

STROKE AND MULTIPLE SCLEROSIS

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Stroke and Multiple Sclerosis

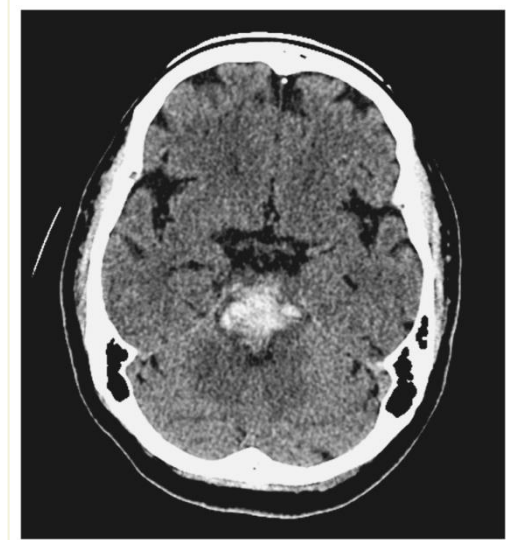
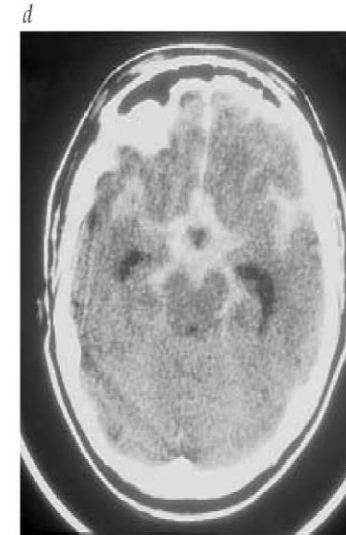
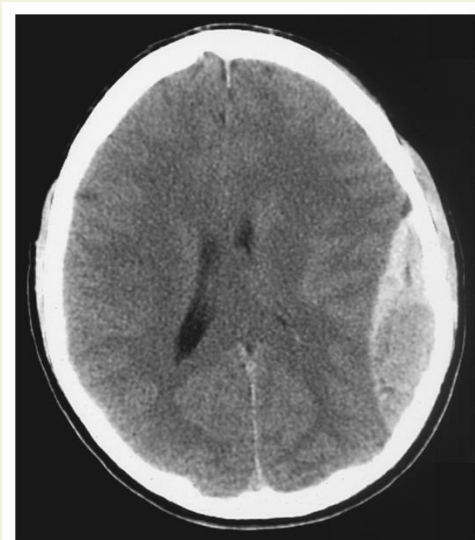
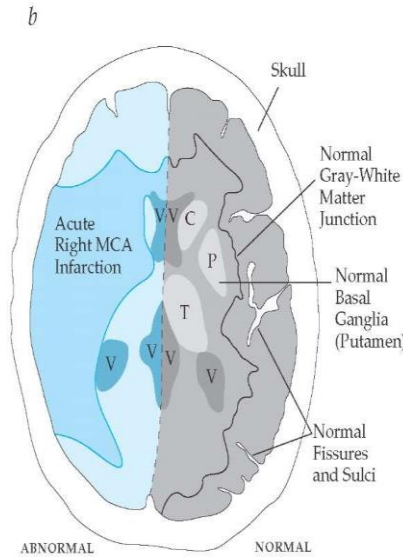
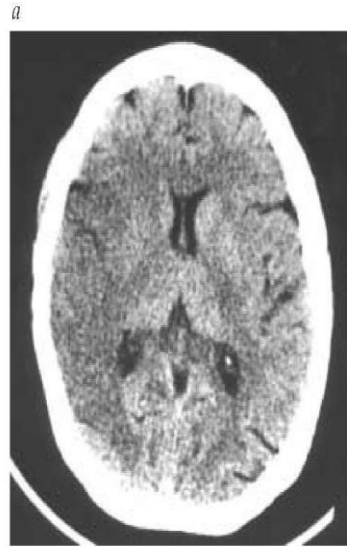
Stroke or Brain Attack

- *5th Leading cause of Death for men*
- *4th leading cause of Death for women*
- *3rd leading cause of death for Blacks*
- *Acute brain injury due to a vascular etiology*
- *Sudden onset*
- *Persist at least 24 hours*
- *Associated neurological deficit/deficits*

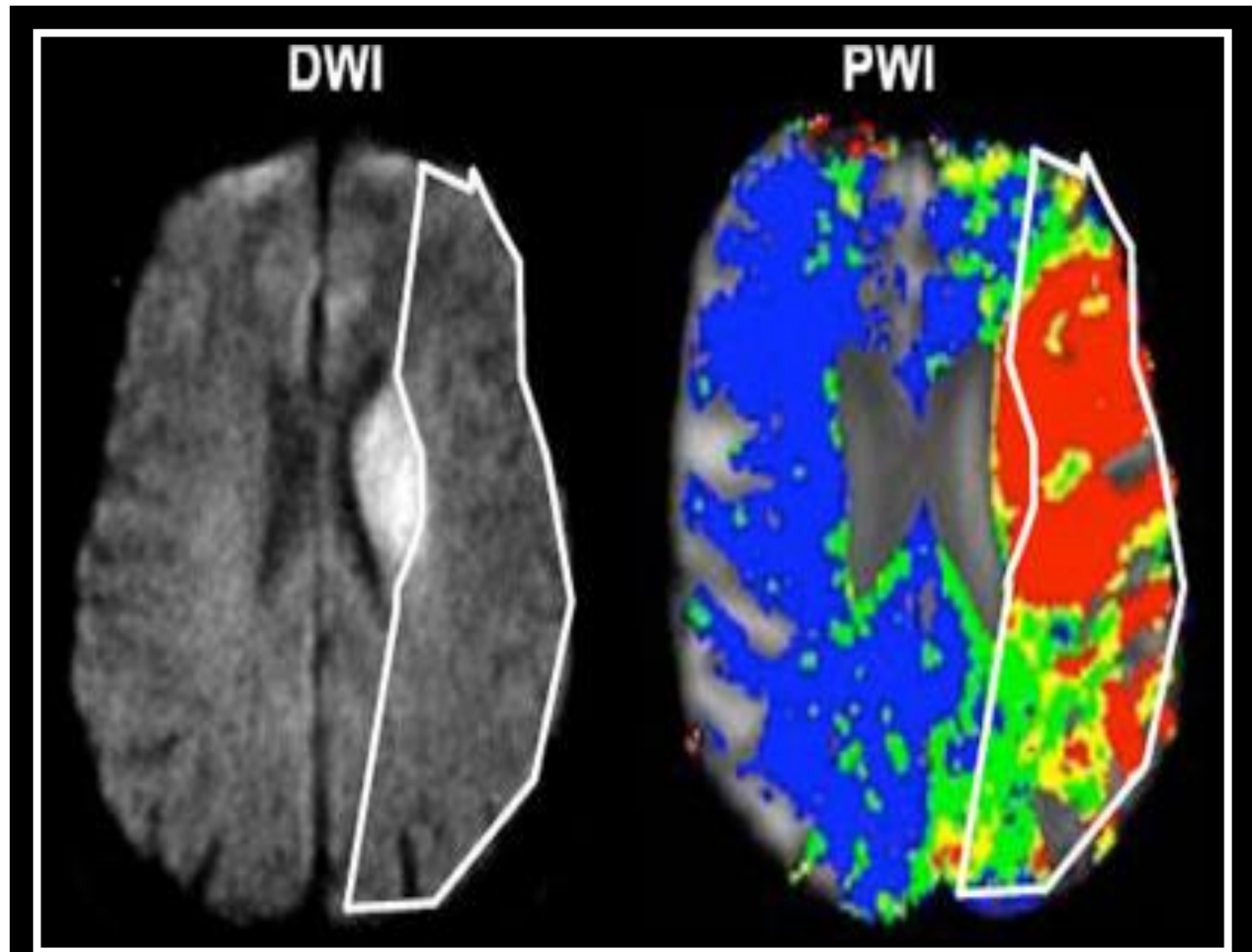
TIA

-Neurological deficits lasting less than 24 hours

Stroke Imaging



Stroke Imaging- diffusion/perfusion



STROKE

- *Occurrence and Financial Facts:*
 - *795,000 Strokes Occur each year*
 - *87 percent of those strokes are ischemic*
 - *Stroke kills 130,000 Americans/year*
 - *Stroke costs the US an estimated 34 billion/yr*
 - *Leading cause of serious long term disability*

STROKE

- *Race/Sex/Geography*
 - *Black risk of death is 1.49X Whites*
 - *Males greater risk than females*
 - *Hispanics higher risk for lacunar infarcts*
 - *Southeastern US has higher risk*
- *Age*
 - *Stroke occurs in all ages*
 - *Stroke risk increases with age*
 - *Age >64 is where 75% of occurrence*

STROKE RISK FACTORS

- ***Non-modifiable Risk Factors***

- *Age*
- *Race*
- *Sex*
- *Ethnicity*
- *History of Migraine*
- *Sickle Cell Disease*
- *Fibromuscular Dysplasia*
- *Heredity*

STROKE RISK FACTORS

- *Laboratory Monitoring Risk*
 - *Glucose and Electrolytes*
 - *CBC with Platelets*
 - *Prothrombin Time/ Partial Thromboplastin Time*
 - *Cholesterol/LDL/HDL*
 - *ANA/RF/Homocysteine/ESR*
 - *Protein C/ Protein S/ Antithrombin III/ Leiden*
 - *Anticardiolipin Antibody*
 - *Lupus Inhibitor/ Antiphospholipid Antibodies*

VASCULAR RISK FACTORS

- Modifiable conditions and lifestyle characteristics identified as a risk factors for stroke:

High blood pressure

Atrial fibrillation

Smoking

Heavy alcohol use

Myocardial infarction

Physical inactivity

Obesity

High Cholesterol

Diabetes mellitus

Carotid artery disease

SLEEP-DISORDERED BREATHING

- Background

- Sleep-disordered breathing (SDB) is both a risk factor and a consequence of stroke
- More than 50% of stroke patients have SDB, mostly in the form of obstructive sleep apnoea (OSA).
- SDB is linked with poorer long-term outcome and increased long-term stroke mortality¹
- Continuous positive airway pressure is the treatment of choice for OSA.

MANAGEMENT OF COMPLICATIONS

■ *Falls*

- *Are common in every stage of stroke treatment*
- *Risk factors include cognitive impairment, depression, polypharmacy and sensory impairment¹*
- *A multidisciplinary package focusing on personal and environmental factors might be preventive²*
- *Exercise, calcium supplements and bisphosphonates improve bone strength and decrease fracture rates in stroke patients^{3,4}*

1: Aizen E et al.: Arch Gerontol Geriatr (2007) 44:1-12

2: Oliver D et al.: BMJ (2007) 334:82

3: Pang MY et al.: Clin Rehabil (2006) 20:97-111

4: Sato Y et al.: Cerebrovasc Dis (2005) 20:187-92

MANAGEMENT OF COMPLICATIONS

- *Dysphagia and feeding*
 - *Dysphagia occurs in up to 50% of patients with unilateral hemiplegic stroke and is an independent risk-factor for poor outcome¹*
 - *For patients with continuing dysphagia, options for enteral nutrition include NG or PEG feeding*
 - *PEG does not provide better nutritional status or improved clinical outcome, compared to NG^{2,3}*

1: Martino R et al.: Stroke (2005) 36:2756-63

2: Dennis MS et al.: Lancet (2005) 365:764-72

3: Callahan CM et al.: J Am Geriatr Soc (2000) 48:1048-54

REHABILITATION

- *Early rehabilitation-*

- *More than 40 % of stroke patients need active rehabilitation*
- *Active rehabilitation should start early, providing the patient is clinically stable*
- *Passive rehabilitation should be given if the patient is unconscious or paralyzed*
- *Rehabilitation should be continued as long as perceptable recovery is taking place*

REHABILITATION

- *Multidisciplinary stroke team for rehabilitation*
 - *Stroke physician*
 - *Nurses experienced in stroke management*
 - *Physiotherapist trained in stroke rehabilitation*
 - *Occupational therapist skilled in stroke*
 - *Speech therapist familiar with speech problems in stroke patients*
 - *Neuropsychologist accustomed to stroke rehabilitation*
 - *Social worker familiar with the problems of stroke patients*

Calculating Risk

ABCD₂

To identify individuals at high early risk of stroke after transient ischemic attack.

A (Age); 1 point for age ≥ 60 years,

B (Blood pressure $\geq 140/90$ mmHg); 1 point for hypertension at the acute evaluation,

C (Clinical features); 2 points for unilateral weakness, 1 for speech disturbance without weakness,

D (symptom Duration); 1 point for 10–59 minutes, 2 points for ≥ 60 minutes.

D (Diabetes); 1 point

Total scores range from 0 (lowest risk) to 7 (highest risk).

Scale:

Scores 0-3:low risk

Scores 4-5:moderate risk

Scores 6-7:high risk

Stroke and Multiple Sclerosis

Types of Stroke

Ischemic- *most common >70%*

Thrombotic

-Atherosclerosis

Embolic

-Emboli from the Heart or Great Vessels

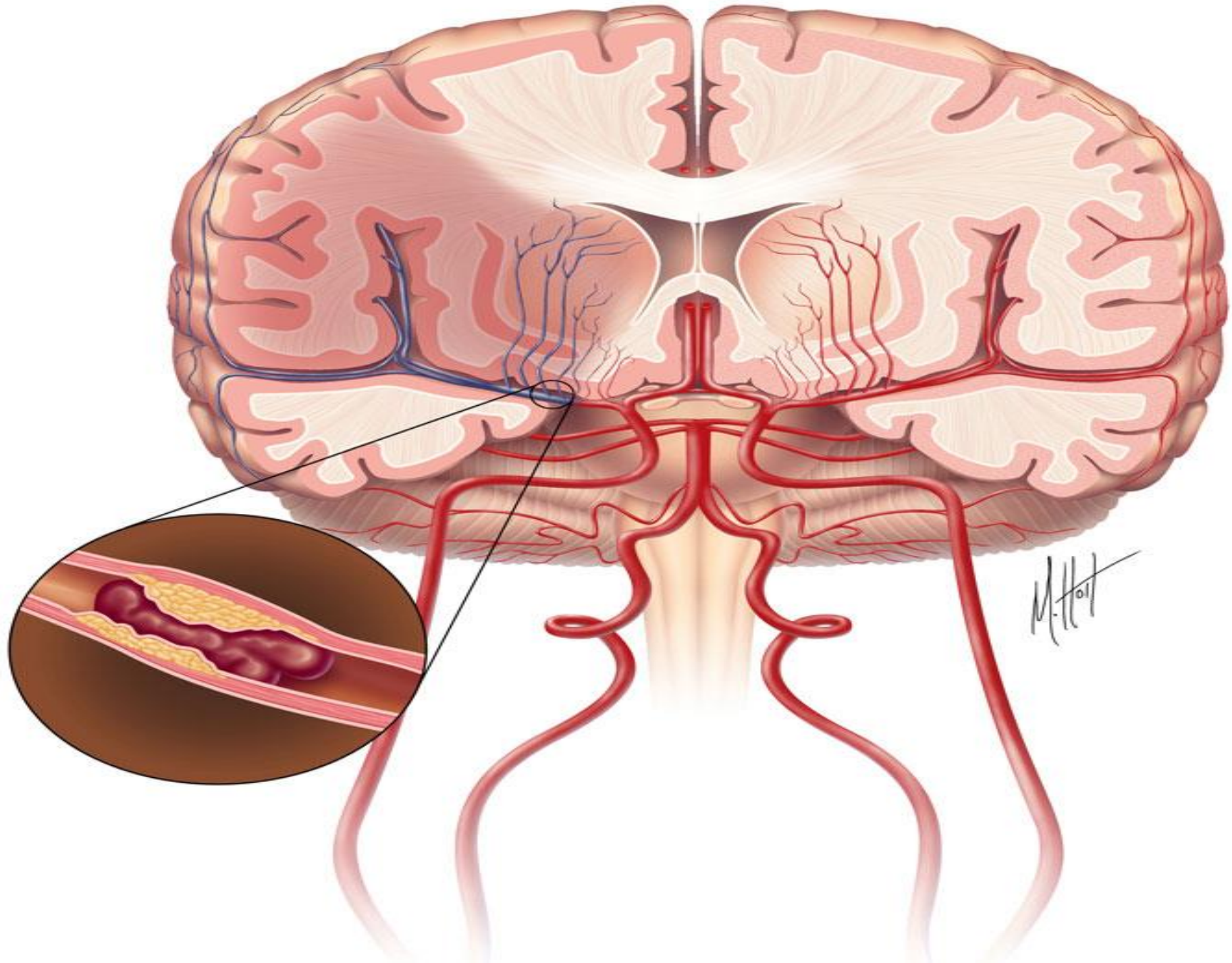
Hemorrhagic-

Intracerebral

-Hypertension or Amyloid Angiopathy

Subarachnoid

-Berry Aneurysms



Stroke and Multiple Sclerosis

Thrombotic Strokes

- **Atherosclerosis involving:**
 - Internal Carotid*
 - Middle Cerebral*
 - Vertebrobasilar*
- **Symptoms**
 - Slow stepwise progression of symptoms*
 - Usually preceded by TIA's*
- **Other Causes**
 - Lupus anticoagulant*
 - Polycythemia*
 - Syphilis*
 - Thrombocytosis*
 - Dissecting Aortic Aneurysm*

Stroke and Multiple Sclerosis

Embolic Stroke

- *Not usually preceded by TIA*
- *Emboli*
 - *Heart*
 - *Large Blood vessel*
 - *Usually effects middle>posterior>anterior cerebral*
- *Symptoms*
 - *Neurodeficits worst at onset*
 - *Weakness is greater in distal extremities*

Stroke and Multiple Sclerosis

Stroke Symptoms By Region

Middle cerebral-

Anterior cerebral-

Posterior cerebral-

Single Hemisphere-

Vertebrobasilar-

Lateral Medullary syndrome-

Lacunar-small vessel-

Stroke and Multiple Sclerosis

Middle Cerebral Artery Occlusion

- *Contralateral hemiplegia*
- *Contralateral hemianesthesia*
- *Homonymous hemianopsia*
- *Impaired conjugate gaze in opposite direction*
- *Impaired spatial- nondominant*
- *Impaired language-dominant*
- *If lesion high- >loss face/upper ext*
 - *If it is in the main trunk- deficit same throughout*

Stroke and Multiple Sclerosis

Anterior Cerebral Artery Occlusion

- *Most affected in distal contralateral leg*
- *Urinary incontinence*
- *Gait abnormalities*
- *If includes corpus callosum the patient will have tactile anomia (**cannot name what they touch**)*

Stroke and Multiple Sclerosis

Posterior Cerebral Artery Occlusion

- *Contralateral homonymous hemianopsia*
- *Usually upper quadrantanopsia*
- *Mild contralateral hemiplegia/anesthesia*
- *Color anomia= corpus callosum damage*
- *Memory loss*
- *If occlusion bilateral memory will be severe/persistent*

Stroke and Multiple Sclerosis

Single Hemisphere injury

- *Does not affect paraspinal muscles*
- *Does not affect pharynx*
- *Does not affect jaw*
- *Does not affect the forehead*
- *If any or all of the above are affected think:*
 - *Bilateral hemispheric infarct*
 - *Brainstem infarct*

Stroke and Multiple Sclerosis

Vertebrobasilar Artery Occlusion

- *Associated with brain stem strokes*
- *Bilateral extremity motor/sensory dysfunction*
- *Quadraplegia in severe cases*
- *Crossed motor and sensory deficits*
- *Horner syndrome*
- *Cerebellar signs/stupor/coma*
- *Cranial nerve dysfunction*

Stroke and Multiple Sclerosis

Lateral Medullary Syndrome

-Also called Wallenberg Syndrome

- *Nausea*
- *Vomiting*
- *Nystagmus*
- *Ipsilateral Horner Syndrome*
- *Ipsilateral palate and vocal cord weakness*
- *Ipsilateral face hemi-anesthesia*
- *Contralateral body hemi-anesthesia*

Stroke and Multiple Sclerosis

Lacunar Strokes

- *Due to hypertension*
- *Occlusion of very small arterioles*
- *Over time they form “cysts” in the brain*
- *Pure hemiplegia*
- *Pure hemisensory*
- *Multiple bilateral frontal lobe “lacunes” can cause pseudobulbar palsy*

Stroke and Multiple Sclerosis

Work up:

History

Computerized Tomography Brain

CBC with platelets

Troponin

*Electrolytes, **Glucose**, Bun, Cr,*

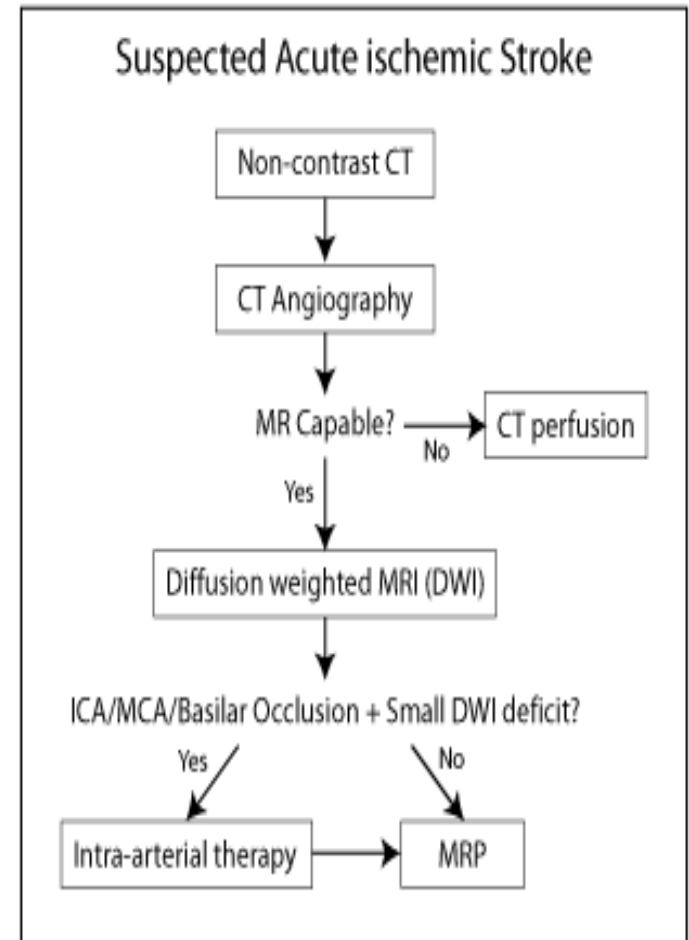
Coagulation profiles

ECG

Trans-thoracic Echocardiogram

Carotid Ultrasound/Trans-cranial Doppler

Consider MRI/MRI Diffusion/Angiography



Stroke and Multiple Sclerosis

Ischemic Stroke Treatment

-Thrombolysis-Alteplase(only need CT/Glucose)

->18 yrs old with an ischemic stroke Dx

Onset time – 3 hours(3-4.5 with caveats)

-Treat BP-gradually IV <180/105

-Aspirin/Antiplatelets

-Oxygen >94%

-Surgical Intervention evaluation LVO

-intra-arterial therapy

-mechanical thrombectomy

Stroke and Multiple Sclerosis

CONTRAINDICATIONS TO ALTEPLASE (tPA)

Absolute-

Intracranial hemorrhage on CT

Clinical Presentation suggests subarachnoid hemorrhage

Neurological surgery, serious head trauma, or previous stroke past 3 months

Uncontrolled hypertension(>185 mmHg SBP or >110 mm Hg DBP)

History of intracranial hemorrhage

Seizure at stroke onset

Known AVM, neoplasm , or aneurysm

Active internal bleeding

Suspected/confirmed endocarditis

Known bleeding diathesis: plts<100,000, heparin with elevated PTT, oral anticoagulants and INR>1.7, thrombin inhibitors

Abnormal blood glucose(<50 or >400 mg/dl)

Relative –

Only minor or rapidly improving stroke symptoms

Patient has had major surgery or serious trauma excluding head trauma in previous 14 days

History of GI/Urinary hemorrhage in last 21 days

Recent arterial puncture at a noncompressible site

Recent lumbar puncture

Post myocardial infarction pericarditis

Pregnancy

Additional WARNINGS to tPA > 3-4.5 hr onset-

Age >80

History of prior stroke and diabetes

Any active anticoagulant use (even with INR <1.7)

NIHSS>25

Stroke and Multiple Sclerosis

• Post Acute Care Therapy

Antiplatelets

ASA (160-300 mg) *_{24-48 hours after acute intervention}*

Plavix(Clopidogrel)

Warfarin for valvular atrial fibrillation

Dabigatran, Apixaban, Rivaroxaben- (non valvular Atrial Fibrillation)

Manage underlying causes:

Cardiac- per ACC for angina or coronary syndromes

HTN- JNC guidelines- <130/80

Diabetes- HbA1C <6.5-7.0

Tobacco abuse management

Hyperlipidemia- LDL <70

If >70% carotid stenosis- surgery in 48 hrs-7 days

Stroke and Multiple Sclerosis

CHADS2

Score for Atrial Fibrillation Stroke Risk:

<i>Congestive Heart Failure</i>	<i>1pt</i>
<i>Hypertension</i>	<i>1pt</i>
<i>Age > 75</i>	<i>1pt</i>
<i>Diabetes Mellitus</i>	<i>1pt</i>
<i>Stroke or TIA Symptoms</i>	<i>2pt</i>

<i>Score > 2</i>	<i>High</i>	<i>oral anticoagulant</i>
<i>Score > 1 < 2</i>	<i>Moderate</i>	<i>oral anticoagulant or ASA</i>
<i>Score 0</i>	<i>Low</i>	<i>ASA 160-325mg</i>

Stroke and Multiple Sclerosis

Intracerebral Hemorrhage

Amyloid Angiopathy

- *Commonly causes recurrent bleeds*
- *>65 yrs old*
- *Subcortical , rarely affects deep structures*
- *Can cause multi-infarctional dementia*
- *Also found in alzheimers patients- unclear association*
- *Occasionally can be associated with subarachnoid*

Stroke and Multiple Sclerosis

Intracerebral Hemorrhage

- ❑ Hypertension
- ❑ Gradual and smooth onset of symptoms
- ❑ Putamen>Thalamus>Pons>Cerebellum
 - *Putamen*
 - *Contralateral hemiparesis/sensory loss/hemianopsia*
 - *Acts just like a middle cerebral infarct*
 - *Thalamus*
 - *Contra hemiplegia/hemianesthesia/sensory>motor*
 - *Pons*
 - *Coma/pinpoint pupils/complete paralysis*
 - *Can have decerebrate posturing bilaterally*
 - *Cerebellum*
 - *Acute dizziness/ataxia/vomiting*
 - *No mentation change or loss of consciousness*

Stroke and Multiple Sclerosis

Subarachnoid Hemorrhage

- *Cerebral saccular aneurysm bleed*
 - Usually Circle of Willis*
 - IC=40%/AC=35%/MC=20%*
- *Hypertensive hemorrhages with ventricular rupture*
- *A-V Malformations*
- *Symptoms*
 - *Acute/Severe headache (thunderclap)-unresponsive to meds*
 - *May be alert/confused /comatose*
 - *No focal neurological signs*
 - *Neck stiffness is classic- but not always present*

Stroke and Multiple Sclerosis

• Hemorrhagic Stroke Work Up

➤ *Computerized Tomography*

(CT misses 10% of Bleeds)

➤ *Lumbar Puncture*

- *Xanthochromic supernatant is diagnostic*
- *If LP (-) can be hours before blood gets in CSF*

➤ *Cerebral Angiography*

➤ *Can re-bleed in 24 hours due to vasospasms*

Treatment

- Neurosurgery consult/Intervention*
- ABC'S/ Intracranial Pressure monitoring*
- Hemodynamic and edema management/Nimodipine/Mannitol/Glycerol/Saline*
- Seizure management*

Stroke and Multiple Sclerosis

Multiple Sclerosis

Myelin deterioration- demyelination

- *Brain*
- *Spinal Cord*
- *Optic Nerve*

Pathophysiology

10x more common in northern latitudes

May be viral in origin— Female 2:1 Males

Autoimmune but does have genetic components

Onset 20-50 yrs of age

Plaques

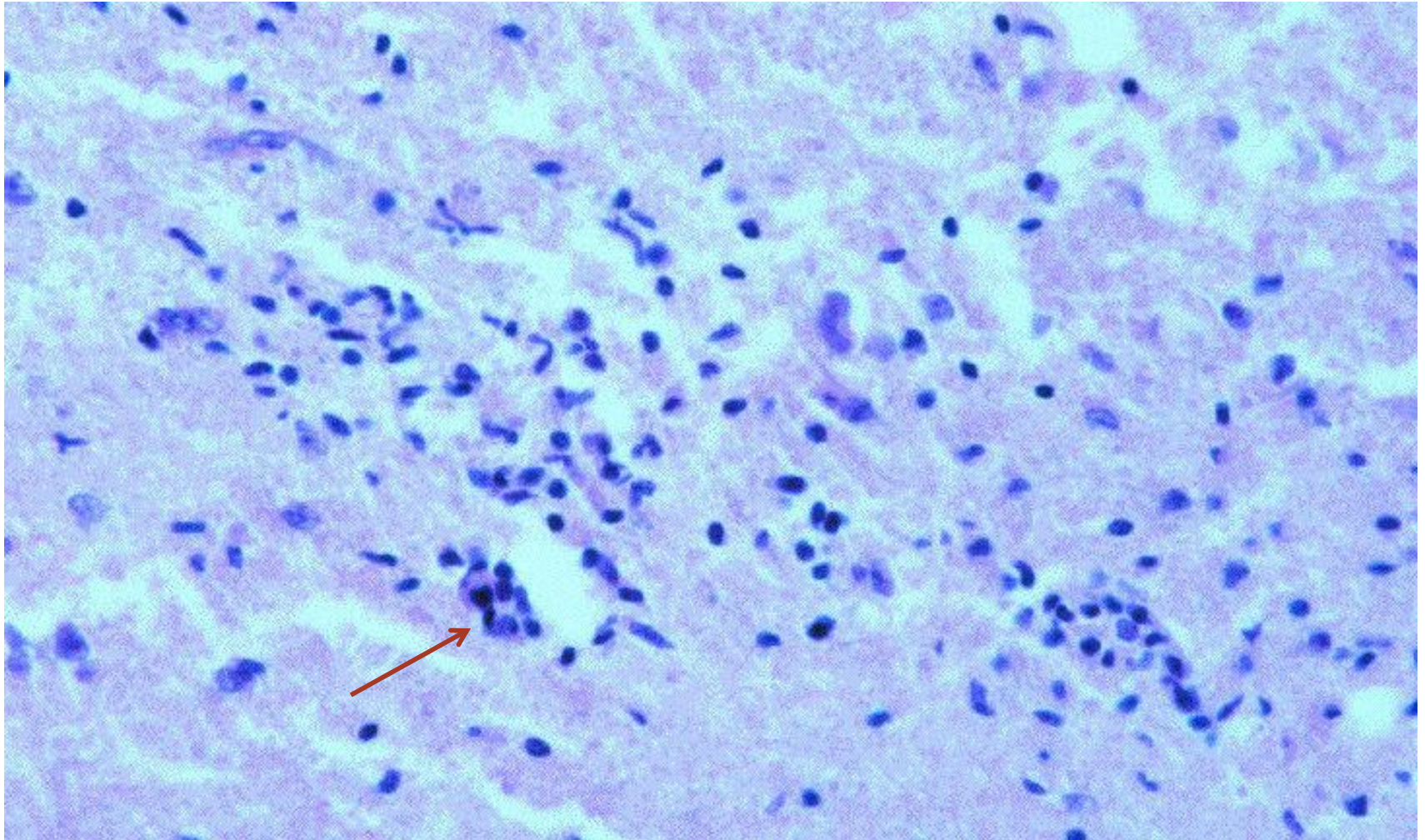
- *Cause a mononuclear inflammation*
- *Demyelination with axonal sparing*
- *Oligodendroglial cell loss and astrocyte proliferation*
- *Long standing lesion Astrogliosis*

Stroke and Multiple Sclerosis

Symptoms

- *Mononeuropathy +/- multiplex*
- *Optic neuritis*
- *Ophthalmoplegia/Ophthalmoparalysis-*
- *Intermittent Diplopia*
- *Extremity weakness*
- *Tremors*
- *Lhermitte sign-*
(Paresthesias radiating down the spine into extremities on neck flexion)

Multiple Sclerosis-H&E STAIN



Stroke and Multiple Sclerosis

Types of Multiple Sclerosis

- **Clinically Isolated Syndrome(CIS)**
No reoccurrence after initial
- **Relapsing-remitting**
Most common
Has attacks followed by none then reoccurs
- **Primary-Progressive**
Men
Gradual decline few plateaus
- **Secondary-progressive**
Stage II relapsing-remitting. No periods of remission
- **Progressive-relapsing**
Rare. Progressive form until the end
- **Malignant (Marburg Variant)**
Very rare. Decline to death in few months

Stroke and Multiple Sclerosis

McDonald Criteria: (attack must last 24 hours and 30 day interval)

Diagnosis of Multiple Sclerosis:

Attacks	Lesions	Additional Information
2 or more	2 or more	none
2 or more	1	Dissemination in space or further attack
1	2	Dissemination in time or further attack
1	1	Dissemination space/time or further attack
0		1 yr of disease progression and 2 of below: <ul style="list-style-type: none">-Positive MRI Brain-Positive MRI Spinal Cord-Positive CSF

Stroke and Multiple Sclerosis

- **Diagnostic Tests:**

- ***MRI –TEST OF CHOICE-Brain/Spinal Cord***

- White plaques lesions*

- ***Evoked Action Potentials***

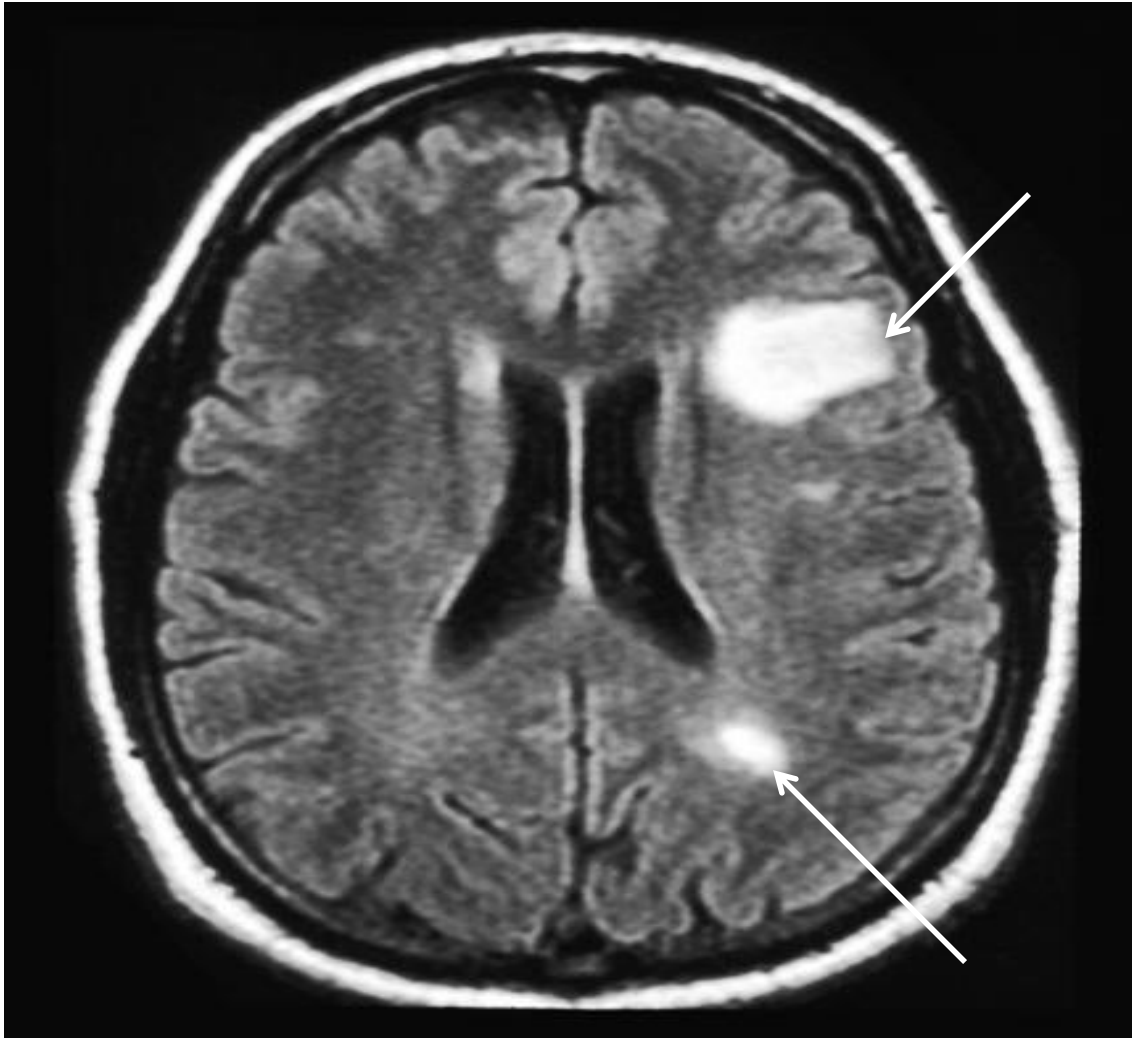
- Silent lesions*

- ***Lumbar Puncture***

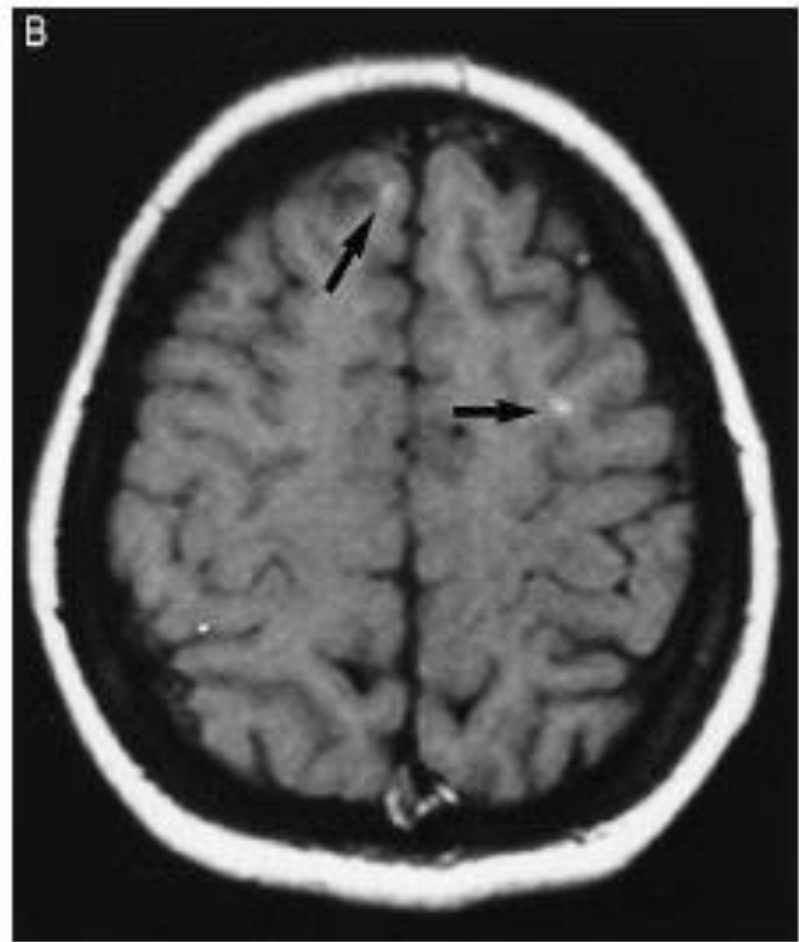
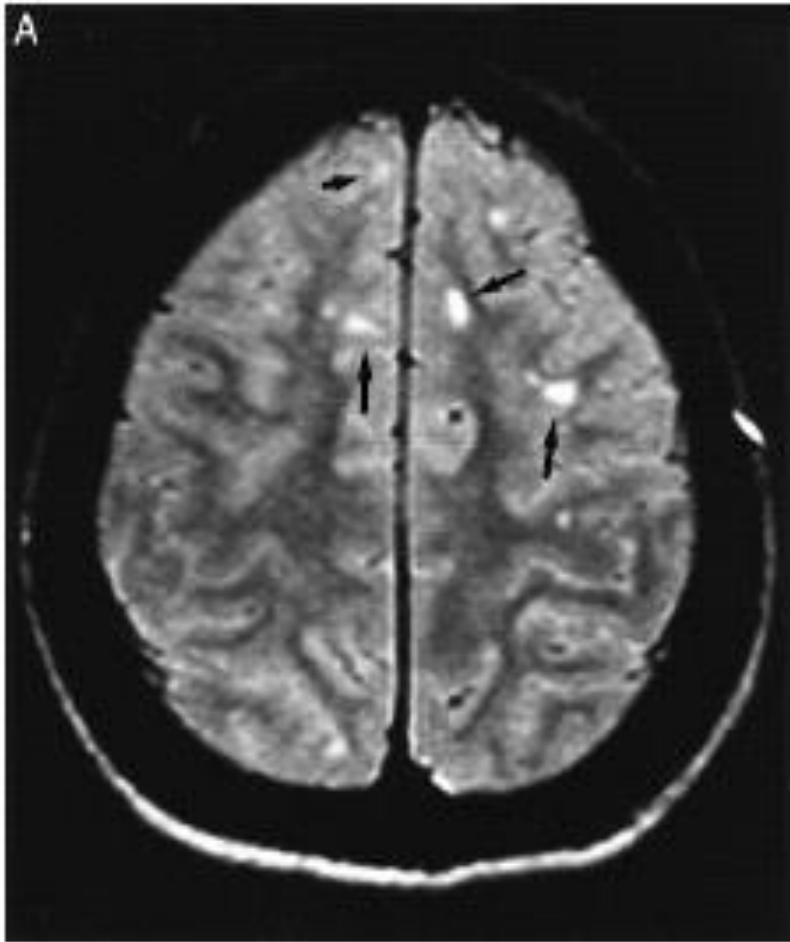
- Increased IgG/Oligoclonal IgG bands in CSF*

- Elevated protein*

Stroke and Multiple Sclerosis



Stroke and Multiple Sclerosis



Stroke and Multiple Sclerosis

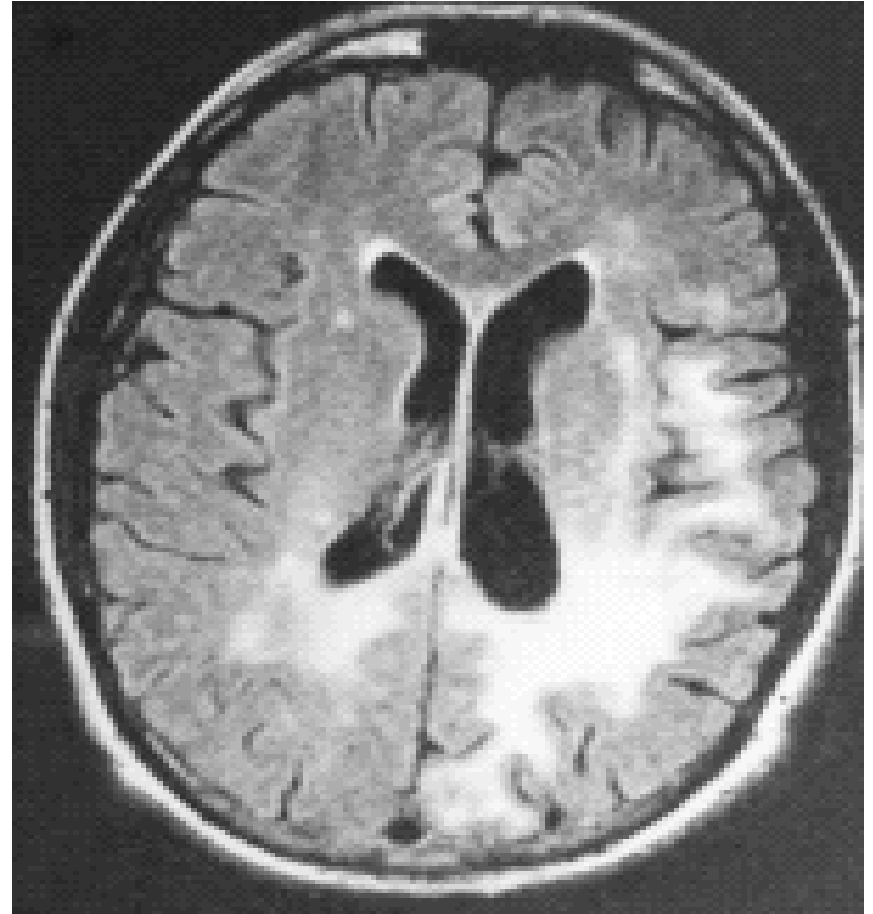
Treatment*

- *Acute Phase/Initial*
 - *Steroids 500mg daily x 5 days*
 - *Plasma exchange for severe deficits with poor response to steroids*
- *Oral Immunomodulator-*
Fingolimod(Gilenya), Ampyra, Aubagio, Tecfidera
- *Relapsing-Remitting- most common*
Beta-interferons(1-a,1-b)-
 - Avonex/Rebif/Betaseron/Extavia/Plegridy**Monoclonal Antibodies-*
 - Ocrevus, Rituxin, Tysarbi*
 - Alemtuzumab (Lemtrada)- HIV negative**Copolymer-*
 - Copaxone/Glatoba*
- *Primary Progressive*
 - Ocrevus(ocrelizumab)*
- *Chronic/Advanced*
 - Novantrone(mitoxantrone)- IV*

**Ambulation difficulties treatment is Ambyra (helps with MS ambulation only)*

Stroke and Multiple Sclerosis

- 34 yr old presents with:
- ataxia
- ophthalmoplegia
- paresthesia of the legs intermittently
- massive weight loss over the past few months.
- history is significant for HIV
- On gancyclovir and protease inhibitors and T-cell counts have remained <200.
- His mentation is going quickly and he has no memory and has stopped eating.
- **What is your diagnosis?**



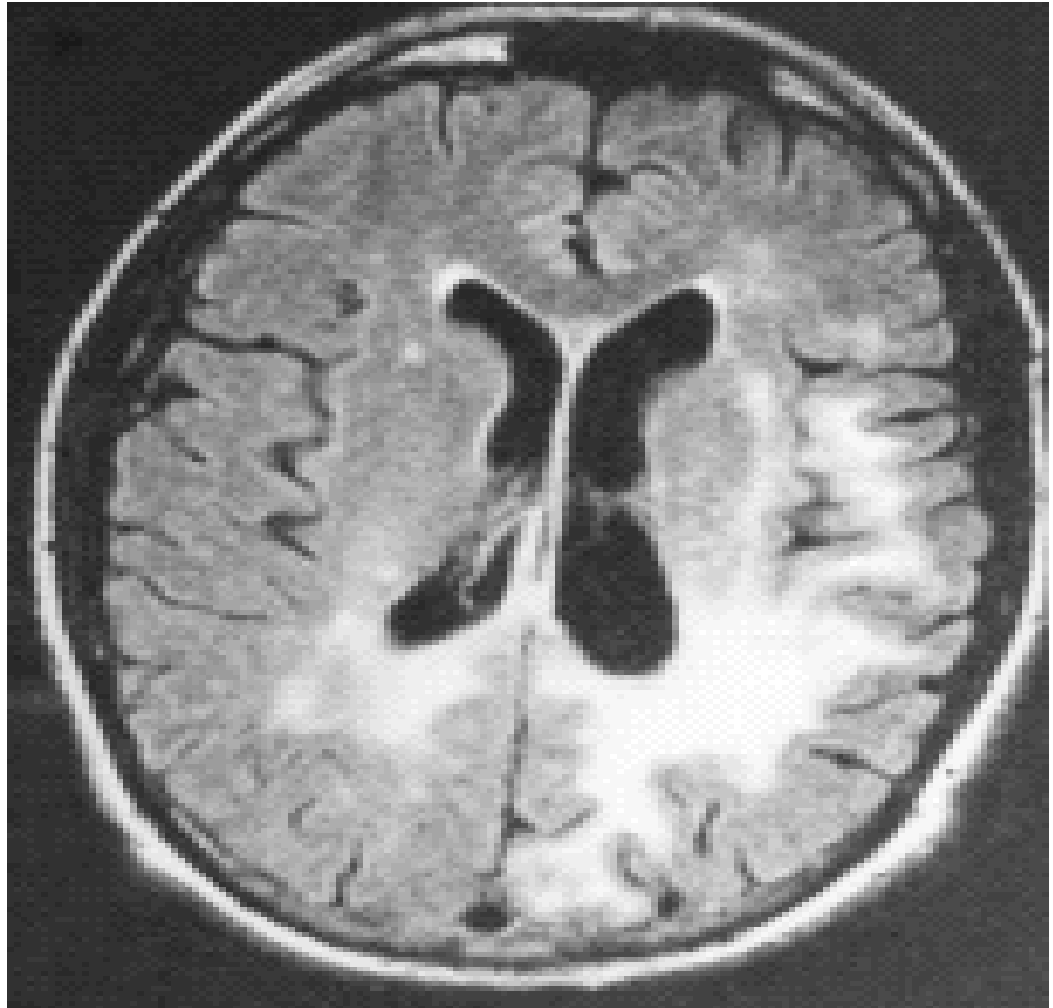
Stroke and Multiple Sclerosis

Answer

PML

Progressive Multifocal Leukoencephalopathy

PML is caused by the JC Virus but there are some drugs that can create a reversible leukoencephalopathy as in this case drug induced



Stroke and Multiple Sclerosis

Central Pontine Myelinolysis(CPM)

- Occurs in patients with severe hyponatremia
- Their sodium is corrected too aggressively
- Quadraparesis
- Mutism
- Pseudobulbar palsy
- Swallowing dysfunction

Treatment:

Correct Na slowly and treat underlying cause