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Textbook of Pharmacology & Pathology for NURSES–I

As per the Revised INC Syllabus for BSc Nursing

Suresh Sharma

2nd Edition

JAYPEE

Textbook of
Pharmacology and Pathology for Nurses–I

As per the Revised INC Syllabus for BSc Nursing

SECOND EDITION

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CHAPTER

16

Gastrointestinal System

Ram Nawal Rao, Joyce Joseph, Suresh Sharma

PEPTIC ULCER DISEASE

A peptic ulcer disease refers to the condition in which the superficial layers of the stomach get eroded due to excessive acid and pepsin activity. They can be located in mucosal layers of the stomach, duodenum, or esophagus.

Types of Peptic Ulcers

Peptic ulcer disease may be classified into two broad categories: (1) Acute peptic ulcer disease and (2) chronic peptic ulcer disease.

Acute Peptic Ulcers (Stress Ulcers)

- Occurs mostly in the stomach and present in the form of small, multiple mucosal erosions.
- Can be due to psychological or physical stress response in the body [mainly seen in cases of shock, trauma, burns and in people, who consume excessive drugs like non-steroidal anti-inflammatory drugs (NSAIDs), aspirin, steroids and in cases of excessive smoking or alcohol usage].
- **Pathological changes:**
  - *Grossly:* Ulcers are oval or circular in shape, with size usually <1 cm in diameter.
  - *Microscopically:*
    - They are shallow and do not invade the muscular layer
    - Ulcers usually heal by re-epithelization without any scar formation at the end

Chronic Peptic Ulcers

Usually gastric and duodenal ulcers come under this category and involve the deeper layers of the stomach and the duodenum.

Etiological Factors

- Presence of *Helicobacter pylori*
- Increased stimulation of vagus nerve
- Decreased inhibition of gastric secretions **(Figs. 16.1A and B)**

Medical Conditions

- Zollinger-Ellison syndrome (a disease that produces too much stomach acid, which harms the mucosal lining)
- Certain medications like Aspirin, NSAIDs, digitalis, steroids
- Acute alcoholism
- Food poisoning
- Genetic influence—people with blood type O are more prone to develop peptic ulcers

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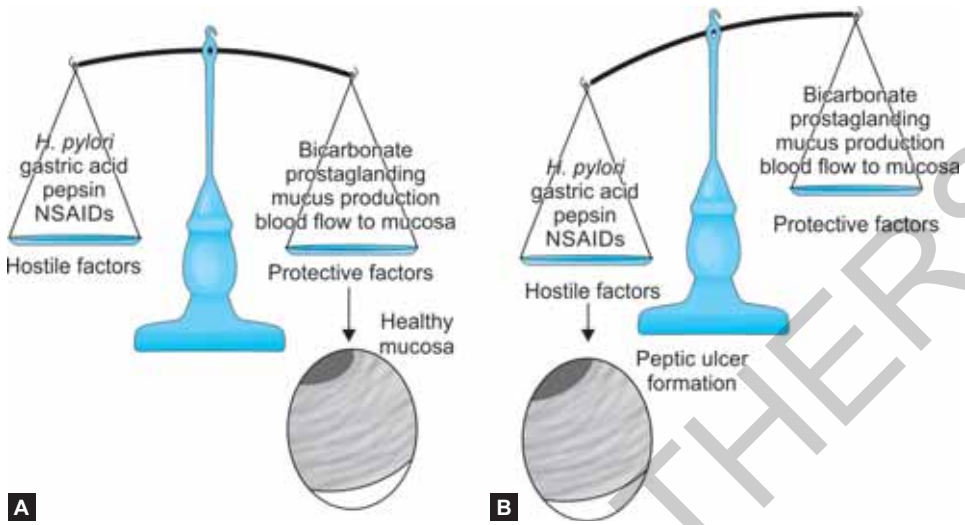

Figs. 16.1A and B: Etiopathogenesis of peptic ulcer: A. Healthy mucosa; B. Peptic ulcer formation.

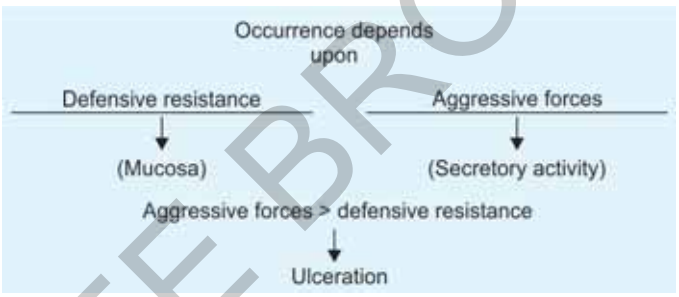

Fig. 16.2: Pathogenesis of peptic ulcer development.

Pathogenesis

- Mechanism of occurrence and development of peptic ulcer disease may be explained through **Figure 16.2**.
- Acid pepsin disease = acid + pepsin mucosal barrier.

Pathological Changes

Grossly

- Peptic ulcers are commonly solitary, small, round to oval, and characteristically punched out **(Fig. 16.3A)**
- Benign ulcers have flat margins with mucosal folds converging toward the ulcer
- Malignant ulcers are larger, bowl-shaped with elevated mucosa at the margin

Histologically (Fig. 16.3B)

Chronic peptic ulcers are composed of four layers from inside to outside as listed below:

1. Necrotic
2. Superficial exudative

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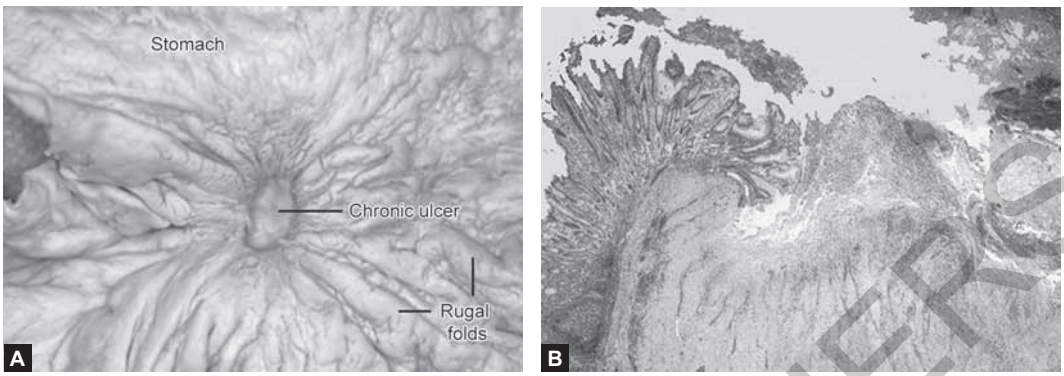

Figs. 16.3A and B: Peptic ulcer of stomach: A. Gross view; B. Microscopic view.

3. Granulation tissue
4. Cicatrization (thick layer of granulation tissue)

Clinical Manifestations

- **Abdominal pain:** In gastric ulcer pain soon after eating while in duodenal ulcer pain may occur or worsen, when the stomach is empty and usually occurs 2–5 hours after a meal
- Dull or burning (most common symptom)
- Bloating and abdominal fullness
- Water brash
- Nausea and copious vomiting
- Loss of appetite and weight loss
- Others signs and symptoms such as:
  - Hematemesis
  - Melena
  - Heartburn
  - Belching
  - General discomfort in the abdomen
  - Feeling sick

Diagnostic Methods

- Barium swallow
- Esophagogastroduodenoscopy
- Stool analysis
- Gastric secretory studies
- Urea breath test

Duodenal ulcers never undergo malignant transformation.

GASTRIC *H. PYLORI* INFECTION

It is also known as type-B gastritis, which is more common and mainly involves the region of antral mucosa in the stomach. It is also called as hypersecretory gastritis, because of access

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secretion of acid, which mainly due to infection of *H. pylori* bacteria, which leads to associated problem of peptic ulcers. This type of gastritis does not have underlying autoimmune basis or an associated autoimmune comorbidity.

Pathogenesis and pathological changes will be same as detailed under gastritis in same chapter.

BUCCAL CARCINOMA

Oral cancer constitutes more than 5% of all human cancers. Squamous cell carcinoma is the most common malignant oral tumor, accounting for approximately 90–95% of all malignant cancers.

Etiopathogenesis

- Tobacco smoking and tobacco chewing
- Chronic alcohol consumption
- Human papillomavirus infection (HPV 16, 18, and 33 types)
- Poor oro-dental hygiene
- Explosive to intense sunlight
- Nutritional deficiencies
- Plummer-Vinson syndrome characterized by atrophy of upper gastrointestinal (GI) tract
- Syphilitic glossitis

All these factors lead to invasion and destruction of underlying tissues in the mouth most commonly the lower lip, tongue, and floor of the mouth to lead to chronic irritation and cancer.

Clinical Manifestations

- Leukoplakia/whitish patch on oral mucosa
- All chronic ulcerative lesions, which fail to heal within 1–2 weeks should be considered potentially malignant
- Ulcer with elevated, indurated border, failure to heal, pain not prominent
- Gingival swelling

Pathological Changes

Squamous cell carcinoma of the oral cavity is of four types:

1. Ulcerative (indurated ulcer)
2. Papillary (wart-like growth)
3. Nodular (slow-growing submucosal nodule) **(Fig. 16.4A)**
4. Scirrhous (infiltration in deeper tissue) **(Fig. 16.4B)**

Diagnostic Methods

- Oral biopsy
- Clinical appearance
- Histological study

Most common primary malignant carcinoma of the salivary gland is Mucoepidermoid carcinoma. Second most common being, Warthin tumor.

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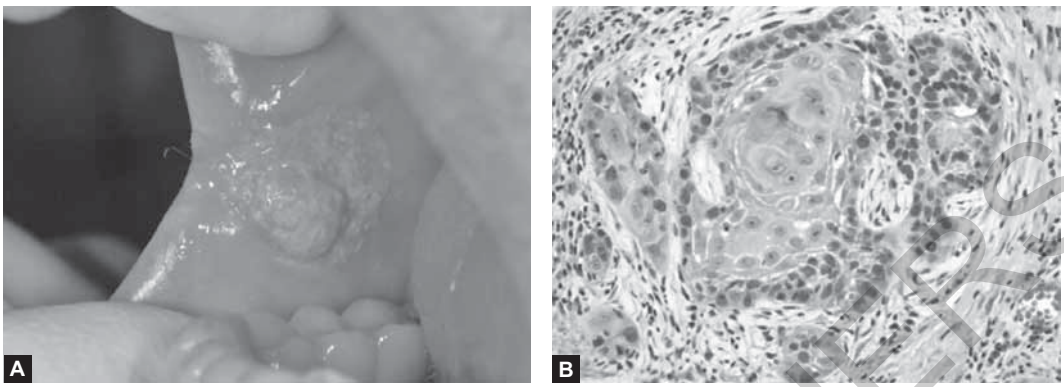

Figs. 16.4A and B: Squamous cell carcinoma of the buccal mucosa: A. Gross; B. Microscopic appearance.

ESOPHAGEAL CARCINOMA

The primary malignant tumors of the esophagus are squamous cell carcinoma (a common type in India) and adenocarcinoma. Esophageal carcinoma is the fifth most common cancer in adults. Tumor cells may involve the esophageal mucosa and muscle layers and can spread to the lymphatics and in later stages may obstruct the esophagus, perforate the mediastinum or erode into great vessels.

Leiomyoma is the most common benign tumor of the esophagus.

Etiopathogenesis

- Gender (male)
- Age (greater risk in the fifth decade of life)
- Chronic esophageal irritation
- Use of alcohol and tobacco
- Gastroesophageal reflux disorder (GERD)
- Heavy smoking and alcohol consumption
- Genetic factors and family history
- Molecular-level abnormality in *TP53* tumor suppressor gene

Clinical Manifestations

- No early symptoms
- Progressive dysphagia and weight loss of short duration
- Dysphagia begins with solid foods and gradually progresses to semisolid and liquid
- Ulceration and subequal hemorrhage from erosive effects of tumor
- Fistula formation and possible aspiration secondary to continued erosive tumor effects
- Feeling of lump in the throat and painful swallowing
- Substernal pain or fullness, regurgitation of undigested food with foul breath and hiccups

Pre-malignant condition in which, replacement of squamous epithelium with goblet cells—Barrett esophagus.

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Pathological Changes

Squamous Cell Carcinoma

Half of the squamous cell carcinoma (90% of the primary esophageal cancers) occurs in the middle third of the esophagus followed by the lower third and then an upper third of the esophagus.

- **Macroscopically:** Basically, the following three types of gross changes may be observed:
  1. Polyploid fungating type (most common, appears as a cauliflower-like friable mass in the lumen)
  2. Ulcerating type (appears as a necrotic ulcer with everted edges)
  3. Diffuse infiltrating type (appears as narrowing of lumen due to infiltration in the wall of the esophagus)
- **Microscopically**
  - Squamous cell carcinoma are well-differentiated carcinomas
  - Prickle cells, keratin formation, and epithelial pearls are also seen

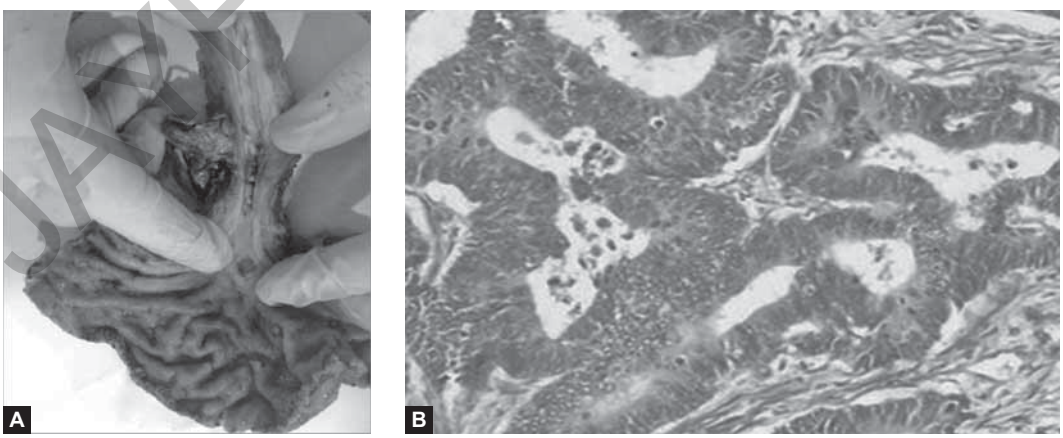
Adenocarcinoma

Adenocarcinoma (less than 10% of the primary esophageal cancers) commonly occurs in the lower or middle third esophagus. The gross and microscopic pathological appearance of adenocarcinoma is illustrated in **Figures 16.5A and B**.

- **Macroscopically:** Appears as nodular and elevated mass
- **Microscopically:** Generally following three types of patterns are seen:
  - Intestinal type—a pattern seen similar to adenocarcinoma of intestine or stomach
  - Adenosquamous type—a pattern seen as an irregular mixture of adenocarcinoma and squamous cell carcinoma
  - Adenoid cystic type—uncommon cribriform appearance in the epithelial tumor

Spread of Esophageal Tumor

- **Locally:** Tumor may invade below into stomach, hypopharynx, trachea, larynx and may even involve lungs, pleura, bronchi, mediastinum



Figs. 16.5A and B: Adenocarcinoma esophagus: A. Microscopic appearance; B. Gross appearance.

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- **Hematogenous:** Rarely metastatic deposits can occur in lungs, liver, and adrenals
- **Lymphatic spread:** Metastasis can occur to cervical, paraesophageal, tracheobronchial, and subdiaphragmatic lymph nodes

Diagnostic Methods

- Esophageal X-ray with barium swallow and motility studies reveals structural and filling defects and reduced peristalsis
- Endoscopic examination with punch and brush biopsies confirms cancer cell type

TUMORS OF STOMACH

The tumors of the stomach may be classified as follows:

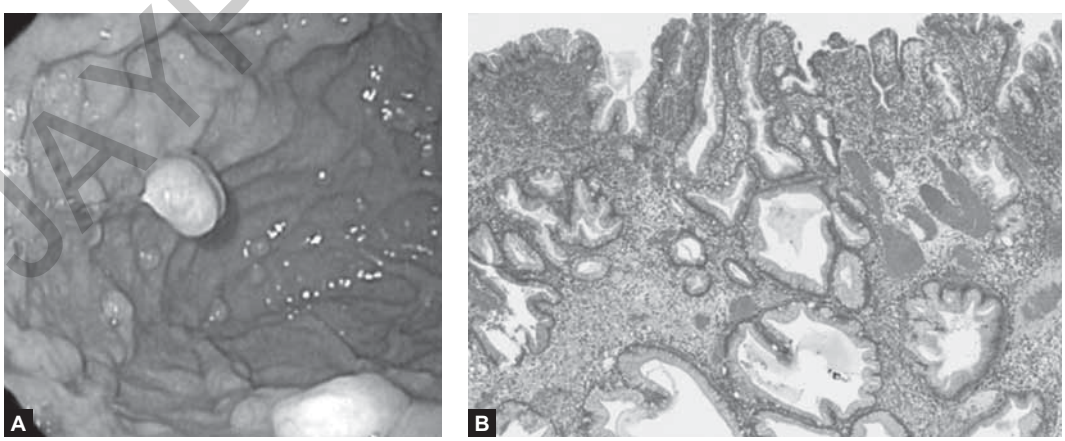
- Tumor like lesions (gastric polyps)
- Benign tumors
- Malignant tumors:
  - Adenocarcinoma
  - Leiomyosarcoma
  - Leiomyoblastoma

Gastric Polyps

Any nodule or mass that projects above the level of the surrounding mucosa is known as a polyp. They are uncommon lesions, found in 0.4% of the adult population. Usually asymptomatic, but sometimes produce dyspepsia and anemia due to blood loss. More than 90% of polyps are non-neoplastic.

Polyps are of two following types:

1. **Inflammatory polyps:** They are not true polyps, mainly consisting of granulation tissue. At times it can be an inflammatory fibroid polyp.
2. **Hyperplastic polyps:** They are also known as regenerating polyps. Usually, small 0.5–1 cm in diameter and are often multiple, most commonly located in the pyloric antrum. Rarely show malignant transformation **(Fig. 16.6A)**. Microscopically, polyps show **(Fig. 16.6B)**:



Figs. 16.6A and B: Gastric Polyp: A. Gross; B. Microscopic.

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- Hyperplastic pyloric type glandular tissue
- Edematous lamina propria
- Inflammatory cells
- Scanty smooth muscle fibers

Benign Tumors

- The benign tumors of the stomach are gastric adenoma
- Incidence of gastric adenoma increases with age, most common in the seventh decade
- Male to female ratio is 2:1
- Up to 40% of gastric adenomas contain a focus of carcinoma at the time of diagnosis and the risk of cancer in the adjacent gastric mucosa is as high as 30%
- Gastric adenoma arises in the background of chronic gastritis and intestinal metaplasia
- The gastric adenoma is also referred to as adenomatous or neoplastic polyps, which are commonly seen in the colon and are also located in the distal portion of the stomach particularly the antrum. Gastric adenomas may be sessile or pedunculated, usually single (3–4 cm in size) and contain proliferative dysplastic epithelium, and has malignant potential

Malignant Tumors

Malignant tumors of the stomach are:

- Gastric carcinoma (90%–95%)
- Lymphomas (4%)
- Carcinoids (3%)
- Mesenchymal tumors (rare)

Gastric Carcinoma

Gastric carcinoma is the most common tumor of the stomach. Gastric cancer is one of the most common lethal malignancies; the highest incidence is in the fourth to sixth decades of life and is twice as common in men than in women.

It is of two types:

1. *Intestinal type*, which arises from gastric mucosa cells that have undergone intestinal metaplasia
2. *Diffuse type*, which arises from native gastric mucosa cells

Etiology

- **Diet:** It is suspected to be the prime offender:
  - Nitrites in diet, found in the preserved food and drinking water undergo nitrosation to form nitrosamines and nitrosamides
  - Smoked and salted food; lack of fresh fruits and vegetables
  - Tobacco smoke, tobacco juice, and consumption of alcohol have a carcinogenic effect on the gastric mucosa
- **Host factors:**
  - Ch. atrophic gastritis 10–18% increased risk of developing carcinoma due to glandular atrophy and intestinal metaplasia
  - Infection by *H. pylori*; it is an important risk factor for the development of gastric cancer

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- Partial gastrectomy favors reflux of bilious intestinal fluid
- *Gastric adenoma:* 40% have carcinoma at the time of diagnosis
- *Genetic factors:* Increased incidence seen in blood group A
- *Close relatives:* Increased incidence in some races (incidence higher in blacks American Indians, Chinese)

Morphology

Located in the stomach at following sites:

- Pylorus and antrum (50–60%)
- Cardia (25%)
- Body and fundus (15–25%)
- Favored location is the lesser curvature of stomach

Classification

Gastric carcinoma is classified based on:

1. **Depth of invasion:**
   - Early gastric carcinoma in which lesion is confined to mucosa and submucosa
   - Advanced gastric carcinoma in which the lesion has extended below the submucosa into the muscular wall
   - All cancers begin as early lesions, which precedes the development of advanced lesions
2. **Macroscopic growth pattern:** The morphological growth patterns of gastric carcinoma are **(Fig. 16.7)**:
   - *Exophytic:* Protrusion of tumor mass into the lumen
   - *Flat:* No visible tumor mass
   - *Excavated:* Shallow or deep ulcer; malignant ulcers have heaped up beaded margins with necrotic bases
   - *Linitis plastica:* Diffuse infiltration of malignancy in the whole stomach; forming a rigid, thickened leather bottle appearance
3. **Histological subtypes:** Two most important histological subtypes are:
   1. *Intestinal type:* This is composed of neoplastic intestinal glands penetrating the wall of the stomach and resembles adenocarcinoma
   2. *Diffuse type:* This is composed of gastric type mucous cells and does not form glands

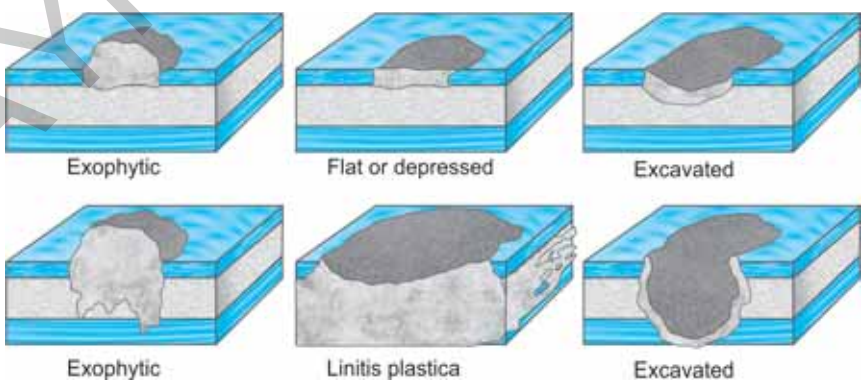

Fig. 16.7: Growth pattern and spread of gastric carcinoma.

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They infiltrate the stomach wall as individual cell or small clusters. Mucin is formed in the malignant cells, which expand the cell and push the nucleus toward the periphery forming Signet ring configuration.

Spread of Gastric Carcinoma

- **Lymphatic:** Paragastric, para-aortic
- **Virchow's node:** Supraclavicular lymph node
- **Hematogenous:** Liver, lungs, brain, and bones
- **Transcoelomic:** Peritoneal cavity, ascites, pouch of Douglas, pelvic and ovaries
- Krukenberg tumors

Clinical Manifestations

- Chronic dyspepsia and epigastric discomfort related to tumor growth in gastric cells and destruction of mucosal barrier
- Persistent abdominal pain
- Gastric distension and vomiting
- Loss of weight
- Loss of appetite
- Anemia, weakness, and malaise
- Postprandial fullness
- Hematemesis, melena, and alteration in bowel habits
- Blood in stools from erosion of gastric mucosa from tumor

Diagnostic Methods

- Barium X-ray with fluoroscopy shows tumor or filling defects in the outline of the stomach, loss of flexibility and distensibility, and abnormal mucosa with or without ulceration
- Gastroscopy with fiberoptic endoscopy
- Computed tomography scan, X-rays, liver and bone scans and liver biopsy reveal metastasis

TYPHOID ULCERS

Typhoid fever is an acute systemic disease resulting from infection with *Salmonella typhi* or Salmonella paratyphi; commonly affects the ileum and the colon.

Pathogenesis

Flowchart 16.1 shows the pathogenesis of typhoid fever.

Pathologic Changes

Macroscopically (Fig. 16.8)

- Mainly seen in the terminal ileum (Peyer's patch)
- Peyer's patches show oval ulcers with a long axis along the length of the bowel
- Base of the ulcer is black due to sloughed mucosa with raised margins due to inflammatory edema and cellular proliferation

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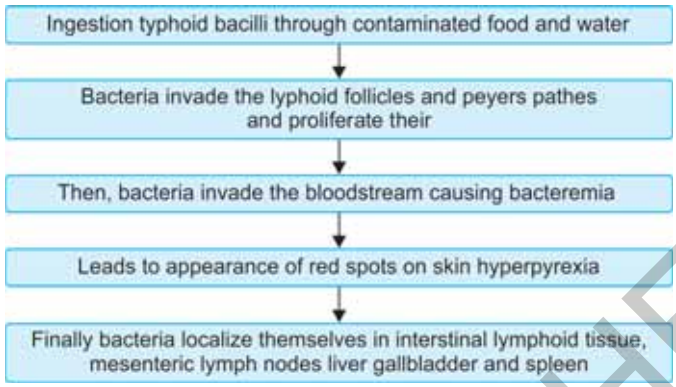
Flowchart 16.1: Pathogenesis of typhoid fever.



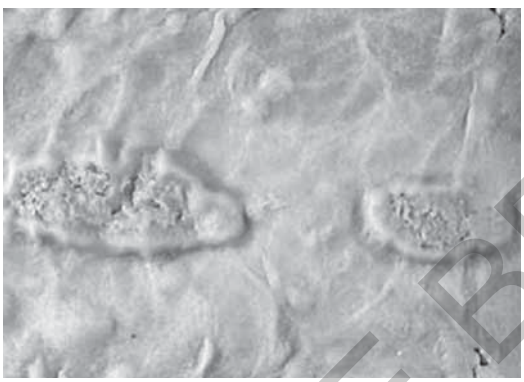


Fig. 16.8: Typhoid ulcer: Gross appearance.

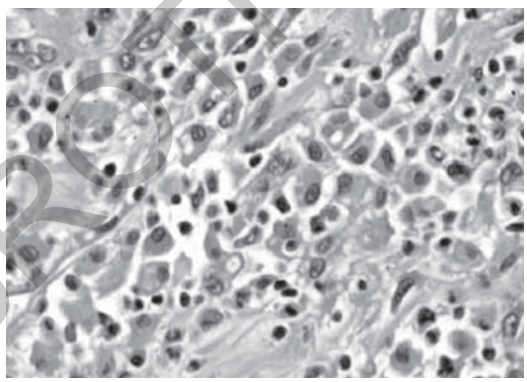


Fig. 16.9: Typhoid ulcer: Microscopic appearance.

Microscopically (Fig. 16.9)

- Cellular proliferation consists of phagocytic histiocytes, lymphocytes, and plasma cells appear with hyperemia and edema
- Peripheral blood smear reflects lymphocytosis with leukopenia and neutropenia

Clinical Manifestations

Proliferation of large mononuclear cells in many different tissues leads to:

- Lymphadenopathy
- Splenomegaly
- Enlargement of lymphoid tissues in the intestine, bone marrow, liver, and lungs
- Lesions may extend deep into the intestinal wall and cause perforation of the bowel, late in the disease usually in the distal ileum

Diagnostic Methods

- Leukopenia of 3,000–4,000 cells/mm^3 is characteristic of the febrile phase of typhoid fever
- Occult blood test

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- Widal test
- Blood culture

INFLAMMATORY BOWEL DISEASE

The term 'inflammatory bowel disease (IBD), is commonly used to include two idiopathic bowel diseases having many similarities but the conditions usually have distinctive morphological appearance:

Etiopathogenesis

The exact etiology of IBD remains unknown. However, multiple factors are implicated which can be considered under the following three groups:

Genetic Factors

- There is about 3 to 20 times higher incidence of occurrence of IBD in first-degree relatives.
- Overall, there is approximately 50% chance of development of IBD (Crohn's disease about 60% concordance, ulcerative colitis about 6% concordance) in monozygotic twins.
- Although no specific and consistent gene association with IBD has been seen, genome-wide search has revealed that disease-predisposing loci are present in chromosomes 16q, 12p, 6p, 14q and 5q.
- HLA studies show that ulcerative colitis is more common in HLA-DRB1—alleles while Crohn's disease is more common in HLA-DR7 and DQ4 alleles.

Immunologic Factors

Defective immunologic regulation in IBD has been shown to play significant role in the pathogenesis of IBD:

- Defective regulation of immune suppression in IBD, immune mechanism of suppression of inflammation is defective and thus results in uncontrolled inflammation.
- Transgenic mouse experimental model studies. Gene 'knock out' studies on colitis in mice have revealed that multiple immune abnormalities may be responsible for IBD as under:
  - Deletion of inflammation inhibitory cytokines.
  - Deletion of molecules responsible for T cell recognition.
  - Interference with normal epithelial barrier function in the intestine.
- Type of inflammatory cells in both types of IBD, activated CD4+ T cells are present in the lamina propria and in the peripheral blood.
  - TH1 cells secrete proinflammatory cytokines IFN-γ and TNF which induce transmural granulomatous inflammation seen in Crohn's disease.
  - TH2 cells secrete IL-4, IL-5 and IL-13 which induce superficial mucosal inflammation characteristically seen in ulcerative colitis.

Exogenous Factors

In addition to role of genetic factors and deranged T-cell mediated immunity, a role for several exogenous and environmental factors has been assigned, e.g.,

1. Microbial factors
2. Psychosocial factors

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3. Smoking
4. Oral contraceptives

Consensus hypothesis in pathogenesis of IBD combines the role of above three major groups of etiologic factors, i.e., in a genetically predispose individual, the effects of exogenous and endogenous host factors result dysregulation of mucosal immune function, which gets further modified by certain environmental factors.

CROHN'S DISEASE

Crohn's disease is an idiopathic chronic ulcerative IBD, characterized by transmural, non-caseating granulomatous inflammation, affecting most commonly the segment of terminal ileum and/or colon, though any part of the gastrointestinal tract may be involved.

Morphologic Features

Crohn's disease may involve any portion of the gastrointestinal tract but affects most commonly 15–25 cm of the terminal ileum which may extend into the caecum and sometimes into the ascending colon.

General Appearance

Characteristic feature is the multiple, well-demarcated segmental bowel involvement with intervening uninvolved 'skip areas'. The lumen of the affected segment is markedly narrowed. The mucosa shows 'serpiginous ulcers', while intervening surviving mucosa is swollen giving 'cobblestone appearance'. There may be deep fissuring into the bowel wall.

Microscopic Examination

Main features are as under:

- Transmural inflammatory cell infiltrate consisting of chronic inflammatory cells (lymphocytes, plasma cells and macrophages).
- Non-caseating, sarcoid-like granulomas are present in all the layers of the affected bowel walls in 60% of cases.
- There is patchy ulceration of the mucosa which may take the form of deep fissures.
- Widening of the submucosa due to edema and foci of lymphoid aggregates, becomes increasingly prominent.
- In more chronic cases, fibrosis.

Complications

- Malabsorption
- Fistula formation
- Stricture formation
- Development of malignancy lymphoma may develop more often in Crohn's disease than adenocarcinoma

ULCERATIVE COLITIS

Ulcerative colitis is an idiopathic form of acute and chronic ulcero inflammatory colitis affecting chiefly the mucosa and submucosa of the rectum and descending colon, though sometimes it may involve the entire length of the large bowel.

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Morphologic Features

Classically, ulcerative colitis begins in the rectum, and in continuity extends upwards into the sigmoid colon, descending colon, transverse colon, and sometimes may involve the entire colon.

General Appearance

The characteristic feature is the continuous involvement of the rectum and colon without any uninvolved skip areas compared to Crohn's disease. The appearance of colon may vary depending upon the stage and intensity of the disease because of remissions and exacerbations. Mucosa shows linear and superficial ulcers, usually not penetrating the muscular layer. The intervening intact mucosa may form inflammatory 'pseudopolyps.

Microscopic Examination

Ulcerative colitis because of remission and exacerbations, is characterized by alternating 'active disease process' and 'resolving colitis'. The changes in the 'active disease process' are as under:

- Crypt distortion, cryptitis and focal accumulations of neutrophils forming crypt abscesses.
- Marked congestion, dilatation and hemorrhages from mucosal capillaries.
- Superficial mucosal ulcerations, usually not penetrating into the muscle coat, and is accompanied by nonspecific inflammatory cell infiltrate of lymphocytes, plasma cells, neutrophils, some eosinophils and mast cells in the lamina propria.
- Goblet cells are markedly diminished in cases of active disease.
- Areas of mucosal regeneration and mucodepletion of lining cells.
- In long-standing cases, epithelial cytologic atypia ranging from mild to marked dysplasia and sometimes developing into carcinoma in situ and frank adenocarcinoma.

Complications

- Toxic megacolon (Fulminant colitis) is the acute fulminating colitis in which the affected colon is thin-walled and dilated and is prone to perforation and fecal peritonitis. There is deep penetration of the inflammatory cell infiltrate into muscle layer which is disrupted.
- Perianal fistula formation may occur rarely.
- Carcinoma may develop in long-standing cases of ulcerative colitis of more than 10 years duration.
- Stricture formation almost never occurs in ulcerative colitis.

Both these disorders primarily affect the bowel but may have systemic involvement in the form of polyarthritis, uveitis, ankylosing spondylitis, skin lesions and hepatic involvement.

COLORECTAL CANCER

- 98% of all cancers in the large intestine are adenocarcinomas. They generally arise in polyps and produce signs and symptoms relatively early. So, can be cured by resection. Peak incidence is 60–70 years. Less than 20% seen before 50 years of age, which are associated with ulcerative colitis or polyposis syndrome.
- Incidence is highest in US, Canada, Australia and other affluent countries and lowest in Japan, Africa and South America because of environmental factors and dietary practices.

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Etiology

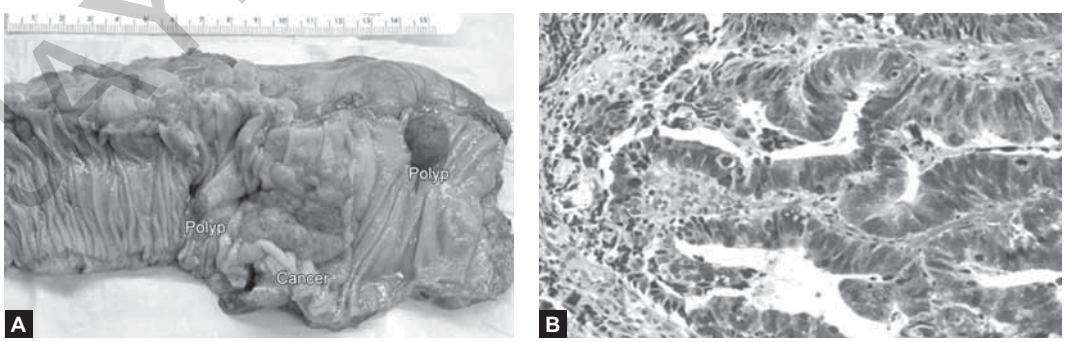
- Environmental and dietary factors have been implicated
- Dietary factors that predispose to carcinoma are:
  - Low content of unobservable vegetable fibers
  - A high content of refined carbohydrate diet
  - A high-fat content (as from meat)
  - Decreased intake of protective micronutrients, e.g., vitamin A, C, E

Morphology

- The location of carcinoma are as follows:
  - Cecum and ascending colon (25%)
  - Rectum and sigmoid colon (25%)
  - Descending colon (25%)
  - Rest is scattered elsewhere in the colon
- Tumors in the proximal colon tend to grow as polypoid, fungating masses. Obstruction is uncommon. In the distal colon they tend to be annular, encircling lesions that produce so-called napkin ring constriction of the bowel. The margins of napkin ring are heaped up, beaded and firm with central ulceration. Both the forms penetrate the bowel wall to produce serosal or subserosal firm masses. Circumferential growth around the bowel wall results in stricture formation **(Fig. 16.10A)**.
- **Microscopically:** The features are those of adenocarcinoma, which may be from well differentiated to anaplastic. Many tumors produce mucin, which worsens the prognosis. 10% of tumors show foci of neuroendocrine differentiation. In some tumors, cells take the signet ring appearance **(Fig. 16.10B)**.

Spread of Tumor

- **Hematogenous spread:** Most commonly goes to the liver, lung, and bones.
- **Lymphatic spread:** Involves mesenteric lymph node going to para-aortic lymph node to cisternae chyle and may involve supraclavicular lymph nodes.
- **Transcoelomic spread:** May involve the peritoneum and then to ovaries thus forming Krukenberg tumors.



Figs. 16.10A and B: Colorectal carcinoma: A. Gross view; B. Microscopy view.

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Carcinoid Tumors

The tumors of neuroendocrine cells are called carcinoids. Neuroendocrine cells are normally dispersed along the length of GI tract mucosa, lungs, pancreas, biliary tract.

They are specialized cells that secrete hormones:

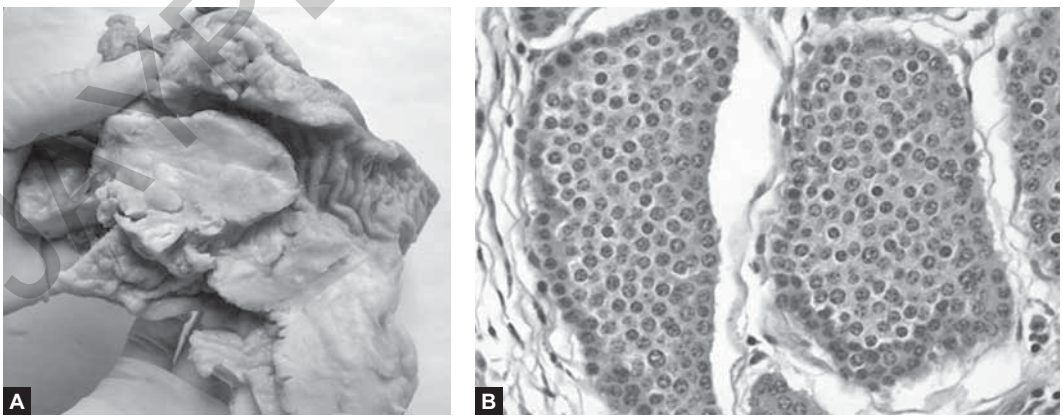
- About 60–80% arises in the tip of appendix
- About 10–20% in terminal ileum, remaining in rest of the gut
- Can occur at any age, peak incidence in sixth decade of life
- Appendiceal and rectal carcinoids rarely metastasize even if they become quite large
- About 90% of gastric, ileal and colonic carcinoids spread to lymph node and distant sites at diagnosis
- Cells of carcinoids tumor can able to synthesize and secrete a variety of hormonal products
- Cell of origin of carcinoids is functionally uncommitted gut endocrine cell that undergo differentiation during tumorigenesis

Gross and Microscopic Morphology (Figs. 16.11A and B)

- Most common site for gut carcinoid is the appendix and may be solitary or multicentric in origin. In the appendix, they appear as bulbous swelling of the tip, which obliterates the lumen.
- Elsewhere in the gut, small yellow-orange nodule present in the submucosa, overlying mucosa may be normal or ulcerated. The tumor is exceedingly firm due to intense fibrosis.
- Microscopic examination shows the neoplastic cells form islands, trabeculae, glands, or sheets.

Clinical Manifestation

- Changes in bowel habits diarrhea, constipation, and sensation of incomplete rectal emptying
- Many patients are asymptomatic for long periods
- Black tarry stools secondary to tumor erosion and necrosis of the intestinal lining



Figs. 16.11A and B: Carcinoid tumor: A. Gross appearance; B. Microscopic appearance.

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- Anemia secondary to increased tumor growth needs and bleeding resulting from necrosis and ulceration of mucosa
- Abdominal aching, pressure or cramps secondary to pressure from tumor
- Weakness, fatigue, anorexia, weight loss secondary to increased tumor growth needs
- Vomiting as disease progresses related to possible obstruction

Diagnostic Methods

- Digital rectal examination reveals mass
- Hemoccult test detects blood in stool
- Proctoscopy and sigmoidoscopy reveal tumor mass
- Colonoscopy reveals tumor location
- Barium X-ray
- Carcinoembryonic antigen may be elevated

MULTIPLE CHOICE QUESTIONS

1. **Leukoplakia is _____ patch.**
   a. Red b. Yellow
   c. White d. Orange
2. **Most common site for tumors of the salivary gland is _____**
   a. Parotid gland b. Submandibular gland
   c. Sublingual gland d. Submaxillary gland
3. **In Barrett esophagus, the type of cell lining is _____**
   a. Squamous cells b. Cuboidal cells
   c. Transitional cells d. Goblet cells
4. **Peptic ulcer is mainly caused by _____**
   a. *E. coli* b. *H. pylori*
   c. *Salmonella* d. *Entamoeba histolytica*
5. **Most common site for carcinoid tumor is _____**
   a. Esophagus b. Small intestine
   c. Stomach d. Appendix

Answer Key

1. c 2. a 3. d 4. b 5. d

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