

DISCIPLINE: NEUROLOGY

Key Points in Anatomy and Physiology

Neurone = cell body, axon, synapse

Astrocytes - form the blood brain barrier

Oligodendrocytes, Schwann cells – form myelin sheaths

Action Potentials pass along axons

Synaptic transmission between neurones and/or muscle cells

Ion Channels

Neurotransmitters

Central Nervous System (CNS)

Brain

White Matter

Grey Matter

Cerebral Hemispheres

Corpus Callosum

Parietal Lobe

Frontal Lobe

Occipital Lobe

Temporal Lobe

Broca's Area

Wernicke's Area

Cerebrospinal fluid (CSF)

Dura mater

Arachnoid

Pia mater

Cerebellum

Brain Stem

Pons

Medulla

Hypothalamus

Pituitary gland

Cranial nerves

Spinal cord

Dorsal Columns

Lateral columns

Ventral columns

Dorsal root ganglia

Anterior horns

Peripheral nervous system (PNS)

Motor Neurone

Sensory Neurone

Brachial Plexus

Lumbo-Sacral Plexus

Peripheral nerves

Autonomic Nervous System (ANS)

Cranial Nerves

I - Olfactory

II - Optic

III - Oculomotor

IV- Trochlear

V - Trigeminal

VI - Abducens

VII - Facial

VIII- Vestibulocochlear

IX- Glossopharyngeal

X - Vagus

XI- Accessory

XII - Hypoglossal

Important Peripheral Nerves

Radial Nerve

Ulnar Nerve

Median Nerve

Musculocutaneous Nerve

Sciatic Nerve

Pudendal Nerve

Lateral Cutaneous Nerve

Femoral Nerve

Common Peroneal Nerve

Important Arteries/Veins

Internal Carotid Artery

Circle of Willis

Anterior Communicating Artery

Middle Communicating Artery

Posterior Communicating Artery
Anterior Cerebral Artery
Middle Cerebral Artery
Posterior Cerebral Artery
Vertebral Artery
Vertebro-basilar Circulation
Anterior Circulation
Middle Meningeal Artery
Cerebral Venous Sinuses
Watershed Area
Lenticulostriate Arteries (site of lacunar infarction)

Investigations

Electro-encephalography (EEG)

Nerve Conduction Studies

Electromyography

Imaging

- CT
- MRI
- Ultrasound (Carotid Doppler)
- X-Ray
- PET

Blood Tests In Neurology

- FBC (Full Blood Count)
- Blood Cultures
- U+Es (Urea and Electrolytes)
- LFTs (Liver Function Tests)
- TFTs (Thyroid Function Tests)
- dsDNA (Lupus Screen)
- Vitamin B12 levels
- Syphilis Serology
- Copper levels
- Creatine Kinase
- Auto-antibodies (In Sydenham's Chorea/Gullian-Barréetc)

Lumbar Puncture

Biopsies

Glasgow Coma Scale (GCS)

Motor response

- 1 - No response
- 2- Extends to Pain
- 3 - Abnormal Flexure to Pain
- 4 - Flexes to Pain
- 5 - Localises to Pain
- 6 - Obeys Commands

Verbal response

- 1 - No Response
- 2 - Incomprehensible Sounds
- 3 - Inappropriate Words
- 4 - Confused, Disoriented
- 5 - Normal, Oriented.

Eye opening

- 1 - No response
- 2 - Eyes open to pain
- 3 - Eyes open to verbal stimulus
- 4 - Eyes open spontaneously

Presenting Problems/Symptoms

Headache

- Tension Headache
- Migraine (with/without aura)
- Cervicogenic Headache
- Analgesic overuse headache

Facial Pain

- Trigeminal Neuralgia
- Temporal Arteritis

Dizziness/Loss of Balance

- Ataxia
- Vestibular Neuronitis
- Menière's Disease
- Drugs
- Demyelination (multiple sclerosis)
- Migraine

Fits/Faints

- Epilepsy
- Cardiac arrhythmia
- Vasovagal syncope

Numbness/Tingling

- Peripheral Neuropathy
- Dysesthasia
- Multiple Sclerosis
- Guillain-Barré syndrome

Weakness

- Muscular Dystrophies (Duchenne's/Becker's)
- Myaesthesia Gravis

Visual/Hearing Problems

- Optic Neuritis
- Cortical Blindness
- Bitemporal Hemianopia
- Homonymous Hemianopia
- Amaurosis Fugax
- Tinnitus
- Scotoma
- Nystagmus
- Vestibular Neuronitis

Speech/Swallowing/Eating

- Dysphagia
- Dysphasia/Aphasia
- Dysarthria
- Loss of taste
- Anosmia (loss of smell)

Tremor

- Fine Tremor
- Intention Tremor
- Parkinsonian tremor
- Cerebellar Ataxia
- Apraxia/Dyspraxia
- Fasciculation

Memory

- Dementia (e.g. Alzheimer's disease)
- Short term (working) Memory loss
- Long Term Memory loss
- Episodic Memory loss

Personality Change

Disorders of Gait

- Cerebellar Ataxia
- Waddling Gait
- Gait Apraxia
- Foot Drop
- Extra-pyramidal Gait (Parkinsonian)

Sleep Disturbance

- Narcolepsy
- Daytime Somnolence
- Insomnia

History Taking

Major presentations of disease specific to this system

Headache

- Where is your head sore?
- Can you point to it?
- When did the headache start?
- Has it been there constantly?
- When does it come on?
- Is there anything that helps?
- Photophobia: Do bright lights upset you?
- Meningism: Is your neck stiff or sore?

Raised Intra-Cranial Pressure

- Is it worse at any particular time in the day?
- Is it worse when you sneeze/cough?
- Have you been (feeling) sick?
- Analgesic overuse Headache
- What medications have you taken?
- How often have you taken them?

Loss of Consciousness/Fits/Faints

- Did you get any warning?
- What were you doing at the time?
- Was anyone with you? (Witness account)
- How quickly did you recover?
- Did you lose control of your bowels?
- Were you tired afterwards? How long for?
- Has this happened before? Have all the episodes been the same?
- Have you ever been diagnosed as having epilepsy in the past?
- What medications do you take to control this?

Dizziness/Vertigo

- Does the feeling stop when you stay still?
- Is it present all the time?
- Have you had any ear problems?
- Is it worse at night?

Numbness/Tingling

- Where is the tingling?
- When does it come on?
- Is it painful?
- When did it start?
- Has it got worse/better?
- Is it constant or intermittent?
- Does anything make it better?
- Does anything worsen the feeling?
- Have you had anything like this in the past?

Weakness

- When does the weakness come on?
- What activities does it stop you doing?
- Is there any muscle pain?
- Does it affect swallowing? Chewing?
- Is your speech affected?
- Does it affect your breathing?
- Does anything make it better/worse?

Visual/Hearing Problems

- How long have you had them?
- Are they intermittent/constant?

- Are they getting worse/better?
- Have you had them before?
- Is your balance affected?
- Do you ever struggle to understand what's being said to you?
- Do you ever have to struggle to hear people speak on the telephone/television/in conversation?

Speech/Swallowing/Eating

- Do you have difficulty finding words?
- Do you have problems pronouncing things?
- Can you swallow easily?
- Which causes more problems; swallowing liquids or solids or are they both the same?
- Is there any pain on chewing?
- Have you noticed altered taste?
- Do you ever get tired (fatigued) when eating?

Tremor

- When do you notice it?
- How long have you had it?
- Which parts of your body does it affect?
- Has it always been the same? Does it change?
- Is it present at rest?
- What difficulty (if any) does it cause you?

Memory

- Have you been having memory problems?
- What do you have problems remembering?
- Can you remember things from years ago?
- Can you remember what you were doing yesterday?
- Can you remember names and faces?
- Has anyone remarked on your difficulties?

Personality Change (this may be brought to your attention by a relative)

- How has your (or the patient's) personality changed?
- When did it start to change?
- Has it been a quick or slow change?

Family History

- Do any diseases run in your family?
- Does anyone have a history of
 - Alzheimer's?
 - Stroke?
 - Dementia?
 - Multiple Sclerosis?
 - Motor Neurone Disease?
 - Huntington's Disease?
 - Muscular Dystrophy?
 - Wilson's Disease?

Drug History

- Which medications do you take?
- How long have you been taking them for?
- Specific drugs which may cause neurological problems:
 - benzodiazepines (diazepam, temazepam, lorazepam)
 - antiepileptics (phenytoin, carbamazepine)
 - antihistamines
 - aspirin
 - corticosteroids
 - anti-TB drugs (isoniazid)
 - nitrates/vasodilators (GTN/Sildenafil)
 - Anti-asthmatic (Salbutamol/Terbutaline)

Social History

- Do you drink alcohol?
 - How much alcohol?
 - How often?
- What is your job?
- Are you exposed to any harmful chemicals through your work?
- How is your sexual health?
- How are you coping with your problems?
- Do you have support at home?
- Are you worried about your problems?
- Do you drive?
- Are you worried about driving?

Physical Examination

Cranial Nerves

CN 1

- Do you have a blocked nose?
- What can you smell? (offer different potent samples)

CN 2

- Do you wear glasses?
- Snellen Chart (Visual Acuity): Can you close one eye and read as much of this chart as you can?
- Visual Fields: Look straight ahead, cover one eye and tell me when you can see my finger/hat pin.
- Visual Inattention Look at my fingers, tell me which one moves.
- Fundoscopy Look straight ahead for me, I would like to look into your eyes with this light.

CN 3,4,6

- Keep your head still and follow my finger with your eyes.
- Pupils: I'm just going to have a look at your eyes...

CN 5

- Can you feel this cotton wool/pin?
- Test ophthalmic, maxillary and mandibular branches: Does it feel the same on both sides?
- Can you clench your jaw for me?
- If necessary – corneal reflex: I'm just going to touch your eye, this may be unpleasant (sorry!)

CN 7

- Can you raise your eyebrows to the ceiling?
- Shut your eyes tightly, keep them closed as I try to open them.
- Puff out your cheeks for me.
- Show me your teeth.
- (Alternatively ask the patient to copy you... "Can I get you to copy me please?")

CN 8

- Ask the patient if they can hear you. "Can you hear me?"

CN 9/10

- Can you cough for me?
- Gag Reflex: I'm sorry, this might not feel nice. I'm just going to touch the back of your throat.

CN 11

- Can you turn your head to the left/right? (While assessing strength of the trapezius muscle)

CN 12

- Assessing for dysarthria: Can you repeat after me – “British Constitution”, “Baby Hippopotamus”, “The Leith police” ?
- Can you stick your tongue out for me?
- Waggle it from side to side.

Motor/Sensory

Notes

- Inspect each muscle group
 - Tone
 - Power
 - Reflexes
 - Co-ordination
 - Fine Touch
 - Proprioception
 - Pain
 - Temperature

Tone

- Just relax while I move your legs/arms. Try not to help me, just go floppy.

Power

- Can you copy these positions for me?
- Stop me pushing down.
- Stop me pulling up.
- Straighten/bend your arms for me
- Open/close your fingers.
- Show me your palm. Point your thumb to the roof for me.
- Squeeze my hand.
- Push down with your leg.
- Pull up with your leg for me.

Sensation

- Does this feel the same on both sides?
- Close your eyes for me. Tell me when you feel this touching you.
- Tell me how this feels....

Co-ordination

- Look at my finger... Touch my finger with your finger.... Now touch your nose.... And my finger again.
- Touch your (left) heel to your (right) knee....Run it down your shin for me...Ok, now lift it up and bring it back to your knee. And keep doing that for me....

Reflexes

- Just relax while I tap you with this tendon hammer – it shouldn't hurt.

Reinforcement

- Can you hold your hands together tightly and when I count to 3, pull them apart. (Demonstrate!)

Proprioception

- Demonstrate which way is 'up'/'down' to the patient. Then ask them to "close your eyes", move their finger/toe and then ask "which way is your (finger/toe) moving – up or down?"

Romberg's Test

- Can you stand up straight with your feet together for me. (Stand close to the patient and reassure;) Don't worry, I'll be here to hold on to if you feel unsteady. Now close your eyes for me.....OK, you can open them again.

Common Conditions

- Alzheimer's Disease
- Amyotrophic Lateral Sclerosis (see MND)
- Anoxic brain injury
- Bell's palsy
- Benign Intracranial Hypertension
- Brain Abscess
- Brain Injury
- Brain Tumour
- Astrocytoma
- Glioma
- Meningioma
- Metastatic from elsewhere
- Cerebral Lymphoma
- Brown-Séquard Syndrome
- Carpal Tunnel Syndrome
- Cerebral Aneurysm
- Cerebral Atrophy
- Cerebral Palsy
- Charcot-Marie-Tooth Disease
- Creutzfeldt-Jacob Disease
- CMV Infection (Cytomegalovirus)
- Dementia
- Diabetic Neuropathy
- Encephalitis
- Epilepsy

- Essential Tremor
- Febrile Seizures
- Guillain-Barré Syndrome
- Herpes Zoster (HZV)
- Huntington's Disease
- Hydrocephalus
- Intracranial Hypertension
- Lumbar Spinal Stenosis
- Menieres Disease
- Meningitis (Bacterial/Viral)
- Motor Neurone Disease (MND)
- Multi-Infarct Dementia
- Multiple Sclerosis
- Muscular Dystrophy
- Myasthenia Gravis
- Narcolepsy
- Optic Neuritis
- Peripheral Neuropathy
- Pituitary Tumour
- Poliomyelitis
- Post-herpetic Neuralgia
- Rabies

Shingles

Spina Bifida

Stroke

Subdural Haematoma

Subarachnoid haemorrhage

Transient Ischaemic Attack (TIA)

Trigeminal Neuralgia

Wilson's Disease

Management of Diseases/Drug Classes

Benzodiazepines

- Diazepam
- Temazepam
- Lorazepam

Antihistamines (for vertigo)

- Cinnarizine

Anti-epileptics

- Phenytoin
- Valproate
- Carbamazepine
- Levetiracetam

Anti-parkinsonism

- L-dopa

Drug/Alcohol dependence

- Disulfiram
- Methadone

Alzheimer's

- Donepezil
- Rivastigmine

Analgesics

- Morphine
- Diamorphine
- Amitriptylline
- Codeine
- Gabapentin
- Paracetamol
- Sumatriptan

Anti-emetics

- Metoclopramide
- Prochlorperazine
- Cyclizine