diverticulum.
  – Incidence:
    » Occurs in infants between 6th to 9th month.
    » Associated with change in diet/weaning.
    » Common in terminal ileum where Peyer’s patches are maximum.
  – Clinical features:
    » Sudden onset of abdominal pain: Occurs intermittently.
    » Vomiting after 24 hours.
    » Facial pallor.
    » Red currant jelly stool.
    » Palpation should be done between spasms:
      - Lump, which hardens on palpation.
- Feeling of emptiness in right iliac fossa (sign of Dance).
- PR—inner mass felt [differential diagnosis (DD) rectal prolapse].

Ultrasound:
- Investigation of choice with a sensitivity of 100%.
- Cross-sectional view shows target sign and longitudinal view shows pseudokidney sign.

Barium enema:
- Rarely required.
- Claw sign in ileocolic intussusception.
- Can be used therapeutically.

Radiological reduction: Air reduction enema after resuscitation.

Reduction by hydrostatic pressure:
- Foley's catheter passed per rectum.
- Normal saline (NS) given as infusion through the catheter.
- Catheter removed and fluid allowed to escape.
- After first injection:
  - Blood-stained.
  - Later: Clear, and then flatus and fecal matter.
- If in doubt: Laparotomy.
- Contraindications:
  - History of > 48 hours duration.
  - If gangrene is suspected.

Volvulus (Fig. 41.2):
- Axial rotation of a portion of alimentary tract:
  - Small intestine: Due to adhesions.
  - Cecum: Also obstructs the small intestine; diagnosed by barium enema.
- Pelvic colon:
  - Adhesions.
  - Overloaded pelvic colon.
- Long pelvic mesocolon.
- Narrow attachment of pelvic mesocolon.

Clinical features:
- Pain, vomiting.
- Distension occurs quickly.

Treatment:
- Flatus tube passed beyond constriction and kept in place to buy time.
- Surgical treatment.
- Compound volvulus or iliosigmoid knotting: Ileum twists around sigmoid and becomes gangrenous.

OBSTRUCTION BY ADHESIONS AND BANDS

- Currently the commonest cause of intestinal obstruction.
- In Western countries where abdominal operations are common.
- Suturing the peritoneum increases the incidence of adhesions and there is no increased wound failure when not sutured.
- Placing the greater omentum beneath wound does not prevent adhesion formation but minimizes the risk of bowel injury in the event of further laparotomy.
- Adhesions:
  - Due to peritoneal irritation, which causes local outpouring of fibrin:
    - May disappear.
    - May become converted to fibrous tissue.
  - Causes:
    - Ischemic areas:
      - Sites of anastomosis.
      - Reperitonealization of raw areas.
    - Foreign bodies:
Mechanism

- Talc.
- Starch granules.
- Gauze lint.
- Cellulose.
- Non-absorbable sutures.

» Infective disease:
  - Peritonitis.
  - Tuberculosis.

» Inflammatory disease: Crohn’s disease.

» Radiation enteritis.

» Sclerosing peritonitis.

- Drug-induced β blockers like propranolol.

Types:

- Type I: Postoperative fibrinous adhesions:
  - Not firm.
  - Occurs between 3rd and 6th postoperative day.
  - Usually after lower abdominal operations:
    ◦ Acute appendicitis.
    ◦ Gynecological operations.
  - Disappears after some months.

- Type II: Postoperative fibrous adhesions:
  - Strong bands.
  - Causes intestinal obstruction.

- Type III: Adhesions of loop of intestine to an inflamed intraperitoneal structure.

- Type IV: Adhesions following chemical irritation.

- Prophylactic treatment for adhesions:
  » Use of physical barriers to decrease tissue apposition:
    - Carboxymethylcellulose.
    - Biodegradable membrane based on sodium hyaluronate (Seprafilm).
    - Polyethylene glycol.
    - Icodextrin.
  » Available as sheets applied directly to the undersurface of the incision.
  » May have detrimental effect on bowel anastomosis.
  » Decreased incidence of postoperative adhesions (15% versus 58%).

- Drug prophylaxis:
  » Efficacy not confirmed.
  » Not recommended in routine surgical practice.

Drugs:

- Anticoagulants.
- Dextran.
- Antihistamines.
- Non-steroidal anti-inflammatory drugs (NSAIDs).
- Povidone.
- Streptokinase.
- Synthetic mixture of surface active phospholipids (DPCC and PG—proprietary name ALEC).
- 4% icodextrin solution (Adept).
• Bands (Figs 14.3A and B):
  – Congenital: Obliterated vitellointestinal duct.
  – String-like: Following previous peritonitis.
  – Omental band: Adherent to parieties.
• Operative correction:
  – Abdomen should be opened through previously undisturbed abdominal wall.
  – Transverse incision allows safe access in patients who have undergone multiple procedures via vertical incisions.
  – Quiescent adhesions are left alone.
• To prevent recurrent obstruction due to adhesions, internal fixations and stenting procedures have been tried:
  – Noble's plication: Bowel loops are sutured.
  – Child-Phillips operation: Transmesenteric plication.
  – Intraluminal intubation:
    » Long intestinal tube is inserted through the nose, gastrostomy or jejunostomy or cecostomy to splint the bowel in gentle, non-obstructing curves.
    » Left in place for at least 1 week postoperatively, even after the diet has been initiated, in the hope that adhesions will form in such a manner that future torsion of loops about bands is less likely.

**OBSTRUCTION DUE TO INTERNAL HERNIA**

• Potential places:
  – Foramen of Winslow.
  – A hole in the mesentery.
  – A defect in the broad ligament.

  – Congenital/acquired diaphragmatic hernia into one of the retroperitoneal fossae.

**OBSTRUCTION FROM STRicture OF SMALL INTESTINE**

• Tuberculous ulceration.
• Crohn’s disease.
• Malignant (rare).
• Radiation enteritis.
• Drug induced:
  – Potassium chloride tablets.
  – Enteric-coated NSAIDs.
• Treatment:
  – Excision.
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- Stricturoplasty:
  » Reobstruction does not occur.
  » About 80% of patients achieve a satisfactory outcome.
- Never bypass—causes blind loop syndrome.
- To avoid stricture due to radiation enteritis, small bowel can be excluded from the radiation field by the use of intraperitoneal saline-filled tissue expanders.

Obstruction by Obturation of Small Intestine

- Gallstone:
  - Elderly obese women.
  - Stone > 2.5 cm.
  - 60 cm proximal to ileocecal junction.
  - Usually incomplete obstruction.
- Bolus:
  - After partial gastrectomy.
  - Unripe apples, coconut and dried fruit.
- Stercolith:
  - Especially in cases of jejunal diverticulum.
  - Stricture of the ileum.
  - Forms around foreign bodies like tomato skin, etc.
- Worms:
  - *Ascaris lumbricoides*.
  - In large bowel, causes pistol shot perforation of cecum.

Obstruction due to Gallstone Ileus

- Treatment:
  - Enterotomy proximal to the impacted site.
  - Stone removed and examined for facets indicating the presence of further stones, which may be present in the proximal bowel.
  - After enterotomy and removal, the entire intestine should be carefully examined to search for additional stones, which should be removed.
  - The risk of recurrent gallstone ileus is 5%–10%.
  - No attempt should be made to deal with choledocho-enteric fistula.

Pseudo-obstruction

- Definition: Obstruction of the small or large intestine in the absence of a mechanical cause or acute intra-abdominal disease.
- Small intestinal pseudo-obstruction:
  - Primary:
    » Familial hollow visceral myopathy: Severe disorder, which involves the smooth muscles of esophagus, entire gastrointestinal tract (GIT) including colon and urinary bladder.
  - Secondary:
    » Neuropathy/myopathy induced by systemic disorders or drug misuse:
      - Diabetes mellitus.
      - Scleroderma.
      - Progressive systemic sclerosis.
      - Acute intermittent porphyria.
      - Hypothyroidism.
      - Chagas disease.
      - Phenothiazine.
      - Laxatives.
    » As a complication of sclerotherapy for esophageal varices.
Tests to rule out pseudo-obstruction:

- Rule out:
  - Hypokalemia.
  - Hypomagnesemia.
  - Hypoalbuminemia.
  - Thyroid function tests.
  - Antinuclear antibodies.
  - Serologic markers.
  - Studies for vasculitis such as lupus.

- Manometric studies for upper and lower intestine:
  - Infrequent low amplitude contractions: Smooth muscle degeneration.
  - Disordered cluster contractions: Nervous degeneration.
  - Biopsy of the intestine to look for myenteric plexus.
  - Full thickness rectal biopsy for Hirschprung's disease.

- Barium meal:
  - Prolonged transit time between stomach and colon (as long as 5 hours).
  - Fluoroscopy for decreased motility.

- Radionuclide-labeled pellets:
  - For slow transit.
  - To assess effects of therapy.

- History of drug intake:
  - Tricyclic antidepressants.
  - Opiates.
  - Antihistamines.
  - Beta-adrenergic agonists.
  - Quinidine: amitriptyline.

- Treatment:
  - Correction of underlying disorder.
  - Intestinal prokinetics like metoclopramide, domperidone or cisapride.
  - Ceruletid IV or intramuscular (IM) during acute episodes.
  - Intravenous erythromycin.

**Colonic Pseudo-obstruction**

- Acute:
  - Ogilvie's syndrome.
  - Selective dilatation of cecum and proximal colon with a sharp cut-off usually at the splenic flexure (less frequently at hepatic flexure or sigmoid).
  - Resembles mechanical obstruction.
  - Etiology: Not clear but it is a form of colonic dysmotility, which is the final common pathway of a variety of physiological and biochemical disturbances.

- Localized form of adynamic ileus developing in patients with major pre-existing non-intestinal conditions requiring hospitalization:
  - Major surgery.
  - Severe trauma.
  - Sepsis.
  - Myocardial infarction.
  - Severe renal/respiratory disease.

- Cecal perforation may occur if radiological size of the cecum exceeds 12 cm.

- Treatment:
  - Colonoscopic decompression.
  - Tube cecostomy if it fails.
  - Recent treatment:
    - 2 mg of neostigmine given IV over 3–5 min.
    - Patient should be supine for 60 min.
    - Continuous electrocardiography (ECG) monitoring to detect bradycardia.
    - If this occurs, 1 mg of IV atropine should be given.

- Recurrence rate 20%: Needs further colonoscopy.

**SUPERIOR MESENTERIC ARTERY SYNDROME**

- Obstruction of distal duodenum due to its compression between the artery and posterior structures, either the aorta or vertebral bodies.

- Etiology:
  - Weight loss.
  - Chronic illness/immobilization in bed.
  - Spontaneous.
  - Abnormalities of fixation of ligament of Treitz.

**OBSTRUCTION DUE TO CROHN’S DISEASE**

- With clinical signs and symptoms of complete small bowel obstruction, one should not persist in the non-operative management just because the patient has documented Crohn's disease.
• Patients with Crohn’s disease are subjected to other, more common causes of a complete small bowel obstruction (such as adhesions) that require emergency surgical intervention.

• Computed tomography may prove helpful in decision-making:
  – If there are specific indications: Immediate laparotomy.
  – If no specific indications and if there are findings consistent with active Crohn’s disease (thickened bowel wall, long obstructive segment): Extended attempt at conservative management.

**COLONIC OBSTRUCTION**

• Incidence:
  – The risk that colorectal cancer will cause obstruction varies with its site along the colon.
  – It is highest for splenic flexure (50%), while < 10% of all rectal carcinomas present with obstruction.
  – At the other sites, the risk is similar, about 20%.

• Colonic contribution to nutrition:
  – Salt and water absorption.
  – Functional capacity in nutrient absorption similar to that of 50 cm of jejunum.
  – Also has a role in nitrogen absorption.

• Pathology:
  – If the capacity of right colon is exceeded, the serosa between the tenia splits.
  – Perforations, usually punctate, appear in the mucosa.
  – Patches of hemorrhage/infarction occurs.
  – Initially they lead to progressive contamination of the peritoneum, but may not actually decompress the obstructed colon.

• Clinically:
  – Insidious.
  – Usually past history of partial obstruction is present.
  – Patient may not be aware that complete obstruction has occurred until 2–3 days have passed.

• Etiology according to anatomic location:
  – Anorectum:
    » Carcinoma.
    » Foreign body.
    » Prostatic carcinoma.
    » Stricture.
    » Imperforate anus.
    » Fecal impaction.
  – Left colon:
    » Carcinoma.
    » Diverticulitis.
    » Crohn’s disease.
    » Hirschsprung’s disease.
    » Volvulus.
    » Toxic megacolon.
  – Transverse/right colon:
    » Carcinoma.
    » Diverticulitis.
    » Crohn’s disease.
    » Volvulus.
  – Cecum:
    » Carcinoma.
    » Appendicitis.
    » Diverticulitis.
    » Intussusception.
    » Volvulus.
    » Crohn’s disease.
  – Cecum:
    » Carcinoma.
    » Appendicitis.
    » Diverticulitis.
    » Intussusception.
    » Volvulus.
    » Crohn’s disease.

• Etiology according to age:
  – Birth to 2 years:
    » Imperforate anus.
    » Foreign body.
    » Hirschsprung’s disease.
    » Fecal impaction.
    » Colonic atresia.
  – 2–18 years:
    » Constipation.
    » Bezoars.
    » Hirschsprung’s disease.
  – 18–55 years:
    » Crohn’s disease.
    » Diverticulitis.
    » Foreign body.
    » Carcinoma.
  – Over 55 years:
    » Carcinoma.
    » Diverticulitis.
    » Fecal impaction.
    » Ogilvie’s syndrome.
    » Ischemic colitis.

• Surgical procedures:
  – Rectum:
    » Abdominoperineal (AP) resection.
    » Resection with proximal colostomy.
    » Colostomy/ileostomy.
    » Colectomy with ileorectal anastomosis.
    » Colectomy and ileostomy.
  – Left colon:
    » Resection, anastomosis and proximal colostomy.
    » Colostomy or ileostomy.
    » Intraoperative lavage, resection and anastomosis.
Resection, colostomy and mucus fistula or closure of distal stump.
- Intestinal bypass.
- Total or subtotal colectomy with anastomosis or ileostomy.
  - Transverse colon:
    - Resection and anastomosis.
    - Resection and ileostomy.
    - Resection with colostomy or ileostomy.
    - Ileostomy.
    - Ileocolonic bypass.
  - Right colon or cecum:
    - Cecectomy.
    - Right colectomy.
    - Resection with ileostomy.
    - Ileocolonic bypass.
- Treatment:
  - If the original cause of left-sided colonic obstruction was malignancy, subtotal colectomy and left hemicolectomy allow straightforward subsequent colonoscopic surveillance due to mobilization of splenic flexure.
  - Best treatment is bowel decompression using either a transstumoral stent or laser recanalization of the tumor followed by bowel preparation and definitive surgery, especially in rectum and sigmoid growths.
  - For on table lavage, it is important to use a short length of scavenger tubing, otherwise the resistance of the tube to the viscous fluid can impede forward flow causing back pressure on cecum.
  - Reversal of Hartmann’s is a major task with a higher morbidity and mortality than closure of a loop stoma (30% morbidity and 2%–3% mortality).
  - Indications of subtotal colectomy:
    - Synchronous colorectal carcinoma.
    - Patients < 50 years of age presenting with obstructing carcinoma, especially if they have a positive family history.
    - Serosal tears of cecum.
    - Perforation of cecum.
- Percutaneous endoscopic colostomy (PEC):
  - In patients not fit for general anesthesia (GA), a percutaneous endoscopic colostomy (PEC) is a useful alternative for sigmoid volvulus and acute colonic pseudo-obstruction.
  - In this procedure, a percutaneous tube is inserted under endoscopic vision, via direct traction and secondary fibrosis, fixes the colon to the anterior abdominal wall.
  - Two-point fixation has been shown to be more successful.
- Self-expanding metal stents (SEMS) in large bowel obstruction:
  - Indications:
    - Palliation of incurable malignancy.
    - Avoidance of emergency surgery in those temporarily unfit.
    - Allowing time for formal bowel preparation before definitive surgery.
    - Allowing neoadjuvant radiotherapy (RT) for locally advanced obstructing carcinoma rectum.
  - Procedure:
    - Inserted under fluoroscopic control by means of a guide wire delivered endoscopically or radiologically.
  - Complications:
    - Tumor ingrowth/overgrowth.
    - Failure to expand.
    - Migration.
    - Hemorrhage.
    - Severe pain.

**CLINICAL EXAMINATION**

**Abdominal Examination**

- Abdominal distension:
  - Minimal in high small bowel obstruction.
  - More prominent in low obstruction.
  - Differential diagnosis—ascites.
- Visible gastric peristalsis, not reliable.
- Surgical scar.
- Tenderness:
  - Not present in uncomplicated obstruction.
  - If present, implies impending strangulation.
- Mass: Possibility of neoplastic or inflammatory process.
- Hernial orifices:
  - Always examine all hernial sites in all patients with intestinal obstruction.
  - Especially in obese patients.
- Rectal examination:
  - Feces present.
  - Ballooning of rectum below a large bowel obstruction.
  - Rectal tumor.
  - Extrarectal masses within the pelvis.
  - Frozen malignant pelvis that causes Blumer’s shelf.
- Three types of bowel sounds:
  - Normal:
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» Low-pitched.
» Lasts about a second every 20 minutes.
– Dynamic obstruction: Prolonged, rapid and noisy.
– Paralytic ileus: High-pitched, tinkling.

General Examination

• Tachycardia and hypotension:
  – Severe dehydration.
  – Peritonitis.
  – Both.
• Fever: Strangulation.
• Poor skin turgor and dry mucus membranes: Dehydration.

QUESTIONS TO ASK YOURSELF IN DIAGNOSING

• Does the patient have bowel obstruction?
• If so, where is it?
• What is the anatomic and pathologic nature of the obstructing lesion?
• Has strangulation occurred?
• What is the general condition of the patient?
  – Fluid and electrolyte balance.
  – Other systemic diseases.

DIAGNOSIS

• Four steps in the diagnosis of small bowel obstruction:
  – Deciding whether or not obstruction exists.
  – Differentiating between mechanical and neurogenic obstruction.
  – Determining level of obstruction.
  – Diagnosing nature of obstructing lesion.
• Clues to etiology:
  – Obstruction at birth/neonatal period:
    » Intestinal atresia.
    » Meconium ileus.
    » Volvulus neonatorum.
  – Obstruction in infancy:
    » Ileocecal intussusception.
    » Hernia.
  – Elderly:
    » Strangulated hernia.
    » Malignancy.
  – Obstruction + hypovolemic shock—mesenteric ischemia, especially if patient has associated atrial fibrillation/atherosclerosis.

FREQUENTLY ASKED QUESTIONS

Why Does Cecum Rupture in Colonic Obstruction with Competent Ileocecal Valve?

• Cecum is the segment of colon with the largest diameter.
• According to the law of Laplace, the pressure required to stretch the walls of a hollow viscus decreases in inverse proportion to the radius of curvature.
• Thus, given an equal pressure throughout the colon, the greatest distension will occur in the portion of the colon with the largest radius—the cecum.