Management of acute stroke

Introduction

Stroke is a common condition worldwide. It is the third leading cause of death and the leading cause of disability in the UK. Acute management of stroke plays an important role in reducing its mortality and morbidity. This article outlines the practical management of acute stroke patients in a UK hospital setting. Secondary prevention, which is usually initiated in acute phase, is beyond the scope of this article.

Definition

Stroke is a clinical syndrome characterized by rapidly developing clinical symptoms and/or signs of focal neurological deficit lasting more than 24 hours and thought to be of vascular origin (Warlow et al, 1996). This definition arbitrarily distinguishes stroke from a transient ischaemic attack (TIA) where symptoms last less than 24 hours. However, the distinction between them is controversial (Albers et al, 2002).

Classification

Stroke is classified either by territory of vascular involvement or by its underlying pathophysiology. While anatomical location helps understand the neurological deficit, pathophysiological classification provides essential information regarding immediate and subsequent management. Ideally, therefore, the diagnosis of stroke should be accompanied by its anatomical as well as pathophysiological classification (*Table 1*).

Clinical features

Clinical features are determined by the location and extent of the lesion and usually a combination of focal neurological symptoms and/or signs is attributed to a specific arterial distribution. Common presentations according to area of brain affected are listed in *Table 2* (not exclusively).

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History taking

Sudden onset is typical of a stroke presentation. One should actively seek relevant vascular risk factors during history taking. Known modifiable risk factors, which are associated with increased risk of stroke, are listed in *Table 3* and differential diagnoses of stroke in *Table 4*.

The following conditions warrant special consideration in diagnosis:

- Stroke in the young (e.g. vasculitis)
- Strong family history of stroke (particularly in first degree relatives)
- Post- or perioperative cases
- Special syndromes (e.g. cerebral autosomal dominant arteriopathy with subcortical infarcts and leukoencephalopathy (CADASIL), capsular warning syndrome, mitochondrial disease).

Investigations

Urgent investigations include baseline blood tests, full blood count, clotting profile, biochemistry including blood glucose, cholesterol and an electrocardiogram (ECG). Further tests such as chest X-rays depend on the individual patient's condition.

Computed tomography scan and stroke

These points are worth mentioning:

- Stroke is a clinical diagnosis; a normal computed tomography (CT) scan does not exclude the stroke
- CT is crucial to rule out differential diagnoses and to differentiate between haemorrhagic and ischaemic strokes
- A CT scan should be performed within 24 hours in every patient with stroke
- Indications for an urgent CT scan are:
  1. Suspected subarachnoid haemorrhage or infective pathology, e.g. meningitis, brain abscess or encephalitis
  2. Patients taking anticoagulants
  3. Patients with a deteriorating or fluctuating level of consciousness
  4. When thrombolysis treatment is considered appropriate
  5. A history or suspicion of head injury and/or sub-/extradural haematoma.

Table 1. Classification of stroke

Anatomical classification*	Total anterior circulation stroke		
	Partial anterior circulation stroke		
	Lacunar stroke		
	Posterior circulation stroke		
	Primary intracerebral haemorrhage		
	Undetermined		
Pathophysiological classification	Ischaemic stroke	Small deep infarcts ('lacunar')	
		Cardioembolic	
		Large artery infarcts	Artery-to-artery embolism
			Extracranial occlusion and poor collaterals
			Intracranial atherosclerosis
			Arterial dissection (carotids/vertebral)
			Arteritis
			Unknown
	Haemorrhagic stroke	Primary (amyloid angiopathic or hypertensive)	
		Secondary, e.g. arteriovenous malformations, aneurysm, coagulopathy (warfarin)	

* From Oxfordshire Community Stroke Project classification (Bamford et al, 1991)

Table 2. Presenting symptoms and signs of stroke

Motor or sensory pathways	Weakness and/or sensory loss in arm, face or leg
Visual pathways	Visual loss (e.g. homonymous hemianopia)
Higher cortical lesions	Speech problems (dysphasia), sensory or visual neglect, memory or behavioural dysfunction, visual or spatial disorientations, cognitive impairment
Brainstem lesions	Ataxia, vertigo, nystagmus, cerebellar signs

Further investigations such as carotid Doppler, magnetic resonance imaging, echocardiography and 24-hour ECG monitoring are usually considered on an individual basis and the need for these should be discussed with a stroke specialist.

Immediate management steps

General and supportive measures

1. Establish correct diagnosis (as above)
2. Attend to ABC (airways, breathing and circulation) if appropriate
3. Monitor conscious level and neuro-observation
4. Normalize physiological parameters, e.g. oxygen, glycaemic control, temperature
5. Blood pressure (BP) monitoring
6. Swallowing assessment
7. Hydration
8. Prevent complications, e.g. deep venous thrombosis, pressure ulcers, aspiration.

Normalizing physiological parameters

The current consensus view is that oxygenation should be kept above 95% in the acute stroke phase if possible. Special care should be given to the cause of hypoxia such as thromboembolism, background chronic respiratory diseases, e.g. chronic obstructive pulmonary disease, aspiration, or airways insufficiency including obstructive sleep apnoea. Maintaining a physiological temperature and blood glucose level is recommended (De Keyser, 1998; Bhalla et al, 2001). It is well recognized that hyperglycaemia is associated with poor outcome. There are trials underway assessing the effect of strict glycaemic control in acute phase (e.g. Glucose Insulin Stroke Trial).

Table 3. Modifiable risk factors for stroke

Major	Hypertension
	Heart disease, especially atrial fibrillation
	Smoking
	Transient ischaemic attack
Less well documented	Excessive alcohol intake or drug abuse
	Acute infection
Secondary	Increased serum cholesterol and/or lipid levels
	Physical inactivity
	Obesity

Blood pressure

BP intervention in the acute phase is controversial. There is a general agreement to withhold or not commence antihypertensive therapy acutely except if the BP is very high. However, there is no consensus on BP levels at which emergency treatment is required. It has been suggested that if systolic BP exceeds 220 mmHg, or diastolic BP exceeds 120 mmHg (Adams et al, 2003), or if the patient exhibits hypertensive encephalopathy, then short-acting agents that can be easily titrated, such as labetolol or nitroprusside, should be considered. They should be used cautiously, aiming for a 10–15% reduction of BP under close monitoring (Adams et al, 1994).

Swallowing

Swallowing problems are common in acute stroke. Accurate assessment of dysphagia is important, allowing optimal management and minimizing potential complications (Ramsey and Smithard, 2004).

Table 4. Differential diagnosis of stroke

3S: seizures, syncope and sepsis
Psychological
Migraine
Labyrinthitis
Tumour (space-occupying lesion)
Metabolic, e.g. hypo-/hyperglycaemia
Others, e.g. transient global amnesia

Hydration

Those who are unable or unsafe to swallow should be given intravenous fluids as initial management.

Specific measures

- Admit to an acute stroke unit
- Thrombolysis should be considered in appropriate cases (see below) and offered if the service is available locally
- Ischaemic stroke resulting from carotid or vertebral dissection needs special management
- Anticoagulation is not recommended in the acute phase in ischaemic stroke patients who present with newly diagnosed atrial fibrillation because of the risk of haemorrhagic transformation. The decision should be discussed with a senior doctor.

Thrombolysis

Thrombolysis of acute ischaemic stroke with intravenous recombinant tissue plasminogen activator (rt-PA) is proven to be beneficial. Thrombolytic therapy within 3 hours of stroke onset appeared more effective in reducing death or dependency with no statistically significant adverse effect on death. This benefit is evident despite increased risk of symptomatic intracerebral bleed in the treated group compared to placebo. At 3-month follow up one fewer was dead or activity of daily living-dependent per ten treated (National Institute of Neurological Disorders Study Group, 1995; Wardlaw et al, 2003).

In the UK, thrombolysis is available in hospitals which have an acute stroke unit and are registered with SITS (Safe Implementation of Thrombolysis in Stroke). SITS is an internet-based interactive thrombolysis register, which serves as an instrument for clinical centres to follow their own treatment results and compare them with other centres in their countries and in the collaborating countries.

Prerequisites for thrombolysis in the UK include:

1. The treatment has to be given in an acute stroke unit under supervision of a stroke specialist with previous experience and/or training in thrombolysis

Table 5. Suitability criteria for thrombolysis

Symptoms and signs of clinically definite acute stroke
Time of stroke onset is known and treatment can be started within 3 hours of onset
Computed tomography or magnetic resonance imaging of the brain has reliably excluded both intracranial haemorrhage and structural brain lesions which can mimic stroke
The patient was independent in activities of daily living before this stroke

Table 6. Contraindications for thrombolysis

Major surgery, trauma (e.g. major fall at time of stroke) or gastrointestinal or urinary tract haemorrhage within the previous 3 weeks
Arterial puncture at a non-compressible site within a week
Current or recent oral anticoagulant therapy with international normalization ratio > 1.4
Current heparin therapy (including low molecular weight heparin)
Known defect of clotting or platelet function or low platelet count ($<10^5$/mm cu)
Pregnancy and/or breast feeding
Hypoglycaemia (blood glucose <2.7 mmol/litre) or hyperglycaemia (blood glucose > 22.1 mmol/litre)
Patient has other life-threatening illness with guarded prognosis
Severe stroke assessed by National Institute of Health Stroke Scale score > 25
Epileptic seizure at the onset of stroke
Prior stroke within last 3 months
History of prior stroke and concomitant diabetes
Systolic blood pressure > 185 mmHg or diastolic blood pressure > 110 mmHg
Minor or rapidly improving neurological symptoms before treatment
Known or suspected history of intracranial structural pathology including subarachnoid haemorrhage, sub-/extradural haematoma or neoplasm
Haemorrhagic retinopathy
Systematic disease which potentially could lead to haemorrhage (e.g. acute pancreatitis, oesophageal varices, severe liver disease)

2. The patient should fulfil all the criteria listed in *Table 5*
3. There should be no contraindication to thrombolysis (*Table 6*).

Carotid dissection

Carotid dissection should be considered particularly in younger patients without vascular risk factors. There may be a preceding episode of cervical strain or injury. Urgent carotid imaging is indicated. Anticoagulation should be considered and discussed with a stroke consultant.

Intracerebral haemorrhages

The mainstay of management is supportive. BP monitoring in these patients is vital. Systolic BP should be kept at least below 180 mmHg and mean arterial pressure should be <130 mmHg (Anonymous, 2004). Seizures should be treated after the first occurrence. Prophylactic anticonvulsant is not recommended in UK and European guidelines. Neurosurgical opinion should be sought when appropriate especially if there is evidence of hydrocephalus or raised intracranial pressure. The results of the Surgical Trial in IntraCerebral Haemorrhage (STICH) trial showed no evidence of an overall benefit of early surgery when compared to initial conservative treatment (Mendelow et al, 2005). For all secondary causes of ICH, the underlying aetiology should be addressed and treated if possible (e.g. aneurysm, anticoagulation).

Conclusions

Acute stroke is a medical emergency. Early diagnosis and appropriate management can reduce mortality and morbidity. BJHM

Conflict of interest: none.

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KEY POINTS

- Although stroke is a clinical diagnosis it is essential to rule out other stroke mimics.
- Stroke in the young requires special consideration both in confirming the diagnosis and identifying the aetiology.
- During the acute phase, close monitoring of physiological parameters is important.
- Blood pressure management in acute stroke requires specialist input.
- Thrombolysis for acute ischaemic stroke is beneficial for selected patients.