

Acute Management of Ischemic Stroke

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Fathima Hanan

Goals :

Immediate goals include -

minimizing brain injury,

treating medical complications

moving toward uncovering the pathophysiologic basis of the patient's symptoms.

The subacute and long-term assessment and management of patients -

physical therapy

testing to determine the precise etiology of the event so as to prevent recurrence.

Initial Assessment :

Airway, breathing and circulation —

Assessing vital signs and ensure stabilization of airway, breathing, and circulation.

Patients with decreased consciousness or bulbar dysfunction may be unable to protect their airway

Intubation may be necessary to restore adequate ventilation and to protect the airway from aspiration.

Patients with adequate ventilation should have the oxygen saturation monitored.

Patients who are hypoxic should receive supplemental oxygen to maintain oxygen saturation >94 percent

**Hemorrhage, Vertebrobasilar ischemia,
or Bihemispheric ischemia**

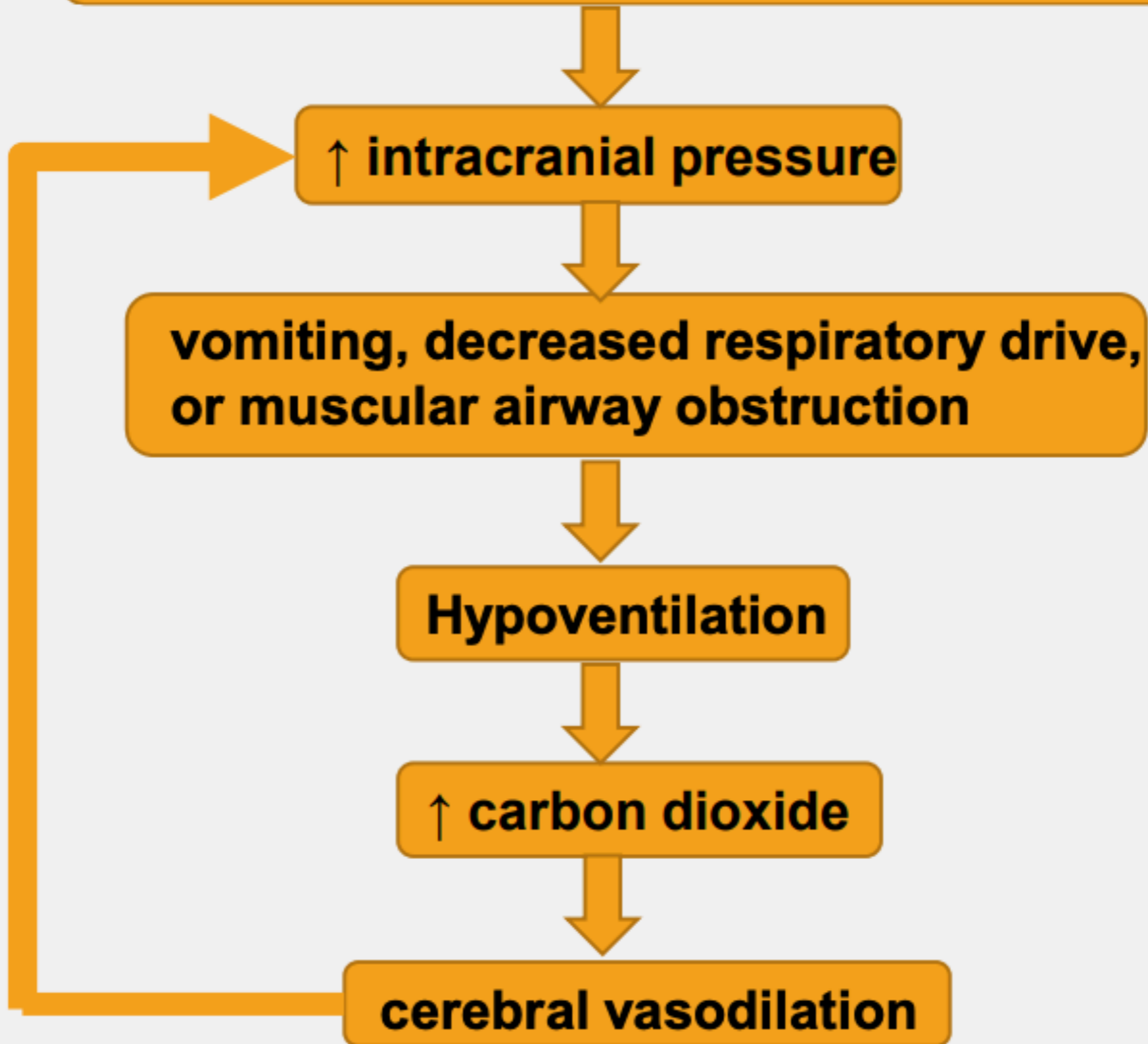
↑ intracranial pressure

**vomiting, decreased respiratory drive,
or muscular airway obstruction**

Hypoventilation

↑ carbon dioxide

cerebral vasodilation



History and Physical Examination:

Establish the time of ischemic stroke symptom onset

Critical because it is the main determinant of eligibility for treatment with intravenous and endovascular thrombectomy

It is important to ask the patient, relative, or any reliable informant whether the patient takes insulin or oral hypoglycemic agents, has a history of epilepsy(rule out Todd's paralysis), drug overdose(amphetamine) or abuse(cocaine), or recent trauma

The three most predictive examination findings for the diagnosis of acute stroke are **facial paresis, arm drift/weakness, and abnormal speech** (a combination of dysarthria and language items derived from the NIHSS)

National Institutes of Health stroke scale score

1a. Level of consciousness	0 = Alert; keenly responsive 1 = Not alert, but arousable by minor stimulation 2 = Not alert; requires repeated stimulation 3 = Unresponsive or responds only with reflex
1b. Level of consciousness questions: What is the month? What is your age?	0 = Both answers correct 1 = Answers 1 question correctly 2 = Answers 2 questions correctly
1c. Level of consciousness commands: Open and close your eyes Grip and release your hand	0 = Performs both tasks correctly 1 = Performs 1 task correctly 2 = Performs neither task correctly
2. Best gaze	0 = Normal 1 = Partial gaze palsy 2 = Forced deviation
3. Visual	0 = No visual loss 1 = Partial hemianopia 2 = Complete hemianopia 3 = Bilateral hemianopia
4. Facial palsy	0 = Normal symmetric movements 1 = Minor paralysis 2 = Partial paralysis 3 = Complete paralysis of 1 or both sides
5. Motor arm 5a. Left arm 5b. Right arm	0 = No drift 1 = Drift 2 = Some effort against gravity 3 = No effort against gravity; limb falls 4 = No movement
6. Motor leg 6a. Left leg 6b. Right leg	0 = No drift 1 = Drift 2 = Some effort against gravity 3 = No effort against gravity 4 = No movement
7. Limb ataxia	0 = Absent 1 = Present in 1 limb 2 = Present in 2 limbs
8. Sensory	0 = Normal; no sensory loss 1 = Mild-to-moderate sensory loss 2 = Severe to total sensory loss
9. Best language	0 = No aphasia; normal 1 = Mild to moderate aphasia 2 = Severe aphasia 3 = Mute, global aphasia
10. Dysarthria	0 = Normal 1 = Mild to moderate dysarthria 2 = Severe dysarthria
11. Extinction and inattention	0 = No abnormality 1 = Visual, tactile, auditory, spatial, or personal inattention 2 = Profound hemi-inattention or extinction

Total score = 0–42

Immediate Work Up :

- Non contrast brain CT or MRI
- EKG
- Finger stick blood glucose
- CBC including platelets
- Troponin
- PT/INR and aPTT
- Ecarin clotting time, thrombin time, or appropriate direct factor Xa activity assay if known or suspected that the patient is taking direct thrombin inhibitor or direct factor Xa inhibitor and is otherwise a candidate for intravenous thrombolytic therapy

CT Brain

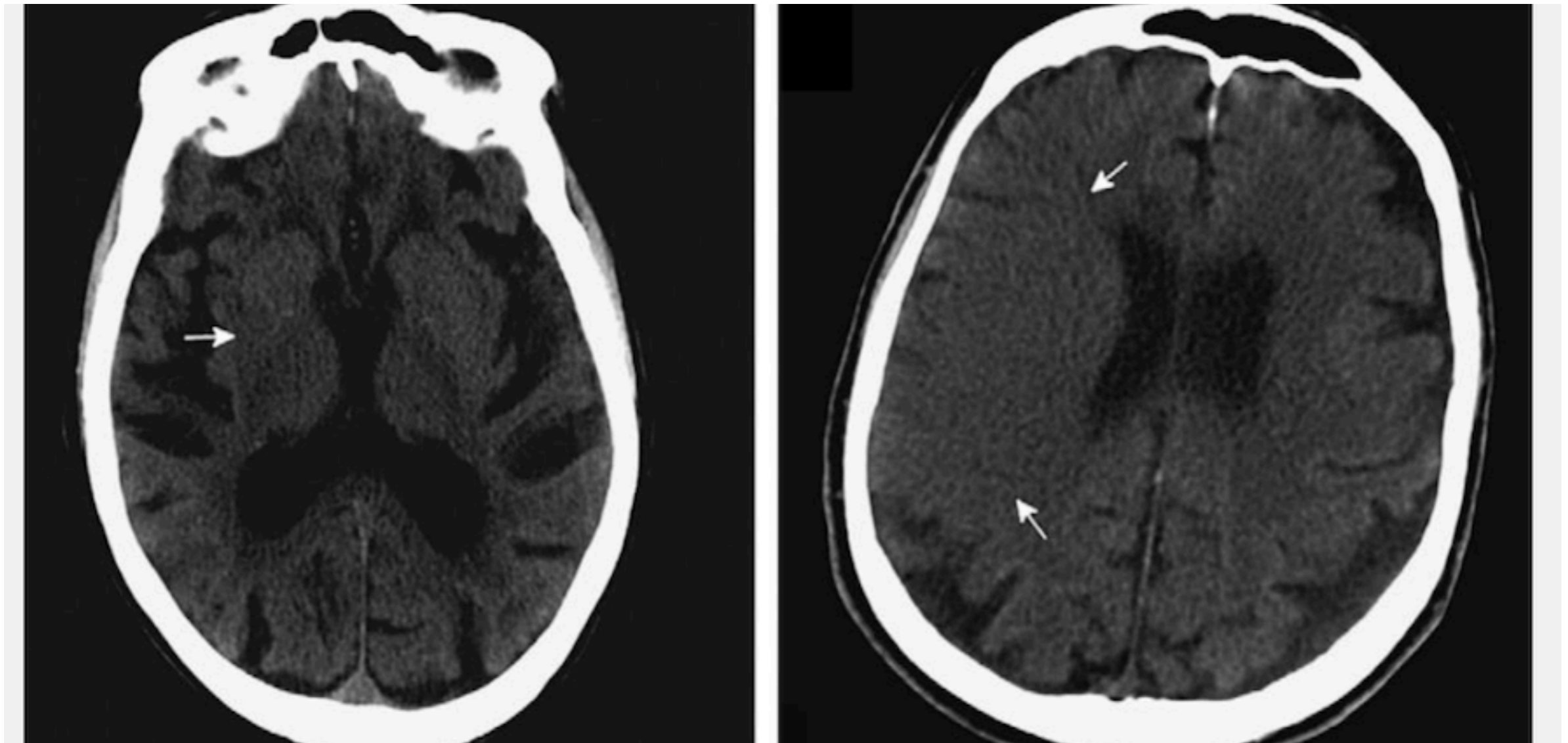
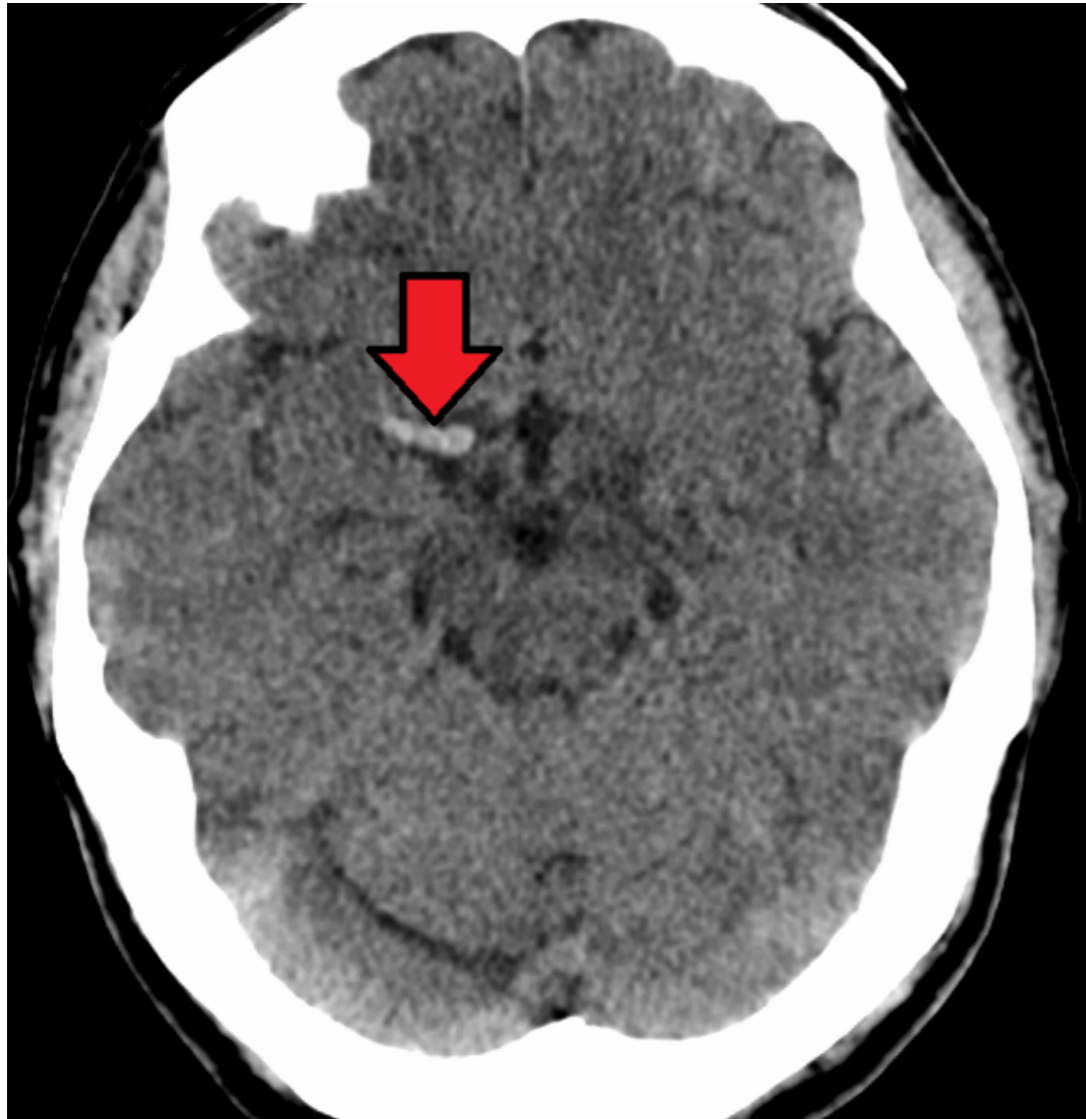


Image Left - Loss of grey white differentiation
Right - Cerebral Swelling



Hyper dense MCA sign- focal hyper density in the MCA in non contrast CT

Cardiac Evaluation :

Electrocardiography (ECG) - screen for atrial fibrillation & concomitant acute cardiac ischemia.

Stroke alone can be associated with ECG changes. The sympathetic response to stroke can lead to demand-induced myocardial ischemia.

Blood Glucose :

Hypoglycemia —

Hypoglycemia can cause focal neurologic deficits mimicking stroke, and severe hypoglycemia alone can cause neuronal injury. It is important to check the blood sugar and rapidly correct low serum glucose (<60 mg/d)

Hyperglycemia -

AHA/ASA guidelines for acute ischemic stroke recommend treatment for hyperglycemia to achieve serum glucose concentrations in the range of 140 to 180 mg/dL

Blood Pressure Management:

1. Before thrombolytic therapy is started, treatment is recommended so that SBP is ≤ 185 mmHg and DBP is ≤ 110 mmHg.

2. For patients who are not treated with thrombolytic therapy, blood pressure should not be treated acutely unless the

- hypertension is extreme (SBP > 220 mmHg or DBP > 120 mmHg)
- the patient has active ischemic coronary disease, heart failure, aortic dissection, hypertensive encephalopathy, or pre-eclampsia/eclampsia

3. BP $> 140/90$ mmHg and neurologically stable

reasonable to start or restart antihypertensive medications during hospitalization can be done as early as 24 to 48 hours after stroke onset for most hospitalized patients, with the goal of gradually controlling hypertension within a few days to a week

When treatment is indicated, **cautious lowering of blood pressure by approximately 15 percent** during the first 24 hours after stroke onset is suggested.

BP Medications :

Consensus guidelines suggest intravenous **labetalol, nicardipine, and clevidipine** as first-line antihypertensive agents if pharmacologic therapy is necessary in the acute phase, since they allow rapid and safe titration to the goal blood pressure

IV Alteplase:

Inclusion Criteria :

Clinical diagnosis of ischemic stroke causing measurable neurologic deficit

Onset of symptoms <4.5 hours before beginning treatment; if the exact time of stroke onset is not known, it is defined as the last time the patient was known to be normal or at neurologic baseline

Age \geq 18 years

Exclusion Criteria :

Patient History

Ischemic stroke or severe head trauma in the previous three months

Previous intracranial hemorrhage

Intracranial neoplasm

Gastrointestinal malignancy

Gastrointestinal hemorrhage in the previous 21 days

Intracranial or intraspinal surgery within the prior three months

Clinical

Symptoms suggestive of subarachnoid hemorrhage

Persistent blood pressure elevation (systolic ≥ 185 mmHg or diastolic ≥ 110 mmHg)

Active internal bleeding

Presentation consistent with infective endocarditis

Stroke known or suspected to be associated with aortic arch dissection

Acute bleeding diathesis

Hematologic

Platelet count $<100,000/\text{mm}^3$

Current anticoagulant use with an INR >1.7 or PT >15 seconds or aPTT >40 seconds

Therapeutic doses of low molecular weight heparin received within 24 hours (eg, to treat VTE); this exclusion does not apply to prophylactic doses (eg, to prevent VTE)

Current use (ie, last dose within 48 hours in a patient with normal renal function) of a direct thrombin inhibitor or direct factor Xa inhibitor with evidence of anticoagulant effect by laboratory tests such as aPTT, INR or appropriate factor Xa activity assays

Head CT

Evidence of hemorrhage

Extensive regions of obvious hypodensity consistent with irreversible injury

Mechanical Thrombectomy

Stroke d/t anterior circulation LAO

<6 hours - MT indicated if

- Treatment can be started within 6 hours of symptom onset
- Neuroimaging with small infarct core and no haemorrhage
- Persistent potentially disabling neurologic deficit

6- 24 hours

Software for automated image analysis and infarct volume determination available?

If yes, MT indicated if treatment can be started within 6-24 hours last known to be well & there is either

- Clinical core mismatch as defined by the DAWN trial

OR

- An imaging target mismatch as defined by the DEFUSE 3 trial

DAWN trial eligibility require all of the following:

- Treatment (femoral puncture) can start within 6 to 24 hours of time last known to be well
- Failed or contraindicated for IV tPA
- A deficit on the NIHSS of ≥ 10 points
- No significant prestroke disability: Baseline mRS score ≤ 1
- Baseline infarct involving $< 1/3$ of MCA territory
- Intracranial occlusion of the ICA or M1 segment of the MCA
- A clinical-core mismatch according to age:
 - Age ≥ 80 years: NIHSS ≥ 10 and infarct volume < 21 mL
 - Age < 80 years: NIHSS 10 to 19 and infarct volume < 31 mL
 - Age < 80 years: NIHSS ≥ 20 and infarct volume < 51 mL

DEFUSE 3 trial eligibility require all of the following:

- Treatment (femoral puncture) can start within 6 to 16 hours of time last known to be well
- A deficit on the NIHSS of ≥ 6 points
- Only slight or no prestroke disability: Baseline mRS score ≤ 2
- Occlusion of the cervical or intracranial ICA (with or without tandem MCA lesions) or the M1 segment of the MCA
- Age 18 to 90 years
- A target mismatch profile on CT perfusion or MRI defined as:
 - An ischemic core volume < 70 mL, and
 - A mismatch ratio (the volume of the perfusion lesion divided by the volume of the ischemic core) > 1.8 , and
 - A mismatch volume (volume of perfusion lesion minus the volume of the ischemic core) > 15 mL

Mechanical Thrombectomy

Stroke d/t anterior circulation LAO

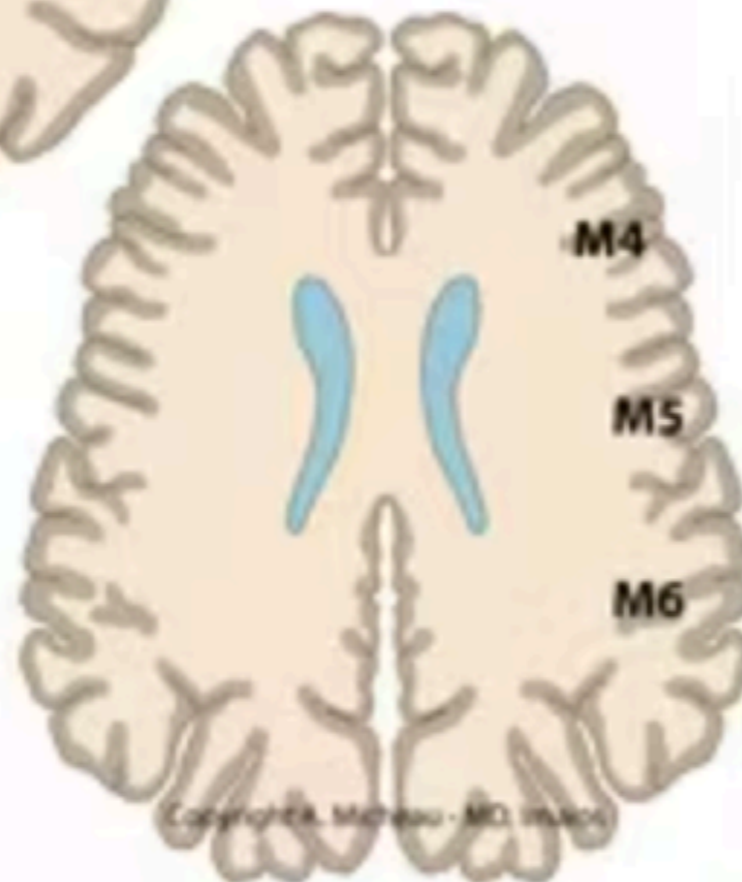
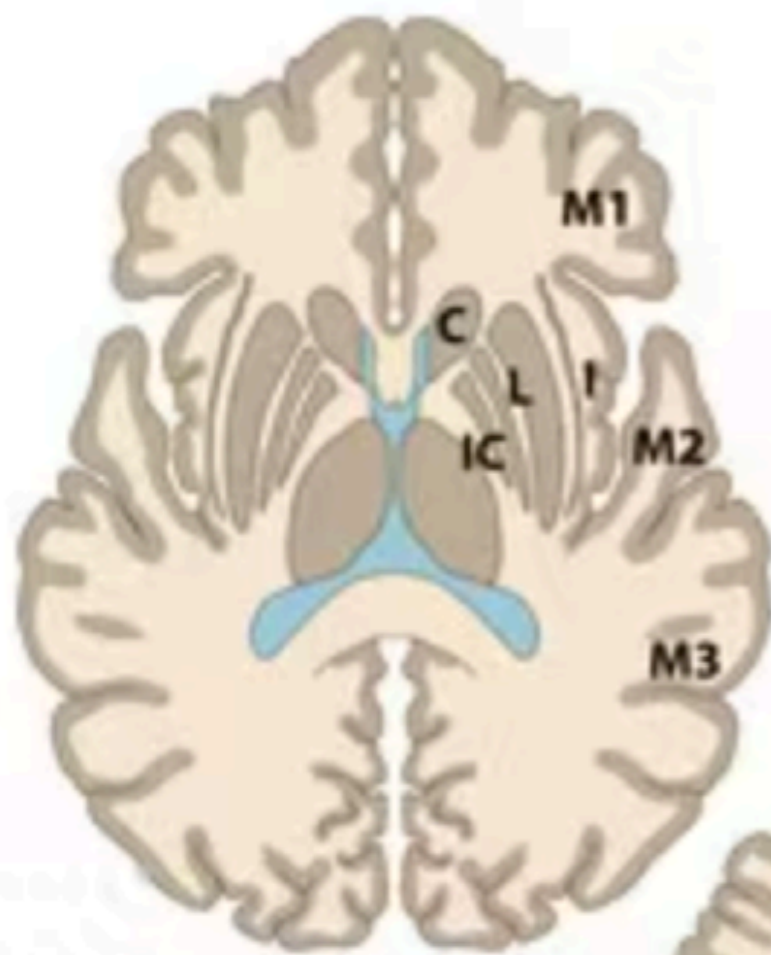
6- 24 hours

Software for automated image analysis and infarct volume determination available?

If no, MT is indicated

- If treatment can be started within the last 6-24 hours known to be well &
- There is clinical - ASPECTS mismatch (eg NIHSS>10 and ASPECTS >6).

ASPECTS Score



- C- Caudate
- I- Insular ribbon
- IC- Internal Capsule
- L- Lentiform nucleus
- M1- Anterior MCA cortex
- M2- MCA cortex lateral to the insular ribbon
- M3- Posterior MCA cortex
- M4- Anterior MCA superior territory
- M5- Lateral MCA superior territory
- M6- Posterior MCA superior territory

ASPECTS Score = /10

Alberta Stroke Program Early CT score (ASPECTS) is a 10-point quantitative topographic CT scan.

To compute the ASPECTS, 1 point is subtracted from 10 for any evidence of early ischemic change for each of the defined regions.

Posterior Circulation LAO

MT may be a treatment option for patients with acute ischemic stroke caused by occlusion of the basilar artery, vertebral arteries, or posterior cerebral arteries at expert stroke centers, but benefit is uncertain

Antithrombotic Therapy:

Non-cardioembolic AIS : antiplatelet agents rather than oral anticoagulation → reduce the risk of recurrent stroke and other cardiovascular events.

AIS in the setting of atrial fibrillation: oral anticoagulation within 4 to 14 days after the onset of neurological symptoms.

Deep Vein Thrombosis

Prophylaxis with **thigh-length intermittent pneumatic compression (IPC)**, starting at admission, for patients **within 72 hours** of acute ischemic stroke onset who have restricted mobility

Pharmacologic VTE prophylaxis for select patients within 48 hours of acute ischemic stroke onset who have restricted mobility.

Options include subcutaneous LMWH (eg, [enoxaparin](#) 40 mg daily or [dalteparin](#) 5000 units once daily)

or subcutaneous low-dose [UFH](#) (5000 units BID to TID daily).

Statin Therapy :

Among patients already taking statins at the time of onset of ischemic stroke continue statin

- High-intensity statin therapy : age ≤ 75 years + clinical ASCVD (Atherosclerotic cardiovascular disease) unless contraindicated.
- Clinical ASCVD : acute coronary syndromes, history of MI, stable or unstable angina, coronary or other arterial revascularization, stroke, TIA, or peripheral arterial disease presumed to be of atherosclerotic origin

Lifestyle Modifications:

smoking cessation

exercise

weight reduction for patients with obesity

Mediterranean style diet

Thank You