Stroke

Cerebrovascular accident (CVA) or **Stroke** is a medical condition that is happened due to poor blood flow to a specific part of the brain resulting in cell death. Stroke can be either ischemic or hemorrhagic.

Stroke involves abrupt onset of ***focal neurologic deficit*** that lasts at least 24 hours and is presumed to be of vascular origin.

About 85% of strokes are ischemic and 15% are due to hemorrhages. However, most stroke burden worldwide is due to hemorrhagic stroke.

Ischemic stroke

Ischemic stroke is characterized by the sudden loss of blood circulation to an area of the brain, resulting in a corresponding loss of neurologic function.

Ischemic strokes are due either to local thrombus formation or emboli occluding a cerebral artery. Cerebral atherosclerosis is a cause in most cases. Emboli arise either from intra- or extracranial arteries.

Thrombus formation and embolism result in arterial occlusion, decreasing cerebral blood flow and causing ischemia and ultimately infarction distal to the occlusion.

Transient ischemic attacks

Transient ischemic attack (TIA) is defined as "a transient episode of neurologic dysfunction caused by focal brain, spinal cord or retinal ischemia without acute infarction."
Transient ischemic attacks are focal ischemic neurologic deficits lasting less than 24 hours and usually less than 30 minutes.

Hemorrhagic stroke

Hemorrhagic stroke can result in abrupt increased intracranial pressure leading to herniation and death. Hemorrhagic strokes include:

Subarachnoid hemorrhage (SAH)	SAH may result from trauma or rupture of an intracranial aneurysm or arteriovenous malformation (AVM).
Intracerebral hemorrhage	Intracerebral hemorrhage occurs when a ruptured blood vessel within the brain causes a hematoma.
Subdural hematomas	Subdural hematomas are usually caused by trauma.

Clinical presentation

Patients may be unable to provide a reliable history because of neurologic deficits. Symptoms include unilateral weakness, inability to speak, loss of vision, vertigo, or falling. Symptoms alone are not specific enough to distinguish ischemic from hemorrhagic stroke. However, generalized symptoms, including nausea, vomiting, and headache, as well as an altered level of consciousness, may indicate increased intracranial pressure and are more common with hemorrhagic strokes and large ischemic strokes.

Neurologic deficits on physical examination depend on the brain area involved. Hemi- or monoparesis and hemisensory deficits are common. Quadriparesis is rare.

Patients with posterior circulation involvement may have vertigo and diplopia. Anterior circulation strokes commonly result in aphasia. Patients may experience dysarthria, visual field defects, and altered levels of consciousness.

Ischemic stroke is not usually painful, but headache may occur in hemorrhagic stroke. Seizures are more common in hemorrhagic stroke than in the ischemic stroke. Seizures occur in up to 28% of hemorrhagic strokes.

Focal neurologic deficit

A focal neurologic deficit (or a focal neurologic sign) is a problem with nerve, spinal cord, or brain function. It affects a specific location, such as the left side of the face, right arm, or even a small area such as the tongue. Speech, vision, and hearing problems are also considered focal neurological deficits.

Diagnosis

- Laboratory tests for hypercoagulable states
- Coagulation inhibitors (protein C, protein S, and antithrombin III)
- Antiphospholipid antibodies
- Computed tomography (CT)
- Magnetic resonance imaging (MRI)
- Others: carotid doppler (CD), electrocardiogram (ECG), transthoracic echocardiogram (TTE), and transcranial doppler (TCD).

Treatment of ischemic stroke

Ischemic stroke therapies include the following:

- Surgical decompression or mechanical thrombectomy are sometimes necessary.
- Reperfusion therapy
- Thrombolytic therapy (i.e. alteplase, within 4.5 hours of symptom onset)
- Aspirin (started between 24 and 48 hours after completion of alteplase)
- Short-acting parenteral antihypertensive agents (e.g., labetalol, nicardipine, nitroprusside) are preferred.

Stroke prevention

Primary prevention of ischemic stroke:

Primary stroke prevention refers to the treatment of individuals with no previous history of stroke. Measures may include use of the following:

Antiplatelets	• Aspirin, clopidogrel, dipyridamole • Extended-release dipyridamole + aspirin • Ticlopidine
Antidyslipidemic agents	Statins
Lifestyle interventions	smoking cessation, avoidance of alcohol
	Exercise

Hyperthermia in acute stroke is potentially harmful and should be treated by paracetamol. Agents with potential bleeding risk, such as NSAIDs, should be avoided, if possible.

Secondary prevention of ischemic stroke:

Secondary prevention refers to the treatment of individuals who have already had a stroke. Measures may include use of the following:

Antiplatelets	aspirin, clopidogrel, extended-release dipyridamole + aspirin	
Anticoagulants	Heparins	LMWH or UFH
	Oral anticoagulants	warfarin, dabigatran, apixaban, rivaroxaban, edoxaban
Treatment of elevated blood pressure		
Antidyslipidemic agents		Statins
Lifestyle interventions		smoking cessation, avoidance of alcohol

Management of seizure

While seizures associated with stroke are relatively uncommon, recurrent seizures may be life threatening. Benzodiazepines, typically diazepam and lorazepam, are the first-line drugs for ongoing seizures.

Treatment of hemorrhage stroke

Medications used in the treatment of acute stroke include the following:

- Anticonvulsants are used to prevent seizure recurrence. Benzodiazepines, (e.g., lorazepam and diazepam) are commonly used to control seizure activity and recurrence. They are often used acutely in combination with phenytoin or fosphenytoin.
- Antihypertensive agents are used to reduce BP and other risk factors of heart disease. Short-acting parenteral agents (e.g., labetalol, nicardipine, nitroprusside) are preferred.
- Mannitol is an osmotic diuretic which is used to decrease intracranial pressure in the subarachnoid space.
- Surgical intervention may be required to evacuate the hematoma.

Other agents:

- Nimodipine is indicated for ***subarachnoid hemorrhage***.
- I.V. Phytonadione (vitamin K1) is recommended for warfarin-associated intracranial hemorrhage. Menadione (vitamin K3) is not effective for this purpose.
- Fresh frozen plasma (FFP) contains the blood's soluble clotting factors. Platelets play a role in blood coagulation. These agents are indicated for the correction of abnormal hemostatic parameters.
- Prothrombin complex concentrate (PCC) is a mixture of vitamin K-dependent clotting factors found in normal plasma. It has an advantage over fresh frozen plasma alone because it results in faster normalization of INR and less chance of fluid overload. PCC is usually reserved for situations in which volume overload is a concern.

Palliative care

Palliative care is an important component of comprehensive stroke care. Some patients with severe strokes die during the initial hospitalization, others will be severely disabled and palliative care can begin to address the patient's and family's short- and long-term needs.

Some patients have advance directives providing instructions for medical providers in the event of severe medical illness or injury.