ANATOMY OF SPLEEN

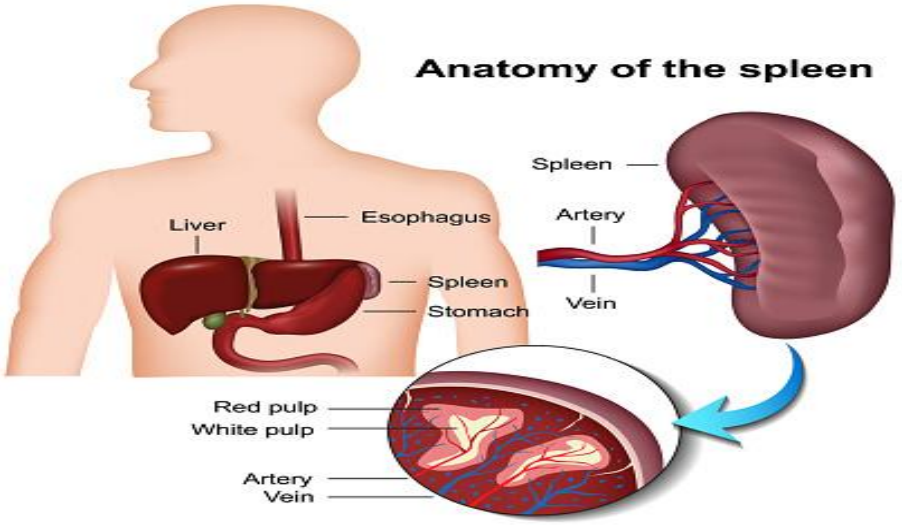
- The spleen is an organ located in the upper left abdomen, roughly the size of a clenched fist.
- It is wedge shaped organ.
- In the adult, the spleen functions mainly as a clearing agent for blood, removing old red blood cells.
- It also plays a role in the immune response.

ANATOMICAL POSITION

- The spleen in located mainly in the left hypochondrium and partly in epigastric region of the abdomen.
- Cover by diaphragm and ribcage.
- So it cannot be palpated on clinical examination (except when enlarged).
- It is an intra peritoneal organ, entirely surrounded by peritoneum.
- The spleen is connected to the stomach and kidney by parts of the greater omentum .
- Gastrosplenic ligament: Connects the spleen to the greater curvature of the stomach.
- Splenorenal ligament: Connects the hilum of the spleen to the left kidney.

STRUCTURE

- The spleen has a slightly oval shape. It is dark purple in color.
- Spleen is 1 inch (2.5 cm) thick, 3 inch (7.5 cm) broad, 5 inch (12.5 cm) long, 7 ounces (200 gm) in weight and is related with 9-11 ribs(Odd numbers 1, 3, 5, 7, 9, 11).
- It is covered by a weak capsule that protects the organ, and allowing it to expand in size.
- The outer surface of the spleen can be anatomically divided into two:
- Diaphragmatic surface: In contact with diaphragm and ribcage.
- Visceral surface: In contact with the other abdominal viscera.



SPLENIC TRAUMA (SPLENIC RUPTURE)

- The spleen is the most commonly injured organ following blunt abdominal trauma and the second most commonly injured organ after penetrating abdominal trauma (First is small intestine).
- Splenic preservation should be attempted in the hemodynamically stable patient when feasible.
- In unstable patients with ruptured spleens, prompt splenectomy remains the standard of care.

ETIOLOGY

- Blunt abdomen Injury to the left side of chest, left lower rib fractures, due to fall from a tree, road traffic accidents can be associated with splenic rupture.
- Retroperitoneal hemorrhage, fracture spine and renal injuries may be associated with splenic injury.
- Penetrating injuries to the abdomen : Gun shots, stabbings may cause rupture of spleen.
- Spontaneous rupture of the spleen : It is seen when spleen is pathological like in malaria,rarely in sarcoidosis, hemolytic anemia and leukemia.
- Iatrogenic : Splenic capsule may be torn during surgical procedures such as vagotomy or gastrectomy due to traction on the stomach.

TYPES OF RUPTURE

Mainly 3 types of rupture are seen in spleen:

1. Acute splenic rupture :

- It occurs mostly due to blunt trauma and is featured by immediate intraperitoneal bleeding.
- In this variety two types are seen, in first type the patient's condition deteriorates rapidly giving no chance to start proper treatment.
- In the second type there is initial shock, from where the patient recovers by treatment revealing signs of ruptured spleen.

2. Delayed splenic rupture:

- It occurs after few days to injury and sudden intraperitoneal bleeding starts.
- Such delayed type of rupture is probably due to :
- Blood clot that temporarily stop the bleeding and becomes lysed by the pancreatic enzymes.
- Slowly enlarging sub capsular hematoma which ultimately ruptures.
- The greater omentum, which secures the injured site initially by shielding, gradually moves off.

3. Occult splenic rupture:

- This condition is characterized by formation of traumatic pseudocyst of the spleen.
- This type is seen in less than 1% of patients sustaining injury to the spleen.
- It is caused by association of intrasplenic or parasplenic hematoma.

CLINICAL FEATURES

- Hypovolemic shock : Injury to spleen may cause severe hemorrhage and ultimately hypovolemic shock.
- Death can occur within few minutes.
- There is increased pulse rate, pallor, hypotension and cold clammy extremities.
- Abdominal distension.
- Paralytic ileus develops gradually.

Kehr's sign:

- Irritation of undersurface of the diaphragm by the blood, it causes irritation of the phrenic nerve (C3-C5). So, the pain is referred to the tip of shoulder.

Balance's sign:

- Blood from the ruptured spleen is coagulated and may present as a tender mass that causes dull sound on percussion in left side of abdomen is known as Balance's sign.

INVESTIGATIONS

- Routine blood tests: Leukocytosis may present.
- Straight X-ray: To see the obliteration of splenic outline, associated intestinal perforation and fractured ribs.
- USG abdomen.
- CT scan of abdomen.

MANAGEMENT

- Emergency splenectomy: If there is large laceration on spleen and there is active hemorrhage with hypotension, emergency splenectomy should be performed because it is quick, easy to perform and life saving.
- Partial splenectomy: It is performed when one portion is devoid of circulation and blood supply of the remaining portion is preserved.
- Splenorrhaphy: It is performed when there is small tear on the spleen and the general condition of the patient is good. This tear is sutured by catgut and flap of omemtum can be wrapped to secure the tear.
- Conservative management: It could be tried if there is parenchymal tear in stable adult or pediatric patient. The patient is admitted in I.C.U. and danger of delayed hemorrhage should be kept in mind.

SPLENOMEGALY

- Splenomegaly is defined as enlargement of the spleen, measured by size or weight.
- The normal spleen is usually not palpable, although it can sometimes be palpated in adolescents and lean and thin individuals.

ETIOLOGY

- The following six etiologies of splenomegaly are common :
- Hypertrophy due to excessive immune response:
  - Subacute bacterial endocarditis (bacterial infection) or infectious mononucleosis (viral infection) or malaria (parasite infection).
- Hypertrophy due to excessive RBC destruction Such as in hereditary spherocytosis or thalassemia major or various types of hemolytic anemia.
- Congestive: Such as in splenic vein thrombosis, portal hypertension or Banti disease (it is a chronic congestive enlargement of the spleen resulting in premature destruction of the red blood cells by the spleen).

- Myeloproliferative : Such as in chronic myeloid metaplasia. Myelocytes are cells of granulocytic series occurring normally in bone marrow, but not in circulating blood
- Infiltrative: Sarcoidosis and some neoplasms.
- Neoplastic : Chronic lymphocytic leukemia and the lymphomas.
- Miscellaneous causes of splenomegaly include the following: Trauma, Metastasis, Cysts, Huge abscess, Hemangiomas etc.
- **Inflammatory splenomegaly:**

- Acute enlargement of the spleen due to various infections or inflammatory processes results from an increase in the defense activities of the organ.
- The demand for increased antigen clearance from the blood may lead to increased numbers of antibody production, with resultant lymphoid hyperplasia.

Hyperplastic splenomegaly :

- Removal of abnormal blood cells from the circulation is the usual cause of hyperplastic splenomegaly.

Congestive splenomegaly:

- Cirrhosis with portal hypertension, splenic vein occlusion (thrombosis) or congestive heart failure (CHF) with increased venous pressure causes congestive splenomegaly,

Infiltrative splenomegaly :

- Infiltrative splenomegaly is the result of engorgement of macrophages with indigestible materials (e.g., sarcoidosis, Gaucher disease, metastatic malignancy).

Infectious splenomegaly:

- Spleen filter the blood-borne pathogens, especially encapsulated organisms, may lead to abscess formation. Size may increase as the abscess enlarges.

Splenic sequestration :

- Acute splenic sequestration crisis (ASSC) is a major cause of morbidity and mortality in children with sickle cell disease and other hereditary hemolytic anemias.

CLINICAL PRESENTATION

- The most common complaint in patients with splenomegaly is mild, vague, abdominal discomfort.
- Patients may also experience pain, which maybe referred to the left shoulder.
- Increased abdominal girth is less common.
- Early satiety from gastric displacement occurs with massive splenomegaly.
- Associated symptoms or signs are typically related to the underlying disorder and may include the following:
- Febrile illness (infectious), Pallor, dyspnea, bruising and/or hemolytic process, History of liver disease (congestive),
- Weight loss, constitutional symptoms (neoplastic),Pancreatitis (splenic vein thrombosis), Alcoholism, hepatitis (cirrhosis).
- Family history should be reviewed to disclose relevant hereditary diseases, such as hemolytic anemias.

PER ABDOMINAL EXAMINATION

- Splenic size is not a reliable guide to splenic function and palpable spleens are not always abnormal.
- Patients with chronic obstructive pulmonary disease (COPD) and low diaphragms commonly have palpable spleens.
- The physical examination should include palpation with the patient in the supine and right lateral decubitus position, with knees up and hips flexed. Apply light fingertip pressure as the patient slowly inspires. The spleen moves with respiratory patterns and may be palpable only at the end of inspiration.

INVESTIGATIONS

- Blood test: It reveals anemia, leucopenia, and thrombocytopenia.
- USG whole abdomen: This is investigation of choice and reveals even mild splenomegaly.
- CT scan: To rule out any neoplasm and abscess.

MANAGEMENT

- Watchful waiting: If there is an enlarged spleen but don't have any symptoms and the cause can't be found, watchful waiting could be suggested.
- Treat the cause: Treatment of causative disease is most important factor.

Splenectomy: If there is an enlarged spleen causes serious complications can't be identified or treated then surgical removal of spleen (splenectomy) may be an option.

COMPLICATIONS

- Infection: An enlarged spleen can reduce the number of healthy red blood cells, platelets and white cells in bloodstream, leading to more frequent infections. Anemia and increased bleeding also are possible.
- Ruptured spleen: The possibility of rupture is much greater when spleen is enlarged.

प्लीहोदर

- विदाह्यभिष्यन्दिरतस्य जन्तोः प्रदुष्टमत्यर्थमसृक्कफश्च। प्लीहाभिवृद्धिं सततं करोति प्लीहोदरं तत् प्रवदन्ति तज्ज्ञाः ॥ (सु.नि.7/14)
- विदाहकारक तथा अभिष्यन्दि पदार्थों के अधिक सेवन करने वाले पुरुष का रक्त और कफ प्रबल रूप से प्रकुपित होकर निरन्तर प्लीहा को बढ़ाते रहते हैं, इसी को प्लीहोदर कहते हैं।
- मेदः क्षये प्लीहाभिवृद्धिः सन्धिशून्यता रौक्ष्य मेदुरमांस प्रार्थना च। (सु. सू. 14/13)

निदान एवं सम्प्राप्ति

- अशितस्यातिसङ्क्षोभाद् यानयानातिचेष्टितैः। अतिव्यवायभाराध्ववमनव्याधिकर्शनैः वामपार्श्र्वाश्रितः प्लीहा च्युतः स्थानात् प्रवर्धते। शोणितं वा रसादिभ्यो विवृद्धं तं विवर्धयेत् ॥(च.चि.13/35-36)

भेद–

- आचार्य चरक ने सूत्र स्थान के अष्टोदरीय अध्याय में पाँच प्रकार के प्लीहा दोष बताए हैं (पञ्च प्लीहदोषाः) ।

प्लीहोदर के लक्षण

- आचार्य चरक के अनुसार
- दौर्बल्यारोचकाविपाकवर्चोमूत्रग्रहतमः प्रवेशपिपासाङ्गमर्द च्छर्दिमूर्च्छाऽङ्गसादकासश्वासमृदुज्वरानाहाग्निनाशकार्यास्यवैरस्यपर्वभेदकोष्ठवातशूलानि, अपि चोदरमरुणवर्ण विवर्णं वा नीलहरितहारिद्रराजिमद्भवति। (च.चि. 13/38)
- आचार्य सुश्रुत के अनुसार
- वामे च पार्श्वे परिवृद्धिमेति विशेषतः सीदति चातुरोऽत्र । मन्दज्वराग्निः कफपित्तलिङ्गैरूपद्रुतः क्षीणबलोऽतिपाण्डुः ।।(सु.नि.7/15)

चिकित्सा–

- स्नेहं स्वेदं विरेकं च निरूहमनुवासनम् । समीक्ष्य कारयेद्वाही वामे वा व्यधयेत् सिराम् ।।(च. चि. 13/77)
- औषध प्रयोग : षट्पल सर्पि, पिप्पली, रोहितक घृत, गुड़ हरीतकी, क्षार एवं अरिष्ट प्रयोग प्रशस्त है।
- सिरावेध : आचार्य सुश्रुत के अनुसार प्लीहोदर के रोगी के चाम बाहु में कूर्पर प्रदेश (left cubital fossa) के अन्दर की सिरा का वेधन करना चाहिए तथा रक्त के सम्यक् प्रवाह हेतु हाथ से प्लीहा का मर्दन करना चाहिए।(सु. चि. 14/13)
- मणिबन्धं सकृन्नाम्य वामाङ्गुष्ठसमीरिताम् । दहेत् सिरां शरेणाशु प्लीह्नो वैद्यः प्रशान्तये ।।(सु. चि. 14/16)