Thrombosis and Embolism

Hemostasis:-

- transient vasoconstriction
- 1° plug → platelets
- 2° plug → coagulation factors
- antithrombotic / clot stabilisation and resorption.

GP Ia IIa → Responsible for adhesion

GP IIb IIIa → Responsible for aggregation

Note: Granules – Dense/delta: ADP, Ca, Serotonin, Epinephrine
α-granules: fibrinogen, factor V & VIII, PDGF, TGF-β, fibronectin
Lysosomal vesicle.

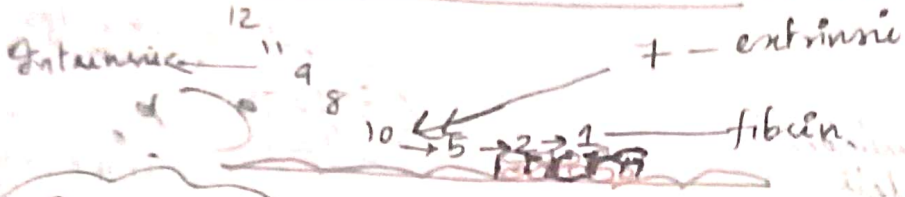
Disorders of platelet functions

- Bernard-Soulier Syndrome → GP Ia-IIa ✗ absent → autosomal recessive disorder
  - problem of bleeding
  - no adhesion
- Glanzmann Sx → Gp IIb IIIa → ✗ Aggregation
  - ↓ aut. recessive disorder
  - ↓ → Bleeding

→ defi Glanzmann Syndrome

→ defi- Bernaid Soulier syndrome

→ defi- von-willibrand factor



Thrombosis:- simply formation of a clot in the blood vessels without injury.

Defn Thrombosis is the formation of a blood clot (solid mass) inside a blood vessel or heart from the constituents of flowing blood, obstructing the flows of blood through the circulatory system.

Note: It is defined as the pathologic formation of intravascular fibrin-platelet thrombus.

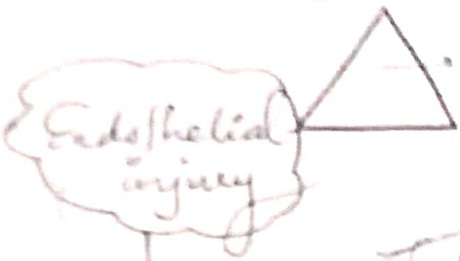
→ The mass itself is called a thrombus.

Why Thrombus is formed.

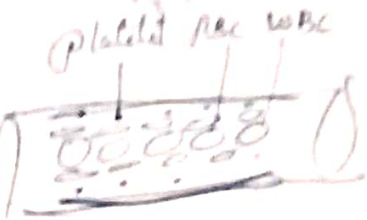
Pathophysiology – Virchow described three 1° events which predispose to thrombus formation (Virchow's triad)

- ✓ Endothelial injury
  - Activation of platelets
  - Activation of clotting system
- ✓ Altered blood flow
- ✓ Hypercoagulability of blood

Stasis of blood flow - Altered blood flow.



- Virchow's triad
- Hypercoagulability



Turbulance → arterial & cardiac thrombi

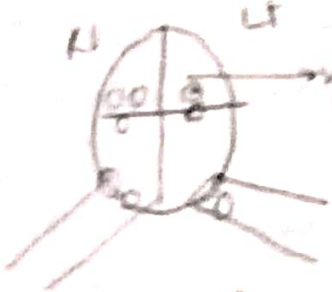
Stasis → venous thrombi

Hypercoagulable states → Hypercoagulability can be defined as any disorder of the blood that predisposes to thrombosis

2 types → Hereditary or 1°
→ acquired or secondary

→ acquired - Prolonged rest, obesity, smoking etc

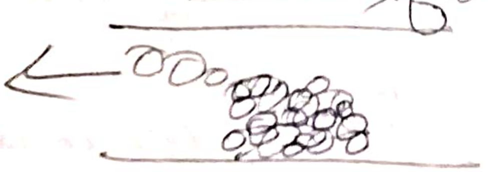
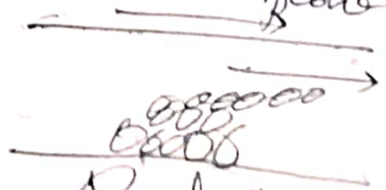
Types:
- Cardiac thrombi
- arterial " — white in color
- venous " — Red in colour

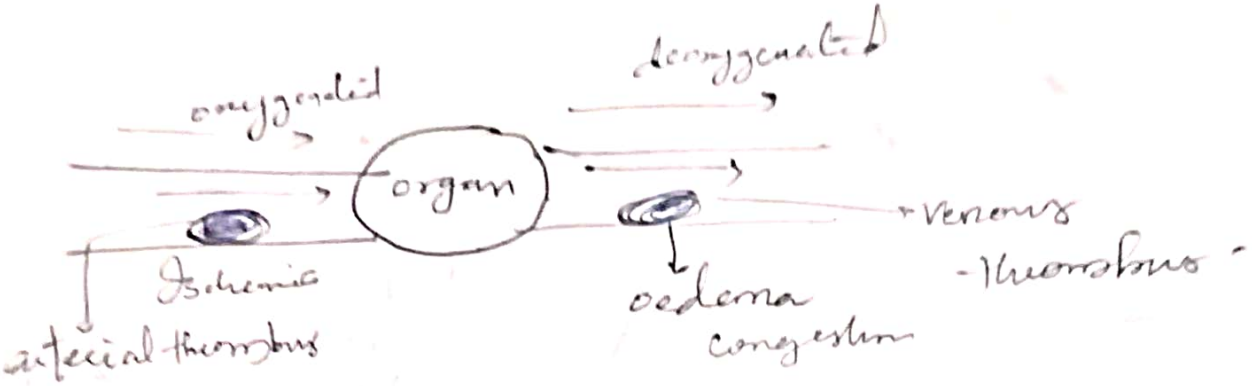


Gross: Arterial thrombi — white & smooth → firm & pale
- less platelet → more fibrin
- Lines of Zahn Present

Venous thrombi
Red & coarse
Lines of Zahn absent

↓
alternate dark and light lines inside the thrombus

Features	Arterial thrombus	Venous thrombus
Pathogenesis	→ endothelial injury / site of turbulence	Stasis of blood
Blood flow	→ Ass. with active b.f	→ sluggish b.f
Sites	→ Coronary, cerebral, femoral arteries CCF	→ Superficial & deep leg veins, Ovarian/periuterine veins
Propagation	→ grows in retrograde manner from point of attachment	→ grows in an antegrade manner from point of attachment
Gross	→ lines of Zahn present	→ lines of Zahn absent
	flow of blood 	flow 
M/s	Pale platelet layer alternating with dark red cell layer so also called as white thrombi	Red cells mixed with relatively less platelet so also called as red thrombi.
Occlusion	Incomplete lumen occlusion	Complete vessel occlusion
Complications	Ischemia & infarction of organs.	Embolism, edema



Fate of thrombus

Embolism:

→ Any freely moving mass 3, 2, 6 from thromboembolism

80–90% → solid → fat embolism

→ liquid — amniotic fluid embolism

→ gas — Air embolism.

Types of Emboli

A) Type
- B) Sterile or not → Bland
- → Septic

C) Source
- cardiac
- arterial
- venous
- lymphatic

D) Blood flow
- Paradoxical → venous to arterial & vice versa (eg. through patent ovale foramen)
- Retrograde.

Thromboembolism (TE)

Arterial TE — Ischaemic infarction

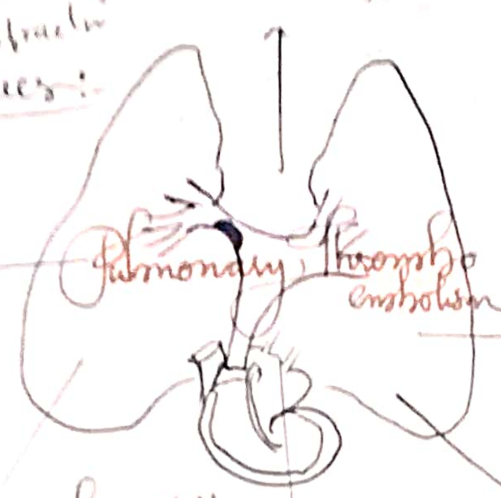
Venous (TE)

Acute corpulmonale

Consequences:

i.e. If the embolism is large & is impacted at the bifurcation of the main pulmonary artery (saddle embolus).

1) Sudden Death



pulmonary infarction

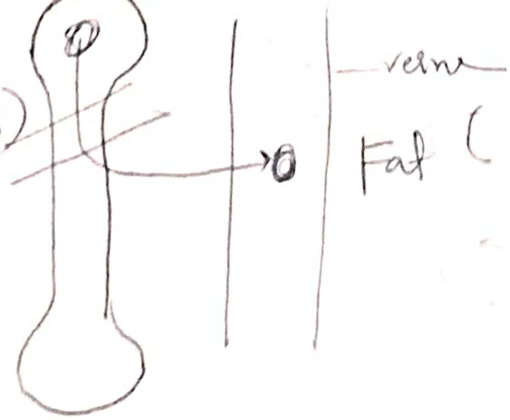
pulmonary hemorrhage

Resolve

Pul. hypertension, chronic cor pulmonale & pul. arteriosclerosis.

Fat embolism :-

Traumatic theory / (Mechanical theory)



Non-traumatic theory
(Emulsion instability theory)
lipid profile altered

- → extensive burns
- → Diabetes M
- → fatty liver
- → Pancreatitis
- Sickle cell anemia
- → Decompression sickness
- → Inflam^n^ of bones & soft tissues
- → extensive fat or oil introduced into the body
- → Hyperlipidaemia → Cardiopulmonary bypass surgery

→ Systemic fat embolism ; Brain
Kidney.
→ Dein – Pulmonary fat embolism.
Fat stain → Sudan black
Oil red O.

Gas Embolism

origin – operation on the head and neck trauma