

PREOPERATIVE EVALUATION AND TREATMENT OF DISORDERS OF HEMOSTASIS

History

The most important component in the evaluation of the patient is a good history. Patients with hemostatic disorders are typically aware of their disorder (e.g., hemophilia), have experienced some problem with bleeding in the past or have easily identifiable risk factors.

History questions related to perioperative hemostasis

Excessive bleeding or bruising with minor trauma, surgery, dental procedures, child birth

Family history of bleeding disorders

Known personal history of bleeding disorders (e.g. hemophilia, von Willebrand Disease)

Liver disease

Alcohol intake

Medication use (especially anticoagulants, aspirin, NSAID's)

Hematologic malignancies

Chemotherapy

Etiology

For the majority of patients with perioperative bleeding the primary issue is clotting factor deficiency, typically due to liver dysfunction (e.g., cirrhosis) or vitamin K deficiency (e.g., malnutrition). In a smaller number of patients the issue is platelet deficiency (thrombocytopenia) or platelet dysfunction. Platelet dysfunction is most often due to medications (e.g., aspirin, NSAIDs) but may also be due to other conditions such as von Willebrand disease and uremia. Rarely, bleeding is due to congenital or acquired inhibitors that interfere with the normal coagulation cascade.

Laboratory Testing

Laboratory testing for hemostasis is not generally required for the average patient with no identifiable risk factors or symptoms. Routine screening of patients with a history of bleeding problems (or for patients unable to provide a history) normally requires no more than a Prothrombin Time (PT)/International Normalized Ratio (INR) and Platelet Count.

Prothrombin Time

The prothrombin time is an excellent screening test for factor deficiency due to liver disease or malnutrition. Generally, an INR of 1.5, or less, is considered sufficient for most surgical procedures, although a lower INR may be appropriate for high risk procedures (e.g., ocular surgery, craniotomy, spinal surgery).

If the INR is elevated, obtaining a full coagulation panel is reasonable. Since the primary issue tends to be liver dysfunction or vitamin K deficiency, a brief trial of vitamin K therapy is appropriate for most patients (see interventions below). If the PT does not improve with vitamin K, or a there is concern for a congenital/acquired inhibitor, the best follow up test is a 1:1 Mixing study.

1:1 Mixing Study

If the PT (or PTT) is prolonged, the most common causes are factor deficiency or an inhibitor (typically an antibody directed against some factor in the clotting cascade). Since patients need only 50% of normal coagulation factor levels to clot appropriately, one can test for the presence or absence of a factor deficiency or inhibitor by performing a 1:1 mix (UW/HMC Lab code: MIX1). In this test, the patient's serum is mixed in a 1:1 ratio with serum from a normal volunteer. If there is a factor deficiency, the PT should normalize with the addition of normal serum. If there is an inhibitor, that same antibody will continue to bind to the clotting factors and the addition of normal serum will not normalize the INR.

Platelet count and function

For the vast majority of patients a simple platelet count is sufficient for evaluation. However, if a functional platelet disorder is suspected (e.g., based on history) it may be necessary to perform a test of platelet function. Classically, the test that was performed was a bleeding time. With a bleeding time, a trained laboratory technician makes a small incision in the patient's skin, typically in the forearm. The incision is of a standard length and depth. A piece of blotter paper is then used to blot any blood loss from the incision site until it has a standardized appearance. This particular test is challenging and the results highly dependent upon the experience and training of the technician. As a result, many centers including UW/HMC have abandoned the bleeding time and switched instead to a Platelet Function Screen (UW/HMC Lab code: PLFS). With the Platelet Function Screen, a sample of the patient's platelets is mixed with collagen bound to ADP or epinephrine. The time to platelet aggregation is then measured and reported against a normal standard. When there is suspicion for von Willebrand disease, a von Willebrand panel can be ordered (UW/HMC Lab code: VWDP). This screening test assays for von Willebrand Factor antigen, Factor VIII Activity and VWF Multimer Analysis.

Interventions

Factor Deficiencies

For patients with hepatic impairment or nutritional deficiency supplementation with vitamin K (phytonadione) is appropriate to consider pre and postoperatively. Vitamin K can be administered orally or parenterally. Oral vitamin K therapy (5-10 mg po daily) is effective, but its absorption may be somewhat erratic and the impact on measurable coagulation factors may take longer than with parenteral therapy. In elective procedures scheduled more than a few days away oral therapy may be very appropriate, though the coagulation factors should be monitored intermittently to assure that they are improving, and in most cases coagulation studies should be repeated on the morning of surgery. There are no known adverse effects to chronic oral vitamin K therapy.

Vitamin K can also be administered parenterally, and this is the preferred route when there is ongoing bleeding, surgery is anticipated in the immediate future or there is a need to correct coagulation disorders immediately. However, parenteral vitamin K administration carries a higher risk for allergic reactions including anaphylaxis and, rarely, death. Some clinicians advocated slow intravenous (IV) infusions of vitamin K over intramuscular/subcutaneous administration because it is felt that IV administration can be more readily controlled and can be stopped if the patient experiences an untoward reaction.

Although vitamin K is often administered as a single 10 mg dose it is not always necessary to give so much of this drug, particularly when the patient will be anticoagulated postoperatively. In particular, for patients with mild elevations of their INR (1.5-2) may respond to lower doses (1 - 2.5 mg IV once). The advantage of giving lower doses is that it will not unnecessarily prolong the time required to re-anticoagulate the patient after surgery.

When patients have factor deficiencies and are bleeding or need urgent procedures it may be necessary to supplement their coagulation factors with the use of fresh frozen plasma (FFP). Most patients who are given FFP should receive simultaneous vitamin K except when the reversal of anticoagulation is intentionally brief. A single unit of FFP increases plasma clotting factors by about 2.5% in the average 70 kg patient, as such most patients require 4 units initially (sometimes more), and additional doses of FFP every 4 to 6 hours depending on the results of subsequent PT assays. Remember that FFP usually only last for about 6 hours, so do give vitamin K simultaneously where appropriate.

Platelet Dysfunction

Most cases of platelet dysfunction are acquired (e.g., due to aspirin ingestion), but some patients may have an underlying disorder of platelet dysfunction (e.g., von Willebrand disease). In either case, infusion of donor platelets (typically a single 6-pack) is usually effective in restoring normal platelet function.

In cases of von Willebrand disease type 1 (mild to moderate with factor VIII levels greater than 5%), desmopressin acetate (DDAVP) may be used to help improve platelet function. Desmopressin is

dosed as 0.3 mcg/kg IV piggyback infused slowly over 15 to 30 minutes. Repeat doses may be required depending on the clinical circumstances, but, tachyphylaxis may occur if given more often than every 48 hours. Hematology consultation should be considered.