

# Anticoagulation Therapy - 2023

## Anticoagulation Therapy

- Prophylaxis
  - Prevent formation of a thrombus
- Treatment of existing clot
  - Prevent enlargement
  - Prevent new clots from forming
  - **Does NOT dissolve an existing clot!**

## Normal Clotting Mechanisms: Hemostasis

- The arrest of bleeding
  - Vascular response → Platelet plug formation → Development of the fibrin clot on the platelet plug by plasma clotting factors → Clot retraction and dissolution

### 1. Vascular response

- Immediate local vasoconstrictive response of injured blood vessels
- Reduces leakage of blood from the injured vessel by reducing vessel size
- Vasoconstriction gives time for platelet response and plasma clotting factors to be triggered.

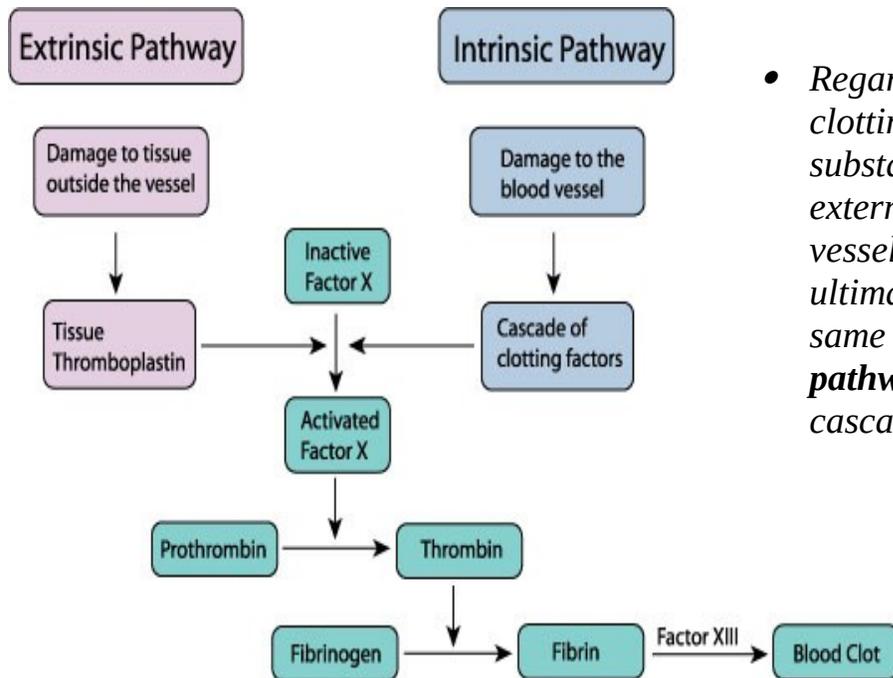
### 2. Platelet plug formation

- Activated by exposure to interstitial collagen from the injured blood vessel
- Platelet stickiness is called adhesiveness.
- Formation of clumps termed “aggregation” or “agglutination”
- Platelets facilitate the reactions of the plasma clotting factors

### 3. Plasma clotting factors

- Labeled with both names and Roman numerals (Table 29-2)
- Always present in circulation in inactive forms until stimulated to initiate clotting through one of two pathways
- Form a visible fibrin clot on the platelet plug
- Two pathways of clotting:
  - **Intrinsic pathway** is activated by *collagen exposure*.
    - Damage to a blood vessel
  - **Extrinsic pathway** is initiated when *tissue factor* or *tissue thromboplastin* is released from injured tissue.
    - Tissue injury, burn, etc.
    - Injured tissue cells cause release of tissue factor and thromboplastin (enzyme released from damaged cells) which initiate clotting cascade to activate factor X which leads to the final common pathway and a clot.
  - **Thrombin is the most powerful enzyme in the coagulation process because it converts fibrinogen to fibrin, an essential component of a blood clot.**

## Coagulation Cascade

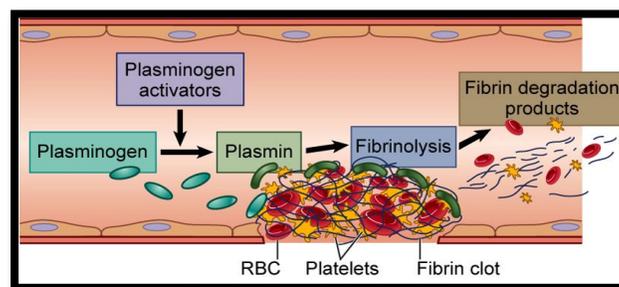


- *Regardless of whether clotting is initiated by substances internal or external to the blood vessel, coagulation ultimately follows the same **final common pathway** of the clotting cascade*

### 4. Clot Retraction and dissolution

- o Anticoagulation, the reverse of clotting, helps keep blood fluid.
- o Anticoagulation occurs by two means.
  - **Antithrombins:**
    - substances in the blood that limit the blood's ability to clot
  - Interfere with thrombin
    - Stops the clotting process before fibrin clot
    - (Endogenous heparin, Protein C, Protein S)
  - **Fibrinolysis:** Process that results in dissolution of the fibrin clot

## Fibrinolytic System



### **Drug Therapy**

- Anticoagulants (Table 37-10) pg. 817
  - o Thrombin Inhibitors (direct and indirect)
  - o Factor Xa Inhibitors
  - o Vitamin K Antagonists (VKA's)
- Thrombolytics ("Clot busters")

### **Anticoagulants: Indirect Thrombin Inhibitors**

Heparin Sodium (Unfractionated Heparin)

- Potentiates action of antithrombin III
- Blocks conversion of prothrombin to thrombin and fibrinogen to fibrin
- Prevents further extension of existing clots and new clots from forming
- Does NOT break down existing clots!

#### Who should receive Heparin?

- For prophylaxis and tx of thromboembolic disorders-DVT, PE
- Thromboembolic complications associated with afib
- Dialysis
- Patency of IV devices
- Prevents clotting in arterial and cardiac surgeries
- STEMI & NSTEMI
- Unstable Angina

#### Heparin Sodium: Sub-q Route

- VTE Prophylaxis
  - o 5000 units q8-12h
- Antidote: Protamine Sulfate
- Administration:
  - o Rotate injection sites
  - o Change needle before injection (Prevents leakage along the needle track & bruising)
  - o No injections within 2 inches of umbilicus
  - o Do not massage
  - o Monitor platelets
  - o Cross-check dose with a co-worker (if facility requires)
    - Not required at Beebe Healthcare, but still a good idea (high alert med)

#### Heparin Sodium: Continuous IV (Per protocol)

- MD to order
- Client's current weight in kg needed
- IV drip concentration
  - o Usually 25,000 units Heparin in 250ml D5W or NS (100 units/ml)
- Baseline lab work required prior to starting infusion!
  - o PTT (aPTT), CBC, PT/INR
- Always use IV Pump!
- Antidote: Protamine Sulfate
- Therapeutic Range
  - o Anti Xa (0.3-0.7 IU/ml)
  - o Measured 6h after Heparin drip started and q6h until in therapeutic range for two draws
  - o Dose adjusted if pt.'s range out of normal
  - o PTT monitored per MD preference (but protocol currently based off of Anti Xa)
- CBC and platelets every 3 days

#### Complication of Heparin Therapy: Heparin Induced Thrombocytopenia (HIT)

- Severe immune drug reaction
- Decreasing platelet count
- Increasing thrombosis
- HIT: Diagnosis
  - o Decreased platelet count
  - o Anti-Xa decreases despite continuing increased doses of Heparin

- o Antibody can be detected in blood
- Treatment
  - o **Stop Heparin ASAP** -- Tell client it is ALLERGY!
  - o Treat complications from clots

### **Anticoagulants: Indirect Thrombin Inhibitors**

#### Enoxaparin (Lovenox): Low-Molecular Weight Heparin (LMWH)

- Impairs normal hemostasis and inhibition of factor Xa
- Produces anticoagulation
- *Prophylactic dose:* 30 – 40 mg sub-q daily or q 12 hours (fixed dose)
  - o Bariatric clients could be ordered up to 60 mg q12 hours
- *Treatment dose:* 1 – 1.5 mg/kg sub-q daily or q 12 hours (weight based)
- Alternate injection sites b/t left & right anterolateral and left & right posterolateral abdominal wall (“love handles”)
- \*Don’t expel air bubble in syringe!

#### Benefits of enoxaparin (Lovenox) vs. Heparin

- More predictable response and longer half-life
- Fewer bleeding complications
- CBC & plats before initiating
  - o No need for daily lab work
- Pt. (or family) can self-administer
- Antidote: Protamine Sulfate

#### Who should receive Lovenox?

- Prevention of DVT post-op (hip or knee surgery; abdominal or bariatric surgery)
- Prevention of long-term DVT in nonsurgical acute illness
- Tx of ACS: unstable angina, non Q-wave MI, STEMI
- Acute DVT with or w/out PE
- Management of VTE during pregnancy

### **Anticoagulants: Direct Thrombin Inhibitors**

- Binds with thrombin, prevents its function
- Produces anticoagulation; Prevents development of thrombus
- Good for clients with Heparin allergy
  - o bivalirudin (Angiomax)
    - Given continuous IV via protocol
    - Monitor PTT
  - o dabigatran (Pradaxa)
    - PO
    - Check PT, PTT initially but recurrent monitoring not needed
    - Antidote: Idarucizumab (Praxbind)

### **Anticoagulants: Factor Xa Inhibitors**

- Inhibits factor Xa, stopping coagulation cascade
- Check CBC, renal function tests initially (no routine coagulation studies needed)
  - o fondaparinux (Arixtra) – Sub-q
  - o rivaroxaban (Xarelto) – PO
  - o apixaban (Eliquis) – PO

- Antidote: andexanet alfa (Andexxa) (very expensive!)

### **Anticoagulants: Vitamin K Antagonists**

#### Warfarin (Coumadin)

- Interferes with hepatic synthesis of Vit K-dependent coagulation factors
  - o Depletes II, VII, IX, X
  - o *Vit K is required for the synthesis of these factors*
- Prevents further extension of clot, new clot formation, and secondary thromboembolic complications
- Long-term use
- Takes 48-72 hours to be effective
- May be started while client still on heparin or enoxaparin (Lovenox)
  - o When INR is therapeutic, other med is discontinued
- Antidote: Vitamin K

#### Monitoring warfarin (Coumadin)

- *Monitor INR*
- INR therapeutic values (pg. 754, Table 33 in diagnostics book):
  - o 1.5-2.0 DVT prophylaxis
  - o 2.0-3.0 DVT/orthopedic surgery/afib
  - o 2.5-3.5 PE
  - o 3.0-4.0 prosthetic heart valve prophylaxis
- Monitored daily, weekly, monthly
- Dosage may change daily dependent upon labs

#### Administering Warfarin (Coumadin)

- Given PO
- Take at the same time daily
- Avoid antiplatelet drugs and/or NSAIDs
- Many interactions with food/drugs/herbals (pg. 818)
- Diet – keep intake of Vitamin K rich foods **consistent**. No drastic changes with intake.

#### Nursing Considerations: All Anticoagulants

- Notify provider of any abnormal lab values or assessments
  - o Unusual bleeding or bruising
  - o Think head to toe
- Minimize injections (especially IM)
- Prevent injury !

#### Client Teaching: Anticoagulants

- Purpose and action of med
- Interactions
- When to call primary healthcare provider, ie. Bleeding
- Lab work needed & Diet
- Safety
- Medic Alert Bracelet