
بسم الله الرحمن الرحيم

Spleen

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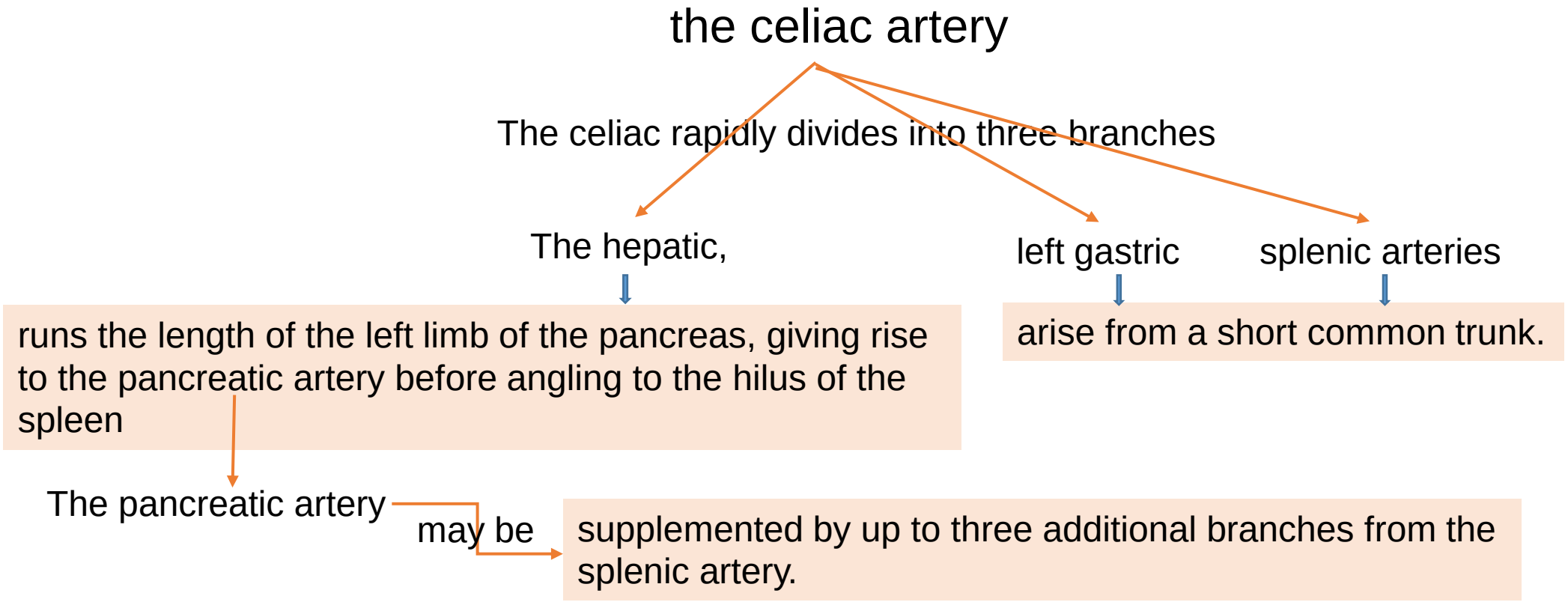
ANATOMY

- usually residing in **the left cranial quadrant of the abdomen**. It has been described **as red, reddish-brown, purple, mahogany, and gray-brown with a purple cast.**
- It is approximately 0.2% of the body weight in dogs and cats.
- The dorsal extremity (head), tethered to the greater curvature of the stomach by the wide gastrosplenic ligament
- The **parietal surface** of the spleen is **convex**, and the **visceral surface** is **concave**, with a longitudinal ridge marking the attachment of nerves, vessels, and omentum. In cross-section, the spleen appears triangular.
- During **splenic contraction**, the spleen may reside entirely under the ribcage and appear pale blue to purple in color. Conversely, during **splenic congestion**, the tail of the spleen may be found as far caudally as the bladder and may be darker brownish-red.

The splenic vascular supply



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The cranial half of the spleen is supplied by **several branches** off these long vessels

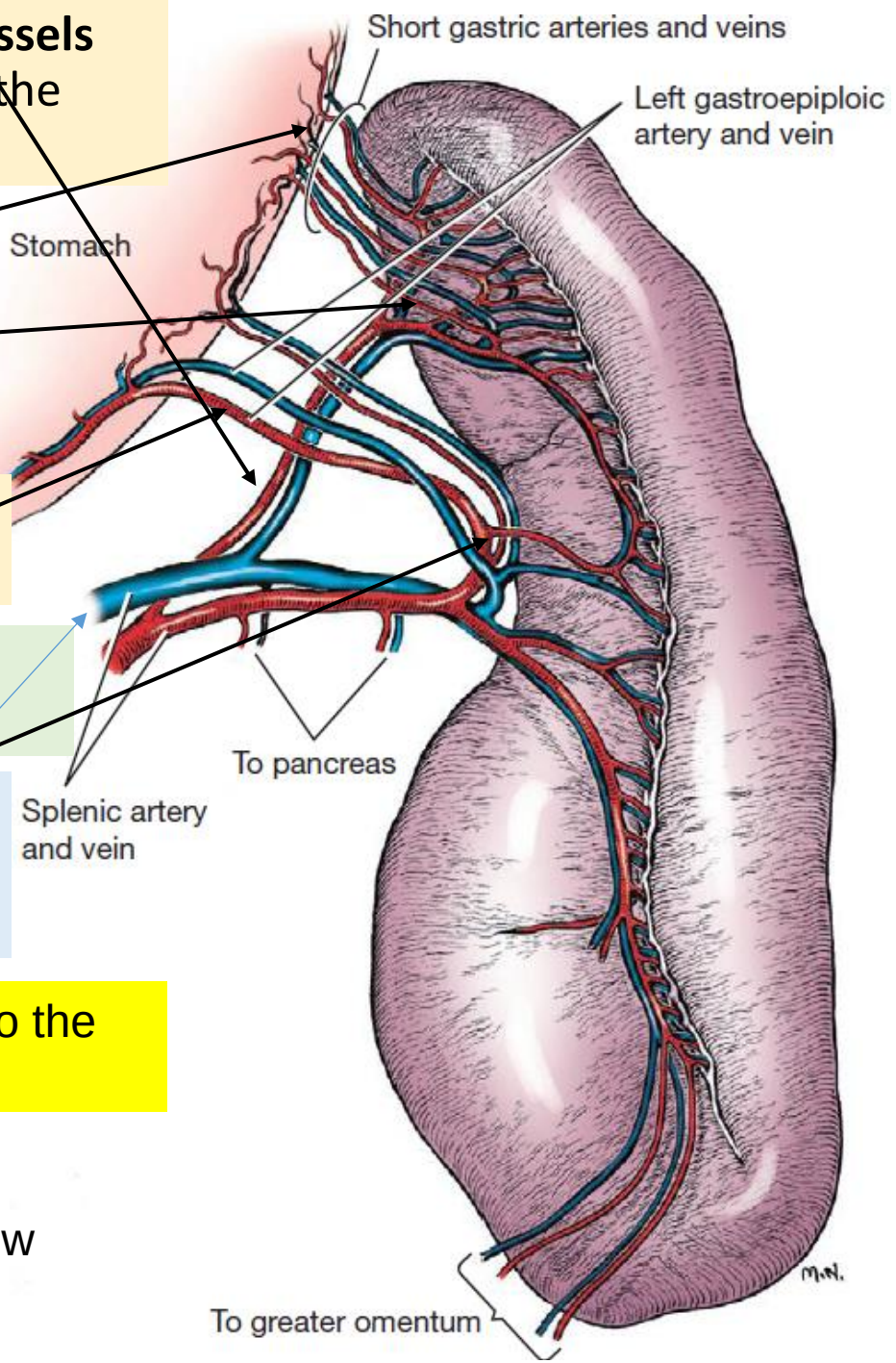
The short gastric arteries ultimately **anastomose** with the **branches of the left gastric artery**

After it passes the middle of the spleen, the continuation of the splenic artery is called **the *left gastroepiploic artery***

It gives off several splenic branches to supply **the caudal splenic extremity** and **angles back to the greater curvature of the stomach** through the gastrosplenic ligament.

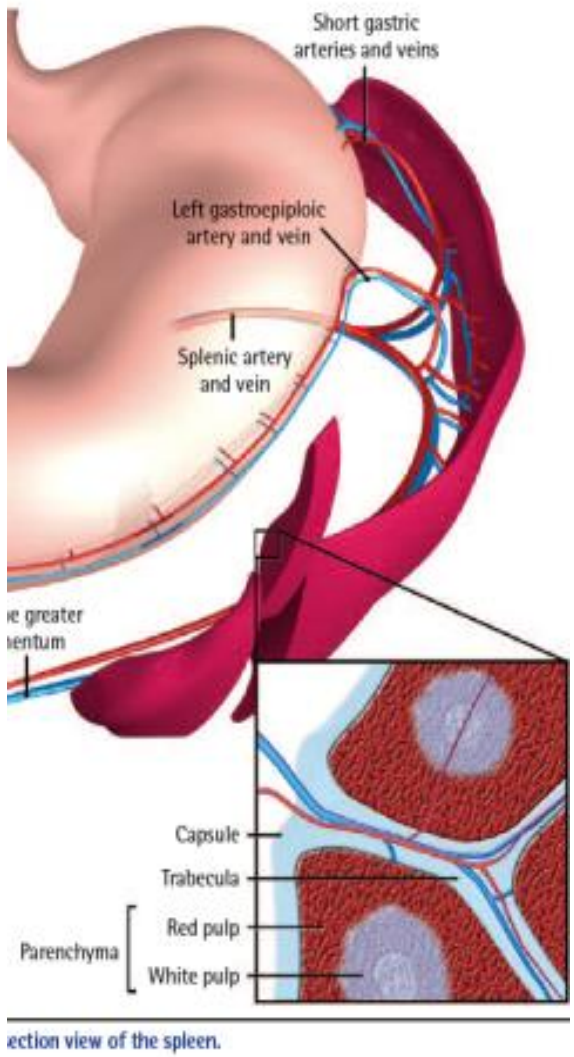
The splenic vein collects blood from the many hilar veins and drains into the gastrosplenic vein before entering the portal vein.

Splenic lymph nodes can be found near the splenic vein and artery a few centimeters distant from the hilus



The parenchyma of the normal spleen consists of **red** and **white pulp** surrounded by a **capsule** and traversed by **a complex network of trabeculae.**

1. **red pulp** is **the site of fetal erythropoiesis,** it contains the venous sinuses and cellular tissue between sinuses. Lymphocytes, macrophages, and all circulating blood cells are found in this loose meshwork of endothelial cells. Activated B-cells are returned to the circulation via the venous sinus system
2. **white pulp** is the **site of immune response,** it consists of diffuse and nodular lymphoid tissue Nodules have a similar microscopic structure to lymph nodes, with a primary follicle at the center. Diffuse lymphoid tissue adjacent to splenic arteries, known as *periarteriolar lymphatic sheaths*, contain primary follicles of B-cells surrounded by a mantle of T-cells that serve to process antigens filtered from the blood.
3. Splenic capsule is made of elastic and smooth muscle
4. **the trabeculae** are formed from a complicated network of fibromuscular fibers.



ection view of the spleen.

- ❑ The spleen is considered sinusoidal or nonsinusoidal depending on **the connections** between the **arterial and venous circulation**.
- ❑**The spleen in dogs is sinusoidal (or sinusal),** having a combination of direct arteriovenous endothelial connection and some areas where red blood cells (RBCs) must traverse a region of red pulp between vessels before entering the venous side.
- ❑**The spleen in cats is nonsinusoidal (or nonsinusal);** its open-ended venous channels and perforated endothelial channels allow direct connection between the arterial and venous vasculature
- ➢**Asplenia**, the failure of the spleen to develop in utero, is an occasional occurrence in dogs and cats.
- ➢The term ***accessory spleen*** has been applied to congenital and acquired fragments, although fragmentation and subsequent survival of splenic tissue after trauma is more appropriately termed ***splenosis*****.**
- ➢Congenital accessory spleens are seen in all species and can be found throughout the body, including the thoracic cavity, inguinal canal, and scrotum. The most common site in dogs is within the **gastrosplenic ligament**

These are **generally benign findings** unless acting as space-occupying lesions.

- ➢**Splenic fissures** are a common finding in dogs. These developmental defects can be differentiated from healed lacerations by the normal appearance of the capsule and smooth surface within the fissure.

PHYSIOLOGY

- The spleen is a functionally diverse organ with active roles in immunosurveillance and hematopoiesis.

- The most critical functions include filtering of microorganisms and antigenic particles from the blood, synthesis of IgG and cytokines of the complement pathway, maturation of newly formed erythrocytes, storage of RBCs and platelets, and removal of abnormal and senescent RBCs.

❖Hematopoiesis

- Splenic extramedullary hematopoiesis occurs during fetal growth and the neonatal period until bone marrow takes over the responsibility
- In adult animals, the spleen can resume some RBC production in response to infiltrative diseases of the bone marrow or with increased demand secondary to peripheral RBC destruction

- Splenic extramedullary hematopoiesis can manifest as generalize splenomegaly or as focal nodules and is a rare finding in cats.
- Single or multiple splenic nodules with active hematopoiesis on histologic examination are common in older dogs.

❖ Reservoir Function

The spleen can store **10% to 20% of a dog's RBC mass and 30% of the platelet** mass. Blood drawn from the splenic sinus system has a **very high hematocrit** (80% to 90%) to accommodate this storage.

RBCs passing through the spleen during normal circulation are divided into three "pools," depending on the circulatory pattern:

1. **The rapid pool** accounts for approximately 90% of blood entering the spleen and takes less than 30 seconds to rejoin the systemic circulation.
2. **The intermediate pool** (9% of circulating blood) takes 8 minutes to traverse the spleen, and
3. **the slow pool** (1% of circulating blood) takes 1 hour.

Physiologic demand mediates splenic contraction via circulating pressors and direct nerve action on splenic smooth muscle, resulting in up to 98% of stored erythrocytes moving into the rapid pool and reducing splenic size to 25% to 50% of normal.

❖ Immunologic Function

- In addition to providing the basis for fetal immune development, the spleen is the largest producer of B-cells, T-cells, and IgM in both dogs and cats.

PATHOLOGY

❖**Generalized splenomegaly** can arise from four mechanisms:

1. inflammation,
2. cellular hyperplasia,
3. congestive enlargement, and
4. cellular infiltration.

1. Splenitis or Inflammation

- *Splenitis* refers to an inflammatory infiltrate that can be further classified by the predominant cell type.
- It has been associated with bacterial, viral, fungal, and protozoal exposure.
- The most common causes of uniform splenomegaly in the dog include bacteremia, low-grade septicemia, and chronic infectious disease in which pathogens and necrotic debris are filtered in the spleen
- Infectious splenitis is dominated by a neutrophilia, which can progress to a localized abscess in some cases.

2. Immune Reaction or Cellular Hyperplasia

- Subacute and chronic diseases such as immune-mediated hemolytic anemia and immunemediated thrombocytopenia generally result in cellular hyperplasia of white and red pulp.

3. Congestion

- Congestive enlargement affects the entire spleen and is usually the result of one of four mechanisms:

1. congestive heart failure,
2. portal hypertension,
3. vascular outflow obstruction, or
4. Relaxation of the splenic capsule in response to chemical stimuli

4. Infiltration

- Splenic infiltration by abnormal cells or substances is seen in neoplastic processes (primary and metastatic) and, rarely, in splenic amyloidosis.

❖Localized Splenomegaly

Localized splenomegaly includes → Neoplastic origin
Localized splenomegaly includes → non-neoplastic origins

The most common causes of localized splenomegaly in dogs → nodular hyperplasia
The most common causes of localized splenomegaly in dogs → splenic hematoma
The most common causes of localized splenomegaly in dogs → splenic hemangiosarcoma.

- ***Nodular Hyperplasia***

  is most common in older dogs and is often an incidental finding Hyperplastic nodules are usually benign Nodules are composed of lymphoid, erythroid, myeloid, and megakaryocyte cells..

- ***Pseudotumor***

  Splenic inflammatory pseudotumor is a rare condition described in dogs and humanscomposed predominantly of plasma cells, lymphocytes, and histiocytes in a fibroproliferative background

- ***Hemangioma***

These are usually solitary masses composed of well-differentiated endothelial cells that connect to well-formed vascular spaces

- *Hamartoma*

  a rare benign proliferation of mature cells and tissues that are normally present in the spleen, similar to nodular hyperplasia

- ***Abscess***

  They are generally associated with **other conditions that compromise vascular supply or drainage of the spleen.**

Torsion of the vascular pedicle resulting in congestion, hypoxia, and necrosis of the splenic parenchyma may lead to abscess formation.

splenic foreign body has been described as the cause of discrete abscess.

Some microorganisms that typically result in generalized splenomegaly can also cause focal lesions (chronic suppurative splenitis).

➢ *Cysts*

Splenic cysts have only been reported in the human literature

➢ ***Segmental Infarction***

Segmental splenic infarction is uncommon in dogs, representing 1% to 2% of lesions found histopathologically.

Infarction occurs primarily in subcapsular areas, possibly as a result of poor perfusion and reduced venous return

Infarcts also form in areas of acute vascular occlusion secondary to infectious agents

➢ ***Plaques***

Siderotic plaques are benign golden brown or black patches that are frequently seen on the surface of the spleen. They result from focal accumulations of stored iron (hemosiderosis) derived from erythrophagocytosis and subsequent hemoglobin breakdown.

Segmental splenic infarcts in an 11-year-old Swiss mountain dog with intestinal lymphosarcoma

Neoplasia

Neoplastic causes of localized splenomegaly can be divided into hemic and nonhemic sources.

Hemic neoplasms include lymphoid, mast cell, histiocytic, plasma cell, and myeloproliferative disease.

- Concurrent evaluation of peripheral blood, bone marrow, and other hemic organs is critical for accurate diagnosis and staging of affected patients

Nonhemic neoplasms include hemangiosarcoma, other sarcomas, and benign tumors of connective tissue origin

Because of the cavitary nature of hemangiosarcoma, neoplastic endothelial cell proliferation can be difficult to identify

This makes differentiation of hemangiosarcoma, hemangioma, and hematoma challenging.

DIAGNOSTIC IMAGING TECHNIQUES

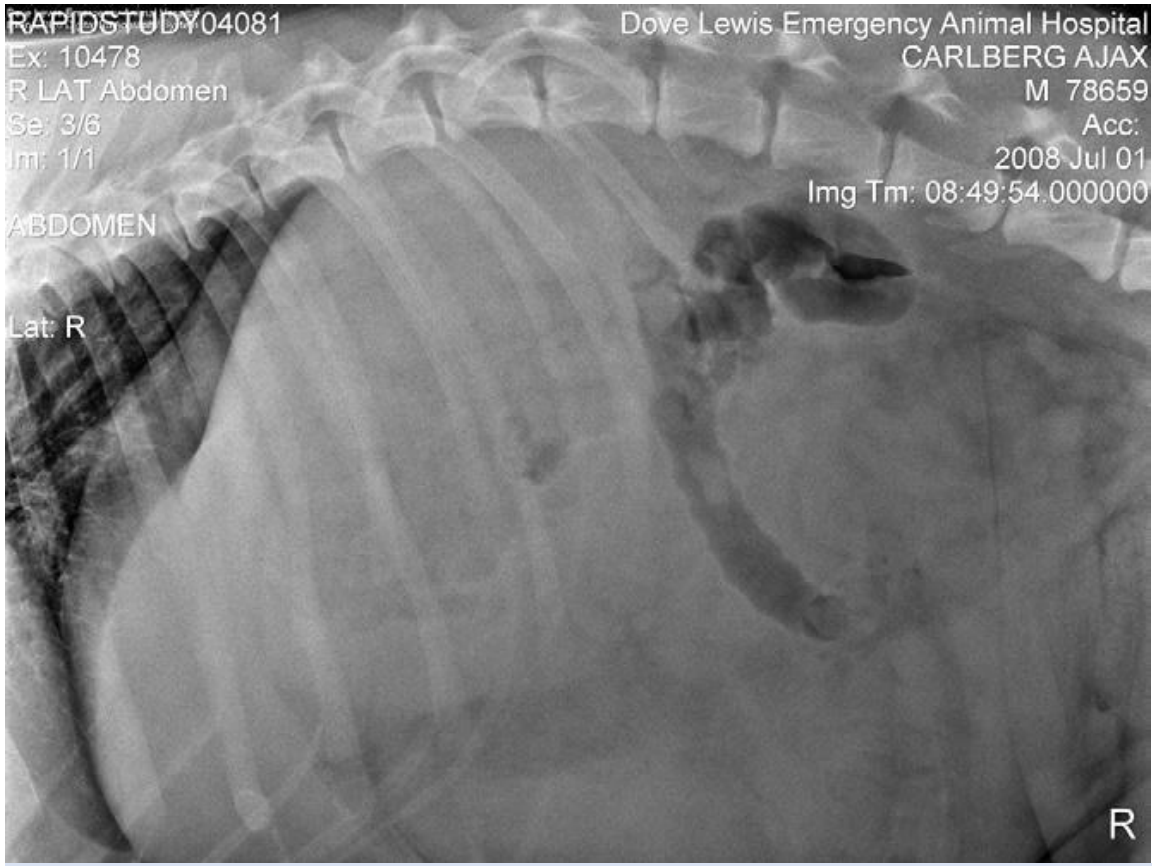
❑Radiography

A standard ventrodorsal projection typically shows the cranial extremity of the spleen as a triangular crosssection in the left cranial quadrant caudolateral to the gastric fundus and craniolateral to the left kidney

❑Ultrasonography

used to identify abnormal splenic architecture and screen the abdomen for metastatic disease

❑ Computed Tomography and Magnetic Resonance Imaging



Lateral radiograph of a dog with splenic torsion. Note the mid-abdominal mass effect and caudal and dorsal displacement of intestines.

CT and MRI may provide useful information in stable patients including evaluation of splenic masses and identification of abdominal or thoracic metastases.

DIAGNOSTIC SAMPLING

- Generalized and localized splenomegaly can be sampled 1. **via fine needle aspiration or 2. with the use of an automated biopsy device (Tru-Cut) 3. Direct surgical biopsy .**
- **a baseline hematocrit and coagulation profile** should be evaluated before sampling.
- **Ultrasound guidance** is recommended because it permits localization of a lesion and assessment of postsampling hemorrhage

Fine needle aspiration, A **left-sided approach** is most commonly performed. The left flank is clipped and aseptically prepped. The spleen is identified and stabilized against the body wall and aspirated with a 22-gauge needle (1.0 to 1.5 inch) attached to a 12-mL syringe.

Needle biopsy is performed in a manner similar to aspiration A small incision is made to facilitate passage of the automated biopsy device through the body wall. Ultrasonographic evaluation of the spleen 15 to 20 minutes after sampling is recommended to assess for excessive hemorrhage.

Direct surgical biopsy during celiotomy or laparoscopy is more likely to yield a diagnostic sample

PERIOPERATIVE CONSIDERATIONS

1. Because of the risk for intraoperative hemorrhage and coagulopathies, **a coagulation profile and blood typing are highly recommended** in animals with splenic disease
2. **Serum chemistries and a complete blood count** are also evaluated to determine the patient's **metabolic status.**
3. **Administration of whole blood or packed RBCs** should be considered before anesthetic induction in animals with a packed cell volume (PCV) less than 20%.
4. **Blood pressure and electrocardiograms (ECGs) are monitored** before and during anesthesia. Hypotension is treated with crystalloid intravenous fluids and colloids such as hetastarch.
5. **Pressor agents** such as **dopamine and dobutamine** are administered in animals with recalcitrant hypotension.
6. Dogs with **ventricular arrhythmias** can be placed on **a lidocaine** constant rate infusion (CRI; 25 to 80 µg/kg/min) before, during, and after surgery.
7. **Supplemental oxygen** is provided before induction and in recovery
8. Patients with **large masses** or **significant hemoabdomen** may require **ventilation until compression on the diaphragm can be relieved.**
9. **Suction** should be available throughout surgery, particularly in the event of hemoabdomen, to improve visualization and remove a pool of potentially neoplastic cells.
10. **Autotransfusion is not recommended**, except in the case **of traumatic splenic rupture**, because of the risk of systemic seeding of neoplastic cells.

Postoperative care

1. appropriate intravenous fluid support,
2. continuous ECG monitoring,
3. supplemental oxygen or transfusions as needed,
4. pain medication, and
5. Nutritional support.
6. Perioperative antibiosis should be discontinued after surgery unless specifically indicated.
7. Dogs with neoplastic conditions may require aggressive nutritional assistance, including nasogastric trickle feeding or partial or total parenteral nutrition.

SURGICAL TECHNIQUES

➢Splenorrhaphy surgical repair of the spleen.

- Salvage of a spleen with small lacerations or punctures is ideal but must be weighed against the future risk of hemorrhage from incomplete hemostasis.
- Capsular closure can be considered when parenchymal hemorrhage can be controlled by direct pressure.
- The capsule is apposed in an interrupted mattress pattern with 4-0 or 5-0, rapidly absorbable, monofilament suture on a taper needle.
- Suture bites will most likely include some of the surrounding parenchyma. Hemostatic agents such as gel foam can be incorporated in closure.

Electrocautery and argon beam coagulation devices can supplement hemostasis provided by capsular closure but rarely provide adequate hemostasis by themselves.

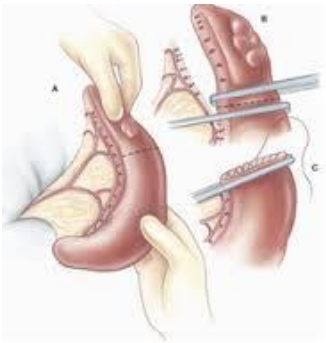
When splenic preservation is essential, the traumatized organ can be enclosed in an absorbable mesh bag to provide external tamponade to control bleeding.

Partial Splenectomy

It is technically more **challenging** than complete splenectomy **but preserves splenic function**.

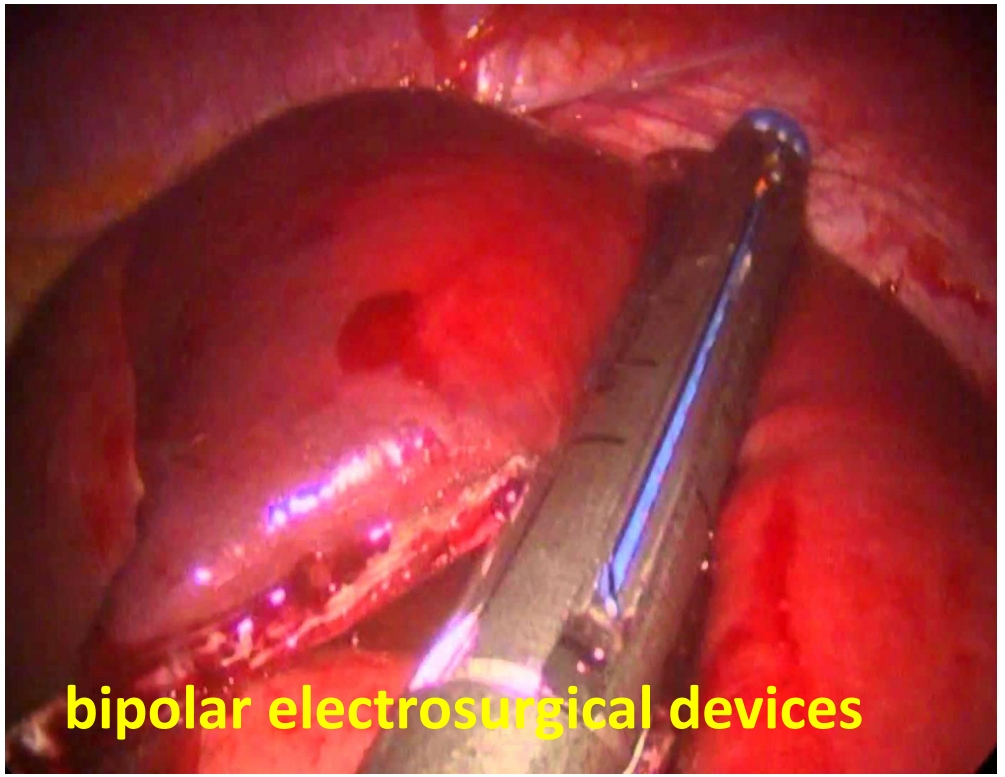
Partial splenectomy is reserved for cases with **a focal splenic abscess or injury** It is most commonly performed when blunt or penetrating abdominal trauma has **compromised vascular supply to a portion of the spleen.**

1. The spleen is **elevated** from the abdomen and **isolated with moistened laparotomy** sponges and drapes.
2. **Hilar vessels** supplying the area to be resected are **identified and ligated**;
3. a line of ischemia should then be evident.
4. Automatic stapling devices provide a rapid and effective means of separating splenic parenchyma and providing hemostasis along the cut edge and are particularly useful for unstable patients.
5. **digital compression is applied to the proposed staple site to partially separate the parenchyma before stapling**
6. The thoracoabdominal stapler applies a double row of stainless steel staples in 35- or 55-mm sections, depending on the unit.
7. **For nonstapled partial splenectomy, the parenchyma is separated with digital pressure along the line of ischemia, taking care to not tear the capsule.**
8. **After the parenchyma has been separated, a gastrointestinal, vascular, or hemostatic clamp is placed across the site without tearing the capsule.**
9. **A second clamp is placed 1 to 2 cm distally, and the spleen is transected midway between the clamps**
10. **The capsule distal to the proximal clamp is apposed with a continuous pattern of absorbable suture. A second line of continuous suture or interrupted mattress pattern can be used to further aid hemostasis**



Other techniques for division of parenchyma include use of a CO2 laser, ultrasonic cutting devices, or bipolar electrosurgical devices

Harmonic_Scalpel ultrasonic cutting devices ...



Laparoscopic partial and complete splenectomy may be desirable for a stable patient with a nonfriable spleen.

Complete Splenectomy

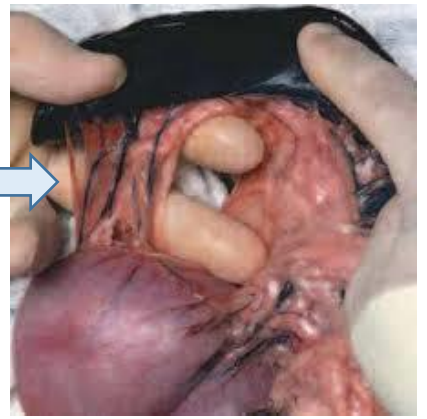
It is indicated with

1. known or suspected neoplasia,
2. splenic torsion,
3. severe trauma,
4. generalized infiltrative disease,
5. some immune-mediated disease processes.

1. The patient is prepared for **midline celiotomy** with a surgical field stretching **from the xyphoid to the pubis**, allowing for adequate exposure in the **event that the spleen is massive or friable**.

2. Abdominal retractors and moistened laparotomy sponges are used to expose and isolate the cranial abdomen.

3. When elevating a diseased spleen from the abdomen, gentle manipulation is required to prevent iatrogenic rupture.



4. splenectomy is often performed by ligation of left gastroepiploic and short gastric arteries and veins and the splenic artery and vein beyond the pancreatic artery.

- Double ligation of the splenic artery and vein is recommended to decrease the risk of postoperative hemorrhage
- Stapling devices are useful for rapid ligation of smaller vessels.
- A bipolar electrosurgical device can also be used for rapid, effective hemostasis.
- some devices seal vessels up to 7 mm in diameter, decreasing surgical and anesthetic time in critical patients.
- Hemostatic clips, which are appropriate for vessels no greater than 3 mm in diameter, are a useful, inexpensive adjunct to hand-tied ligatures.
- In some patients, omental adhesions or the mass itself may obstruct visualization of the splenic artery and vein; in that case, splenectomy is performed the old-fashioned way—by ligation of individual hilar vessels.
- In the event of a torsed splenic pedicle, manual ligation is preferred over stapling devices. The pedicle is ligated in sections with multiple encircling or mattress sutures.

5. After resection of a ruptured spleen, copious lavage is performed to remove potentially neoplastic cells from the abdominal cavity.

SURGICAL CONDITIONS OF THE SPLEEN

○ Splenic Trauma (Traumatic splenic lacerations)

causes include

1. penetrating foreign bodies (sticks, fence material, bite wounds, gunshot wounds, and wounds from edged weapons).
2. Vehicular accidents and falls are the most reported cause of **blunt abdominal trauma**
3. Iatrogenic laceration during

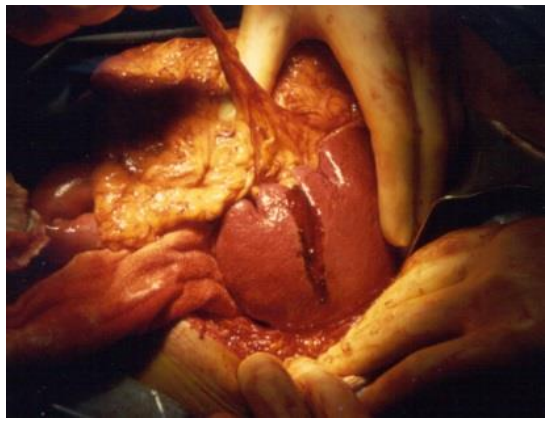
a. surgery (celiotomy or spay hook or Laparoscopic portal placement),

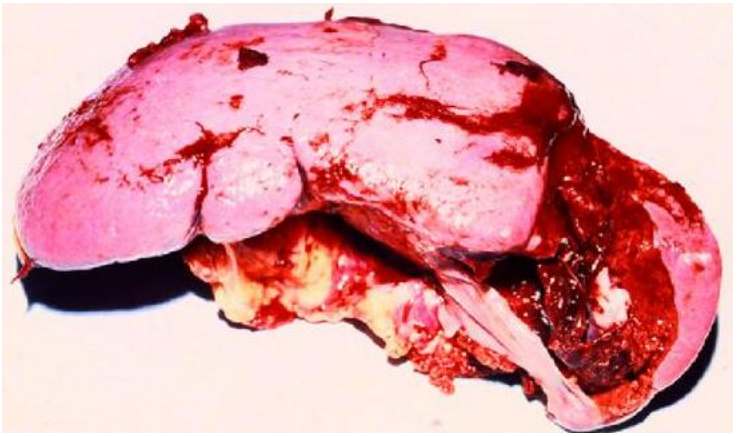
b. diagnostic procedures (diagnostic peritoneal lavage, fine needle aspirate or needle biopsy, gastrocentesis (in the event of volvulus), and gastrotomy tube placement.)

Lacerations may involve the **capsule**, **parenchyma**, or **vasculature** and

may lead to

massive hemorrhage into the abdominal cavity





Splenic Trauma

- Patients suspected of splenic injury are stabilized **with intravenous crystalloids and colloids, when indicated for hypotension, and intravenous analgesics.**
- Serial PCV and total protein are measured to determine whether surgical intervention is indicated.

- If **hemoabdomen** is present, a fluid sample is obtained by **abdominocentesis for PCV and total protein measurement.**

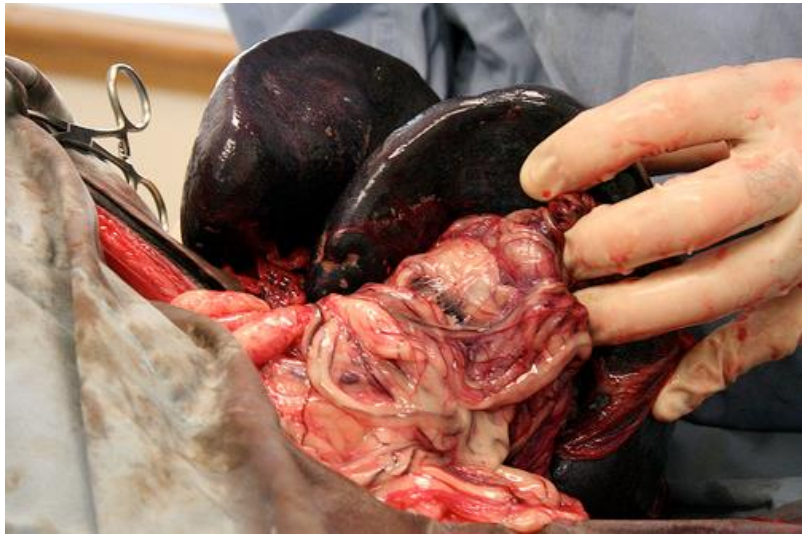
A snug circumferential external bandage is applied to the patient to generate **counter pressure** for control of early hemorrhage.

If **emergency surgery** is indicated for **uncontrollable hemorrhage**, blood typing and transfusion are recommended to improve anesthetic stability.

Significant splenic trauma generally requires partial or complete splenectomy Prognosis for dogs and cats after splenectomy for traumatic injury is good to excellent if the patient survives the immediate perioperative period

○ Splenic Torsion

- Torsion of the spleen is uncommon in dogs and has not been reported in cats.



❖ It is most often seen **in large- and giant breed dogs** that have a **deep-chested body type**, including Great Danes, Saint Bernards, German shepherds, and Irish setters. Males are more commonly affected.


Great Danes


Saint Bernards


German shepherds


Irish setters

Torsion of the splenic pedicle initially occludes
1. venous drainage, resulting in splenic congestion.
2. Subsequent arterial occlusion results in splenic infarction.

Grossly, the **torsed spleen** appears markedly **enlarged and blue-black from cyanosis.** It is commonly described as **a "C" shape**, with the head and tail tightly curled over one another and **hilar vessels located** at the **center** of the twist.

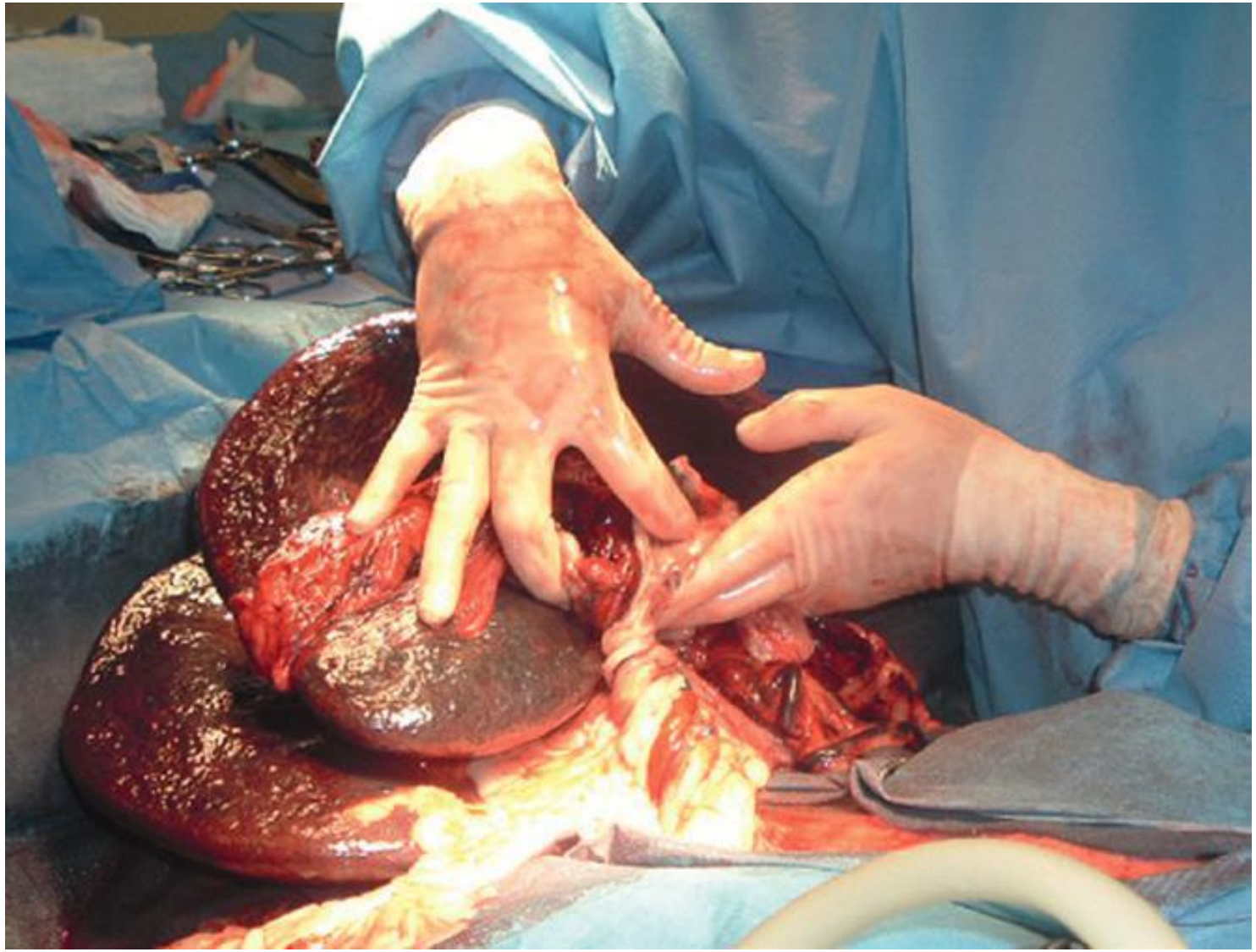
The pathogenesis is unknown, it is hypothesized that Volvulus of the stomach may stretch the gastrosplenic ligaments, loosening splenic attachments, or leave the spleen in a torsed position after spontaneous resolution of gastric dilitation and volvulus.

Conversely, splenic torsion may interfere with normal gastric motility, predisposing dogs to gastric tympany and gastric dilitation and volvulus

Splenic torsions can be acute or chronic.

Clinically, **chronic splenic torsion** can be difficult to distinguish from other causes of abdominal pain because of vague presenting signs, such as lethargy, anorexia, vomiting, diarrhea, polyuria and polydipsia, discolored urine, and weight loss.

Dogs with **acute splenic torsion** may present with signs of hypovolemic or toxic shock. Hematologic findings may include leukocytosis, anemia, and thrombocytopenia.



Intraoperative view of the vascular pedicle of a torsed spleen. Cranial is to the lower right in the image.

Diagnosis of splenic torsion

1. On radiographs: the torsed spleen appears **as a mid-abdominal mass**. Sometimes the "**C-shaped"** spleen can be appreciated on a lateral abdominal view.
2. on CT Splenic torsion can also be diagnosed by **failure of splenic contrast enhancement** and presence of a "**corkscrew-like" soft tissue mass in the location of the splenic pedicle.**
3. Ultrasonography is generalized splenomegaly and lacy, diffusely hypoechoic splenic parenchyma are often noted the most common modality for diagnosis of splenic torsion.

Treatment and Prognosis

- The treatment includes Supportive care and splenectomy
- The prognosis is guarded to good; chronic torsion carries a better prognosis because of a decreased incidence of cardiovascular shock and toxemia

Splenic Neoplasia

Pathophysiology

- Splenic neoplasia is **common** in dogs, and one third to two thirds of all splenic lesions are reportedly neoplastic in this species.
- **Hemangiosarcoma** is the most common neoplastic lesion of the spleen in dogs, rapid growth and widespread metastasis are typical because of its vascular endothelial origin and ready access to the systemic circulation.

Other canine splenic neoplasms include leiomyosarcoma, undifferentiated sarcoma, fibrosarcoma, osteosarcoma, liposarcoma, myxosarcoma, mast cell tumor, chondrosarcoma, rhabdomyosarcoma, malignant fibrous histiocytoma, lymphoma, metastatic adenocarcinoma, and myeloproliferative disease.

The most common **splenic neoplasms in cats** are lymphosarcoma and mast cell tumors. Myeloproliferative disease, hemangiosarcoma, undifferentiated sarcomas, metastatic carcinoma, adenocarcinoma, fibrosarcoma, lipoma, metastatic melanoma, malignant fibrous histiocytoma, and rhabdomyosarcoma of the spleen in cats have also been reported.

Physical examination often reveals splenomegaly with or without a palpable splenic mass, abdominal pain, and sometimes abdominal distension with a fluid wave. Pale mucous membranes or scleral icterus may be present.

Diagnostics

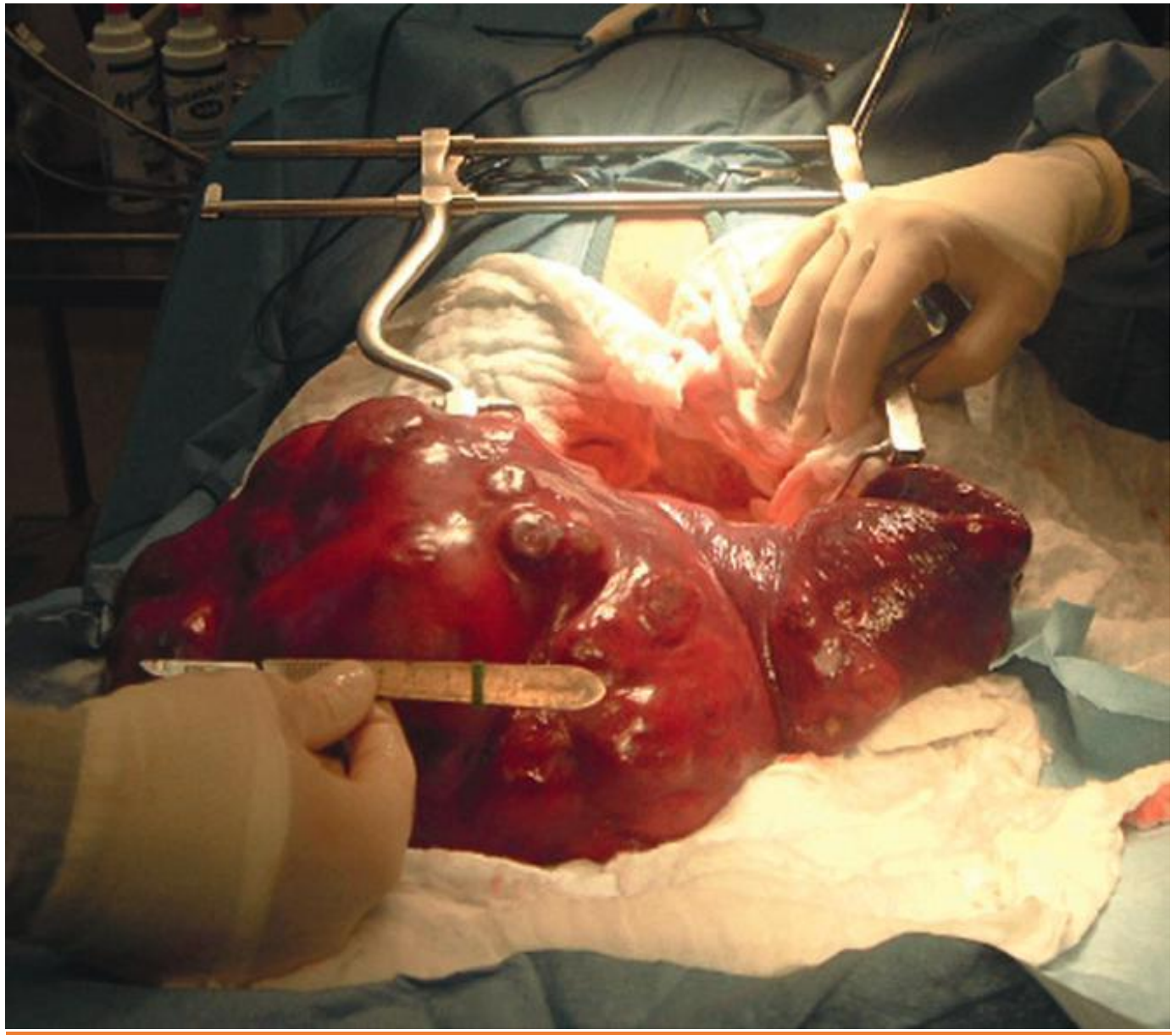
1. **Hematologic changes** are nonspecific; anemia, mature neutrophilic leukocytosis, and increased total bilirubin and liver enzymes are common findings. Hematocrit may be predictive of neoplasia.
2. **Abdominal radiographic findings** include an abdominal mass and loss of detail consistent with effusion.
3. **Abdominal ultrasonography** is an excellent modality for identifying and characterizing effusion, splenic lesions, and Metastases. But, diffuse and focal sonographic abnormalities are nonspecific findings in dogs and cats.

- **Cardiac ultrasonography or a thoracic CT scan** is strongly encouraged in cases of nontraumatic hemoabdomen because of the potential for right atrial or pulmonary metastases with hemangiosarcoma.

Treatment includes patient stabilization and complete splenectomy with biopsy of other abdominal sites as indicated.

The prognosis for dogs with primary splenic neoplasia **varies** significantly **with *tumor type and staging*.**
Hemangiosarcoma is an aggressive tumor with a **very poor prognosis**, although some variability in ***survival time*** is noted, depending on:

1. The **cancer stage** at the time of splenectomy and
2. The use of postoperative adjuvant **chemotherapy**.



Canine splenic hemangiosarcoma. This 11-year-old mixed-breed dog also had microscopic hepatic metastases. Cranial is at the top of the image.

Staging of Canine Hemangiosarcoma

STAGE	CLINICAL DESCRIPTION
T	T0: No tumor evident
	T1: Diameter <5 cm, confined to affected organ, does not invade beyond dermis (cutaneous lesions)
	T2: Diameter >5 cm, ruptured organ or subcutaneous invasion
	T3: Invasive tumor
N	N0: No regional nodes involved
	N1: Regional nodes involved
	N2: Distant nodes involved
M	M0: No distant metastasis
	M1: Distant metastasis
I	T0 or T1, N0, M0
II	T1 or T2, N0 or N1, M0
III	T2 or T3, any N, M1

Chemotherapy is most effective in patients with microscopic disease, so dogs with gross evidence of metastasis **(stage III) are least** likely to gain survival time. **Doxorubicin** is the most cited chemotherapeutic agent for canine hemangiosarcoma

1. The median survival for dogs with stage I hemangiosarcoma treated with splenectomy and immunotherapy was 425 days compared with 166 days for splenectomy only.
2. Dogs with stage II tumors had a median survival time of 162 days when treated with immunotherapy and splenectomy, compared with 96 days for splenectomy alone.
3. Dogs with stage III hemangiosarcoma have the shortest survival time.

Benign splenic hematoma in a 9-year-old Labrador retriever. Cranial is at the bottom of the image

Prognosis for other splenic neoplasms depends upon the tumor type.

POSTOPERATIVE COMPLICATIONS

1. Hemorrhage from inadequately ligated vessels and from other abdominal tumor sites (e.g., liver) is the most commonly cited complication.
2. Vascular Compromise to the left limb of the pancreas may occur from the disease process (e.g., splenic torsion) or iatrogenically. Splenic surgery may also result in **acute portal vein thrombosis**.
3. Arrhythmias, in the form of ventricular premature contractions, or ventricular tachycardia.

One proposed mechanism of arrhythmias is myocardial ischemia and hypoxia secondary to reduced cardiac return and hypovolemic shock from mass rupture and loss. Very large splenic masses may also impair venous return by direct pressure on the caudal vena cava. Other factors that may contribute to arrhythmia development include acid-base and electrolyte imbalances, microemboli, and myocardial depressant factors associated with pancreatic ischemia from hypovolemia or pancreatic vascular compromise

4. Disseminated Intravascular Coagulation, It occurs secondary to severe systemic disease complicated by hypotension, ischemia, and hypoxia.
5. Gastric Dilatation and Volvulus in several canine patients as early as 5 days after surgery. Causes:

A. stretching of the supporting gastric ligament by an expanding splenic mass, which may predispose the stomach to twist on its longitudinal axis,

B. or because removal of a large space-occupying mass may create opportunity for abnormal movement and positioning of the stomach.

6. Infection, Because the spleen is also the primary site for removal of RBCs infected by bacteria, rickettsial agents, and hemoparasites, splenectomized animals are believed to be at higher risk for infection
7. Oxygen Transport, Splenectomized animals are at higher risk of hypoxia and ischemia in the event of acute blood loss.