

### 3: STOMACH

#### PEPTIC ULCER DISEASE

**Definition:** Excavation of gastric/duodenal mucosa through muscularis mucosa. DU > GU in some regions (India).

#### Etiopathogenesis:

- **H. pylori:** Gram-negative spiral, urease-producing; DU 90–95%, GU 60–65%
- **Acid & Pepsin:** Hypersecretion key in DU (“No acid – No ulcer”)
- **Drugs:** NSAIDs, steroids (COX-1 inhibition → mucosal damage)
- **Genetic/Host:** Blood group O+, smoking, alcohol
- **Hypergastrinaemia:** Zollinger–Ellison syndrome → refractory ulcers
- **Stress ulcers:** Curling (burns), Cushing (head injury)

#### Clinical Features:

- **DU:** Epigastric hunger pain, nocturnal, relieved by food, periodic
- **GU:** Pain postprandial, anorexia, weight loss, less periodic, vomiting relieves
- **General:** Epigastric tenderness, haematemesis, melaena, anaemia

#### Investigations:

Test	Use
Upper GI Endoscopy	Gold standard, biopsy for H. pylori/malignancy
Rapid urease/C13/C14 breath	Detect H. pylori
Barium meal	Niche, notch, duodenal cap deformity
Pentagastrin PAO	High in DU/ZES

#### Management:

Type	Details
Medical	PPIs (Omeprazole, Pantoprazole), H2 blockers (Ranitidine, Famotidine), Sucralfate, H. pylori triple therapy (PPI + Clarithromycin + Amoxicillin/Metronidazole 7–14d)
Surgical	DU: HSV, truncal vagotomy + gastrojejunostomy; GU: distal gastrectomy (Billroth I/II)

#### Complications:

Type	Key Points
Haemorrhage	DU: gastroduodenal artery; GU: left gastric artery; haematemesis/melaena; treat with resuscitation + endoscopic adrenaline/coagulation; surgery if failed
Perforation	5% cases; anterior DU common; board-like rigidity; X-ray: gas under diaphragm; Graham's patch repair; Valentino syndrome: retroperitoneal leak mimics appendicitis
Pyloric Stenosis	Chronic scarring → gastric outlet obstruction; projectile vomiting; hypokalaemic, hypochloraemic metabolic alkalosis; treat: electrolyte correction + truncal vagotomy with gastrojejunostomy
Structural	Hour-glass contracture (lesser curve); Tea-pot deformity (hand-bag stomach)
Malignancy	Gastric ulcers: 5–10% risk; always biopsy

## PERFORATED PEPTIC ULCER

**Definition:** Full-thickness erosion of gastric or duodenal wall → spillage of contents → peritonitis; occurs in ~5% of PUD cases.

### Etiology & Risk Factors:

- Anterior duodenal ulcers most common; posterior ulcers → bleeding/retroperitoneal perforation
- *H. pylori* infection (80%), NSAIDs, smoking, alcohol
- Wound classified as "Dirty" → >60% infection risk

### Pathophysiology:

- Acidic gastric contents → chemical peritonitis → peritoneal fluid neutralization → diffuse bacterial peritonitis
- Retroperitoneal perforation → Valentino syndrome (mimics appendicitis)

### Clinical Features:

- Sudden, severe epigastric pain, vomiting, tachycardia, sweating
- Board-like rigidity, guarding, rebound tenderness (Blumberg sign)

- Pain may transiently subside (~6 h)

**Investigations:**

Modality	Findings
X-ray erect abdomen/chest	Gas under diaphragm (~70%)
CT scan	Detects minimal air, wall edema, fluid collection
Blood tests	Leukocytosis, mild ↑ serum amylase

**Management:**

- **Resuscitation:** NPO, NG aspiration, IV fluids, broad-spectrum IV antibiotics (aerobic + anaerobic)
- **Surgery:**
  - Graham's omental patch (standard)
  - Cellan-Jones (pedicled omental patch)
  - Kocherisation for posterior duodenal ulcers
  - Laparoscopic omental patch increasingly used
- **Gastric ulcers:** Mandatory edge biopsy
- **Post-op:** H. pylori eradication (triple therapy) + PPIs for ulcer healing

## Highly Selective Vagotomy (HSV)

**Definition:**

- Surgical denervation of acid-secreting stomach (body & fundus) for intractable duodenal ulcers

**Procedure & Mechanism:**

Step	Details
Selective Denervation	Ligation of vagal branches along lesser curvature
Esophageal Clearance	Distal 6 cm cleared of nerve fibres
Antral Preservation	Nerve of Latarjet ("Crow's foot") intact
Limit	Stop ~7 cm proximal to pylorus; preserves antral pump

**Advantages:**

Benefit	Explanation
Natural Gastric Emptying	No pyloroplasty/gastrojejunostomy needed
Low Morbidity	Mortality ~0.2%, morbidity ~0.5%
Reduced Complications	Minimal dumping, diarrhea, nutritional deficits

#### Indications:

- Intractable duodenal ulcers, Type II/III gastric ulcers (with excision)

#### Disadvantages:

- Higher ulcer recurrence (10–15%/10 yrs), risk of lesser curve ischemia

#### Comparison:

- Preserves motility vs truncal vagotomy, avoids routine drainage procedures

## CARCINOMA STOMACH

#### Definition:

Malignant epithelial tumour of the stomach;  
common in males, Japan, South India;  
often locoregional with early nodal involvement.

#### Premalignant Conditions:

- Chronic atrophic gastritis (intestinal type)
- Intestinal metaplasia (risk proportional to extent; *H. pylori* eradication crucial)
- Gastric adenomatous polyps >2 cm (25% malignant potential)
- Pernicious anaemia (6× risk)
- Post-gastric surgery (remnant cancer ~15 years post-Billroth II or vagotomy)
- Menetrier's disease (giant mucosal folds → malignancy)

#### Etiology:

- **Diet:** Nitrosamines, smoked foods, red meat, high salt ↑ risk; fruits, vitamin C protective
- **Infections:** *H. pylori* major carcinogen (except OG junction)
- **Genetic:** 10% familial; Blood Group A; e-cadherin mutations → hereditary diffuse gastric cancer
- **Lifestyle:** Smoking, alcohol

#### Pathology:

- **Lauren Classification:** Intestinal (favourable, *H. pylori*), Diffuse (poor, signet-ring cells)
- **Early GC (Japanese):** T1, protruded (I), superficial (II), excavated (III)
- **Advanced GC (Bormann):** Polypoid (I) → Linitis plastica (IV, leather-bottle)
- **Common site:** Prepyloric/pyloric 65%

#### Clinical Features:

- **Early:** Dyspepsia, epigastric discomfort
- **Advanced:** Weight loss, anorexia, LOADS (Lump, Obstruction, Anaemia, Dyspepsia, Silent)

- Metastases:
  - Virchow's node (left supraclavicular)
  - Sister Mary Joseph nodule (periumbilical)
  - Krukenberg tumour (bilateral ovaries)
  - Blumer's shelf (rectovesical/Douglas pouch)

## SPREAD OF CA STOMACH

### a. Direct Spread:

- Horizontal: *submucosa*; vertical: *through gastric layers*
- Invades **pancreas, colon, liver, mesocolon**
- Diffuse type → **Linitis Plastica**

### b. Lymphatic Spread:

Subpyloric, gastric, pancreaticoduodenal, celiac	Regional spread
Virchow's node (L supraclavicular)	Advanced sign
Irish node (L axillary)	Rare distant nodal

- **D1:** stations 1–6; **D2:** stations 1–11 along celiac/splenic vessels

### c. Haematogenous Spread:

- Common: **liver** (multiple, umbilicated nodules)
- Other: **lungs, bones, adrenals**
- Intestinal type: *more blood-borne*; diffuse type: *lymphatic*

### d. Transperitoneal Spread:

Deposit	Site
Krukenberg tumour	Bilateral ovaries
<b>Sister Mary Joseph</b>	<ul style="list-style-type: none"> <li>• Palpable periumbilical metastasis; poor prognosis</li> <li>• Common primaries: stomach &gt; ovary &gt; colon &gt; uterus &gt; breast</li> <li>• Spread: lymphatics of round ligament/ligamentum teres</li> </ul>
Blumer's shelf	Rectovesical/Douglas pouch

- Mechanism: *seeding or retrograde lymphatics* → **malignant ascites**

### Staging (AJCC/UICC TNM):

T	Depth
T1	Mucosa/submucosa
T2	Muscularis propria

T3	Subserosa
T4	Serosa/adjacent structures

N	Regional nodes involved
N1	1-2
N2	3-6
N3a	7-15
N3b	≥16

**Surgical Management:**

Procedure	Indication/Details
Subtotal gastrectomy	Distal/pyloric tumours; remove 60-75%
Total gastrectomy	Proximal/body tumours, Linitis plastica; Roux-en-Y oesophagojejunostomy
Nodal dissection	D2 preferred over D1 for major vessels
Palliative	Partial gastrectomy, anterior gastrojejunostomy, Devine's exclusion for obstruction/bleeding

**Key Points:**

RO resection is curative;

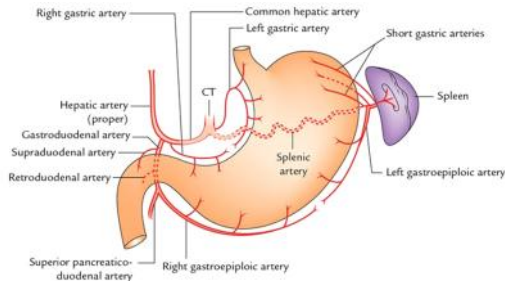
early detection improves survival.

Risk modification includes H. pylori eradication, diet, and surveillance of premalignant conditions.

## BLOOD SUPPLY AND LYMPHATICS OF STOMACH

**Arterial Supply:** Rich submucosal anastomoses → resilience;  
main arteries:

Artery	Origin & Territory
Left Gastric	Coeliac axis; lesser curvature; Type IV ulcers, Mallory-Weiss
Right Gastric	Common hepatic; lesser curvature
Left Gastroepiploic	Splenic; greater curvature
Right Gastroepiploic	Gastroduodenal; greater curvature
Short Gastric	Splenic; fundus

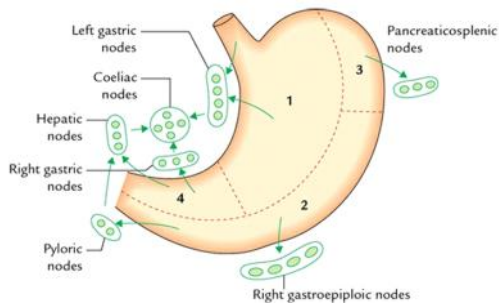


**Venous Drainage:** Mirrors arteries; portal system predominates

- Left/Right Gastric → portal vein
- Right Gastroepiploic → SMV
- Left Gastroepiploic & Short Gastric → splenic vein

**Lymphatic Drainage:** Longitudinal → early cancer spread

Region	Nodes
Proximal stomach	Left gastric, splenic, superior pancreatic
Antrum/pylorus	Right gastric, right gastroepiploic, subpyloric
OG junction	Communicates with esophageal nodes



- Efferent: Suprapyloric → para-aortic → Virchow's node; subpyloric → SM nodes
- Surgical: D1 (perigastric), D2 (along major trunks) for curative clearance

## GASTROSCOPY

**Definition:**

- Visualises oesophagus, stomach, duodenum
- Diagnostic + therapeutic; usually outpatient

**Indications:**

**Diagnostic**

PUD, GERD, Barrett's oesophagus

**Therapeutic**

Haemorrhage control (banding, clips, cautery)

Gastric/oesophageal malignancy      Polypectomy, EMR, ESD  
 Upper GI bleeding (variceal/non-variceal)      Stricture dilatation, PEG placement  
 H. pylori detection  
 Gastritis, polyps, GAVE, Dieulafoy lesion

**Procedure:**

- **Prep:** 8h fasting; lignocaine throat spray
- **Scope:** Flexible/video gastroscopy; retroflex "U/J" manoeuvre for fundus
- **Technique:** Air insufflation; gentle passage; endoscopic biopsy if needed

**Complications:**

- Bleeding, aspiration, perforation (cricopharyngeus common)

**Advanced Modalities:**

- **EUS:** depth + nodes
- **Chromoendoscopy:** stains detect metaplasia/malignancy
- **Third space endoscopy (POEM):** submucosal tunnelling for achalasia

**HELICOBACTER PYLORI - Gram negative bacteria**

**Definition:**

- Gram-negative, spiral, flagellated bacterium
- Transmitted faeco-oral, global prevalence 80-90%

**Pathogenesis:**

- **Urease:** Hydrolyses urea → ammonia; creates alkaline microenvironment
- **Gastrin feedback:** Ammonia ↑ gastrin → ↑ acid secretion
- **Toxins:** CagA, VacA → mucosal injury
- **Barrier disruption:** Proteases, lipases, endopeptidases → mucus breakdown
- **Metabolic toxicity:** Dehydrogenase converts alcohol → aldehydes, injuring mucosa

**Clinical Significance:**

Condition	Role of H. pylori
Duodenal/Gastric Ulcers	90-95% DU, 60-65% GU
Gastritis	Type B, mainly antrum

Gastric Cancer	Initiates Correa cycle: atrophic gastritis → metaplasia → dysplasia → adenocarcinoma
MALToma	Strongly associated
GERD/Oesophageal Adenocarcinoma	Slightly protective

**Diagnosis:**

- **Non-invasive:** Urea breath test (C13/C14), CLO test
- **Invasive:** Endoscopic biopsy; Warthin-Starry, Giemsa stains
- **Serology:** IgG ELISA (limited active infection detection)

**Management:**

Therapy	Components
Triple Therapy (7–14d)	PPI (Omeprazole/Lansoprazole/Pantoprazole) + Clarithromycin + Amoxicillin or Metronidazole/Tinidazole
Quadruple Therapy	PPI + Bismuth + Tetracycline + Metronidazole

- **Follow-up:** PPI 6–12 weeks; confirm eradication via gastroscopy or breath test

## CONGENITAL HYPERTROPHIC PYLORIC STENOSIS

**Definition:** Hypertrophy of pyloric circular muscle → gastric outlet obstruction (GOO) in neonates; most common cause of neonatal bowel obstruction.

**Etiology & Risk Factors:**

- First-born males; familial/autosomal dominant (chromosome 12q)
- Syndromes: Apert, Cornelia de Lange
- Environmental: Early erythromycin/azithromycin exposure, low NO synthase

**Pathophysiology:**

- Thickened circular pyloric muscle → narrowed channel → delayed gastric emptying
- Obstruction → vomiting → dehydration, weight loss, failure to thrive

**Clinical Features:**

- Onset: 3–6 weeks
- Projectile, non-bilious vomiting
- Visible gastric peristalsis (VGP) left→right

- Palpable “olive-shaped” mass in right hypochondrium

**Metabolic Abnormalities:**

- Hypochloreaemic, hyponatraemic, hypokalaemic metabolic alkalosis
- Paradoxical aciduria via RAS activation

**Investigations:**

Modality	Key Findings
USG (IOC)	Pyloric thickness $\geq 4$ mm, length $>14$ mm; "Doughnut," "Cervix," "Target" signs
X-ray	Single-bubble stomach; little/no distal gas
Contrast Study	String sign, Mushroom sign, Double tract sign

**Differential:** Duodenal atresia – bilious vomiting since birth, often with Down’s syndrome

**Management:**

1. **Stabilisation:** Correct dehydration/metabolic imbalance; IV N/2 saline + dextrose  $\pm$  KCl
2. **Surgery:** Ramstedt’s pyloromyotomy – longitudinal incision through muscle to submucosa; mucosa intact
  - Open or laparoscopic; feeds resume 4–6 h post-op if mucosa intact

**TRICHOBEZOAR**

**Definition:**

- Mass of ingested hair in stomach (“hairball”)

**Etiology & Pathogenesis:**

- **Trichophagy:** Compulsive hair eating
- **Psychiatric link:** Behavioral disorder; psychiatric referral mandatory

**Clinical Features:**

Feature	Details
Gastric Outlet Obstruction	Mass blocks pylorus, causing backup
Symptoms	Vomiting, epigastric pain, early satiety

Rapunzel Syndrome

Tail of hair extends into duodenum/jejunum

**Management:**

Approach	Indication
Endoscopic Removal	Small bezoars
Surgical Gastrotomy	Large bezoars; complete extraction

- Post-removal psychiatric therapy essential to prevent recurrence

## GASTROINTESTINAL STROMAL TUMORS – GIST

**Definition & Origin:**

- Most common mesenchymal GI tumour (0.2% of GI neoplasms)
- Arise from *interstitial cells of Cajal* (intestinal pacemakers)

**Epidemiology & Sites:**

Site	Frequency
Stomach (fundus)	50–60%
Small bowel	25%
Rectum	15%
Colon	10%

- Age: 50–70 yrs; sex: equal

**Genetics & Markers:**

- c-KIT (CD117) mutation in >95%
- Other markers: CD34 70–80%, DOG-1 sensitive & specific
- KIT exon 11: most common; exon 9: aggressive, poor prognosis
- PDGFRA mutations also seen

**Clinical Features:**

- Extraluminal mass → haemorrhage, abdominal pain, palpable mass
- Large tumours → obstruction, intussusception, acute perforation
- Syndromic: *Carney Triad* (GIST + paraganglioma + pulmonary chondroma), *Carney-Stratakis Syndrome* (GIST + paraganglioma)

**Investigations:**

- *CECT: tumour size, extent, metastases*
- *PET-CT: treatment monitoring, recurrence*
- *EUS/FNAC: histological confirmation*

**Risk & Prognosis:**

<i>Risk Factors</i>	<i>Notes</i>
<i>Tumour &gt;10 cm</i>	<i>High-risk</i>
<i>Mitotic rate &gt;15/30 HPF</i>	<i>Aggressive</i>
<i>Liver metastases</i>	<i>Poor prognosis</i>
<i>KIT exon 9</i>	<i>Worse outcome</i>

**Management:**

- *Surgery: R0 resection, wedge excision for gastric tumours; avoid capsule rupture; lymphadenectomy rarely needed*
- *Medical: Imatinib for unresectable, metastatic, or high-risk; adjuvant/neoadjuvant 6–12 months; resistant cases → Sunitinib, Regorafenib, Sorafenib*