



Update in the Management of Patients with Stroke

The diagnostic and therapeutic armamentarium of emergency physicians for the management of patients with acute stroke has greatly expanded in recent years. The lecturer will explore the latest options related to the management of patients with stroke in the emergency department, including imaging, thrombolysis, anticoagulation, and neuroprotective agents. Recommendations for establishing a code stroke team will be presented.

- Describe the current controversies in the emergency department management of patients with acute stroke.
- Discuss the most recent diagnostic and treatment modalities.
- Identify the essential components for a code stroke team in the emergency department.

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FACULTY

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UPDATE IN STROKE MANAGEMENT

I. DEFINITIONS

A. Stroke - sudden or rapid onset of a neurologic deficit in a vascular territory due to a cerebrovascular disease lasting longer than 24 hours

B. TIA - same, lasting less than 24 hours

C. Cerebrovascular diseases include atherosclerosis; lipohyalinosis; cerebral embolism; dissection; fibromuscular dysplasia; berry aneurysm; vascular malformations; vasculitis

D. Hypercoagulable states include prethrombotic and thrombosis prone patients

II. CLASSIFICATION

A. Ischemic Strokes

1. Thrombotic

a. Carotid Disease

(1) stroke

(2) TIA

(a) hemisphere

(b) transient monocular blindness (amaurosis fugax)

b. Vertebro-basilar Disease

(1) mainstem

(2) branch

c. Lacunar Disease

(1) pure motor

(2) pure sensory

(3) dysarthria - clumsy hand

(4) ataxic hemiparesis

(5) lacunar state

2. Embolic (cardiac source and arterial source)

a. Middle cerebral occlusion and branches

b. Anterior cerebral occlusion

c. Posterior cerebral occlusion

d. Vertebro-basilar (top of basilar)

3. Hypercoagulable states

a. Primary

- (1) protein S/protein C deficiency
- (2) antithrombin III deficiency
- (3) fibrinolytic disorders

b. Secondary

- (1) antiphospholipid antibody syndrome
- (2) paraneoplastic (Trousseau's syndrome)
- (3) rheological problems (e.g. immobility; obesity; artificial surfaces)

B. Hemorrhagic Strokes

1. Intracerebral Hemorrhage related to hypertension or congophilic angiography

- a. Putamen
- b. Thalamus
- c. Pons
- d. Cerebellum
- e. Lobar (often due to congophilic angiopathy or blood dyscrasias)

2. Subarachnoid Hemorrhage

- a. Congenital (berry) aneurysm
- b. Arteriovenous Malformation (AVM)
- c. Blood dyscrasias with hemorrhagic diathesis (eg. thrombocytopenia, hemophilia)

III. DIAGNOSIS

A. Clinical Picture

1. Anterior circulation

- a. ophthalmic artery
- b. anterior cerebral artery
- c. middle cerebral artery

2. Posterior circulation

- a. vertebral artery
- b. mainstem basilar artery
- c. basilar branch disease
- d. top of the basilar syndrome
- e. posterior cerebral artery

B. Non-Invasive Studies for Carotid Disease

1. Ophthalmodynamometry
2. Real Time Ultrasound (B Scan)
3. Phonoangiography
4. Doppler
5. Nuclear flow studies

C. Digitalized Angiography (Venous and Arterial)

D. CT Scan (Including fast CT techniques such as Spiral CT)

E. Angiography (MRA and Conventional Angiography)

F. Lumbar Puncture is now rarely used

G. Magnetic Resonance Imaging (MRI) including diffusion weighted and perfusion images

H. Position Emission Tomography (PET)

I. Single Photon emission Computed Tomography (SPECT)

J. Magnetic resonance functional imaging (fMRI)

K. Echocardiography (transthoracic and transesophageal)

IV. TREATMENT

A. General Measures

1. Minimize fluid intake for 24-48 hours. No IV, if possible, no fluids containing free water (e.g. 5% dextrose in water)
2. N.P.O. for 24-48 hours
3. Moderate control of blood pressure

B. Specific Measures

1. Carotid endarterectomy in patient with significant carotid stenosis (60-99%)

2. Anticoagulation

- a. Heparin in inoperable cases of progressing stroke due to significant thrombotic disease in either carotid or vertebro-basilar arteries.
- b. Warfarin (Coumadin) 1.2-1.5 times control PT (INR=2.0-3.0) in reliable patients with known significant risk factor for cerebral embolus, such as:
 - (1) arterial fibrillation with or without mitral disease
 - (2) patent foramen ovale
 - (3) myocardial infarction with dyskinetic left ventricle
 - (4) cardiomyopathy
- c. Warfarin (Coumadin) relatively contra-indicated in:
 - (1) unreliable and/or alcoholic patients
 - (2) endocarditis
 - (3) known blood dyscrasia
 - (4) patients who tend to fall
- d. Warfarin (Coumadin) high intensity (ie. INR = 3.0-3.5) in patients with antiphospholipid antibody syndrome

3. Antiplatelet Drugs

- a. Aspirin is effective in preventing TIA or stroke. The lowest proved effective dose is 30 mg per day but most neurologists still prescribe 325-650 mg qd (i.e. one-two adult aspirin tablets)
- b. Aspirin plus dipyridamole may have a role in aspirin failures
- c. Sulfinpyrazone has not been proved to be effective.
- d. Ticlopidine, 250mg.bid, a drug which blocks the adenosine diphosphate pathway of platelet aggregation is effective in preventing TIA or stroke, but it is substantially more expensive than aspirin and is associated with more serious side effects (e.g. thrombocytopenia; leukopenia)

4. Antithrombolytic therapy in subarachnoid hemorrhage (Six weeks or until surgery) is becoming less popular.
 - a. epsilon aminocaproic acid, 36gms/d I.V.
5. Antispasm therapy in subarachnoid hemorrhage (days 3-10)
 - a. Raise blood pressure - risk re-hemorrhage
 - b. Amine depletors (e.g. reserpine, kanamycin)
 - c. Beta receptor stimulation with isoproterenol
6. Surgical clipping of berry aneurysm
7. Surgical removal of AVM's
8. Embolization of unresectable AVM's
9. Treat cerebral edema as required:
 - a. hyperosmolar agents (i.e. mannitol, glycerol)
 - b. steroids (i.e. dexamethasone)
 - c. barbiturates
10. Thrombolytic therapy
 - a. intravenous tPA
 - b. intra-arterial urokinase, pro-urokinase, tPA
11. Experimental therapies
 - a. hemodilution
 - b. angioplasty and stents
 - c. cerebral bypass surgery
 - d. cellular protection with glutamate receptor blockers, free radical scavengers, calcium entry blockers, etc.
 - e. laser lysis of clots

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