

---BLEEDING & BLOOD REPLACEMENT---

Hemostasis

Injury → vasoconstriction → platelets → release adenosine → platelet aggregation (white thrombus); formed independent of clotting factors

More permanent thrombus required, need fibrin (coagulation pathway)

Coagulation pathway:

Intrinsic: 12, 11, 9, 8, 10 (PTT)

Extrinsic: 7, 10 (PT/INR)

Common: 10, 5, 2 (thrombin), fibrin (loose), 13, fibrin (tight)

Liver synthesizes all factors except 8 (endothelial cells)

Vit K dependent factors: 2, 7, 9, 10

Coumadin = vit K antagonist

Heparin = increases antithrombin neutralization of factors IX-XII

Patient evaluation

Prolonged bleeding after minor cuts, dental procedures, surgeries

Frequent bruising, nosebleeds, or excessive menses

HSM, hemarthroses

Petechiae = platelet d/o

Ecchymosis = coag pathway abnormality

PT/INR, PTT, platelet count, bleed time, thrombin time if suspect bleeding d/o

Excessive surgical bleeding

Liver dz

Acute alcohol ingestion

Hypersplenism

von Willebrands dz

decreased platelet adhesion and decreased factor VIII

Rx: DDAVP or cryoprecipitate (vWF, factor VIII, fibrinogen)

Type A hemophilia

Factor VIII deficiency

Rx: purified factor VIII concentrates

Thrombocytopenia

Decreased production (aplastic anemia)

Increased degradation (ITP, DIC)

Splenic pooling (cirrhosis)

Platelet function d/o

NSAIDs (reversible)

ASA / Plavix: stop for 7 days before surgery

Uremia: require dialysis before surgery

Massive transfusion

> 10 units over 4-6 hours

d/t low platelets and dilution of clotting factors

under anesthesia, only signs = bleed from suture sites, oliguria, hemoglobinuria

Rx: local hemostatic agents – Gelfoam, Surgicel

Post op bleeding

- 50% d/t inadequate hemostasis during surgery
- Circulating heparin after bypass surgery
- s/p hepatectomy (decreased liver fxn)
- Vit K deficiency
- Factor VIII deficiency (bleed on POD 3-5)
- DIC

Common bleeding d/o

--DIC

Etiology

- Release of tissue debris into blood (OB)
- Platelet activation d/t adenosine, thrombin, etc
- Extensive endothelial damage
- Hypotension leading to stasis (decreased concentration of coag inhibitors)
- Block of reticuloendothelial system
- Liver dz

Labs: increased PT, PTT, D-dimer; thrombocytopenia, decreased fibrinogen

Rx

- Treat precipitating cz (eg sepsis)
- Platelet transfusion
- Cryoprecipitate to replace fibrinogen
- FFP
- Rarely heparin

--Primary fibrinolysis

TPA administration or prostate surgery (prostate may release urokinase)

Rx: amino caproic acid (may cz thrombotic events)

--Hypercoagulable states

Etiology

- #1 congenital cz = activated protein C resistance (APCR)
- #1 cz = factor V leiden (prot C normally neutralizes factor VIII, V)
- Deficiencies of ATIII, Prot C or S
- Antiphospholipid syndrome
- Hyperhomocystinemia
- Suspect congenital cz if pt has event at <40 y.o.

Rx: Low dose heparin (5000 IU subQ) + compression boots = adequate to prevent thrombotic event w/o compromising surgical hemostasis

Blood replacement

Whole blood = plasma, platelets, WBCs, RBCs

FFP contains all clotting factors (200ml)

Cryoprecipitate contains factor VIII, fibrinogen, fibronectin (5-30ml)

Small risk of HIV, hepatitis

Whole blood only used in small kids in selected operations

Type and Screen: pts ABO and Rh type are determined and Ab screen performed

If + Ab screen, must crossmatch (donor RBCs w/ pt's plasma)

Chronic anemia – transfuse only if systemic effects occur d/t hypoxia

Hemophilia A – maintain factor VIII levels at:

Minor trauma or post op: 15-20%

Major trauma, major surgery, or dangerous bleed 50-60%

vWD – DDAVP Q2-3days

Transfusion safety

Febrile transfusion rxn = #1 adverse rxn; Rx: Tylenol + Benadryl

Major transfusion rxn

Stop transfusion immediately

Repeat crossmatch of blood

Support BP and renal perfusion

Manage DIC

IVF, diuretics, dialysis

Immediate hemolytic rxn (ABO mismatch)

Sx; fever, anxiety, agitation, h/a, chest tightness, SOB, lumbar pain

Hypotension, hemoglobinuria, ARF, DIC

Rx: check transfusion documentation, repeat crossmatch

Exclude infxn, examine for DIC, monitor renal fxn

IVF, diuretics, bicarb, replace platelets and coag factors

Infxn: hepatitis 1 in 100,000; HIV 1 in 500,000

Volume overload: usu w/ plasma (d/t proteins)

Massive transfusion: > pts nl blood volume replaced in < 24 hours

Coagulopathy (platelet and factor def)

Hypothermia

Citrate (binds calcium, prevents clotting) toxicity (pts w/ hepatic dysfxn)

Hyperkalemia, acidosis, hypocalcemia