**STROKE**

**DESIRED TREATMENT OUTCOMES**

* The short-term goals of treatment for acute ischemic stroke include reducing secondary brain damage by re-establishing and maintaining adequate perfusion to marginally ischemic areas of the brain and to protect these areas from the effects of ischemia (i.e., neuroprotection).
* The long-term goals oftreatment include prevention of a recurrent stroke through reduction and modification of risk factors and by use of appropriate treatments.
* The short-term goals for the treatment of hemorrhagic stroke include rapid neurointensive care treatment to maintain adequate oxygenation, breathing, and circulation. Management of increased intracranial pressure and blood pressure (BP) are important in the acute setting.
* Long-term management includes prevention of complications and prevention of a recurrent bleed and delayed cerebral ischemia. Prevention of long-term disability and death related to them stroke are important regardless of the type of stroke.

**TREATMENT OF ACUTE ISCHEMIC STROKE**

1. Tissue oxygenation should be maintained acutely
2. Volume status and electrolytes should be corrected.
3. If required, the blood glucose should be corrected, as both hyperglycemia and hypoglycemia may worsen brain ischemia.
4. If the patient is febrile, treat with acetaminophen, as fever is associated with brain ischemia and increased morbidity and mortality after stroke.
5. Intravenous (IV) and subcutaneous heparin will significantly decrease the risk of developing deep vein thrombosis (DVT) post-stroke .Heparin 5000 units subcutaneously every 12 hours should be given for DVT prophylaxis in patients who are not candidates for intravenous alteplase.

Low-molecular-weight heparins are not recommended in the treatment of acute ischemic stroke.

1. Blood pressure should be optimized; however, hypertension should generally not be treated initially in acute stroke patients, as this may cause decreased blood flow in ischemic areas, potentially increasing the infarction size.
2. **Thrombolytic Therapy**

**Systemic Thrombolytic Therapy:**

The current American Stroke Association guidelines include alteplase as the only Food and Drug Administration (FDA) approved acute treatment for ischemic stroke and strongly encourage early diagnosis and treatment of appropriate patients.

Withhold antiplatelet / antithrombotic medication until CT scan excludes haemorrhage.

* If the patient presents **within 4.5 hours of onset** of focal symptoms, thrombolysis may be appropriate.
* If patient presents > 4.5 hours, follow local protocol for stroke admissions.

A dose of 0.9 mg/kg (maximum 90 mg) is recommended; the first 10% is given as an IV bolus and the remainder is infused over 1 hour.

Antiplatelet agents, anticoagulants, and invasive procedures such as the insertion of a central line or the placement of a nasogastric tube should be avoided for 24 hours after the infusion of alteplase to prevent bleeding complications. Bladder catheterization should also be avoided for 30 minutes post-infusion.

**Streptokinase:**

Streptokinase is not indicated for use in acute ischemic stroke treatment. due to a high incidence of hemorrhage in the streptokinase-treated patients.

**Intra-arterial Thrombolytics**

Intra-arterial thrombolytics are typically avoided except at major stroke centers where there is more experience with this route of administration. Alteplase is the only product currently available; therefore, when intra-arterial thombolytics are given, alteplase must be used.

Due to the limitations of intra-arterial thrombolysis, current guidelines recommend that treatment with IV alteplase in eligible patients not be delayed by waiting for intra-arterial thrombolytics

1. **aspirin therapy**

is recommended in most patients with acute ischemic stroke within the first 24 to 48 hours after stroke onset and should be continued for at least 2 weeks. The administration of anticoagulants and antiplatelet agents should be delayed for 24 hours in those patients receiving alteplase.

**PREVENTION OF ACUTE ISCHEMIC STROKE**

**Primary Prevention**

* **Aspirin**

The use of aspirin in patients with no history of stroke or ischemic heart disease reduced the incidence of non-fatal myocardial infarction (MI) but not of stroke. A meta-analysis of eight trials found that the risk of stroke was slightly increased with aspirin use, especially hemorrhagic stroke.

* **Statin Therapy**

Recent studies show that statin use may reduce the incidence of a first stroke in high-risk patients (e.g., hypertension, coronary heart disease, or diabetes) including patients with normal lipid levels.

* **Blood Pressure Management**

Lowering blood pressure in patients who are hypertensive has been shown to reduce the relative risk of stroke, both ischemic and hemorrhagic, by 35% to 45%.23 Also, the more blood pressure is lowered, the greater the reduction in stroke risk.

**Secondary Prevention:** Secondary prevention of stroke should be considered in all patients as soon as possible after their stroke.

**Nonpharmacologic Therapy**

* **Carotid Endarterectomy**
* **Carotid Angioplasty** Carotid angioplasty with or without **stenting** is typically restricted to patients who are refractory to medical therapy and are not surgical candidates.

**Pharmacologic Therapy**

* **Aspirin**

considered to be the first-line secondary prevention agent for ischemic stroke and decreases the risk of subsequent stroke by approximately 25% in both men and women with previous transient ischemic attacks or stroke. The FDA has approved doses of 50 to 325 mg for secondary ischemic stroke prevention.

* **Warfarin**

patients with atrial fibrillation usually start oral anticoagulants 10 to 14 days after the acute stroke, long-term anticoagulation with warfarin is recommended and is effective in both primary and secondary prevention of stroke. The goal International Normalized Ratio (INR) for this indication is 2 to 3.

* **Ticlopidine**

Ticlopidine is slightly more beneficial in stroke prevention than aspirin in both men and women. The usual recommended dosage is 250 mg orally twice daily. Ticlopidine is costly, and side effects include bone marrow suppression, rash, diarrhea, and an increased cholesterol level. Neutropenia is seen in approximately 2% of patients.

* **Clopidogrel**

Clopidogrel is slightly more effective than aspirin with a relativerisk reduction of 7.3% more than that provided by aspirin, and it may be considered as first-line therapy in patients with peripheral arterial disease. The usual dose is 75 mg orally taken on a daily basis. Clopidogrel has a significantly lower incidence of diarrhea and neutropenia than ticlopidine, and laboratory monitoring is typically not required.

* **Blood Pressure (BP)**

After the acute phase, all patients with a BP > 130 mmHg systolic or > 80 mmHg diastolic should be considered for a Long-acting angiotensin-converting enzyme inhibitor (ACEI) and a diuretic (such as bendroflumethiazide), if tolerated and not contraindicated. Add additional antihypertensives if BP remains above target level. Even ‘normotensive’ patients (< 130 mmHg systolic or < 80 mmHg diastolic) may benefit from antihypertensive treatment, especially with ACEIs.

* **Cholesterol:** Unless contraindicated, treat all patients who have had an ischaemic stroke with a statin regardless of baseline cholesterol concentration. Recommended drug of choice is: **Simvastatin oral 40 mg each night.**

**TREATMENT OF ACUTE HEMORRHAGIC STROKE**

There is no proven treatment for intracerebral hemorrhage. Management is based on neurointensive care treatment and prevention of complications. Treatment should be provided to manage the needs of the critically ill patient including management of increased intracranial pressure, seizures, infections, and prevention of re-bleeding and delayed cerebral ischemia

* Blood pressure is often elevated after hemorrhagic stroke and appropriate management is important to prevent re-bleeding and expansion of the hematoma. Blood pressure can be controlled with IV boluses of labetalol 10 to 80 mg every 10 minutes up to a maximum of 300 mg or with IV infusions of labetalol (0.5 to 2 mg/minute) or nicardipine (5 to 15 mg/hour).
* Deep vein thrombosis prophylaxis with intermittent compression stockings should be implemented early after admission.
* Oral nimodipine is recommended in subarachnoid hemorrhage to prevent delayed cerebral ischemia. Delayed cerebral ischemia occurs 4 to 14 days after the initial aneurysm rupture and is a common cause of neurologic deficits and death.
* Hemostatic Therapy: Recombinant factor VIIa has been shown to have a benefit in the treatment of ICH.

**Patient Care and Monitoring**

1. Assess the patient’s signs and symptoms including the time of onset of symptoms and the time of arrival in the emergency department.

2. Perform thorough neurological and physical examinations evaluating for a potential cause of the stroke.

3. Perform a CT scan to rule out a hemorrhagic stroke prior to administering any treatment.

4. Evaluate the inclusion and exclusion criteria for thrombolytic therapy to determine if it is appropriate for the patient.

5. Transfer the patient to a stroke center if available and develop a plan for the acute management of the patient.

6. Determine the patient’s risk factors for stroke.

7. Develop a plan for the long-term management of risk factors in order to prevent a recurrent stroke.

8. Educate the patient on appropriate lifestyle modifications that will reduce stroke risk.

9. Educate the patient on their medication regimen and stress the importance of compliance.

**(alteplase, aspirin, warfarin, Clopidogrel, labetalol)**