Therapeutic areas – Part 2

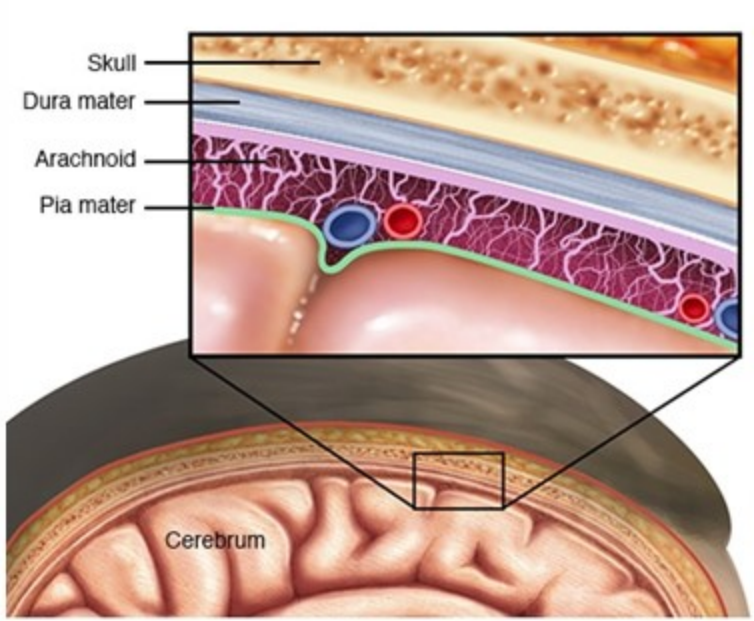
CNS

Module 4 Topic 5_2

CNS Disorders

Meningitis

- Inflammation of the membranes (meninges) surrounding the brain and spinal cord
- Causes
  - Viral infections
  - Bacterial infections
    - ear or sinus infection
    - a skull fracture
  - Fungal infections



CNS Disorders

Meningitis (contd)

- Signs and symptoms
  - Headache with nausea or vomiting
  - Fever
  - Neck stiffness
  - Confusion or difficulty concentrating
  - Seizures ('fits' or 'convulsions')
  - Skin rash (in meningococcal meningitis)
- Treatment
  - Acute bacterial meningitis - intravenous antibiotics and corticosteroids
  - Drain infected sinuses or mastoid bone behind ear

CNS Disorders

Encephalitis

- Inflammation of the brain
- **Primary encephalitis** - occurs when a virus or other agent directly infects the brain
- **Secondary encephalitis** - due to a faulty immune system reaction to an infection elsewhere in the body, immune system also mistakenly attacks healthy cells in the brain

CNS Disorders

Encephalitis (contd)

- Causes of viral encephalitis
  - Herpes virus
    - Herpes simplex virus (HSV) type 1 (cold sores and fever blisters around mouth) - and HSV type 2 (genital herpes), Epstein-Barr virus (infectious mononucleosis),Varicella-zoster virus (chickenpox)
  - Enteroviruses
    - Polio virus and Coxsackie virus
  - Mosquito-borne viruses
    - Viruses causing Chikungunya, western equine and eastern equine encephalitis

CNS Disorders

Encephalitis (contd)

- Causes of viral encephalitis
  - Rabies virus
  - Childhood infections
    - Common childhood infections, such as measles, mumps and German measles (rubella) - used to be fairly common causes of secondary encephalitis

CNS Disorders

Encephalitis (contd)

- **Treatment**
  - Treatment for mild encephalitis usually consists of:
    - Bed rest
    - Plenty of fluids
    - Anti-inflammatory drugs — such as acetaminophen, ibuprofen, and naproxen sodium to relieve headaches and fever
- **Antiviral drugs**
  - Antiviral medications commonly used to treat encephalitis include:
    - Acyclovir
    - Ganciclovir
    - Foscarnet
- **Additional therapy**, such as:
  - **Physiotherapy** to improve strength, flexibility, balance, motor coordination and mobility
  - **Occupational therapy** to develop everyday skills for everyday activities
  - **Speech therapy** to relearn muscle control and coordination to produce speech
  - **Psychotherapy**

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CNS Disorders

Rabies

- Viral encephalitis transmitted by the saliva of infected mammals
- Rabid animals transmit the infection through their saliva, usually by biting
- Virus travels from the site of entry via peripheral nerves to the spinal cord (or to the brain stem when the face is bitten), then to the brain

CNS Disorders

Rabies (contd)

- Symptoms and Signs
  - Fever, headache, and malaise; encephalitis (furious rabies; in 80%) or paralysis (dumb rabies; in 20%)
  - Restlessness, confusion, agitation, bizarre behavior, hallucinations, and insomnia; excessive salivation, attempts to drink cause painful spasms of the laryngeal and pharyngeal muscles leading to hydrophobia – fear of water

CNS Disorders

Rabies (contd)

- Treatment
  - Treatment once rabies has developed is only supportive and includes heavy sedation (eg, with ketamine and midazolam)
  - Death usually occurs 3 to 10 days after symptoms begin
- Prevention
  - Preexposure rabies prophylaxis
    - For people at risk, including veterinarians, animal handlers
  - Postexposure rabies prophylaxis
    - With rabies vaccine and rabies immune globulin (RIG)

CNS Disorders

Brain abscess

- Intracerebral collection of pus
- Causes
  - Direct extension of cranial infections e.g. osteomyelitis, mastoiditis, sinusitis, subdural empyema
  - Penetrating head wounds including neurosurgical procedures
  - Hematogenous spread e.g. in bacterial endocarditis
  - anaerobes, such as *Bacteroides*, anaerobic and microaerophilic streptococci, Staphylococci (common after cranial trauma, neurosurgery, or endocarditis); Enterobacteriaceae (in chronic ear infections)

CNS Disorders

Brain abscess (contd)

- Treatment
  - Antibiotics (initially cefotaxime or ceftriaxone, plus metronidazole for *Bacteroides* sp or vancomycin for *Staphylococcus aureus* based on suspicion, then as guided by culture and susceptibility testing)
  - Usually CT-guided stereotactic aspiration or surgical drainage
  - Sometimes corticosteroids, anticonvulsants, or both

CNS Disorders

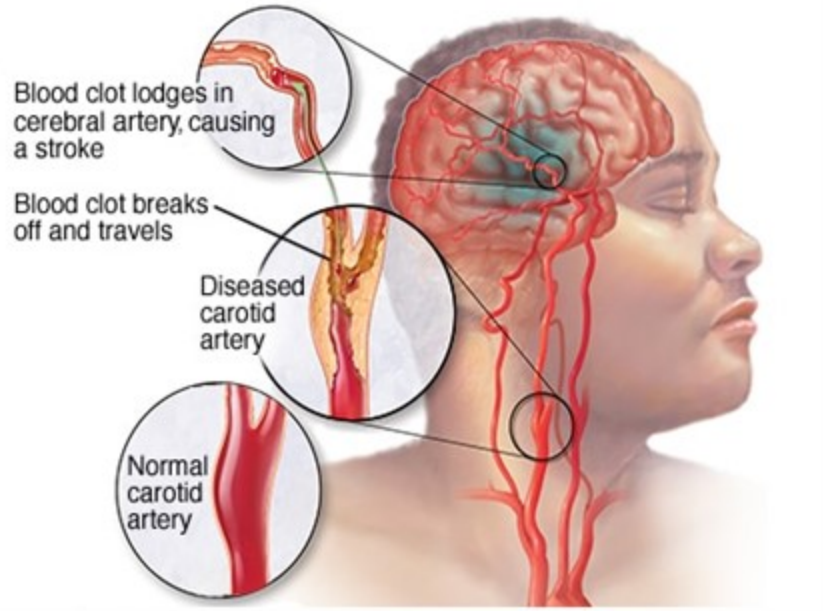
Stroke

- When the blood supply to part of brain is interrupted or reduced, depriving brain tissue of oxygen and nutrients
- Within minutes, brain cells begin to die
- Causes
  - Blocked artery (ischemic stroke)
  - Leaking or bursting of a blood vessel (hemorrhagic stroke)

CNS Disorders

Ischemic stroke

- **Thrombotic stroke** occurs when a blood clot (thrombus) forms in one of the arteries that supply blood to the brain
- **Embolic stroke** occurs when a blood clot forms away from the brain and is swept through the bloodstream to lodge in brain arteries. This type of blood clot is called an embolus



CNS Disorders

Stroke (contd)

- **Prevention**
  - Controlling high blood pressure (hypertension)
  - Lowering the amount of cholesterol and saturated fat in the diet
  - Controlling diabetes
  - Anti-platelet drugs e.g. aspirin, clopidogrel
  - Anticoagulants e.g. heparin, warfarin

CNS Disorders

Dementia

- Group of symptoms affecting memory, thinking and social abilities severely enough to interfere with daily functioning
- Causes
  - Alzheimer's disease - Plaques (clumps) of a protein called beta-amyloid, and fibrous tangles made up of tau protein deposited in brain
  - Vascular dementia
  - Lewy body dementia – protein deposits in brain
  - Frontotemporal dementia - degeneration of cells

CNS Disorders

Dementia (contd)

- Cognitive changes
  - Memory loss, which is usually noticed by a spouse or someone else
  - Difficulty communicating or finding words
  - Difficulty reasoning or problem-solving
  - Difficulty handling complex tasks
  - Difficulty with planning and organizing
  - Difficulty with coordination and motor functions
  - Confusion and disorientation

CNS Disorders

Dementia (contd)

- Psychological changes
  - Personality changes
  - Depression
  - Anxiety
  - Inappropriate behavior
  - Paranoia
  - Agitation
  - Hallucinations

CNS Disorders

Dementia (contd)

- **Prevention** - There's no sure way to prevent dementia, but the following might be beneficial:
  - **Keep your mind active** - Mentally stimulating activities, such as reading, solving puzzles and playing word games
  - **Be physically and socially active** - Physical activity and social interaction might delay the onset of dementia
  - **Quit smoking** - Smoking may increase risk of dementia and vascular conditions

CNS Disorders

Dementia (contd)

- **Prevention**
  - **Get enough vitamin D** - People with low blood levels of vitamin D are more likely to develop Alzheimer's disease and other forms of dementia
  - **Control of blood pressure**
  - **Maintain a healthy diet** - Eating a healthy diet rich in fruits, vegetables, whole grains and omega-3 fatty acids, commonly found in certain fish and nuts might lower risk of dementia

CNS Disorders

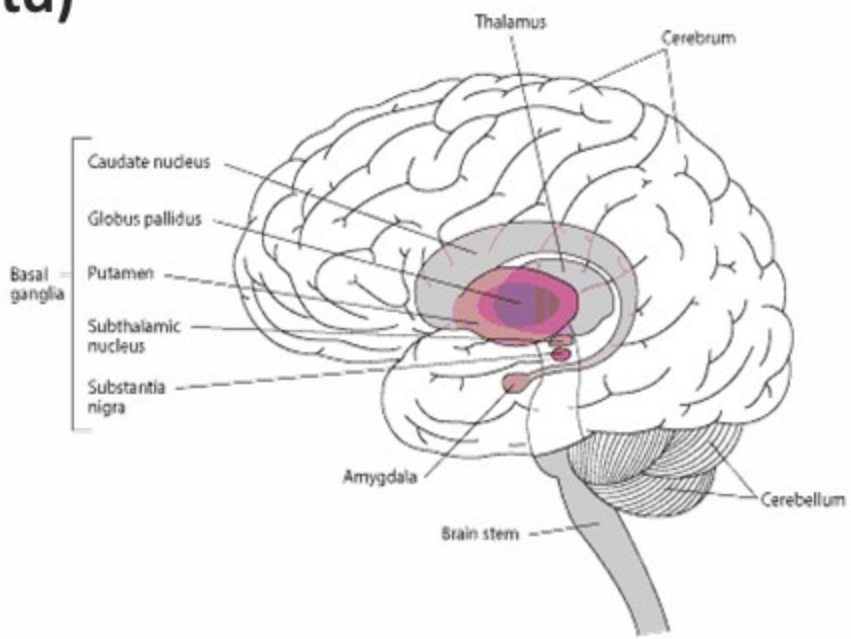
Parkinson's Disease (PD)

- A slowly progressive, degenerative disorder characterized by resting tremor, stiffness (rigidity), slow and decreased movement (bradykinesia), and gait and/or postural instability
- **Pathologic hallmark of PD** is synuclein-filled Lewy bodies in the nigrostriatal system

CNS Disorders

Parkinson's Disease (contd)

- Pigmented neurons of the substantia nigra, locus ceruleus, and other brain stem dopaminergic cell groups degenerate, leading to depletion of dopamine and causes many of the motor manifestations of PD



CNS Disorders

Parkinson's Disease (contd)

- Treatment
  - Carbidopa/levodopa (mainstay of treatment)
  - Amantadine, MAO type B (MAO-B) inhibitors e.g. selegiline, or, in few patients, anticholinergic drugs e.g. benztropine, diphenhydramine
  - Dopamine agonists e.g. ropinirole
  - Catechol *O*-methyltransferase (COMT) inhibitors, always used with levodopa, particularly when response to levodopa is wearing off
  - Surgery if drugs do not sufficiently control symptoms or have intolerable adverse effects