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
Acute brain injury due to a vascular etiology
Sudden onset
Persist at least 24 hours
Neurological deficit

**TIA**

Neurological deficits lasting less than 24 hours
Stroke Imaging
STROKE

- 795,000 Strokes Occur each year

- 625,000 were ischemic strokes

- By 2025, the annual number is expected to be over 1 million

- 4.4 million Stroke Survivors exist today
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 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

• Modifiable Risk Factors

• Hypertension*
• Diabetes Mellitus
• Cardiac Diseases
  • Atrial Fibrillation
  • Valvular Disease
  • R→L Shunting (PFO, Atrial and Ventricular Enlargement)
• Hypercholesterolemia
• Transient Ischemic Attacks
• Carotid Stenosis
• Hyperhomocystinemia
• Lifestyles
  • Alcohol
  • Tobacco
  • Illicit Drug Use
  • Obesity
  • Physical Inactivity
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

• Conditions and lifestyle characteristics identified as a risk factors for stroke:

  High blood pressure
  Atrial fibrillation
  Diabetes mellitus
  Carotid artery disease
  Myocardial infarction

  High Cholesterol
  Hyperhomocysteinemia
  Smoking
  Heavy alcohol use
  Physical inactivity
  Obesity
High Blood Pressure (BP)

- Background
  - High blood pressure (>120/80mmHg) is the most important and prevalent modifiable risk factor for stroke
  - Significant reduction of stroke incidence with a decrease in BP\(^1\)
  - No class of antihypertensive is clearly superior
    - LIFE: lortsatan is superior to atenolol\(^2\)
    - ALLHAT: chlorthalidone is more effective than amlodipine and lisinopril\(^3\)

Background
- Independent risk factor for ischemic stroke
- Improving glucose control may not reduce stroke\(^1\)
- BP in patients with diabetes should be <130/80mmHg\(^2\)
- Statin treatment reduces the risk of major vascular events, including stroke\(^3\)
- Elevated blood glucose in the early phase of stroke is associated with death and poor recovery

HIGH CHOLESTEROL

- Background
  - Statin treatment reduces the incidence of stroke from 3.4% to 2.7%\(^1\)
  - No significant effect for prevention of fatal stroke\(^1\)
  - Heart Protection Study found an excess of myopathy of one per 10,000 patients per annum\(^2\)
  - No data support statin treatment in patients with LDL-cholesterol <150 mg/dl (3.9 mmol/l)

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CIGARETTE SMOKING

Background

- Independent risk factor for ischemic stroke in men and women
- 2-3 fold increased risk compared to non-smokers
- Spousal cigarette smoking may be associated with an increased stroke risk
- 50% risk reduction by 2 years after stopping smoking

ALCOHOL CONSUMPTION

- Background
  - Increased risk for both ischemic (RR 1.69) and hemorrhagic stroke (RR 2.18) with heavy alcohol consumption (>60g/day)\(^1\)
  - BP elevation might be a reasonable explanation\(^3\)
  - Light alcohol consumption (<12g/day) associated with reduced ischemic (RR 0.80) and hemorrhagic stroke\(^1\)
  - Red wine consumption carries the lowest risk\(^2\)

PHYSICAL ACTIVITY

- Background
  - Regular exercise (at least 3x30min/week) is associated with a decreased risk of stroke
  - Physically active individuals have a lower risk of stroke or death than those with low activity (RR 0.73)\(^1\)
  - This is mediated, in part, through beneficial effects on body weight, blood pressure, serum cholesterol, and glucose tolerance\(^2\)

**Body Weight, Diet, Nutrition**

**Background**

- High body mass index (BMI ≥25) increases risk of stroke in men and women\(^1\)
- Abdominal adiposity is a risk factor for stroke in men but not women\(^2\)
- A randomized trial in women found no effect of dietary interventions to reduce the incidence of stroke\(^3\)
- Tocopherol and beta carotene supplementation do not reduce the risk of stroke. Vitamin E might increase mortality when used at high-dose (≥400 IU)

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HORMONE REPLACEMENT THERAPY

• Background
  • Stroke rates rise rapidly in women after the menopause
  • Hormone replacement therapy in postmenopausal women is associated with an 44% increased risk of stroke

1: Gabriel S et al.: Cochrane Review (2005) CD002229
Background

- In low risk persons low dose aspirin reduced coronary events, but not stroke\(^1\)
- In women over 45 years aspirin reduces the risk of ischemic stroke (OR 0.76; 95\%CI 0.63-0.93) \(^2\)
- Aspirin reduces MI in patients with asymptomatic carotid artery disease\(^3\)

ATRIAL FIBRILLATION (AF)

- **Background**
  - Average stroke rate of 5% per year
  - Pradaxa, Apixaban, Rivaroxaban for nonvalvular AF
  - Aspirin reduces stroke (RR 0.78) in patients with non-valvular AF\(^1\)
  - Warfarin (INR 2.0-3.0) is more effective than aspirin at reducing stroke (RR 0.36; 95%CI 0.26-0.51)\(^1\)
  - Combination of aspirin and clopidogrel is less effective than warfarin and has a similar bleeding rate\(^2\)

ATRIAL FIBRILLATION (AF)

- **Background**
  - Anticoagulation with an INR below 2.0 is not effective
  - Increased risk for bleeding complications with an INR > 3.5
  - Patients <65 years of age with “lone AF” (without other risk factors) are at low risk, whereas patients older than 65 years are at a higher risk for embolic stroke
  - Anticoagulation can be safe and effective in older individuals¹,²

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ASYMPTOMATIC CAROTID ARTERY (ICA) STENOSIS

• Background\textsuperscript{1,2}
  • Carotid endarterectomy (CEA) is still a matter of controversy in asymptomatic individuals
  • RRR for stenosis >60\%\textsuperscript{NASCET} is 38-53\%
  • ARR is 5.9-12.6\%
  • NNT to avoid one stroke/year is 63-166
  • The combined surgical risk must not exceed 3\%

Specific issues

- No prospective trials tested the benefit of antiplatelet drugs in patients with asymptomatic carotid stenosis\(^1\)
- The ipsilateral stroke risk increases with the degree of the stenosis\(^2\)
- Patients with an occlusion of the contralateral ICA do not benefit from endarterectomy\(^3\)
- Women have lower benefit from CEA than men\(^3\)
- Aspirin reduces stroke risk during and after CEA\(^4\)

1: Chambers BR et al.: Cochrane Review (2005)
Background

- Antihypertensive drugs reduce stroke recurrence risk after stroke or TIA (RR 0.76; 95%CI 0.63-0.92)\(^1\)
- Target BP level and reduction should be individualized
- The reduction in stroke occurs regardless of baseline BP and type of stroke\(^2\)

Background

- In people with type 2 diabetes with previous stroke pioglitazone reduces fatal or nonfatal stroke (HR 0.53; 95%CI 0.34-0.85; P=0.0085)\(^1\)

- In addition there is a trend to reduce the combined end point of death and major vascular events (HR 0.78; 95%CI 0.60-1.02; P=0.067)\(^1\)

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\(^1\) Wilcox R et al.: Stroke (2007) 38:865-73
HIGH CHOLESTEROL

• Background
  • Atorvastatin (80mg) reduces stroke recurrence by 16%¹
  • Simvastatin (40mg) reduces risk of vascular events in patients with prior stroke, and of stroke in patients with other vascular disease (RR 0.76)²
  • ARR for statin treatment is low (NNT 112-143 for 1 year)¹
  • Statin withdrawal at the acute stage of stroke may be harmful³

Background

- Beta carotene increased the risk (RR 1.10) of cardiovascular death\(^1\)
- Antioxidant supplements may increase mortality\(^2\)
- Folate, B12, B6 vitamins given to lower homocysteine levels may not reduce stroke recurrence and may increase vascular events\(^3\)

Background

- Estrogen therapy is not effective in secondary prevention after TIA or stroke and may increase stroke severity\(^1\)

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 mortality\(^1\)
  • Continuous positive airway pressure is the treatment of choice for OSA.

ANTITHROMBOTIC THERAPY

• Background: Aspirin
  • 13% relative risk reduction for stroke after TIA or stroke\(^1\)
  • Most widely studied dosages of aspirin are 50-150mg
  • The incidence of GI-disturbances with aspirin is dose dependent
  • No difference in effectiveness amongst low (<160mg), medium (160 – 325mg) or high (500 - 1500mg) dose aspirin

• **Background:** Clopidogrel plus aspirin

• Compared with clopidogrel the combination of aspirin and clopidogrel does not reduce the risk of ischemic stroke, myocardial infarction, vascular death, or re-hospitalization\(^1\)

• Compared with aspirin alone the combination does not reduce the risk of myocardial infarction, stroke, or cardiovascular death\(^2\)

• **Risk of life-threatening or major bleeding is increased**\(^1,2\)

Specific issues

- In patients with AF and stable coronary disease, aspirin should not be added to oral anticoagulation\(^1\)
- Some retrospective studies suggest that anticoagulation may be beneficial in aortic atheroma\(^2\), fusiform basilar artery aneurysms\(^3\), or arterial dissection\(^4\)
- It is unclear if patients with patent foramen ovale (PFO) benefit from oral anticoagulation\(^5\)

CAROTID ENDARTERECTOMY (CEA)

- **Background**\(^1,2\)
  - CEA reduces the risk by 48% of recurrent disabling stroke or death in patients with 70-99\%\(^\text{NASCET}\) ipsilateral carotid artery stenosis
  - If perioperative complications exceed 6\%, the benefit of CEA will diminish; if it approaches 10\%, the benefit will vanish entirely
  - There is also some risk reduction in male patients with 50 - 69\% stenosis of the ipsilateral carotid artery, provided that the complication rate is below 3\%

CAROTID ENDARTERECTOMY

• Specific issues

  • CEA should be performed as soon as possible (ideally within 2 weeks) after the last cerebrovascular event\textsuperscript{1,2}

  • Elderly patients (>75 years) without organ failure or serious cardiac dysfunction benefit from CEA\textsuperscript{1}

  • Women with symptomatic stenosis >70% should undergo CEA. Women with moderate stenosis should be treated medically\textsuperscript{2}

CAROTID ENDARTERECTOMY

Specific issues

- The benefit from CEA is lower with lacunar stroke

- Patients with leuko-araiosis should be made aware of the increased operative risk

- Occlusion of the contralateral ICA carries a higher perioperative risk

- Continuation of aspirin is required until surgery, but heparin may be used in very severe stenosis

- All grading of stenoses should be according to NASCET-criteria
TREATMENT OF STROKE RISK FACTORS

• Hypertension
  • Ideal 120/80 certainly < 140/90 and <130/80 Diabetics

• Hypercholesterolemia
  • LDL < 100
  • HMG CoA Inhibitors/Statins

• Diabetes Mellitus
  • Glucose < 126
  • HBA1C < 7.0

• Atrial Fibrillation
  • Valvular AF- Warfarin Therapy INR 2.0-3.0/Nonvalvular AF -Dabigatran

• TIA
  • Antiplatelets – ASA, Aggrenox, Plavix

• Lifestyle Modifications
  • Alcohol: < 2 drinks a day
  • Exercise: 30 minutes 3X a week
  • Tobacco/Drugs: Cease Tobacco and Illicit drugs
  • Obesity: Ideal 18-24 BMI; Waist <40 Men and <35 Women
  • Nutrition: 5 servings fruits and/or vegetables a day

• Carotid Stenosis
  • Evaluation of asymptomatic carotid stenosis between 60-99% for surgery

• Hypercoagulable States
  • Condition specific anticoagulation with warfarin
  • Minimizing Hormone Replacement Therapy/Oral Contraceptives only after risk assessment done

• Hyperhomocystenemia
  • Folic Acid in combination with Vitamin B6 and B12 showed no decrease in stroke reduction
Falls

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

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 outcome\(^1\)

• 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\(^2,3\)

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
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 ≥ 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 ranged from 0 (lowest risk) to 7 (highest risk).

**Scale:**

Stroke risk at 2 days, 7 days, and 90 days:

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 form the Heart or Vessels

**Hemorrhagic** -
  - Intracerebral
    - Hypertension or Amyloid Angiopathy
  - Subarachnoid
    - Berry Aneurysms
Stroke and Multiple Sclerosis

Blood begins to fill the space inside the brain
Stroke and Multiple Sclerosis

Thrombotic Strokes

Atherosclerosis
- 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- same throughout
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 quadrant anopsia
Mild contralateral hemiplegia/anesthesia
Color anomaia= 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 hemianesthesia

Contralateral body hemianesthesia
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
- EKG
- Trans-thoracic Echocardiogram
- Carotid Ultrasound/Trans-cranial Doppler
- MRI/MRI Diffusion/Angiography
Stroke and Multiple Sclerosis

Ischemic Stroke Treatment

Thrombolysis-Alteplase

>18 yrs old with an ischemic stroke Dx

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

Oxygen

Treat BP-gradually

Aspirin

Heparin/Antiplatelets

Consider Surgical Intervention
Stroke and Multiple Sclerosis

• CONTRAINDICATIONS TO ALTEPLASE
  • Evidence of intracranial hemorrhage on pretreatment CT
  Only minor or rapidly improving stroke symptoms
  Clinical presentation suggestive of subarachnoid hemorrhage
  Active internal bleeding
  Known bleeding diathesis, including but not limited to:
    - **Platelet count < 100,000/mm**
      Patient has received heparin within 48 hours and has an elevated aPTT
      Current use of oral anticoagulants (e.g., warfarin sodium) or recent use with an elevated prothrombin time > 15 seconds
  Patient has had major surgery or serious trauma excluding head trauma in the previous 14 days
  **Within 3 months any intracranial surgery, serious head trauma, or previous stroke.**
  History of gastrointestinal or urinary tract hemorrhage within 21 days
  Recent arterial puncture at a non compressible site
  Recent lumbar puncture.
  **On repeated measurements, systolic blood pressure greater than 185 mm Hg or diastolic blood pressure greater than 110 mm Hg at the time treatment is to begin**
  History of intracranial hemorrhage
  Abnormal blood glucose ( < 50 or > 400 mg/dL)
  Post myocardial infarction pericarditis
  Patient was observed to have seizure at the same time the onset of stroke symptoms were observed
  Known arteriovenous malformation, or aneurysm
Stroke and Multiple Sclerosis

- **Post Acute Care Therapy**

  **Antiplatelets**
  - ASA (50-325 mg)/Aggrenox/Ticlopidine
  - Clopidogrel
  - Coumadin
  - Dabigatran, Apixaban, Rivaroxaban- (non valvular Atrial Fibrillation)

  **Manage underlying causes**
  - Cardiac- ACC
  - HTN- JNC guidelines
  - Diabetes- HbA1C <6.5-7.0
  - Tobacco abuse
  - Hyperlipidemia- LDL <70
  - If >70% carotid stenosis- surgical evaluation
Stroke and Multiple Sclerosis

• CHADS2

Score for Atrial Fibrillation Stroke Risk

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

Score >2  High  oral anticoagulant
Score >1 <2  Moderate  oral anticoagulant or ASA
Score 0  Low  ASA 75-325mg
Intracerebral Hemorrhage

Amyloid Angiopathy

- Commonly causes recurrent bleeds
- >65 yrs old
- Subcortical, rarely affects deep structures
- Can cause multi-infarctional dementia
- Also found in Alzheimer's patients - unclear association

Occasionally can be associated with subarachnoid
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 supernatent is diagnostic
- If LP (-) can be hours before blood gets in CSF
- Cerebral Angiography
  - Can rebleed in 24 hours/Vasospasm

**Treatment**

- Neurosurgery consult/Intervention
- ABC’S
- Hemodynamic and edema management/Nimodipine/Mannitol/Glycerol/Saline
Stroke and Multiple Sclerosis

• Multiple Sclerosis
  Myelin deterioration
    Brain-
    Spinal Cord-
    Optic Nerve -
  Pathophysiology
    10x more common in northern latitudes
    May be viral in origin— Female2:1 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
- 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

Benign
  No occurrence 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

- Diagnostic Tests
  - MRI – TEST OF CHOICE - Brain/Spinal Cord
    - White plaques
  - 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

Oral Immunomodulator-  Fingolimod(Gilenya), Aubagio, Tecfidera

Relapsing-Remitting
Beta-interferons(1-a,2-b)
  Avonex
  Rebif
  Betaseron
  Extavia
  Tysarbi
Copolymer-
  Copaxone
Chronic/Advanced
Novantrone
Stroke and Multiple Sclerosis

- 34yr old with history of ataxia, ophthalmoplegia and paresthesia of the legs intermittently with a massive weight loss over the past few months.
- His history is significant for HIV and has been 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?
PML is caused by the JC Virus but there are some drugs that can create a reversible leukencephalopathy.
Stroke and Multiple Sclerosis

Central Pontine Myelinolysis

- 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