

Hemostasis: Techniques and Technologies



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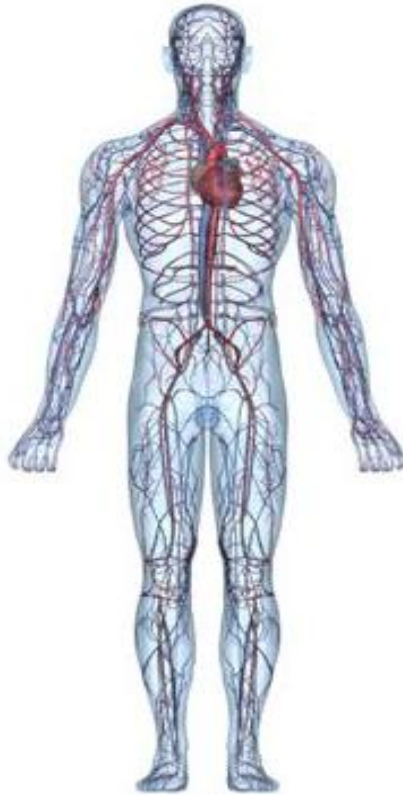
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Learning Objectives

- Describe normal hemostasis
- Compare types of gastrointestinal (GI) bleeds to potential diagnoses
- Differentiate variceal from nonvariceal bleeding
- Discuss variceal treatment techniques
- Describe nonvariceal treatment techniques

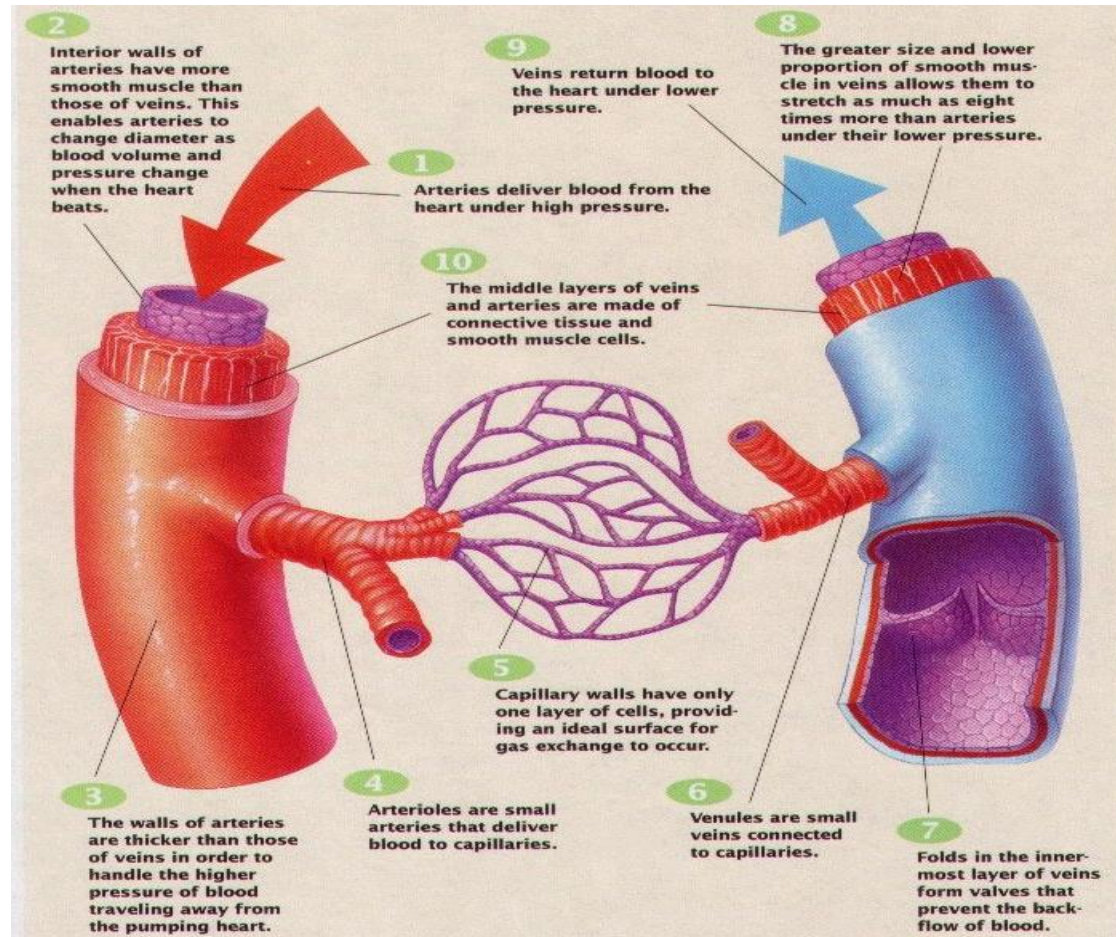
Anatomy and Physiology of the Vascular System



Vascular System: Anatomy and Physiology

- System components:
 - Heart
 - Arteries
 - Arterioles
 - Veins
 - Capillaries
- Carries blood throughout the body

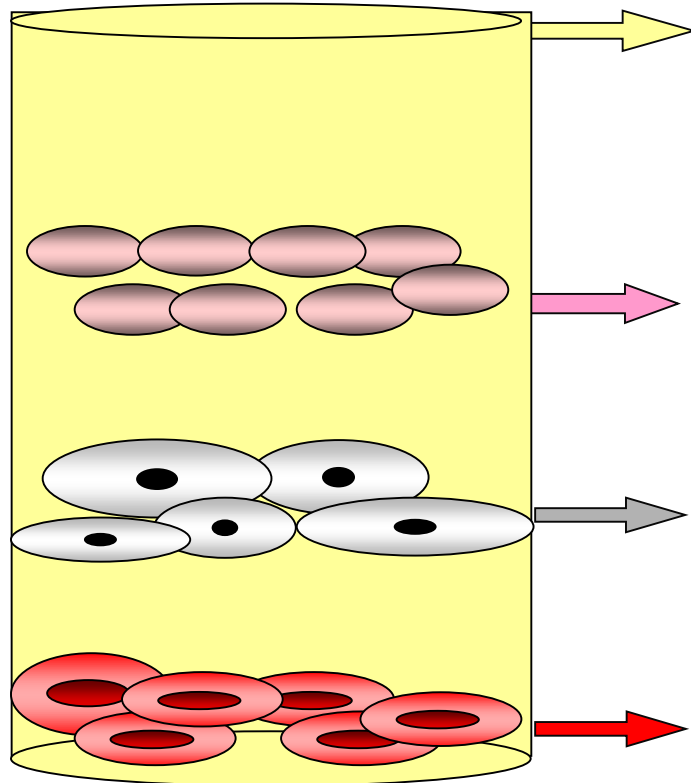
Hepatic Portal System



Hepatic System

- Manages blood flow between the digestive tract and heart
- Responsible for drainage of blood from capillaries in:
 - Spleen
 - Stomach
 - Intestines
 - Pancreas
 - Gallbladder

Blood Biology



Plasma (liquid)

Distributes nutrients
Removal of waste
Maintains body temperature

Platelets (Thrombocytes)

Prevention of blood loss
Assists in wound healing

White blood cells / WBC (Leukocytes)

Protection against foreign matter
& microorganisms

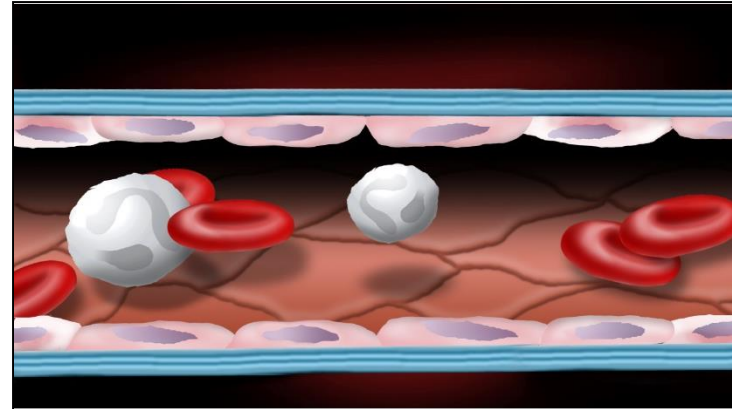
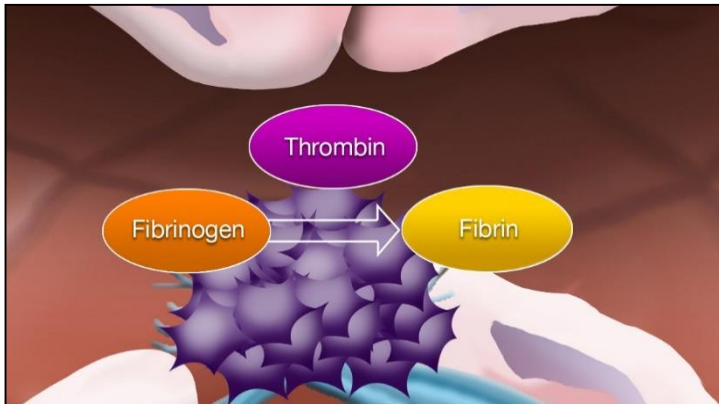
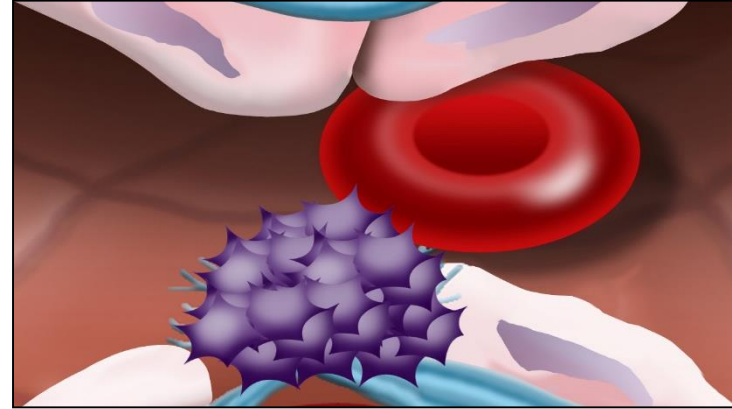
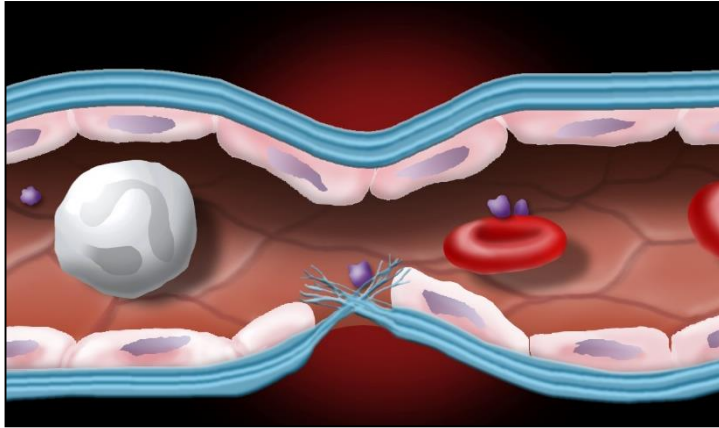
Red blood cells / RBC (Erythrocytes)

Oxygen transport
Carbon dioxide removal

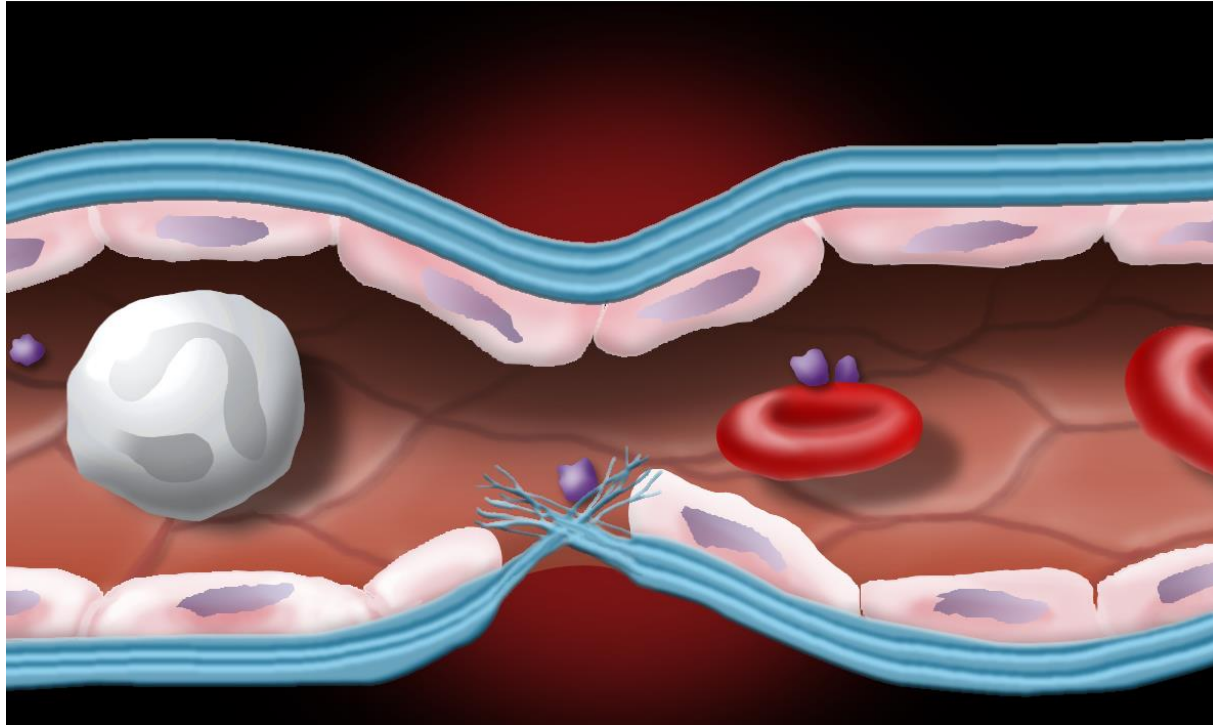
Hemostasis

- Physiological process that stops bleeding
- Forms plug while maintaining blood circulation
- Activated within seconds
- Two main hemostatic components:
 - Primary hemostasis
 - Secondary hemostasis

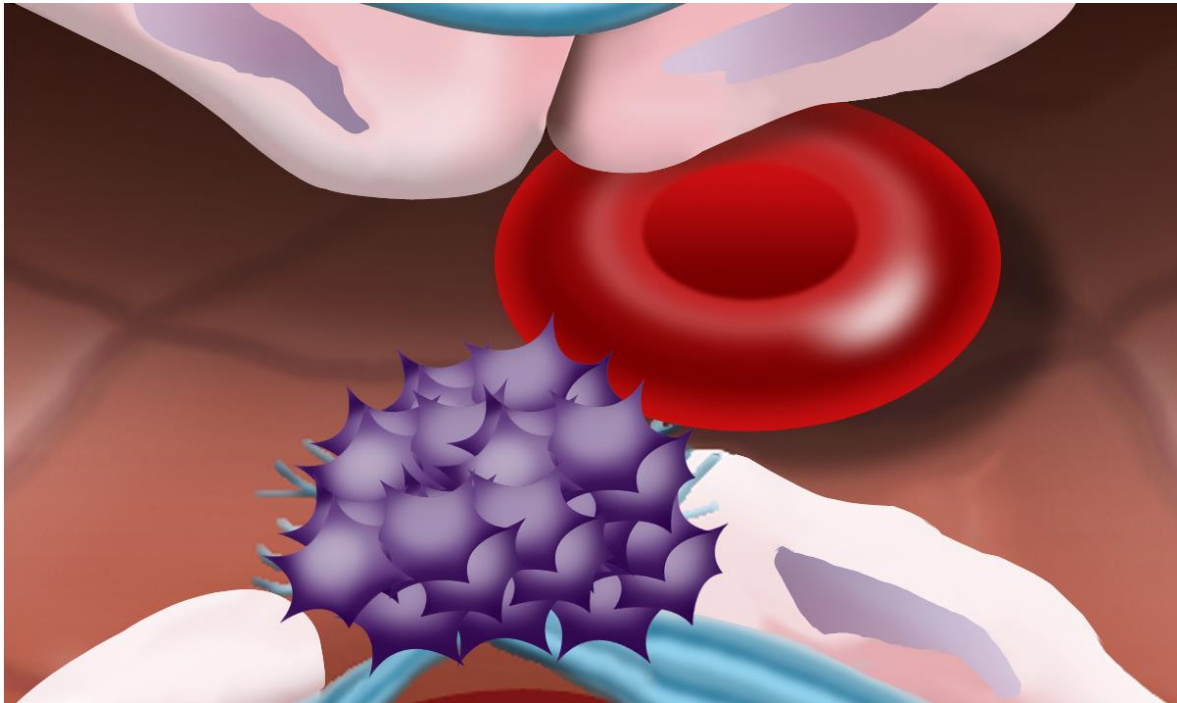
Normal Hemostasis



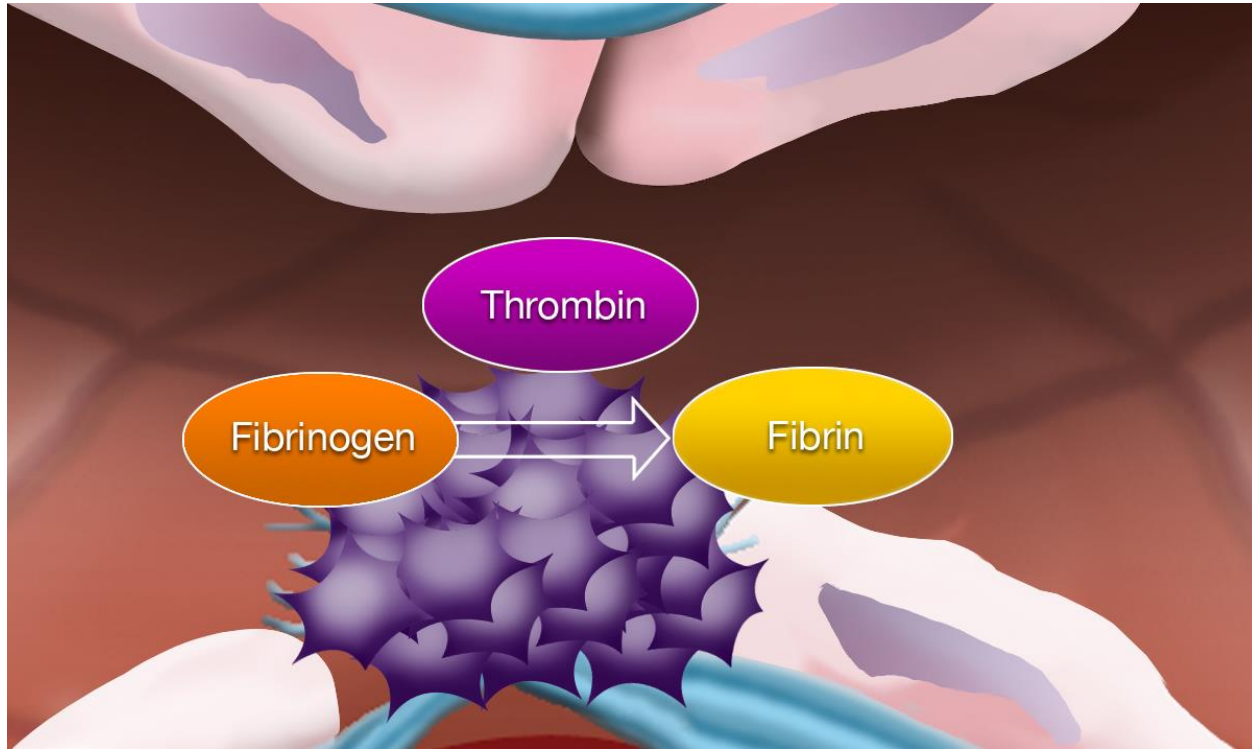
Vasoconstriction



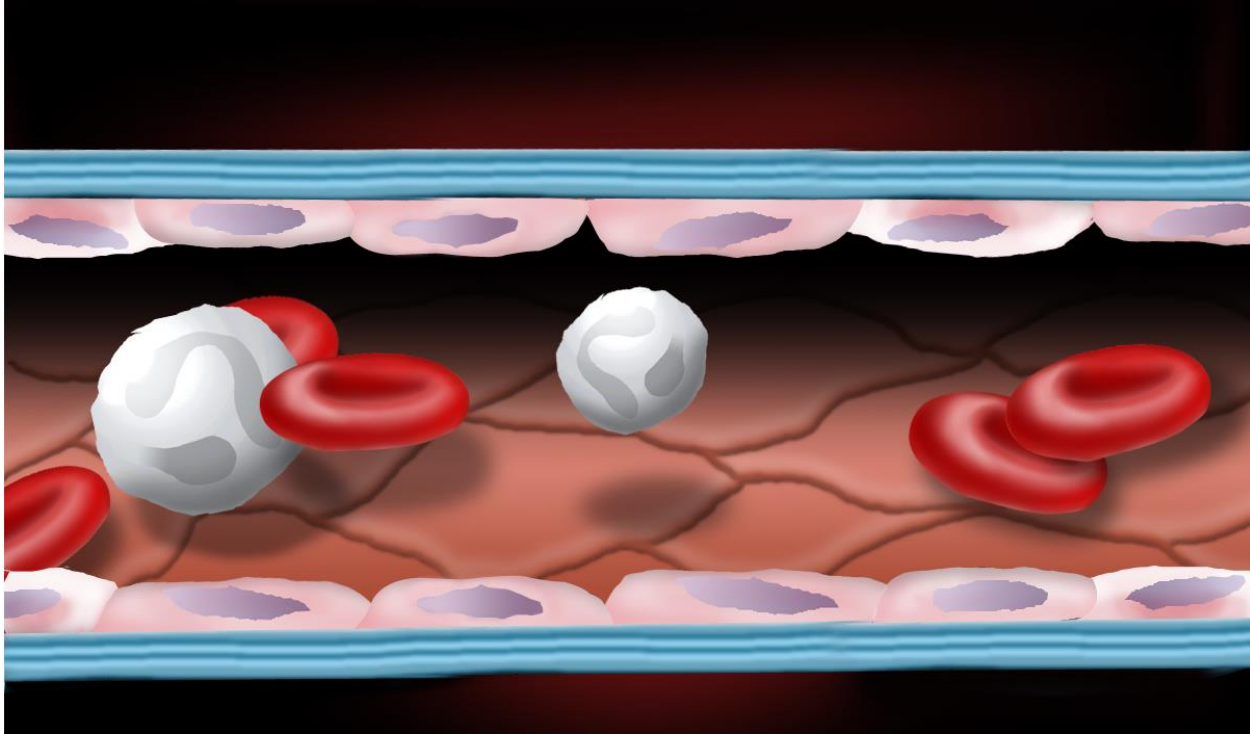
Platelet Activation and Aggregation



Fibrin Mesh



Clot Dissolution



Primary Hemostasis

- Platelets aggregate
- Platelets adhere to site of injury and each other forming a plug

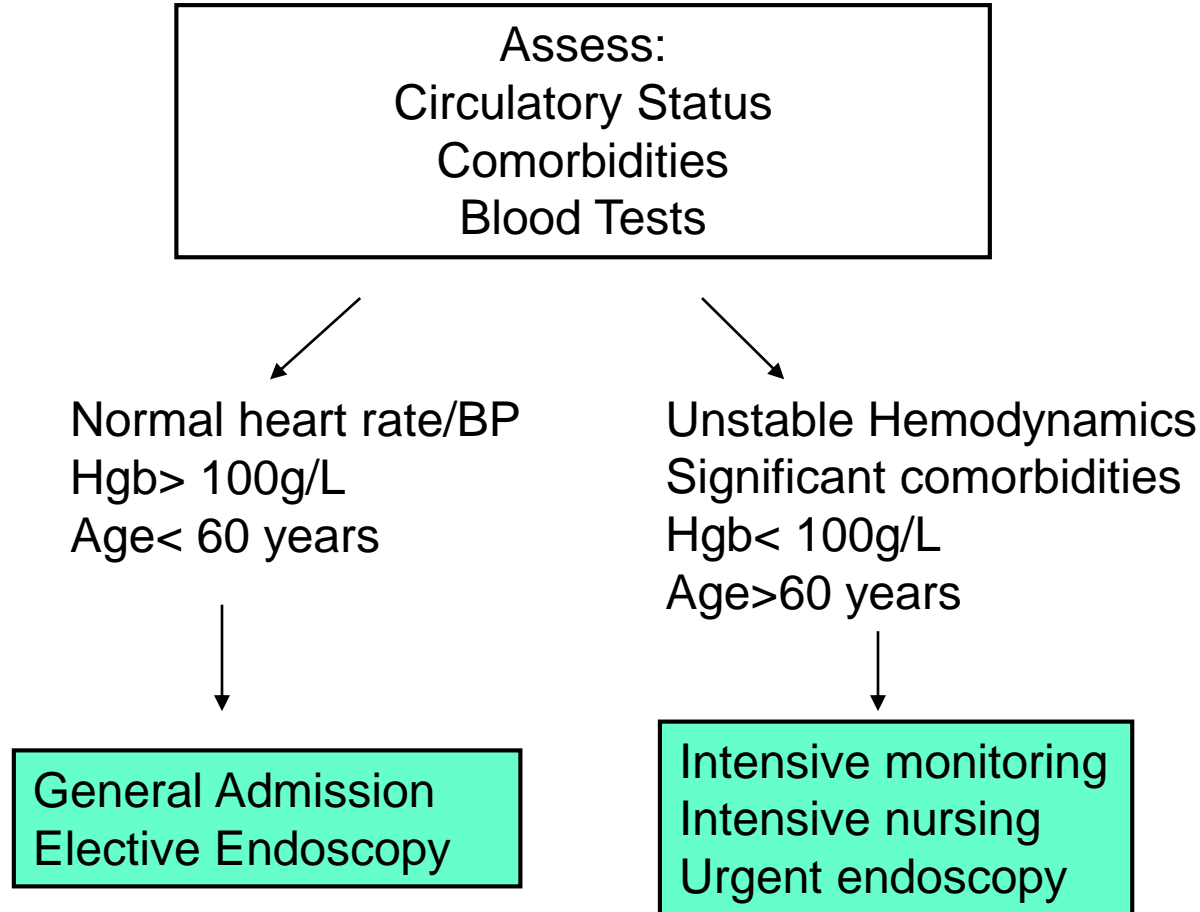
Secondary Hemostasis

- Deposition of insoluble fibrin
- Forms a mesh
 - Integrates into and around platelet plug
- Strengthens and stabilizes blood clot

Gastrointestinal Bleeding

- Symptom of disease or trauma
- Originates from any area of GI tract
- Caused by pathologies such as:
 - Hemorrhoids
 - Ulcers
 - Tears or inflammation in esophagus
 - Diverticulitis, ulcerative colitis, Crohn's disease
 - Polyps
 - Cancer

Assess GI Bleed

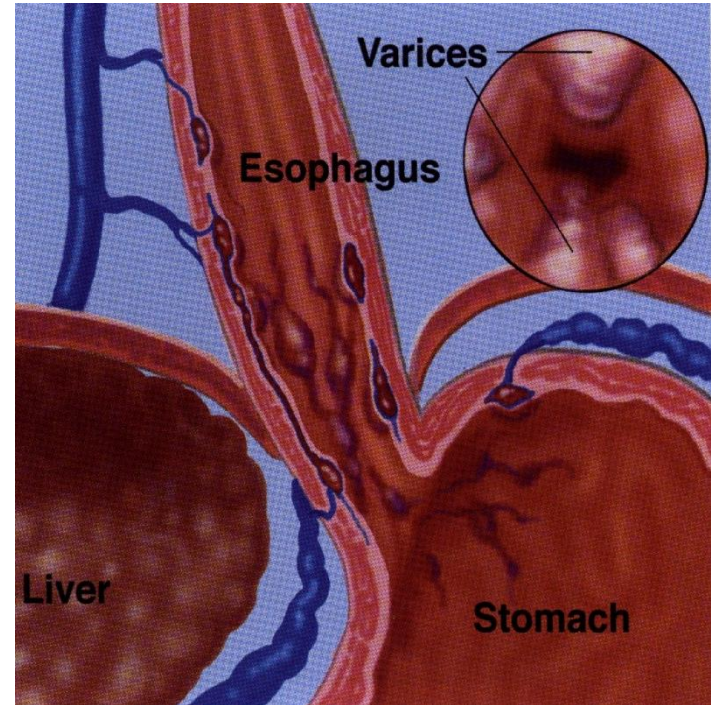


Gastrointestinal Bleeding

ANATOMICAL LOCATION	TYPE OF BLEED	POTENTIAL DIAGNOSIS
Esophagus	Vomiting bright red blood or coffee ground material, black stool	Ulcer, Varices, Liver disease
Stomach	Vomiting bright red blood or coffee ground material, black stool	Ulcer, Gastritis, Varices
Small Intestines	Bright red/maroon bleeding	Ulcer, AVMS, Diverticula
Large Intestine	Blood in stool	Colon cancer, Polyps, Colitis, Arterial-venous malformations, Diverticula
Rectum	Bright red bleeding	Hemorrhoids, Diverticulitis, Tumors

Categories of Bleeding

- Variceal:
 - Bleeding in esophagus, stomach or rectum
 - Dilated vein
- Nonvariceal:
 - Bleeding in GI tract
 - Cause other than dilated vein



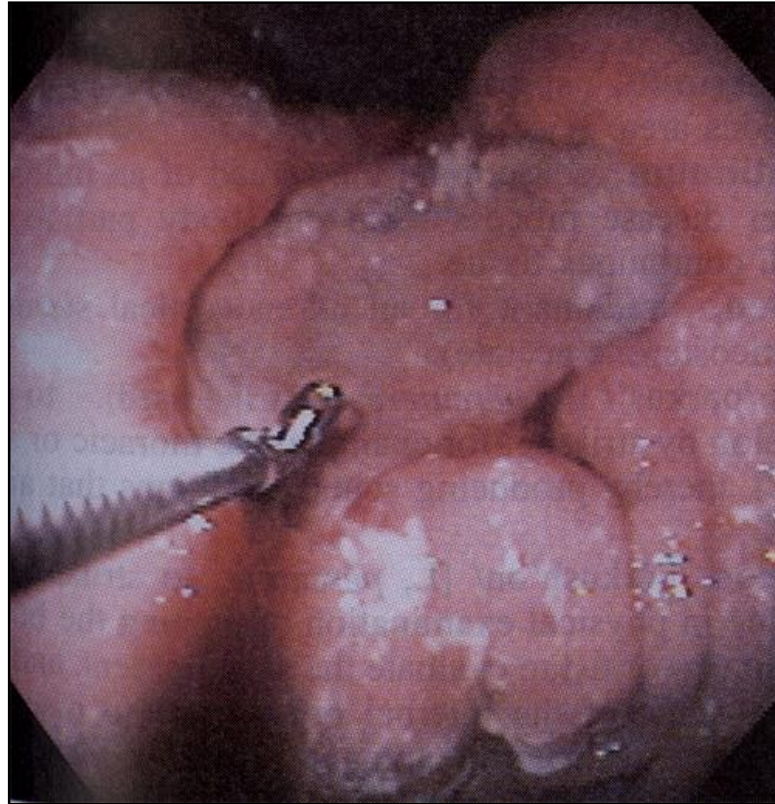
Variceal Bleeding

- Asymptomatic
- Diagnosed with bleed
- Patient in shock
 - Hypotensive, blood loss
- Bleed 30%
- Rebleed 70%
- Mortality rate 10-20%

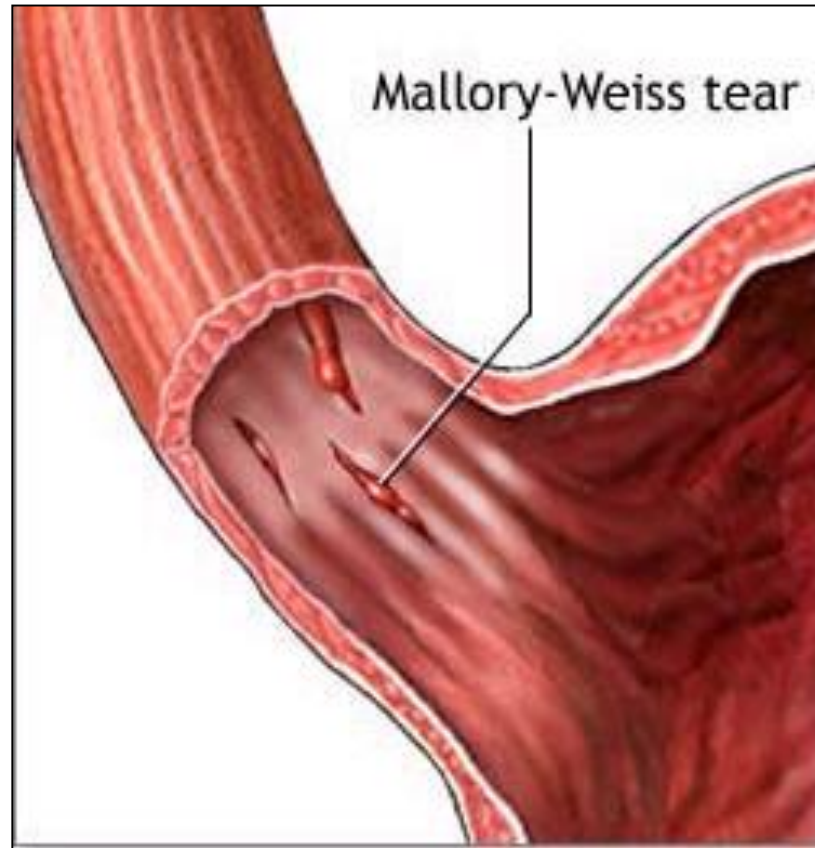
Nonvariceal Bleeding

- Causes:
 - Duodenal ulcer
 - Peptic (gastric) ulcer
 - Mucosal tear (Mallory-Weiss)
 - Dieulafoy's lesions

Peptic Ulcer Disease



Mallory-Weiss Tears



Dieulafoy's Lesion



Endoscopic Treatment Techniques

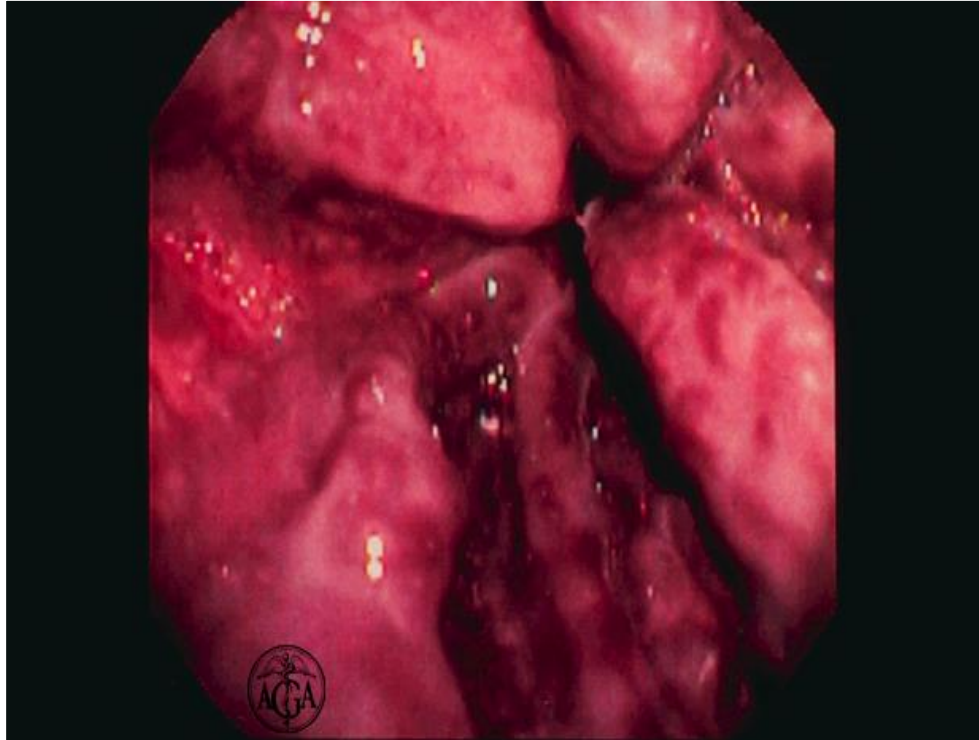
Variceal:

- Rubber band ligation
- Sclerotherapy
- Combination therapies

Nonvariceal:

- Injection therapy
- Thermal
- Mechanical
- Combination therapies

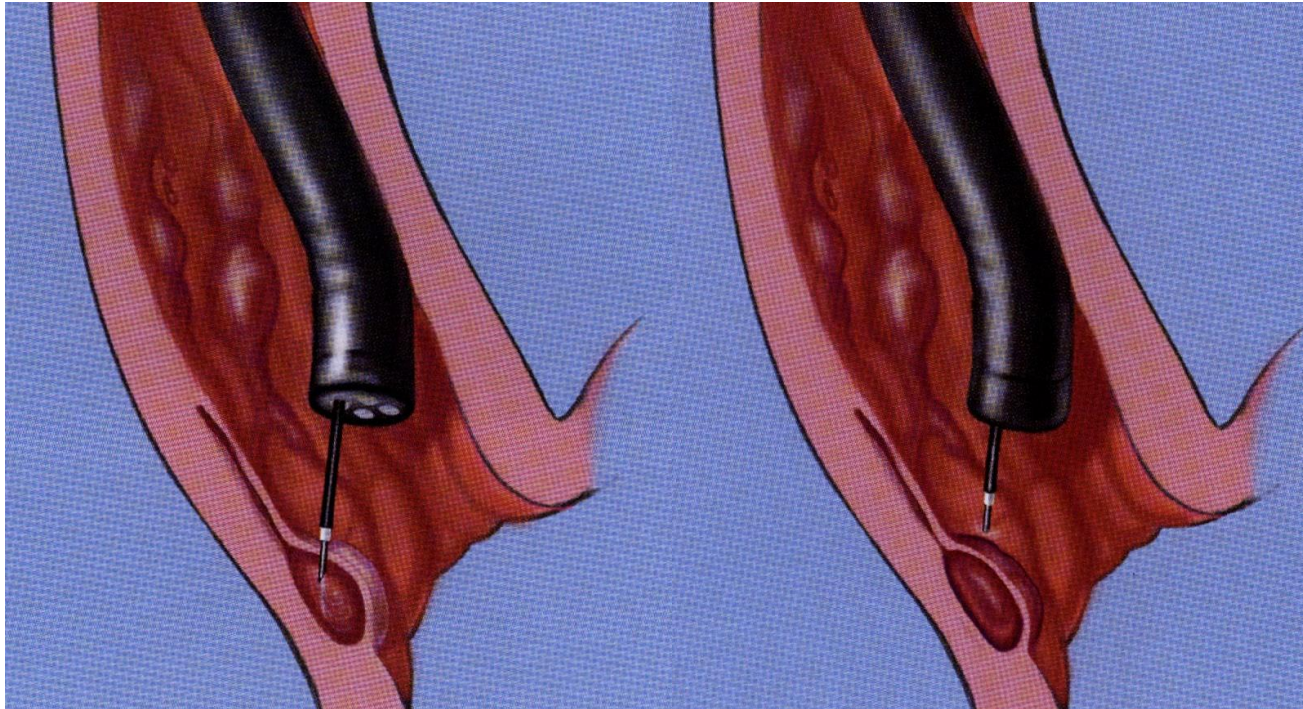
Variceal Treatment Techniques



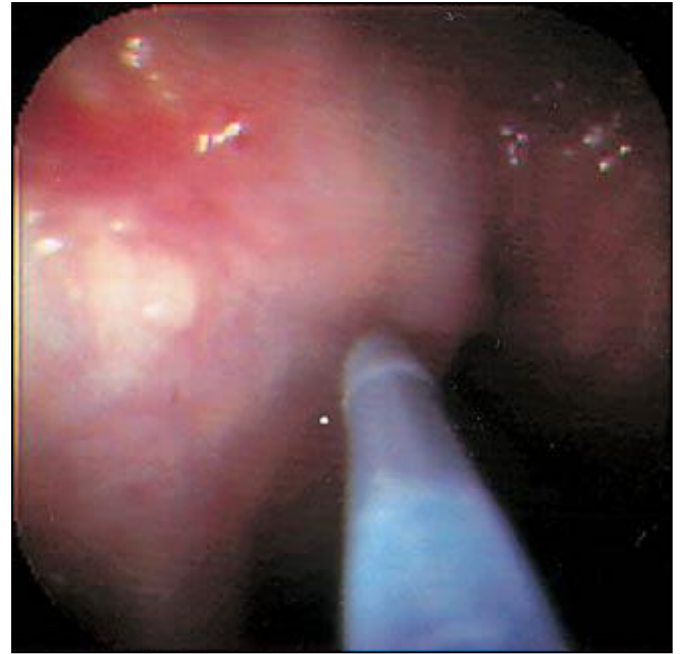
Sclerotherapy

Intravariceal

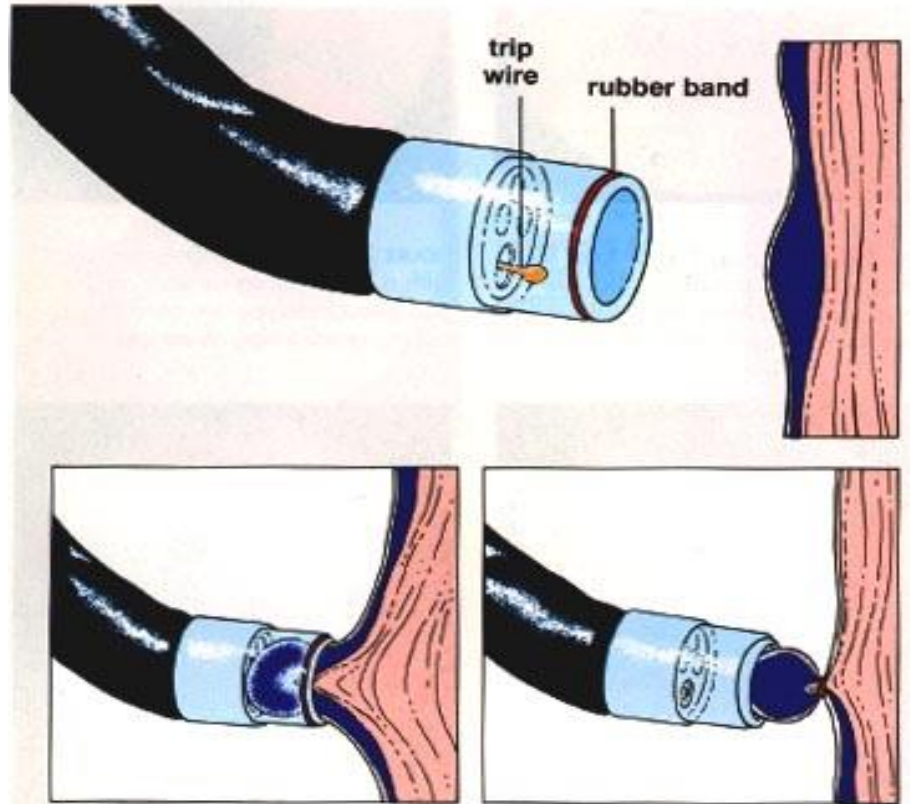
Paravariceal



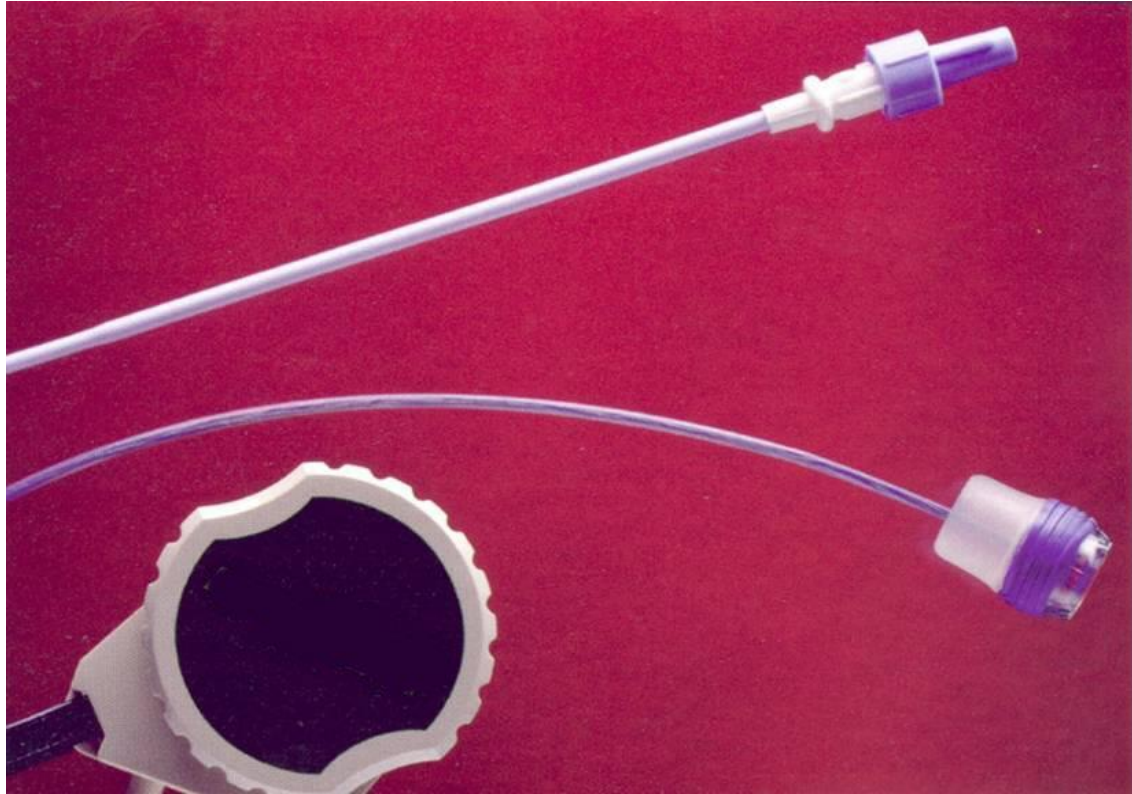
Sclerotherapy Technique



Variceal Ligation



Multi-shot Devices



Band Ligation vs. Sclerotherapy

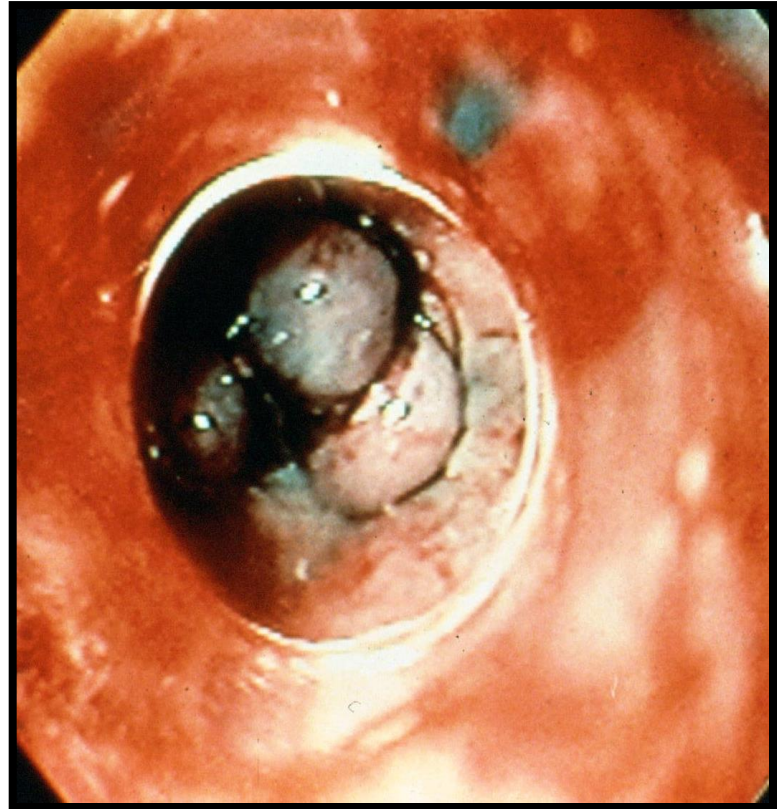
- Same efficacy
- Lower rebleeding rates
- Fewer deaths from rebleed
- Fewer complications

Ligation Technique

- Endoscopically locate the varices
- Begin with the most distal varix and proceed circumferentially to proximal
- Press ligating unit against varix
- Suction to “Red Out”
- Continue to suction
- Deploy band

Band Ligation

- Swelling
- Sloughing
- Ulceration
- Healing



Single Band Applications: Varices & Hemorrhoids

- Rubber band ligation treatment for hemorrhoids is quick
- Performed in less than 2 minutes
- Can be performed in the physician's office with minimal post procedure recovery time



Nonvariceal Treatment Techniques



Injection Therapy

- Hypertonic saline
- Epinephrine
- Sclerosants
- Thrombin and fibrin
- Cyan-acrylate glues

Injection Therapy Technique

- Locate the bleeding site
- Advance the needle out of catheter
- Inject agent into mucosal lining



Thermal Coagulation

- Monopolar electrosurgery
- Bipolar electrosurgery
- Heater probe
- Argon plasma coagulation (APC)
- Lasers

Monopolar Coagulation

- Current flows from generator, to active instrument electrode, to patient, to dispersive electrode
- Provides hemostasis
- Reduces the rate of recurrent bleeding
 - In actively bleeding and in high-risk non-bleeding patients
- Associated with greater tissue injury than is the bipolar mode



Bipolar Coagulation

- Delivers current through instrument electrode
 - Only the tissue grasped is included in the circuit
 - Dispersive electrode is not needed
- Limited to tissue in contact with the instrument electrode
- Instrument electrodes are coated
 - Reduces tissue adhesion
 - Provide more efficient hemostasis



Bipolar Probes



Silver



- Reduced tissue adhesions
- Higher conductivity (35%)
- Less resistance (28%)

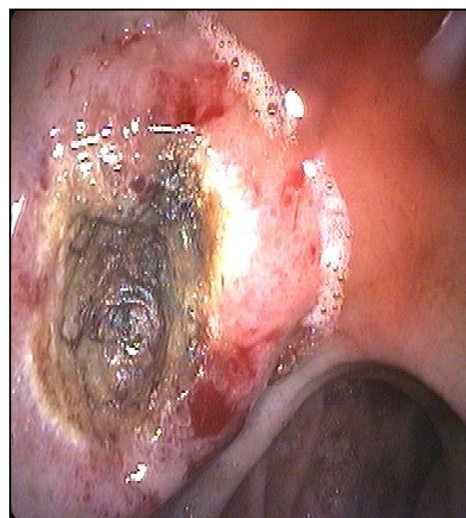
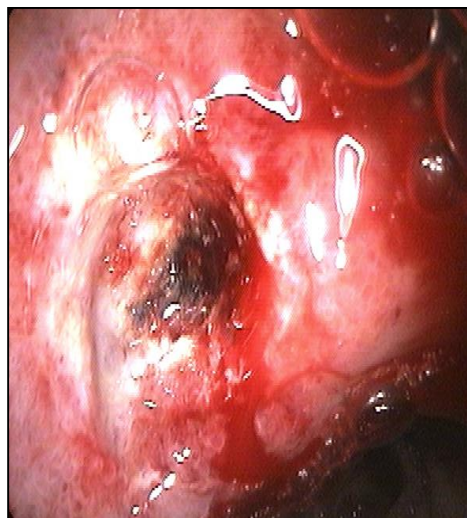


Gold



- Lower conductivity
- Higher resistance

Argon Plasma Coagulation



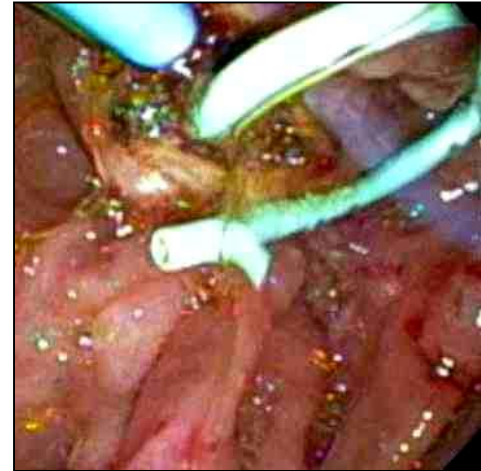
Advantages of APC

- Gas is nontoxic
- Noncontact
reduces rebleed
- Depth to tissue is
limited
- Treats multiple
lesions



APC Clinical Applications

- AVMs
- Watermelon stomach
- Post polypectomy bleeding
- Tumor bleed
- Post sphincterotomy bleed
- Peptic ulcer disease



APC Techniques

- Tailor power
- Calibrate the distance/ tip to tissue
- Avoid direct contact
- Avoid over insufflation
- Use isolated pulses and or painting effect
- Purge catheter
- Use double channel scope
- Use patient return electrode monitoring style
- Secure pad contact
- Check all connections
- Avoid inadvertent activation
- Follow monopolar guidelines

Endoscopic Doppler US

- Audible nonimaging probe
 - Differentiates between arterial and venous blood flow
- Used for acute peptic ulcer hemorrhage
- Recent FDA review
- Reduces risk of rebleed

Mechanical Therapy

- Endoscopic use of:
 - Clips
 - Balloons
 - Bands
- Differs according to:
 - Opening capacity
 - Rotation ability
 - Jaw width
 - Cost



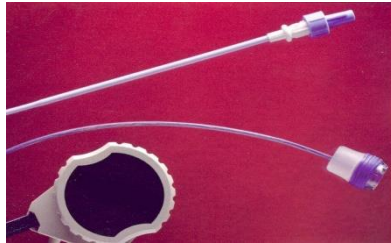
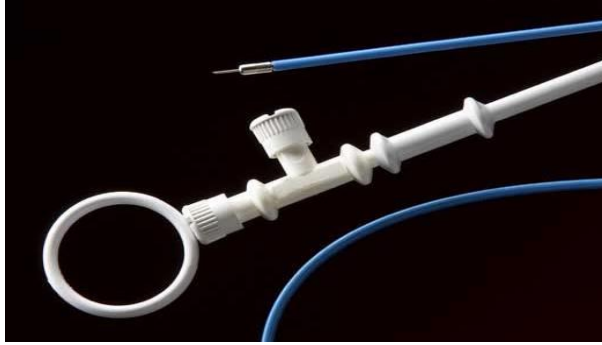
Clinical Assessment

- Initial assessment:
 - History
 - Physical examination
 - Laboratory tests (CBC, chemistry, liver panel)
- Information should guide decisions:
 - Triage
 - Resuscitation
 - Therapy
 - Diagnostic testing

Clinical Assessment

- Potential symptoms:
 - Dizziness
 - Confusion
 - Angina
 - Severe palpitations
 - Cold/clammy hands
- Physical examination:
 - Laboratory test results
 - Comorbidities

Summary



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