MEDAVIE HealthEd ÉduSanté

Hemorrhage

Primary Care Paramedicine

Module: 14

Section: 02a

Introduction

- Hemorrhage
  - Abnormal internal or external loss of blood from the closed vascular system
- Homeostasis
  - Tendency of the body to maintain a steady and normal internal environment

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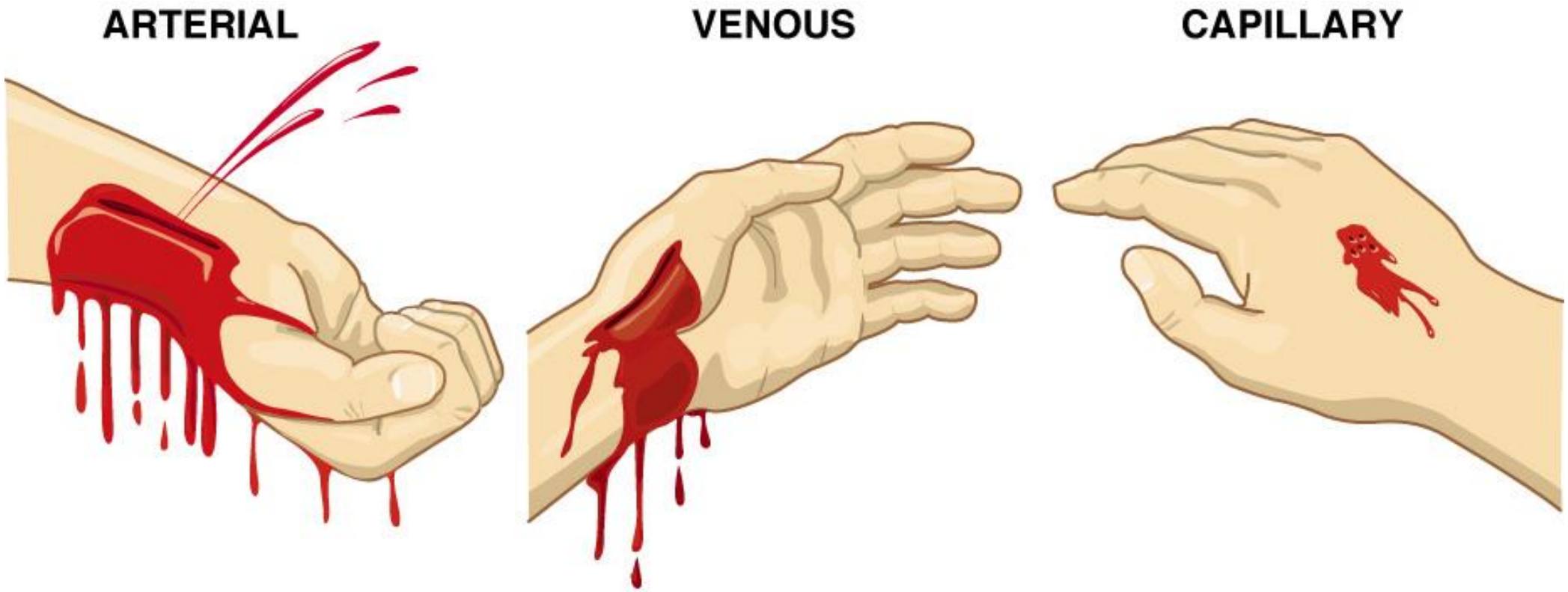
Hemorrhage



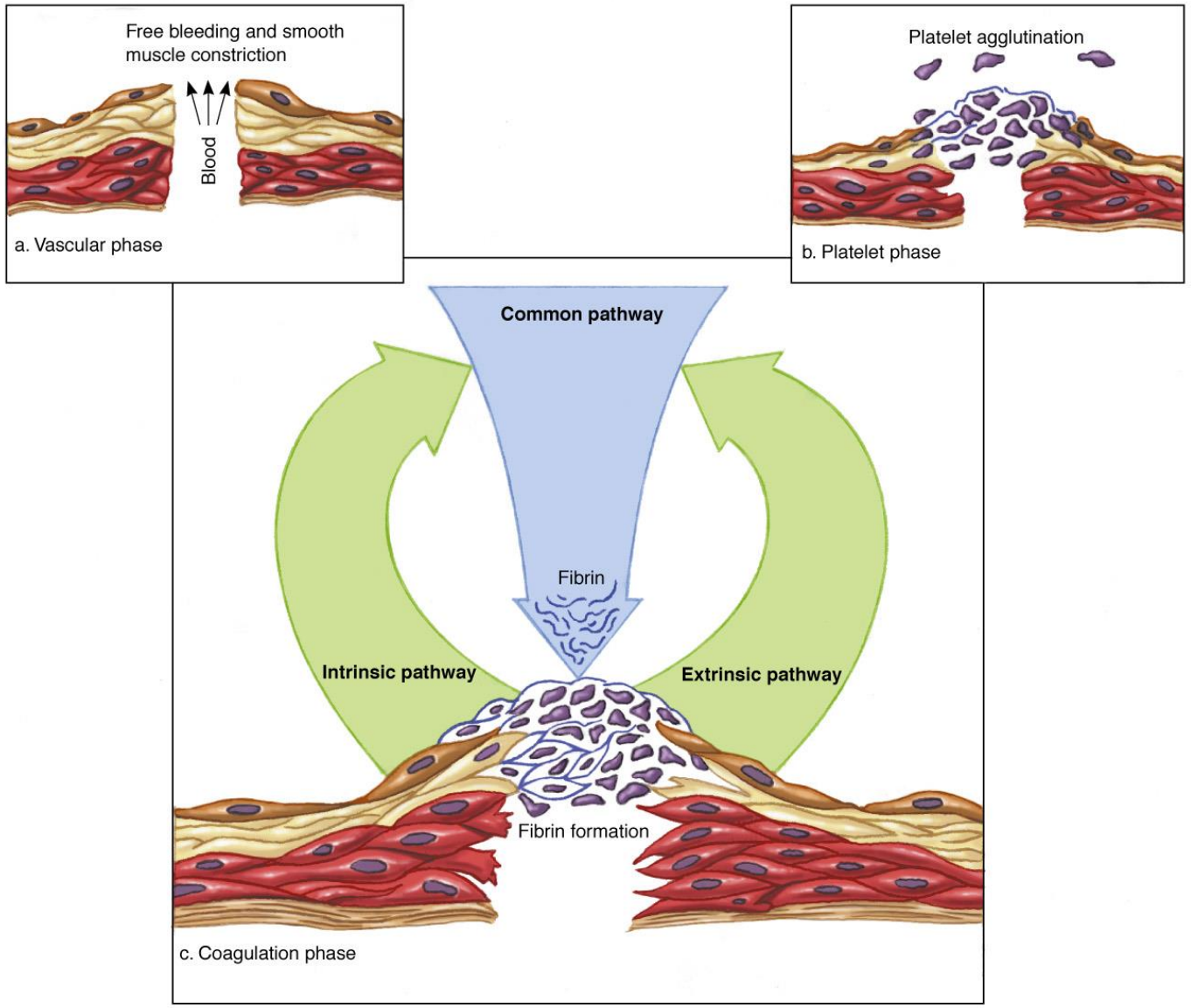
- Spurting blood
- Pulsating flow
- Bright red color

- Steady, slow flow
- Dark red color

- Slow, even flow

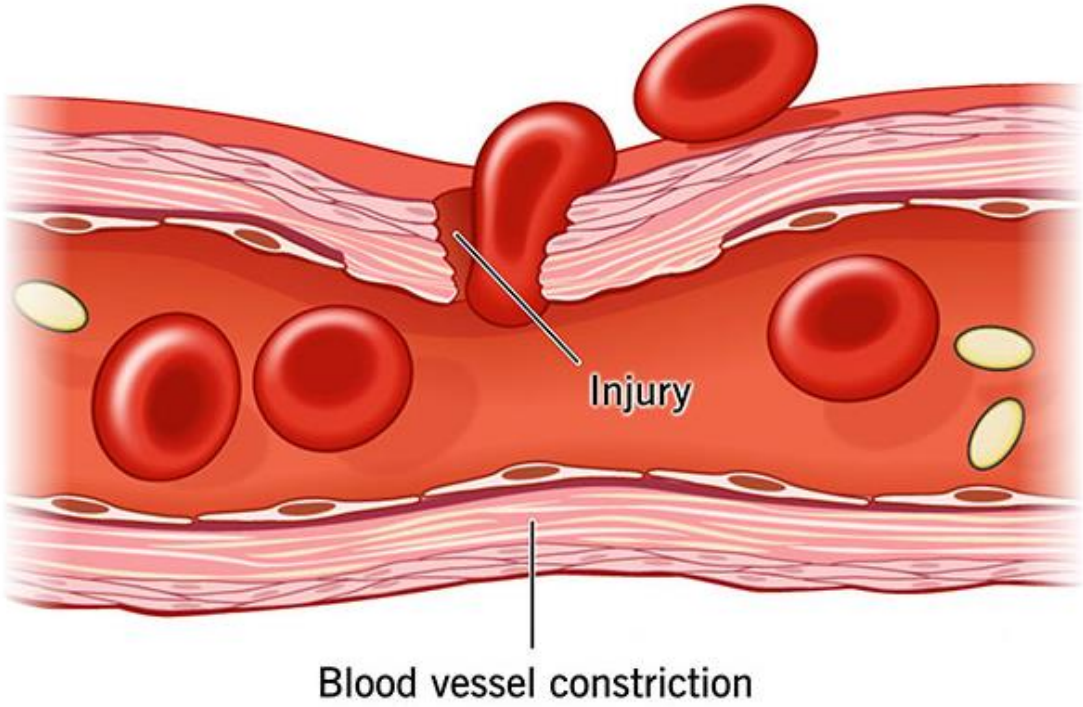
Clotting

- Body's response to local hemorrhage
- Three step process
  - Vascular phase
  - Platelet phase
  - Coagulation



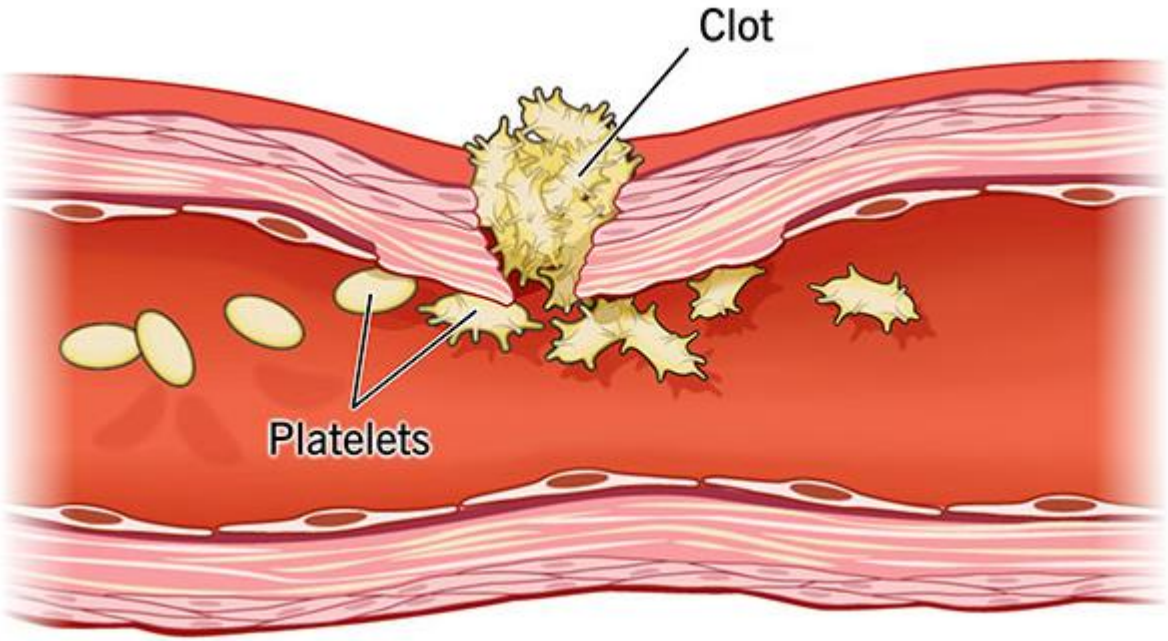
Vascular Phase

- As blood vessel is torn, smooth muscle contracts
- Lumen size reduced
  - Reduces volume and strength of blood flow through it



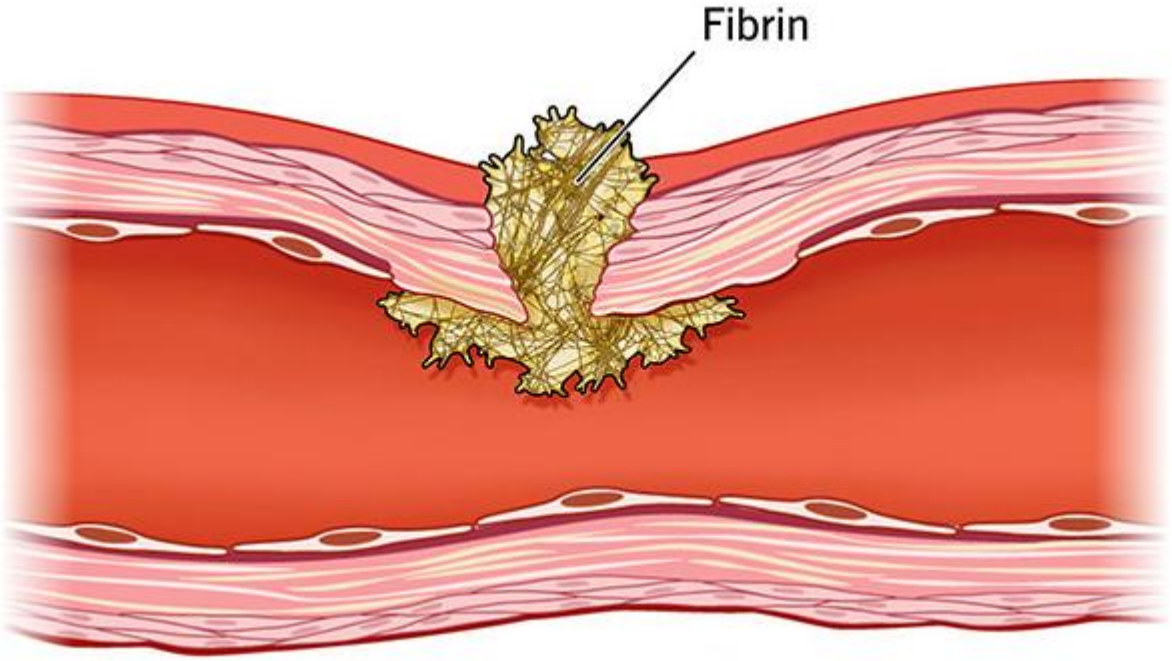
Platelet Phase

- Tunica intima damaged
  - Causes turbulent blood flow
  - Frictional damage to platelets
  - Platelets become adherent
- Platelets then stick to collagen on vessel's interior surface
- Aggregate
  - Collect other platelets

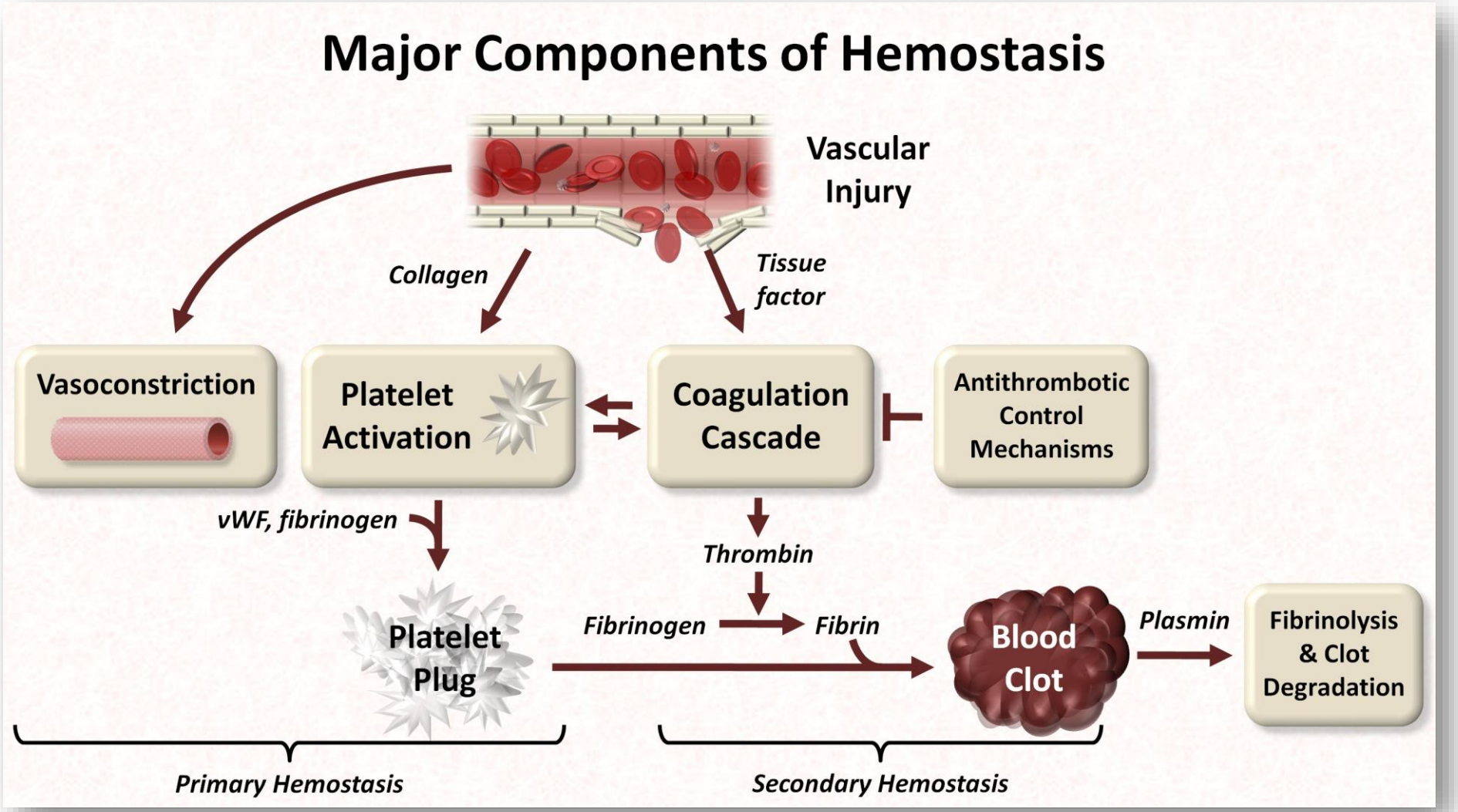


Coagulation

- Enzymes released into bloodstream
  - Intrinsic pathway (from damaged platelets)
  - Extrinsic pathway (from damaged blood vessel and surrounding tissue)
- Triggers a series of reactions resulting in the formation of fibrin
  - Forms protein mesh that traps other blood cells
  - Forms clot (generally takes 7-10 minutes)
  - Over time clot matrix contracts closing wound

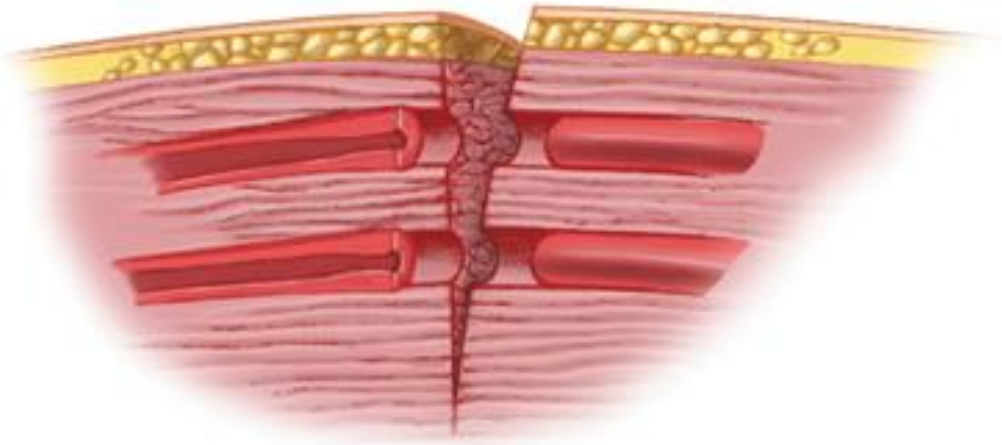


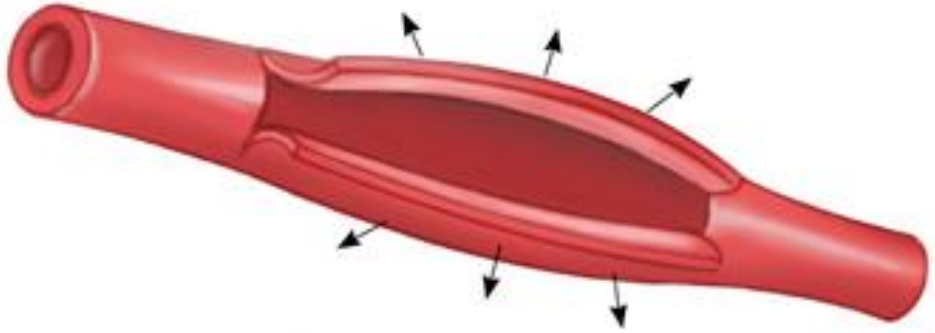
Hemostasis


Major Components of Hemostasis
Vascular Injury
Collagen
Tissue factor
Vasoconstriction
Platelet Activation
Coagulation Cascade
Antithrombotic Control Mechanisms
vWF, fibrinogen
Thrombin
Platelet Plug
Fibrinogen
Fibrin
Blood Clot
Plasmin
Fibrinolysis & Clot Degradation
Primary Hemostasis
Secondary Hemostasis

Nature of the Wound

- Transverse
  - Vessels constrict and draw inward
  - Reduction of lumen
  - Reduction of blood loss
  - Example: clean tear
- Longitudinal
  - Constriction of smooth muscle
  - Enlarges wound
  - Increased blood loss
  - Example: crushing trauma





Factors Affecting Clotting

- Movement of the wound site
- Aggressive fluid therapy
  - Increases BP and pushes clots
  - Fluid dilutes clotting factors
- Low Body Temperature
  - Ineffective clot formation
- Medications
  - ASA, heparin, warfarin (coumadin)

External Hemorrhage Control

- Direct pressure
- Elevation
- Immobilization
- Ice
- Pressure points
- Tourniquet as a last resort
  - Release may send accumulated toxins back into circulation

Hemorrhage Control

- Apply direct pressure

Hemorrhage Control

- Elevate the extremity above the level of the heart

Hemorrhage Control

- If bleeding does not stop, apply direct fingertip pressure

Hemorrhage Control

- If bleeding continues, apply pressure to a pressure point

Internal Hemorrhage

- Hematoma
  - Pocket of blood between muscle and fascia
- Humerus or tibia/fibula fracture: 500-750mL
- Femur fracture: 1,500mL
- Unexplained shock is best attributed to abdominal trauma

Internal Hemorrhage Control

- General Management
  - Immobilization
  - Stabilization
  - Elevation
- Epistaxis: Nose bleed
  - Causes: Trauma, hypertension
  - Treatment: Lean forward, pinch nostrils

Internal Hemorrhage Control

- To control nosebleed, have the patient sit leaning forward

Internal Hemorrhage Control

- Pinch the fleshy part of the patient's nostrils firmly together

Outward Signs of Internal Hemorrhage

- Hemoptysis
- Esophageal varices
- Melena
- Chronic hemorrhage
  - Anemia

Stages of Hemorrhage

- 60% of the body's weight is fluid
  - 7% of male body weight is in circulating volume (5 L or 10 units)
  - 6.5% of female body weight is in circulating volume (4.6 L or 9-10 units)

Stage One

- Blood loss of up to 15% (500-750 ml)
- Healthy body can easily accommodate for the loss
- No effect on BP, pulse pressure, renal output
- Compensation
  - Catecholamine release
  - Patient may display some anxiety, elevated heart rate, marginally cool skin due

Stage Two

- Blood loss of up to 15 to 25 % (750 – 1250 ml)
- First line compensatory mechanisms can no longer maintain BP
  - Secondary mechanisms now employed
- Early decompensation
  - Catecholamine release
  - Increase peripheral vascular resistance
  - Cool clammy skin, restlessness and thirst

Stage Three

- Blood loss between 25 and 35% (1250 -1750 ml)
- Compensatory mechanisms unable to cope
- Late decompensation
  - Classic signs of shock
  - Tachycardia, decreased BP, urine output
  - Pulse pressure narrows
- Without intervention, patient survival unlikely

Stage Four

- Blood loss of greater than 35%
- Irreversible
  - Signs of failure of end organ perfusion
  - Pulses may or may not be palpable
  - Patient lethargic, confused moving towards unconscious
- Patient survival unlikely

Signs and Symptoms

Table 19-1 Patient Signs Associated with Stages of Hemorrhage

Stage	Blood Loss	Vasoconstriction	Pulse Rate	Pulse (Pressure) Strength	Blood Pressure	Respiratory Rate	Respiratory Volume
1	< 15%	↑	↑	→	→	→	→
2	15–25%	↑↑	↑↑	↓	→	↑	↑
3	25–35%	↑↑↑	↑↑↑	↓↓	↓	↑↑	↓
4	> 35%	↓↓	Variable	↓↓↓	↓↓↓	↓	↓↓

Concomitant Factors

- Pre-existing condition
- Rate of blood loss
- Patient Types
  - Pregnant
    - >50% blood volume than normal
    - Fetal circulation is impaired when mother is compensating
  - Athletes
    - Greater fluid and cardiac capacity

Concomitant Factors

- Patient Types
  - Obese
    - CBV is based on ideal weight
    - Obese patients have proportionally less CBV
  - Children
    - CBV 8-9% of body weight
    - Underdeveloped compensatory mechanisms
    - Treat aggressively
  - Elderly
    - Decreased CBV
    - Medications: BP and anticoagulants
    - Pre-existing disease
    - Decreased perception of pain

Hemorrhage Assessment

- Scene assessment
- Primary assessment
- Focused history and secondary assessment
  - Rapid trauma assessment
  - Focused secondary assessment
  - Additional considerations
- Ongoing assessment

Scene Assessment

- Safety
- BSI precautions essential
  - Protects patient and paramedic
  - Contaminated gloves should be changed immediately
- Mechanism of injury
  - Anticipate sites of external/internal bleeding
  - Determine amount of time elapsed since injury
  - Appreciate progressive effects of blood loss

BSI

- When caring for a hemorrhaging patient, employ appropriate body substance isolation procedures

Primary Assessment

- General impression
  - Look for subtle signs of hemorrhage
  - Correct immediate life-threats, stabilize c-spine
- ABCs
  - Note rapid respiratory rate, narrowing pulse pressure, skin colour
  - High concentration oxygen
- Establish patient priorities
  - Consider rapid transport

Focused History and Secondary Assessment

- Primary survey will determine nature of history and secondary
- Rapid trauma assessment
- Focused secondary determined by rapid transport decision

Additional Assessment

- Bright red blood from orifices
  - Suggests direct bleeding
- Coffee grounds emesis
  - Partially digested blood, slower or long term bleeding
- Melena
  - Suggest blood has remained in bowel for a long time
- Hematochezia
  - Passage of stool with frank blood in it
- Orthostatic hypotension

Injuries with Significant Blood Loss

- Pelvic fracture: 2000 mL
- Femur fracture: 1500 mL
- Tibia fracture: 750 mL
- Fractured humerus: 750 mL
- Large contusion: 500 mL

Ongoing Assessment

- Reassess vital signs and mental status
  - Stable patients q 15 minutes
  - Unstable patients q 5 minutes
- Reassess interventions
  - Oxygen
  - ETT
  - IV/fluid administration
  - Medication actions

Hemorrhage Management

- Manage only after airway and breathing problems corrected
- VSA patient
  - Rule out reversible causes (tension pneumothorax, pericardial tamponade)
  - Consider reallocating resources to other patients
- Direct pressure/pressure dressing

Hemorrhage Management

- If bleeding persists
  - Finger pressure applied to the source of the bleed
  - Elevation
  - Arterial pulse points
  - Splinting/immobilization
  - Consider tourniquet

Common Pressure Points

a. Radial artery for hand

b. Brachial artery for forearm

c. Femoral artery for thigh

d. Popliteal artery for leg and foot

FIGURE 19-8 Common pressure points for hemorrhage control.

Head Wounds

- May be associated with both severe hemorrhage and skull fracture
  - Requires gentle pressure
- Fluid drainage from ears and nose
  - Escaping CSF reduces ICP
  - Cover and bandage loosely

Neck Wounds

- Risk of air being drawn into venous circulation
  - Large blood vessels may entrain air
  - Seal with an occlusive dressing
- Risk of airway compromise
  - Avoid circumferential dressings
  - May have to apply manual pressure enroute to hospital

Gaping Wounds

- Gaping wound prevents application of uniform direct pressure
  - Bleeding originates from many sites
  - Open nature of wound
- May have to pack wound to apply pressure

Crush Injuries

- Source of bleeding may be difficult to determine
- Normal control mechanisms may be ineffective
- Consider BP cuff over dressing or constrictive band

Transport Considerations

- Consider rapid transport
  - Serious hemorrhage that you cannot keep up with
  - Suspected serious internal hemorrhage
  - Decompensating shock
  - When in doubt
- Other considerations
  - Patient anxiety