

- I. Definitions
  - A. Hemostasis
  - B. Thrombosis
  - C. Thrombus
  - D. Embolus
  - E. Bleeding disorders
- II. Blood clotting
  - A. Blood vessel anatomy
    - 1. endothelium
    - 2. smooth muscle
    - 3. collagen fibers
  - B. Three steps of hemostasis
    - 1. vasospasm
    - 2. platelet plug formation
    - 3. coagulation
- III. Platelet plug formation and inhibition
  - A. Platelet background
    - 1. thrombopoietin
    - 2. resting
  - B. Platelet plug formation
    - 1. activated by 2 means
    - 2. collagen binding
    - 3. platelet activation
    - 4. platelet secretions
      - a. ADP
      - b. thromboxane A<sub>2</sub>
      - c. serotonin
  - C. Mechanisms to block platelet activation
    - 1. block ADP binding
      - 1) ADP cell surface receptor = P2Y<sub>12</sub>
      - a. drugs
        - 1) clopidogrel - (Plavix)
        - 2) prasugrel - (Effient)
        - 3) ticagrelor - (Brilinta)
        - 4) ticlopidine - (Ticlid)
    - 2. Increase cAMP levels
      - a. dipyridamole - (Persantine)
      - b. cilostazol - (Pletal)
    - 3. block production of thromboxane A<sub>2</sub> - Aspirin
      - a. mechanism of action
        - a) cyclooxygenase
    - 4. block fibrinogen receptor
      - 1) abciximab - (Reopro)
      - 2) eptifibatide - (Integrilin)
      - 3) tirofiban - (Aggrastat)

#### IV. Coagulation and Inhibitors

- A. Blood clotting
  - 1. clotting factors
  - 2. pathway(s)
    - a. Phase 1
      - 1) contact activation pathway
      - 2) tissue factor pathway
    - b. Phase 2 - prothrombin -> thrombin
    - c. Phase 3 - fibrinogen -> fibrin

#### V. Blood Coagulation Inhibitors

- A. Inhibit Xa
  - 1. fondaparinux - (Arixtra)
  - 2. rivaroxaban - (Xarelto)
  - 3. apixaban - (Eliquis)
- B. Inhibit thrombin (IIa)
  - 1. argatroban - (Argatroban)
  - 2. dabigatran - (Pradaxa)
- C. Warfarin (Coumadin)

#### VI. Activate Normal Anticoagulation Pathways

- A. Antithrombin
- B. Heparin
  - 1. LMWHs
    - a. enoxaparin - (Lovenox)
    - b. dalteparin - (Fragmin)

#### VII. Thrombolytic Drugs

- A. Background
  - 1. plasminogen
  - 2. plasmin
  - 3. two step activation
    - a) tissue plasminogen activator (tPA)
    - b) urokinase plasminogen activator (uPA)
- B. Recombinant drugs
  - 1. alteplase - (Activase)
  - 2. reteplase - (Retavase)
  - 3. tenecteplase - (Tnkase)
  - 4. streptokinase
  - 5. urokinase (Kinlytic)

#### VIII. Drugs Used to Treat / block Bleeding

- A. Stop conversion of plasminogen to plasmin
  - 1. aminocaproic acid - (Amicar)
  - 2. tranexamic acid - (Cyklokapron, Lysteda)
- B. Antagonize heparin
  - 1. protamine sulfate
- C. Block warfarin
  - 1. vitamin K