Principles of Hematology in Relation to Dental Management

Dr. Saleh Al-Bazie, BDS, OMFS (USA), D.Sc.D,

Consultant, OMFS, KSU, SHMC

Goals

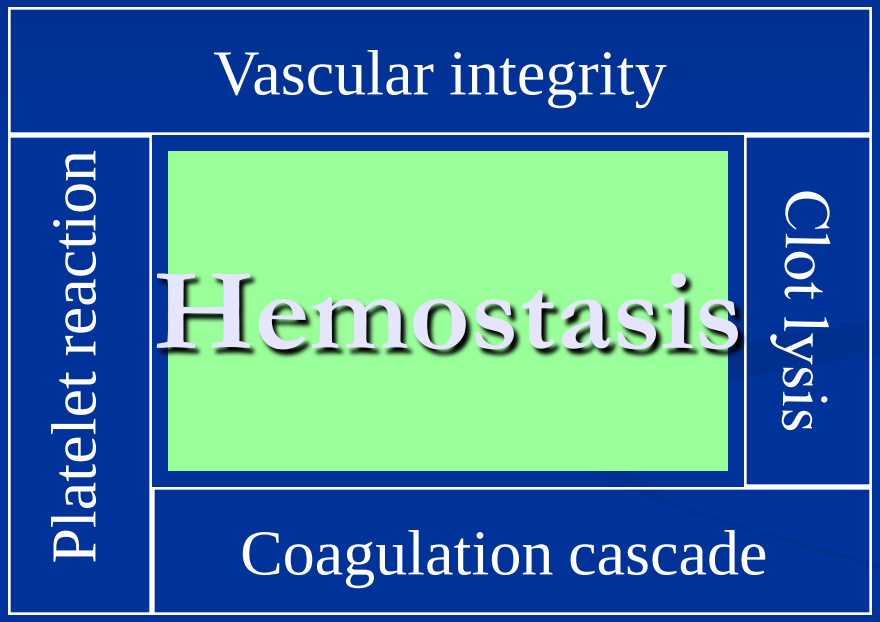
- provide an overview of the coagulation system
- concepts rather than details of hemostasis
- if time, discussion of some cases

OVERVIEW

- What is Hemostasis ?
- Mechanism of Normal Control of Bleeding.
- Classification and Etiology of Bleeding Disorders.
- Identification of Bleeding Problems.
- Management in a Dental Office.

What is Hemostasis ?

- **It is simply the arrest of Bleeding !**
- **Physiological Hemostasis depends of normal functioning of**
  1. **Vascular Endothelium**
  2. **Blood Flow Dynamic**
  3. **Platelets**
  4. **Coagulation Cascade**
  5. **Anticlotting Mechanisms**
  6. **Fibrinolytic System**

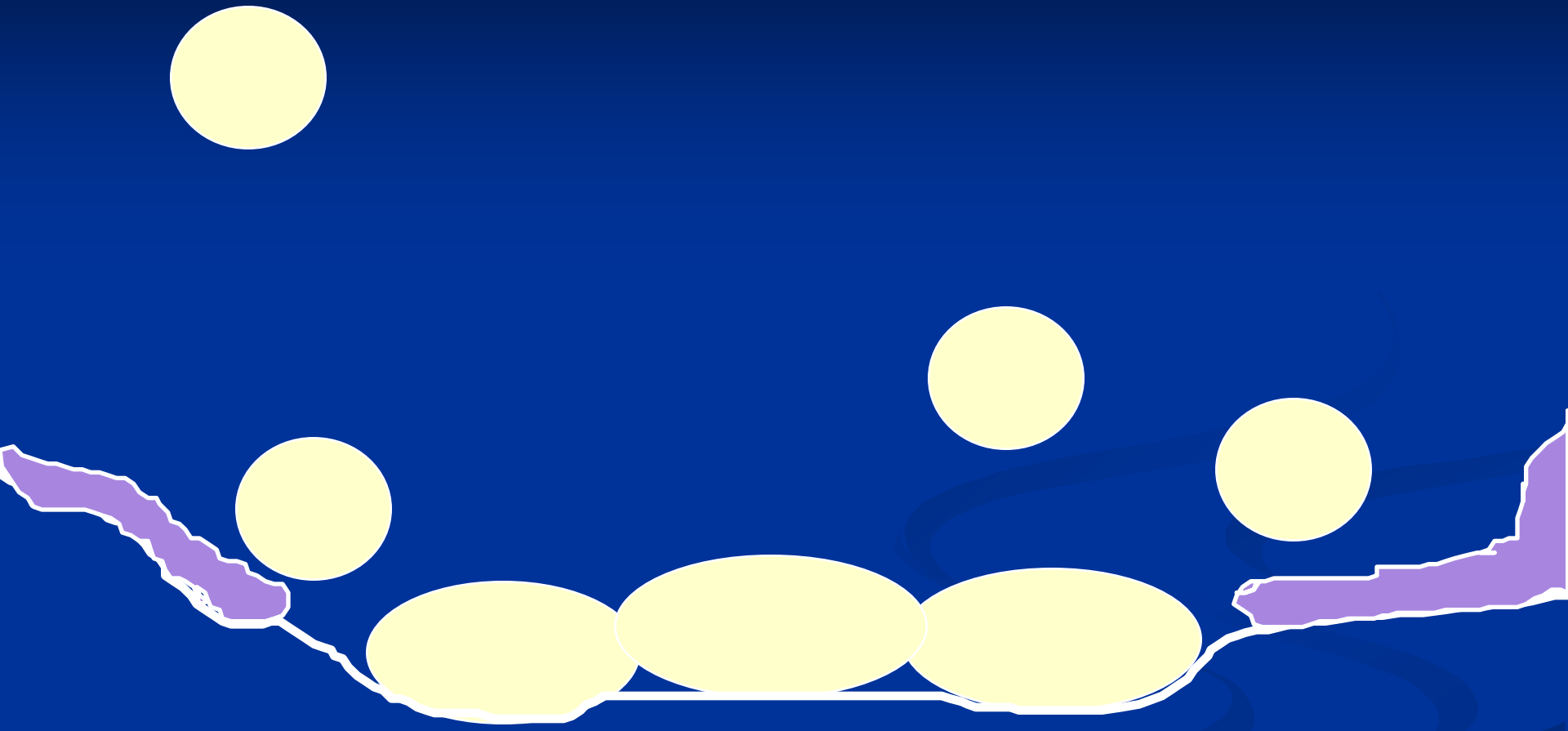

Vascular integrity
Platelet reaction
Hemostasis
Clot lysis
Coagulation cascade

Conditions which can cause Bleeding Disorders

- Scurvy
- Infections
- Chemicals
- Allergy
- Genetic Defects
- Aspirin
- NSAIDs
- Alcohol
- Penicillin
- DIC
- Autoimmune disease
- vON Willibrand's disease
- Uremia
- Radiation
- Leukemia
- Hemophilia
- Christmas Disease
- Liver Disease
- Vitamin deficiency
- Anticoagulants

Platelet Disorders

- Normal 150,000-400,000/ml.
- 50,000/ml. Hemorrhage Platelet Antibodies
- 10,000/ml. Immune diseases. Cytotoxic drugs. Bone marrow failure.
- Elective surgery below 50,000/ml. is contraindicated.
- If count < 100,000, increased bleeding tendency
- If count < 20,000, spontaneous bleeding



PATIENT IDENTIFICATION

- **Is your patient a "BLEEDER" ?**
- **A Good History :**

  1. Physical Examination.

  2. Screening Clinical lab tests.

  3. Observation of excessive bleeding following a surgical procedure.

WHAT TESTS TO ORDER ?

TESTS	*NORMAL*	*ABNORMAL*
1. PT (Extrinsic / Common Pathways) Liver	11-15 sec.	Defective Vitamin K dependent, factors, disease, Oral Anticoagulant
2. PTT. (Intrinsic / Common Pathways)	30-45 sec.	Hemophilia, vWD, Heparin
3. BT (Platelet / Vascular phases)	1-6 min.	Platelet Disfunction vWD,Thrombocytopenia
4. Platelet Count	150,000 to	

HEMOPHILIA - A

- sex linked disorder
- 1in 5,000 to 1 in 10,000 male births
- Factor VIII deficient
- 80% reduction in or absence of Factor VIII leads to a bleeding disorder

Hemophilia-A	Factor VIII level
1. mild	5-25% of normal
2. moderate	1-4% of normal
3. severe	< 1% of normal

SCREENING TESTS

- PT, Platelet count =======>Normal
- APTT =======>Prolonged
- Specific Factor Assays
- Factor VIII inhibitors

DENTAL MANAGEMENT

- Detection and Referral
- Consultation with Hematologist
- Hospitalization for surgical procedures
- Use of good surgical techniques
- Use of local measures, microfibrillar Collagen, Gelfoam with Thrombin, packed Collagen, Surgicel and sutures
- Prophylactic Antibiotics
- Avoid Aspirin

REPLACEMENT THERAPY

- Heat Activated and Recombinant Factor VIII / Cryoprecipitate for mild Hemophilia
- Fresh Frozen Plasma
- Fresh Whole Blood
- Epsilon - aminocaproic acid
- Local therapy with ice packs

HEMOPHILIA - B / CHRISTMAS DISEASE

- Factor IX deficiency (Vitamin K dependent)
- X-linked , Hereditary
- Affects 1 in 30,000 male births
- Mild (5-25%), moderate (1-4%), severe(<1%)
- Clinically similar to Hemophilia A

Screening Tests

- **Specific Factor Assays**
- **PTT - Prolonged (corrected by normal serum but not by Barium - adsorbed Plasma)**
- **PT - Normal**
- **BT - Normal**

Replacement Therapy

- **Fresh Frozen Plasma or Prothrombin complex concentrates**
- **Lyophilized Factor IX concentrate**

VON-WILLEBRAND'S DISEASE

- Most common bleeding disorder
- Males and Females equally affected
- Abnormal Platelet function
- Prolonged BT
- May be a decrease in factor VIII leading to a prolonged APTT
- Mild Mucosal Bleeding
- Factor VIII Deficiency

VON-WILLEBRAND'S DISEASE (continued.)

- **Nose bleeds, heavy menses, bleeding gingiva, easy bruising**
- **Bleeding following surgery or trauma can be severe**

vWD type I, II & III

- **vWd type I :**
  1. most common.
  2. Decrease in overall concentration of vWF.
- **vWD type II :**
  1. Abnormality in vWF.
  2. Mild symptoms
- **vWD type III**
  1. Most severe form
  2. vWF absent
  3. Factor VIII very low
  4. Prolonged BT, and APTT
  5. Bleeding into muscles and joints.

Dental Management

- **vWF Type I and Type II**

Surgical procedures by using DDAVP (Desmopressin) and EACA

- **vWF Type III**

Fresh Frozen Plasma

Cryoprecipitate replacement

Factor VIII concentrates ineffective (contain low level of vWF).

Liver Disease

- History of Jaundice / Alcoholism ?
- Most coagulation factors produced in liver
- Defect in Coagulation or Platelets ?
- Screening Tests :
  1. PT for Coagulation defect
  2. BT for Platelet defect
  3. If PT and BT are normal, surgery possible.
- Management :

  1. Vitamin K for factor deficiency

  2. Fresh frozen Plasma for Thrombocytopenia, deficiency of fibrinogen, plasminogen.

Dental Management of Patients on Anti Coagulation Therapy

- **2 main groups of Anticoagulants**

1. **Heparin**
2. **Coumadins**

Heparin

- Inactivates Thrombin
- Inhibits activation of factors IX, X, XI &XII
- Inhibits aggregation of Platelets
- Immediate effect, given intravenously
- Good Anticoagulation level is kept at 2-3 times the control (Clotting time) 20-25 min., < 40 min.)
- Length of effect 2 - 4 hrs.
- Overdose may cause internal bleeding
- Action reversed by Protamine-Sulfate

Coumadin

- Inhibit in Liver Vitamin K - dependent clotting factors - II, VII, IX, & X
- Optimum effect achieved in 36-48 hr..
- Therapy kept within 25-35 sec. (PT)
- Given orally, slow onset
- Length of effect 48 hrs.
- INR

Considerations

- Potential bleeders
- Surgery safe when PTT 1.5 - 2 times normal

  (20 -25 sec.)
- Handle tissues gently, use local measures
- Always consult physician before operating
- PTT always needed at least 24 hr.. pre-op.
- If anticoagulation level too high, withhold drug 1-2 days pre-op.

Considerations
(continued.)

- **Effect reversed by Vitamin K1 (25-50 mgs.), given slowly @ 5 mg/min. I/V.**
- **Recall**

Drugs which inhibit Anticoagulants

- **Antacids**
- **Barbiturates**
- **Oral Contraceptives**
- **Vitamin C**

Drugs which Potentiate Anticoagulants

- **Aspirin**
- **Broad Spectrum Antibiotics**
- **Methyl Dopa**

Drugs with No Interaction

- **Tylenol**
- **Librium**
- **DO NOT USE ASPIRIN.**

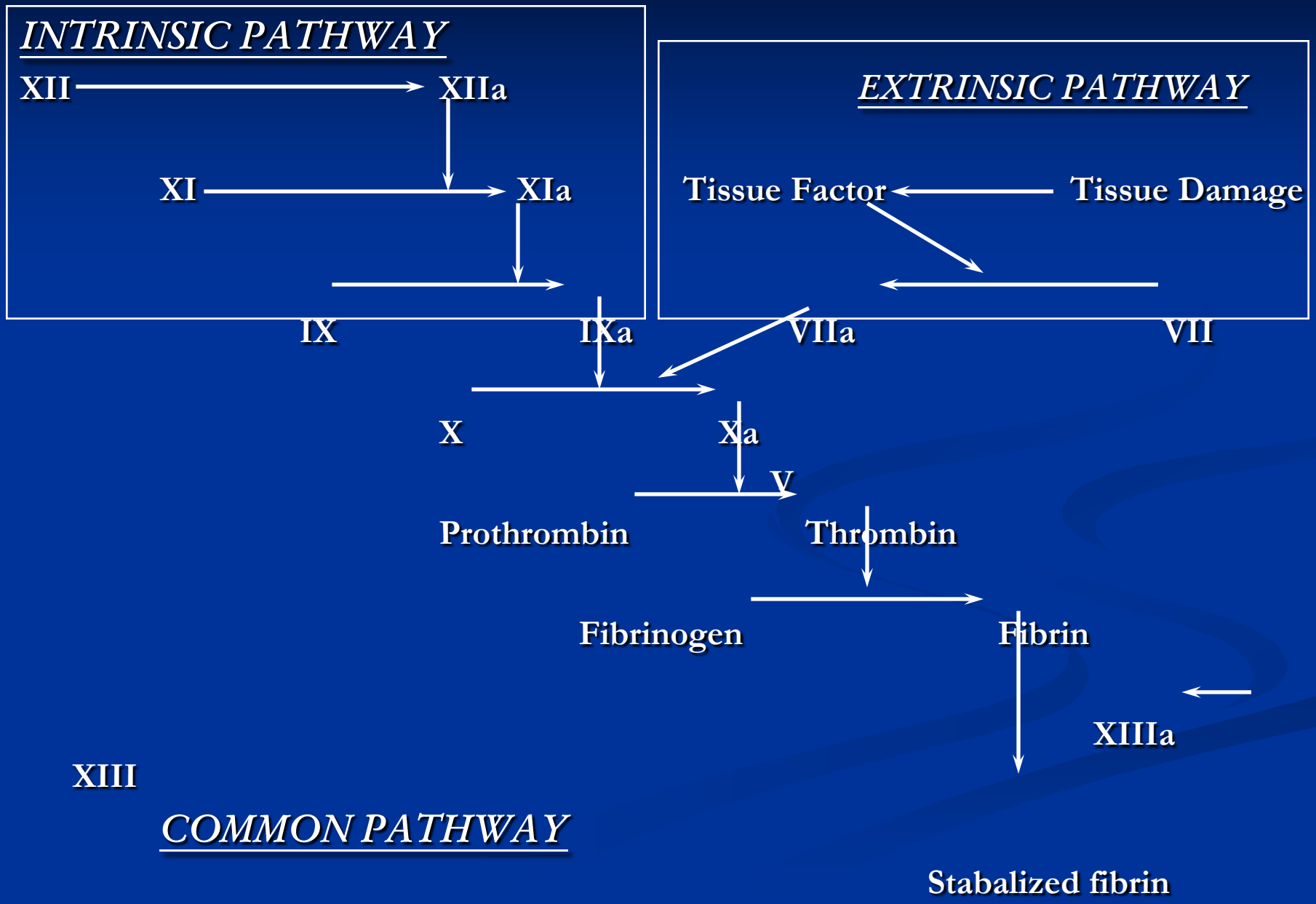
CONCLUSION

- Encourage patients to maintain good oral health
- Dental treatment often requires hospitalization.
- Patients in terminal phase secondary to other diseases should be offered conservative dental treatment.
- With proper understanding and preparation, most indicated dental treatment can be provided

CLINICAL CLUES

CLINICAL SIGN	*DISORDER*
Lifelong history of easy bruising or bleeding.	Factor deficiency VWD
Family history in Males only	Hemophilia A or B
Family history in both sexes	Factor XI deficiency, VWD
Excess bleeding at surgery	Mild Factor deficiency VWD, Thrombocytopenia
Acquired bruising tendency	Aspirin / other drug Thrombocytopenia
Delayed Bleeding	Factor XIII deficiency
Bruising / Bleeding starting during another illness	Drugs, Thrombocytopenia, Acquired anticoagulant.

COAGULATION CASCADE



PATIENTS ON ASPIRIN THERAPY

- Irreversibly inhibits Cyclooxygenase
- Aspirin inhibits Platelet aggregation
- Bleeding time moderately prolonged
- One dose may inhibit Platelet function for a week
- Thrombin induced Platelet Activation unaffected
- Never give with another Anticoagulant

What are the three phases of hemostasis?

Vascular

Platelets

Coagulation phases

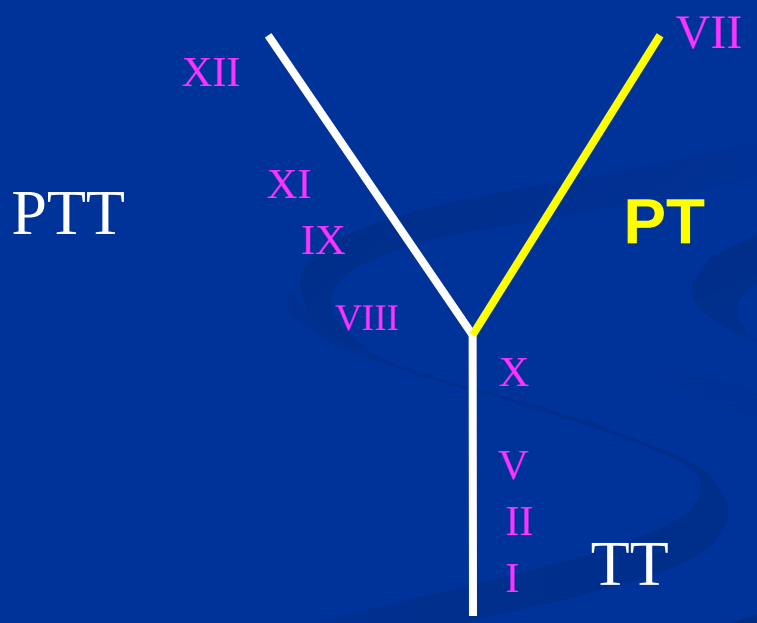
- Thrombocytopenia that less than 50,000/mm^3 is absulote contraindication for elective surgery
- 50,000-100,000/mm^3 is save to perform surgery provided normal platelets function
- Bleeding time is used to test platelets function

Which blood tests used to monitor warfarin (coumadin), ASA, and Heparin?

How dose heparin, ASA, Coumadin affect clotting?

Coumadin

Affects extrinsic pathway, interferes with hepatic synthesis of vit K dependent clotting factors.

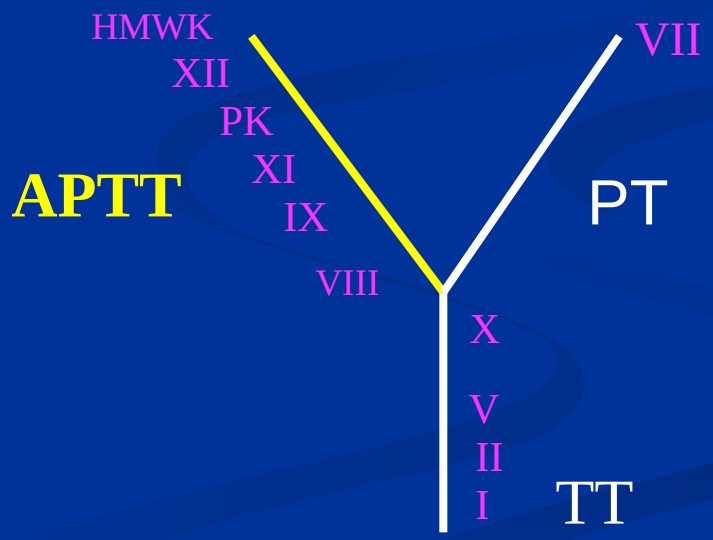


PT - ↑

APTT, TT, PLC - N

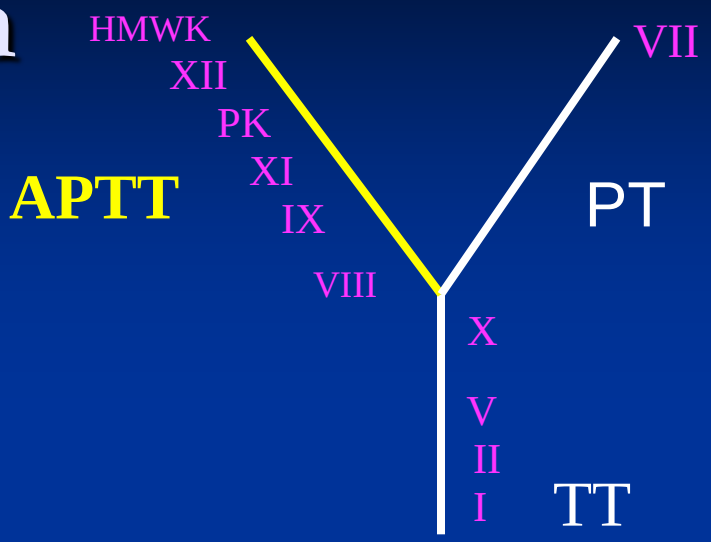
Heparin

- Heparin: affects intrinsic pathways, prevents formation of prothrombine activator



APTT - ↑
PT, TT, PLC - N

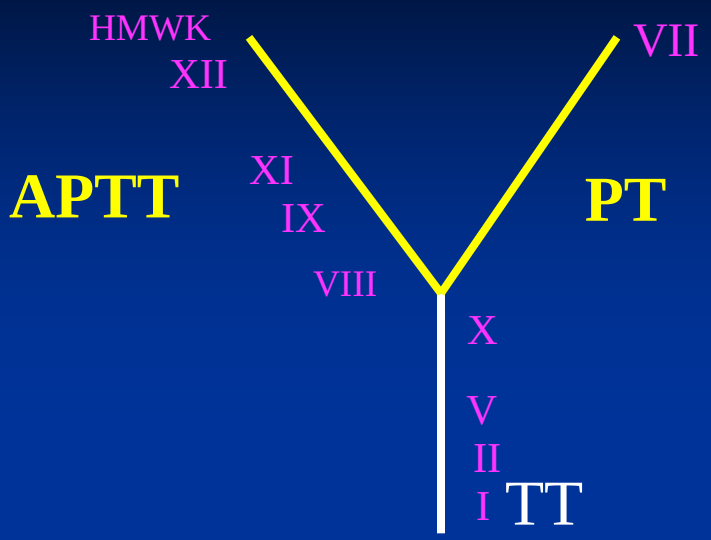
Heparin



APTT - ↑
PT, TT, PLC - N

* Factor deficiency
* vWD
* Inhibitors
* Heparin therapy

Liver Disease



PT, APTT - ↑
TT, PLC - N

* Common Pathway Factor deficiency
* Vitamin K deficiency
* Oral anticoagulant therapy
* Liver disease

- ASA: Alter cyclooxygenase activity, which control the release of the adhesive protein from platelets.

What are the diseases caused by deficiency of factors VIII, IX?

- VIII:

Hemophilia A

- IX:

Hemophilia B

Which blood clotting factors are vit K dependent?

- II, VII, IX, X

What are the normal values for each of PT, PTT, platelets count, WBC count, Bleeding time (BT)?

- PT:

12-14 sec

- PTT:

35-45min

- Platelets

150-400k

- WBC:

5-11k

- BT:

7-11 min

What are the reversal agents (if any) for each of ASA, Warfarin, and Heparin?

- ASA:

Time, platelets transfusion

- Warfarin:

Vit K

- Heparin:

Protamine sulfate

How long you should wait after stopping each of ASA, Warfarin, and Heparin?

- ASA:

- ASA: 5 days

- ASA: 5 days
- Warfarin:

- ASA: 5 days
- Warfarin: 2-3 days

- ASA: 5 days
- Warfarin: 2-3 days
- Heparin:

- ASA: 5 days
- Warfarin: 2-3 days
- Heparin: 4 hrs

When it is safe to re-start each of ASA, Warfarin, and Heparin after a surgical procedure?

- ASA

- ASA Same day
- Warfarin
- Heparin:

- ASA Same day
- Warfarin Same day
- Heparin:

- ASA ?: Same day
- Warfarin ?: Same day
- Heparin ?: After one hr

Case #1

- 44 yo male healthy presented for extraction of tooth
- Taking 2 tabs of Asprin in the last few days Pain management
- Stop Aspirin for 5 days
- Do extraction as normal parient

Case #2

- 39 yo female w/fever + RLQ pain
- hx excessive bleeding s/p tonsilectomy and dental extractions

- Hct 39%
- plat = 190,000/ mm3
- PT, aPTT slightly prolonged

- **Bleeding time = 18 mins**
- **Cryoprecipitate, FFP**

Case #3

- 48 yo f w/exercise intolerance s/p MVR for regurgitation
- large liver, jvd
- no hx bleeding
- continued oozing in OR

- post op:
  - Hct 28%
  - aPTT sl prolonged
  - PT prolonged
  - TT normal
  - BT nl
  - fibrinogen 225 mg%

- **Tx = FFP; Vitamin K of little value in this instance**

Case #4

- 78 yo male s/p TURP
- excessive bleeding from bladder
- oozing from IV site
- moderately hypotensive

- Hct 30%
- platelets normal
- prolonged PT, aPTT, and TT (twice normal)
- RT normal

- **FSP present**
- **fibrinolytic state exists**

If BT, aPTT, PT are all normal: One or more of the following must be true:

- Surgical problem - suture deficiency
- Patient is hypothermic - ACT, aPTT, PT run in vitro at 37^0C
- lab tests are in error