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19. PEPTIC ULCER

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19. PEPTIC ULCER

WHAT IS A PEPTIC ULCERS?

- A peptic ulcer is a sore that forms when digestive juices wear away the lining of the digestive system. A peptic ulcer can occur in the lining of the stomach, duodenum, or lower part of the esophagus.
- Peptic ulcer disease (PUD) is one of the most common diseases affecting the GI tract. It causes inflammatory injuries in either the gastric or duodenal mucosa, with extension beyond the submucosa into the muscularis mucosa.
- A **peptic ulcer** is a distinct hole in the mucosal lining of the stomach (gastric ulcer) or the first part of the small intestine (duodenal ulcer),a result of corrosive effects of acid and pepsin in the lumen.
- Histologically, peptic ulcer is identified as necrosis of the mucosa which produces lesions equal to or greater than 0.5 cm (1/5").
- The etiologies of this condition are multifactorial and are rarely related simply to excessive acid secretion.
- Helicobacter pylori is one of the most common causes of peptic ulcer. Ulcers can also be caused or worsened by drugs such as aspirin, ibuprofen, and other NSAIDs.

INTRODUCTION:

- Peptic ulcer disease (PUD) is one of the most common diseases affecting the GI tract. It causes inflammatory injuries in either the gastric or duodenal mucosa, with extension beyond the submucosa into the muscularis mucosa. The etiologies of this condition are multifactorial and are rarely related simply to excessive acid secretion. Even though gastric ulcer is a common disease, a diagnosis can be difficult because it has a wide spectrum of clinical presentations, ranging from asymptomatic to vague epigastric pain, nausea, and iron-deficiency anemia to acute life-threatening hemorrhage.

DEFINITION:

- An ulcer is defined as disruption of the mucosal integrity of the stomach and/or duodenum leading to a local defect or excavation due to active inflammation. Ulcers occur within the stomach and/or duodenum and are often chronic in nature.
- A peptic ulcer is a hole in the gut lining of the stomach, duodenum, or esophagus. A peptic ulcer of the stomach is called a gastric ulcer; of the duodenum, a duodenal ulcer; and of the esophagus, an esophageal ulcer.

TYPES OF PEPTIC ULCERS

There are three types of peptic ulcers:

- **Gastric ulcers:** ulcers that develop inside the stomach
- **Esophageal ulcers:** ulcers that develop inside the esophagus
- **Duodenal ulcers:** ulcers that develop in the upper section of the small intestines, called the duodenum

CAUSE OF PEPTIC ULCERS

- Nonsteroidal Antiinflammatory Drugs (NSAIDs)
    - Peptic ulcers occur in 5-20% of longterm NSAID use
- Helicobacter Pylori
    - Duodenal Ulcer: 90-100% Prevalence
    - Gastric Ulcer: 70-90% Prevalence
- Acid Induced Ulcers
    - Idiopathic
    - Zollinger-Ellison Syndrome
- Chronic Disease
    - Stress Ulcers in chronic debilitated conditions
    - Chronic Obstructive Pulmonary Disease
    - Cystic Fibrosis
    - Alpha-1-Antitrypsin Deficiency
    - Systemic Mastocytosis
    - Basophilic Leukemia
    - Chronic Renal Failure
    - Cirrhosis

SYMPTOMS OF PEPTIC ULCER:

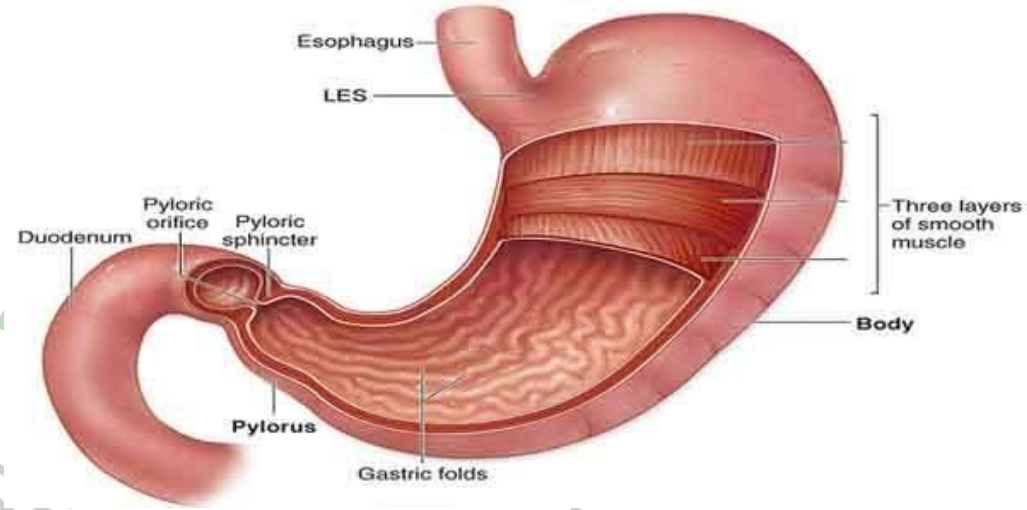
- A burning pain in the gut is the most common symptom. The pain
    - feels like a dull ache
    - comes and goes for a few days or weeks
    - starts 2 to 3 hours after a meal
    - comes in the middle of the night when your stomach is empty
    - usually goes away after you eat

- Other symptoms are
    - losing weight
    - not feeling like eating
    - having pain while eating
    - feeling sick to your stomach
    - vomiting
    - Bleeding from ulcers
- If blood loss is slow, it may not be obvious. People suffering from slow bleeding may feel tired and weak. If the bleeding is heavy, blood will appear in vomit or stool. Stools containing blood appear tarry or black.
- Melena (tarry, foul-smelling feces due to presence of oxidized iron from hemoglobin)

NORMAL ANATOMY AND PHYSIOLOGY OF STOMACH

The stomach is a key part of the gastrointestinal (GI) tract, sitting between the oesophagus and duodenum. Its functions are to mix food with stomach acid and break food down into smaller particles using chemical and mechanical digestion.

The stomach can perform these roles due to the layers of the stomach wall. These are the gastric mucosa, submucosa, muscularis externa and serosa.



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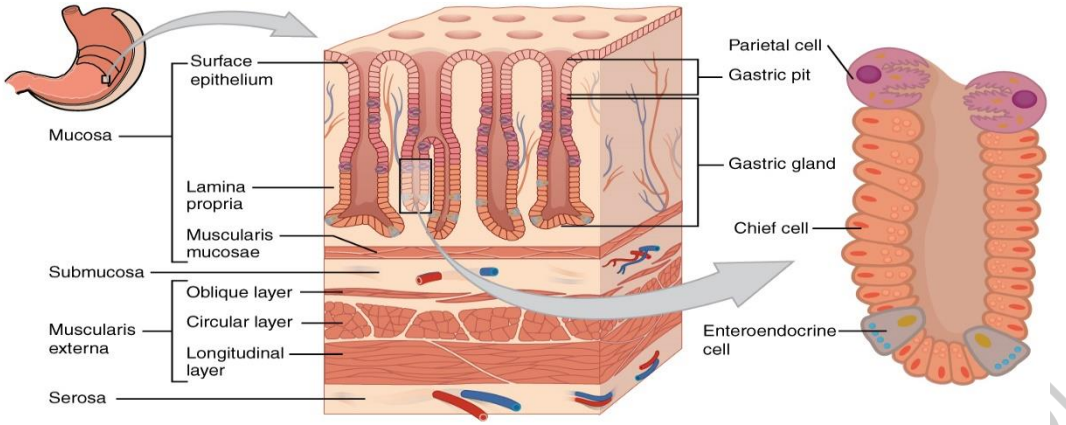
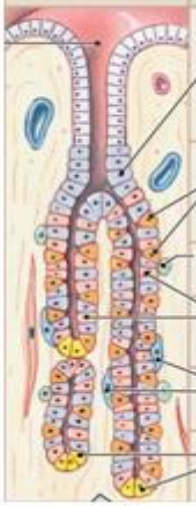




GASTRIC MUCOSA	CELL TYPES	SUBSTANCE SECRETED	STIMULUS FOR RELEASE	FUNCTION OF SECRETION
	Mucous neck cell	Mucus	Tonic secretion; with irritation of mucosa	Physical barrier between lumen and epithelium
		Bicarbonate	Secreted with mucus	Buffers gastric acid to prevent damage to epithelium
	Parietal cells	Gastric acid (HCl)	Acetylcholine, gastrin, histamine	Activates pepsin; kills bacteria
		Intrinsic factor		Complexes with vitamin B_{12} to permit absorption
	Enterochromaffin-like cell	Histamine	Acetylcholine, gastrin	Stimulates gastric acid secretion
	Chief cells	Pepsin(ogen)	Acetylcholine, acid secretion	Digests proteins
		Gastric lipase		Digests fats
	D cells	Somatostatin	Acid in the stomach	Inhibits gastric acid secretion
	G cells	Gastrin	Acetylcholine, peptides, and amino acids	Stimulates gastric acid secretion

Functions of the Stomach

1. Mixes saliva, food, and gastric juice to form chyme.
2. Serves as a reservoir for food before release into small intestine.
3. Secretes gastric juice, which contains
   - ✓ Hcl -kills bacteria and denatures protein
   - ✓ Pepsin-begins the digestion of proteins,
   - ✓ Intrinsic factor-aids absorption of vitamin B
   - ✓ Gastric lipase-aids digestion of triglycerides
4. Secretes gastrin into blood.

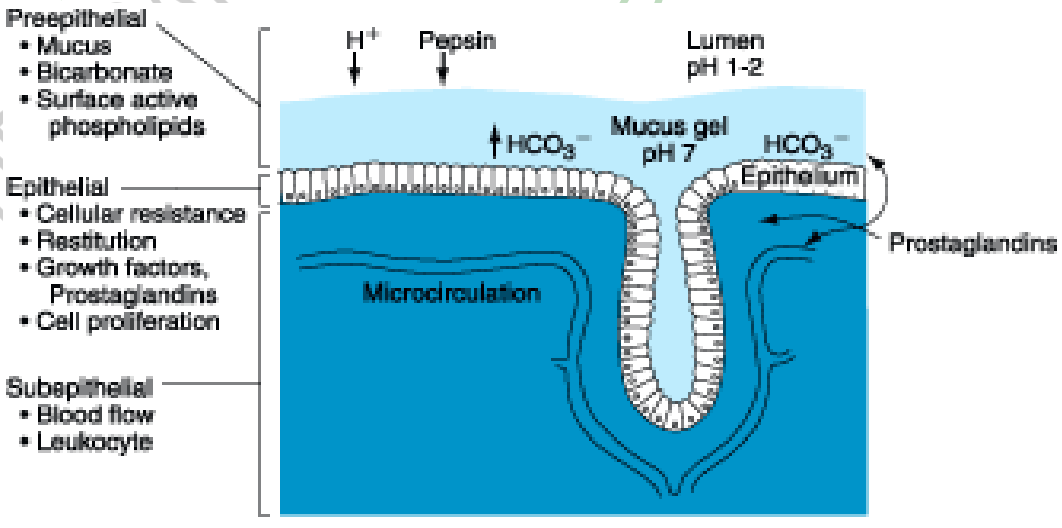
PATHOPHYSIOLOGY OF PEPTIC ULCER

Peptic ulcer disease occurs due to the imbalance between the aggressive factors and local mucosal defensive mechanisms.

Aggressive factors	Local mucosal defensive mechanisms
1.Endogenous factors a. gastric acid secretion b. pepsin secretion **2.Exogenous factors** a.NSAIDs b. alcohol c. caffeine d. H.pylori infection, e.smoking f. occupation, stress and trauma	mucin, prostaglandin, nitric oxide, growth factors, bicarbonate, chemical agents, hydrophobic cell membrane, rapid cell turnover, restitution, blood flow, Angiogenesis

A) MUCOSAL DEFENCE:

The gastric epithelium is under a constant assault by a series of endogenous noxious factors including HCl, pepsinogen/pepsin, and bile salts. In addition, a steady flow of exogenous substances such as medications, alcohol, and bacteria encounter the gastric mucosa. A highly intricate biologic system is in place to provide defense from mucosal injury and to repair any injury that may occur. The mucosal defense system can be envisioned as a three-level barrier, composed of preepithelial, epithelial, and subepithelial elements.



The first line of defense is a mucus-bicarbonate layer, which serves as a physicochemical barrier to multiple molecules including hydrogen ions. Mucus is secreted in a regulated fashion by gastroduodenal surface epithelial cells. It consists primarily of water (95%) and a mixture of lipids and glycoproteins. Mucin is the constituent glycoprotein that, in combination with phospholipids (also secreted by gastric mucous cells), forms a hydrophobic surface with fatty acids that extend into the lumen from the cell membrane. The mucous gel functions as a nonstirred water layer impeding diffusion of ions and molecules such as pepsin. Bicarbonate, secreted by surface epithelial cells of the gastroduodenal mucosa into the mucous gel, forms a pH gradient ranging from 1 to 2 at the gastric luminal surface and reaching 6 to 7 along the epithelial cell surface. Bicarbonate secretion is stimulated by calcium, prostaglandins, cholinergic input, and luminal acidification.

Surface epithelial cells provide the next line of defense through several factors, including mucus production, epithelial cell ionic transporters that maintain intracellular pH and bicarbonate production, and intracellular tight junctions. If the preepithelial barrier were breached, gastric epithelial cells bordering a site of injury can migrate to restore a damaged region (*restitution*). This process occurs independent of cell division and requires uninterrupted blood flow and an alkaline pH in the surrounding environment. Several growth factors including epidermal growth factor (EGF), transforming growth factor (TGF) a, and basic fibroblast growth factor (FGF) modulate the process of restitution. Larger defects that are not effectively repaired by restitution require cell proliferation. Epithelial cell regeneration is regulated by prostaglandins and growth factors such as EGF and TGF-a. In tandem with epithelial cell renewal, formation of new vessels (*angiogenesis*) within the injured microvascular bed occurs. Both FGF and vascular endothelial growth factor (VEGF) are important in regulating angiogenesis in the gastric mucosa.

An elaborate microvascular system within the gastric submucosal layer is the key component of the subepithelial defense/repair system. A rich submucosal circulatory bed provides HCO3-, which neutralizes the acid generated by parietal cell secretion of HCl. Moreover, this microcirculatory bed provides an adequate supply of micronutrients and oxygen while removing toxic metabolic by-products.

Prostaglandins play a central role in gastric epithelial defense/repairs. The gastric mucosa contains abundant levels of prostaglandins. These metabolites of arachidonic acid regulate the release of mucosal bicarbonate and mucus, inhibit parietal cell secretion, and are important in maintaining mucosal blood flow and epithelial cell restitution. Prostaglandins are derived from

esterified arachidonic acid, which is formed from phospholipids (cell membrane) by the action of phospholipase A2. A key enzyme that controls the rate-limiting step in prostaglandin synthesis is cyclooxygenase (COX), which is present in two isoforms (COX-1, COX-2), each having distinct characteristics regarding structure, tissue distribution, and expression. COX-1 is expressed in a host of tissues including the stomach, platelets, kidneys, and endothelial cells. This isoform is expressed in a constitutive manner and plays an important role in maintaining the integrity of renal function, platelet aggregation, and gastrointestinal mucosal integrity. In contrast, the expression of COX-2 is inducible by inflammatory stimuli, and it is expressed in macrophages, leukocytes, fibroblasts, and synovial cells. The beneficial effects of nonsteroidal anti-inflammatory drugs (NSAIDs) on tissue inflammation are due to inhibition of COX-2; the toxicity of these drugs (e.g., gastrointestinal mucosal ulceration and renal dysfunction) is related to inhibition of the COX-1 isoform. The highly COX-2-selective NSAIDs have the potential to provide the beneficial effect of decreasing tissue inflammation while minimizing toxicity in the gastrointestinal tract.

B) AGGRESIVE FACTORS:

1. ENDOGENEOUS SECRETIONS:

A) Physiology of gastric acid secretion

Phases of gastric secretion

Cephalic phase – this results from the thought, sight, smell or taste of food. Neural stimuli arise in the cerebral cortex, appetite centre or hypothalamus and are transmitted through the vagus.

Gastric phase – food entering the stomach elicits long vasovagal reflexes, local enteric reflexes and release of gastrin. This phase accounts for about 70% of total gastric secretion.

Intestinal phase – food mixed with gastric secretions (chyme) entering the proximal small intestine can stimulate modest gastric secretion. Mechanisms include duodenal gastrin release, absorbed amino acids, other hormones and reflexes.

B) Pepsinogen secretion:

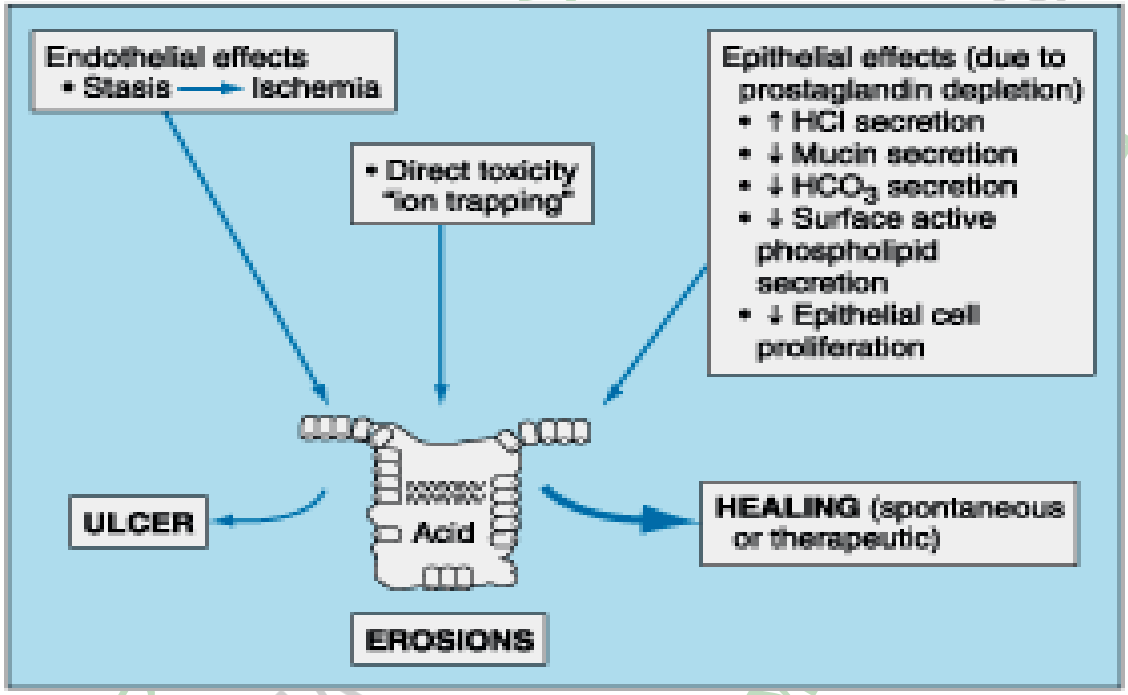
The chief cell, found primarily in the gastric fundus, synthesizes and secretes pepsinogen, the inactive precursor of the proteolytic enzyme pepsin. The acid environment within the stomach leads to cleavage of the inactive precursor to pepsin and provides the low pH (<2.0) required for pepsin activity. Pepsin activity is significantly diminished at a pH of 4 and irreversibly inactivated and denatured at a pH of more than 7. Many of the secretagogues that stimulate

acid secretion also stimulate pepsinogen release. Pepsinogen is released in response to neural stimulation and in the presence of gastric acid.

2. EXOGENEOUS FACTORS:

A) Role of NSAIDs:

1. Prostaglandins play a critical role in maintaining gastroduodenal mucosal integrity and repair. It therefore follows that interruption of prostaglandin synthesis can impair mucosal defense and repair, thus facilitating mucosal injury via a systemic mechanism.



2. Injury to the mucosa also occurs as a result of the topical encounter with NSAIDs. Aspirin and many NSAIDs are weak acids that remain in a nonionized lipophilic form when found within the acid environment of the stomach. Under these conditions, NSAIDs migrate across lipid membranes of epithelial cells, leading to cell injury once trapped intracellularly in an ionized form. Topical NSAIDs can also alter the surface mucous layer, permitting back diffusion of H+ and pepsin, leading to further epithelial cell damage.

B) Role of H. Pylori:

It can cause damage by:

1) Direct mechanisms

2) Inflammatory mechanisms/immune mechanism

3) Alteration of gastric acid and gastric physiology

Gastrin levels may rise

Somatostatin levels may drop (impairing negative feedback)

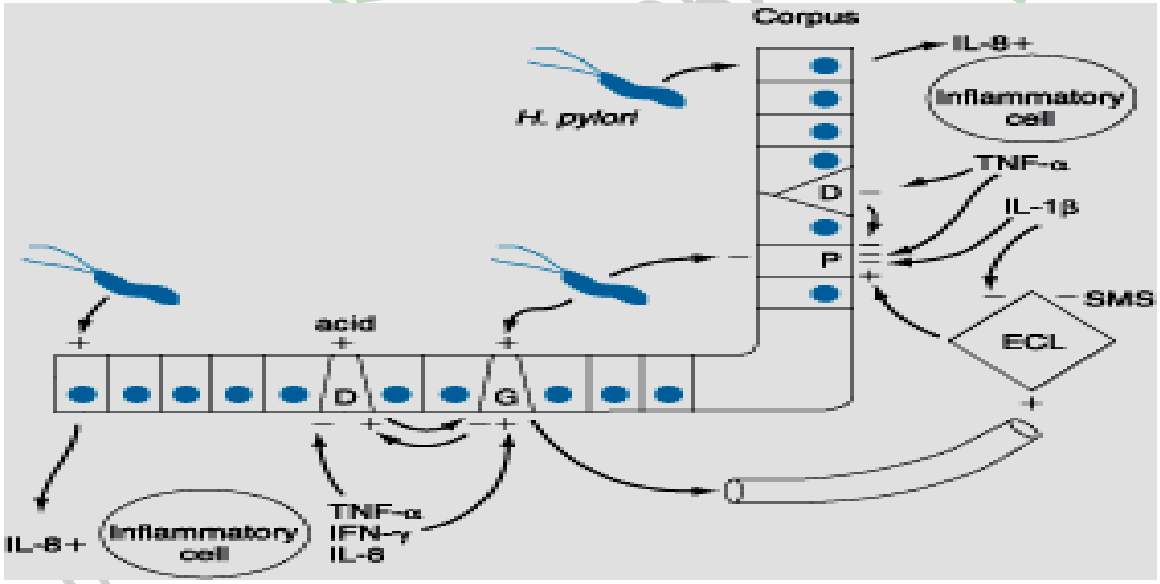
1. *Bacterial factors*: Urease, which allows the bacteria to reside in the acidic stomach, generates NH3, which can damage epithelial cells.

The bacteria produce surface factors that are chemotactic for neutrophils and monocytes, which in turn contribute to epithelial cell injury .

H. pylori makes proteases and phospholipases that break down the glycoprotein lipid complex of the mucous gel, thus reducing the efficacy of this first line of mucosal defense.

H. pylori express adhesins, which facilitate attachment of the bacteria to gastric epithelial cells.

2. *Host factors*:



The host responds to *H. pylori* infection by mounting an inflammatory response, which contributes to gastric epithelial cell damage without providing immunity against infection.

T lymphocytes and plasma cells are components of the chronic inflammatory infiltrate, supporting the involvement of antigen-specific cellular and humoral responses.

A number of cytokines are released from both epithelial and immune modulatory cells in response to *H. pylori* infection including the proinflammatory cytokines tumor necrosis factor (TNF)a, interleukin (IL)1a/b, IL-6, interferon (IFN)g, and granulocyte-macrophage colony stimulating factor.

Several chemokines such as IL-8 and growth-regulated oncogene (GRO) a, involved in neutrophil recruitment/activation have been observed in *H. pylori*-infected mucosa.

C) Cigarettes

* Cigarette smoking impairs ulcer healing and promotes recurrence
* Thought to stimulate gastric acid secretion
* May alter blood flow or gastric motility
* May cause bile reflux or reduce production of prostaglandins

D) Alcohol

Acute ingestion may cause gastritis, gastric mucosal damage, and GI bleeding, however not considered a risk factor for PUD

E) Caffeine

Caffeine acts synergistically with histamine (but not pentagastrin) to stimulate secretion. It also enhances the secretion of pepsin.

F) Stress induced ulcer:

1. psychological stress
2. physiological stress as in
    - Shock
    - Severe Trauma
    - Septicemia
    - Extensive burns (Curling's ulcers in the posterior aspect of the first part of the duodenum).
    - Intracranial lesions (Cushing's ulcers developing from hyperacidity following excessive vagal stimulation).

DIAGNOSIS:

A) Physical Examination:

Epigastric pain described as a burning or gnawing discomfort can be present in both DU and GU. The discomfort is also described as an ill-defined, aching sensation or as hunger pain. The typical pain pattern in DU occurs 90 min to 3 h after a meal and is frequently relieved by antacids or food. Pain that awakes the patient from sleep (between midnight and 3 A.M.) is the most discriminating symptom.

Dyspepsia that becomes constant, is no longer relieved by food or antacids, or radiates to the back may indicate a penetrating ulcer (pancreas). Sudden onset of severe, generalized abdominal pain may indicate perforation. Pain worsening with meals, nausea, and vomiting of

undigested food suggest gastric outlet obstruction. Tarry stools or coffee ground emesis indicate bleeding.

Endoscopy is a common and efficient diagnostic method that allows clinicians to see the GI tract. Not only does it detect more than 90% of all ulcers, but it is also very safe and well tolerated, even by the elderly. Endoscopy can identify H. pylori-positive individuals and differentiate among various types of ulcers. This procedure is performed under sedation and involves inserting an endoscope - a small, flexible tube with a tiny camera on the end - down throat and into the stomach and duodenum. It allows the doctor to see the lining of the esophagus, stomach, and duodenum to check for possible ulcers, inflammation, or food allergies. The endoscope can also be used to perform **tissue tests** to detect the presence of H. pylori.

The endoscopy is often used in conjunction with a test called a **pH probe**, in which a small wire is inserted into the lower part of the esophagus to measure the amount of acid going into that area.

Upper gastrointestinal (upper GI) X-ray. Your doctor may begin with this test, which outlines your esophagus, stomach and duodenum. During the X-ray, you swallow a white, metallic liquid (containing barium) that coats your digestive tract and makes an ulcer more visible. An upper GI X-ray can detect some ulcers, but not all.

B) Lab test:

1. Blood test may show hypochromic anemia.

2. Stool test may detect occult blood if the ulcer is chronic. 'Occult' means that blood or its breakdown products are present in the stool but cannot be seen. Occult bleeding may reach 200 ml per day, cause iron deficiency anemia and signify serious gastrointestinal disease. Any cause of gastrointestinal bleeding may be responsible but the most important is colorectal cancer, particularly carcinoma of the caecum which may have no gastrointestinal symptoms.

C) Other tests for H.Pylori detection:

H pylori infection can be diagnosed using various invasive or noninvasive methods.

- *Invasive tests*
  - Biopsy: Identification of the organism in an endoscopically obtained biopsy specimen remains the criterion standard for diagnosis of *H pylori* infection. Routinely, 2 biopsy samples are obtained from the antrum and the body of the stomach. Gastritis is apparent on routine histological slides stained with hematoxylin and eosin; however, special staining with Giemsa or Warthin-Starry silver stain provides almost 100%

accurate results. False-negative results can occur in patients with active gastrointestinal bleeding and in patients taking antisecretory agents.

- Culture: This is the most specific method; however, it is not routinely performed in clinical practice because of the fastidious nature of the organism.
- Rapid urease test: This test contains urea-impregnated agar and a pH indicator that changes color if urease is present in the biopsy sample. This test is quick and accurate, with a sensitivity and specificity of higher than 90%.

- *Noninvasive tests*
  - Antibody testing: Serological testing is simple, inexpensive, and widely available, although it is of limited value because positive results cannot be used to differentiate between past exposure and active infection.
  - Urea breath testing (UBT): This test is useful for documenting the eradication of *H pylori* after treatment. *H pylori* produce a large amount of urease. Patients ingest carbon-labeled urea (i.e., carbon 13 or carbon 14) that is broken down by urease with release of the labeled carbon. A failure to detect exhaled labeled carbon dioxide confirms the eradication of the bacteria. UBT should be performed 4 weeks after *H pylori* eradication to prevent false-negative results.
  - Stool antigen: This test, approved by the FDA, helps identify bacterial antigens in stool. The test has been shown to be extremely accurate with a sensitivity of 89-98% and with a specificity of greater than 90% in helping to diagnose infection or to document eradication. To assess for eradication of *H pylori*, stool antigen should be checked only after 8 weeks of completion of therapy.

TREATMENT:

A) Life style manifestation:

Diet

Large amounts of food should be avoided because stretching or swelling of the stomach can result in painful symptoms.

- *Fruits and Vegetables.* A diet rich in fiber may cut the risk of developing ulcers in half and speed healing of existing ones. Fiber found in fruits and vegetables is particularly protective; vitamin A contained in many of these foods may increase the benefit.

Milk. Milk actually encourages the production of acid in the stomach, although moderate amounts (two to three cups a day) can be drunk without harm.

Coffee and Carbonated Beverages. Coffee (both caffeinated and decaffeinated), soft drinks, and fruit juices with citric acid increase stomach acid production. Consuming more than three cups of coffee per day may increase susceptibility to *H. pylori* infection.

Spices and Peppers The rule of thumb is to use these substances moderately, and to avoid them if they irritate the stomach.

Garlic. Some studies suggest that high amounts of garlic may have some protective properties against stomach cancer, although a recent study concluded that it offered no benefits against *H. pylori* itself and, in high amounts, causes considerable gastrointestinal distress.

Exercise

Some evidence exists that exercise may help reduce the risk for ulcers in some people. In one 2000 study, exercise was associated with a lower risk for duodenal (but not gastric) ulcers in men. In this study, exercise appeared to have no effect on ulcer development in women.

Addiction: Stop alcohol and stop smoking

Stress Relief

Stress relief programs have not been shown to promote ulcer healing, but they may have other health benefits.

B) Drug treatment:

Drugs Used in the Treatment of Peptic Ulcer Disease

Drug Type/Mechanism	Examples	Dose
Acid-suppressing drugs		
Antacids	Mylanta, Maalox, Tums, Gaviscon	100-140 meq/L 1 and 3 h after meals and hs
H2 receptor antagonists	Cimetidine	800 mg hs
	Ranitidine	300 mg hs
	Famotidine	40 mg hs
	Nizatidine	300 mg hs
Proton pump inhibitors	Omeprazole	20 mg/d
	Lansoprazole	30 mg/d
	Rabeprazole	20 mg/d
	Pantoprazole	40 mg/d
Mucosal protective agents		
Sucralfate	Sucralfate	1 g qid
Prostaglandin analogue	Misoprostol	200 mcg qid
Bismuth-containing compounds	Bismuth subsalicylate (BSS)	See anti-*H. Pylori* regimens (Table 285-7)

Therapy for eradication of H.Pylori:

Regimens Recommended for Eradication of *H. pylori* Infection

Drug	Dose
TRIPLE THERAPY	
1. Bismuth subsalicylate *plus*	2 tablets qid
Metronidazole *plus* Tetracyclin	250 mg qid
	500 mg qid
2. Ranitidine bismuth citrate *plus*	400 mg bid
Tetracycline *plus*	500 mg bid
Clarithromycin *or* metronidazole	500 mg bid
3. Omeprazole (lansoprazole) *plus*	20 mg bid (30 mg bid)
Clarithromycin *plus*	250 or 500 mg bid
Metronidazol *or*	500 mg bid
Amoxicillin	1 g bid
QUADRUPLE THERAPY	
Omeprazole (lansoprazole)	20 mg (30 mg) daily
Bismuth subsalicylate	2 tablets qid
Metronidazole	250 mg qid
Tetracycline	500 mg qid

Choice of a particular regimen will be influenced by several factors including efficacy, patient tolerance, existing antibiotic resistance, and cost of the drugs.

The aim for initial eradication rates should be 85 to 90%. Dual therapy [PPI plus amoxicillin, PPI plus clarithromycin, ranitidine bismuth citrate (Tritec) plus clarithromycin] are not recommended in view of studies demonstrating eradication rates of <80 to 85%.

The combination of bismuth, metronidazole, and tetracycline was the first triple regimen found effective against *H. pylori*. The combination of two antibiotics plus either a PPI, H2 blocker, or bismuth compound has comparable success rates. Addition of acid suppression assists in providing early symptom relief and may enhance bacterial eradication.

Triple therapy, although effective, has several drawbacks, including the potential for poor patient compliance and drug-induced side effects. Compliance is being addressed somewhat by simplifying the regimens so that patients can take the medications twice a day.

Therapy of NSAID-Related Gastric or Duodenal Injury

Recommendations for Treatment of NSAID-Related Mucosal Injury

Clinical Setting	Recommendation
Active ulcer	
NSAID discontinued	H2 receptor antagonist or PPI
NSAID continued	PPI
Prophylactic therapy	Misoprostol PPI Selective COX-2 inhibitor
***H. pylori* infection**	Eradication if active ulcer present or there is a past history of peptic ulcer disease

NOTE: PPI, proton pump inhibitor; COX-2, isoenzyme of cyclooxygenase.

Ideally the injurious agent should be stopped as the first step in the therapy of an active NSAID-induced ulcer. If that is possible, then treatment with one of the acid inhibitory agents (H2 blockers, PPIs) is indicated. Cessation of NSAIDs is not always possible because of the patient's severe underlying disease. Only PPIs can heal GUs or DUs, independent of whether NSAIDs are discontinued.

Prevention of NSAID-induced ulceration can be accomplished by misoprostol (200 ug qid) or a PPI. High-dose H2 blockers (famotidine, 40 mg bid) have also shown some promise. The use of COX-2-selective NSAIDs may also reduce injury to gastric mucosa.

C) Surgery:

Bleeding stops spontaneously in about 70% to 80% of people with bleeding ulcers. For massive bleeding, fluid replacement is essential and blood transfusions may be required.

Endoscopy

The Procedure. Endoscopic treatment of bleeding generally involves the following:

- The physician places an endoscope (a thin, flexible plastic tube) into the patient's mouth and down the esophagus (food pipe) into the stomach.
- The surgeon passes a probe through an endoscopic tube and applies electricity, heat, or small clips to coagulate the blood and stop the bleeding.
- An injection of epinephrine (commonly known as adrenaline) directly into the ulcer increases the effectiveness of endoscopic treatments and may reduce rebleeding. Epinephrine plus a combination of blood clotting factors termed fibrin glue may prove to be even more effective.

The use of proton-pump inhibitors after endoscopy appears to reduce the risk for rebleeding.

A repeat endoscopy performed by experienced doctors may be effective in controlling bleeding about 75% of cases.

Major Abdominal Surgery

Major abdominal surgery for bleeding ulcers is now generally performed only when endoscopy fails or is not appropriate. Certain emergencies may require surgical repair, such as when an ulcer perforates the wall of the stomach or intestine, causing sudden intense pain and life-threatening infection.

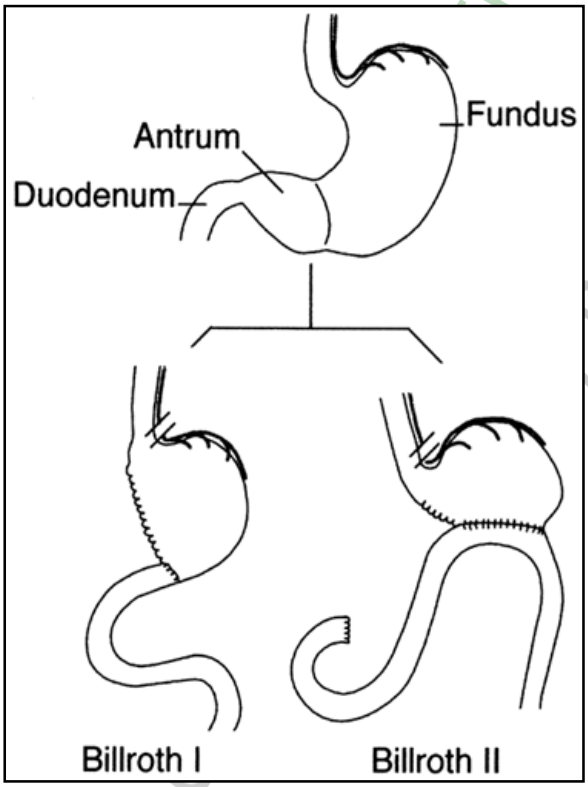
Major Surgical Procedures. There are a number of surgical procedures aimed at long-term relief of ulcer complications.

- Vagotomy cuts the vagus nerve and interrupts messages from the brain that stimulate acid secretion in the stomach. This surgery may impair stomach emptying; a recent variation that cuts only parts of the nerve may reduce this complication.
- Antrectomy removes the lower part of the stomach, which manufactures the hormone responsible for stimulation of digestive juices.
- Pyloroplasty enlarges the opening into the small intestine so that stomach contents can pass into it more easily.
- **Total gastrectomy:**Removing the entire stomach is done only for resistant Zollinger-Ellison syndrome or extensive cancers.
- **Billroth I and II**

After removing a piece of the stomach, the remainder must be reattached to the rest of the bowel. Simply joining the upper stomach back to the duodenum is called a Billroth I or gastroduodenostomy. It is sometimes better to attach the stomach with another piece of bowel (the jejunum), creating a "y" with the bile drainage and the duodenum forming the second branch of the "y." This part of the procedure is called a gastrojejunostomy. A gastroenterostomy is a more general term for connecting the stomach with any piece of bowel.

A selective **vagotomy** can be done alone. A complete vagotomy requires either a pyloroplasty or antrectomy. An antrectomy must be reconnected with either a Billroth I or a Billroth II.

Some of these procedures are now being done through a laparoscope.



Risks

All of these procedures carry risks, generally in proportion to their benefits. The more extensive surgeries such as vagotomy and antrectomy with Billroth II reconnection have the highest success rate and the highest complication rate.

Complications include:

- Diarrhea after a meal
- Dumping syndrome occurring after a meal and characterized by sweating, abdominal **pain**, vomiting, light-headedness, and diarrhea
- Hypoglycemia after a meal
- Alkaline reflux **gastritis** marked by abdominal pain, vomiting of bile, diminished appetite, and iron-deficiency anemia
- Recurrence of an ulcer
- Malabsorption of necessary nutrients, especially iron, in patients who have had all or part of their stomachs removed.

RELATED DISEASES:

ZOLLINGER-ELLISON SYNDROME

Severe peptic ulcer diathesis secondary to gastric acid hypersecretion due to unregulated gastrin release from a non-b cell endocrine tumor (gastrinoma) defines the components of the ZES.

MENETRIER'S DISEASE

Ménétrier's disease causes giant folds of tissue to grow in the wall of the stomach. The tissue may be inflamed and may contain ulcers. The disease also causes glands in the stomach to waste away and causes the body to lose fluid containing a protein called albumin. Ménétrier's disease increases a person's risk of stomach cancer.

GASTRITIS:

Chronic or acute inflammation of the stomach, especially of the mucous membrane of the stomach. Gastritis commonly refers to inflammation of the lining of the stomach, but the term is often used to cover a variety of symptoms resulting from stomach lining inflammation and symptoms of burning or discomfort.

DIFFERENCE BETWEEN GASTRIC ULCER AND DUODENAL ULCER:

1. LOCATION:

a. DU almost always develops in the duodenal bulb (the first few cm of the duodenum). A few, however, arise between the bulb and ampulla.

b. GU form most commonly in the antrum or at the atral fundal junction.

2. PATIENT AGE:

a. DU appears in people between ages 20-50.

b. GU occurs between 45 and 55.

Note: 80% of peptic ulcers are duodenal, other are gastric.

3. SYMPTOMS:

Other symptoms remain same except the location of pain.

a. In DU pain is usually restricted to small, midepigastric area. Pain may radiate in coastal margins into the back or the right shoulder. Pain from DU frequently awakens the patient between midnight and 2 A...M.; it is never present before breakfast.

b. GU pain is less localized. It may be referred to the left sub-coastal region. Gastric ulcer rarely produces nocturnal pain.

4. ROLE OF H.PYLORI.

a. 90% of DU patients are affected with it.

b. 70% of GU patients are affected with it.

5. PHYSIOLOGICAL DEFECTS:

a. In DU patients:

1. Increased capacity of gastric acid secretion:
    a. Some DU patients have up to twice the normal number of parietal cells.
    b. Nearly 70% of DU has elevated levels of pepsinogen I and a corresponding increase in pepsin secreting capacity.
2. Increased parietal cell responsiveness to gastrin.
3. Above normal postprandial gastric secretion.
4. Defective inhibition of gastrin release at low pH, possibly leading to failure to suppress postprandial acid secretion.
5. Above normal rate of gastric emptying, resulting in delivery of a greater acid load to duodenum.

b. In GU patients:

1. Deficient mucosal resistance, direct mucosal injury, or both
2. Elevated serum gastrin levels (in acid hypersecretors)
3. Decreased pyloric pressure at rest and in response to acid or fat in the duodenum.
4. Delayed gastric emptying.
5. Increased reflux of bile and other duodenal contents.
6. Subnormal mucosal levels of prostaglandins (this level normalize when ulcer heals).

COMPLICATIONS

Left untreated, peptic ulcers can result in:

- Internal bleeding
- A hole (perforation) in your stomach wall
- Obstruction
- Gastric cancer