Initial Evaluation of Causes of Stroke in Frail Older Adults

Pippa Tyrrell, FRCP, *Salford Royal Foundation Trust and University of Manchester; UK NICE Guidelines Development Group, Acute Stroke and TIA, London, UK.*

Sharon Swain,PhD, *National Coordinating Centre for Chronic Conditions, Royal College of Physicians; UK NICE Guidelines Development Group, Acute Stroke and TIA, London, UK.*

Anthony Rudd, FRCP, *St Thomas's Hospital London; UK NICE Guidelines Development Group, Acute Stroke and TIA, London, UK.*

The investigation and management of stroke has changed beyond recognition in the last two decades. The management of frail older patients with stroke represents a particular clinical challenge. Recognition of symptoms in people with significant comorbidities may be difficult and while intensive investigation may be inappropriate for a very frail aging patient, older people can gain a great deal from expert treatment and secondary prevention following stroke.

Key words: *stroke, frail older adults, ischemic stroke, intracerebral hemorrhage*

Introduction

The advent of new treatments for stroke has led to marked changes in the way that stroke care is organized, with an emphasis on rapid referral to hospital for urgent investigation and treatment. Across the developed world, national publicity campaigns are encouraging people to treat stroke as a medical emergency and to call emergency services for rapid transfer to stroke centres for urgent brain scanning and, where possible, thrombolysis. Evaluation of the causes of the stroke is essential to provide appropriate management, including secondary prevention. This certainly involves brain scanning with computed tomography (CT) and/or magnetic resonance imaging (MRI), detailed clinical assessments, electrocardiography, blood tests, and, often, carotid artery imaging.

Frail older adults represent a particular challenge in stroke management. The causes of stroke in frail older adults are much the same as those in younger or fitter individuals, but it can be challenging to balance the need for investigation and treatment (with the possibility of preventing further strokes) with the disruption and discomfort of investigations and new treatments, particularly for the very disabled or frail person.

Stroke, although common among older adults, may be difficult to recognize in people with significant comorbidities. It usually presents with a sudden onset of focal neurological signs, for example, speech disturbance, facial droop, unilateral weakness, incoordination, or sensory disturbance. However, it can also present with more subtle neurological deterioration, which may be difficult to detect in a frail older adults with significant comorbidities. Small strokes may cause a deterioration in memory, which may go unnoticed in someone with pre-existing dementia, and pneumonia may develop as a result of an impairment of swallowing secondary to a stroke in a very frail person. Clinicians need to be alert to the possibility of stroke as a cause of clinical deterioration in frail older adults.

Definition of Stroke

Stroke is defined by the World Health Organization[1] as "a clinical syndrome consisting of rapidly developing clinical signs of focal (or global in case of coma) disturbance of cerebral function lasting more than 24 hours or leading to death with no apparent cause other than a vascular origin." A transient ischemic attack (TIA) is defined as stroke symptoms and signs that resolve within 24 hours. There are limitations to these definitions. The symptoms of a TIA usually resolve within minutes or a few hours at most, and anyone with continuing neurological signs when first assessed should be assumed to have had a stroke. Brain attack is sometimes used to describe any neurovascular event and may be a clearer and less ambiguous term to use.

Evaluation of the Causes of Stroke

Clinical Assessment

A simple stroke recognition instrument such as FAST (Face Arm Speech Test)[2] can be used by front-line health care professionals to determine the new onset of possible stroke symptoms. A more detailed instrument such as ROSIER[3] (Recognition of Stroke in the Emergency Room) involves the immediate exclusion of hypoglycemia (a common stroke mimic) with a finger prick glucose test, and a clinical assessment of face, arm, and leg weakness; speech disturbance; and visual field loss. This test has high sensitivity for a diagnosis of stroke but may fail to detect TIA (where neurological symptoms have resolved by the time of assessment) or posterior circulation stroke symptoms (e.g., a loss of balance and coordination, swallowing difficulties).

A full neurological assessment including an assessment of the cranial nerves, motor and sensory function, and coordination is needed to determine the location of the stroke (cortical anterior circulation, posterior circulation, or lacunar)

and to assess the patient's neurological deficits. Loss of sensation in a limb, for example, may not be apparent without careful neurological assessment but may have a profound impact on rehabilitation, where walking or manipulation of objects may be impaired, and may be associated with poststroke pain. Limb apraxia or visuospatial and cognitive dysfunction may not be detected without careful neurological assessment. Early assessment of swallowing is important to determine whether fluids and food can be safely administered by mouth. A standardized swallow assessment can be used at the bedside on admission, followed by expert assessment when necessary within 72 hours. History taking and physical examination must be performed to reveal any symptoms and signs of generalized vascular disease, including irregular pulse, together with a history of risk factors (smoking, hypertension, dyslipidemia), recent infection (which may predispose to stroke), premorbid illness, and medications. People taking anticoagulants or who have known bleeding diathesis should have an immediate clotting screen.

A diagnostic algorithm is presented in Figure 1.

Brain Imaging

Imaging with CT or MRI (Figure 2) is essential to exclude hemorrhage and stroke mimics. Brain imaging should take place urgently (within 1 hour) in patients for whom acute treatments such as thrombolysis are being considered, and in patients with an impaired level of consciousness, with a history of trauma, who are taking anticoagulants, or who have a clotting diathesis. Stroke can conveniently be classified following scan as ischemic or hemorrhagic; some infarcts undergo hemorrhagic change and are termed hemorrhagic infarction.

Computed Tomography or Magnetic Resonance Brain Imaging?

Computed tomography brain imaging is quicker, more widely available, and generally better tolerated than MRI. Older adults and very unwell or frail individuals may find MRI particularly difficult to undergo. Contrast CT is well established for the diagnosis of tumours; CT angiography and perfusion are now relatively straightforward and can be of value in determining the cause of a stroke. However, there are some situations in which MRI provides information that CT cannot; for example, diffusion weighted MRI can detect small areas of ischemia, for example, after a TIA or minor stroke.

Ischemic Stroke

The majority of strokes (approximately 85%) are caused by an infarction secondary to ischemia of brain tissue caused by a blood clot in large or small arteries, usually secondary to an atherothrombotic plaque or due to an embolism, often from the heart.[4]

The resultant blood clot occludes an artery in the intra- or extracranial cerebral vasculature to cause ischemia in the brain. The size of the clot determines the diameter of the vessel occluded and, thus, the volume of brain affected.

Although initially not associated with hemorrhagic change on structural imaging at presentation, ischemic stroke may undergo a process called hemorrhagic transformation, where blood becomes visible within the infarct on scanning. This may be asymptomatic and only detected by chance on subsequent scans, or symptomatic and associated with a clinical deterioration. Symptomatic hemorrhagic transformation is more commonly associated with larger infarcts, usually within the first 2 weeks after presentation. Antiplatelet agents and anticoagulants may increase the risk of hemorrhagic transformation of cerebral infarction.

Cardioembolic stroke is most commonly associated with atrial fibrillation but may also be caused by a clot in the heart secondary to a myocardial infarction. Physicians need to be aware of rare causes of embolism that may be difficult to diagnose, particularly in older adults, such as bacterial endocarditis.

Intracerebral Hemorrhage

Primary intracerebral hemorrhage occurs in about 10% of strokes.[4] It is severely disabling and associated with high mortality. Although the incidence of intracerebral hemorrhage has fallen overall over the past 20 years, largely due to improved identification and treatment of hypertension, there has not been an equivalent fall in incidence among older adults.[5] This is likely to be due to anticoagulant-associated hemorrhage and amyloid angiopathy in older adults. As the population ages, the absolute number of hemorrhages in older adults might be seen to increase.

Complications of intracerebral hemorrhage include the expansion of a hematoma, hydrocephalus, intraventricular hemorrhage, and edema. Individuals with cerebellar hematoma are at particular risk of deterioration, specifically due to direct compression of the brain stem and cerebellum, and hydrocephalus. Increasing numbers of older adults are given anticoagulation medication, particularly for atrial fibrillation, and these people are at particular risk of hematoma expansion, which is associated with clinical deterioration. Physicians need to be aware of the need to reverse anticoagulation in patients with intracerebral hemorrhage. This is done most effectively using a combination of intravenous prothrombin complex concentrate and vitamin K.[4] Intracerebral hemorrhage can be a devastating cause of stroke and is associated with high mortality.

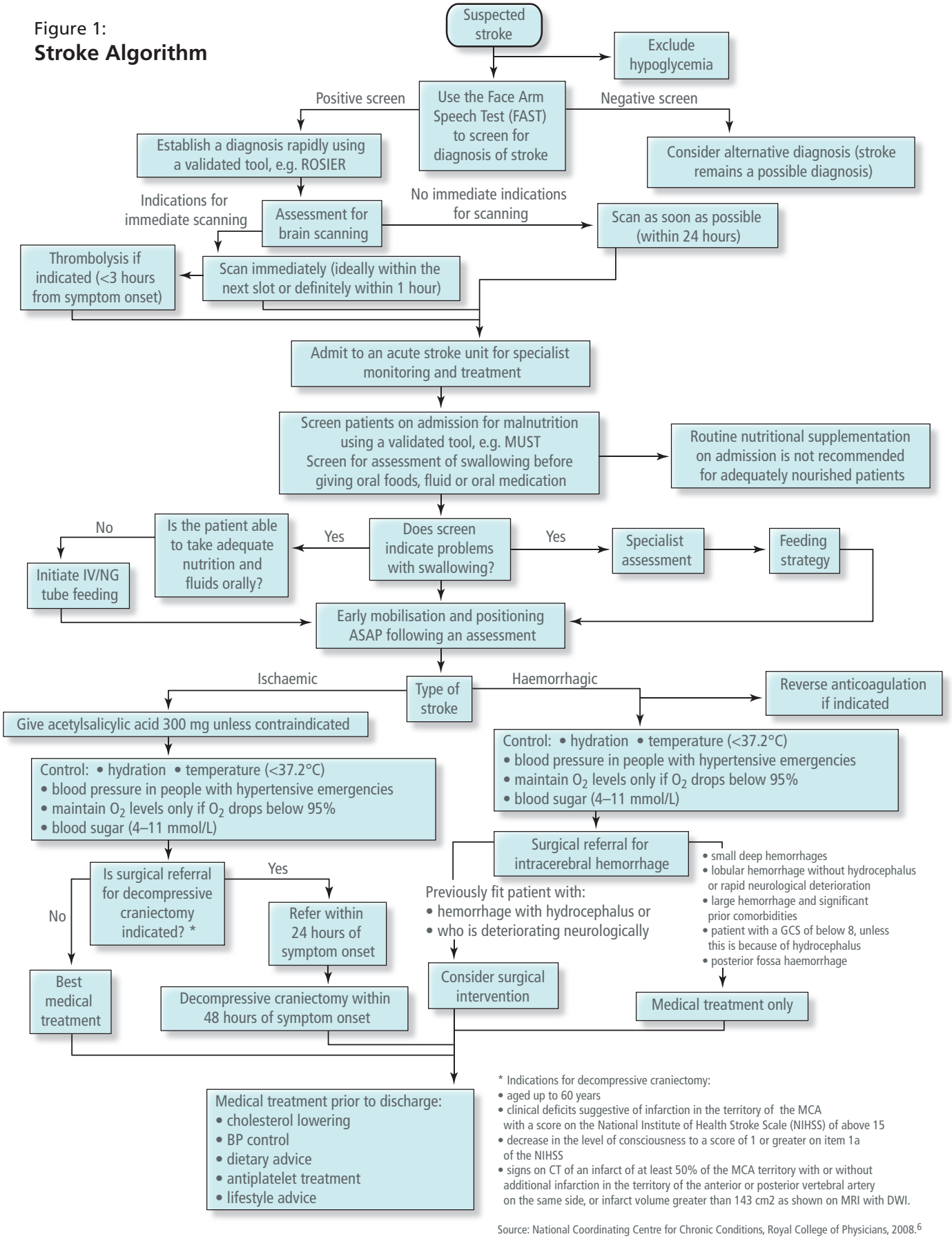
Electrocardiography

An electrocardiogram (ECG) is essential in the diagnosis of arrhythmia and to exclude possible causes of cardioembolic stroke, such as a recent myocardial infarction, and left ventricular hypertrophy. Paroxysmal atrial fibrillation may not always be detected on a single ECG, so 24-or 48-hour Holter monitoring may be useful.

Echocardiography

Echocardiography can detect valvular abnormalities, a clot in the ventricle, and dilated atria that may predict for future emboli; it is a valuable tool in making

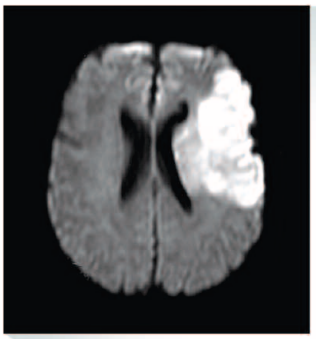
Figure 1:
Stroke Algorithm



* Indications for decompressive craniectomy:
- aged up to 60 years
- clinical deficits suggestive of infarction in the territory of the MCA with a score on the National Institute of Health Stroke Scale (NIHSS) of above 15
- decrease in the level of consciousness to a score of 1 or greater on item 1a of the NIHSS
- signs on CT of an infarct of at least 50% of the MCA territory with or without additional infarction in the territory of the anterior or posterior vertebral artery on the same side, or infarct volume greater than 143 cm2 as shown on MRI with DWI.

Source: National Coordinating Centre for Chronic Conditions, Royal College of Physicians, 2008.[6]

Figure 2:
Scans Illustrating Types of Stroke



Diffusion weighted MRI revealing ischemic stroke

CT scan revealing hemorrhagic stroke

decisions about long-term anticoagulation. Transesophageal echocardiography may be indicated in those patients for whom a cardioembolic cause such as endocarditis is suspected.

Carotid Imaging

Duplex ultrasound imaging of the carotid arteries is noninvasive and widely available; it detects arterial narrowing that may be amenable to carotid endarterectomy to prevent strokes. Computed tomographic angiography and MR angiography are alternatives to duplex imaging.

Differential Diagnosis of Stroke on Brain Scanning

Even after expert clinical evaluation, brain scanning can sometimes reveal unexpected causes of stroke symptoms. Common stroke mimics include brain tumours, and extracerebral hemorrhage which may follow trauma. Subarachnoid hemorrhage may occur in older adults and should be considered in patients with a sudden onset of severe ("thunderclap") headache and an impaired level of consciousness. Subarachnoid hemorrhage is not always detectable on a brain scan, and lumbar puncture may be needed to exclude xanthochromia in cerebrospinal fluid.

Prevention of Stroke: Assessing Risk Factors

Most patients with stroke, particularly older adults, have vascular risk factors including hypertension, dyslipidemia, and diabetes. They often have generalized vascular disease including ischemic heart disease, renovascular disease, and peripheral vascular disease. Fasting blood tests for glucose and lipids should be performed, as well as blood tests for renal function. Care is needed in the choice of antihypertensive agents, for example, in renovascular disease, and an estimation of glomerular filtration rate is helpful. A full blood count excludes polycythemia.

Conclusion

The evaluation of the causes of stroke in the frail older adult is the same as that in younger people.[6] However, older people are at higher risk of cerebrovascular disease, so secondary prevention is of great importance, and many older people can be treated successfully with acute treatments including thrombolysis, where appropriate, and make an excellent recovery. However, for very frail patients with significant comorbidities, the assessment of stroke may be difficult, particularly in those with a pre-existing neurological impairment. Clinicians need to involve patients, where appropriate, and their caregivers in the decision of how far and how actively to investigate the causes of stroke.

No competing financial interests declared.

Clinical Pearls

Be aware of stroke symptoms and ACT-FAST!

Exclude hypoglycemia, which can mimic stroke.

Remember stroke as a cause of deterioration in a frail older person with comorbidities.

References

1. Hatano S. Experience from a multi-centre stroke register: a preliminary report. Bull World Health Organ 1976;54:541–53.
2. Harbison J, Hossain O, Jenkinson D, et al. Diagnostic accuracy of stroke referrals from primary care, emergency room physicians and ambulance staff using the Face Arm Speech Test. Stroke 2003;34:71–6.
3. Nor AM, Davis J, Sen B, et al. The Recognition of Stroke in the Emergency Room (ROSIER) scale: development and validation of a stroke recognition instrument. Lancet Neurol 2005;4:727–34.
4. Sudlow CLM,Warlow CP. Comparable studies of the incidence of stroke and its pathological types. Results from an international collaboration. Stroke 1997;28:491–9.
5. Lovelock CE, Molyneux AJ, Rothwell PM. Change in incidence and aetiology of intracerebral haemorrhage in Oxfordshire, UK between 1981 and 2006: a population based study. Lancet Neurology 2007;6:487–93.
6. National Coordinating Centre for Chronic Conditions, Royal College of Physicians. National clinical guideline for diagnosis and initial management of acute stroke and transient ischaemic attack (TIA). London, England: National Institute for Health and Clinical Excellence; www.nice.org July 2008. Accessed March 27, 2009.

Key Points

Stroke is a medical emergency.

The public and health care professionals need to be aware of the symptoms of stroke and the need to call for expert medical help.

Acute stroke management includes accurate diagnosis, early treatment (including thrombolysis where appropriate), assessment of neurological deficit, early expert rehabilitation, and risk factor management.

Recognition of stroke symptoms in the frail older patient can be challenging.

Management of stroke in the frail older person requires expert skills, but older patients can have a great deal to gain from prompt specialist management.