





Coagulation disorder in Children

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Objectives



สามารถซักประวัติและตรวจร่างกายผู้ป่วยที่มีความผิดปกติของ การแข็งตัวของเลือดได้อย่างครอบคลุมและเหมาะสม

สามารถวินิจฉัยแยกโรคและให้การรักษาเบื้องต้นในผู้ป่วยที่ มีความผิดปกติของการแข็งตัวของเลือดได้อย่างถูกต้อง



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Conclusions

The Best Laboratory Test is

"The History Taking"







Clinical evaluation



	Primary Hemostatic disorder	Secondary Hemostatic disorder	
Prototypic disorders	thrombocytopenia platelet function defect von Willebrand disease	hemophilia	
Bleeding	immediate	delayed	
Petechiae	yes	no	
Hemarthrosis	no	yes	
Intramuscular Hematoma	uncommon	common	
Epistaxis	common	uncommon	
Menorrhagia	common	uncommon	



ก. Wet purpura



ค. Hematoma



ข. Ecchymosis



4. Hemathrosis



Case Scenario #1



A 3-year-old boy was noted to have bruises over his extremities off and on.

He presented with several episodes of epistaxis.

Other history was unremarkable

Physical examination

Multiple scattered bruises over the extremities and trunk.

Petechiae were seen on these areas and face.

No splenomegaly. Lymph node was negative.

Neurologic examination was normal



Case Scenario #1



Complete blood count

Hb 10 g/dL

Hct 29 %

MCV 65 fL

MCH 29.6 pg

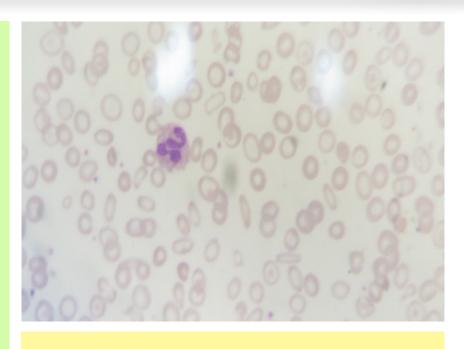
MCHC 35.9 g/dL

RDW 17 %

WBC 5.3 \times 109/L

(P 44, L 39, M 14, E 1, B 2)

PLT 348 x 10⁹/L



Coagulogram

PT 12 sec (12-15 sec)

aPTT 29 sec (25-35 sec)

TT 12 sec (10-20 sec)

Bleeding time = 15 mins



Bleeding Time



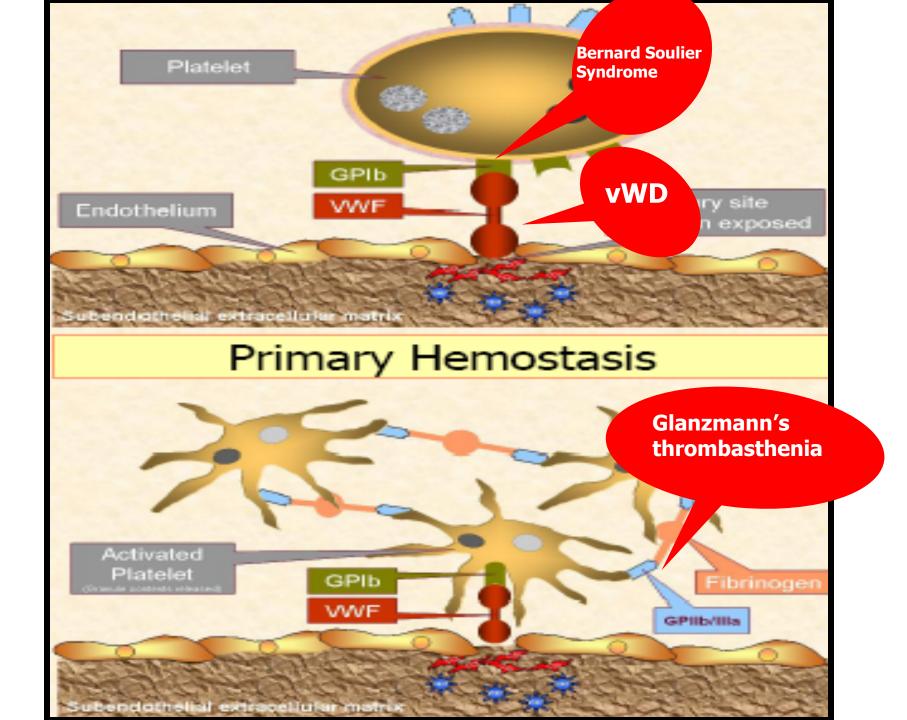
Normal range up to 10 mins

Prolongation in

- Plt. dysfunction
- VWD (aPTT prolonged)
- Thrombocytopenia (<60 x 109/L)
- Hypofibrinogenemia (TT prolonged)
- Vascular defect



NOT recommend for <u>Pre-operative evaluation</u>
Poor sensitivity and reproducibility
Most preferred method: Modified Ivy method





Lab investigations



vWD investigation

Blood group "A"

vWF: Ag = 0.95U/ml (95%)

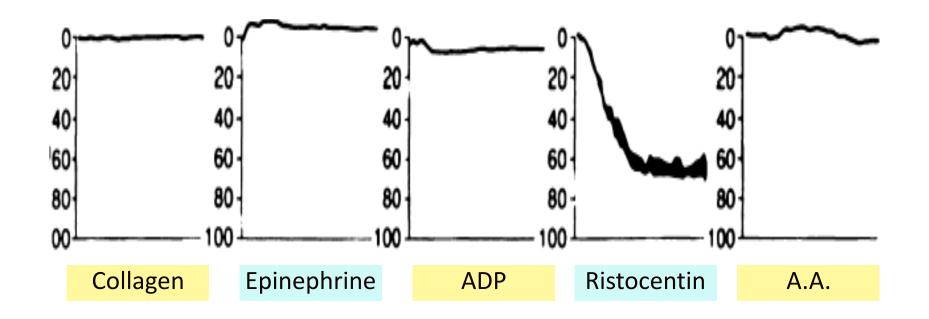
Factor VIII : C activity = 1.2 U/ml (120%)

vWF:RCO = 0.78 U/ml (78%)



Platelet Aggregation test

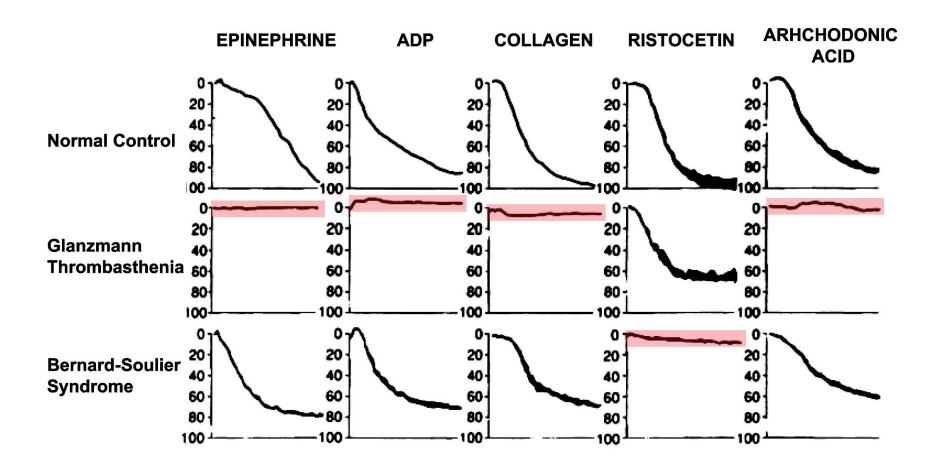






Platelet Aggregation Profiles







Glanzmann Thrombasthenia



- Autosomal recessive inheritance (high rate of consanguinity)
- Severe mucocutaneous bleeding starting in infancy
- Deficiency or abnormality of GPIIb/IIIa (platelet αIIbβ3 integrin)
- Normal platelet count and morphology
- Absent platelet aggregation in response to ADP, epinephrine, collagen
- Normal ristocetin-induced platelet agglutination
- Treatment: local pressures, DDAVP, fibrinolytic inhibitors, platelet transfusion, FVIIa

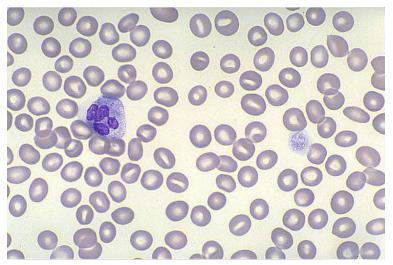
Ref : Poon MC J Thromb Haemost 2004 ; 2 : 1096-1103

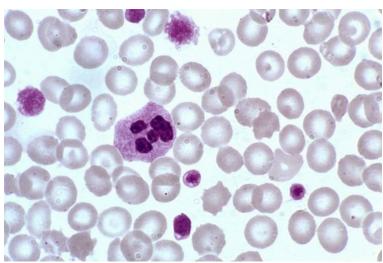


Bernard-Soulier Syndrome



- Autosomal recessive inheritance (consanguinity frequent)
- Deficiency or abnormality of GPIbα, GPIbβ, GPIX
- Prolonged bleeding time
- Normal platelet aggregation in response to ADP, epinephrine, and collagen
- Abnormal or absent agglutination in response to ristocetin

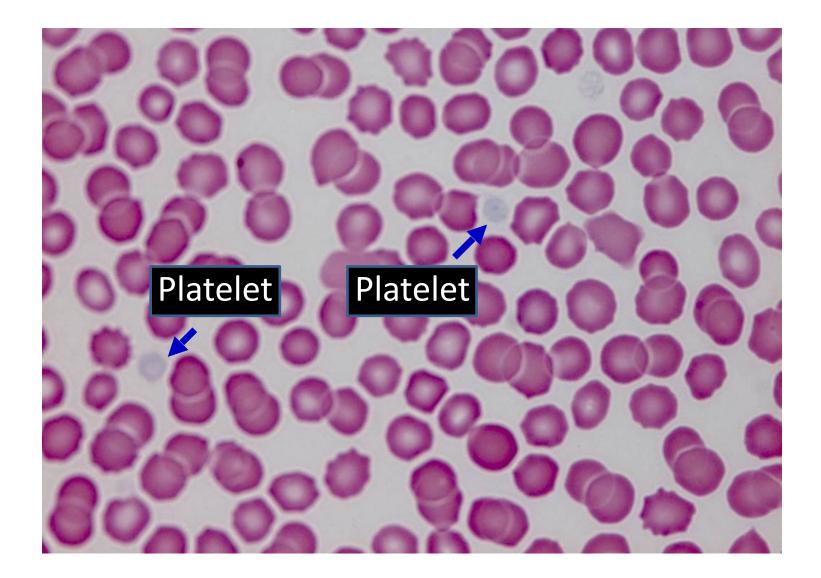






Storage Pool deficiency



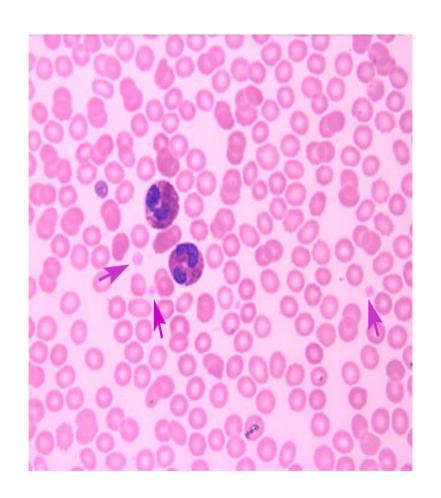




Acquired Platelet Dysfunction with Eosinophilia (APDE)



- Acquired
- Normal Platelet count
- Eosinophilia
- Absent platelet aggregation in response to ADP, epinephrine, collagen
- Normal ristocetin-induced platelet agglutination
- Treatment: local pressures, platelet transfusion
- Resolve in 6-12 mo.





Case Scenario #2



A 12-year-old girl was planed to do elective tonsillectomy next week.

She also had a history of a heavy periods for the last 2 months and easy bruising in childhood (not often).

Family History:

His father also had a Hx of easy bruising

Physical examination

Tanner stage IV

No hepatosplenomegaly

No bruises over the extremities



Lab investigations



Complete blood count

Hb 10 g/dL

Hct 30 %

MCV 60 fL

MCH 29.6 pg

MCHC 35.9 g/dL

RDW 18 %

WBC 5.3 x 109/L

(P 44, L 39, M 14, E 1, B 2)

PLT $350 \times 109/L$

Coagulogram

PT = 12 sec (12-15 sec)

aPTT = 38 sec (25-35 sec)

TT= 12 sec (10-20 sec)

Bleeding time = 12 mins



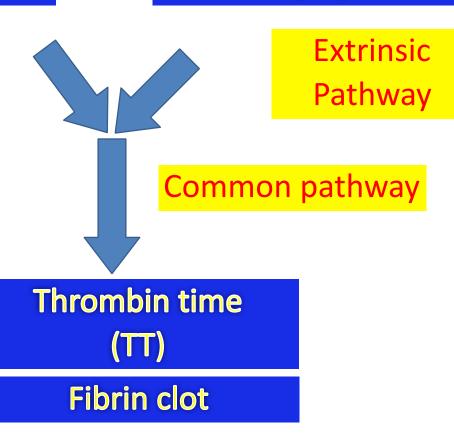
Coagulation Pathways



Partial thromboplastin time (PTT)

Prothrombin time (PT)

Intrinsic Pathway





Lab investigations



vWD investigation

Blood group "O"

vWF: Ag = 0.25 U/ml (25%)

Factor VIII: C activity = 0.40 U/ml (40%)

vWF:RCO = 0.48 U/ml (48%)

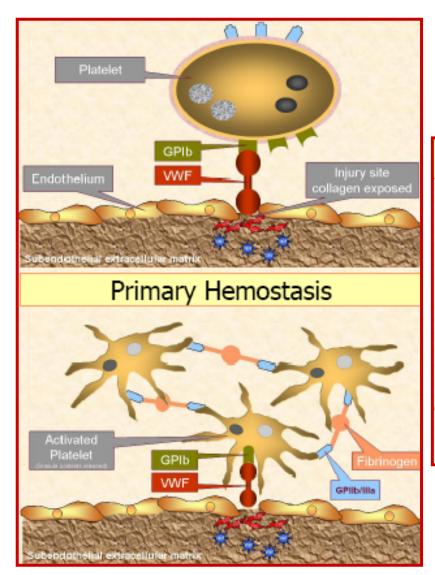
Liver function test: Normal

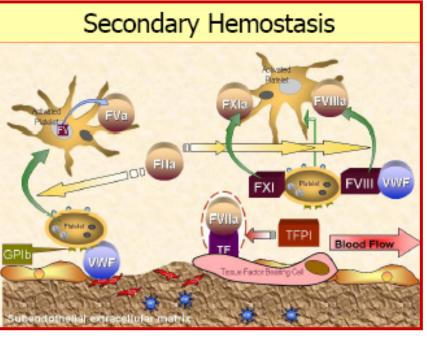
BUN / Cr : Normal



Role of VWF in Hemostasis









von Willebrand Disease (vWD)



- Most common inherited bleeding disorder
- Characterized by deficiency of von Willebrand factor (vWF)
- Variable clinical manifestations
- Autosomal dominant (Both boy and girl)



von Willebrand Disease (vWD)



- Mucosal-type bleeding
 - Menorrhagia
 - Epistaxis
 - Easy bruising
- Excessive bleeding with trauma
 - Postoperative bleeding
 - Bleeding following tooth extraction
- Gastrointestinal bleeding in patients with severe deficiency

Ref: Hambleton J. Curr Opin Hematol. 2001;8:306-311.



Case Scenario #3



A 2-year-old boy who had fallen from upstairs. Then he developed drowsiness, and soft tissue swelling at right frontal area.

PH: There was only circumcision without complications.

FH: Negative for bleeding disorder

Physical examination

V/S: WNL

HEENT :swollen at right frontal and face area

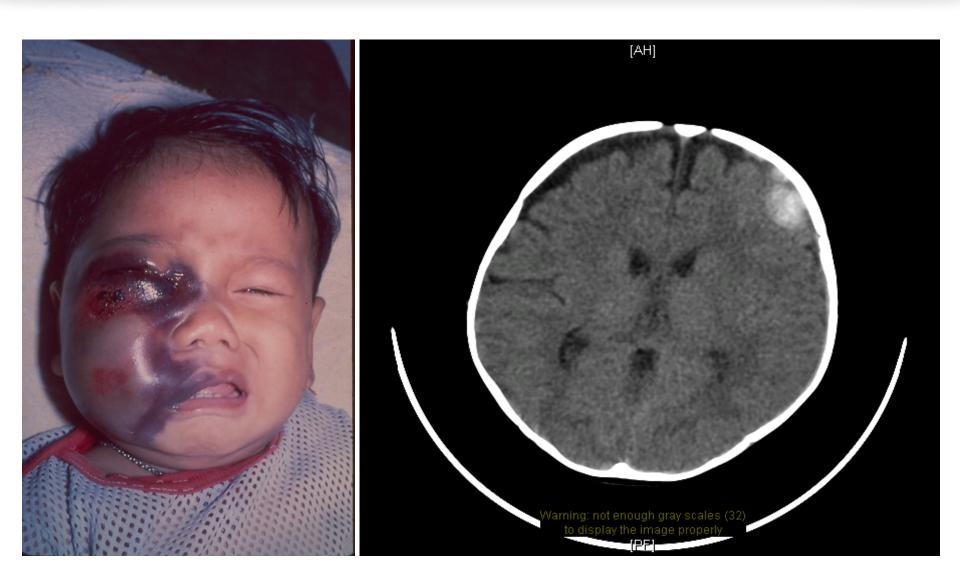
Ext.: No bruises over extremities

NS: Drowsiness



Case Scenario #3







Lab investigations



Complete blood count

Hb 12.4 g/dL

Hct 37.2 %

MCV 82.3 fL

MCH 29.6 pg

MCHC 35.9 g/dL

RDW 12.1 %

WBC 5.3 x 109/L

(P 44, L 39, M 14, E 1, B 2)

PLT $360 \times 109/L$

Coagulogram

PT = 12 sec (12-15 sec)

aPTT = 40 sec (25-35 sec)

TT= 12 sec (10-20 sec)



Lab investigations



vWD investigation

Blood group "A"

vWF: Ag = 0.95U/ml (95%)

Factor VIII: C activity = 0.12 U/ml (12%)

vWF:RCO = 0.68 U/ml

Liver function test: Normal

BUN / Cr : Normal



Hemophilia



Severe Haemophilia	Moderate Haemophilia	Mild Haemophilia
< 1% factor level	1% to 5% factor level	> 5% -30% factor level
Spontaneous bleeding May bleed 1-2 times per week	Can bleed with light injury May bleed 1 time per month	Can bleed with severe injury, surgery, invasive procedure
Characterized by joint involvement (haemarthrosis)	May have joint involvement	May never have a bleeding -Rarely has joint involvement



Hemarthosis







Severe to moderate hemophilia A,B



Case Scenario #4



An 8-year-old boy who presented with drowsiness and fever since last 4 days.

PH: No underlying disease

Physical examination

Vital signs: T 39 C, Tachycardia

Lung &CVS: WNL

Abdomen: hepatomegaly

Ext.: generalized petichiae

NS: Drowsiness

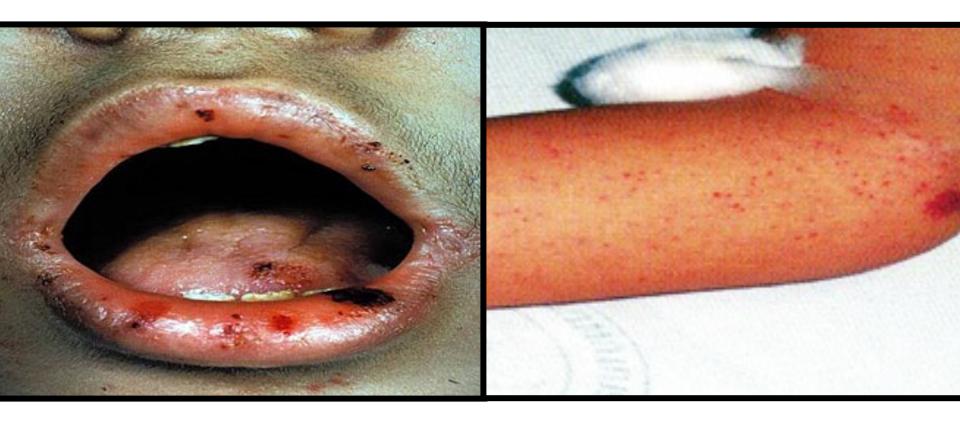
Sensory & motor : WNL

Sensory & motor: WNL



Case Scenario #4







Lab investigations



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Complete Blood Count

Hb 9.8 g/dL ,Hct 30 %

MCV 86 fL,MCH 28.9 pg, MCHC 35.9 g/dL RDW 14.5 %

WBC 2.5 x 109/L P 66 L 30 M 4

PLT 20 x 109/L
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Initial Coagulogram

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PT = 20 sec (12-15 sec), INR 1.5 ( 0.9-1)
aPTT = 40 sec (25-35 sec)
TT= 12 sec (10-20 sec)
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Liver Function Test: WNL

BUN / Cr: WNL



Differential Diagnosis



Component	Vit.K def.	Liver disease	DIC
RBC Morphology	Normal	Target cell	Fragmented cells, burr cells, schistocyte
PTT	Prolonged	Prolonged	Prolonged
PT	Prolonged	Prolonged	Prolonged
D-dimer	Normal	Normal	Markedly increased
Platelets	Normal	Normal	Reduced
Factors decreased	II, VII, IX, X	I, II, V, VII, IX, X	VIII



Clinical manifestration of DIC



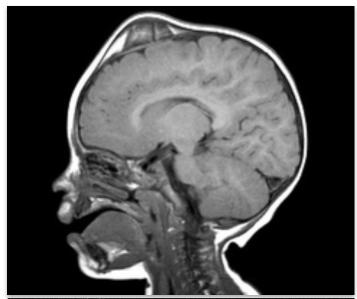


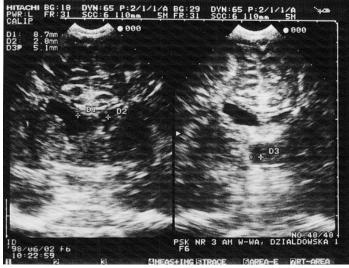


Acquired Prothrombin Complex Deficiency (APCD)



- Acquired
- CNS, GI bleeding in neonate
- Normal Platelet count
- Vitamin K deficiency
- Factor II,VII, IX, X
- Prolonged PT,APPT
- Treatment: Vit K, FFP







Take Home Messages



Primary and secondary hemostasis: what's the different

Platelet dysfunction

Bleeding time

Platelet aggregation study

Diseases: vWD, BS, GT, APDE

Hemophilia - Isolated APTT prolong



Take Home Messages



DIC: "consumptive coagulopathy"

Platelets counts low

FDP, D-dimer

Fibrinogen

PT, PTT prolong

APCD (Vit K deficiency)

PT,PTT prolong but normal in Platelet counts







Thank you for your kind attention

