Stroke (Cerebrovascular Accident): Clinical Breakdown

Pathophysiology, Ischemic vs. Hemorrhagic Classifications, Acute Clinical Presentation (FAST), and Management Principles

A **Stroke** (Cerebrovascular Accident, CVA) occurs when blood flow to a region of the brain is interrupted or reduced, depriving brain tissue of oxygen and vital nutrients. Within minutes, brain cells begin to die (cerebral infarction). Stroke represents a neurological medical emergency requiring immediate evaluation and intervention.

> **Core Clinical Principle:** Strokes are categorized primarily into ischemic strokes (caused by thrombotic or embolic vascular occlusion) and hemorrhagic strokes (caused by intracranial or subarachnoid vessel rupture), requiring completely different acute medical treatments.

1. Stroke Classifications: Ischemic vs. Hemorrhagic

Distinguishing between stroke subtypes via neuroimaging (CT or MRI) dictates acute emergency management protocols.

Stroke Subtype	Prevalence & Mechanism	Primary Acute Intervention
Ischemic Stroke	Accounts for ~85% of cases; caused by a thrombus or embolus blocking cerebral blood flow.	Thrombolytic therapy (IV alteplase or tenecteplase) within therapeutic window and/or endovascular thrombectomy.
Intracerebral Hemorrhage	Accounts for ~10% of cases; bleeding directly into brain parenchyma due to vessel rupture (often from hypertension).	Blood pressure stabilization, reversal of anticoagulation, and potential neurosurgical intervention.
Subarachnoid Hemorrhage	Accounts for ~5% of cases; bleeding into the subarachnoid space, frequently caused by a ruptured aneurysm.	Aneurysm clipping or coiling, management of cerebral vasospasm, and intensive care monitoring.

2. Pathophysiology & The Ischemic Core

Understanding cellular injury dynamics explains why rapid restoration of blood flow is critical.

- **The Ischemic Core & Penumbra:** In ischemic stroke, the central core experiences severe ischemia and rapid cell death. Surrounding this core is the ischemic penumbra—tissue that is functionally impaired but electrically salvageable if reperfused promptly.
- **Excitotoxicity & Oxidative Stress:** Energy failure causes membrane depolarization, excessive glutamate release, calcium influx, and free radical generation, which collectively trigger delayed neuronal apoptosis.

3. Clinical Presentation (FAST) & Management Principles

Recognizing acute stroke warning signs and initiating rapid secondary prevention prevents recurrence and optimizes recovery.

- **FAST Warning Signs:** Face drooping, Arm weakness, Speech difficulty, and Time to call emergency services immediately. Additional signs include sudden confusion, severe headache, and vision loss.
- **Secondary Prevention:** Focuses on strict blood pressure control, antiplatelet or anticoagulant therapy, statins for dyslipidemia, glycemic management, and neurorehabilitation.