isolated splenic torsion in dogs is a rare condition in which the spleen is rotated around its vascular pedicle. Although splenic torsion is often found secondary to gastric dilatation-volvulus (GDV), this article focuses on isolated splenic torsion. The exact etiology of splenic torsion is unknown, but it is thought to occur after gastric dilatation or a partial (intermittent) gastric torsion. Once the dilation or intermittent torsion subsides, the spleen remains in its abnormal position as a result of the stretching of associated ligaments. Once in this abnormal position, the thin-walled splenic veins become occluded; however, the thicker-walled splenic artery is only partially occluded. Because blood outflow is obstructed and blood inflow is maintained, congestive splenomegaly ensues.

Splenic torsion usually occurs in large, deep-chested dogs; the incidence is highest in German shepherds and Great Danes. No sex or age predilection has been found. Splenic torsion is usually classified as acute or chronic. The acute form typically presents with acute clinical signs, including abdominal distention and/or pain, cardiovascular collapse, and shock. The chronic form causes vague abdominal discomfort that can persist for weeks. These dogs typically have a palpably enlarged and malpositioned spleen, intermittent vomiting or retching, depression, lethargy, anorexia, and discolored urine (hemoglobinuria due to hemolysis). Because of the two variant forms of splenic torsion, physical examination findings are nonspecific and can often resemble other gastrointestinal disorders. This makes isolated splenic torsion difficult to diagnose.

DIAGNOSTIC CRITERIA

Owner Observations
- Lethargy.
- Depression.
- Anorexia.
- Polydipsia/polyuria.
- Vomiting.
- Diarrhea.
- Abdominal pain/discomfort.

Other Historical Considerations/Predispositions
- Splenic torsions are classified as chronic or acute.
  — Some patients with chronic splenic torsion have intermittent waxing and waning signs for several days to several weeks.
  — Patients with acute splenic torsion typically present with signs of cardiovascular collapse and shock.
- This condition can be concomitant with GDV.

Physical Examination Findings
- Signs of cardiovascular collapse and shock (tachycardia, tachypnea, pale mucous membranes, prolonged capillary refill, and/or weak peripheral pulses) are observed in more than half of patients with acute splenic torsion.
- Abdominal palpation usually reveals splenomegaly with an abdominal pain response.
- Pale mucous membranes; anemia; dehydration.
- Lethargy; weakness; anorexia.
- Diarrhea; vomiting.
- Icterus.
- Fever.

Laboratory Findings

Complete Blood Count
- Most dogs exhibit mild to moderate anemia with a decrease in hemoglobin.
- Leukocytosis with neutrophilia and monocytosis is commonly seen.
- Thrombocytopenia may occur.
• Target cells (damaged erythrocytes that have traversed the abnormal splenic circulation) may also be found.

**Serum Chemistry $**
- Increased serum alkaline phosphatase.
- Increased serum alanine transaminase.
- Hyperbilirubinemia.

**Urinalysis $**
- Hemoglobinuria (caused by intravascular or intrasplenic hemolysis) is most commonly seen.
- Proteinuria, hematuria, or bilirubinuria may occasionally be seen.

**Coagulation Panels $**
- Disseminated intravascular coagulation can be a common sequela to splenic torsion. If coagulopathy is suspected, prothrombin time and activated partial thromboplastin time can be tested and fibrin degradation products may be submitted for analysis.

**Other Diagnostic Findings**

**Radiography $**
- Abdominal radiography reveals splenomegaly along with displacement, poor visceral detail, and displacement of the small intestine. The spleen can appear to be folded into a C shape in the central portion of the abdomen.
- The gastric shape may also be distorted because the pylorus is pulled closer to the cardia as a result of traction on the gastrosplenic ligament.
- Peritoneal fluid may be present around an enlarged, displaced spleen.
- Rarely, splenic gas caused by anaerobic bacteria (e.g., *Clostridium* spp) can be seen on abdominal radiographs.

**Ultrasonography $**
- Abdominal ultrasonography usually reveals a markedly enlarged spleen and enlarged splenic vessels. Diffuse hypoechoic splenic parenchyma with linear echoes separating a large anechoic mass may be unique to splenic torsion.
- Doppler color flow studies reveal decreased venous flow.
- Intravascular thrombi may also be observed.

**Computed Tomography $**
- When available, computed tomography can be used to diagnose isolated splenic torsion in dogs. It is commonly used to diagnose the condition in humans.

### CHECKPOINTS
- Some authors recommend that the pedicle not be derotated before total splenectomy to avoid the release of any trapped toxic byproducts of anaerobic metabolism into systemic circulation.
- Some authors advise untwisting the pedicle, if possible, to check for signs of thrombosis in the splenic artery and vein and their branches. If thromboses are present, a total splenectomy should be performed; however, if vascular patency is present, repositioning may be adequate.
- Some authors agree that total splenectomy is safer because of risk of torsion recurrence and the lack of a good method to secure the spleen.

**Summary of Diagnostic Criteria**
- Abdominal ultrasonography is the most useful tool in diagnosing splenic torsion. Splenomegaly, diffuse hypoechoic parenchyma with linear echoes separating an anechoic mass, and distended splenic vessels are unique to splenic torsion.
- Radiography may reveal decreased visceral detail, splenomegaly with displacement, and other organ (small intestine) displacement.
- Physical examination findings include cardiovascular collapse and shock with palpable splenomegaly and abdominal pain or discomfort in large, deep-chested dogs.
- There are no pathognomonic laboratory findings for splenic torsion. However, mild to moderate anemia, leukocytosis with neutrophilia, occasional thrombocytopenia, elevated liver enzymes, and hemoglobinuria are typical.

**Diagnostic Differentials**

**Conditions That Cause Splenomegaly**
- **Spleenic neoplasia:** Diagnosis is usually made with histopathology.
- **Spleenic trauma** (hematoma): Ruled out by lack of history of traumatic episode; confirmation requires histopathology.
- **Spleenic abscess:** Usually diagnosed based on histopathologic examination of ultrasound-guided or aspiration biopsy samples.
Tickborne diseases (e.g., ehrlichiosis, Rocky Mountain spotted fever, babesiosis) can cause splenomegaly, thrombocytopenia, and anemia. Usually accompanied by lymphadenopathy and fever. Ruled out with tick titers.

Immune-mediated diseases (e.g., hemolytic anemia): Diagnosed by autoagglutination and spherocytes on blood smear. Coombs’ test is probably not useful (can be positive or negative). Anemia may be severe.

Conditions with Midabdominal Masses

- Renal enlargement (neoplasia or hydronephrosis).
- Lymph node enlargement.
- Gastrointestinal neoplasia: Abdominal radiography and ultrasonography are usually suggestive, but a biopsy is needed for diagnosis.
- Pancreatic neoplasia.
- Liver neoplasia.
- Enlargement of urinary bladder secondary to obstruction (can cause abdominal wall distention).
- Testicular torsion in cryptorchid males.

Conditions That Cause Abdominal Discomfort

- GDV: Diagnosis can be made by abdominal radiography.
- Intestinal volvulus: Diagnosis can be made by abdominal radiography and ultrasonography.
- Gastrointestinal obstruction: Diagnosis can be made by abdominal radiography and ultrasonography.
- Pancreatitis: Other than biopsy, no single test can confirm pancreatitis. Elevated trypsin-like immunoreactivity is suggestive of pancreatitis, but normal levels do not rule it out. Radiography and ultrasonography are also used in the confirmation of pancreatitis.
- Peritonitis: Radiography and ultrasonography may show evidence of air, fluid, or both in the abdomen, but diagnosis is usually based on cytology from abdominocentesis or peritoneal lavage.
- Abdominal trauma.
- Urinary tract obstruction.
- Expansile masses with organ displacement.

ON THE NEWS FRONT

Humans have an increased risk of developing overwhelming infection and/or sepsis after undergoing splenectomy; however, this has not been recognized in dogs unless they are receiving immunosuppressive therapy at the time of surgery.

TREATMENT RECOMMENDATIONS

Initial Treatment

- Animals in cardiovascular collapse and shock should be stabilized with aggressive intravenous fluid therapy and broad-spectrum antibiotics. Crystalloids (e.g. Normosol-R, 0.9% NaCl, and lactated Ringer’s solution; up to 90 ml/kg/hr initially until perfusion and blood pressure normalize) are typically the fluid of choice. $–$$
- Packed erythrocytes may be administered to severely anemic patients. The rate for normovolemic patients is usually 3 to 10 ml/kg/hr given over 4 to 6 hours for a total dose of 20 ml/kg. $–$$
- If coagulopathy is present, fresh-frozen plasma may be administered at 10 to 20 ml/kg over 4 hours. $–$$
- Once the animal is stabilized, surgical treatment can be pursued. Surgical treatment consists of total splenectomy or (less commonly) splenic repositioning. If splenic torsion is identified very early and no palpable thrombi are present, repositioning could be considered; however, few surgeons feel comfortable with repositioning the spleen after torsion has occurred. Untwisting the pedicle is not advised as leaving the twist prevents embolization of thrombi into the portal vein. $$–$$$–$$
- Partial pancreatectomy may be required if the left pancreatic limb is affected by torsion. If the pancreas is incorporated into the torsion and looks ischemic or devitalized, partial pancreatectomy would be indicated. Partial splenectomy is rarely performed for splenic torsions.

Alternative/Optional Treatments/Therapy

Prophylactic gastropexy should always be considered at the time of surgery. GDV has been reported following splenectomy for treatment of splenic torsion in dogs. Splenic torsion increases tension on the gastro-splenic, hepatoduodenal, and hepatogastric ligaments. The laxity caused by stretching of these ligaments may increase mobility of the stomach and predispose the dog to GDV. $$

Supportive Treatment

- Ongoing fluid support is essential throughout the treatment of splenic torsion. $
- Whole blood or packed erythrocytes should be available in case of abdominal hemorrhage from the congested spleen. $–$$
- Therapy for ventricular arrhythmias should also be considered as part of supportive treatment. There is a high incidence of cardiac arrhythmias associated with dogs undergoing splenectomy.
— Lidocaine bolus (1–2 mg/kg slowly over 2 min to determine an adequate response). Bolus can be repeated until the arrhythmia responds or until the maximum dose (8 mg/kg) is given.
— If bolus is effective, a constant-rate infusion (25–75 µg/kg/min) can be given.

• Procainamide (6–15 mg/kg IM or slow IV q4–6h or 25–50 µg/kg/min constant-rate infusion) is the second-line drug used if lidocaine is ineffective. Maintenance therapy is continued with oral procainamide (8–20 mg/kg PO q8h).

• Sotalol (1–2 mg/kg PO q12h) or other antiarrhythmics should be considered if maintenance therapy is required.

**Patient Monitoring**
- Patients should be monitored for decreases in blood pressure, mucous membrane color, and capillary refill time. A decrease in these parameters may be evidence of intraperitoneal hemorrhage.
- Patients should be monitored for clinical signs associated with pancreatitis (vomiting), which occur as a result of disruption of pancreatic blood flow associated with the splenic torsion.
- Electrocardiographic monitoring for evidence of cardiac arrhythmia is recommended for hospitalized patients.
- Patients should be monitored postoperatively for signs of peritonitis (e.g., increased abdominal pain, fever, vomiting, peritoneal effusion).
- The incision should be monitored for signs of inflammation or dehiscence.

**Home Management**
- Owners should inspect the incision site daily for signs of inflammation until the follow-up examination.
- Owners should be educated about possible signs of pancreatitis, which can occur after splenic torsion as a result of the interruption in the blood supply.
- Owners should be educated about possible signs of GDV, which can develop after surgical management of splenic torsion. GDV occurs as a result of laxity caused by the stretching of the gastroplenic, hepatoduodenal, and hepatogastric ligaments. Gastropexy concomitant to splenectomy should prevent GDV in the future.
- Owners should feed a consistent and appropriate diet and restrict activity for 10 to 14 days after surgery (i.e., until the follow-up examination).

**Milestones/Recovery Time Frames**
Most animals treated with surgical intervention (splenectomy or splenic repositioning) recover very quickly. A follow-up examination should be performed 10 to 14 days after surgery, at which time sutures should be removed and the integrity of the suture line checked.

**Treatment Contraindications**
Because barbiturates and narcotics may exacerbate splenic engorgement, they should be avoided during anesthetic induction.

**Prognosis**

**Favorable Criteria**
If the underlying splenic torsion can be diagnosed promptly, the patient is properly stabilized, and surgical management (splenectomy or splenic repositioning) is pursued, the prognosis is generally good.

**Unfavorable Criteria**
- Disseminated intravascular coagulation.
- Splenic infarction/necrosis.
- Peritonitis.
- Pancreatitis.
- Cardiac arrhythmias (usually resolve in 72 hours).

**Recommended Reading**