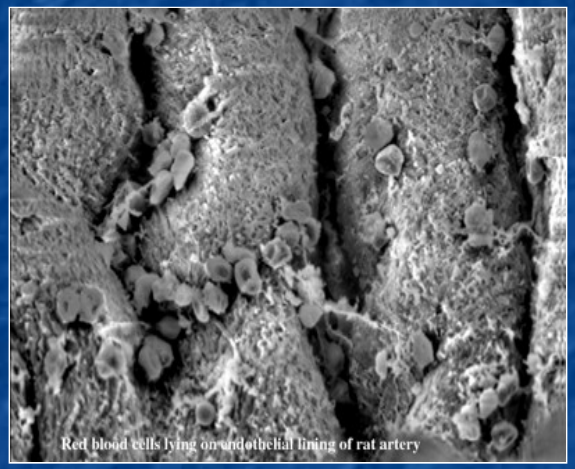
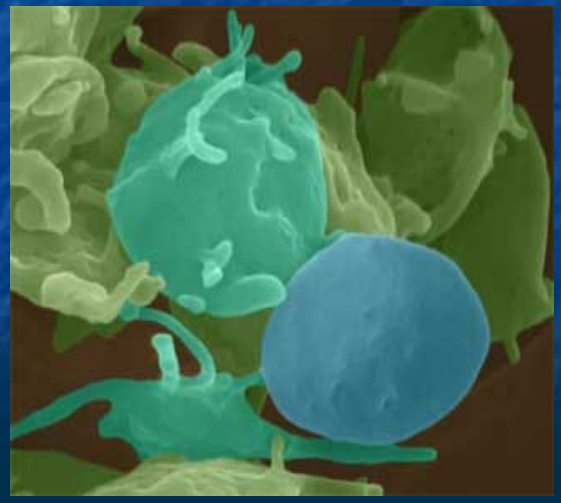
QUÁ TRÌNH CẦM MÁU

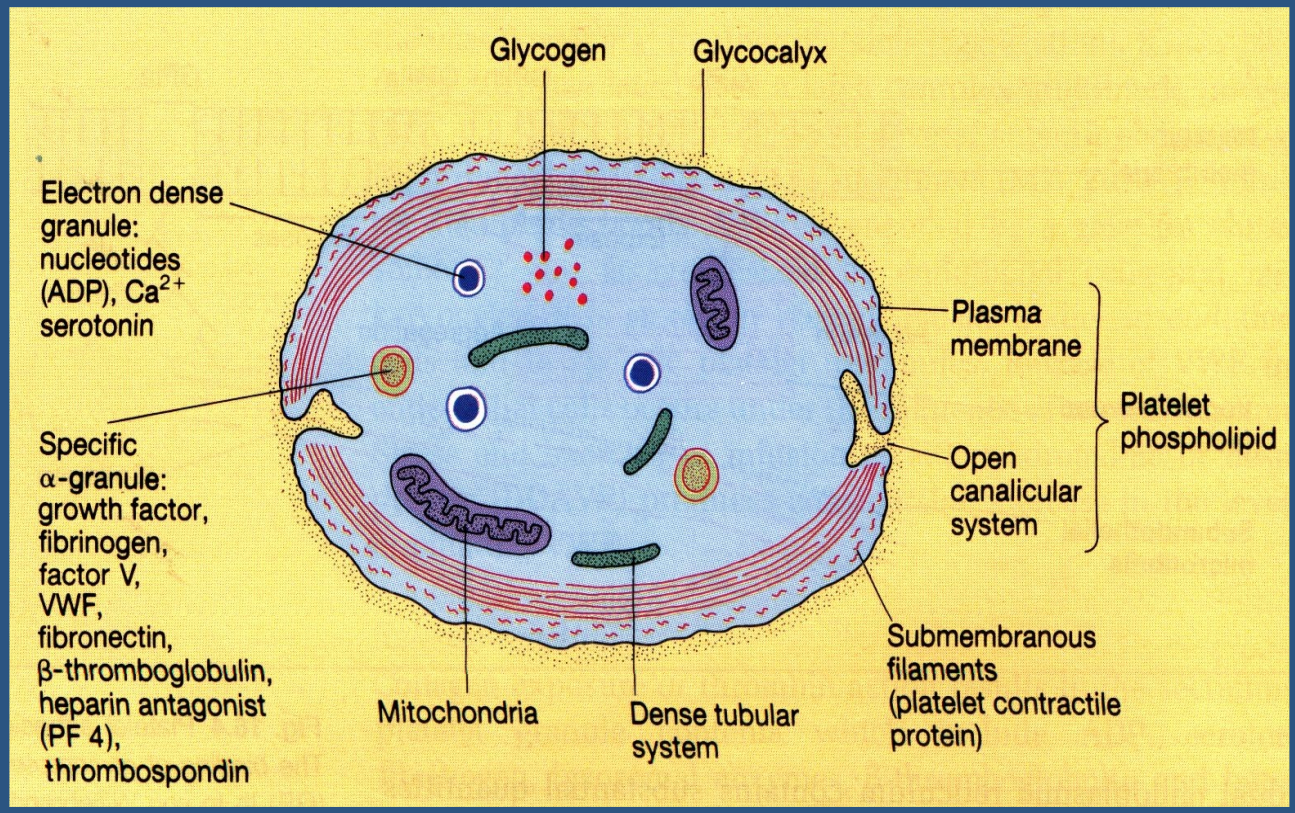
Cáöm maïu laì mäüt quaï trçnh tæ ång taïc giæ îa ba yãúu täú: thaình maûch, tiãøu cáöu vaì caïc protein dênh

Primary Hemostasis



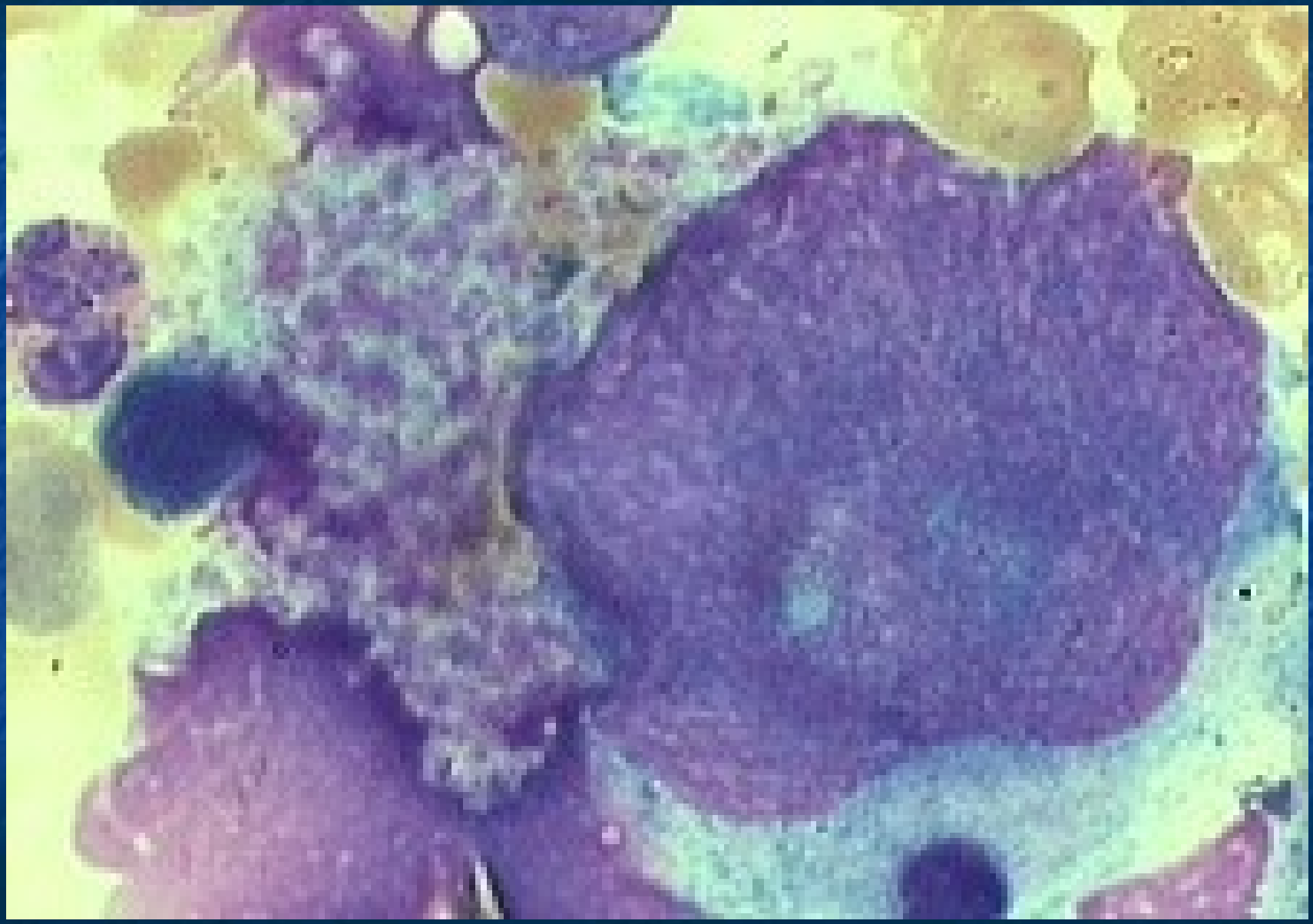


Diagrammatic Representation of the Platelet

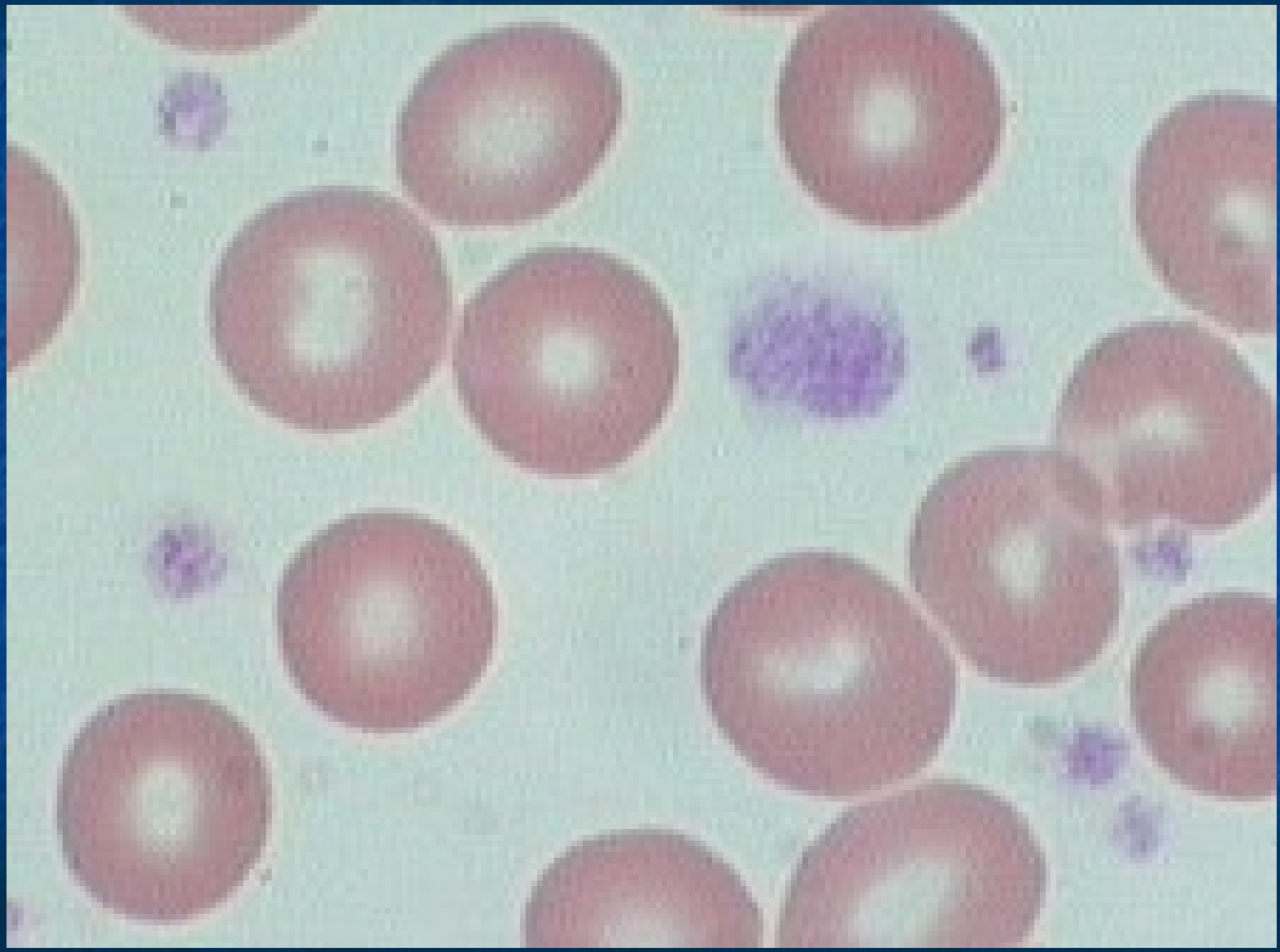


Megakaryocyte

Platelets forming from cytoplasm



Normal platelets and one giant platelet



CAÏC YÃÚU TÄÚ THAM GIA

1. Tiãøu cáöu

1.1. Âàûc tênh cå baín

-Háúp phuû vaì váûn chuyãøn caïc cháút

- Kãút dênh

  +Coï khaí nàng daìn traíi vaì dênh vaìo mäüt säú bãö màût

  + coï sæû tham gia cuía mäüt säú caïc yãúu täú Ca++, caïc yãúu täú huyãút tæång, GPIb, GPIIb/IIIa, yãúu täú von Willebrand.

+ Khåíi âáöu cho sæû phoïng thêch caïc cháút coï hoaût tênh bãn trong tiãøu cáöu
+ Caïc cháút æïc chãú dênh tiãøu cáöu: promethazin, cocain, quinin, aspirin, serotonin liãöu cao...
+ Âo âäü dênh giuïp âaïnh giaï vãö chæïc nàng cuía tiãøu cáöu.

- *Ngæ ng táûp tiãøu cáöu: khaí nàng kãút dênh láùn nhau, taûo nãn caïc kãút chuûm tiãøu cáöu*

+ *Caïc cháút gáy ngæ ng táûp TC: ADP, thrombin, adrenalin, serotonin, acid arachidonic, thromboxan A2, collagen, riscocetin...goüi laì "cháút kêch hoaût" TC.*

+ Cå chãú gáy ngæng táûp tiãøu cáöu:

ÆÏc chãú PÆ giaïng hoïa ATP thaình ADP

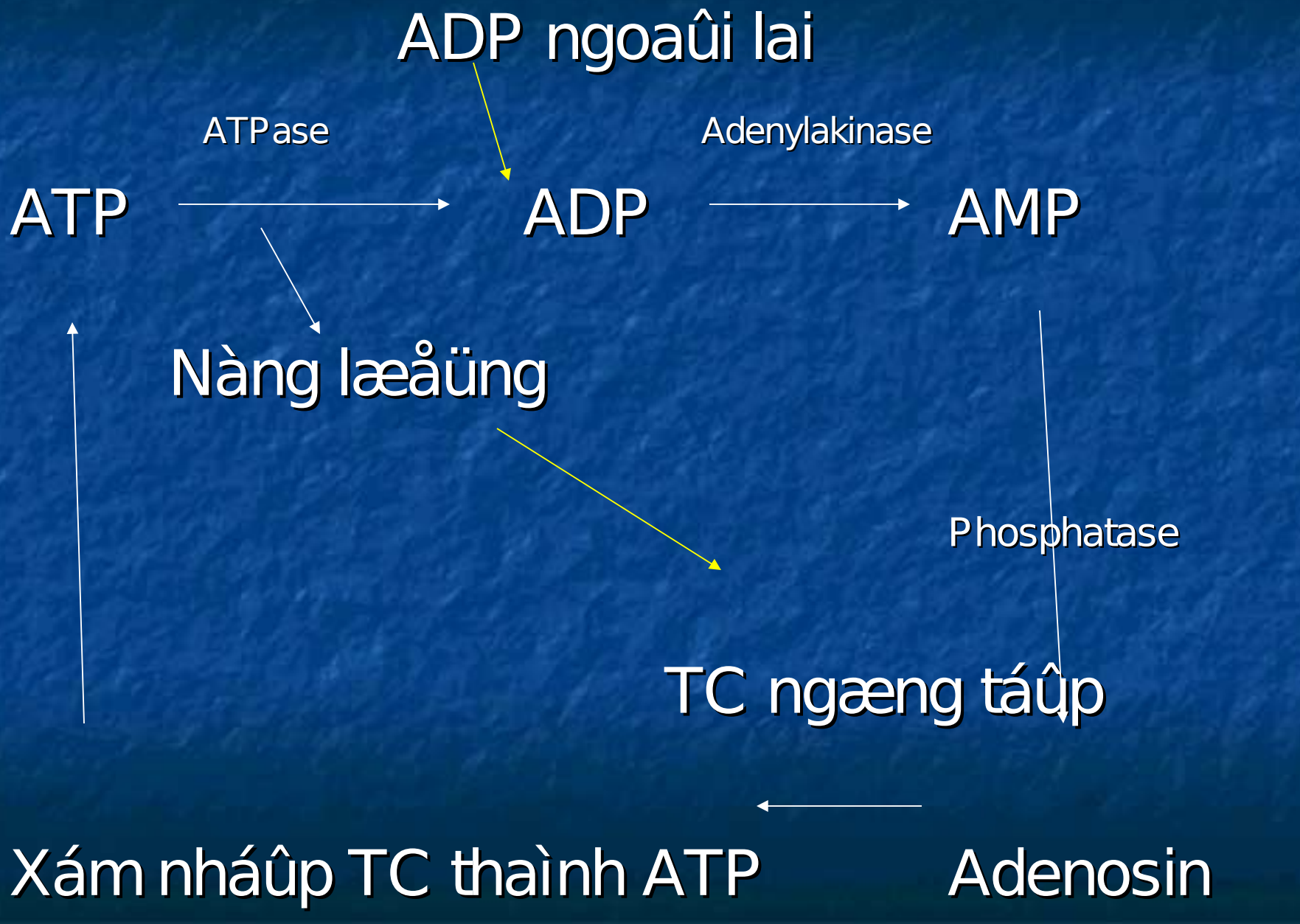
Tæång taïc giæîa caïc yãúu täú kêch táûp våïi phospholipid maìng vaì caïc men

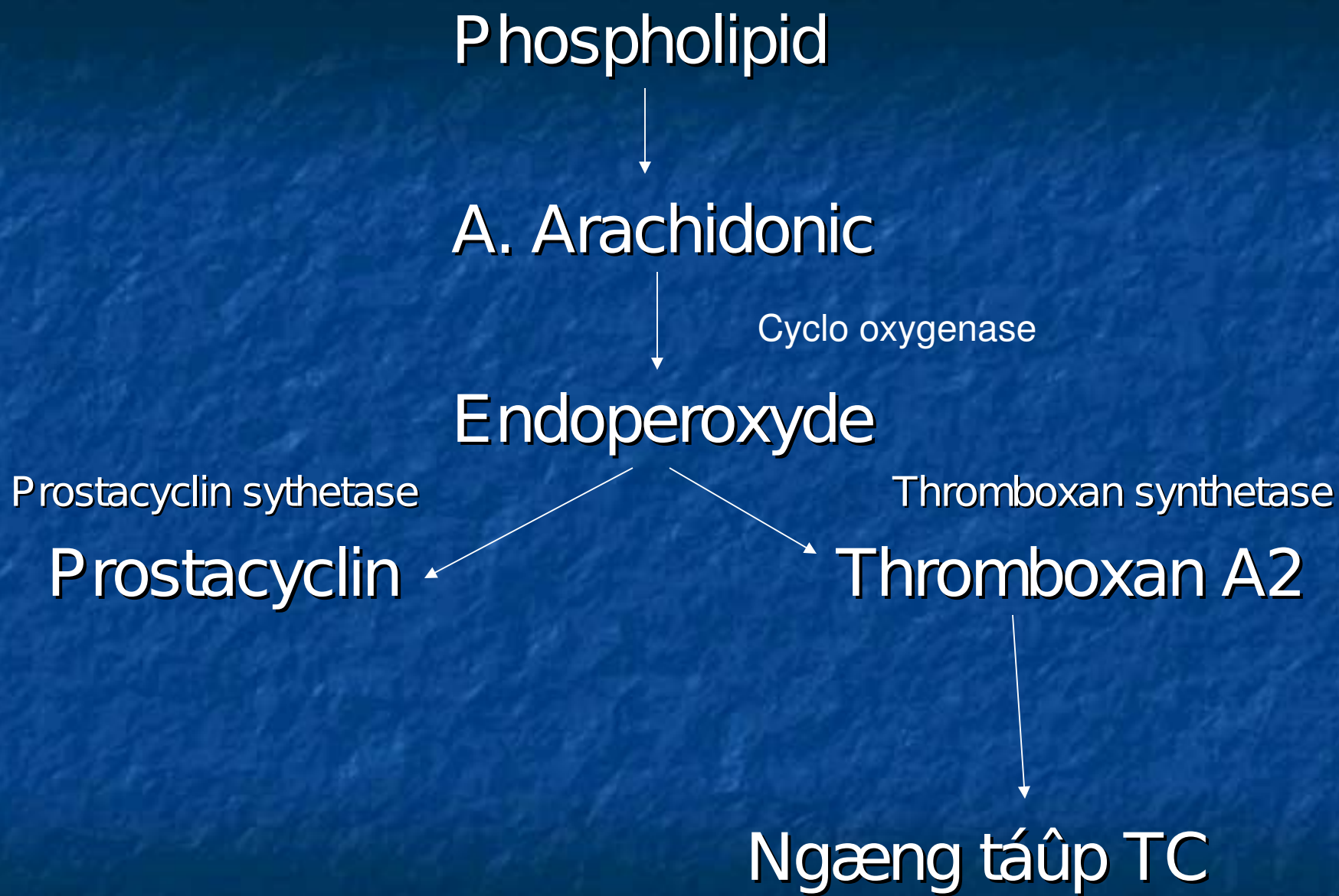
Thrombin taïc âäüng lãn yãúu täú 5 TC

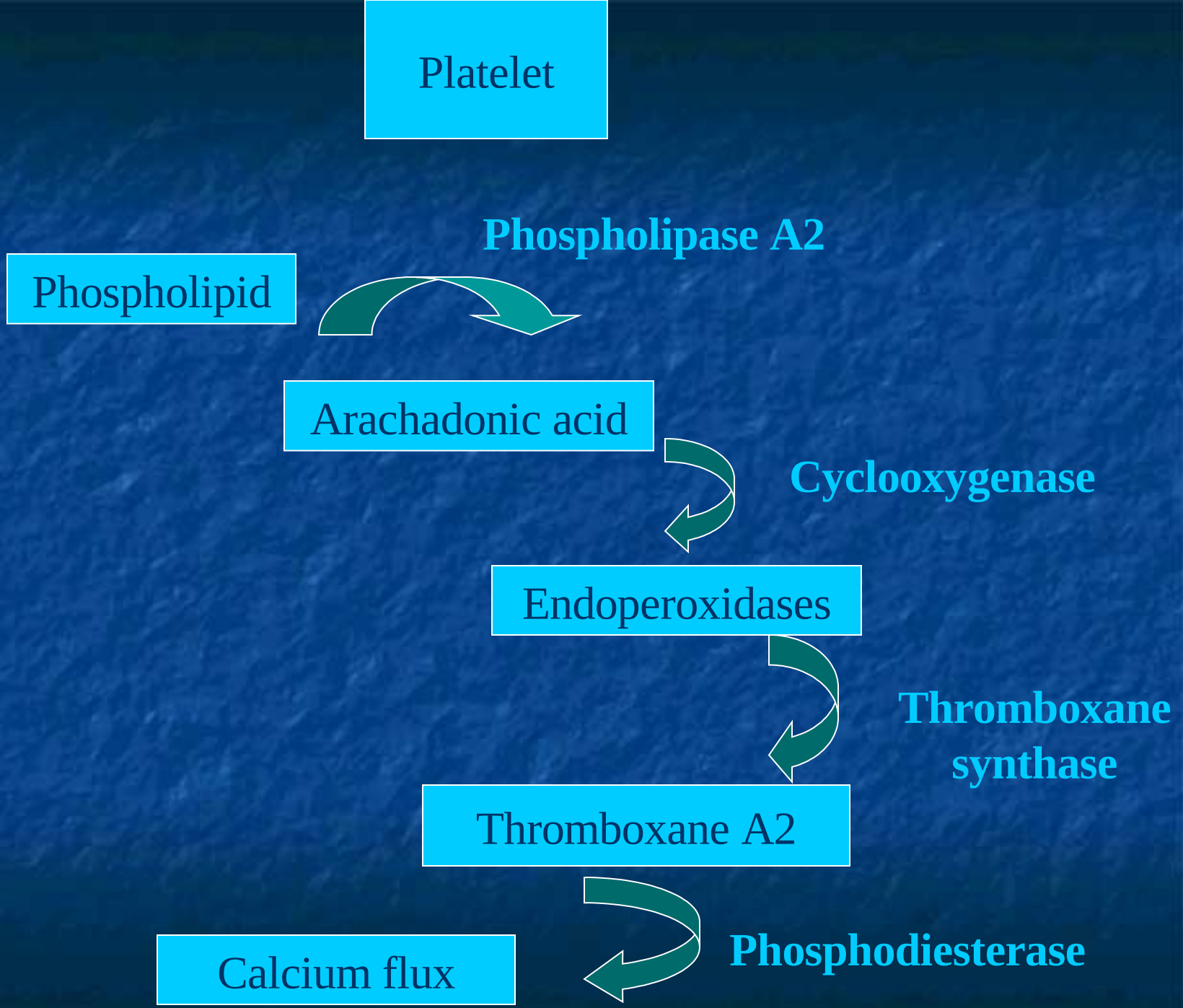
Adrenalin vaì noradrenalin: giaïn tiãúp (thäng qua ADP) vaì træûc tiãúp kêch thêch ngæng táûp (qua acid arachidonic).

Riscocetin kêch thêch yãúu täú v-W gàõn våïi TC taûi vë trê receptor GPIb.

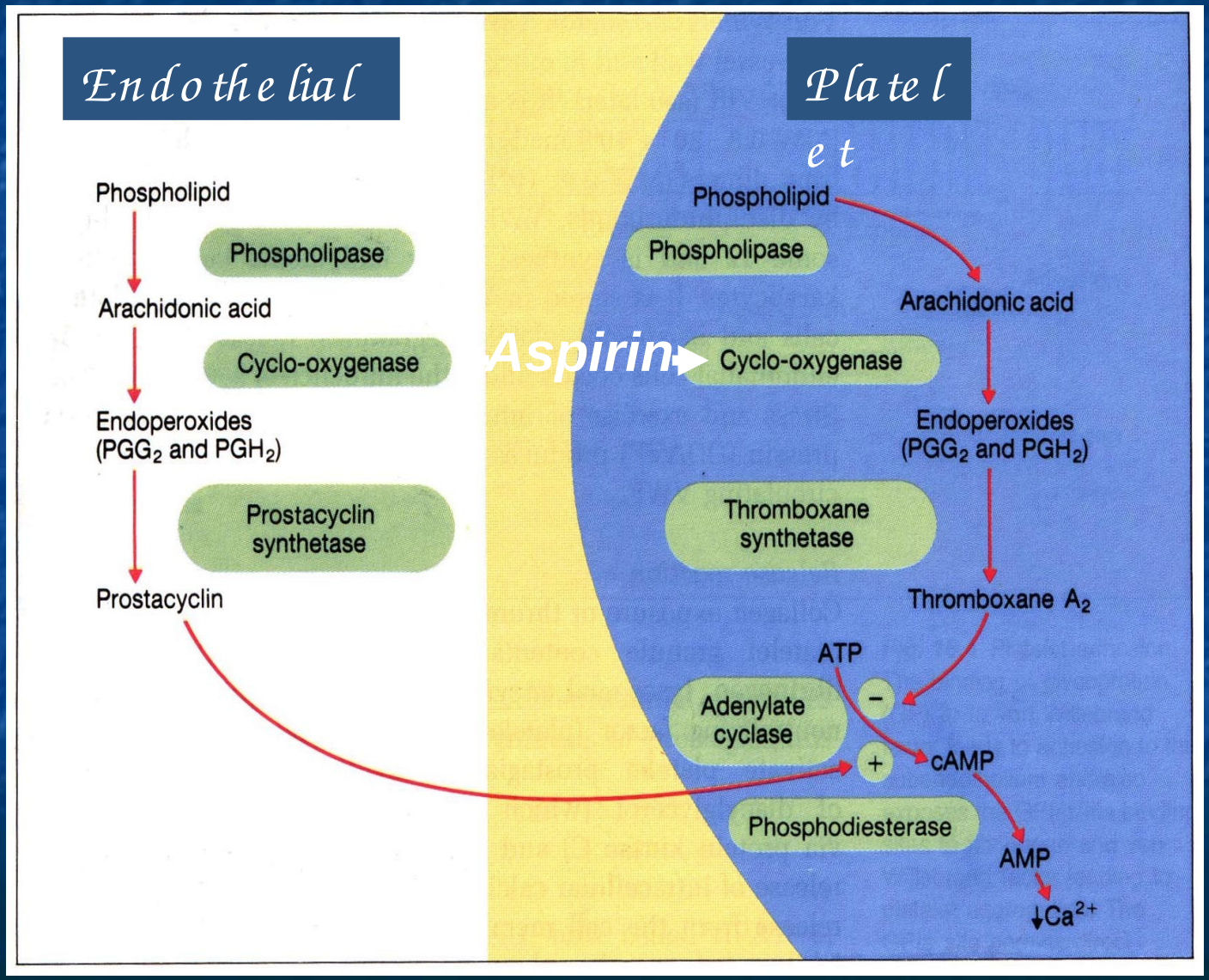
Qua trung gian liãn kãút cuía fibrinogen våïi GPIIb/IIIa âaî hoaût hoaï


ADP ngoaûi lai
ATPase
Adenylakinase
ATP
ADP
AMP
Nàng læåüng
Phosphatase
TC ngæng táûp
Xám nháûp TC thaình ATP
Adenosin


Phospholipid
A. Arachidonic
Cyclo oxygenase
Endoperoxyde
Prostacyclin sythetase
Thromboxan synthetase
Prostacyclin
Thromboxan A2
Ngæng táûp TC


Platelet
Phospholipase A2
Phospholipid
Arachadonic acid
Cyclooxygenase
Endoperoxidases
Thromboxane synthase
Thromboxane A2
Phosphodiesterase
Calcium flux

Platelet Function and Aspirin



+ Âiãöu kiãûn ngæng táûp: Maìng TC nguyãn veûn, khäng täøn thæång,coï màût 1 säú yãúu täú huyãút tæång (fibrinogen).
+ Mäüt säú cháút gáy æïc chãú ngæng táûp tiãøu cáöu

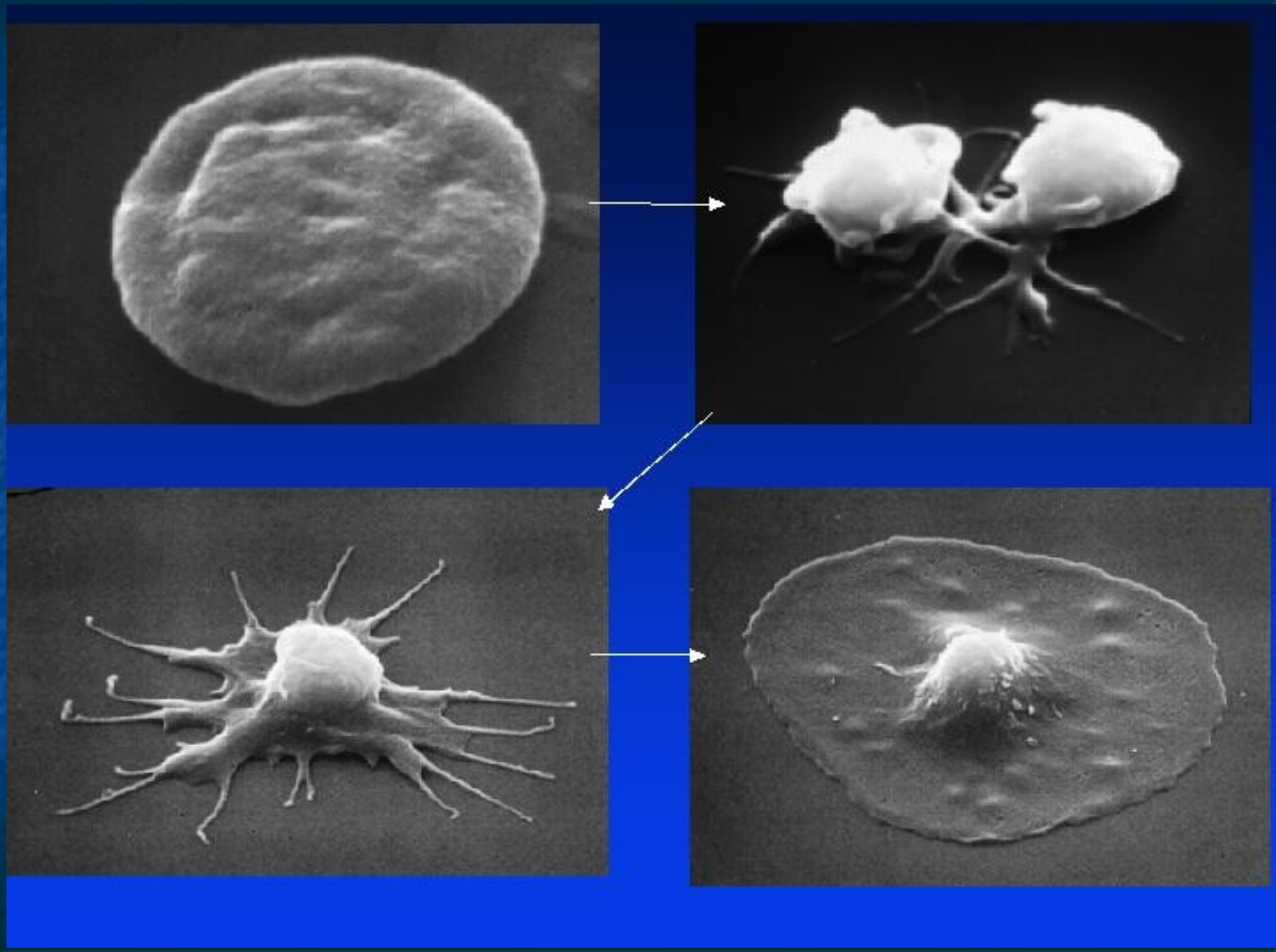
Thuäúc: aspirin, phenylbutazol, clopromazin...

Caïc saín pháøm do thoaïi hoaï fibrinogen, fibrin

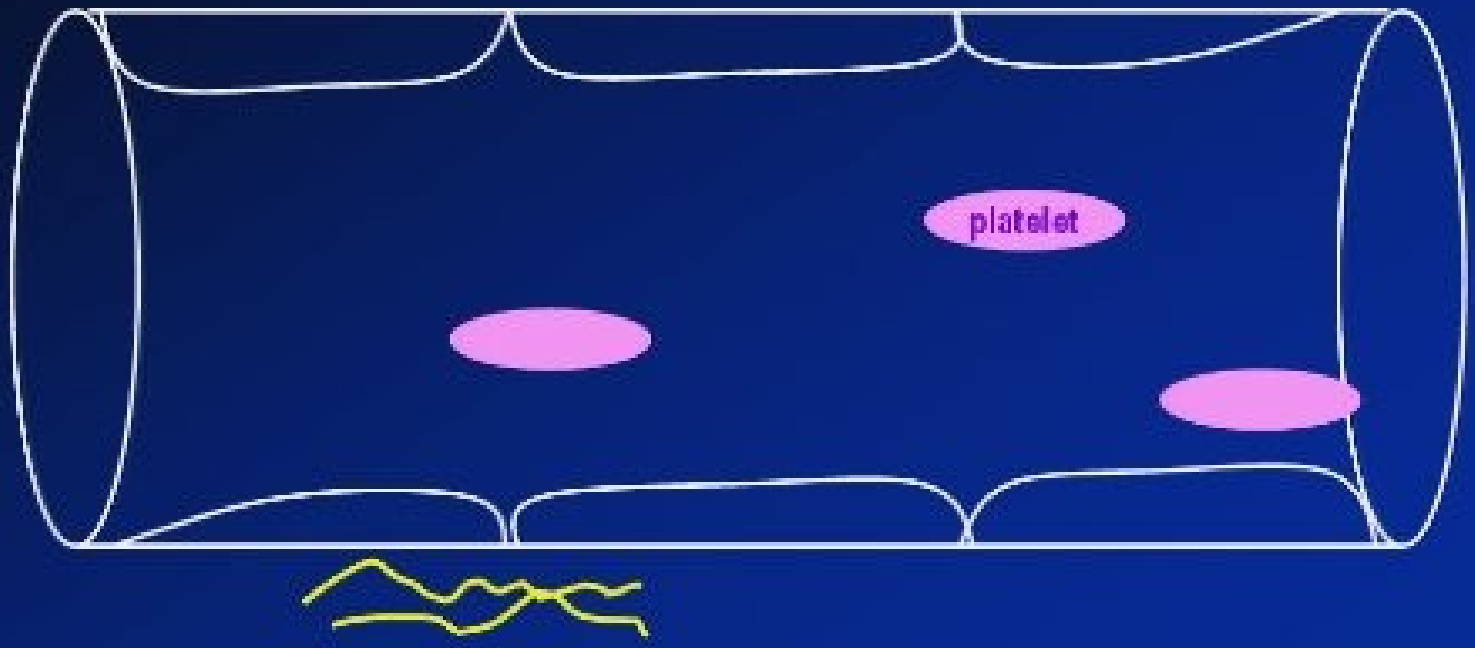
Caïc cháút æïc chãú sinh lyï

Caïc cháút æïc chãú khäng sinh lyï

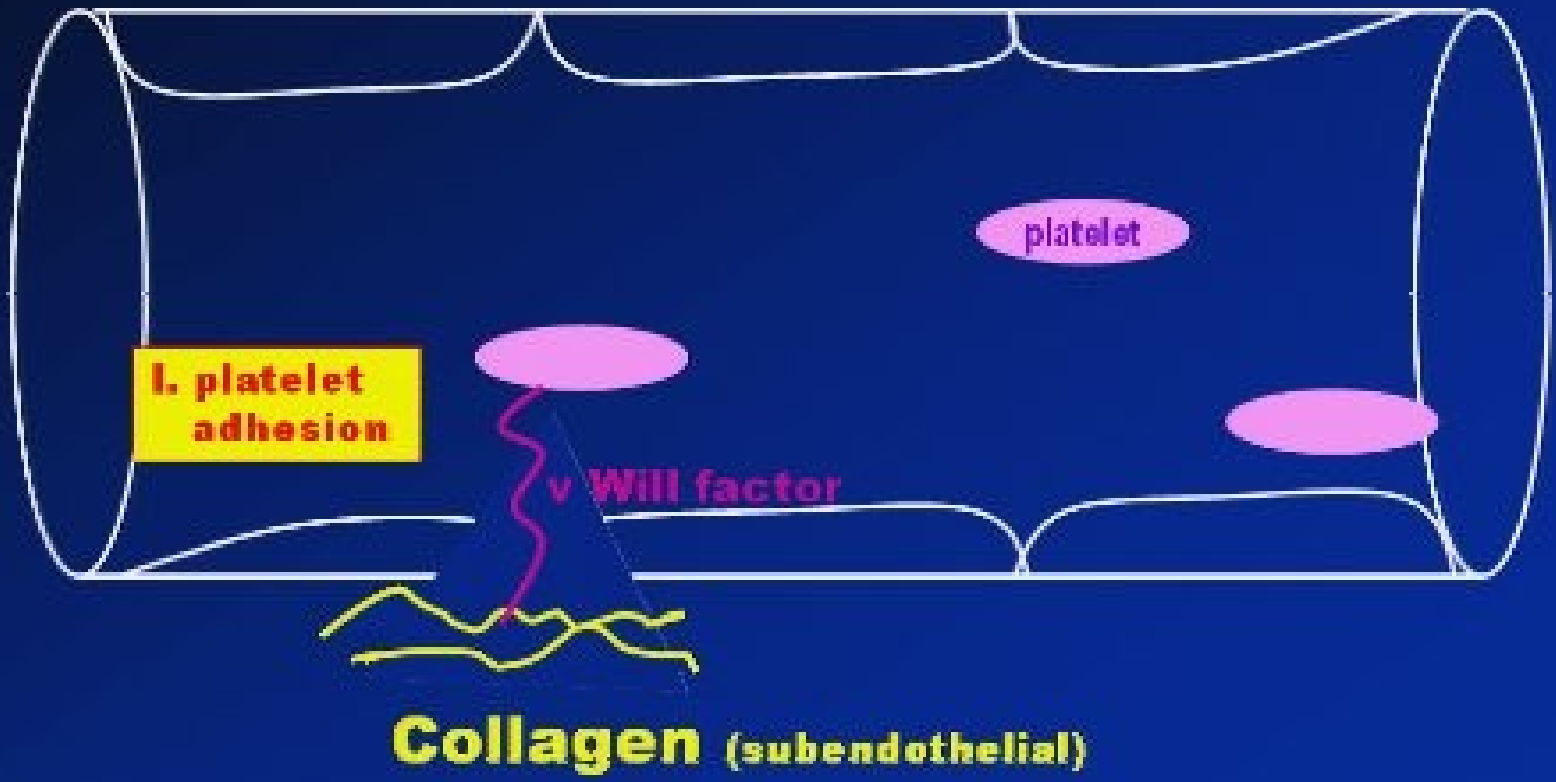
- Thay âäøi hçnh daûng vaì phoïng thêch caïc cháút



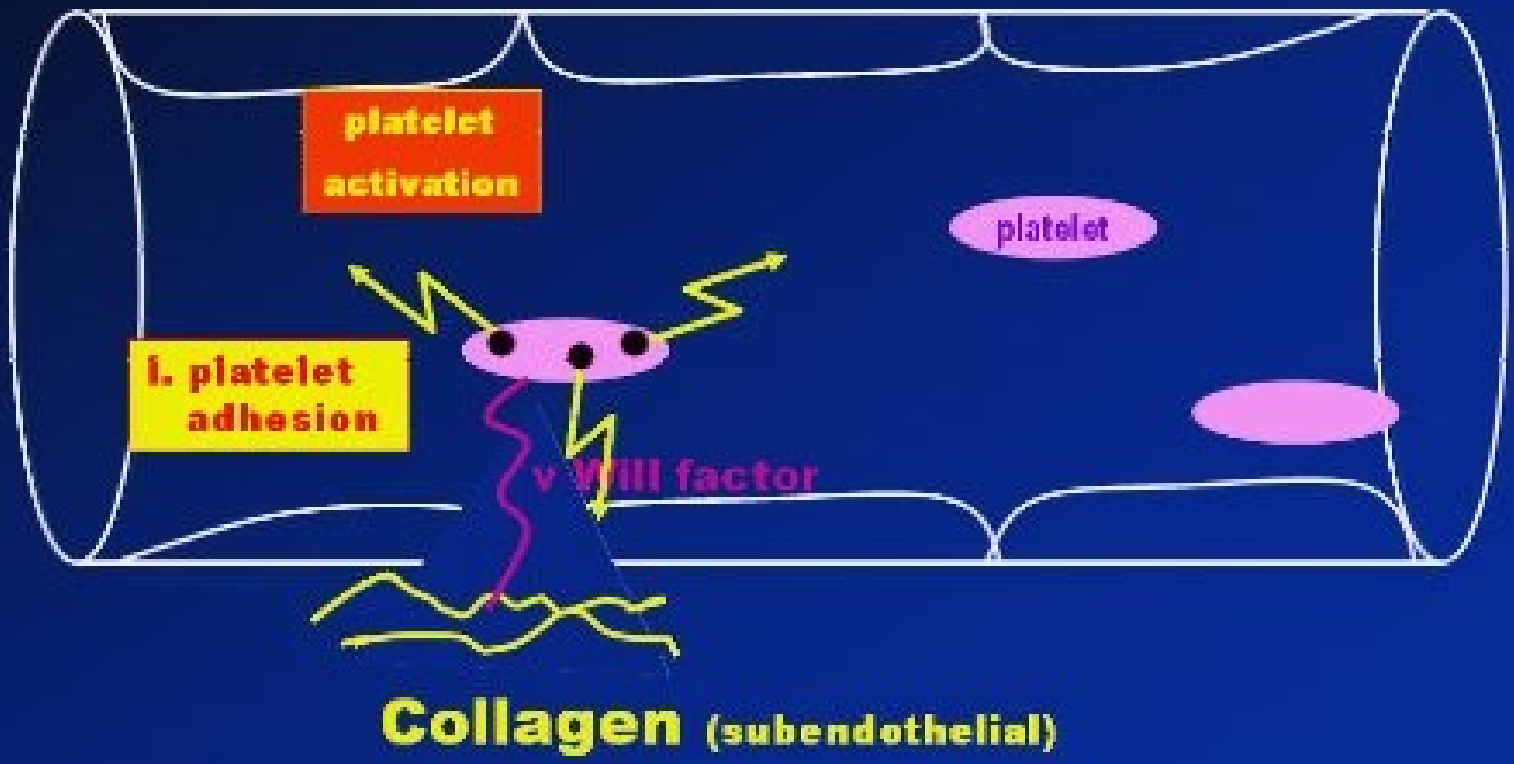
Platelet adhesion / aggregation



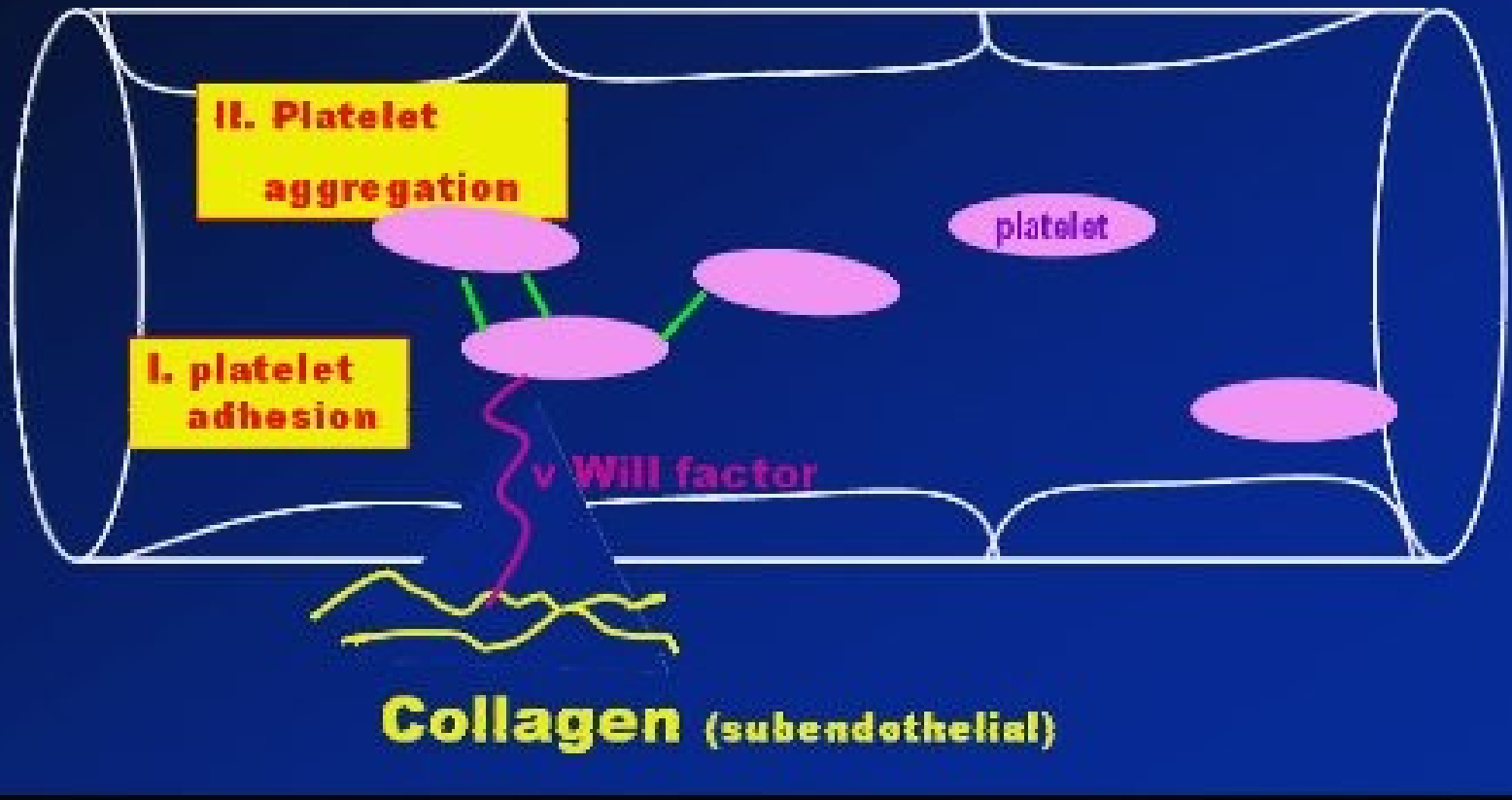
Platelet adhesion / aggregation



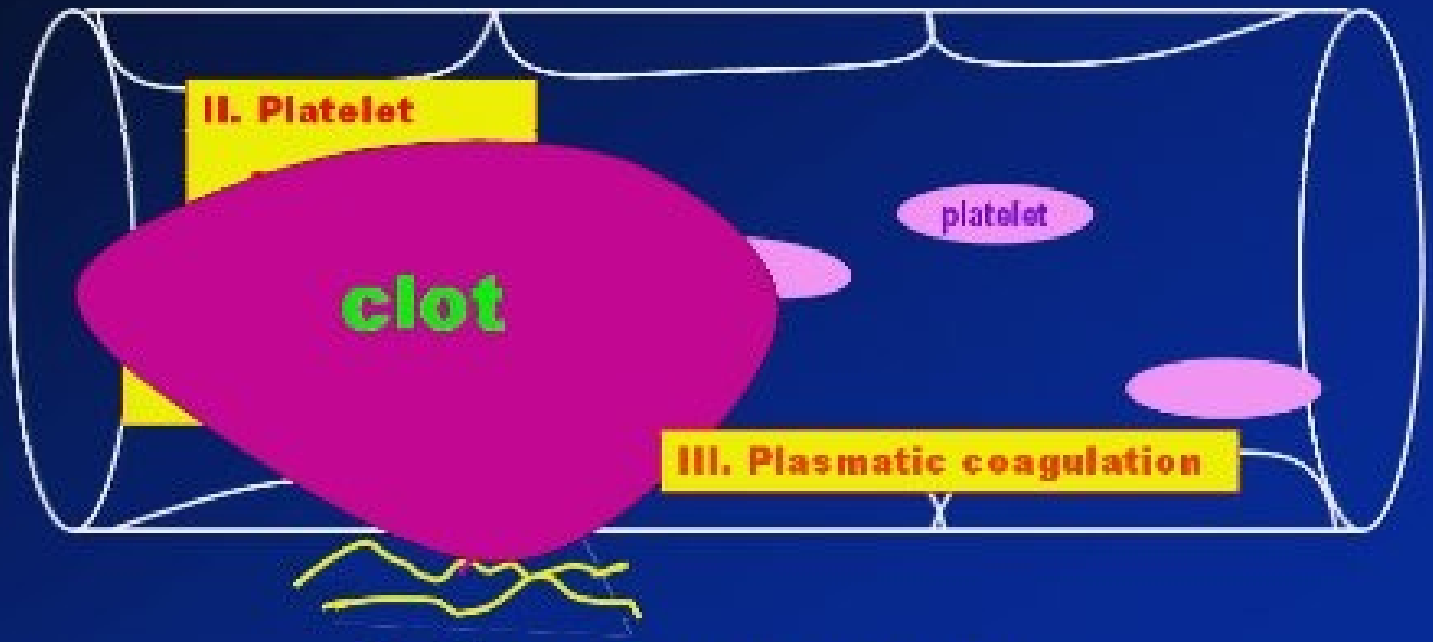
Platelet adhesion / aggregation



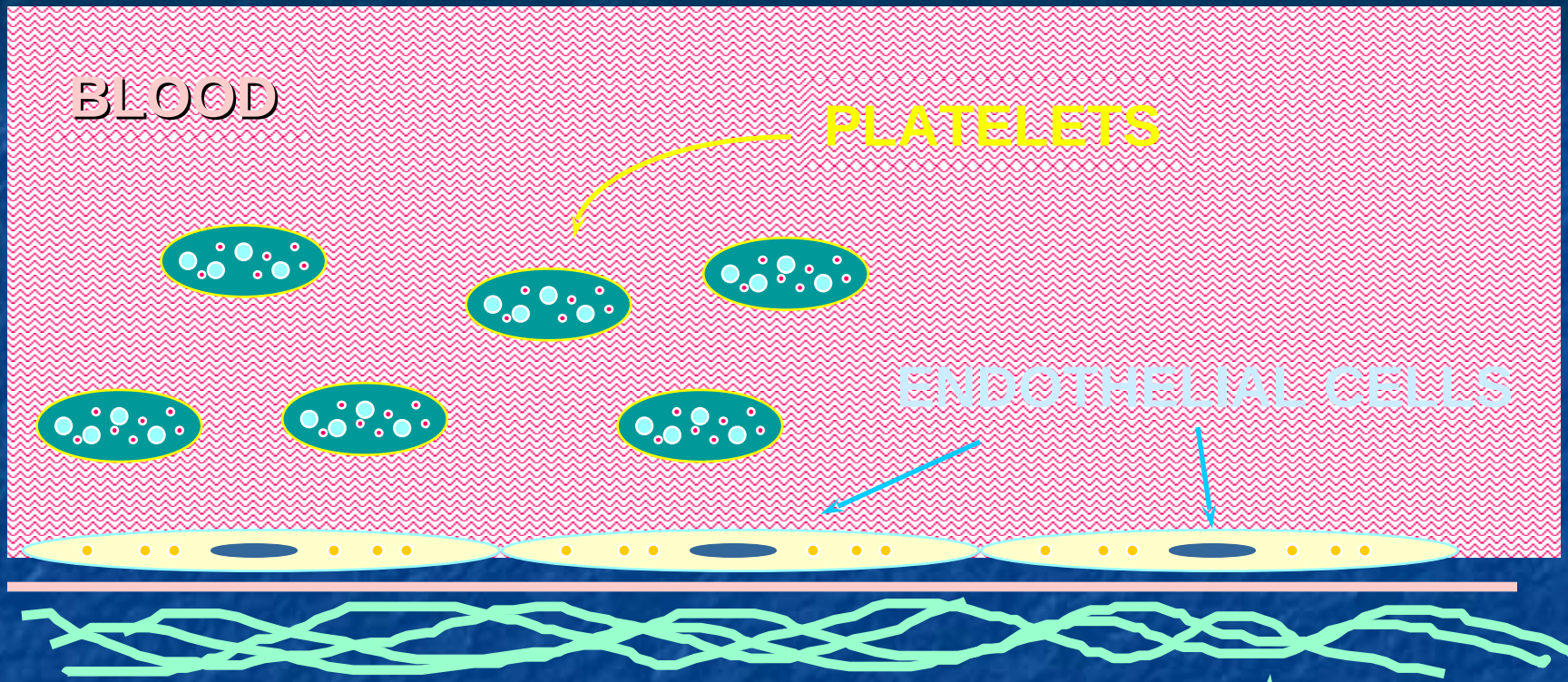
Platelet adhesion / aggregation



Platelet adhesion / aggregation



BLOOD CLOTTING/COAGULATION: Participants



COLLAGEN, CELLS,
ETC, OF VESSEL WALL

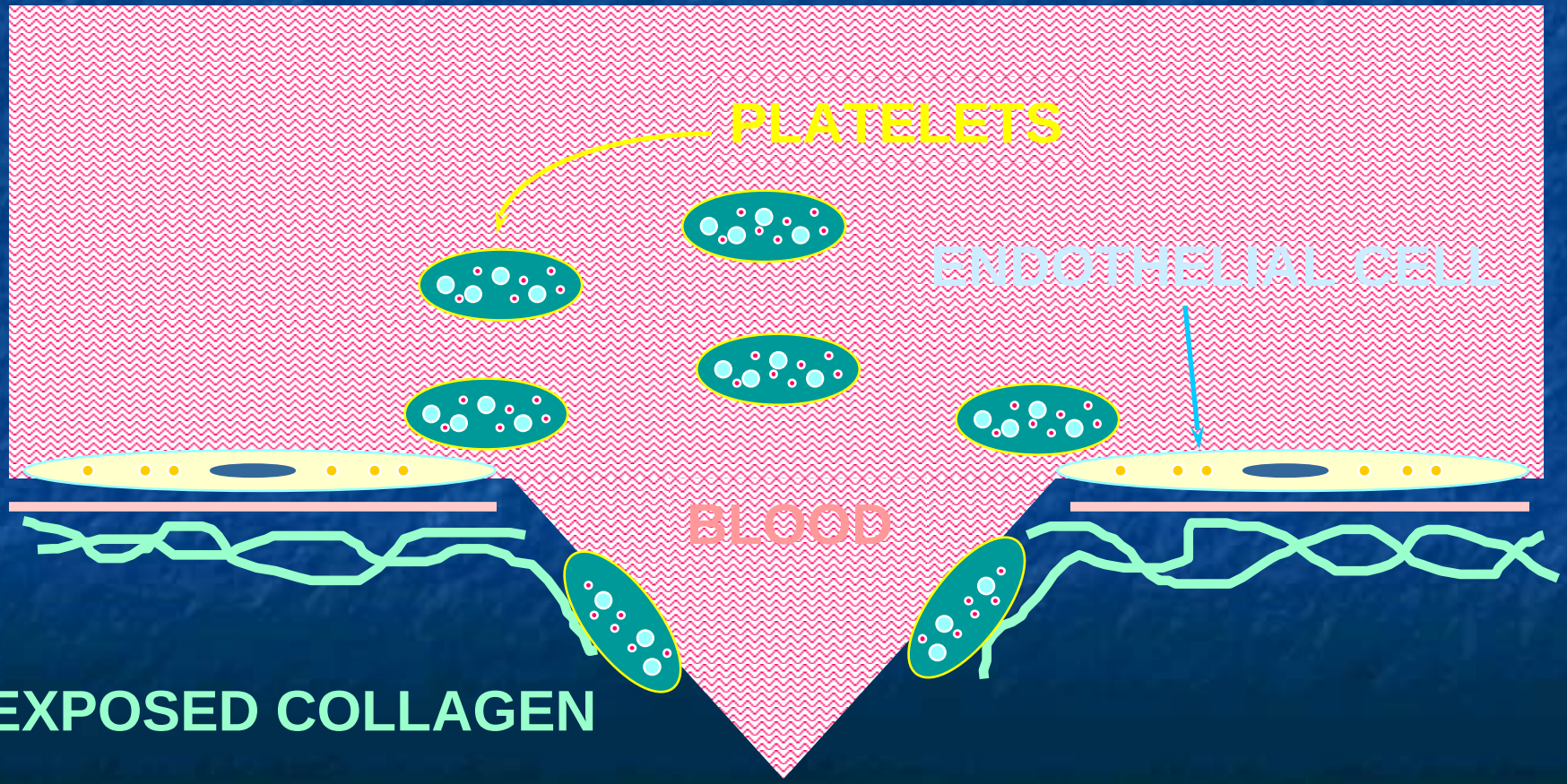
BLOOD CLOTTING/COAGULATION: Problem

Torn wall,

Gaps in endothelium,

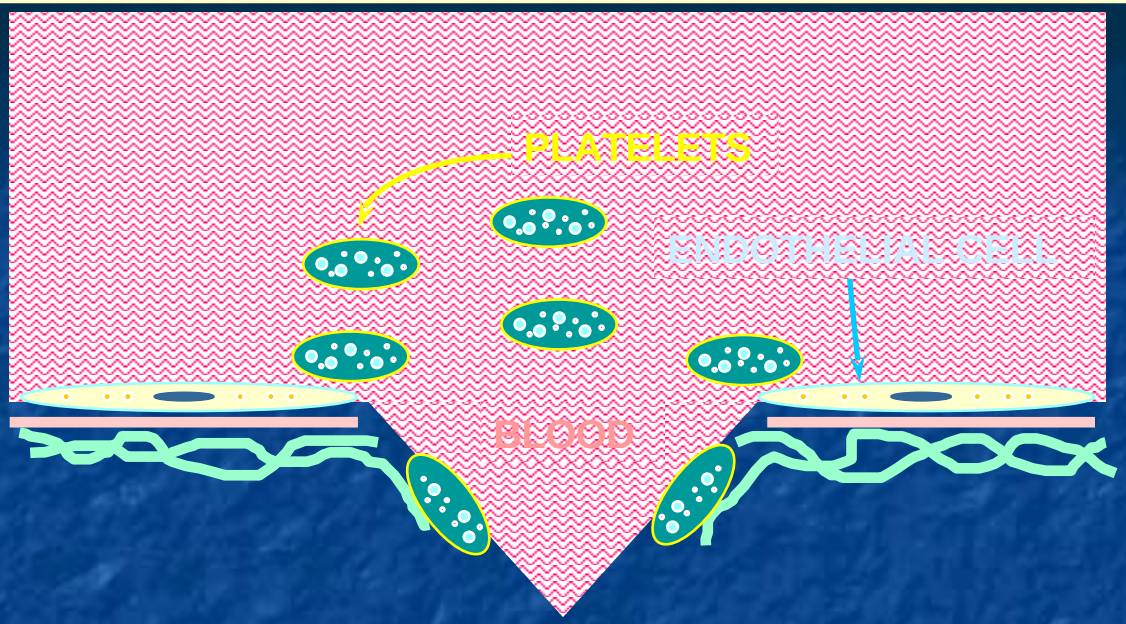
Exposed collagen,

Oozing/gushing blood



BLOOD CLOTTING/COAGULATION: Solutions

EXPOSED

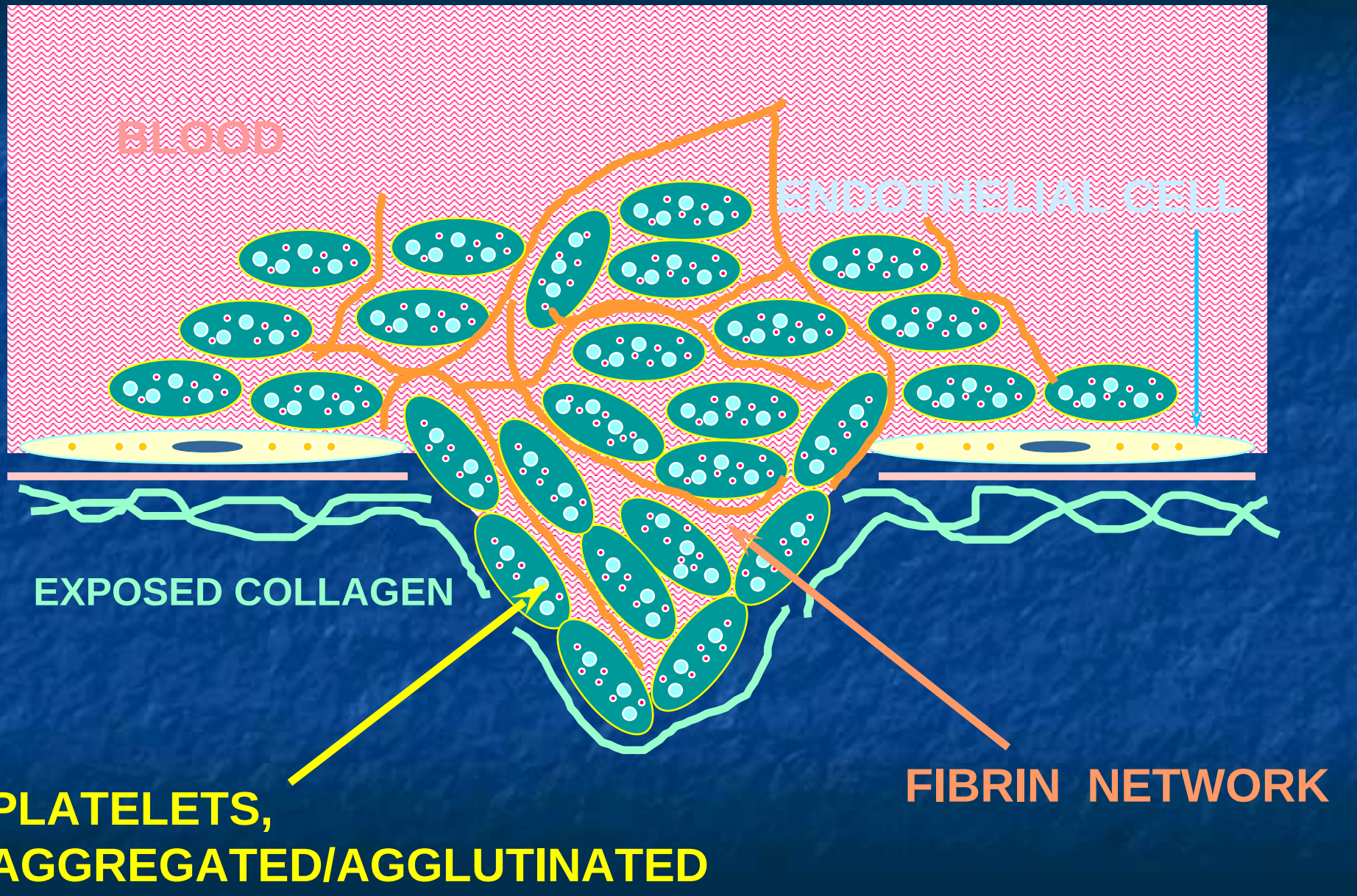


- Elements to stick to the damaged wall
- Elements that stick to each other to make a plug
- Blood material to build a scaffold reinforcing the plug
- Controls (+ & -) to direct & restrain the processes
- Ways to consolidate, then later dissolve the plug

BLOOD CLOTTING/COAGULATION: Solutions

- Elements to stick to the damaged wall — Platelets, Endothelium
- Elements that stick to each other to make a plug — Platelets
- Blood material to build a scaffold reinforcing the plug — Fibrinogen
- Controls (+ & -) to direct & restrain the processes — Clotting factors
- Ways to consolidate, then later dissolve the plug — Transglutaminase; Plasmin

BLOOD CLOTTING/COAGULATION: Clot



How to get platelets to stick & the clot to form

Released factors

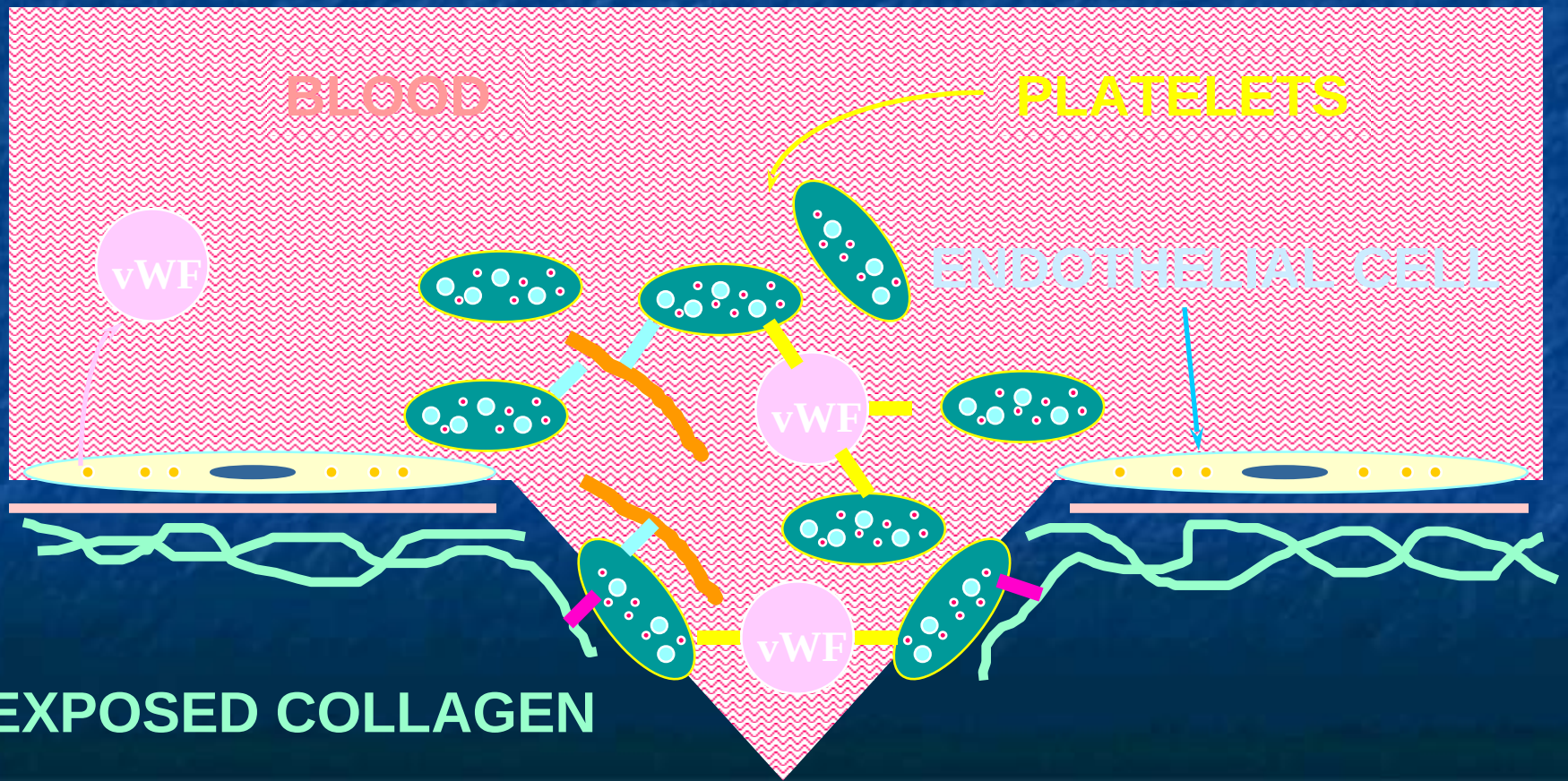
Activation mechanisms

Activated receptors

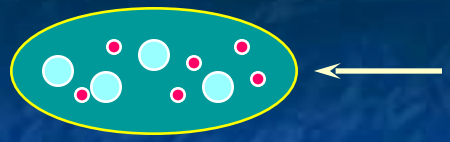
Binding intermediaries

vWF

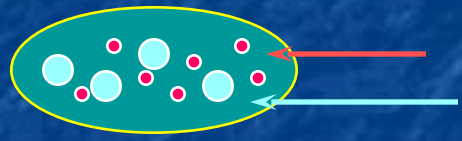
Thrombin



PLATELETS & ENDOTHELIUM

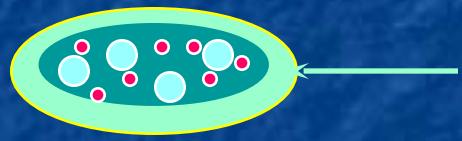


Platelet membrane

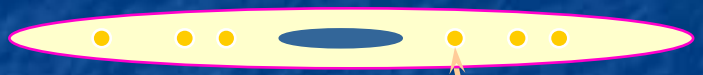


Platelet granules

Platelet granules



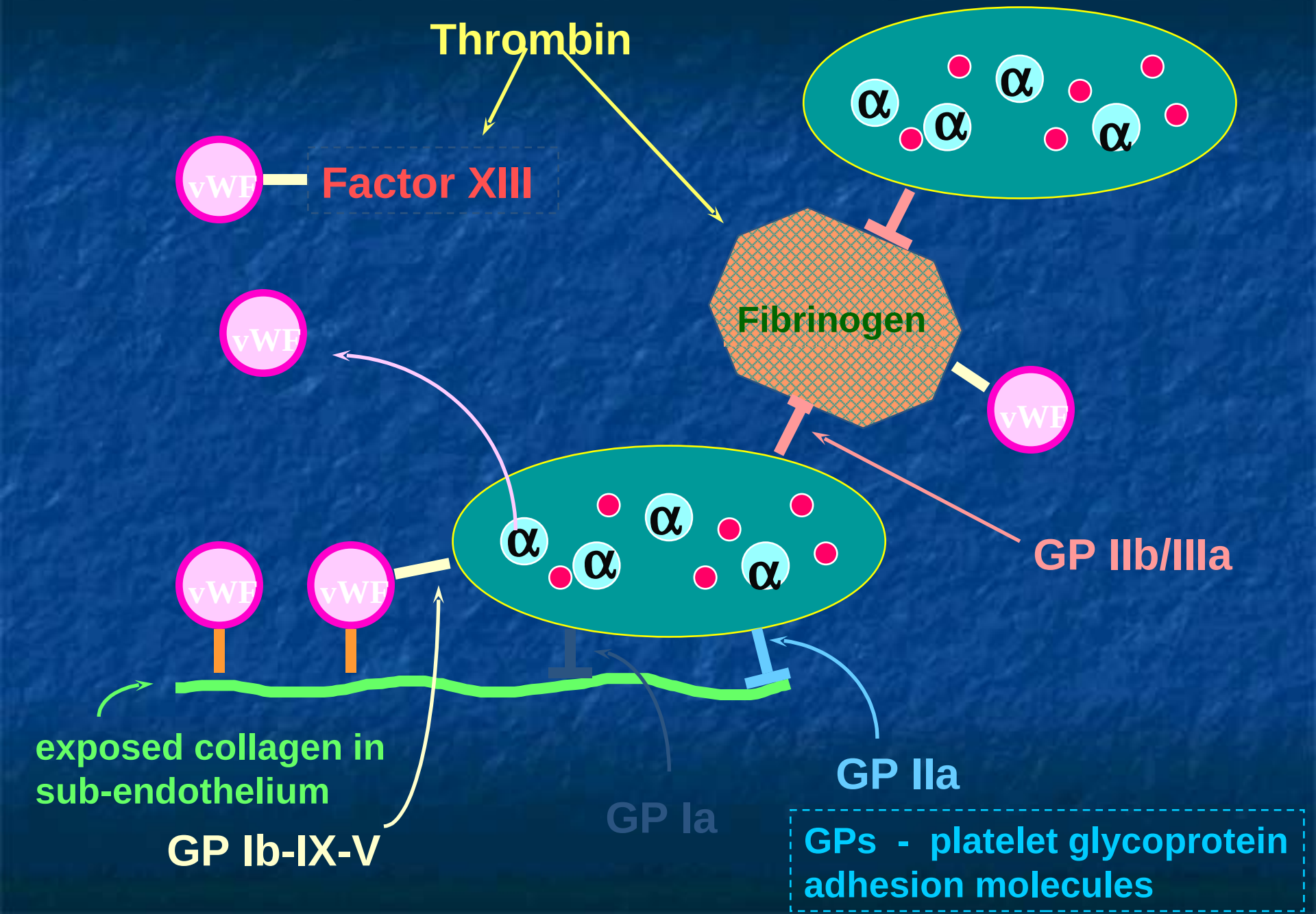
Platelet cytoskeleton



Endothelial membrane

Weibel-Palade granules

STICKINESS & PLATELET ACTIVATION I



STICKINESS & PLATELET ACTIVATION II

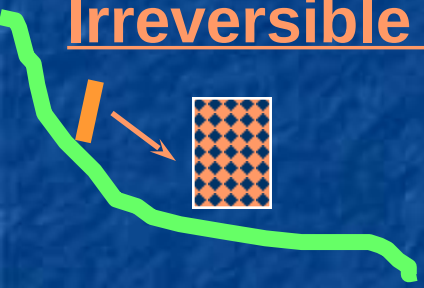
vWF — GP Ib-IX-V Receptor complex

activates

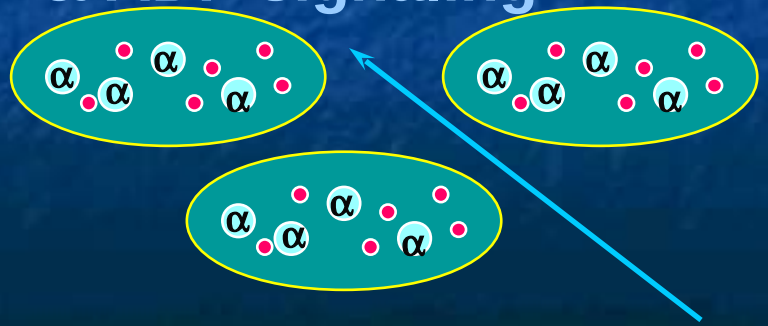
GP IIb/IIIa Receptor complex

vWF release

Irreversible adhesion



Platelet recruitment by vWF & ADP signaling



Platelet spreading

+ Ca^{2+}

Drugs

Platelet drugs

- aspirin
- clopidogrel = Plavix®

  ticlopidine = Ticlid®
- GP IIb/IIIa inhibitors

  - abciximab = ReoPro®
  - tirofiban = Aggrastat®
  - eptifibatide = Integrilin®

1.2. Chæïc nàng TC

- Baío vãû näüi mä

+ Cáön thiãút cho sæû nguyãn veûn cuía thaình maûch

+ Vai troì yãúu täú täng træåíng näüi maûc nguäön gäúc TC (PDECGF: platelet derived endothelial cell growth factor).

- Tham gia vaìo quaï trçnh cáöm maïu

- Tham gia vaìo quaï trçnh âäng maïu

+ quaï trçnh hoaût hoaï ngay taûi maìng tiãøu cáöu âãø chuyãøn yãúu täú XI thaình XIa.

+ phoïng thêch yãúu täú 3 tiãøu cáöu - laì yãúu täú quan troüng âãø taûo thaình phæïc håüp IXa, VIIIa vaì Ca++ trong

2. Maûch maïu

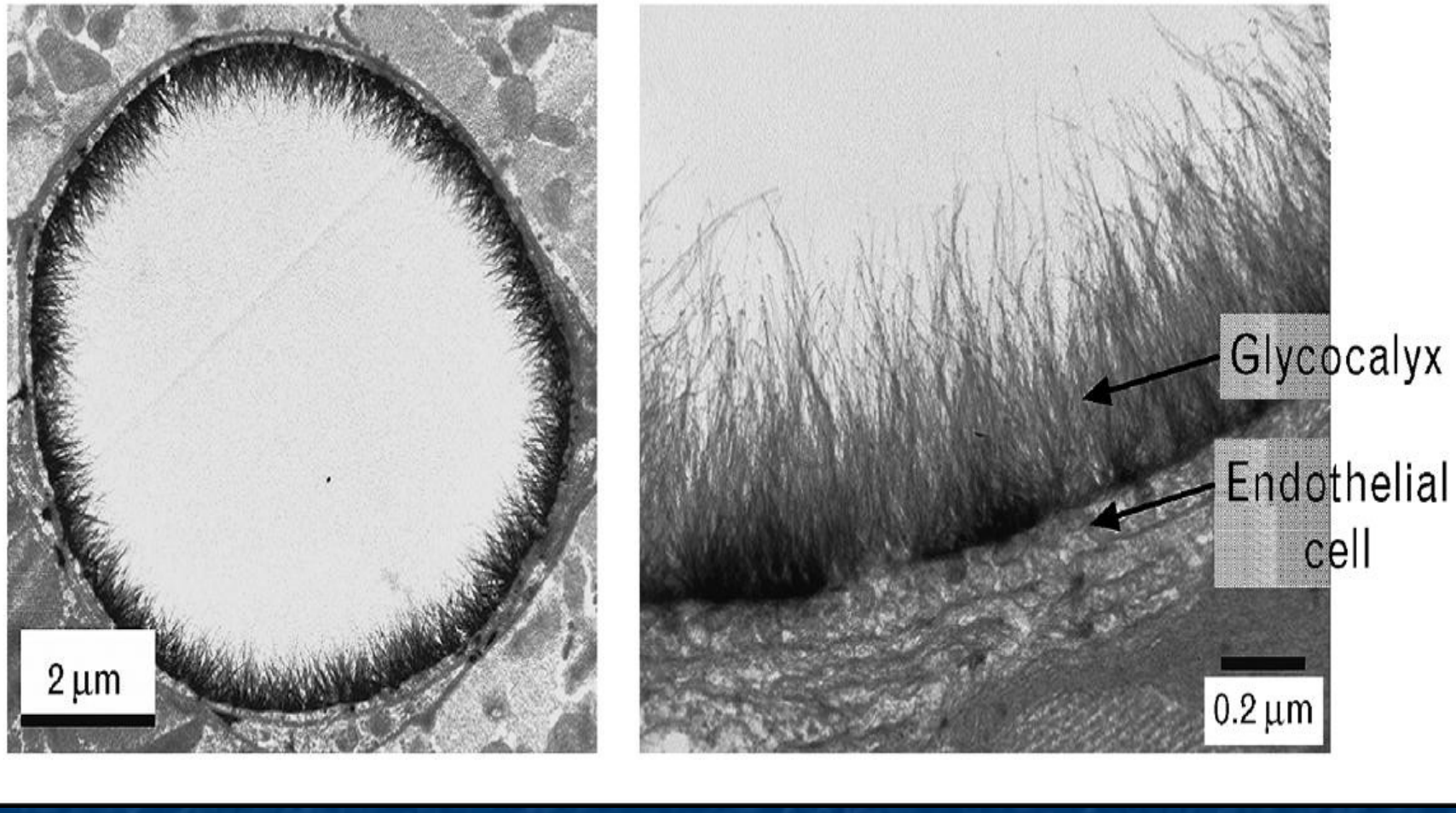
2.1. Sæû co maûch

- Tãú baìo näüi maûc tiãút ra angiotensin II
- Tiãøu cáöu tiãút ra thromboxan A2

2.2. Vai troì cuía caïc tãú baìo näüi maûc

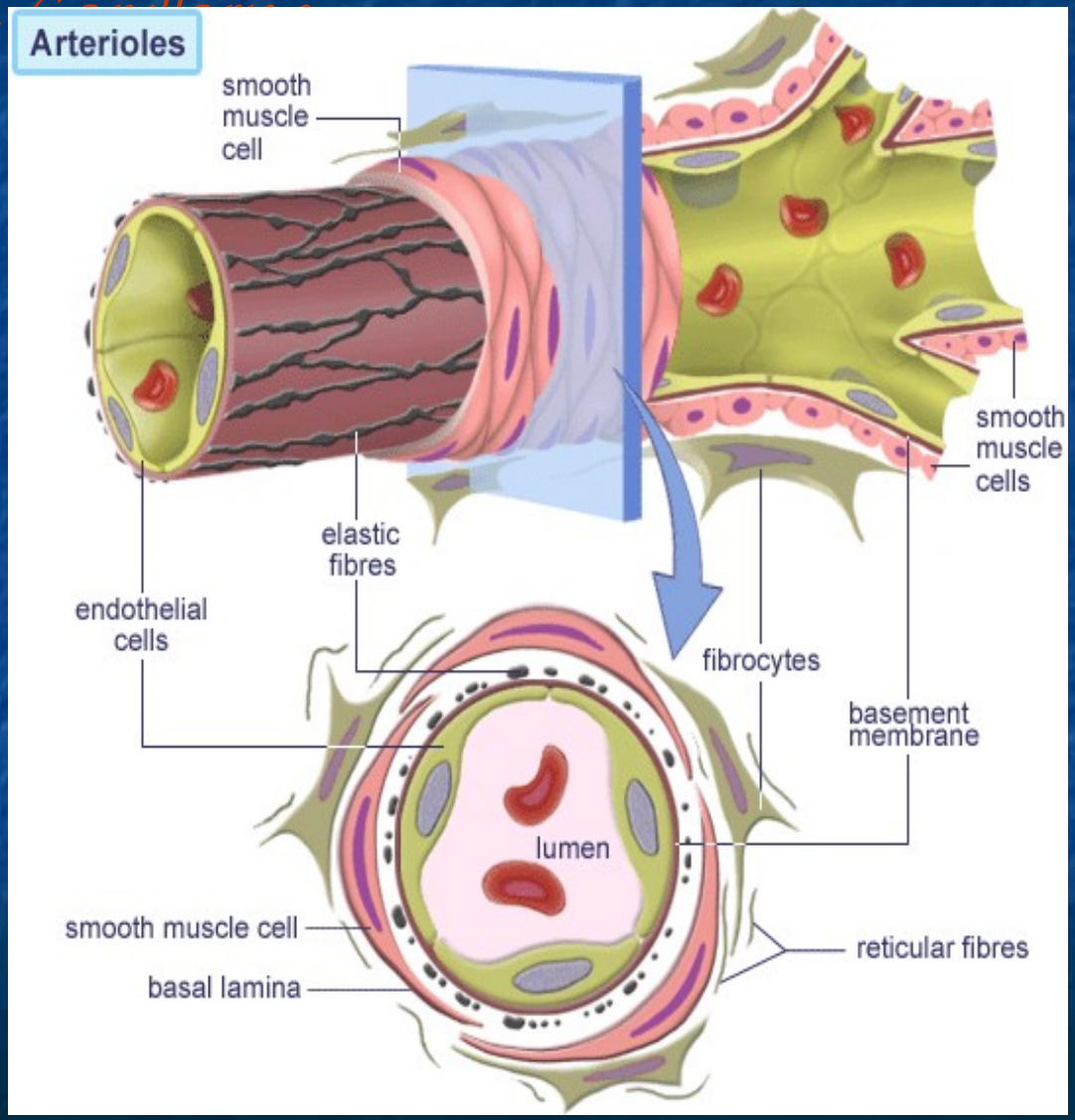
- Låïp glycocalyx, chæïa heparin sulphat vaì caïc cháút glycosaminoglycan
- Maìng lipid keïp chæïa ADPase
- Chuyãøn hoaï vaì báút hoaût peptid hoaût maûch
- Men prostacyclin synthetase
- Thrombomodulin: hoaût hoaï protein C
- Taûo ra yãúu täú hoaût hoaï plasminogen
- Täíng håüp protein S -1 âäöng yãúu täú cuía protein C.
- Täøng håüp yãúu täú von Willebrand

→ Låïp tãú baìo "khäng sinh huyãút khäúi"

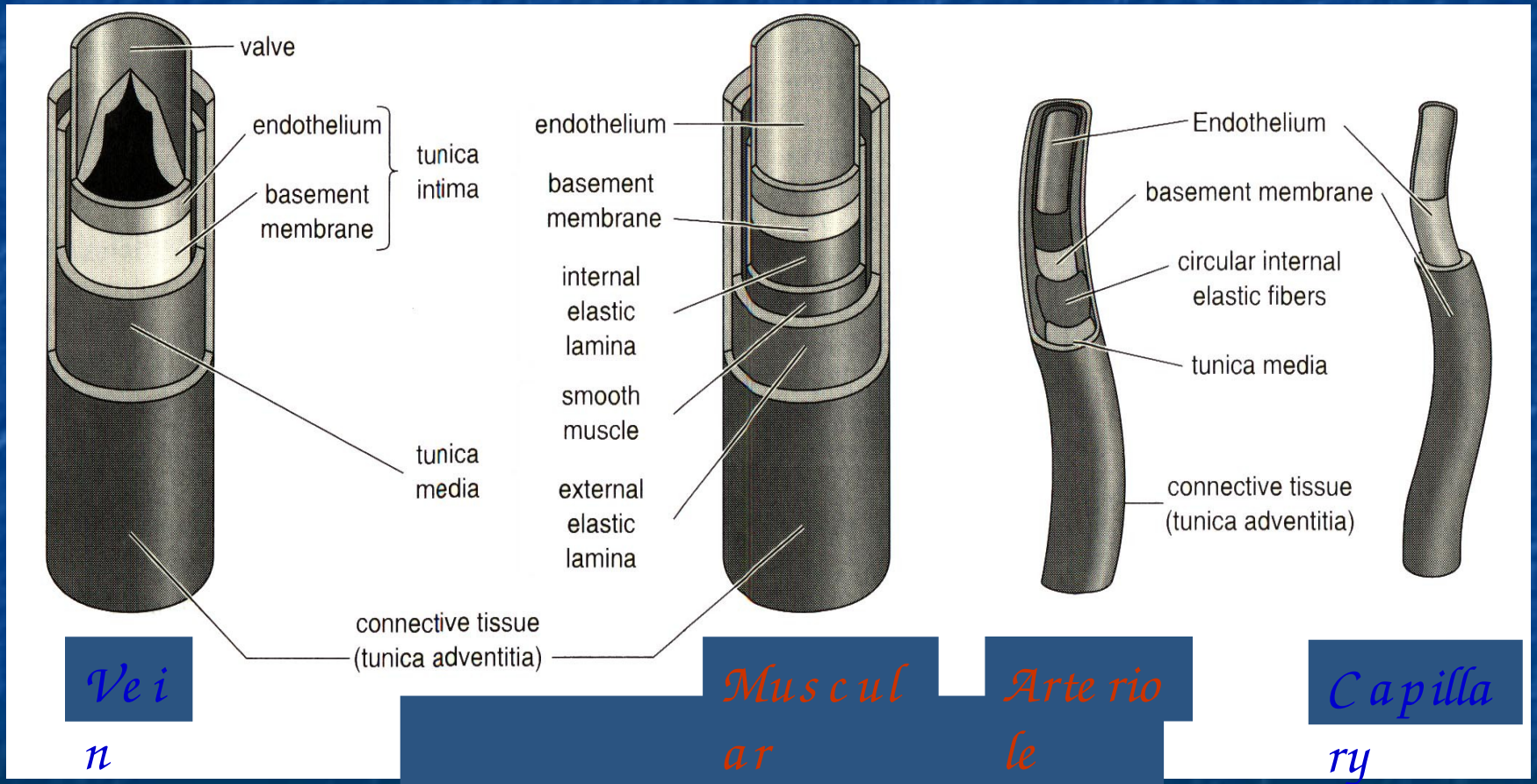


Spaan J. A. E. et al., 2003

Wall Structures of Veins, Arteries, Arterioles and Capillaries



Wall Structures of Veins, Arteries, Arterioles and Capillaries



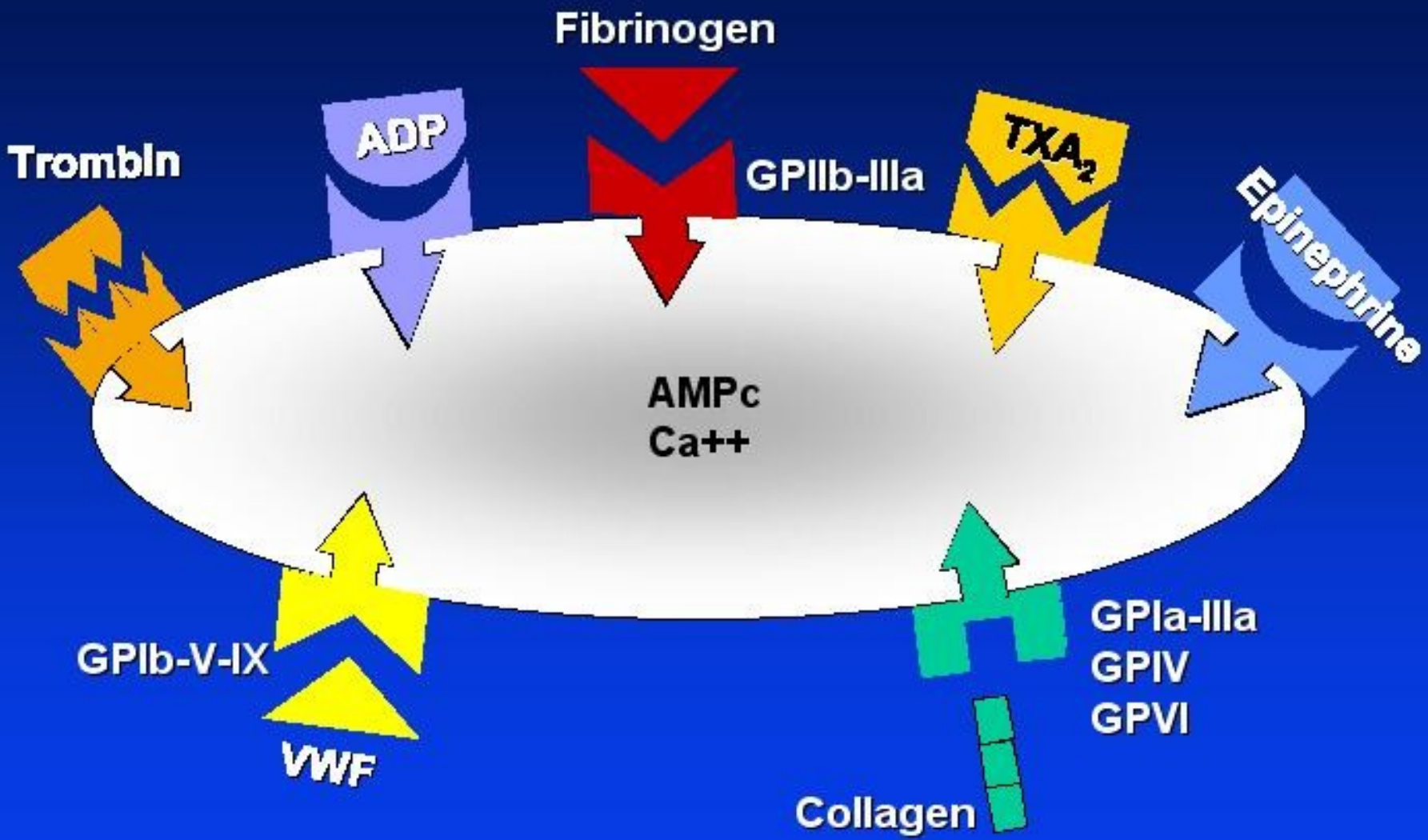
Vein

Muscular artery

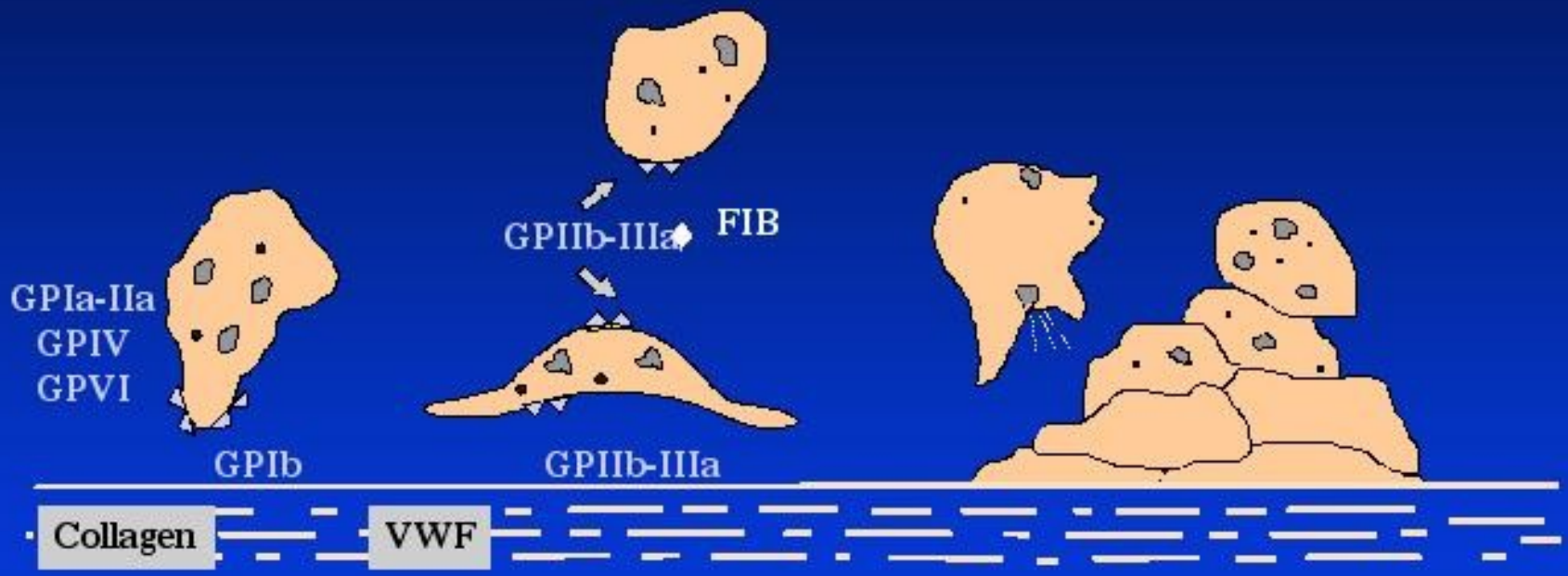
Arteriole

Capillary

MECHANISMS OF PLATELET ACTIVATION



PLATELET FUNCTIONS



CONTACT ADHESION AGGREGATION AND RELEASE

2.3. Vai troì cuía täø chæïc dæåïi näüi maûc

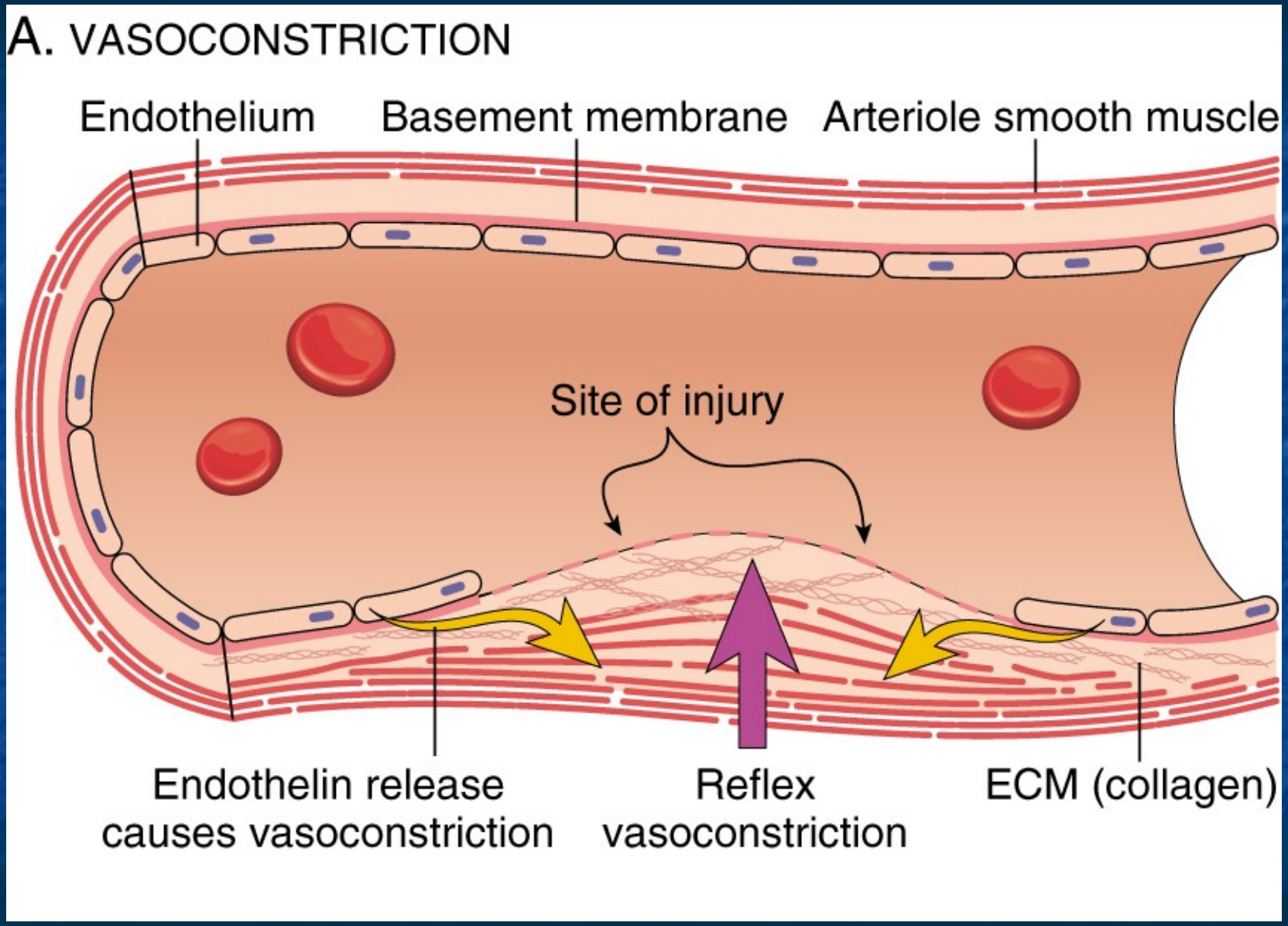
- Thaình pháön: såüi collagen, täø chæïc chun, proteoglycan, maìng nãön, vi såüi, caïc mucopolysacharid, fibronectin...
- Khi thaình maûch bë täøn thæång, låïp dæåïi näüi maûc bë bäüc läü, dáùn âãún hiãûn tæåüng dênh tiãøu cáöu våïi caïc thaình pháön dæåïi näüi maûc, âàûc biãût laì våïi collagen vaì caïc microfibrin qua vai troì trung gian cuía yãúu täú von-Willebrand vaì GPIIb/IIIa...

CAÏC GIAI ÂOAÛN CÁÖM MAÏU

1. Thåìi kyì âáöu tiãn

1.1. Hiãûn tæåüng co maûch

- *X*aíy ra cuûc bäü
- Laìm heûp doìng maïu chaíy ra ngoaìi. Coï yï nghéa trong viãûc hçnh thaình âinh cáöm maïu ban âáöu.


A. VASOCONSTRICTION
Endothelium
Basement membrane
Arteriole smooth muscle
Site of injury
Endothelin release causes vasoconstriction
Reflex vasoconstriction
ECM (collagen)

1.2. Dênh tiãøu cáöu vaìo låïp dæåïi näüi maûc

- Thaình maûch täøn thæång täø chæïc dæåïi näüi maûc bäüc läü TC dênh vaì ngæng táûp.
- Tiãøu cáöu dênh maûnh vaìo collagen do læûc huït ténh âiãûn vaì do yãúu täú v - W.
- Sau âoï TC âæåüc hoaût hoaï, ngæng táûp, thay âäøi hçnh daûng vaì phoïng thêch caïc cháút.

1.3. Hoaût hoaï quaï trçnh âäng maïu

Khi thaình maûch bë täøn thæång, quaï trçnh âäng maïu cuîng láûp tæïc âæåüc khåíi âäüng theo 2 con âæåìng ngoaûi

2. Thåìi kyì måí räüng

2.1. Voìng xoàõn hoaût hoaï tiãøu cáöu

2.2. Caïc cháút gáy ngæng táûp tiãøu cáöu

- Thromboxan A2
- ADP :ngæng táûp tiãøu cáöu do caïc cå chãú :

+ Cuìng Ca++ vaì yãúu täú v-W taûo thaình cáöu näúi dênh caïc tiãøu cáöu våïi nhau.
+ ÆÏc chãú sæû thoaïi hoaï cuía ATP.
+ Hoaût hoaï phospholipase

- Thrombin

Caïc yãúu täú khaïc: serotonin, adrenalin, fibrinogen... cuîng coï taïc duûng træûc tiãúp hoàûc giaïn tiãúp hoaût hoaï tiãøu

3. Thåìi kyì hoaìn thiãûn

3.1. Hoaìn chènh nuït cáöm maïu

3.2. Caïc YT tham gia h/tæåüng co cuûc maïu

- Tiãøu cáöu: säú læåüng vaì chæïc nàng.

+ Thrombospondin gàõn vàïi GP IV

+ v - W vaì fibronectin gàõn vaìo GP IIb/IIIa

+ Thrombostenin laìm co âinh cáöm maïu

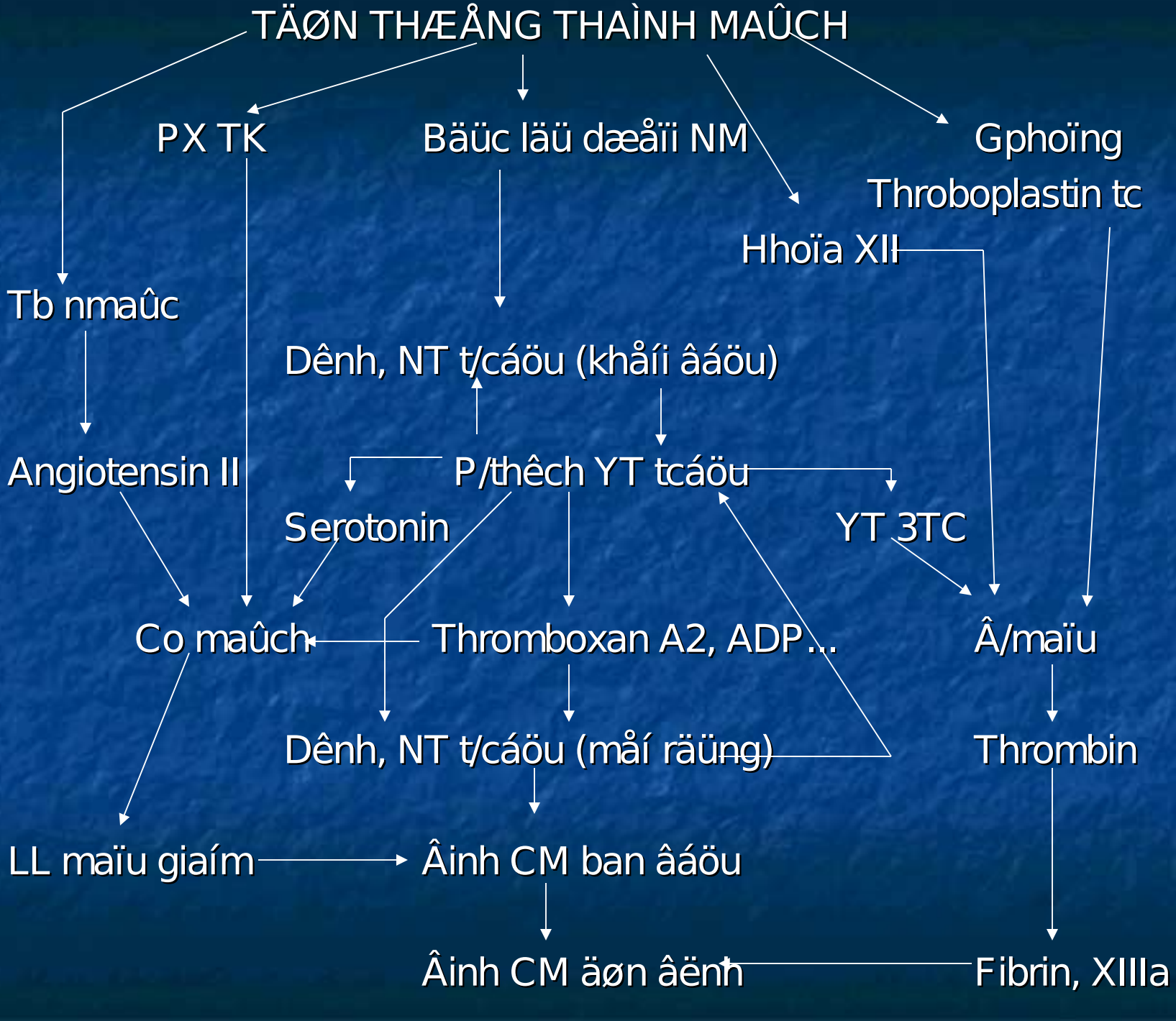
+ ATP chuyãøn thaình ADP

- Huyãút tæång

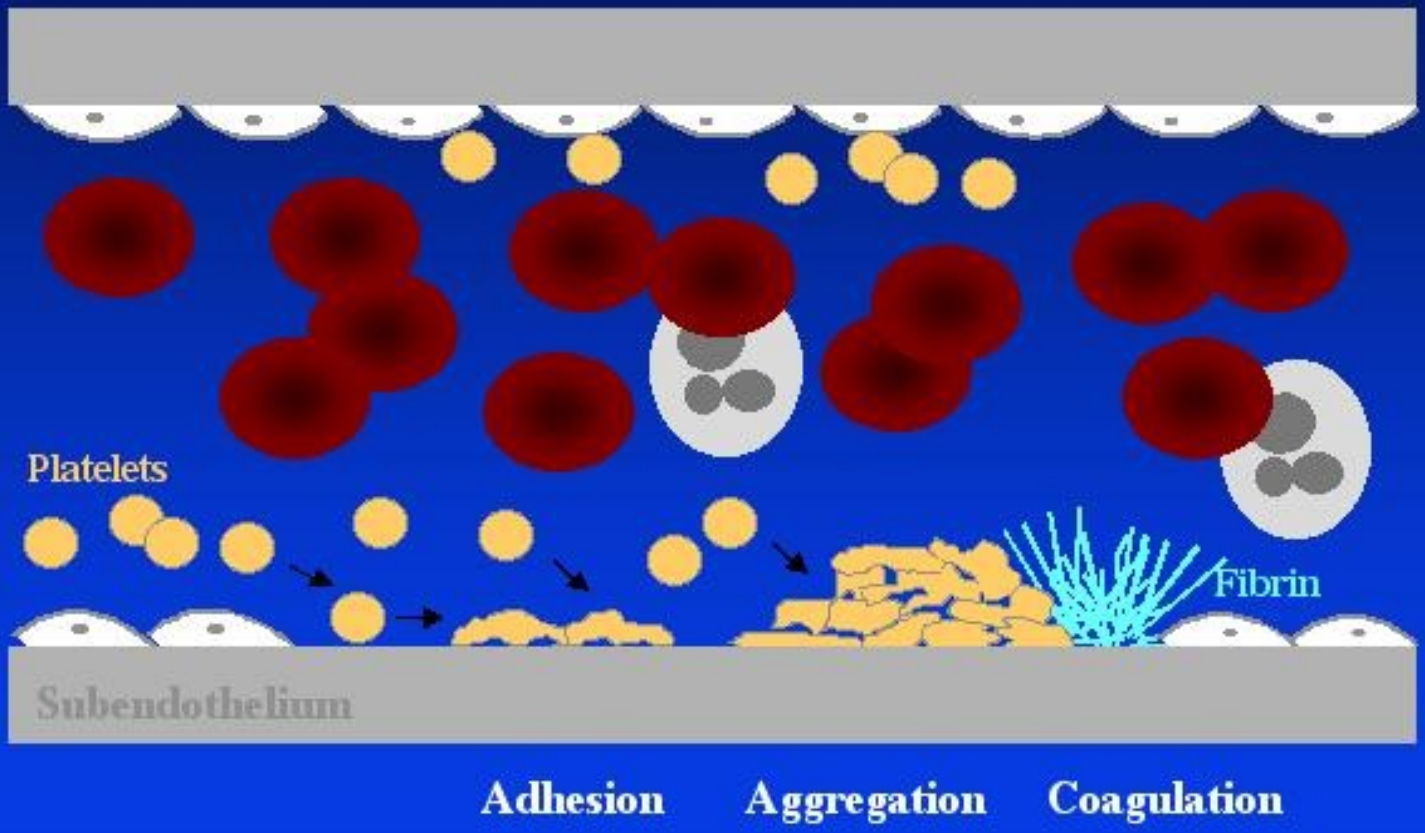
+ Fibrin laì maûng læåïi bao boüc tiãøu cáöu.

+ C/ cáúp XIII, Ca++, glucose, ATP, ADP...

Kãút quaí : hçnh thaình mäüt âinh cáöm


TÄØN THÆÅNG THAÌNH MAÛCH
PX TK
Bäüc läü dæåïi NM
Gphoïng
Throboplastin tc
Hhoïa XII
Tb nmaûc
Dênh, NT t/cáöu (khåíi âáöu)
Angiotensin II
P/thêch YT tcáöu
Serotonin
YT 3TC
Co maûch
Thromboxan A2, ADP...
Â/maïu
Dênh, NT t/cáöu (måí räüng)
Thrombin
LL maïu giaím
Âinh CM ban âáöu
Âinh CM äøn âënh
Fibrin, XIIIa

PLATELETS AND PRIMARY HEMOSTASIS



ÂIÃÖU HOAÌ QUAÏ TRÇNH CÁÖM MAÏU

1. Vai troì cuía huyãút tæ ång

ADP adenylat kinase AMP phosphatase Adenosin

2. Vai troì cuía thaình maûch

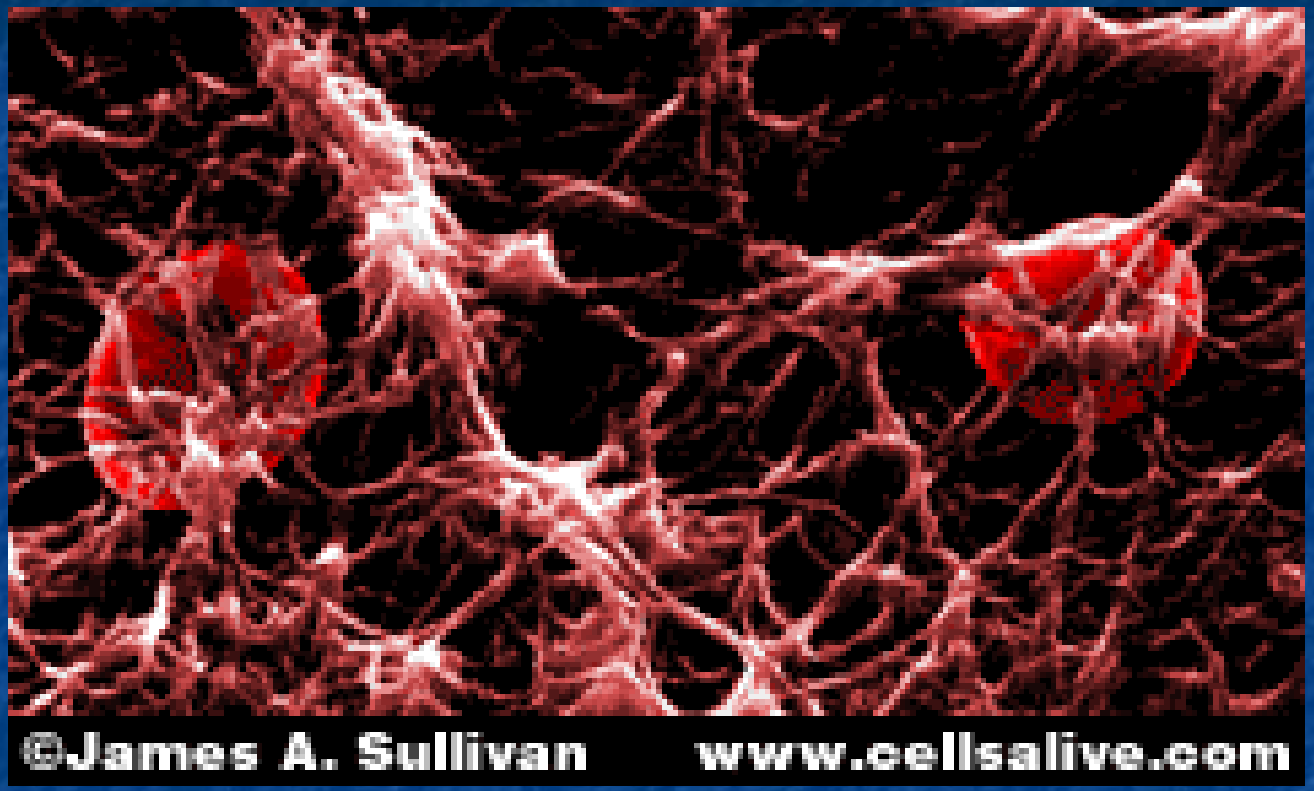
- Tãú baìo näüi maûc: prostacyclin synthetase
- Caïc men ATP ase, ADP ase, 5-dinucleotid

3. Vai troì cuía caïc tãú baìo maïu

- Phospholipid maìng
- Säú læåüng tãú baìo maïu

4. Vai troì cuía quaï trçnh tiãu fibrin

Saín pháøm thoaïi giaïng fibrinogen vaì fibrin



This scanning electron micrograph shows the fine structure of a blood clot. Platelets released from the circulation and exposed to the air use fibrinogen from the blood plasma to spin a mesh of fibrin.