



New Diagnostic Techniques and Treatment of Ischemic Stroke

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ABSTRACT

A Stroke occurs when blood vessels in the brain get rupture and bleed or when there is a blockage in the blood supply to the brain due to plaque. Ischemic stroke occurs when there is restricted blood flow to the brain due to vascular stenosis or insufficient oxygen supply. Hemorrhagic stroke occurs when there is a rupture of a blood vessel which leads to accumulation of blood in the brain. Ischemic stroke ranges from mild (Transient ischemic stroke) to severe (severe ischemic stroke). Ischemic stroke is diagnosed by physical examination, various blood tests, Computed tomography scan, Magnetic resonance imaging scan, Carotid Ultrasound, Cerebral angiogram, Echocardiogram and can also be done by using new techniques such as cone beam imaging, cerebrotech stroke detecting visor. The first step for treating the ischemic stroke is an emergency response which can be done by tissue plasminogen activator and mechanical thrombectomy. Secondary treatment includes Carotid artery stenosis, Carotid endarterectomy, Carotid artery stenting and it can also be treated by some new techniques such as vivistim nerve stimulation treatment and cerenovus aneurysm device. Relevant treatment of ischemic stroke is essential in the reduction of mortality and morbidity.

Keywords: Cone beam imaging, Cerebrotech stroke detecting visor, Vivistim nerve stimulation, Cerenovus aneurysm device.

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INTRODUCTION

A Stroke occurs when blood vessels in the brain get rupture and bleed or when there is a blockage in the blood supply to the brain due to plaque¹. Due to blockage, the brain cells cannot get oxygen and they start to die within a few minutes. This can cause brain damage, long-term disability, and sometimes death².

Stroke is the second foremost cause of death. There are two kinds of stroke Ischemic stroke and Hemorrhagic stroke. 85% is of strokes are ischemic stroke and the remaining 15% are hemorrhagic stroke³.

Ischemic stroke occurs when there is restricted blood flow to the brain due to vascular stenosis or insufficient oxygen supply. Hemorrhagic stroke occurs when there is a rupture of blood vessels which leads to accumulation of blood in the brain⁴.

Ischemic stroke ranges from mild (Transient ischemic stroke) to severe (severe ischemic stroke). TIA is also called a mini-stroke and it is different from other types of major stroke because blood flow to the brain is blocked for only a short time i.e; not more than 5mins⁵.

Dual antiplatelet therapy is initiated within 24 hours of symptoms onset and continued for 3 weeks which minimizes the risk of ischemic stroke. In acute ischemic stroke condition thrombolysis within 4.5 hours and mechanical thrombectomy within 24 hours after symptoms onset which improves functional outcomes⁶. Ischemic stroke can occur due to various pathophysiological changes. Ischemic stroke has highly effective evidence-based therapies such as alteplase and mechanical thrombectomy⁷.

American stroke association recommended to remembering F.A.S.T this stands for

F- face drooping

A-Arm weakness

S- Speech problem

T- Time to call

Other symptoms may include difficulty in walking, dizziness, confusion, severe headache⁸.

Diagnosis

- Physical exam
- Blood tests
- Computerized tomography (CT) scan: A CT scan uses a sequence of X-rays to create a detailed image of your brain. A CT scan can manifest bleeding in the brain, an ischemic stroke, a tumor or other conditions. Dye is injected into the bloodstream to view blood vessels in



the neck and brain in greater detail (computerized tomography angiography).

- **Magnetic resonance imaging (MRI):** An MRI utilizes powerful radio waves and magnets to create a detailed view of the brain. An MRI can detect brain tissue damaged by an ischemic stroke and brain hemorrhage. A dye is injected into a blood vessel to view the arteries and veins and highlight blood flow (magnetic resonance angiography or magnetic resonance venography).
- **Carotid ultrasound:** In this test, sound waves establish detailed images of the inside of the carotid arteries in the neck. This test shows the build-up of fatty deposits (plaques) and blood flow in the carotid arteries.
- **Cerebral angiogram;** In this uncommonly used test, a thin, flexible tube (catheter) is inserted through a small incision, usually in the groin, and guides it through major arteries and into the carotid or vertebral artery. A dye is injected into blood vessels to make them clear under X-ray imaging. This procedure gives a complete view of arteries in the brain and neck.
- **Echocardiogram:** An echocardiogram uses sound waves to establish detailed images of the heart. An echocardiogram can find a source of clots in the heart that may have traveled from heart to brain and caused stroke⁹.
- **Cone beam imaging:** It is a technology used for detecting hemorrhage, Occlusion site, ischemic core, and tissue that is at risk. It bypasses the CT scan and directs towards the Angio suite for imaging and appropriate care.
- **Cerebrotech stroke detecting visor:** It is a device that detects emergent large vessel occlusion in suspected stroke patients. It is designed to detect stroke within seconds and uses low-energy radio waves to detect the blockages¹⁰.

Treatment

Emergency Response

Tissue Plasminogen Activator (tPA): Tissue plasminogen activator (tPA) is the most common emergency stroke treatment medication. tPA works by dissolving arterial blood clots that obstruct nourishment from getting to the brain. This life-saving medication is delivered intravenously to ischemic stroke patients within 4.5 hours of a stroke.

Mechanical Thrombectomy: If there is a medical reason to avoid the use of tPA, neurovascular surgeons perform mechanical thrombectomy through a device. These devices include stentriever (including Solitaire) and the Penumbra system. Endovascular thrombectomy can be performed up to 8 hours after a stroke¹¹.

Secondary Treatment

Secondary treatment mainly focuses on diagnosing and treating the condition that caused the stroke.

Carotid artery stenosis is the narrowing of the two large blood vessels in the neck that supply blood to the brain. The narrowing is usually caused by the build-up of cholesterol. This condition reports for about 25 percent of ischemic strokes. carotid artery stenosis can be treated through:

Carotid endarterectomy (CEA) - the surgical removal of plaque in the artery

Carotid artery stenting (CAS) - the minimally invasive placement of a stent in the artery using catheters to prevent the artery from narrowing¹².

Vivistim nerve stimulation treatment: A device known as vivistim is used to stimulate the vagus nerve. It works by vagus nerve stimulation with muscle movement, this stimulation leads to the strengthening of neural circuits in the brain associated with motor functioning, learning, and memory.

Cerenovus aneurysm device: It is received a CE mark for its Bravo flow diverter device. It is used in patients suffering from intracranial aneurysms. This device is designed to divert blood flow from an aneurysm which reduces the risk of stroke. This device aims to improve clinician ease of use and reduce the length of procedure¹⁰.

Intracranial atherosclerotic disease (ICAD): Is a narrowing of arteries in the brain. Approximately 10 percent of strokes happen due to ICAD. When necessary, balloon angioplasty (widening of the arteries) or intracranial stenting is performed.

Other medications include anticoagulants such as Dabigatran, Warfarin, Low molecular weight heparin, Danaparoid¹³.

CONCLUSION

- ✓ Relevant treatment of ischemic stroke is essential in the reduction of mortality and morbidity.
- ✓ Thrombolysis within 4.5 hours and mechanical thrombectomy within 24 hours after symptom onset can show a better outcome of the functional activity
- ✓ Treatment is mainly focused on symptomatic management then secondary: prevention and rehabilitation.
- ✓ Administration of 4- tissue plasminogen activator remains as the mainstay of treatment for decades.



REFERENCES

1. Hankey GJ. Stroke. Lancet. 2017 Feb 11;389(10069):641-54. doi: 10.1016/S0140-6736(16)30962-X. Epub 2016 Sep 13. PMID: 27637676.
2. Iadecola C, Buckwalter MS, Anrather J. Immune responses to stroke: mechanisms, modulation, and therapeutic potential. J Clin Invest. 2020 Jun 1;130(6):2777-88. doi: 10.1172/JCI135530. PMID: 32391806; PMCID: PMC7260029.
3. Silver B, Wulf Silver R. Stroke: diagnosis and management of acute ischemic stroke. 2014 May; 420:16-22. PMID: 24818555.
4. Chung CP- Types of Stroke and their differential diagnosis-primer on cerebrovascular diseases (second edition)- 2017; 372-6. <https://doi.org/10.1016/B978-0-12-803058-5.00077-1>
5. <https://www.cdc.gov>stroke>types of stroke>.
6. Mendelson SJ, Prabhakaran S. Diagnosis and Management of Transient Ischemic Attack and Acute Ischemic Stroke: A Review. JAMA. 2021 Mar 16;325(11):1088-98. doi: 10.1001/jama.2020.26867. PMID: 33724327.
7. Washington, Glaser, Lotea N, CE: Acute ischemic stroke, American journal of nursing, 2021 September; 121 (9): 26-33. doi:10.1097/01.NAJ.0000790184.66496.1d
8. Han S, Hersh E, Ischemic stroke: Symptoms, treatment and more, 2015 September 29.
9. Stroke – Diagnosis and treatment, 2021 February 09; <https://www.mayoclinic.org>stroke>
10. Edwards C, World stroke day: The latest medical technology for stroke treatment, Medical device network, 2018 November 26; <https://www.medicaldevice-network.com>
11. Kohli P, Holland K, Stroke- diagnosis and treatment, 2021 November 09; www.healthline.com>health
12. Brott TG, Hobson RW 2nd, Howard G, Roubin GS, Clark WM, Brooks W, et al; Stenting versus endarterectomy for treatment of carotid artery stenosis. 2010 Jul 1;363(1):11-23. doi: 10.1056/NEJMoa0912321. PMID: 20505173; PMCID: PMC2932446.S
13. Gomez CR, Qureshi AI, Medical treatment of patients with intracranial atherosclerotic disease. J Neuroimaging. 2009 Oct;19.1:25-9 doi: 10.1111/j.1552-6569.2009.00419.x. PMID: 19807855.

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