Inland Empire Periodontal Study Club

May 2009

How to avoid becoming British

Or in other words…

How the body avoids
“Bloody hell!!”

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- A review of the physiology of platelet aggregation, blood coagulation, and clot formation
- Dental management of patients receiving anticoagulation or antiplatelet treatment

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- Hemostasis- the prevention of blood loss
  - Internal pressure and constriction
  - Formation of a platelet plug
  - Blood coagulation : clot formation

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- Internal pressure and constriction
  - Immediate constriction of smooth muscle
    - Slows local blood flow
    - Presses the opposed endothelial surfaces of the vessel together, inducing a stickiness capable of keeping them “glued” together
    - Short lived in all but the smallest vessels

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- Formation of the Platelet plug
  - Injury of a vessel allows platelet contact with the underlying connective tissue collagen
  - Von Willebrand factor (a circulating plasma protein) then acts as a bridge between collagen and platelets
  - Adhesion of platelets to collagen trigger the release of the platelet secretory vesicles

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- Formation of the Platelet plug
  - These vessicles contain agents including Adenosine diphosphate and serotonin that induce new platelets to stick to old ones which rapidly creates a platelet plug.
  - Clopidogrel bisulfate (Plavix) is an inhibitor of ADP-induced platelet aggregation acting by direct inhibition of adenosine diphosphate (ADP) binding to its receptor and of the subsequent ADP-mediated activation of the glycoprotein GPIIb/IIIa complex.

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- Formation of the Platelet plug
  - Platelet adhesion also induces the synthesis of Thromboxane A2 from arachidonic acid in the platelet plasma membrane. This is released into the extracellular fluid to further stimulate platelet aggregation and release of secretory vessicles.
  - Platelets contain a high concentration of actin and myosin, which are stimulated to contract in aggregated platelets. This results in the compression and strengthening of the platelet plug.

Forms a compact, strong platelet plug

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Blood coagulation : Clot formation

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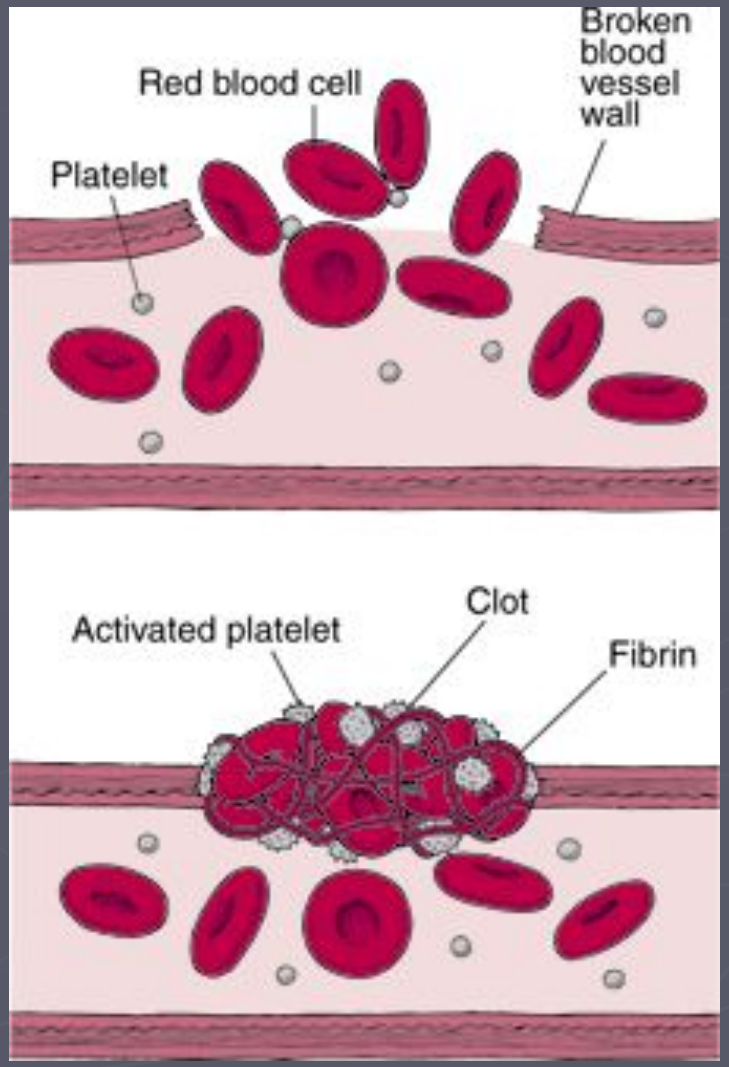
- Classical View
- Intrinsic and Extrinsic pathways.
- Intrinsic- initiated by damage, or alteration, to blood independent of contact with damaged tissue
- Extrinsic- initiated by exposure to factors derived from damaged tissue.



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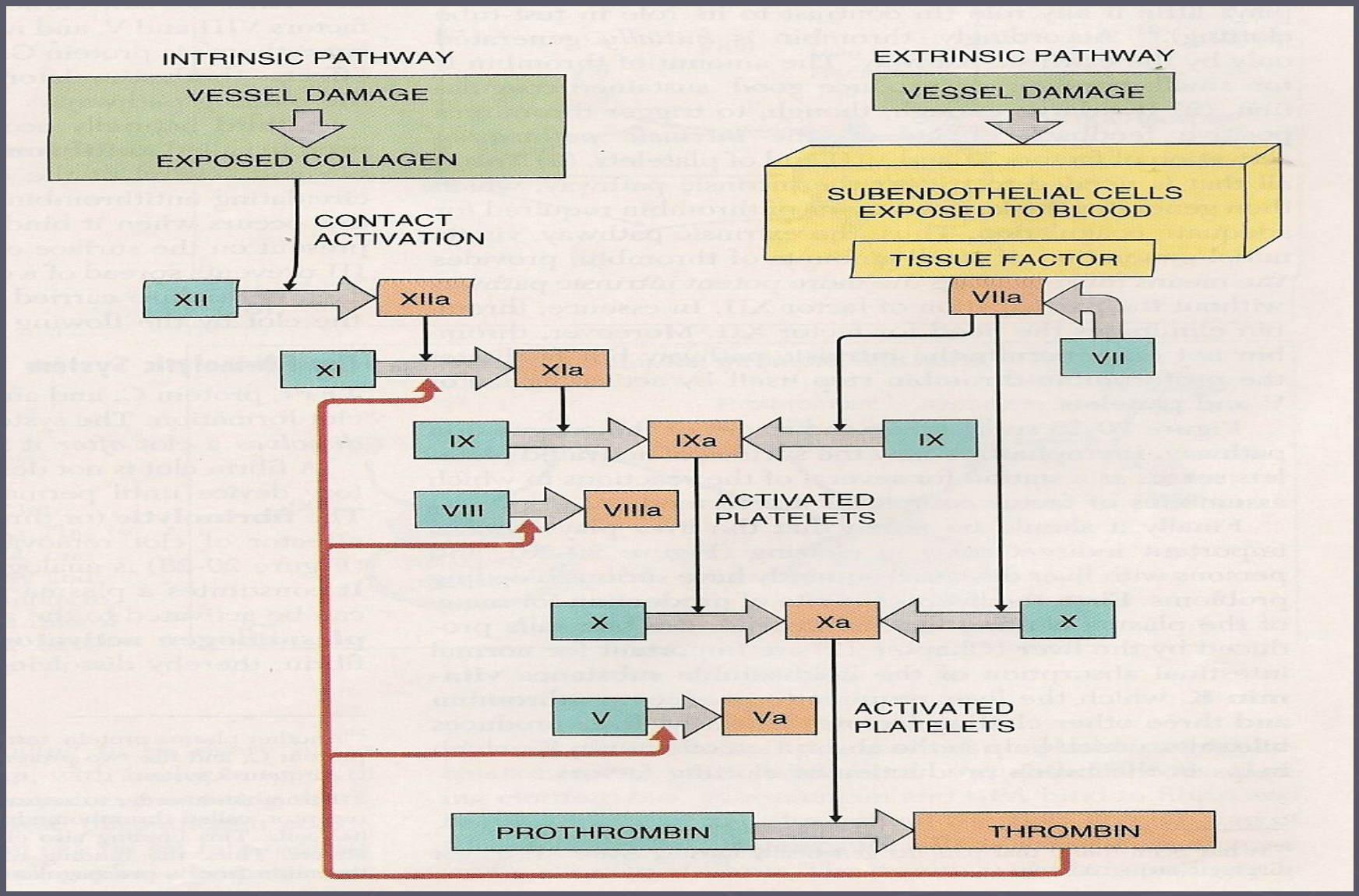
INTRINSIC PATHWAY
VESSEL DAMAGE
EXPOSED COLLAGEN
CONTACT ACTIVATION
XII
XIIa
XI
XIa
IX
IXa
IX
VIII
VIIIa
ACTIVATED PLATELETS
X
Xa
X
V
Va
ACTIVATED PLATELETS
PROTHROMBIN
THROMBIN
EXTRINSIC PATHWAY
VESSEL DAMAGE
SUBENDOTHELIAL CELLS EXPOSED TO BLOOD
TISSUE FACTOR
VIIa
VII

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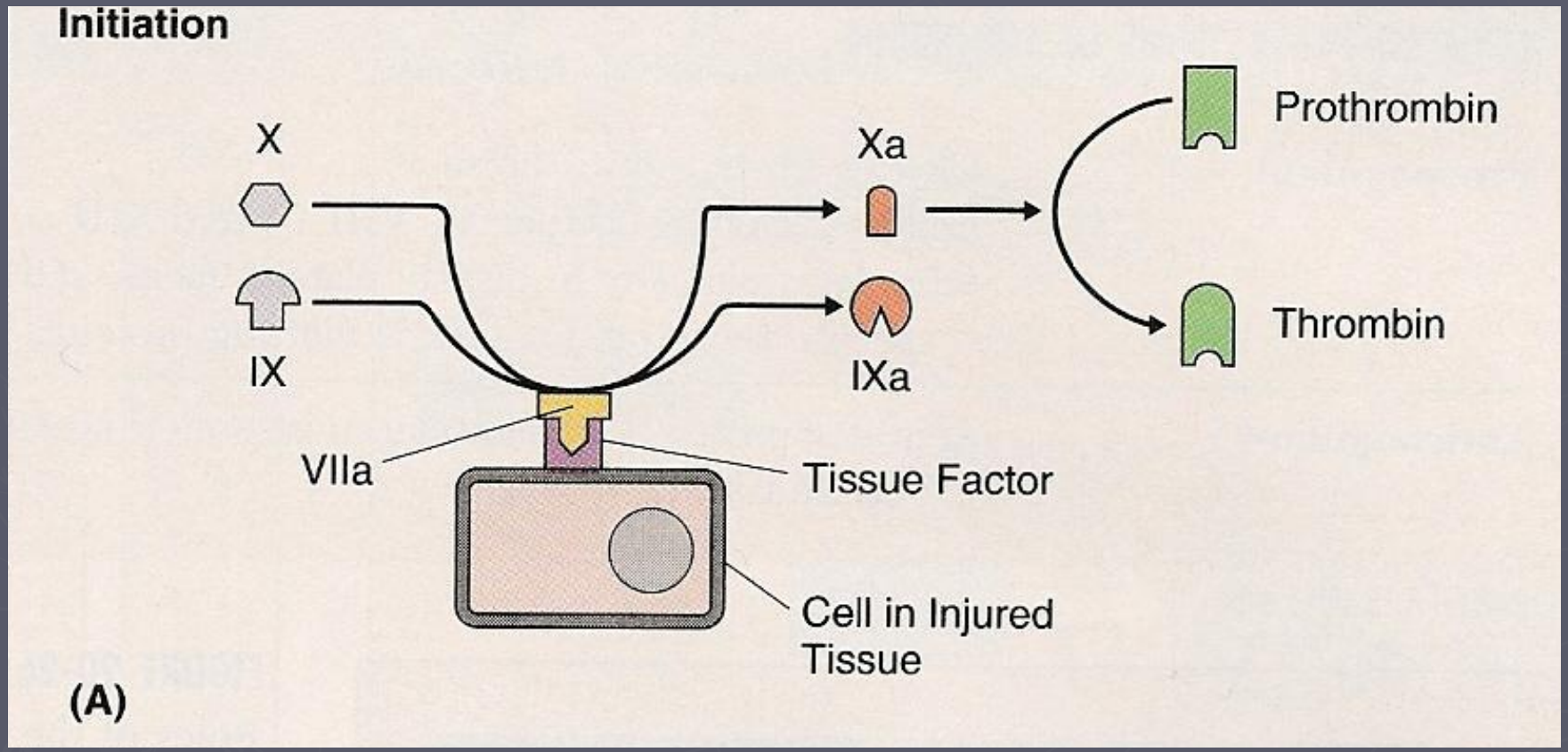
Initiation
X
IX
Xa
IXa
Prothrombin
Thrombin
VIIa
Tissue Factor
Cell in Injured Tissue
(A)

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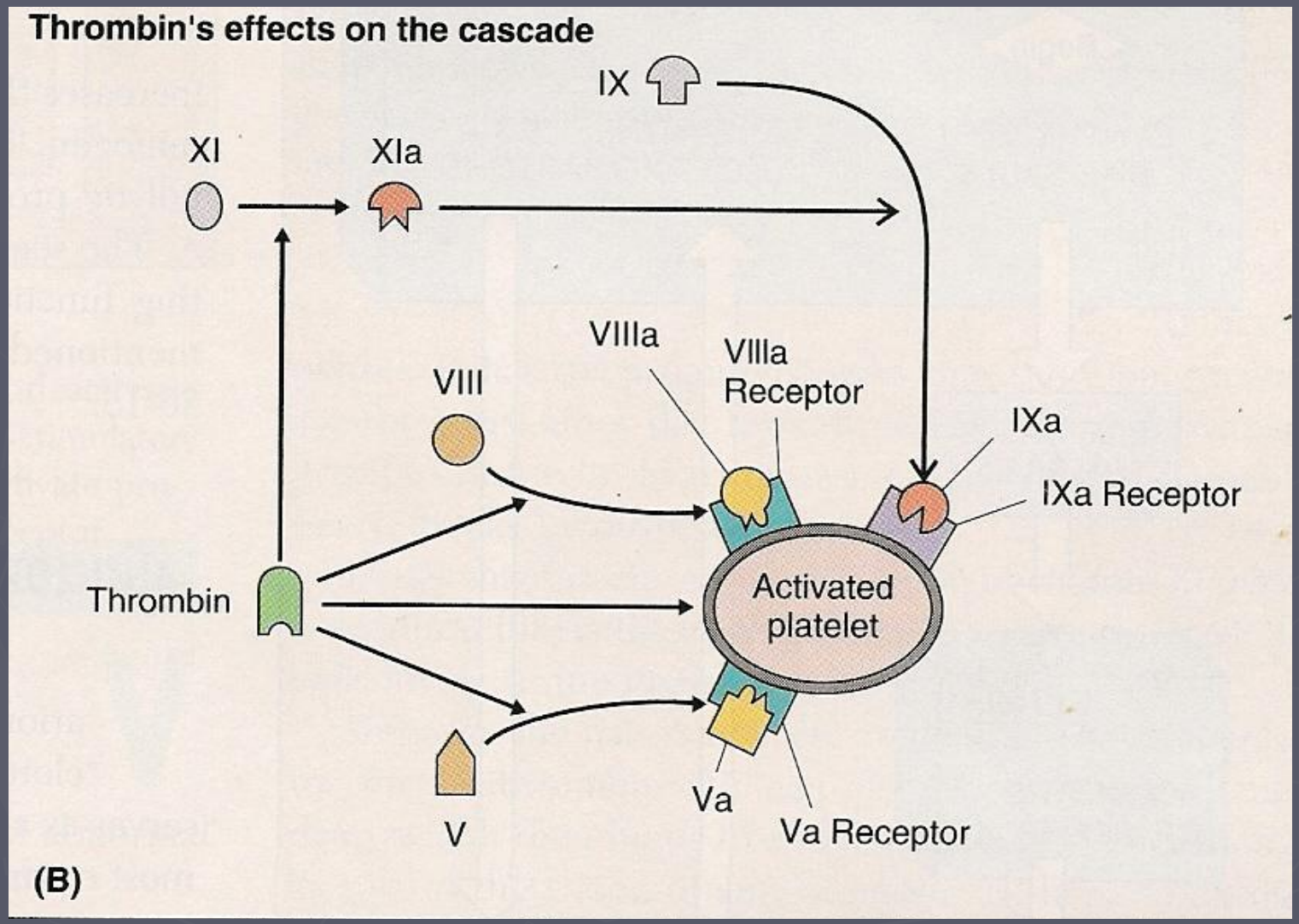
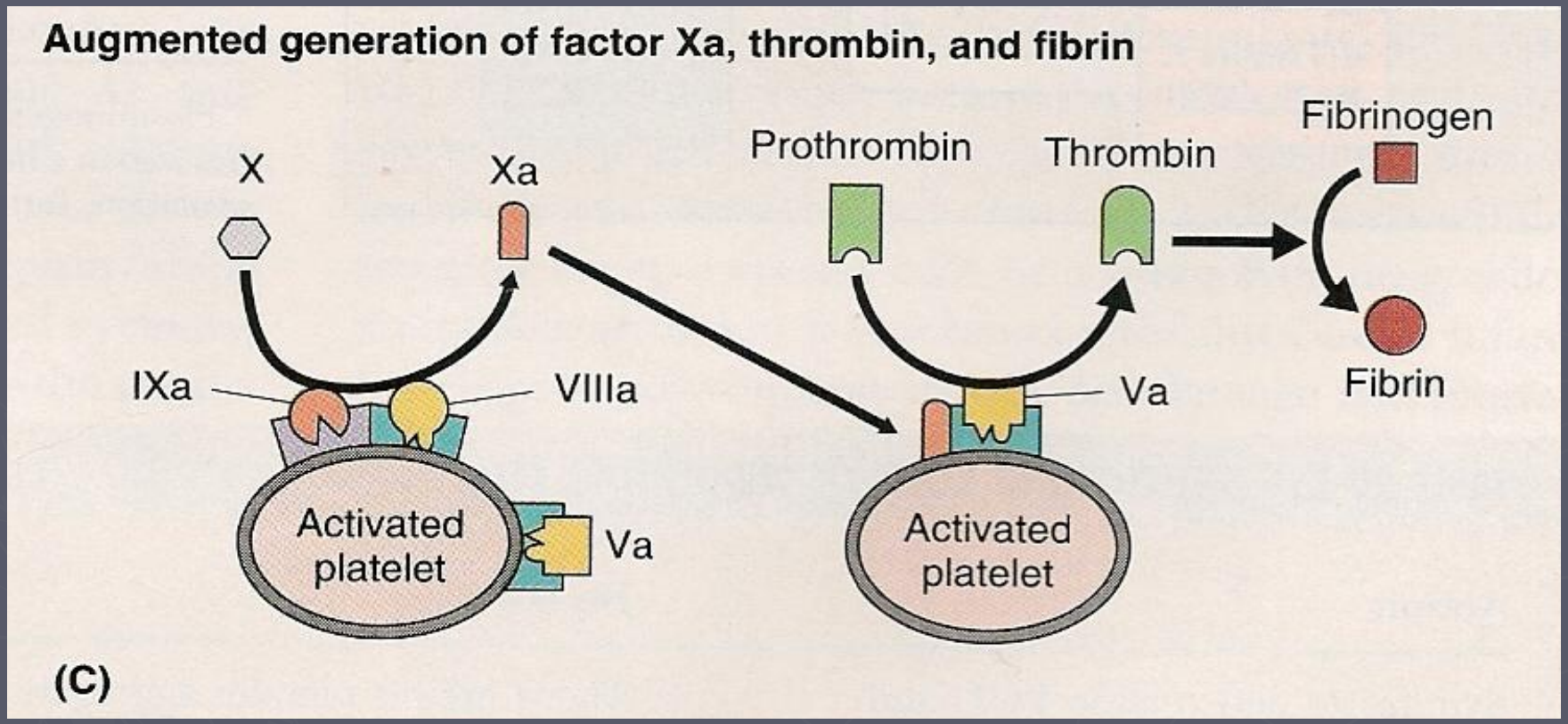

Thrombin's effects on the cascade
IX
XI
XIa
VIIIa
VIIIa
Receptor
VIII
IXa
IXa Receptor
Thrombin
Activated
platelet
Va
Va Receptor
V
(B)

IEPSC


Augmented generation of factor Xa, thrombin, and fibrin
X
Xa
IXa
VIIIa
Activated platelet
Va
Prothrombin
Thrombin
Fibrinogen
Fibrin
Va
Activated platelet
(C)


IMAGEBANK

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- Anticlotting systems- limit the process and keep it from spreading excessively
  - Tissue factor pathway inhibitor- a plasma protein that binds to tissue factor-factor VIIa complexes and partially inhibits the complexes ability to generate factor X
  - Protein C- activated by thrombin, this plasma protein inactivates factors VIII and V.
  - Antithrombin III- plasma protein which inactivates thrombin and other clotting factors once it is activated by heparin (present on the surface of endothelial cells)

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- Measurement of clotting time
- Prothrombin Time-PT – traditionally used to test anticoagulation time. Normal value is 10 to 15 seconds. Varies greatly on the type of thromboplastin used in the laboratory.
- International Normalized Ratio-INR –Mathematically corrects the PT test results for the quality of thromboplastin used in the the test against an international standard thromboplastin. A normal individual should have an INR value of 1.0.

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- Target INR for Specific Medical Conditions
- Venous thrombosis 2.0-3.0
- Atrial fibrilation 2.0-3.0
- Post myocardial infarction 2.5-3.5
- Presence of Mechanical Heart Valve 3.0-3.5
- Hypercoagulable states 3.0-4.0

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- Herbal Supplements that Affect Platelet Aggregation : Agents and Uses
- Garlic lowers cholesterol and blood pressure
- Gingko improves memory function
- Ginseng enhances endurance, lowers blood sugar
- Ginger antinausea, antispasmodic
- Feverfew migraine headaches, arthritis
- Vitamin E antioxidant, cancer prvention

These agents can be associated with compromised platelet aggregation. It is recommended that all herbal supplements be avoided for one week prior to surgery.

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- Antiplatelet Therapy
- Three main types
  - Acetylsalicylic Acid- ASA- the only NSAID used in the treatment and prevention of thromboembolic diseases.
  - Clopidogrel- (Plavix - clopidogrel bisulfate). Gaining popularity in secondary prevention of CVA, myocardial infarction, and peripheral arterial insufficiency.
  - Dipyridamole- inhibits adenosine uptake in erythrocytes and endothelial cells which increases plasma adonosine (increased binding on platelets)
    - Less antilplatelet activity than other two but reversible in 24 hours after drug is discontinued

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- Antiplatelet therapy
  - Patients will have a prolonged bleeding time but this may not be clinically significant because postoperative bleeding after dental procedures can mostly be controlled using local hemostatic measures.
  - These medications should not be discontinued prior to dental procedures.
  - On the other hand, if a patient is on a combination of both ASA and clopidogrel (Plavix), they should be referred to a dental hospital or hospital based OMS.
    - Lockhart PB, et al (2003 Br Dent)

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- Anticoagulation therapy
  - Most common Warfarin (Coumadin)
    - Antagonist of Vitamin K- reduces production of functional Vitamin K dependent clotting factors by approximately 30-50%

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- When warfarin therapy is stopped, it takes about four days for INR to reach 1.5 and another takes another 3 days for INR to reach 2 once therapy is restarted.
- Significant risk of thromboembolism when at sub-therapeutic INR.

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- Management of Anticoagulation patient
  - Ideally an INR within 24 hours of surgery in therapeutic range (2.0-4.0) Stable INR within 72 hours
  - No surgery with INR above 4.0.
  - Minimize or stage surgery.
  - Beginning of day and beginning of week to deal with re-bleeding issues.
  - Local hemostatic measures.

Conclusions

Despite the inconvenience of increased bleeding by patients on antiplatelet or anticoagulation medications, the risk of altering these medications is higher than problems arising from bleeding after dental procedures. These medications should not be altered and appropriate measures should be taken to control blood loss during dental procedures.

Conclusions

- These measures include
  - Timely INR readings prior to treament
  - Gentle surgery
  - Minimal or staged surgery
  - Application of pressure and sutures
  - Use of hemostatic agents such as:
    - Gelfoam (Pfizer)
    - Surgicel (Johnson and Johnson)
    - Colla-plug (Integra LifeSciences, Zimmer)
    - Act-Cel (Coreva Health Sciences)
    - BloodSTOP (LifeScience PLUS)

- ActCel- sterilized cellulose. Dissolves in 1-2 weeks. Expands to 3-4 times its size and quickly converts to a gel. Hypoallergenic and bacteriostatic.

ActCel
advanced bleeding control

Instructions for Use with Extractions

Patient with excessive bleeding:

1. Divide one sterile 2 X 2 inch piece into fourths.
2. Place one or more piece(s) [1 X 1 inch square], depending on the size of the socket and the amount of bleeding, into the middle of the socket with cotton plier.
3. Move it around in the socket until totally saturated with blood.
4. If the gauze is placed on bleeding points, apply for 1-2 minutes or until the bleeding stops, then remove the excess before closure.
5. Approximate the soft tissue by suturing with interrupted (in papillae), mattress, or cross suture to better cover and protect the Hemostatic Gauze and prevent it from being withdrawn by regular gauze sponge outside the socket.
6. Slightly moisten a 2 X 2 (or bigger) gauze sponge and have the patient place pressure on the socket by biting gently. Dry gauze can tend to pull the ActCel Hemostatic Gauze from the socket if they touch.

Additional patient precautions:

1. Bite on gauze for 15-20 minutes.
2. If bleeding continues or restarts, bite again for 15-20 minutes. This can be repeated as needed over a few hour period.
3. If bleeding does not stop, consult your dentist. (Repacking and resuturing may be required in rare cases.)
4. Rest for 2-3 hours.
5. No rinsing for 24 hours.
6. Avoid surgery area with tongue.
7. Avoid hot liquids and hard foods on the day of surgery.
8. Don't chew on surgical area for three days.
9. Avoid aspirin or NSAIDs.

Instructions for Prevention of Dry Sockets

1. After tooth removal, inspect socket for loose bone chips. Remove if present.
2. Thoroughly debride socket and flap area with copious sterile saline lavage.
3. Place one or more pieces of 1 X 1 inch square Hemostatic Gauze into socket.
4. Move the gauze around until totally saturated with blood.
5. Don't suture tightly closed.
6. Place slightly moistened regular gauze sponge over the socket and instruct the patient to bite with gentle pressure.
7. Refer to: "Additional patient precautions" given above.
8. Do not use to treat a dry socket (usually 4-6 days past surgery).
9. You may dust about 20 1"x1" pieces with 250 mg tetraycline powder.

Instructions for Prevention of Dry Sockets

10 ActCel gauze becomes part of the clot and gradually turns into glucose and saline when in contact with some type of bodily fluid, water, saline or hydrogen peroxide.

Situations that predispose bleeding:

Group 1*:

Aspirin:
inhibit platelet aggregation by inhibiting the pathway of cyclo-oxygenase enzyme

Anti-inflammatories
similar mechanism as aspirin but effect more limited

Anticoagulants
inhibits synthesis of vitamin K-dependent coagulation factors

Antibiotics
altered intestinal flora which can decrease production of Vitamin K

Anticancer drugs/chemotherapy
patient may be on drugs that reduce the number of circulating platelets

Group 2*:

- liver damage from alcoholism (may have decreased production of liver-dependent coagulation factors) non-alcoholic liver disease
- primary hepatitis
- hypertension (elevated systolic blood pressure, 180-200 systolic, may cause prolonged bleeding)

Group 3*:

- Hemophilia A (factor VIII deficiency)
- Hemophilia B or Christmas disease (factor IX deficiency))
- Hemophilia C (factor XI deficiency)
- Von Willebrand's disease (absent or reduced levels of factor VIII)
- Thrombcytopenia (defective or decreased production of platelets)
  Acquired, Congenital
- Disseminated intravascular coagulation or DIC (lack of clotting factors and platelets at the site where required)
- Hypoprothrombinemia (deficiency in prothrombin or factor II)
  Acquired, Congenital

*Some of the above situations require consultation with physician/hematologist.

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