



## AN UPDATED REVIEW ON STROKE

**Onkar B Doke\*, Priyanka D Thombare, Sumit S Taur,  
Vishwajit S Shinde, Bhakti R Sonawane**

Vidya Niketan College of Pharmacy, BATU University, Lakhewadi,  
Pune, Maharashtra- 413103, India

Corresponding author E-mail: [onkardokevncop@gmail.com](mailto:onkardokevncop@gmail.com)

### ARTICLE INFO

#### Key words:

Stroke, medication,  
examination

Access this article online

Website:

<https://www.jgtps.com/>

Quick Response Code:



### ABSTRACT

Stroke is the subsequent driving reason for death and supporter of inability overall and has critical financial expenses. In this way, more compelling remedial mediations and further developed post-stroke the executives are worldwide wellbeing needs. The most recent 25 years of stroke research has carried extensive advancement concerning creature exploratory models, restorative medications, clinical preliminaries and post-stroke recovery studies, however huge holes of information about stroke treatment remain. Regardless of our expanded comprehension of stroke pathophysiology and the enormous number of studies focusing on numerous pathways prompting stroke, the failure to make an interpretation of examination into clinical settings has essentially hampered progresses in stroke research. Most examination has zeroed in on reestablishing blood stream to the mind and limiting neuronal deficiencies after ischemic affront. The significant difficulties for stroke specialists are to portray the key systems hidden treatments, produce reproducible information, perform multicenter pre-clinical preliminaries and increment the translational worth of their information prior to continuing to clinical investigations.

### INTRODUCTION:

Stroke poses a considerable chance of mortality. Survivors may lose eyesight and/or speech, as well as becoming paralysed and confused. Stroke is so named because of the manner it knocks people out. People who have previously had a stroke are at a much higher risk of experiencing another one. The risk of mortality varies according on the kind of stroke. Transient ischemic attacks, or TIAs, with symptoms that disappear in less than 24 hours, had the best result, followed by strokes caused by carotid stenosis. Blockages in arteries are more harmful, with rupture of a cerebral blood vessel being the most deadly of them. In 1658, Jacob Wepfer examined apoplexy post mortem and was the first to

discover that it may be caused by either bleeding in the brain (haemorrhagic stroke) or a blockage of one of the brain's major arteries (ischaemic stroke). In 2015, stroke was the second leading cause of mortality (after ischemic heart disease), accounting for 6.3 million fatalities worldwide. Ischemic stroke was responsible for around 3 million deaths, whereas hemorrhagic stroke caused 3.3 million deaths. Each year, 15 million individuals worldwide have a stroke. Of them, 5 million die and another 5 million become permanently crippled, putting a strain on families and communities. Stroke is uncommon in adults under the age of 40; when it occurs, the major cause is elevated blood pressure. However, stroke affects around 8% of children with

sickle cell illness. High blood pressure and tobacco use are the two most important modifiable hazards. For every ten persons who die from a stroke, four may have been rescued if their blood pressure had been controlled. Smoking is responsible for two-fifths of all stroke fatalities in those under the age of 65. Atrial fibrillation, heart failure, and a heart attack are all significant risk factors. Stroke incidence is dropping in many affluent nations, owing mostly to improved high blood pressure treatment and lower smoking rates. However, the absolute number of strokes continues to climb as the population ages.<sup>1, 2, 3, 4, 5</sup>

### Types of stroke:

#### 1) Ischemic stroke:

When cells don't receive enough blood flow to get oxygen, it's known as ischemia. Usually, something obstructs blood arteries in the brain, preventing blood flow, which is why this occurs. Approximately 80% of all strokes are ischemic strokes, which are the most prevalent type. An ischemic stroke is often caused by one of the following:

- A. A thrombus forming in your brain (thrombosis).
- B. An embolism, which is the fragment of a clot that broke free and entered your blood vessels before being lodged in your brain.
- C. Small vessel blockage (lacunar stroke), which can occur from untreated hypertension (high blood pressure), hyperlipidemia (high cholesterol), or Type 2 diabetes (high blood sugar) that persists over an extended period of time.
- D. Unknown causes (The term "cryptogenic" refers to "hidden origin"; these strokes are cryptogenic). (Refer figure 1)

#### 2) Hemorrhagic stroke:

Hemorrhagic strokes result in bleeding in or around the brain. This occurs in one of two ways.

- A. **Intracerebral bleeding** occurs when a blood artery rips or bursts, placing pressure on surrounding brain tissue.

#### B. Bleeding into the subarachnoid space:

The arachnoid membrane is a thin layer of tissue with a spiderweb-like structure that surrounds the brain. The subarachnoid space ("sub" meaning "under") separates it from your brain. Damage to blood arteries that flow through the arachnoid membrane can result in a subarachnoid haemorrhage, which occurs when blood enters the subarachnoid space and puts pressure on the brain tissue underneath. (See Fig. 1).

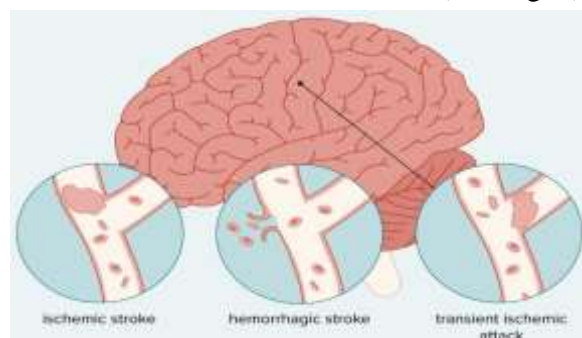


Figure 1: Types of stroke

**3. Transient Ischemic Attack (a warning or "mini-stroke"):** Transient ischemic attack (TIA) is sometimes known as a "mini-stroke." It differs from other forms of stroke in that blood supply to the brain is disrupted for just a brief period of time, often no more than 5 minutes.<sup>6, 7, 8, 9</sup>

#### SYMPTOMS:

Different parts of your brain govern different skills, thus stroke symptoms vary depending on which section is impacted. A stroke, for example, can damage Broca's region, which governs how you utilise muscles in your face and mouth to talk. That's why some individuals slur their words or have difficulty speaking after a stroke.

Symptoms of stroke may include one or more of the following:

- ✓ One-sided weakness or paralysis.
- ✓ Aphasia refers to difficulties or loss of speech ability.
- ✓ Slurred or garbled speech (dysarthria).
- ✓ Loss of muscular control on one side of the face.
- ✓ Sudden loss of senses, including vision, hearing, smell, taste, and touch.

- ✓ Blurred or double vision.
- ✓ Ataxia refers to a lack of coordination or clumsiness.
- ✓ Dizziness or vertigo.
- ✓ Nausea and vomiting.
- ✓ Neck stiffness.
- ✓ Emotional instability and personality shifts.
- ✓ Confusion or excitement.
- ✓ Seizures.
- ✓ Amnesia (memory loss).
- ✓ Sudden, intense headaches.
- ✓ Passing out or fainting.
- ✓ Coma.<sup>9, 10</sup>

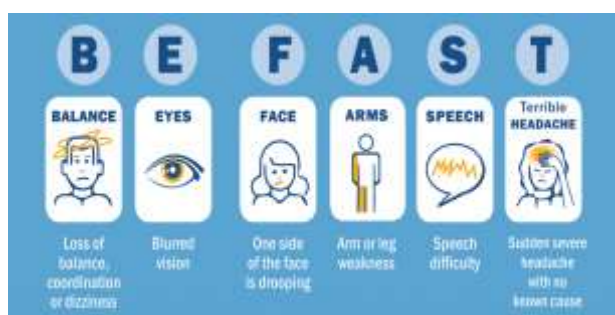


Figure 2: Signs and Symptoms of Stroke

### CAUSES:

Ischemic and hemorrhagic strokes can occur for a variety of reasons.

Ischemic strokes are mainly caused by blood clots.

These can happen for a wide range of reasons, including:

- Atherosclerosis.
- Clotting disorders.
- Atrial fibrillation, especially caused by sleep apnea.
- Heart defects (either atrial or ventricular septal defect).
- Microvascular ischemic disease.

Hemorrhagic strokes can occur due to a variety of factors, including:

- High blood pressure that has been present for a long time or is extremely high.
- Brain aneurysms can cause hemorrhagic strokes.
- Brain tumors, including malignancy.
- Moyamoya disease.

A variety of different illnesses and variables might increase a person's stroke risk. These include:

- Alcohol consumption disorders.
- Migraine headaches
- Type 2 diabetes.
- Smoking and other forms of tobacco use.
- Drug misuse (including prescription and non-prescription drugs).<sup>11, 12</sup>

### RISK FACTORS FOR STROKE:

A stroke can occur at any age. Certain risk factors, however, enhance your chances of having a stroke. Some risk factors for stroke can be altered or managed, whilst others cannot.

Stroke risk factors that can be altered, treated, or medically controlled include:

- **High blood pressure:** Blood vessels which supply blood to the brain can be harmed by blood pressure of 140/90 or greater.
- **Heart disease:** The leading cause of mortality for stroke survivors and the second most significant risk factor for stroke is heart disease. Numerous risk factors for heart disease and stroke are similar.
- **Diabetes:** Individuals with diabetes have a higher risk of stroke compared to those without the disease.
- **Smoking:** The risk of an ischemic stroke is nearly doubled when you smoke.
- **Birth control pills (oral contraceptives)**
- **History of TIAs (transient ischemic attacks):** Mini-strokes are another name for TIAs. Their symptoms are similar to those of a stroke, but symptoms don't last. Compared to someone of the same age and sex who has never experienced a TIA, you are about ten times more likely to suffer a stroke if you have experienced one or more TIAs.
- **High red blood cell count:** A notable rise in red blood cell count thickens blood and increases the risk of clotting. The risk of stroke increases as a result.
- **High blood cholesterol and lipids:** An accumulation of plaque-induced atherosclerosis, or thickening or

hardening of the arteries, can be exacerbated by high cholesterol levels. Deposits of calcium, cholesterol, and fats make up plaque. The quantity of blood flowing to the brain might be reduced by plaque accumulation inside the arterial walls. If the brain's blood flow is interrupted, a stroke happens.

- **Lack of physical activity**
- **Obesity**
- **Excessive alcohol use:** Consuming more than two drinks daily might elevate blood pressure. Alcohol abuse can result in stroke.
- **Illegal drugs:** Abuse of IV (intravenous) medications increases the risk of stroke due to cerebral embolisms, or blood clots. Drugs like cocaine have been strongly associated with heart attacks, strokes, and several other cardiovascular issues.
- **Abnormal heart rhythm:** A number of heart conditions might increase your risk of stroke. Atrial fibrillation, an irregular heartbeat, is the most potent and manageable cardiac risk factor for stroke.
- **Cardiac structural abnormalities:** Long-term, chronic heart damage can be brought on by valvular heart disease, which damages the heart valves. This may eventually increase your risk of stroke.

#### Unchangeable risk factors for stroke:

- **Older age:** The risk of stroke more than doubles for every ten years of life beyond the age of 55.
- **Race:** Compared to white people, African Americans are far more likely to die from a stroke and sustain permanent impairment. This is partially due to the higher prevalence of high blood pressure among African-Americans.
- **Gender:** While men are more likely to have a stroke, women exceed men in terms of fatalities.
- **History of prior stroke:** Having a stroke increases your risk of having another one.

- **Heredity or genetics:** Individuals with a family history of stroke are more likely to develop the condition.<sup>13, 14, 15, 16</sup>

**COMPLICATIONS:** The complications after stroke can vary. They may occur because of either a direct injury to the brain during the stroke, or because abilities have been permanently affected.

Some of these complications include:

The complications following a stroke can vary. They can arise as a result of either a direct brain injury during the stroke or permanently impaired capacities.

Some of the complications are:

- Seizures
- Loss of bladder and bowel control
- Cognitive impairment, including dementia
- Limited mobility, range of motion, or capacity to control specific muscle motions.
- Depression
- Mood or emotional changes
- Shoulder pain
- Bed sores
- Sensory or sensation changes

Complications can be treated using approaches like:

- Medication
- Physical therapy
- Counseling

Certain complications may even be reserved.<sup>17, 18</sup>

#### PREVENTION:

Lifestyle improvements cannot prevent all strokes. However, many of these adjustments can significantly reduce your chance of a stroke.

These changes include the following:

- **Quit smoking:** If you smoke, quitting immediately will reduce your chance of stroke. You can consult your doctor to develop a quit strategy.
- **Limit alcohol use:** Limit alcohol consumption. Heavy alcohol consumption can elevate blood pressure, increasing the risk of stroke. If lowering your intake

proves challenging, consult your doctor for assistance.

- **Keep a moderate weight:** Obesity and overweight increase the risk of stroke. Eat a well-balanced diet and be physically active on a regular basis to aid with weight management. Both steps can help lower blood pressure and cholesterol levels.
- **Get regular checkups.** Consult your doctor about how frequently you should have your blood pressure, cholesterol, and any other medical concerns checked. They can also help you make these lifestyle adjustments and provide guidance.

Taking all of these precautions can help you get in better shape to prevent strokes.<sup>19, 20, 21</sup>

**DIAGNOSIS:** Stroke occurs swiftly. For the greatest results, a person should be treated at a hospital within 3 hours of their symptoms showing.

Doctors can employ a variety of diagnostic techniques to identify the type of stroke. This includes:

- **Physical examination:** Doctors will inquire about the patient's symptoms and medical history. They will assess muscular strength, reflexes, sensitivity, eyesight, and coordination. They may also measure blood pressure, listen to the carotid arteries in the neck, and inspect the blood vessels behind the eyes.
- **Blood tests:** A doctor may run blood tests to assess the risk of bleeding or blood clots, including evaluating levels of clotting factors and detecting infections.
- **CT scan:** A CT scan can detect several brain conditions such as hemorrhages, strokes, and tumors.
- **MRI scan:** MRI scans employ radio waves and magnets to create images of the brain, allowing doctors to detect damaged tissue.
- **Carotid ultrasound:** A doctor may perform an ultrasound scan to assess blood flow and identify narrowing or plaque.
- **Cerebral angiogram:** A doctor injects a dye into the brain's blood arteries to make them visible on an X-ray or MRI. This shows a detailed picture of the blood arteries in the brain and neck.

- **Echocardiogram:** An echocardiogram provides a thorough image of the heart, allowing doctors to identify potential sites of clots that could go to the brain.<sup>22, 23, 24, 25</sup>

#### **TREATMENT:**

Treatment for stroke varies according to the type of stroke:

##### **A) Ischemic stroke and TIA:**

These stroke types are treated similarly since they are caused by a blood clot or obstruction in the brain. They could include:

##### **1) Clot-breaking drugs:**

Thrombolytic medications break up blood clots in the brain's arteries, preventing strokes and reducing brain damage.

One such medicine, tissue plasminogen activator (tPA), also known as Alteplase IV r-tPA, is regarded as the gold standard for treating ischemic stroke. This medication works by dissolving blood clots quickly.

People who receive a tPA injection are more likely to recover from a stroke and have fewer long-term disabilities as a result of it.

##### **2) Mechanical thrombectomy:**

Mechanical thrombectomy involves inserting a catheter into a major blood artery inside the cranium. They next use an instrument to remove the clot from the vessel. This operation is most effective when performed 6 to 24 hours after the stroke occurs.

##### **3) Stents:**

When artery walls weaken, doctors may use a stent to maintain the narrowing artery.

##### **4) Surgery:**

When other therapies fail, surgery can remove blood clots and plaques from arteries. A catheter may be used during this procedure. If the clot is particularly large, the surgeon may open an artery to remove it.

##### **B) Hemorrhagic stroke:**

Strokes induced by bleeding or leaks in the brain necessitate unique therapeutic procedures. Treatment options for hemorrhagic stroke include:

##### **1) Medications:**

A hemorrhagic stroke, unlike an ischemic stroke, is treated with the goal of causing your

blood to clot. As a result, you may be prescribed medication to counteract any blood thinners you are currently taking.

You may be administered medicines to reduce blood pressure, lower brain pressure, prevent seizures, or prevent blood vessel constriction.

**2) Coiling:**

Your doctor will route a long tube to the bleeding or weakened blood artery. They then place a coil-like device in the location where the artery wall is weakened. This prevents blood flow to the region and reduces bleeding.

**3) Clamping:**

During imaging examinations, your doctor may uncover an aneurysm that has not yet started to hemorrhage or has stopped.

A surgeon may put a small clip at the aneurysm's base to prevent further bleeding. This cuts off the blood flow, preventing the possibility of a ruptured blood vessel or fresh bleeding.

**4) Surgery:**

If an aneurysm bursts, your doctor may perform surgery to avoid more bleeding. Similarly, a craniotomy may be required to alleviate pressure on the brain following a major stroke.

In addition to emergency treatment, your healthcare team will advise you on how to avoid future strokes.

**Stroke medications:**

There are several drugs used to treat strokes. The type of medication your doctor recommends is primarily determined by the type of stroke you experienced.

Some drugs are designed to prevent a second stroke, while others try to prevent a stroke from occurring in the first place.

Your doctor may prescribe one or more of these medications to treat or prevent a stroke, depending on your medical history and risk factors.

The most popular stroke treatments are:

**1) Direct-acting oral anticoagulants: (DOACs)**

This newer medicine class acts in the same way as older anticoagulants (by reducing your blood's ability to clot), but it often works faster and with less monitoring.

DOACs, when used to prevent strokes, may also lower the risk of brain bleeding.

**2) Tissue plasminogen activator: (tPA)**

This emergency drug can be administered during a stroke to break up the blood clot that is causing it. It is the only medication available that can accomplish this right now, but it must be used within 3 to 4.5 hours of the onset of stroke symptoms.

This drug is injected into a blood artery to allow the treatment to begin working as soon as possible, lowering the chance of stroke consequences.

**3) Anticoagulants:**

These medications prevent blood clots. The most often used anticoagulant is warfarin (Coumadin, Jantoven). These medications can help keep existing blood clots from growing larger, so doctors may give them to prevent a stroke or after an ischemic stroke or TIA has occurred.

**4) Antiplatelet drugs:**

These drugs prevent blood clots by making it more difficult for platelets to bind together. The most popular antiplatelet medications are aspirin and clopidogrel (Plavix). The medications can help avoid ischemic strokes. They are particularly important in preventing subsequent strokes.

If you've never had a stroke before, only use aspirin as a preventive measure if you have a high risk of atherosclerotic cardiovascular disease (e.g., heart attack and stroke) but a low risk of bleeding.

**5) Statins:**

Statins help to decrease elevated blood cholesterol levels. They are among the most often prescribed drugs in the United States.

These medications inhibit the synthesis of an enzyme that converts cholesterol into plaque—the thick, sticky material that can accumulate on the walls of arteries and cause strokes and heart attacks.

Common statins include:

- Rosuvastatin (Crestor)
- Simvastatin (Zocor)
- Atorvastatin (Lipitor)

#### 6) Blood pressure drugs:

High blood pressure can cause bits of plaque to break off in your arteries. This debris can clog arteries, resulting in a stroke. As a result, controlling high blood pressure by medication, lifestyle changes, or both can help avoid strokes.<sup>26, 27, 28, 29</sup>

#### Recovering from a stroke:

To recover from a stroke, it's crucial to start treatment as soon as possible. In a hospital, a care team can stabilize your condition, assess the effects of the stroke, and begin therapy to help you regain some of your affected skills. Stroke recovery typically focuses on four main areas:

##### 1) Speech therapy:

A stroke can result in speech and language problems. A speech and language therapist will help you rediscover how to talk.

Alternatively, if you have difficulty communicating verbally after a stroke, they will assist you in developing new communication skills.

##### 2) Cognitive therapy:

Following a stroke, many individuals may have changes in their thinking and reasoning abilities. This can lead to behavioral and mental problems.

An occupational therapist can assist you in regaining your former thinking and behavioral patterns, as well as managing your emotional responses.

##### 3) Relearning sensory skills:

If a stroke affects the area of the brain responsible for relaying sensory impulses, your senses may become "dulled" or no longer function properly. That could indicate that you don't feel things well, such as temperature, pressure, or discomfort. An occupational therapist can assist you in adjusting to the lack of sensation.

##### 4) Physical therapy:

A stroke can reduce muscle tone and strength, making it difficult to move your body as well as you once could. A physical therapist will help you regain your strength and balance, as well as find strategies to work around any limits. Rehabilitation can take place in a clinic, a skilled nursing home, or at your house.<sup>28, 29</sup>

#### CONCLUSION:

Stroke is the subsequent driving reason for death and a significant supporter of inability around the world. The pervasiveness of stroke is most elevated in emerging nations, with ischemic stroke being the most well-known type. Impressive headway has been made in how we might interpret the pathophysiology of stroke and the basic systems prompting ischemic affront.

Stroke treatment essentially centers around reestablishing blood stream to the mind and treating stroke-prompted neurological harm. Absence of progress in late clinical preliminaries has prompted huge refinement of creature models, center driven concentrate on plan and utilization of new advances in stroke research. At the same time, regardless of progress in stroke the executives, post-stroke care applies a significant effect on families, the medical services framework and the economy. Upgrades in pre-clinical and clinical consideration are probably going to support effective stroke treatment, recuperation, recovery and anticipation.

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