



Coagulopathy

Recommended Diagnostics

- Presentation/history will often determine whether to pursue primary or secondary hemostatic disorders. Some patients may have disorders of both. Coagulopathies are either congenital or acquired. Most congenital coagulopathies cause bleeding in the first several months of life. Patient history should include travel history and exposure to any supplements, herbal medications, and human/veterinary medications. Also consider breed specific diseases, which can help narrow rule outs and help the clinician choose the most appropriate tests.

Primary hemostasis abnormality thrombocytopathia (acquired or congenital)

- Typically presents as mucosal or cutaneous bleeding (petechiae/ecchymoses), epistaxis, hematuria, and melena, but more severe bleeding can occur
- Dobermans, dachshunds, miniature pinschers, Corgis, German shorthaired or wirehaired pointers, Shelties, Maltese, Cocker spaniels, and Norwich terriers are predisposed to Von Willebrand's disease
 - Note: Many other breeds may also be affected by Von Willebrand's
 - Type II and especially Type III von Willebrand's can cause more severe bleeding than the more common Type I seen in Dobermans
- Other breeds predisposed to other thrombocytopathies include, but are not limited to, the Basset hound, Otterhound, and Great Pyrenees
- Medications – aspirin, sulfa drugs, acetaminophen, penicillin, NSAIDS (topical and oral), clopidogrel. Even calcium channel blockers, antihistamines, and anesthetics may affect platelet function, although uncommon.
- Severe illnesses such as neoplasia, pancreatitis, liver dysfunction, or renal failure may decrease platelet function
- Snake envenomation may decrease platelet function
- Infectious diseases may affect platelet number and, less commonly, platelet function
 - Rickettsial
 - Fungal
 - Parasitic
 - Protozoal
 - Viral

- Bacterial

Recommended Diagnostics for Thrombocytopeny

- CBC
 - Thrombocytopeny should be ruled out and confirmed with a blood smear since analyzers may not yield an accurate count in the face of large platelets (megaplatelets) or platelet clumping
 - Under 100x magnification on a blood smear, there should be 10-20 platelets per hpf, which each platelet representing about 15,000 platelets/microliter
 - Spontaneous bleeding does not typically occur until platelet count is <20,000/microliter
 - If thrombocytopeny is confirmed, pursue appropriate diagnostics
- Chemistry panel
 - Look for evidence of illnesses such as liver or renal disease
 - May be skipped or delayed if patient is well otherwise and finances are very limited
- Blood smear
 - Confirm thrombocytopeny – look for platelet clumps/megaplatelets
 - Blood parasites
 - Look for schistocytes
- SNAP 4dx
- Perform buccal mucosal bleeding time (BMBT) if platelets >100,000/microliter
 - Normal time to clot formation is 3-5 minutes
 - Prolonged BMBT confirms thrombocytopeny

Recommended Treatment for Thrombocytopeny

- Address underlying infectious or neoplastic processes.
- Discontinue any topical or oral medications that may be causing platelet dysfunction
- Severe thrombocytopenies may lead to the need for a transfusion
 - Von Willebrand's
 - Desmopressin
 - 1 mcg/kg SC 30 minutes prior to surgery
 - Cryoprecipitate
 - 1 unit/10 kg IV q6-12 hr prn
 - Whole blood transfusion
 - Transfused platelets will only survive several hours
 - Best to reserve for severe blood loss anemia
 - Fresh frozen plasma
 - 10 ml/kg IV

- Other thrombocytopathies
 - Whole blood transfusion

****Other thoughts**

- If von Willebrand's is suspected based on breed, and it is confirmed with prolonged BMBT, then a PCV/TP and cryoprecipitate and/or whole blood transfusion can be performed without other tests to save money
- Testing for von Willebrand's (Type 1, 2, and 3) is available
 - Comparative Hemostasis Lab at Cornell
- King Charles Cavalier Spaniels and a few other breeds (Norfolk terriers, Chihuahuas, Labs, poodles, Shih Tzu, Jack Russels, etc) get macrothrombocytosis that does not cause bleeding. Their normal platelet counts range from 60,000 to 110,000, but most are megaplatelets.

Secondary hemostasis disorders (congenital or acquired)

- Typically manifests as larger bleeds than most primary hemostasis disorders, including but not limited to pericardial, peritoneal, or pleural hemorrhage, hematuria, hemarthrosis, and epistaxis
- Acquired coagulopathies are caused by rodenticide ingestion, heparin, liver failure, disseminated intravascular coagulation, neoplasia, and severe ionized hypocalcemia

Recommended Diagnostics

- History/Physical exam
 - Exposure to warfarin?
 - Anti-coagulant rodenticide exposure?
 - Within 4 hours → emetics if alert and vitamin K injection followed by oral vitamin K for at least 4 weeks
 - After 4 hours → activated charcoal and vitamin K injection followed by oral vitamin K 4 weeks
 - Medical history
 - History or clinical signs of liver disease or liver failure?
 - Bile acid assay (if bilirubin normal)
- In house ACT test-prolonged if all clotting factors decreased by 90% or more
 - Normal is <120 seconds
 - Use non-anticoagulated blood
 - Affected by decreased platelets
 - Tests intrinsic and common pathways
 - Not as sensitive as PT/PTT
- PT/PTT
 - PT prolonged and PTT normal
 - Consider rodenticide toxicity or early DIC
 - Factor VII deficiency (Beagles and others)
 - PTT prolonged and PT normal
 - Hemophilia A (Factor VIII deficiency)
 - Hemophilia B (Factor IX deficiency)
 - Other factor deficiencies possible
 - Prothrombin deficiency: Cocker spaniels, Boxers, others
 - Factor X deficiency: Cocker spaniels, others
 - Factors XI deficiency: Kerry Blue Terrier, others
 - For suspected congenital deficiencies, submit citrated blood to Cornell Comparative Hemostasis Lab
 - PT/PTT prolonged
 - Rodenticide

- DIC
 - Liver failure
 - Neoplasia
 - Dilutional coagulopathy
- Look up affected breeds for specific factor deficiencies before sending out a tests to assure selection of the test that will yield the most likely diagnosis
- Thrombin time (TT)
 - Tests for time for thrombin to convert fibrinogen to fibrin
 - Tests for fibrinogen deficiency or defect
- CBC or PCV/TS
 - Thrombocytopenia is common with DIC
- Fibrin degradation products and D-dimers
 - Positive with progressed DIC
 - Positive with excessive fibrinolysis
 - Greyhounds and similar breeds may have excessive fibrinolysis 1-2 days post-trauma or post-surgery due to early fibrinolysis of clots
- Chemistry panel
 - Helps support liver failure
 - Identifies other systemic problems
 - May omit if animal is well otherwise

Recommended Treatment

- Transfusions may be indicated if bleeding is severe or rapid enough to cause clinical signs of anemia or hypovolemia
 - Fresh whole blood transfusion
 - Contains all clotting factors and fibrinogen
 - Use if plasma not available
 - Donor should ideally be screened for DEA 1.1 antigen
 - Crossmatch should be performed thereafter if it has been more than 3-4 days since transfusion
 - Fresh frozen plasma
 - 10 ml/kg IV until clotting times normalize
 - Contains all clotting factors
 - Use for Hemophilia A
 - Frozen plasma
 - 10 ml/kg until clotting times normalize
 - Contains all factors except Factors V and VIII
 - Do not use for Hemophilia A
 - Cryoprecipitate
 - May use for Hemophilia A or fibrinogen deficiency
 - 1-5 ml/kg IV over 1 hour

- Vitamin K1
 - 2-5 mg/kg SC, PO
 - Give for at least 4 weeks for rodenticide toxicity
 - Check PT/PTT 48 hours after discontinuing
 - Some products last longer than others. Always check the active ingredient if possible to guide how long to give Vitamin K
 - Do not give IM if clotting times are prolonged
 - Give if unknown cause of coagulopathy
 - Do not give if it is known to NOT be rodenticide. For instance, it is not necessary or helpful for Hemophilia A or B
- Aminocaproic acid
 - For greyhounds and similar breeds with excessive fibrinolysis
 - 500 mg PO q8h for 5 days, beginning the day of surgery

**Other thoughts

- If on a limited budget, save money for Vitamin K and a fresh frozen plasma or whole blood transfusion. In other words, never rule out rodenticide.
- Types II and especially Type III von Willebrand's may present with severe bleeding, like a secondary clotting system disorder. So if PT/PTT are normal, always check BMBT.

