POSTGRADUATE RADIOLOGY

An Exam Preparatory Manual

(A Study Guide For MD/DM Examination)





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JAYPEE

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CHAPTER 10

Gastrointestinal Radiology

QUESTIONS AND ANSWERS

Q1. Discuss imaging of carcinoma rectum.

Answer: Carcinoma rectum is a common malignancy of the gastrointestinal tract. Imaging plays a pivotal role in **diagnosis, local and distant staging (TNM), surgical planning**, and **treatment response assessment**.

Imaging Modalities

1. MRI Pelvis
- **Modality of choice** for **local staging** (T and N).
- Provides high-resolution **T2-weighted images** in multiple planes.
- Useful for assessing:
  - Tumor depth (T-stage)
  - Mesorectal fascia (CRM involvement)
  - Lymph nodes (N-stage)
  - Extramural vascular invasion (EMVI)

2. Endorectal Ultrasound (ERUS)
- Excellent for early-stage tumors (T1-T2).
- High resolution of rectal wall layers.
- **Limitations:** Poor for higher T-stage, operator dependent.

3. CT Chest, Abdomen, and Pelvis
- Useful for detecting distant metastases (M-stage)—lungs, liver, and peritoneum.
- Less accurate than MRI for local T staging.

4. PET-CT
- Indicated for suspected metastatic or recurrent disease.
- Detects metabolically active lesions not seen on CT/MRI.

TNM Staging (AJCC, 8th Edition)

T—Tumor

Stage	*Description*	*Imaging findings*
T1	Tumor invades submucosa	ERUS or high-resolution MRI
T2	Tumor invades muscularis propria	Thickening of muscle layer
T3	Tumor invades through muscularis into perirectal fat	Spiculated tumor margin extending into fat (MRI)
T4a	Tumor invades visceral peritoneum	MRI shows invasion of serosal surfaces
T4b	Tumor invades adjacent organs	Blurring/loss of fat planes with adjacent organs (MRI/CT)

N—Nodes

Stage	*Description*	*Imaging criteria*
N0	No regional lymph node metastasis	No abnormal nodes
N1	1–3 regional nodes	Size >5 mm, round, irregular border, and heterogeneous signal on MRI
N2	≥4 regional nodes	Multiple abnormal nodes in mesorectum/pelvis

M—Metastasis

Stage	*Description*	*Imaging*
M0	No distant metastasis	Normal CT chest/abdomen
M1a	Metastasis to one organ (e.g., liver and lung)	CT and PET-CT shows organ-specific lesions
M1b	Metastases in more than one organ	
M1c	Peritoneal metastasis with/without other organs	

Role of Imaging in Treatment Planning
- Determines eligibility for **neoadjuvant chemoradiation** (T3/T4 or N+).
- Identifies **CRM involvement**—predicts local recurrence risk.
- Assesses **response to therapy** and suitability for **surgical resection**.
- Guides **surveillance** post-treatment.

Sample MRI Reporting Terms
- Tumor location (distance from anal verge)
- T stage
- Nodal status
- CRM status (positive if tumor or node within 1 mm)
- EMVI (positive/negative)
- Presence of fistula, obstruction, or adjacent organ invasion

Conclusion
Imaging, particularly **MRI**, is indispensable in the staging of rectal cancer. Accurate TNM staging directly impacts **prognosis** and **treatment strategy**, making radiology central to patient management.

Q2. Describe carcinoid of small intestine.

Answer:
- Carcinoid tumors are **well-differentiated neuroendocrine tumors (NETs)** arising from **enterochromaffin cells**.
- Most common site in the **GI tract**: **Terminal ileum**.
- Typically, slow growing but may metastasize early, especially to the **liver**.

Pathology
- Origin: **Kulchitsky cells** of crypts.
- May produce hormones like **serotonin**, leading to **carcinoid syndrome** (rare unless liver metastasis present).
- Associated with **fibrosis and desmoplastic reaction** in mesentery.

Clinical Features
- Often **asymptomatic**; found incidentally.
- May present with:
  - Abdominal pain
  - Intermittent obstruction (due to mesenteric fibrosis)
  - GI bleeding
  - **Carcinoid syndrome** (flushing, diarrhea, wheezing, and right heart valvopathy) in metastatic disease.

Imaging Findings

1. CT Abdomen
- **Primary tumor** often small, enhancing submucosal nodule in distal ileum.
- **Classic finding**: Soft tissue mesenteric mass with **calcification** and **radiating fibrotic strands** causing tethering of small bowel loops.
- Liver metastases: **Hypervascular** on arterial phase.

2. MRI
- Superior for **liver metastases**.
- Lesions appear **T1 hypointense**, **T2 hyperintense**, and show **strong postcontrast enhancement**.

3. Somatostatin Receptor Imaging (SRI)
- **Ga-68 DOTATATE PET-CT** (modern standard): High sensitivity and specificity for detecting primary and metastatic NETs.
- **Octreoscan (Indium-111 pentetreotide)**: Older technique, still used where PET not available.

4. Ultrasound
- Limited for primary tumor.
- Can detect **hyperechoic liver metastases** and **mesenteric mass**.

5. Barium Studies (less used now)
- May show **kinking**, **narrowing**, or **apple-core lesion** in the ileum.
- May see spiculated mesenteric mass causing bowel tethering.

Biochemical Markers
- **Serum chromogranin A—**elevated in most NETs.
- **24-hour urinary 5-HIAA—**elevated in carcinoid syndrome.

Differential Diagnosis
- Lymphoma
- Adenocarcinoma
- Gastrointestinal stromal tumor (GIST)
- Tuberculosis (for mesenteric mass)

Role of Imaging
- Localizes primary tumor.
- Assesses for mesenteric involvement and fibrosis.
- Detects **liver and nodal metastases**.
- Guides **biopsy** and monitor **treatment response**.

Conclusion
Small intestinal carcinoids are subtle but have characteristic imaging findings, especially the **enhancing ileal lesion with fibrotic mesenteric mass**. **CT, MRI, and Ga-68 PET-CT** play vital roles in diagnosis, staging, and surveillance.

Q3. Describe radiology of appendix.

Answer: The appendix is a **blind-ending tubular structure** arising from the **cecum**, usually posteromedially. Its imaging is essential in diagnosing **appendicitis**, tumors, and congenital anomalies.

Normal Appendix on Imaging
- **Length**: Up to 6–10 cm
- **Diameter**: ≤6 mm
- **Wall thickness**: <2 mm
- **Compressible** on US
- **No periappendiceal fat stranding or fluid**

Imaging Modalities

1. Ultrasound (US)

- **Modality of choice in children and pregnancy**
- **Technique**: Graded compression
- **Findings in appendicitis**:
  - Noncompressible, blind-ending tubular structure >6 mm in diameter
  - Target sign on transverse view
  - Increased echogenicity of surrounding fat
  - Appendicolith (hyperechoic with shadowing)
  - Free fluid or abscess in complicated cases

2. CT Abdomen (Contrast-enhanced)

- **Gold standard in adults** for suspected appendicitis
- **Axial, coronal, and sagittal planes**
- **Findings:**
  - Enlarged appendix (>6 mm)
  - Wall thickening and enhancement
  - Periappendiceal fat stranding
  - Appendicolith (high-attenuation focus)
  - Complications: Perforation, abscess, and phlegmon

3. MRI Abdomen

- Used in **pregnant women** or patients allergic to contrast
- T2-weighted and post-contrast T1 sequences
- Findings similar to CT:
  - Enlarged, fluid-filled appendix
  - Wall enhancement
  - Surrounding inflammation

4. Barium Enema (Rarely used now)

- Nonfilling of appendix or cutoff at base may suggest appendicitis.
- Obsolete due to poor sensitivity and invasiveness

Other Pathologies and Imaging

Condition	*Imaging findings*
Appendicitis	As above; most common indication
Appendiceal mucocele	Cystic, tubular, low-attenuation lesion; calcified wall on CT
Carcinoid tumor	Small, enhancing mass; may be an incidental finding
Adenocarcinoma	Irregular mass; often indistinguishable from complicated appendicitis
Appendicular abscess	Fluid collection with rim enhancement
Stump appendicitis	Residual appendix with inflammation after incomplete appendectomy
Intussusception	Appendix may be lead point; US or CT may show "target" or "sausage-shaped" mass
Appendicolith	High-density calcified body on CT or echogenic on US

Nuclear Medicine (Rare Use)

- **Tc-99m HMPAO WBC scan** may show increased uptake in right lower quadrant.
- Limited role due to availability of high-resolution CT/MRI.

Summary Table

Modality	*Best use*
Ultrasound	First-line in children and pregnancy
CT abdomen	Gold standard in adults
MRI abdomen	Preferred in pregnancy if US inconclusive
Barium enema	Obsolete
Nuclear medicine	Rarely used

Conclusion

Radiology of the appendix revolves around diagnosing **acute appendicitis**, its **complications**, and identifying **appendiceal neoplasms**. **Ultrasound, CT, and MRI** are the key modalities depending on clinical scenario and patient profile.

Q4. Discuss pseudomyxoma peritonei (PMP).

Answer:

- **Pseudomyxoma peritonei** is a rare clinical condition characterized by the **accumulation of mucinous ascites in the peritoneal cavity**, often due to **rupture of a mucin-producing neoplasm**.
- Often referred to as "**jelly belly**" due to the gelatinous nature of the ascitic fluid.
- Most commonly originates from:
  - **Appendiceal mucinous neoplasm (most common)**
  - Ovarian mucinous tumors
  - Colorectal or pancreatic tumors (rare)

Pathology

- Classified into three histologic types:
  1. **Disseminated peritoneal adenomucinosis (DPAM)—**low-grade
  2. **Peritoneal mucinous carcinomatosis (PMCA)—**high grade
  3. **Intermediate/hybrid types**
- Disease spreads along **peritoneal surfaces** by redistribution rather than invasion:
  - **Pelvis (pouch of Douglas)**
  - **Paracolic gutters**
  - **Omentum ("omental caking")**
  - **Diaphragmatic surfaces**

Radiological Imaging

1. CT Abdomen and Pelvis (Modality of choice)

Classic Findings:

- **Low-attenuation mucinous ascites** with scalloping of visceral surfaces (especially **liver and spleen**)
- **"Omental caking"—**soft-tissue thickening in omentum
- **Septated mucin collections** or mucin lakes
- **Peritoneal implants/nodules**
- **Curvilinear or punctate calcifications**
- **Primary tumor** may be visualized (e.g., mucinous appendiceal mass or ovarian tumor)
- **Sugar baker index: 13 compartments (total score 39) are used to measure it.**

2. Ultrasound

- Anechoic or echogenic complex **ascitic fluid**
- **Nonmobile** mucin locules with internal echoes and septations
- **Scalloping of solid organs** may be seen

3. MRI
- Used when CT is inconclusive or for surgical planning
- T1: **Low signal** (mucin)
- T2: **High signal** with possible layering
- Better delineation of peritoneal disease and implants

4. PET-CT
- Limited use; variable FDG uptake depending on tumor grade
- May help in evaluating **high-grade** PMP or recurrent disease

Differential Diagnosis
- Peritoneal carcinomatosis (nonmucinous)
- Tuberculous peritonitis
- Mesothelioma
- Peritoneal inclusion cysts
- Ovarian cancer with ascites

Role of Radiology
- Detects and characterize **mucinous ascites**
- Identifies **primary tumor** source (appendix and ovary)
- Assesses **extent of peritoneal involvement**
- Guides **surgical planning** (cytoreductive surgery)
- Monitors **postoperative recurrence**

Management Summary (for context)
- **Cytoreductive surgery + HIPEC (hyperthermic intraperitoneal chemotherapy)** is the standard treatment.
- Imaging used for **preoperative staging and postoperative surveillance**.

Conclusion
Pseudomyxoma peritonei is a radiologically distinctive entity, best evaluated by **contrast-enhanced CT (CECT)**, showing **mucinous ascites, omental caking**, and **scalloping of solid organs**. Early detection and characterization are crucial for surgical planning and improving outcomes.

Q5. Discuss ultrasound in acute abdomen.

Answer: The **acute abdomen** refers to **sudden, severe abdominal pain** requiring **urgent diagnosis and management**.

Ultrasound is a **first-line imaging modality**, especially in **children**, **pregnant women**, and **young adults**, due to its **availability, lack of radiation, and real-time imaging**.

Advantages of USG in Acute Abdomen
- **Noninvasive**
- **No ionizing radiation**
- Bedside capability [point-of-care ultrasound (**POCUS**)]
- Real-time evaluation
- Cost-effective
- Can be repeated easily

Common Conditions Diagnosed by USG

1. Acute Appendicitis
- Noncompressible, blind-ending tubular structure >6 mm
- Target/bullseye appearance
- Wall thickening, periappendiceal fat echogenicity
- Appendicolith (echogenic with shadow)
- Free fluid or abscess in complicated cases

2. Acute Cholecystitis
- Distended gallbladder with wall thickening >3 mm
- **Gallstones**
- **Sonographic Murphy's sign** positive
- Pericholecystic fluid
- Sludge or emphysematous changes (if severe)

3. Biliary Colic/Choledocholithiasis
- Dilated CBD (>6 mm)
- Mobile intraluminal echogenic foci with posterior shadowing
- Intrahepatic biliary dilatation

4. Pancreatitis
- Enlarged, hypoechoic pancreas
- Peripancreatic fluid
- Pseudocyst formation (in chronic or complicated cases)
- May be limited by overlying bowel gas

5. Intestinal Obstruction
- Dilated bowel loops >2.5 cm
- Increased peristalsis (early), absent peristalsis (late)
- Transition point may be visible
- Free fluid suggests complication (e.g., strangulation)

***6.* Perforation (e.g., Peptic Ulcer Perforation)**
- Free intraperitoneal fluid
- Reverberation artifacts from pneumoperitoneum (if visible)
- Indirect signs only—limited sensitivity

7. Ectopic Pregnancy/Ruptured Ovarian Cyst
- Adnexal mass or gestational sac outside uterus
- Free fluid (hemoperitoneum)
- Empty uterus

8. Pelvic Inflammatory Disease (PID)
- Thickened, fluid-filled fallopian tubes (hydrosalpinx)
- Complex adnexal masses (tubo-ovarian abscess)

9. Aortic Aneurysm/Dissection
- Abdominal aorta >3 cm
- Dissection flap or intraluminal thrombus
- Emergency if rupture suspected

10. Trauma (FAST Scan)

Focused Assessment with Sonography in Trauma:
- Detects **free intraperitoneal fluid** (blood)
- Examines **Morison's pouch, splenorenal, pelvic**, and **pericardial** spaces

Limitations of USG
- Operator dependent
- Limited by:
  - Obesity
  - Bowel gas
  - Deep retroperitoneal structures
- May require CT for further evaluation

Conclusion
Ultrasound is an essential frontline tool in evaluating the **acute abdomen**, particularly effective in **gallbladder**, **gynecologic**, **appendiceal**, and **biliary** pathology. Though limited in some situations, it plays a **critical role** in early diagnosis and guiding further management.

Q6. Describe carcinoma esophagus—imaging and radiological interventions.

Answer: Carcinoma of the esophagus is a **malignant tumor** of the esophageal mucosa, most commonly **squamous cell carcinoma (upper/mid esophagus)** and **adenocarcinoma (lower esophagus and Barrett's esophagus)**.

Imaging is essential for **diagnosis, staging (TNM)**, **treatment planning**, and **follow-up**.

Imaging Modalities and Findings

1. Barium Swallow (Esophagogram)
- First-line in **dysphagia evaluation**
- Helps localize and characterize the lesion

Findings:
- **"Shouldering"** margins
- **Irregular, narrowed lumen**
- **Apple-core or napkin-ring appearance**
- Length of involvement and motility assessment

2. Endoscopic Ultrasound (EUS)
- Best for **T staging** (depth of wall invasion)
- Assesses **regional lymph nodes** (N stage)
- Allows **FNA** of suspicious nodes

T Staging:
- T1: Mucosa/submucosa
- T2: Muscularis propria
- T3: Adventitia
- T4: Adjacent structures

3. Contrast-Enhanced CT of Thorax and Abdomen

Mainstay for Staging
- Assesses:
  - Esophageal wall thickening (>5 mm)
  - Tumor length and location
  - **Regional and distant lymphadenopathy**
  - **Metastasis** (liver, lungs, and adrenals)
  - Tracheoesophageal fistula

4. PET-CT (18F-FDG)
- Best for **distant metastases (M staging)**
- Detects **occult metastases** and **recurrence**
- Useful in assessing **treatment response**

5. MRI
Limited role; can be used in evaluating **T-staging** and **locoregional extension**, especially in **cervical esophagus**

TNM Staging Summary (AJCC)
- **T1–T4**: Based on depth of invasion
- **N0–N3**: Number of regional lymph nodes involved
- **M0/M1**: Distant metastasis

Radiological Interventions in Esophageal Carcinoma

1. Image-Guided Biopsy

CT/US-guided FNA or core biopsy of:
- Enlarged mediastinal or abdominal lymph nodes
- Hepatic or adrenal metastases

2. Esophageal Stenting (Palliative)

Fluoroscopy-guided self-expanding metallic stent (SEMS) placement:
- **Indications:**
  - **Palliation of dysphagia**
  - Tracheoesophageal **fistula management**
- **Procedure:**
  - Predilation, guidewire insertion
  - SEMS deployment under fluoroscopy

3. Percutaneous Gastrostomy (PEG)
- For **nutritional support** when oral intake is compromised
- CT/US/fluoroscopy-guided tube placement

Role of Radiology
- Diagnosis and characterization (barium and CT)
- Accurate **staging (T, N, M)**
- Guide **biopsy**
- Perform **interventions** for palliation and nutrition
- Monitor **treatment response and recurrence**

Conclusion

Imaging plays a pivotal role in the **diagnosis, staging, and management** of carcinoma esophagus. **CT and PET-CT** are essential for staging and treatment planning, while **EUS** offers detailed T and N staging. **Radiological interventions** like **esophageal stenting** and **PEG** play a key role in **palliative care**.

Q7. Discuss imaging of small bowel and small bowel tumors.

Answer:
- The **small bowel** includes **duodenum, jejunum, and ileum**, and is involved in nutrient absorption.
- Small bowel tumors are rare but important causes of **obscure GI bleeding**, **obstruction**, or **incidental findings**.
- Imaging is crucial for **detection, characterization, staging, and follow-up**.

Imaging Modalities for Small Bowel

1. Plain X-ray
- Limited value
- May show signs of **obstruction**, **perforation**, or **calcification**

2. Barium Studies

a. Barium Meal Follow Through (BMFT):
- Traditional method for mucosal detail
- Tumors appear as **filling defects**, **mucosal irregularity**, or **apple-core lesion**

b. Enteroclysis (Double contrast):
- Superior luminal distension
- Better for **mucosal and submucosal lesions**
- Used less frequently now

3. Multidetector CT Enterography/CT Enteroclysis
- **Preferred cross-sectional modality**
- Requires **neutral oral contrast** for bowel distension
- Provides detailed assessment of **wall thickness, enhancement**, and **extraintestinal extension**

Findings:
- Wall thickening
- Mass lesions
- Lymphadenopathy
- Mesenteric involvement
- Complications: Obstruction, fistula, and perforation

4. MR Enterography
- No radiation; ideal for **young patients** and **IBD**
- High soft-tissue contrast
- Excellent for **intramural lesions, fistulas, and active inflammation**

5. Capsule Endoscopy
- Evaluates **entire small bowel mucosa**
- Highly sensitive for **small polyps, early tumors**, and **bleeding lesions**
- **No therapeutic capability**

6. Balloon-Assisted Enteroscopy
- Diagnostic and therapeutic
- Used after capsule endoscopy

Imaging of Small Bowel Tumors

Classification (by pathology):
- **Benign tumors:**
  - **Adenoma**
  - **Leiomyoma**
  - **Lipoma**
  - **Hemangioma**
- **Malignant tumors:**
  - **Adenocarcinoma**
  - **Lymphoma**
  - **Carcinoid tumor**
  - **Gastrointestinal stromal tumor**
  - **Metastases** (melanoma, breast, and lung)

Imaging Features of Common Tumors

Tumor	*Common site*	*Imaging features*
Adenocarcinoma	Duodenum, proximal jejunum	Annular/constricting mass, irregular stricture, wall thickening, and shouldering
Lymphoma	Ileum	Homogeneous bulky mass, aneurysmal dilation of lumen, and minimal obstruction
Carcinoid	Terminal ileum	Small hyperenhancing mass, desmoplastic reaction, calcification, and mesenteric retraction
GIST	Jejunum	Exophytic mass, central necrosis, and variable enhancement
Lipoma	Ileum	Well-defined, homogeneous **fat attenuation** lesion
Hemangioma	Jejunum	Hypervascular lesion, phleboliths, and may cause bleeding

Role of Imaging
- Detects and localizes tumor
- Determines size, extent, mural versus extramural involvement
- Evaluates **lymph nodes and metastases**

- Assesses **complications** (bleeding, perforation, and obstruction)
- Guides **biopsy or surgical planning**

Conclusion

Imaging of the small bowel has advanced with **CT/MR enterography** replacing older techniques like BMFT.

Small bowel tumors, though rare, are best assessed using **cross-sectional imaging**, with **capsule endoscopy** and **enteroscopy** aiding mucosal evaluation.

Radiology plays a vital role in **early detection, characterization, and staging** of these lesions.

Q8. Discuss the segmental anatomy of liver and the common variants of hepatic artery and portal vein.

Answer: Couinaud classification is the most widely used functional anatomic classification of liver **(Fig. 1)**.

Vertical Division: Hepatic vein:

- Right hepatic vein
- Middle hepatic vein:
  A. Right lateral (posterior) section
  B. Right medial (anterior) section
  C. Left medial section
  D. Left lateral section

Liver is divided into four sections by two vertical plane of three tributaries of hepatic veins:

1. RHV
2. MHV: They divide liver into four sections
3. LHV
   - Right lateral (posterior) section lies right to RHV
   - Right medial (anterior) section lies left to RHV and right to MHV.
   - Left medial section lies right to LHV and left to MHV
   - Left lateral section lies to the left of LHV.

Horizontal Division (Fig. 2)

Plane of portal vein bifurcation into right and left portal vein divides liner sections into superior segments and inferior segments.

- Superior segments: II, IVA, VIII, and VII
- Inferior segments: III, IVB, V, and VI

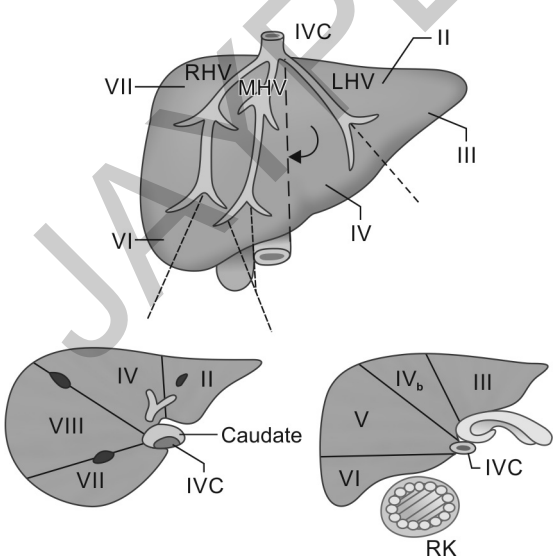

FIG. 1: Couinaud classification (vertical division).

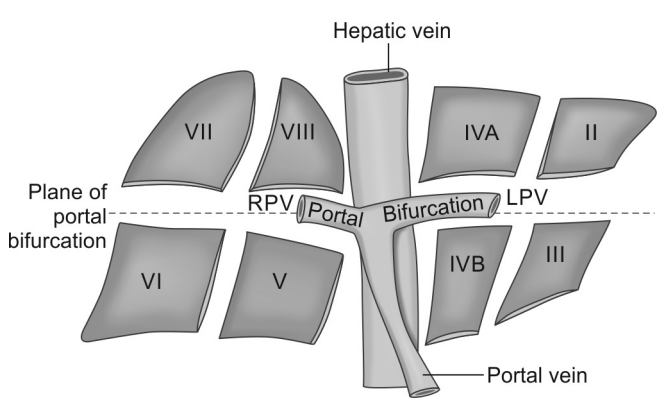

FIG. 2: Horizontal division of liver into superior and soft segments.

Segment I (Caudate Lobe):
It is a separate lobe that receives a portal vein from the right or the left portal vein; drains directly into IVC.

Significance of segmental division of liver:

Clinical significance:
In certain pathology, there is early change in the caudate lobe as it has different supply and advantage.

For example, in Budd-Chiari syndrome:
- Obstruction/thrombosis of hepatic vein
- But, since caudate lobe drain diversity into IVC, it is spared (rather there is compensatory hypertrophy of the caudate lobe)

Surgical significance:
Since each section has separate portal vein and hepatic artery supply, and separate venous drainage; they can be surgically removed through the plane without cutting uninvolved segment.

For example:
- Revision of left lateral segments—left lateral section
- Revision of left medical segments—left medical section

Radiological significance:
Knowledge of segmental anatomy, their supply, and drainage can help in planning for regional procedures.

For example:
- Locoregional therapy in HCC.
- Percutaneous drainage of biliary obstruction, e.g., PTBT. Right sided versus left sided.

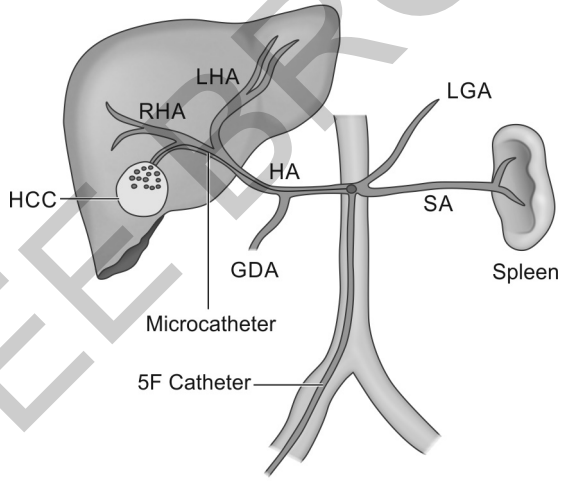

FIG. 3: TACE/TARE technique.

Anatomical variation in arterial supply:

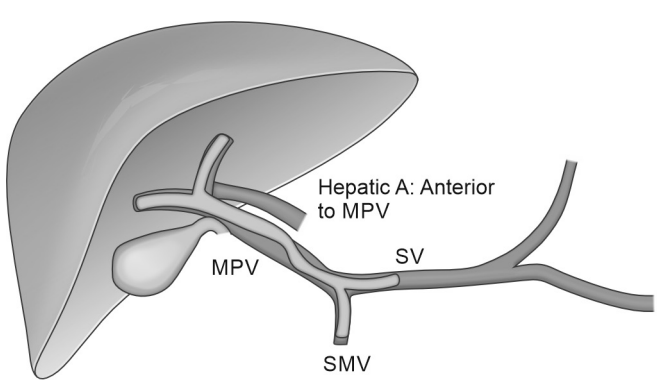

FIG. 4: Normal relation of PV and hepatic artery.

Normal right hepatic artery: Runs anterior to MPV

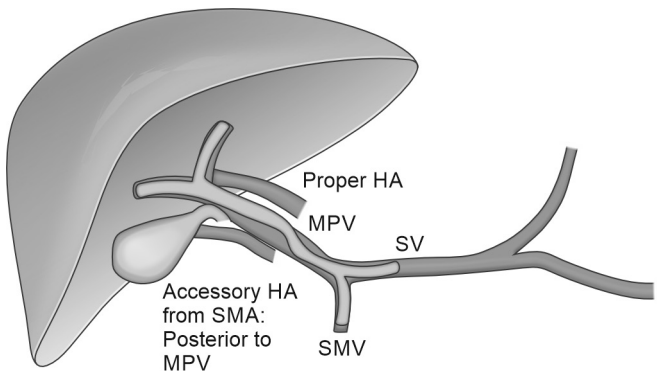

FIG. 5: Accessory hepatic artery from SMA.

Accessory hepatic artery: If additional hepatic artery in presence of normal hepatic artery. If accessory RHA arises from SMA, it runs posterior to MPV **(Fig. 5)**.

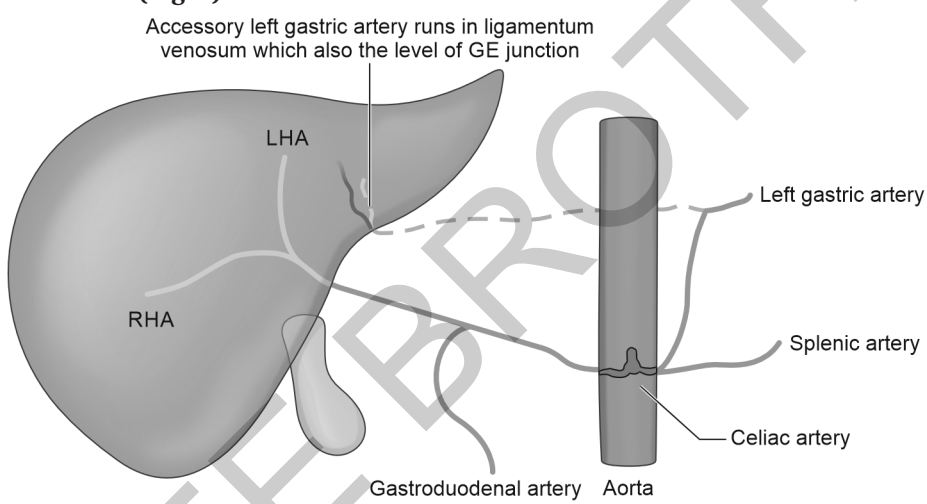

FIG. 6: Left hepatic artery from left gastric artery.

Replaced hepatic artery: No arterial supply from celiac trunk; RHA from SMA and LHA from left gastric course as described above **(Fig. 6)**.

Significance

- Knowledge of accessory/replaced hepatic artery helps to plan locoregional therapy in HCC.
- Pivotal to know for surgery.

Q9. Draw a labeled diagram of hepatobiliary system. Briefly discuss cause, imaging appearances, and IR management of surgical jaundice.

Answer:

Causes of Surgical Jaundice (Fig. 7)

Extrahepatic Causes:

Intraductal Causes:

- Stone
- Mass
- Stricture
- Parasite
- Cholangitis/cholangiopathy
- TB

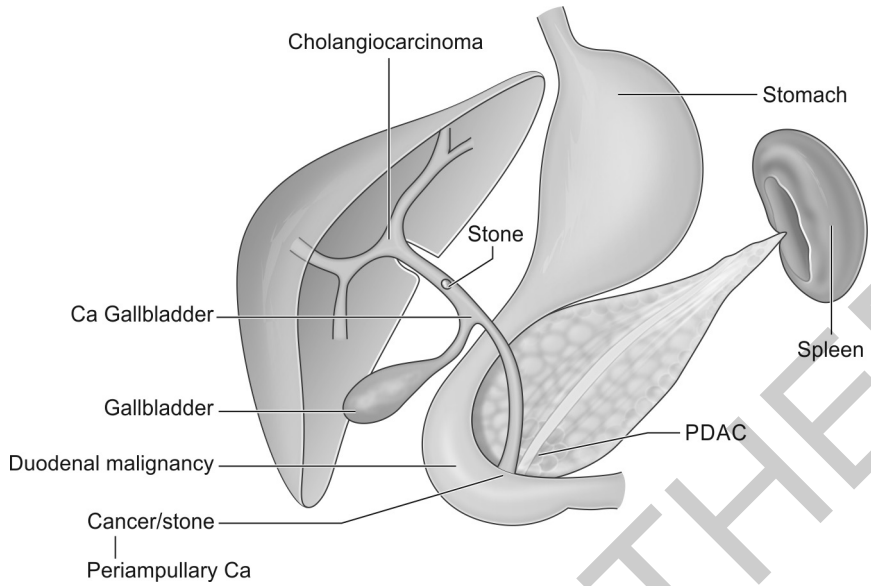

FIG. 7: Causes of obstructive jaundice.

Extraductal Causes:
- Mass
- Pancreatitis
- Inspected calculi/cystic duct stove
- Stasis due to long term IV feeding

Intrahepatic Causes:
- Hepatitis
- Cirrhosis
- Drugs
- Mass

Role of Imaging
- To confirm biliary obstruction
- To find cause of obstruction
- To deliver site abdominal extent of obstruction to plan treatment: Surgery and IR

Imaging		
Diagnostic		***Therapeutic***
X-ray	1. USG	for
USG	2. Fluroscopy	IR procedure
Cholangiography		
CT/MRI: Nuclear imaging		

Imaging Findings:

X-ray:
- Mural calcification—porcelain gallbladder
- Mural air—emphysematous cholecystitis
- Calcified gallstone/gallstone ileus
- CCP—calcification along punctuation location
- Limited role in case of mass.
- Direct cholangiography
- Under USG/Fluoro guidance

POSTGRADUATE RADIOLOGY
An Exam Preparatory Manual
(A Study Guide For MD/DM Examination)

Salient Features

- *Examination-centric design*: Tailored exclusively for the final MD/MS Radiology examination pattern, focusing on structured long answer questions of 10 marks each.
- *Comprehensive model answers*: Each question is accompanied by a detailed, point-wise answer that mirrors the expected format and depth in university examinations.
- *Essential hand-drawn diagrams*: Includes clear, reproducible, hand-sketched illustrations of key radiological anatomy, pathologies, and imaging classifications to enhance visual learning and diagrammatic presentation in answers.
- *Structured chapter flow*: Chapters are organized system-wise, covering all major radiological subspecialties as per the university syllabus, ensuring no topic is left unaddressed
- *High-yield points and mnemonics*: Integrated "Key Points" boxes and memory aids to help in quick revision and retention of complex information.
- *Based on latest guidelines and evidence*: Content is updated with current imaging protocols, classification systems (e.g., LI-RADS and PI-RADS), and evidence-based practices, drawn from the author's extensive academic work.

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