Myocardial Infarction

Myo - Muscle

cardial - Heart tissue

Infarction — tissue death due to lack of blood flow.

Heart attack or acute myocardial Infarction

→ Death of Heart Muscle cell due to lack of blood flow a process called necrosis.

→ Coronary circulation — System that supply oxygenated blood to heart.

↓

system of small [DEPTH OF BIOLOGY]
artery and veins.

↓

when it is blocked ⟶ Heart Attack

↓

after long time Heart tissue dies

⇒ Almost all heart attack are results of endothelial cell dysfunction.

↓

relates to anything that Inflamed

↓ [DEPTH OF BIOLOGY]

the slippery Inner lining of artery.

↓

Tunica Intima

⇒ Tobacco → Toxin → floats in blood → damages the endothelial cel

↓

This damage now became the site of atherosclerosis

↓

A type of coronary artery disease.

endothelial cell (Tunica Intima)

damaged endothelial cell

⊙ One classic instant toxin found in tobacco which floats around in blood and damage these cells.

↓

That damage become a site for atherosclerosis (a type of coronary artery disease) where deposits of fats, cholestrol, Ca, Protein and WBC build up and start to block blood flow to the heart tissue

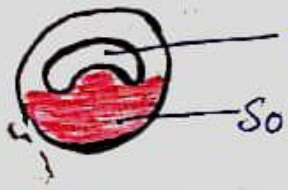
⇒ Heart attack happens when—

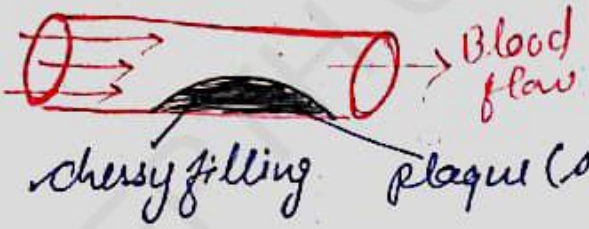
There is sudden complete blockage or occlusion of a coronary artery.

Here fat, cholestral, Protein, Ca, WBC build up.

↓

blocks and reduces blood flow causes tissue necrosis





. Since this plaque sits right in the lumen of the blood vessle

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and blood flow put constant pressure on this plaque

↓

and when this plaque gets broken

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Now the cheesy filling (mix of fat, cholesterol, platelets, RBC, WBC)

→ Thrombogenic means

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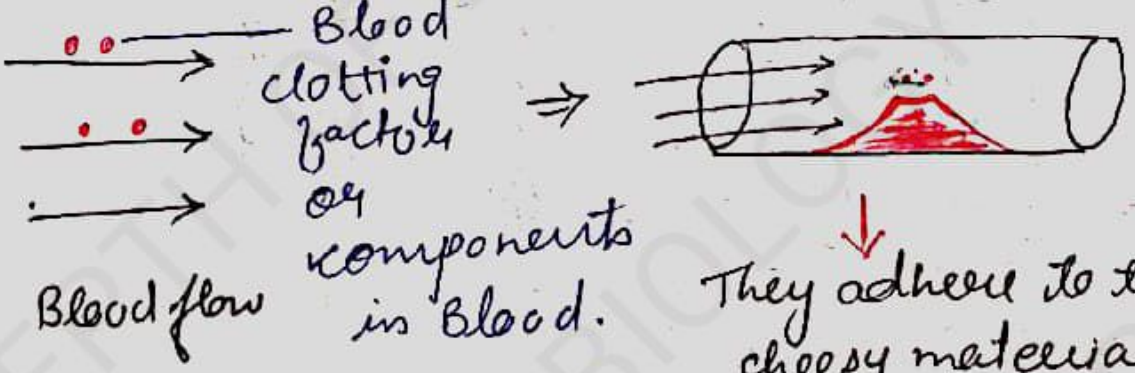
This means it tends to form clots very easily.



↓

They adhere to the exposed cheesy material

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The platellets also release chemicals that enhance the clotting process.

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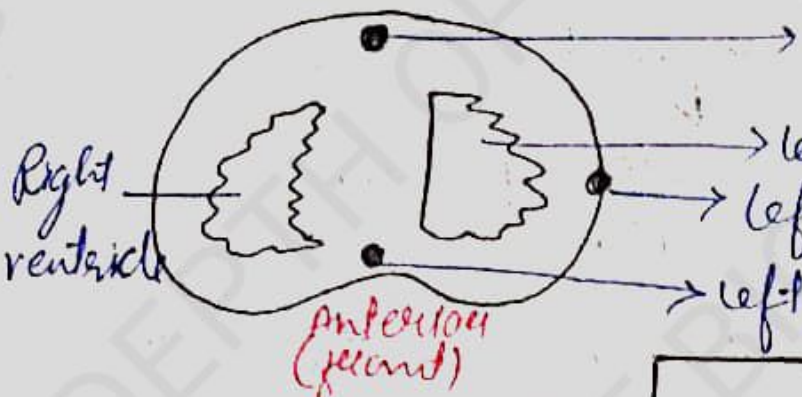
this happens supercfast within minutes

↓

and now Coronary Artery is fully occluded



LAD = RV + LV

if blocked.

supply blood to the anterior wall and septum of left ventricle.

* accounts for 40-50% cases.

- Right coronary Artery :- Blockage of this RCA which covers the posterior wall, septum and papillary muscle of the left ventricle account for about 30-40% of total cases.
- Left Circumflex artery → or LCx which supplys the lateral wall of the left ventricle — 15-20% cases.

⇒ Majority of these areas supply the left ventricle — Most heart attack involve the left ventricle.

lets say,

LAD (Left anterior descending) artery (gets blocked)

↓

and within about minute the muscle cells in this zone don't see enough oxygen and becomes Ischemic

* In starting it is reversible

↓

and the muscle layer's ability to contract is severely reduced.

↓

after 20-40 minutes damage starts becoming Irreversible and cells start to die and this zone changes to Zone of Necrosis or dead tissue.

↓

Once lost these cell never regrow.

↓

QUICKLY Identification and treatement is Important.

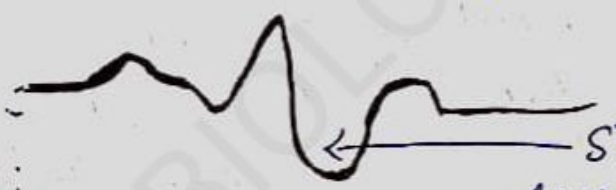
⇒ The first area affected is the Inner 3rd of myocardium

∵ it is farthest from coronary Artery and the last area to recieve blood.

* and its subject higher Pressure from Inside the heart (called subendocardial Infarction)

→ In ECG this point typically show an S.T segment depression.

or doesn't show S.T segment elevation



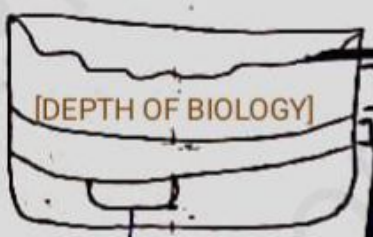
ST segment depression.

Sometime we call this

→ NSTEMI

↓

NON S-T elevation myocardial Infarction



→ Endocardium (Smooth Inner membrane).

→ Subendocardial Infarction

Coronary artery.

→ Transmural Infarction.

* Another cause of Subendocardial Infarction

→ severe Atherosclerosis

→ Hypotension

after 3-6 hours → Zone of Necrosis extend through the entire wall thickness called (Transmural Infarction)

⇓

shows ST segment elevation on ECG

⇓

That's why that are sometime called.

STEMI [DEPTH OF BIOLOGY]

Or

ST-elevation Myocardial Infarction.

NSTEMI	STEMI
↓	↓
• ST-depression	• ST elevation
• These are caused by Partial Infarction of the wall.	• Involves whole wall thickness

Symptoms :-

ⓐ - chest pain / Pressure —might radiate→ left arm or Jaw.

ⓑ sweating

ⓒ Nausea

ⓓ Fatigue

ⓔ Dyspnea [DEPTH OF BIOLOGY]

ⓕ reffered pain → Heart Nerve Irritated → This pain can be felt in the Jaw, shoulder, arm.

⇒ When Irreversible damage to heart cells.

↓

Their membranes becomes damaged and protein and enzyme inside escape, can enter the blood stream. [DEPTH OF BIOLOGY]

• Three keyones are → Teroponin I
→ Troponin T
→ CK-MB → which is a combination of Creatinine Kinase enzyme M and B

• Both Troponin I and T can be elevated in the blood

↓

within 2-4 hours after Infarction and usually pick around 48 hours and stay elevated per 7-10 days

→ CK-MB start rise after 2-4 hours after infarction and peaks around 24 hours and return to Normal after 48 hours

* A second Heart attack happens following 10% of MI

II Complications →

↳ major complication are arrythmias or Abnormal Heart-rythm. [DEPTH OF BIOLOGY]

• In this case disrupted signals.

Cardiogenic shock — can't pump enough blood] 0-24 hrs

Pericarditis — Inflamation of Pericardium] 1-3 days

Tissue affected invaded by neutrophills

and If we start Blood flow again by removing Blockage

→ Leads to Muscle Contraction

→ Heart all dying Dead

↓

means irreversibly damaged cell

Next couple weaks [DEPTH OF BIOLOGY]

Macrophage Invade the tissue and the healing Process begins with the formation of granulation tissue which is new C.T that's yellow and soft.

-HN·C

At this phase tissue's most at risk of Myocardial rupture after 2 weeks an several months

[DEPTH OF BIOLOGY]

remaining muscle grows / change shape. That ultimately continue to fail) → which can Lead to heart failure

Therapy → (Improve short and long term function.)

① Fibrinolytic Therapy (medications) → to Break down fibrin in blood clot.

② Angioplasty (Ballon used to open artery)

③ Percutaneous Coronary Intervention

* In this blood flow start again

other Medications → [DEPTH OF BIOLOGY]

° so to avoid cell death after blood flow start again we give.

① Antiplatellets → aspirin
② Anticoagulant → Heparin
③ Nitrates → relax coronary artery.
④ Beta blockers → slows heart rate

For long term → Improves diet and quit smoking.

If O_2 influx takes place after long time [DEPTH OF BIOLOGY]

Here, ROS ↑↑↑ (reactive O_2 → leads to Damage cell.