A Web-based Course for Teaching Coagulation

Andy N.D. Nguyen, M.D.

University of Texas-Houston, Medical School, Department of Pathology and Laboratory Medicine

The 3rd Annual Advances in Teaching and Learning Day, Feb 14, 2002

Educational Purpose

⌘ To offer a comprehensive training experience for pathology residents and fellows on hematology rotation. The materials in this program will supplement other existing clinical and teaching activities

Intended Audience

- The program is designed primarily for pathology residents and fellows
- Parts of the materials are also useful for others (residents in other clinical specialties, practicing physicians, and medical technologists)

Key Components

- Lessons: to cover all aspects of coagulation
- Practicals: case studies
- Examination

Design Platform

- Microsoft Windows server with Internet Information server
- On-line teaching management software: Web Course in a Box (Madduck Co)
- Web pages: html, JavaScript

Demo

- Web address:
  http://dpalm.uth.tmc.edu/faculty/bios/nguyen/nguyen.html
  -> Coagulation Course

- Student guest account:
  User name: jsmith
  Password:505

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Bookmarks   Go to: 129.106.169.35/wcb/schools/11/51/anguyen/4/default.htm   What's Related

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User Name: jsmith

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COAG 5320 (section 15) -- Summer, 2001

Coagulation

Instructor: Andy Nguyen   E-mail: nguyen@casper.med.uth.tmc.edu
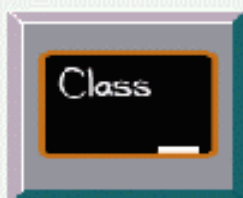
Class Info

Announcements

Schedule

Students

Learning Links

Help/Utilities

This web page created using Web Course in a Box™

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Bookmarks   Location: http://129.106.169.35/wcb/schools/11/51/anguyen/4/courseinfo.html   What's Related

Summer, 2001 -- COAG 5320 -- Section 15

Course Info

Instructor: Andy Nguyen   **Email address: nguyen@casper.med.uth.tmc.edu**

Goals and Objectives
Policies and Procedures
Required Texts
Web Links

Goals and Objectives ▲

Extensive coverage of hemostasis and thrombosis as applied to clinical medicine.

Document: Done

Start   Course Info -- COAG ...   Exploring - WithDemoFigures   Microsoft PowerPoint - [UA...   1:52 PM

DATE: Thu, May 10, 6:03PM
SUBJECT: Course prerequisites

Prospective students need to contact instructor by e-mail to ensure that presiquisites have been met.

Page last updated Thu, May 10, 6:04PM by Andy Nguyen.

Summer, 2001 -- COAG 5320 -- Section 15

Schedule

WEEKS 1-2	WEEKS 3-4	WEEK 5	WEEK 6	WEEK 7
WEEK 8	WEEK 9	WEEK 10		

WEEKS 1-2

Covering Lesson 1 (Hereditary Disorders of Coagulation Proteins)

WEEKS 3-4

Covering Lesson 2 (Acquired Disorders of Coagulation Proteins)

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Summer, 2001 -- COAG 5320 -- Section 15

Students Directory

Send Email to All Students in Class

Homepage	E-mail	Portfolio
Darlene Brown	brown@casper	📁
Lisa Nguyen	lisa@casper.med.uth.tmc.edu	📁
John Smith		📁

Document: Done

Start   Students Directory -- ...   Exploring - WithDemoFigures   Microsoft PowerPoint - [UA...   Monday, June 25, 2001

Lisa Nguyen

Email: lisa@casper.med.uth.tmc.edu

Portfolio:

Biography

BS, Texas A&M University 1998

Special Interests

Medical technology, informatics

WWW Links of Interest

American Medical Informatics Association

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Bookmarks Location: http://129.106.169.35/wcb/schools/11/51/anguyen/4/help.html What's Related

Summer, 2001 -- COAG 5320 -- Section 15

Help/Utilities

Student Guide

Change Your Password

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Web Course in a Box

Student's Guide

A. Introduction

Your instructor has created a set of Web pages for your class using an authoring tool called Web Course in a Box (WCB). This WCB Student's Guide is designed to help you get started using WCB COURSE PAGES and to acquaint you with features which will let you use them more efficiently.

The World Wide Web provides a user-friendly, multimedia environment for accessing learning materials. Materials on the Web can be accessed at any time, including remotely from your home or dorm if you have a computer with an Internet connection

B. Internet Access

The WCB COURSE PAGES your instructor has created can be viewed with any Web browser; recommended are Netscape Navigator, version 2.0 or higher, or Microsoft Internet Explorer, version 3.0 or higher. In order to use a Web browser, you will need to have an Internet connection. Your instructor or your Computing Services can provide you with information on Internet access on campus as well as possible off-campus options.

You may use a Web browser other than those recommended (such as the text-only Lynx or the AOL Web browser

Summer, 2001 -- COAG 5320 -- Section 15

Learning Links

Discussion Forums

Forum for Coagulation Class

A general discussion forum to discuss various issues in coagulopathy. Every student is welcome to post questions and answers.

Lessons

Lesson 1: Hereditary Disorders of Coagulation Proteins

Lesson 2: Acquired Disorders of Coagulation Proteins

Lesson 3: Hereditary Disorders of Platelets

Lesson 4: Acquired Disorders of Platelets

Lesson 5: Findings in Anticoagulant Therapy

Lesson 6: Therapeutic Modalities

Practical 1: a 5 year-old male with marked brusing

Practical 2: a 35 year-old male found unconscious in a house fire

Practical 3: a 27 year-old female with rash

Exercises and Quizzes

Final Examination

Links

WEB COAG homepage

Decision-support system for coagulopathy

Coagulation profiles

Displaying pattern of seven screenning coagulation tests for each disorder (from WEB COAG)

Differential diagnosis

Displaying differential diagnoses that fit the coagulation results given by the user (from WEB COAG)

Synopsis of coagulopathy and therapy

Displaying essential information on coagulopathy and therapeutic modalities (from WEB COAG)

Coagulation cascade diagram

Viewing the coagulation cascade and clicking on the factors in the diagram to see associated disorders (from WEB COAG)

Diagnostic Flowchart for prolonged aPTT

Flowchart with diagnostic algorithms for a prolonged aPTT with a normal PT

Page last updated Thu, May 10, 6:32PM by Andy Nguyen.

Document: Done

Start | Learning Links -- C... | Exploring - WithDemoFig... | Microsoft PowerPoint - [... | learn2.gif (800x600x16.7... | 2:04 PM

COAG 5320 -- Section 15 -- Summer, 2001

Forum for Coagulation Class

[Post Message] [Archive]

- Hypercoagulation risk in patients with Factor XII deficiency - **Darlene Brown** *11:10:29 5/11/101* (1)
  - Re: Hypercoagulation risk in patients with Factor XII deficiency - **Lisa Nguyen** *11:44:38 5/11/101* (0)

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WCB Forum

Post A Message!

Subject:

Factor II mutation and Factor II level   Submit

Message:

Does anybody know whether Factor II level increases or decreases in
Factor II mutation ?

Attachment:

Browse...

Document: Done

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COAG 5320 -- Section 15 -- Summer, 2001

Forum for Coagulation Class

[Post Message] [Archive]

- Factor II mutation and Factor II level - **John Smith** *14:08:42 6/25/101* (0)
- Hypercoagulation risk in patients with Factor XII deficiency - **Darlene Brown** *11:10:29 5/11/101* (1)
  - Re: Hypercoagulation risk in patients with Factor XII deficiency - **Lisa Nguyen** *11:44:38 5/11/101* (0)

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Bookmarks   Location: http://129.106.169.35/wcb/schools/11/51/anguyen/4/forums/forum1/messages/1.html   What's Related

[Read FollowUps] [Post Followup] [Message List]

Subject: Hypercoagulation risk in patients with Factor XII deficiency
Posted by: Darlene Brown on 11:10:29 5/11/101:

I have not been able to figure out why patients with Factor XII deficiency do not have bleeding problem. It is even a paradox that they have high risk for hypercoagulation. Is there anybody in this class who has the answer to this?
Thanks
Darlene Brown

FollowUps:

- **Re: Hypercoagulation risk in patients with Factor XII deficiency** Lisa Nguyen *11:44:38 5/11/101* (0)

Document: Done

Start   Hypercoagulation risk...   Exploring - Temp   Microsoft PowerPoint - [UA...   2:17 PM

[Read FollowUps] [Post Followup] [Message List]

Subject: Re: Hypercoagulation risk in patients with Factor XII deficiency
Posted by: Lisa Nguyen on 11:44:38 5/11/101:
In Reply to: Hypercoagulation risk in patients with Factor XII deficiency posted by Darlene Brown on May 11 19101 at 11:10:29:

Hi Darlene:
From what I understand, the requirement of Factor XII for normal hemostasis is poorly defined. Bleeding diatheses have not been reported in patients with Factor XII deficiency. Furthermore, it has been suggested from clinical obsevation that these patients predispose to thrombosis, possibly due to the decrease in surface-mediated fibrinolysis (Factor XII participates in activating fibrinolysis). However, no comprehensive study has been conducted to confirm their high risk for hypercoagulation.
Lisa Nguyen

FollowUps:

Lesson 1: Hereditary Disorders of Coagulation Proteins

Hereditary Disorders of Coagulation Proteins

This lesson covers basic information on various hereditary disorders of coagulation proteins: pathophysiology, diagnosis, and treatment.

LESSON 1

Andy Nguyen,M.D./ UT-Medical School at Houston, Pathology/ Last Revision on: 5/4/01

Hereditary Disorders of Coagulation Proteins:

- Factor XII Deficiency, Hereditary:
- Prekalikrein Deficiency
- Factor XI Deficiency
- Factor IX Deficiency (Hemophilia B)
- Factor VIII Deficiency (Hemophilia A)
- Acquired Factor VIII Inhibitor in Hemophilia A
- vonWillebrand's Disease, type I
- vonWillebrand's Disease, type IIA
- vonWillebrand's Disease, type IIB
- vonWillebrand's Disease, type III
- Factor VII Deficiency
- Factor X Deficiency
- Factor V Deficiency
- Afibrinogenemia
- Hypofibrinogenemia
- Dysfibrinogenemia
- Factor XIII Deficiency

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DEFICIENCY OF FACTOR XII (Hageman factor)

Andy Nguyen,M.D./ UT-Medical School at Houston, Pathology/ Last Revision on: 12/9/96

- **Biochemical aspects:**
  Factor XII is a single-chain beta-globulin with a MW of 80,000. Activated factor XII cleaves prekallikrein, factor XI, and factor VII proteolytically, converting them to their active forms.
- **Pathological Basis:**
  - Mode of inheritance: autosomal recessive.
  - Acquired deficiency is seen in patients with nephrotic syndrome. The pathological basis of this acquired deficiency has not been established since urinary loss of factor XII alone may not account for the reduced plasma activity of this factor.
- **Treatment:**
  - No treatment necessary for hereditary type.
  - Management of nephrotic syndrome in acquired type.

Diagnostic Criteria for Hereditary F XII Deficiency

1. Negative_bleeding_history
2. APTT:abnormal
3. Mixing_APTT:corrected
4. Factor_XII_assay:abnormal
5. No_evidence_of_renal_insufficiency_or_failure
6. APTT,incubated_10_min:not_corrected

Document: Done

Practical 1: a 5 year-old male with marked brusing

See the case history of this patient

PRACTICAL 1: a 5 year-old male with marked brusing

Andy Nguyen,M.D./ UT-Medical School at Houston, Pathology/ Last Revision on: 5/10/01

- **Clinical History:**

Patient is a 5 year-old boy referred by his pediatrician because of a marked bruising tendency of the arms and legs. The mother related that the bruising typically appeared without serious trauma.

Past medical history revealed no bleeding at the time of circumcision or in association with separation of the umbilical cord. At 20 months of age, the patient underwent corrective eye surgery for strabismus without any unusual bleeding. At 3 years of age, the patient had an episode of marked epistaxis that necessitated hospital admission and transfusion of one unit of blood.

There was a family history of bleeding on the maternal side of the family. The patient's mother, maternal grandmother and maternal great grandmother had experienced episodes of abnormal bleeding. Their bleeding was characterized by recurrent epistaxis and easy bruising together with menorrhagia. The patient's mother had required 9 units of blood at the time of his delivery.

The patient was on no medication at the time of evaluation.

- **Physical Examination:**

Physical examination revealed a number of bruises over the arms and legs.

- **Screening Coagulation Laboratory Results:**
  - ○ PT= 12 sec (Normal 11-13)
  - ○ aPTT= 34 sec (Normal 25-34)
  - ○ Plt= 300,000 /uL (Normal 133,000-333,000)
  - ○ Bleeding Time >15 min (Normal<9)

STEPS TO FOLLOW IN THIS PRACTICAL:

- Read this case history thoroughly, then make a list of differential diagnosis based on the clinical history and screening coagulation laboratory results.
- Formulate a strategy for diagnosis (sequence of tests ordered). Put emphasis on proper utilization of laboratory tests (to prevent over-utilization) and still obtaining optimal care for patients with adequate laboratory testing.
- State different treatment plan for all possible diagnoses.
- Submit your assessment of the case to the course instructor via e-mail.
- Note: useful references for this practical can be found from reference links in the "Learning Links" page of this course. Students are also encouraged to use the "Discussion Forum" in the "Learning Links" page to exchange ideas during this exercise.

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Bookmarks Location: http://129.106.169.35/wcb/schools/11/51/anguyen/4/exercises/quiz6/frame.html What's Related

Final Examination

Fill in your answer and hit the return key.
You have just one try for each question.
Correct answer is shown after your answer is entered.

What's your name? `Mary`

1. A 55 year-old male underwent cononary artery bypass with no complications. Patient developed sudden thrombocytopenia 6 days after surgery. The most likely etiology for his thrombocytopenia is:

    a. ○ Heparin-induced antibody
    b. ○ Thrombotic thrombocytopenic purpura (TTP)
    c. ○ Immune thrombocytopenic purpura (ITP)
    d. ○ Lupus anticoagulant
    e. ○ Evan's syndrome

2. Protein S is a coagulation inhibitor that potentiates activity of

    a. ○ Protein C

Document: Done

Start | Final Examination - N... | Exploring - Temp | Microsoft PowerPoint - [UA... Monday, June 25, 2001 2:31 PM

Good, Mary, keep going!

Fill in your answer and hit the return key.
You have just one try for each question.
Correct answer is shown after your answer is entered.

What's your name? Mary

1. A 55 year-old male underwent cononary artery bypass with no complications. Patient developed sudden thrombocytopenia 6 days after surgery. The most likely etiology for his thrombocytopenia is:

   a. ● Heparin-induced antibody
   b. ○ Thrombotic thrombocytopenic purpura (TTP)
   c. ○ Immune thrombocytopenic purpura (ITP)
   d. ○ Lupus anticoagulant
   e. ○ Evan's syndrome

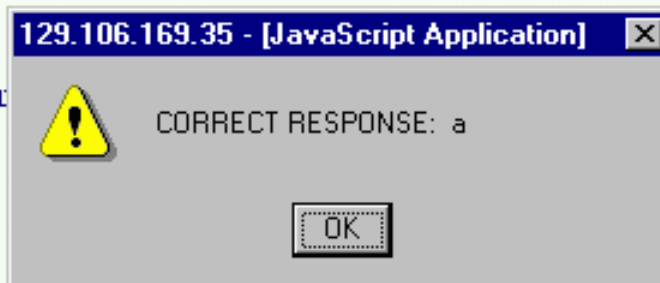2. Protein S is a coagulation inhibitor that potentiates activity of

   a. ○ Protein C

Good, Mary, keep going!

2. Protein S is a coagulation inhibitor that potentiates activity of

   a. ○ Protein C
   b. ○ Alpha 2-macroglobu
   c. ○ Thrombomodulin
   d. ○ Antithrombin III
   e. ⦿ Heparin

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⚠ CORRECT RESPONSE: a

[OK]

3. Which of the following protein is a potent fibrinolysis inhibitor:

   a. ○ Streptokinase
   b. ○ Tissue plasminogen activator (tPA)
   c. ○ Thrombomodulin-protein C complex
   d. ○ Apha 2-antiplasmin
   e. ○ Urokinase

4. The reference ranges for adult and neonate are the same for which of the following tests:

Good, Mary, keep going!

4. The reference ranges for adult and neonate are the same for which of the following tests:

- a. ⦿ Platelet count
- b. ○ PT
- c. ○ aPTT
- d. ○ Factor VII
- e. ○ Factor X

5. Which factor decreases first after coumadin treatment:

- a. ⦿ Factor VII
- b. ○ Factor II
- c. ○ Factor IX
- d. ○ Factor X
- e. ○ Factor V

Click when done

Out of 5 questions, you got **4** right for a score of **80%**.
Good performance!
It took you **4 minutes** to complete the exercise.

Your results have been submitted!

You may <u>re-take</u> the quiz if desired.

WEB COAG

Decision Support System for Coagulopathy

Andy Nguyen, M.D./ **UT-Medical School at Houston, Pathology**/ Last Revision on: 8/20/99

WEB COAG is a WWW-based decision-support system for diagnosis of coagulopathy. Currently, there are three main features in this system:

- Coagulation Profile: displays pattern of seven screenning coagulation tests for each disorder. The tests include: prothrombin time (PT), activated partial thromboplastin time (PTT), fibrinogen (FIB), thrombin time (TT), fibrin split product (FSP), platelet count (PLT), and bleeding time (BT).
- Differential Diagnosis: displays differential diagnoses that fit the coagulation results given by the user.
- Synopsis of Coagulopathy and Therapy: displays essential information on coagulopathy and therapeutic modalities.

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WEB COAG: SCREENNING LABORATORY PROFILES OF COAGULATION DISORDERS

Andy Nguyen,M.D./ UT-Medical School at Houston, Pathology/ Last Revision on: 8/5/99

Select a disorder from the drop-down list to see its coagulation profile:

Hemophilia A ▼

Coagulation Profile:	**TT:** ⦿ Normal ◯ Abnormal
PT: ⦿ Normal ◯ Abnormal	**FSP:** ⦿ Normal ◯ Abnormal
PTT: ◯ Normal ⦿ Abnormal	**PLT:** ⦿ Normal ◯ Abnormal
FIB: ⦿ Normal ◯ Abnormal	**BT:** ⦿ Normal ◯ Abnormal

[Show Profile Now]   [Help]

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WEB COAG: DIFFERENTIAL DIAGNOSIS

Andy Nguyen,M.D./ UT-Medical School at Houston, Pathology/ Last Revision on: 8/10/99

Enter Coagulation Data:

TT: ⦿ Normal ○ Abnormal

PT: ○ Normal ⦿ Abnormal

FSP: ⦿ Normal ○ Abnormal

PTT: ⦿ Normal ○ Abnormal

PLT: ⦿ Normal ○ Abnormal

FIB: ⦿ Normal ○ Abnormal

BT: ⦿ Normal ○ Abnormal

[Diagnose now]   [Start Over]   [Help]

LIST OF DIFFERENTIAL DIAGNOSES:

```
Factor VII deficiency
Vitamin K deficiency
Coumadin treatment
```

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Calculating Units of Cryopecipitate Needed for Fibrinogen

Andy Nguyen,M.D./ UT-Medical School at Houston, Pathology/ Last Revision on: 8/9/99

Baseline Fibrinogen Level (mg/dl): `50`

Desired Fibrinogen Level (mg/dl): `150`

Patient's Body Weight (Kg): `65`

[Calculate Units of Cryo Needed->]   `10`

[Start Over] [Help]

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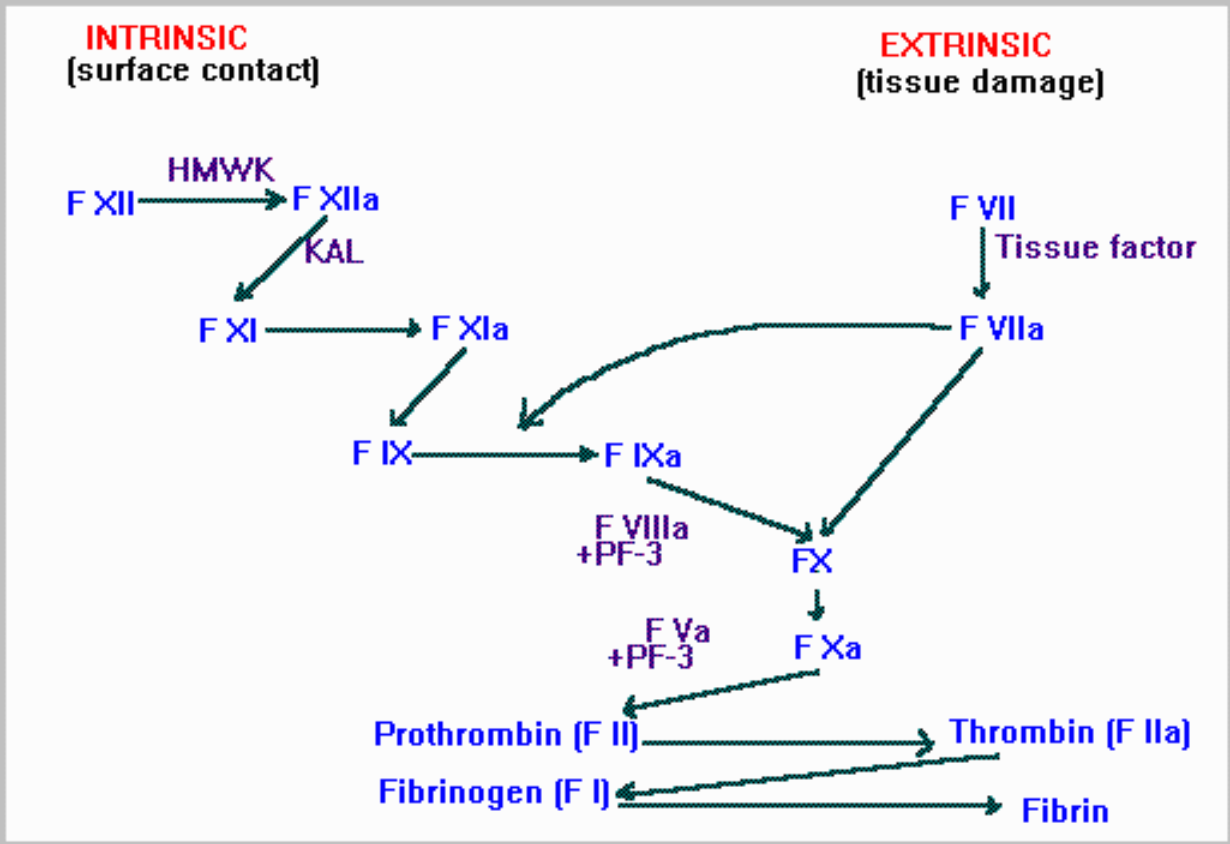
Coagulation Cascade Diagram

Andy Nguyen, M.D./ UT-Medical School at Houston, Pathology/ Last Revision on: 8/10/99

Click on the factors in the diagram below to see associated disorders

INTRINSIC
(surface contact)

EXTRINSIC
(tissue damage)

HMWK

F XII ⟶ F XIIa

KAL

F XI ⟶ F XIa

F VII

Tissue factor

F VIIa

F IX ⟶ F IXa

F VIIIa +PF-3

FX

F Va +PF-3

F Xa

Prothrombin (F II) ⟶ Thrombin (F IIa)

Fibrinogen (F I) ⟶ Fibrin

Document: Done

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WEB COAG: Platelet Aggregation Patterns

Andy Nguyen,M.D./ UT-Medical School at Houston, Pathology/ Last Revision on: 8/12/99

Select a disorder from the drop-down list to see its aggregation pattern:

Storage Pool Disease ▼

Aggregation with Reagents:

ADP: ○ Normal ● Abnormal

EPI: ○ Normal ● Abnormal

COL: ○ Normal ● Abnormal

RIS: ● Normal ○ Abnormal

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Bookmarks   Location: http://dpalm.med.uth.tmc.edu/faculty/bios/nguyen/webcoag/coaginterpIM/PTTChart1.htm   What's Related

Prolonged aPTT Panel: Flow Chart 1

UT-Medical School at Houston, Pathology/ Last Revision on: 4/13/99

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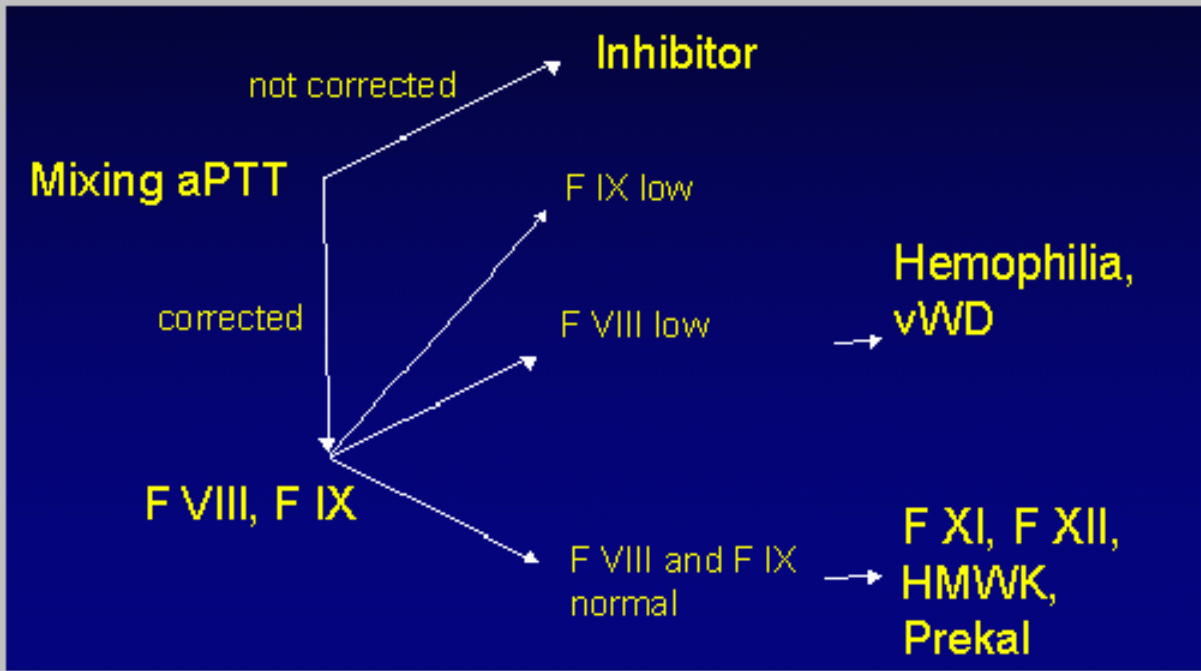
Prolonged aPTT Panel: Flow Chart 2

UT-Medical School at Houston, Pathology/ Last Revision on: 4/13/99

Inhibitor:

TT, clin data

$+$ → Heparin effect

$-$

F VIII, F IX, dRVVT

Factor inhibitor   Lupus anticoagulant
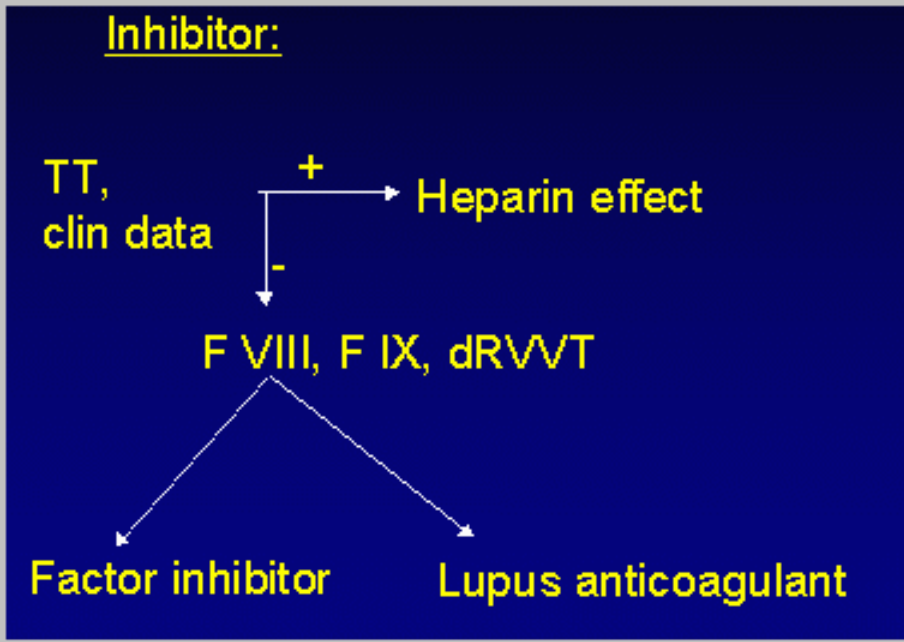
Prolonged aPTT Panel: Flow Chart 3

UT-Medical School at Houston, Pathology/ Last Revision on: 4/13/99

Factor inhibitor:

Factor VIII or F IX low → Factor VIII or F IX inhibitor
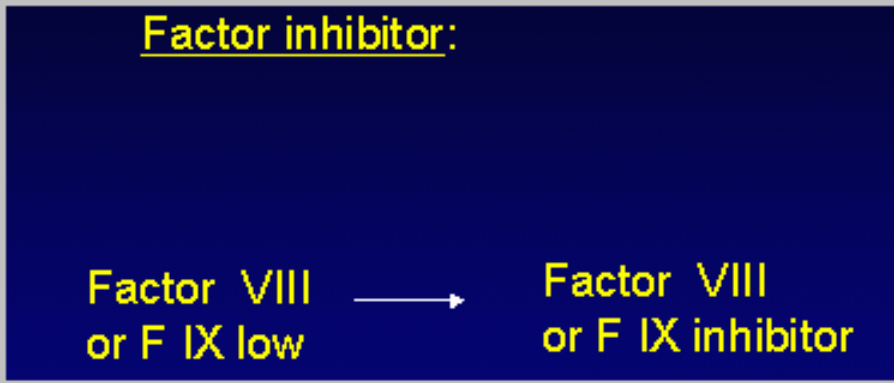
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Factor VIII (or IX) Deficiency

UT-Medical School at Houston, Pathology/ Last Revision on: 3/22/99

- **Summary of Laboratory Results:** Patient's aPTT was prolonged, PT was normal. A (1:1) mixing study for aPTT was performed which showed no correction. Assays were performed for the factor VIII (or IX). Factor VIII (or IX) level was found to be low.

- **Diagnosis:** Factor VIII (or IX) Inhibitor

- **Recommendation/ Comments:** Hematology consultation is suggested to follow up this patient for clinical management if not already done. Factor VIII (or IX) inhibitor assay is suggested to determine the inhibitor level.

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Unique Values

- Users can access this program anywhere with a web browser
- Updating materials is greatly simplified with centralized servers
- Started a pilot program for pathology residents and fellows to take this course (Oct 2001). Feedback->(a) to assess the benefits of on-line learning; (b) for future enhancement

Plan for Completion of Project

- The current version is approximately 70% completed
- Add more practicals (3 to 15)
- Add more questions (5 to 30)

Demo

⌘Web address:
http://dpalm.uth.tmc.edu/faculty/bios/
nguyen/nguyen.html -> Coagulation
Course