Spleen and Its Surgical Aspects

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Learning Objectives

- Understand spleen anatomy & functions
- Recognize surgical indications for splenectomy
- Learn different surgical techniques & complications
- Know post-splenectomy care & patient management

Anatomy of the Spleen

- Location: LUQ, intraperitoneal
- Wt 75-250 gm, along 10^{th} rib, between gastric fundus & L hemidiaphragm.
- Vascular supply: Splenic artery (celiac trunk), splenic vein (portal vein)
- Relations: Stomach, pancreas, left kidney, diaphragm

Functions of the Spleen

- Immune role: Filters blood, removes encapsulated bacteria
- Hematological role: RBC recycling, platelet storage
- Fetal hematopoiesis

Investigations of the Spleen

- Laboratory Tests:
  - Complete Blood Count (CBC) → Check for anemia, leukopenia, thrombocytopenia (suggests hypersplenism).
  - Peripheral Blood Smear → Abnormal RBCs (spherocytes in hereditary spherocytosis).
  - Coagulation Profile → Check for disseminated intravascular coagulation (DIC) in trauma.
  - Liver Function Tests (LFTs) → To assess portal hypertension.

Investigations of the Spleen

- Imaging Modalities:
  - Ultrasound (US) (First-line in non-emergency cases)
    - Detects splenomegaly, cysts, abscesses.
    - Doppler to assess splenic blood flow (e.g., splenic vein thrombosis).
  - CT Scan (Best for Trauma & Detailed Anatomy)
    - Detects lacerations, infarctions, hematomas.
    - AAST grading for splenic trauma.
  - MRI (Superior for Vascular & Soft Tissue Lesions)
    - Useful for evaluating splenic tumors, infarctions, and congenital anomalies.
  - Nuclear Scintigraphy (99mTc-labeled RBC scan)
    - Detects functional splenic tissue in asplenia or accessory spleens.

Investigations of the Spleen

- Special Investigations:
  - Bone Marrow Aspiration → If hematological disorders suspected.
  - PET-CT Scan → If lymphoma or metastasis is suspected.

Congenital Abnormalities of the Spleen

- Asplenia
  - Complete absence of the spleen
  - Associated with congenital heart defects (e.g., heterotaxy syndrome).
  - Increased risk of overwhelming infections due to lack of splenic immune function.

- Polysplenia
  - Presence of multiple small spleens.
  - Often linked to situs anomalies (e.g., left isomerism).
  - May have normal or reduced splenic function.

Congenital Abnormalities of the Spleen

- Accessory Spleens
  - Present in 10-30% of people.
  - Usually found near the splenic hilum, but can be in the pancreas or other locations.
  - Important in post-splenectomy cases, as they may retain splenic function.

- Wandering Spleen
  - Caused by lax ligaments (gastrosplenic, splenorenal), allowing excessive mobility.
  - Risk of torsion, leading to infarction and acute abdomen.
  - Treatment: Splenopexy (fixation) or splenectomy if infarcted.

- Congenital Splenic Cysts
  - True cysts (epithelial-lined) vs. pseudocysts (post-traumatic).
  - Usually asymptomatic, but large cysts can cause pain or compression.
  - Management: Observation or surgical removal if symptomatic.

Splenic Rupture

- ***When to Consider It?***
  - Blunt abdominal trauma (e.g., motor vehicle accidents, falls, sports injuries).
  - Penetrating injuries (e.g., stab wounds, gunshots).
  - Spontaneous rupture (seen in infectious mononucleosis, malaria, leukemia, or anticoagulated patients).
  - Fractures of 9^{th},10^{th}, 11^{th} left ribs
  - Iatrogenic.

- ***Presentation:***
  - Early Signs:
    - Left upper quadrant (LUQ) pain.
    - Kehr's sign: Referred pain to the left shoulder (phrenic nerve irritation).
    - Tenderness over the spleen.
  - Late Signs (Hemorrhagic Shock):
    - Hypotension, tachycardia, pallor.
    - Abdominal distension & peritoneal signs (if severe bleeding).

Splenic Rupture

Management

- Initial Resuscitation (ABCDE Approach)
  - Airway & Breathing: Oxygen supplementation if needed.
  - Circulation: IV fluid resuscitation, blood transfusion if unstable.
  - Hemodynamic Monitoring: Watch for signs of shock.

- Definitive Management
  - Conservative (Non-Operative) Management:
    - Indicated for hemodynamically stable patients with low-grade injuries.
    - Requires strict monitoring, serial hemoglobin checks, and repeat imaging.
    - Embolization (Angioembolization) if active bleeding but stable.
  - Surgical Management:
    - Splenorrhaphy (Repair) → If salvageable and patient is stable.
    - Splenectomy → If uncontrolled bleeding, shattered spleen, or hemodynamic instability.

- Post-Management Care
  - Post-splenectomy vaccination (Pneumococcus, Meningococcus, H. influenzae).
  - Lifelong infection risk → Consider prophylactic antibiotics in high-risk patients.

Splenic Trauma

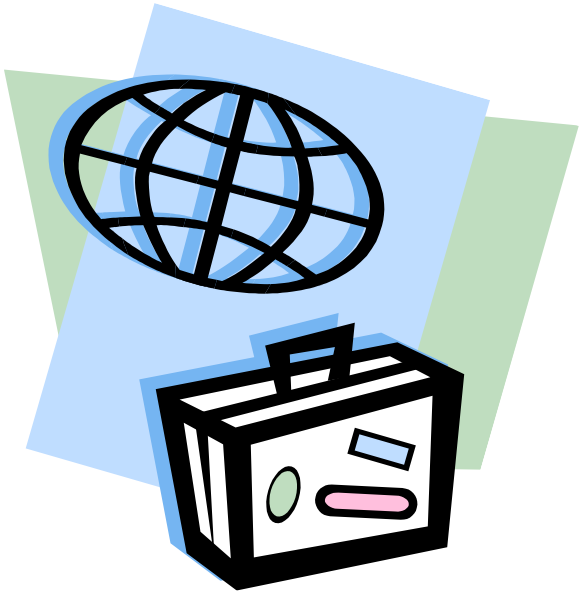
- **Spleen**
  - Is one of most vascular organs , pass through it 350 liter of blood / day , contain 1 unit of blood at any moment !
  - **Types of trauma :**

    1- Blunt

    2- penetrating : Easily diagnosed , because patient almost always referred to Surgery .

Blunt Trauma of Spleen

- 25% of all blunt trauma of abdominal viscera
- More in male 3:2
- Most common cause is RTA
- Presentation :
  - Asymptomatic
  - abdominal pain (50%) , abdominal Distention , Hypotension (25%)



Diagnosis

- **For stable patient :**

1. ***UltraSound***
2. ***CT***
3. ***Angiography***

4. Plain radiography / chest and abdomen

- **The radiography signs of rupture are:-**

1. Obliteration of the splenic outline
2. Obliteration of the psoas shadow
3. Indentation of the left side of the gastric air bubble
4. Fracture of one or more lower ribs on the left side (present 27 % of cases
5. Elevation of the left side of the diaphram
6. Free fluid between gas filled intestinal coils .

5. CT

- Modality of choice
- Used with contrast .
- Findings :
  1. Lacerations : irregular hypodense area with no enhancement .
  2. Sub-capsular hematoma : regular shape , cresentric .
  3. Intraparenchymal hematoma .
  4. Fragmentation with autosplenictomy .

Diagnosis

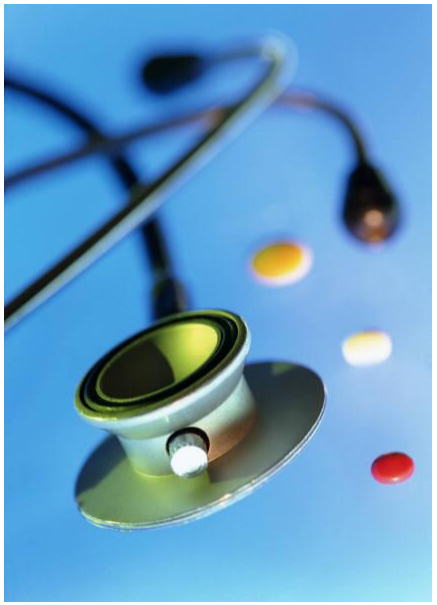
- Unstable patient :
  - Open and See !
  - Peritoneal lavage
  - FAST

Splenic Trauma Classification (AAST Grading)

- Grade I – V classification (hematoma → shattered spleen)
- Management: Conservative vs. surgical

Spleen injury grading scale :

- **Stage 1 :**
  - Subcapsular Hematoma < 10 % of surface area .
  - Capsular tear depth < 1 cm .



Spleen injury grading scale :

- **Stage 2 :**
  - Subcapsular hematoma of 10 – 50 % of surface area .
  - Laceration depth :
    - 1-3 cm
    - Not involving trabecular vessels
  - Intraparenchymal Hematoma < 5 cm in Diameter .

Spleen injury grading scale :

- **Stage 3 :**
  - Sub-capsular Hematoma > 50 % , or Ruptured spleen .
  - Laceration depth :
    - > 3 cm
    - Involving the trabecular Vessels .
  - Intraparenchymal hematoma > 5 cm in diameter .

Spleen injury grading scale :

- **Stage 4 :**
  - Laceration involving hilar or segmental vessels with devascularization of > 25 % of speen

Spleen injury grading scale :

- **Stage 5 :**
  - Shattered spleen

Treatment

1. **Conservative:**
   - Admit patient to ICU
   - Repeated ultrasound
   - For those with stage 1 or 2 .

2- Splenectomy.

3- Coservative splenoraphy: Suturing of spleen to prevent further bleeding .

4- Splenic Artery Embolization:

- Less mortality and morbidity than splenictomy
- Complications :
  1. Pancreatitis
  2. Splenic Abscess
  3. Pleural Effusion (most common)

SPLENOMEGALY

Causes of splenomegaly

Infection
- Acute (viral)
- Subacute
- Chronic (malaria)

Immunological inflammatory disorders
- Felty syndrome (with rheumatoid arthritis and granulocytopenia)
- Systemic lupus erythematosus
- Sarcoidosis
- Amyloidosis
- Thyroiditis

Haemolytic anaemia

Immune thrombocytopenia

Portal hypertension
- Thrombosis of the portal vein
- Liver cirrhosis

Primary metastatic neoplasms
- Leukaemia (in particular, chronic lymphocytic leukaemia)
- Lymphoma/Hodgkin's disease
- Myeloproliferative syndromes
- Sarcoma

Storage diseases
- Gaucher's disease
- Niemann–Pick disease

Splenomegaly & Hypersplenism

Hypersplenism: *Clinical syndrome*

1-Splenic enlargement.

2-Any combination of anaemie,leucopenia or thrombocytopenia.

3-Compensatory bone marrow hyperplasia.

4-Improvement after splenectomy.

Splenectomy

Indications for splenectomy

Traumatic

- Rupture after blunt injury to the abdomen
- Iatrogenic injury during another procedure (particularly mobilization of the splenic flexure of the colon)

Haematological

- Immune thrombocytopenia
- Hereditary spherocytosis
- Autoimmune haemolytic anaemias
- Malaria
- Schistosomiasis
- Leishmaniasis
- Staging of haematological malignancies (e.g. Hodgkin's disease)

With other viscera

- Radical gastrectomy
- Pancreatectomy

Miscellaneous

- Treatment for gastric varices
- Treatment of splenic artery aneurysms
- Treatment of splenic cysts/tumours

Indications for Splenectomy

- Trauma (most common)
- Hematological diseases: ITP, hereditary spherocytosis
- Splenic abscess & cysts (hydatid cysts, post-infectious abscesses)
- Portal hypertension & hypersplenism
- Splenic tumors (hemangiomas, lymphomas)

Splenectomy for Blood Disorders

1-ITP:

-15-50 y female.

-CP: Ecchymoses purpuric patches of skin & MM.

Post traumatic skin petechial haemorrhage.

Epistaxis,Menorrhgia.

10% palpable spleen.

- Investigations: B.T increased, C.T & P.T normal, thrombocytopenia.

Surgical Techniques for Splenectomy

- Open Splenectomy: Trauma, large spleens
- Laparoscopic Splenectomy: Elective cases, smaller spleens
- Steps: Positioning, port placement, ligation of splenic artery, avoiding pancreatic injury

Surgical Complications

- Bleeding (major risk)
- Pancreatic injury → fistula risk
- Gastric perforation (iatrogenic)
- Post-splenectomy sepsis (OPSI)

Post-Splenectomy Care

- Vaccinations: Pneumococcal, Meningococcal, H. influenzae
- Lifelong infection risk (OPSI) & antibiotic prophylaxis
- Risk of thrombocytosis → possible aspirin prophylaxis

Case-Based Discussion

- Case: 27-year-old male, post-car accident, LUQ pain, FAST-positive, CT shows Grade IV splenic injury.
- What's the next step?
- Conservative vs. splenectomy?
- Factors influencing the decision?
- Post-op care needed?

Summary & Key Takeaways

- Spleen has immune & hematological roles
- Splenectomy mainly for trauma & hematological disorders
- Laparoscopic approach preferred for elective cases, open for trauma
- Post-op care includes vaccinations & infection prevention

Q&A

- Thank you! Any questions?