Hemorrhage in Oral Surgery
(Diagnosis & Management)
Types of Hemorrhage

- **Arterial:**
  Bright red, in jets with pulsation, profuse.

- **Venous:**
  Dark red in color and flows steadily and heavily.

- **Capillary:**
  Bright red in color and is no more of a minimal ooze.
Types of Hemorrhage

颢 Primary:

This occurs during the surgery, as a result of injury like cutting or laceration of the artery or bleeding from bone.

This also occurs when surgery is done in an infected area with a lot of granulation tissue.

It can also occur after a very short period of time immediately after surgery.

This type of bleeding is really normal and can be controlled easily.
Intermediate (Reactionary):

This type of bleeding occurs within a few hours after surgery.

This type of bleeding occurs as a result of failure of coagulation to occur (as in patients with systemic bleeding problems or those on anticoagulants).

Patients who have unknowingly disturbed / dislodged the clot are also prone for this type of bleeding.
Secondary:

This occurs after 7 to 10 days after surgery.

This is mainly due to partial division of blood vessel in combination with infection of the wound (Like patients who undergo radical neck dissection etc.).

This type of bleeding is not very frequently encountered after oral surgery procedures.
Process of Coagulation

1. Blood vessel constricts
2. Loss of blood into tissues
   - Extravascular pressure
   - Compression of injured blood vessel
3. Platelet adhesion to wall of injured vessel and platelet aggregation
4. Platelet plug
5. Blood clot
6. Blood vessel injury
   - Intrinsic pathway to clot formation
   - Extrinsic pathway to clot formation
   - Blood flow at site of injury
   - Blood loss at site of injury
Damaged Vessel Endothelium Is Stimulus to Platelets Causing Platelet Adhesion
The Hemostatic Balance
Arterial Thrombosis
Reactions to Blood Vessel Injury

- Local vasoconstriction seals off small injury
- Platelet aggregation forms a platelet plug
- Hageman factor is activated
- Intrinsic pathway converts prothrombin to thrombin to seal system
- Extrinsic pathway clots the blood that has leaked out of the vascular system
Types of Blood Disorders

- **Thromboembolic Disorder**
  - Conditions that predispose a person to the formation of clots and emboli

- **Hemorrhagic disorder**
  - Disorder in which excess bleeding occurs
Bleeding Disorders Treated With Clotting Factors

- Hemophilia
  - Genetic lack of clotting factors that leaves the patient vulnerable to excessive bleeding with any injury

- Liver disease
  - Clotting factors and proteins needed for clotting are not produced

- Bone marrow disorders
  - Platelets are not formed in sufficient quantity to be effective
Actions of Anticoagulants

- **Anticoagulants**
  - Interfere with the clotting cascade and thrombin formation

- **Antiplatelets**
  - Alter the formation of the platelet plug

- **Thrombolytic drugs**
  - Break down the thrombus that has been formed by stimulating the plasmin system
Anticoagulants and Their Indications

- **Warfarin (Coumadin)**
  - Maintains a state of anticoagulation when patient is susceptible to potentially dangerous clot formation

- **Heparin (generic)**
  - Inhibits the conversion of prothrombin to thrombin

- **Antithrombin (Thrombate III)**
  - Used for hereditary antithrombin III deficiencies; replacement therapy in congenital antithrombin III deficiency
Evaluation of the Bleeding Patient

- Patient’s history
- Family history
- Physical findings
- Laboratory evaluation
Evaluation of the Bleeding Patient

- Type and extent of bleeding (eg, mucous membrane bleeding, petechiae, hemarthrosis, severity, etc.)
- Past history of bleeding, surgery, dental extractions
- Family history of bleeding disorder, autoimmune disease
- Underlying diseases (eg, liver disease, renal failure, malabsorption syndrome, sepsis, SLE)
Acute and Chronic Hemophilic Arthropathy
PREVIOUS CHALLENGES TO THE HEMOSTATIC SYSTEM

Surgery
Tonsillectomy
Wisdom teeth extraction

In contrast - minor abdominal surgery may be uneventful
X-Linked recessive: Hemophilias

Autosomal dominant: VWD

Autosomal recessive: Others
Anticoagulants
Coumadin
Heparin
Platelet Antagonists
Platelet Antagonists
- Aspirin
- NSAIDS
- Alcohol
- Antihistamines
- Beta blockers
- Nitrates
- Calcium blockers
ACQUIRED DISORDERS OF COAGULATION

Does the patient have symptoms or signs of liver disease?

Is there a reason why the patient should be vitamin K deficient?

- Malnutrition
- Biliary obstruction
- Broad Spectrum antibiotics
ACQUIRED DISORDERS OF COAGULATION

Does the patient have a co-existent systemic disease?
- Sepsis
- Disseminated malignancy
- Obstetric problems
- Burns
- Snake Bite
Historical Diagnosis of von Willebrand Disease

- Prolonged bleeding time with normal platelet count
- Autosomal dominant mode of inheritance
Functions of von Willebrand Factor (VWF)

- Serves as a bridge between platelets and injury sites in the vessel walls
- Protects FVIII from rapid proteolytic degradation
Laboratory Screening Tests

The most commonly used tests are:

- Bleeding Time (BT)
- Platelet count.
- Prothrombin Time (PT)
- Partial Thromboplastin Time (PTT)
Bleeding Time (BT)

- Normal: 3-8 minutes (Ivy method)

- Increased in:
  - Platelet Defects (Quantitative Or Qualitative).
  - Blood Vessel Defects.
**Prothrombin Time (PT)**

- Test plasma + tissue
  - thromboplastin + CaCl₂
- Time formation of fibrin clot

- Normal range: 11.0-12.0 sec
- Measures: factors I (fibrinogen), II (prothrombin), V, VII, X
- Examines the efficiency of Extrinsic & Common coagulation pathways.
- Increase in value (may be due to vit K defic., Coumadin therapy, or Liver disease).
PTT

- Examines Intrinsic Coagulation Pathway (factors VIII, IX, XI, XII).
- Increases in:
  2. Acquired (Heparin therapy).
Activated Partial Thromboplastin Time (APTT)

- Test plasma + partial thromboplastin reagent
- Normal range: 30-40 sec+

Time formation of fibrin clot
Treatment of Bleeding Problems
TYPES OF TREATMENT

Local Therapy
  Pressure
  Cautery
  Suturing
  Topical Hemostatics
TYPES OF TREATMENT

Systemic Pharmacological Therapy

Antifibrinolytic agents
- Tranexamic Acid: Cyklokapron
- Epsilon amino caproic acid: Amicar

DDAVP: desmopressin

Hormone preparations: estrogens
BLOOD COMPONENT THERAPY

Packed Red Blood Cells
If hematocrit <25%
Facilitates platelet function due to enhanced platelet margination

Platelets
Plasma
BLOOD COMPONENT THERAPY

- Cryoprecipitate
  - Factor VIII
  - VWF
  - Fibrinogen

- Coagulation factor concentrates
  - Factor VIII
  - Factor IX
Antifibrinolytic Therapy

- Epsilon Amino Caproic Acid (Amicar)
  p.o. 6g Q 6h x 5 days (for children and adolescents, 75mg Kg Q6h x 5-7 days)
  - Adjunct therapy for VWD, preventing rapid clot dissolution
Local Hemostatic Agents

- Thrombin
- Absorbable gelatin sponge (Gelfoam, Surgifoam)
- Microfibrillar collagen (Avitene)
- Oxidized Cellulose (Surgicel, Oxycel)
- Fibrin Sealant (Tisseal)
- Gelatin Matrix (FloSeal)
- Epinephrine (Adrenaline)
- Tranexamic acid 5% (For irrigation and as mouth washes)
- Bone wax (Bees wax + Acetyl salicylic acid)
Thrombin

- Indicated for controlling intraoperative capillary bleeding and oozing, cannot control arterial bleeding
- Packaged as powder with sterile diluent
- Available in spray kit- can be sprayed into area where hemostasis is desired
- Cannot be injected into blood vessels—will cause intravascular clotting
Absorbable Gelatin Sponge

- Examples: Gelfoam, Surgifoam, Gelfilm
- Mode of action not fully understood
- Absorbs fluid (up to 45 times its weight in blood) and puts pressure on the bleeding surface
Absorbable Gelatin Sponge: Use

- May be cut to desired size
- May be applied dry, or soaked with saline or thrombin spray prior to use
- When used in confined spaces, may cause excess pressure when it expands (of particular concern in neurosurgical & spine cases)
Microfibrillar Collagen

- Example: Avitene
- Available in sheets or powder
- Provides a surface for platelet aggregation
- Apply with dry forceps, as it will adhere to moist surfaces such as gloves
Oxidized Cellulose

- Examples: Surgicel, Oxycel
- Available in sheets which can be cut to the desired size
- Applied dry
- Blood bonds with the oxidized cellulose to form artificial clot
- May be left in wound or removed after clot dries
Fibrin Sealant

- Examples: Tisseal, Hemaseal
- Designed for hemostasis and tissue sealing (ex: can aid dura repair during spine surgery)
- Must be reconstituted before use - use company-made device which warms and mixes the product
- Stored in Pharmacy in refrigerator
Gelatin Matrix (FloSeal)

- Promotes hemostasis
- Not for use in ophthalmic procedures
- Not for use in presence of infection
- Stored at room temperature in storeroom, not pharmacy
- Does not need to be warmed prior to use
- FloSeal packaged with Thrombin, which must be mixed with gelatin matrix prior to use
- Use within 2 hours of reconstitution
- Applying pressure with moist sponge to site after applying FloSeal will hasten clot formation
Epinephrine (or Adrenaline)

- Causes vasoconstriction, reducing bleeding
- Added to irrigation or LA to reduce intraoperative bleeding and improve visualization
Post-extraction Hemorrhage

Causes

➢ Local:
  ➢ Non-compliance with instructions
  ➢ Remaining pulp tissue
  ➢ Remaining granulation tissue
  ➢ Soft tissue laceration
  ➢ Fractured socket wall
  ➢ Nutrient canal

➢ Systemic:
Pt Management

- Psychologically.
- Pt & Family history.
- Good light source.
- Thorough cleaning & irrigation.
- Good inspection (type & source of bleeding).
- Dealing with the cause.
- Using different local hemostatics.
- If no complete response...... Hospitalization and complete coagulation screening investigations.
Platelet Count

- Normal: 190,000 – 400,000 / ml
- Thrombocytopenia:
  - 50,000 – 100,000……Minor surgical procedures (e.g. tooth extraction & biopsy) could be done, with the use of local hemostatics, without need for platelet transfusion.
The Pt with Anticoagulation

- Warfarin action (anti-factors II, VII, IX, X) starts after 3 days. Measured by PT.
- Standardization by using of the International Normalized Ratio (INR).
  \[ \text{INR} = \frac{\text{Pt PT}}{\text{Control PT}} \]
- Until 1.5 times the control is considered safe for surgery.
Dental Procedures

INR level up to 2.5 times:

Simple tooth extraction and Periapical surgery, with the use of Local Antifibrinolytic Agents (Tranexamic acid 10 ml, 4.8% aqueous solution, for socket irrigation) and Suturing. Gauze pack for 20 minutes. Followed by Mouth Wash (with the same solution), for 2 minutes, 4 times/day for 1 week. Full liquid diet 24-48 hrs, Soft diet for another 5 days. Avoid Hot liquids (Clot Lysis).
Do not give Aspirin or NSAIDs for analgesia.

Pts with low-dose Aspirin Therapy:
The drug should be stopped for 7-10 days
(No risk for Thrombo-Embolic events).