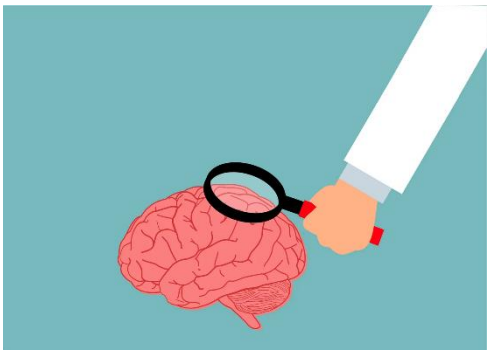
Neurological Examination



Neurological exam is not easy and can feel rather daunting to do, let alone localise the lesion and arrive at differentials.. (unless of course you're a Neurologist)!

The aim of this handout is to provide a simple & structured approach to hopefully help.

Before we start, the following frameworks are particularly important in Neurology:

Problem Representation – *who, when, what*

Semantic Qualifiers – *e.g. acute vs chronic, symmetrical vs asymmetrical*

Hallmark Features – *specific signs of a (neurological) disease*

Acute vs Chronic – *differentiating chronic conditions from acute pathology*

History

Primary neurological complaint:

This is key to a focused exam. The aim is not to do a full neuro exam from head to toe but **focus on the parts of the neuro exam based on the complaint.** For example, if tremors & slowing then focus would be on extrapyramidal exam.

PMH of any neurological conditions:

This is important for 2 reasons. Firstly, it can help in guiding to the diagnosis – e.g. PMH of MS, presenting with paraesthesia & weakness of the legs would suggest most likely MS relapse. Secondly & importantly, it helps to **differentiate what neurological signs are chronic so as not to be confused with the acute findings** – e.g. if known idiopathic

Parkinson's Disease – the parkinsonism signs would be chronic and should not be incorporated as part of the acute neurological findings.

5 Red Flag Neurological Signs (esp. OOH):

1. **Speech, swallow, breathing impairments** (in the absence of resp / gastro cause) – this should always raise suspicion for potentially rapidly progressive bulbar pathology such as MND, MG, GBS and stroke.

2. **Fasciculations** – look at the patient's tongue, arms, legs and posterior trunk; if present then this could indicate MND esp. with the above impairments.

3. **Ptosis** (+/- complex ophthalmoplegia) & fatiguability – myasthenia gravis (until proven otherwise), also cavernous or brain stem pathology

4. **Ascending weakness** with absent ankle reflexes – strongly suggestive of GBS.

5. **Impaired proprioception**, saddle paraesthesia / sensory level, bladder / bowel dysfunction – spinal cord compression. Beware that the severity of motor weakness does not always correlate to the cord compression pathology.

If any of the above are present then seek **urgent Neurology review and monitor closely inc. FVC.** Respiratory muscle weakness from a neurological condition can deteriorate rapidly hence consider ITU escalation if appropriate. If features of cord compression, then urgent MRI spine (vet with Radiology) and inform Neurosurgery to be on standby.

Focused Neurological Exam

Most important is following a structured pathway – largely divided into 3 pathways:

- **Extrapyramidal (Parkinsonism)**
- **Motor / sensory (UMN vs LMN)**
- **Cerebellar (Coordination)**

The key is to **identify the pathway as early as possible** in your exam so you can focus the rest of your exam on finding further signs with that pathway. E.g. if asymmetrical resting tremor with mask like facies on inspection, then the rest of your exam will be focused on looking for extrapyramidal signs (not focusing on power, reflex or sensation).

Doing a neurological exam in a structured order should be **second nature** (like brushing your teeth) through **practice, practice, practice!** It will be very difficult to find the neurological signs when you are thinking of what to do next.

The following are key high yield findings in each part of the exam:

Inspection:

This part is vastly underrated. You can gauge a lot - spend at least 30-60 seconds!

- Look for wasting or fasciculations (tongue, arms, legs, posterior trunk) = LMN pathway. Fasciculations would indicate looking for signs of MND.

- Ask the patient to stretch out their arms & hands, close their eyes and count from 20 backwards – this may precipitate their underlying tremor = extrapyramidal pathway

- Pronator drift – ask the patient to raise their arms up in the air with their palms toward the ceiling and close their eyes – unilateral rotating movement of their palm indicates potential stroke

- Hemiplegic posture with significant unilateral atrophy = previous stroke

- Abnormal gait – shuffling in Parkinson's, wide based in cerebellar dysfunction, spastic (scissor gait) in UMN lesions, high stepping in peripheral neuropathy, waddling in myopathy

- Face – mask like facies in Parkinson's, facial asymmetry in stroke

- Speech – dysarthria = cerebellar, hoarseness could indicate bulbar involvement

Tone:

Helps to differentiate between extrapyramidal, UMN & LMN pathways.

- Rigidity (lead-pipe & cog-wheel) – hypertonia which is **not velocity dependent** = extrapyramidal pathway

- Spasticity (UMN) – hypertonia which is **velocity dependent** – resistance increases with faster movement = UMN pathway

- Hypotonia – limb feels floppy with little resistance = LMN pathway (unless acute stroke suspected)

Power:

Always compare right & left sides and test distal & proximal muscles.

- The key in an acute setting is not to document every single muscle group with their precise power (time consuming act) but a global weakness pattern / picture – e.g. symmetrical 3/5 distal weakness of lower limbs.

- Test for fatiguability to see if weakness is a neuro-muscular junction problem (MG) esp. if there is ptosis.

- It is difficult to ascertain with just power whether it is UMN or LMN pathway – the weakness must **be interpreted alongside inspection, tone, reflex and history** (e.g. history of ascending lower limb weakness + hypotonia + bilateral distal weakness + absent ankle reflexes = LMN pathway)

- Useful test for bradykinesia (extrapyramidal sign) – **repetitive movements induce rigidity & slowing** such as repeatedly touching fingers or tapping feet.

Reflex:

This is perhaps my least favourite part of the neuro exam as it is somewhat subjective (unless you're a neurologist testing reflexes day in & day out).

- Hyperreflexia = UMN, areflexia = LMN. Always interpret reflexes with other abnormalities to determine the pathway.

Sensation:

The distribution & pattern of sensory loss is key. Check for modality (light touch, pin-prick, vibration / proprioception) if needed. Ask patient to close their eyes – compare sensation on both sides (distal to proximal).

- Distal symmetrical sensory loss (i.e. glove & stocking) – peripheral neuropathy (e.g. diabetes, alcohol, chemotherapy)

- Dermatomal sensory loss (often with radicular pain) – radiculopathy (nerve root)

- Sensory level (often with bilateral weakness & impaired proprioception) – spinal cord compression or lesion

- Hemisensory loss – brain lesion (e.g. stroke) often with cortical signs (neglect, aphasia, visual field defects)

Coordination:

Coordination primarily assesses cerebellar function.

The classical mnemonic – **DANISH:**

- **D**ysdiadochokinesis & dysmetria & dysarthria
- **A**taxia
- **N**ystagmus (bi-directional)
- **I**ntention tremor
- **S**lurred scanning speech
- **H**ypotonia

- Gait – wide based or impaired tandem indicative of cerebellar dysfunction.

- Causes of cerebellar dysfunction include stroke, tumour (cerebellar-pontine angle), MS, paraneoplastic, alcohol (Wernicke's), hypothyroid, neuro-degenerative (MSA), congenital (i.e. Frederich's ataxia)

Hallmark features of (Important) Neurological Diseases

Idiopathic Parkinson's Disease (PD) - mnemonic **TRAP:**

Tremor
Rigidity
Akinesia / bradykinesia
Postural instability with shuffling gait

(Also mask like facies, micrographia)

Signs are asymmetrical with symmetrical indicating advanced disease.

Drug induced Parkinsonism – **symmetrical parkinsonism (tremor predominant)** after dopamine blocking drugs (e.g. anti-psychotics, metoclopramide)

Vascular Parkinsonism – arises from vascular damage to the basal ganglia pathways (i.e. stroke or small vessel disease**). Pre-dominantly extrapyramidal signs of the lower limbs suggestive rather than the upper limb pre-dominance seen in idiopathic Parkinson's Disease.** Important as dopaminergic therapies such as levodopa are generally ineffective.

Parkinson-plus syndromes

As the name suggests – Parkinsonism signs with additional features often with a poorer prognosis than PD with poor response to levodopa

- Progressive Supranuclear Palsy (PSP) – falls (backwards) + vertical gaze palsy (difficulty reading) + dysarthria

- Lewry Body Dementia (LBD) – Parkinsonism + hallucinations + cognitive impairment

- Multi-System Atrophy (MSA) – cerebellar signs + severe autonomic failure + cognitive impairment

Motor Neuron Disease (MND) – mixed UMN + LMN signs with preserved sensation

Cervical myelopathy – hand clumsiness + gait disturbance + UMN signs in limbs

Creutzfeldt-Jakob disease (CJD) & prion disorders – rapid cognitive decline + myoclonic jerks + mixed neurology (i.e. extrapyramidal & cerebellar & motor signs)

5 causes of mixed neurological signs

1. Multi-territory infarcts - infarcts in different areas of the brain simultaneously
2. Neuro-degenerative disorders – e.g. Parkinson plus syndromes, CJD
3. Overlap of acute & chronic neurology – failure to differentiate acute signs from signs of pre-existing neurological conditions
4. Functional Neurological Disorder (FND) – often the first clue that there is no underlying organic disorder
5. Misidentification of neurological sign/s – e.g. mistaking myopathy for neuropathy

5 key differentiating features between myopathy vs neuropathy

1. Myopathy tends to be proximal whilst neuropathy is more distal.
2. Myopathy is often associated with pain & stiffness whilst neuropathy may have other tone or reflex impairments which are absent in myopathy.
3. Weakness may be more generalised in myopathy whilst more localised in neuropathy esp. if dermatomal or mononeuropathy pattern.
4. CK is often significantly elevated in myopathy (muscle inflammation) whilst unremarkable in neuropathy.
5. Nerve Conduction Studies is the definitive distinguishing test.

Summary – 5 Steps in Neurological Exam

1. What is the primary neurological complaint? – *helps to focus exam*
2. Any PMH of neurological conditions? – *acute vs chronic neurology*
3. Any red flag neurological signs? – *helps to determine urgency*
4. Structured pathway? – *focus on the pathway during exam*
5. What disease / differentials best explains the findings? – *tie everything together*