⚙️ MECHANICAL HEMOLYSIS

Definition:

Hemolysis caused by abnormal mechanical forces acting on red blood cells (RBCs), leading to their physical destruction. 🩸

🧩 MAJOR SETTINGS OF MECHANICAL HEMOLYSIS

1️⃣ Cardiac / Prosthetic Valve Hemolysis 💔

- Turbulence generated by dysfunctional or artificial heart valves
- Red cells are sheared ("blender effect")
- Can lead to clinically significant hemolytic anemia

2️⃣ Repetitive Physical Trauma 🏃‍♂️🥁

- Hemolysis from repeated physical pounding
- Examples:
  - Marathon runners ("foot-strike hemolysis") 🏃
  - Martial arts (karate chopping) 🥋
  - Bongo drumming 🥁
- Usually mild and self-limited

3️⃣ Microangiopathic Hemolytic Anemia (MAHA) 🔬

- Occurs when small vessels are narrowed or obstructed
- RBCs are mechanically damaged while passing through vessels
- Clinical significance: often signals a serious underlying disorder

Common Causes of MAHA:

Condition	Mechanism

Disseminated intravascular coagulation (DIC)	Fibrin deposition narrows vessels
Severe hypertension	High shear stress in microvasculature
Thrombotic thrombocytopenic purpura (TTP)	Platelet-rich thrombi in small vessels
Hemolytic uremic syndrome (HUS)	Endothelial damage & microthrombi
Disseminated intravascular cancer	Tumor cells obstruct small vessels

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🩸 Morphology — Peripheral Blood Smear

Mechanical destruction produces fragmented RBCs called schistocytes. Key forms include:

- Burr cells (echinocytes)
- Helmet cells (bite-like appearance)

- Triangle cells

Note: The presence of schistocytes is a diagnostic clue for MAHA 🔍

🧠 Clinical Relevance

- Microangiopathic hemolysis itself may not be severe
- Serves as a marker for underlying critical conditions, e.g., DIC, TTP, HUS
- Must investigate cause of microvascular damage for proper management ⚠️

📌 Quick Exam Flowchart — Mechanical Hemolysis

Abnormal mechanical forces → RBCs physically damaged → Hemolysis

Pathways:

- Heart valves → turbulence → RBC shearing

- Repetitive trauma → pounding → mild hemolysis
- Microvasculature obstruction → vessel narrowing → schistocytes → MAHA → underlying disease (DIC/TTP/HUS/cancer)

-> The End <-