The Neurology Block

Acute ischaemic stroke, seizures and status epilepticus, acute neuromuscular weakness, peripheral neuropathy, myelopathy and demyelination, and the extrapyramidal disorders.

Cases 64–69 · 8,642 words

This block covers the neurological teaching of both internal medicine courses. The **first course** supplies cases 64 and 66; the **second course** supplies cases 67 and 69.

Case	Lecture it serves
System opener: the neurological history and examination	History taking in neurology; physical examination in neurology; localisation in neurology
Case 64 — Acute ischaemic stroke	Stroke
Case 65 — Seizures and status epilepticus	Seizure disorder and epilepsy; seizure seminar
Case 66 — Acute neuromuscular weakness	Neuromuscular and muscle disorders
Case 67 — Peripheral neuropathy	Peripheral neuropathies
Case 68 — Myelopathy and demyelinating disease	Myelopathies and demyelinating disorders
Case 69 — Parkinson disease and the extrapyramidal disorders	Parkinson and extrapyramidal disorders

The localisation lecture is served by the system opener, which sets out the upper versus lower motor neurone distinction and the site-by-site table. **Coma** is Seminar 10 and **dementia** is a Part Two case; both are second-course seminars.

System Opener · The Neurological History and Examination

THE TWO QUESTIONS, IN THIS ORDER

Where is the lesion? Then, what is the lesion?

The **examination** answers the first question by localising the problem along the neuraxis. The **history — specifically the time course —** answers the second, because pathology has a characteristic tempo.

Students who reverse this order end up with a list of diagnoses and no way to choose between them.

The history — tempo tells you the pathology

Time course	Pathology
Seconds to minutes, maximal at onset	Vascular — ischaemic stroke, haemorrhage; or a seizure
Minutes to an hour, spreading	Migraine aura (spreads and evolves over minutes), seizure with spread, metabolic disturbance
Hours to days	Infection, inflammation, demyelination
Weeks to months, progressive	Tumour, chronic inflammatory disease, degenerative disease
Episodic and stereotyped, with full recovery between	Seizures, migraine, transient ischaemic attack

- **Make the patient describe the symptom rather than name it.** "Dizzy" may mean vertigo, presyncope, unsteadiness or anxiety, and these have entirely different differentials. "Numb" may mean loss of sensation or weakness. Ask what they actually felt and what they could not do.
- **Obtain a witness account** for any episode involving altered consciousness. Without it, blackouts cannot reliably be diagnosed — and the witness is frequently in the corridor and never asked.
- Record **handedness**, functional impact, occupation, and **driving**, which has legal consequences in stroke and epilepsy.

The examination — localise before you diagnose

First: upper or lower motor neurone?

	Upper motor neurone	Lower motor neurone
Tone	Increased, spastic, clasp-knife	Reduced, flaccid
Reflexes	Brisk	Reduced or absent
Plantar response	Extensor	Flexor or absent
Wasting	Absent, or late from disuse	Prominent
Fasciculation	Absent	Present
Weakness pattern	Pyramidal — extensors weak in the arm, flexors weak in the leg	Depends on the nerve, root or segment involved

A caution: in the first hours to days of an acute upper motor neurone lesion — an acute stroke, or spinal shock after cord injury — the limb may be **flaccid with absent reflexes**. The upper motor neurone signs develop later. Do not localise on tone alone in the acute setting.

Then: where along the neuraxis?

Site	The findings that place it there
Cortex	Higher cortical dysfunction — dysphasia, neglect, apraxia; cortical sensory loss; homonymous visual field defect; seizures
Brainstem	Crossed signs — an ipsilateral cranial nerve palsy with contralateral limb signs. Also diplopia, nystagmus, dysarthria, dysphagia, vertigo, and altered consciousness
Spinal cord	A sensory level, sphincter disturbance, bilateral signs below the lesion, and back pain. This is the localisation you cannot afford to miss
Root	Dermatomal sensory loss with myotomal weakness, loss of one reflex, and pain radiating in the root distribution
Peripheral nerve	Distal, often length-dependent; sensory and motor together; areflexia; glove-and-stocking loss in polyneuropathy
Neuromuscular junction	Fatigable weakness with no sensory loss and preserved reflexes; ptosis, diplopia and bulbar involvement
Muscle	Symmetrical proximal weakness, no sensory loss, reflexes preserved until late, raised creatine kinase

The sequence

- **Higher function and speech** — orientation, attention, and whether the problem is **dysphasia** (a language disorder — expressive, receptive or mixed), **dysarthria** (a motor speech disorder with intact language), or **dysphonia**.
- **Cranial nerves**, including **fundoscopy** and visual fields.
- **Motor:** inspection for wasting and fasciculation, tone, power graded on the Medical Research Council scale, reflexes, plantars, coordination.
- **Sensory**, tailored to the hypothesis rather than performed exhaustively — look for a level, a dermatome, or a glove-and-stocking pattern.
- **Gait** — the single most informative part of the neurological examination, and the one most often omitted because the patient is already on the bed.

Case 64 · Acute Ischaemic Stroke

CLINICAL VIGNETTE

A **68-year-old man** collapsed into a chair at **08:15** while eating breakfast. His wife, who was with him, says he suddenly could not speak and his right arm fell to his side. He arrives in the emergency department at **09:40**.

He has hypertension and takes amlodipine. He is not on any anticoagulant. No previous stroke, surgery or bleeding.

On examination: alert but **globally aphasic**. Gaze is deviated to the left. There is a dense right hemiplegia with a right homonymous hemianopia and right facial weakness. **Capillary glucose 7.2 mmol/L.** Blood pressure 178/98 mmHg. **The pulse is irregularly irregular.**

Non-contrast computed tomography of the head: no haemorrhage; a hyperdense left middle cerebral artery. Computed tomographic angiography shows an **occlusion of the left middle cerebral artery**.

TIME IS BRAIN

Roughly **1.9 million neurons are lost every minute** that a large vessel occlusion goes untreated. Every step below is organised around time.

Target door-to-needle time for thrombolysis is under 60 minutes, and shorter is better. The history, examination, imaging and consent all happen in parallel, not in sequence.

1. Focused History — Four Things, Fast

- **The time of onset, or the time the patient was last known to be well.** This is the single most important fact in the entire encounter. If he woke with the deficit, the clock starts when he was last seen normal — although advanced imaging now allows selected patients outside the conventional window to be treated.
- **Contraindications to thrombolysis:** recent surgery or major trauma, active bleeding, previous intracranial haemorrhage, known aneurysm or vascular malformation, recent stroke, **anticoagulant use and the time of the last dose**, and any bleeding disorder.
- **Was there a seizure at onset, or a preceding headache and vomiting?** The first raises a postictal deficit; the second raises haemorrhage.
- **Premorbid function**, which shapes decisions about aggressive intervention — obtained from the family in a few sentences.

Stroke mimic	What gives it away
Hypoglycaemia	The reason you check the glucose before anything else. It can produce a dense hemiplegia and aphasia that resolve completely with glucose.
Postictal (Todd) paresis	Witnessed seizure, gradual recovery, previous epilepsy
Migraine with aura	Younger patient, positive symptoms spreading over minutes, headache
Sepsis or metabolic upset unmasking an old deficit	Fever, delirium, a previous stroke in the same territory
Subdural haematoma or tumour	Longer history, fluctuation, headache, imaging
Functional neurological disorder	Inconsistent findings, give-way weakness, positive Hoover sign

2. Physical Examination

- **Airway, breathing, circulation, conscious level, and capillary glucose** — in that order, and glucose within the first minute.
- **A formal stroke severity score**, which guides thrombectomy decisions and allows objective comparison later.
- Blood pressure in both arms, cardiac rhythm and murmurs, carotid bruits, peripheral pulses, temperature, and a search for a source of embolism including signs of endocarditis.

BEFORE ANYTHING IS GIVEN BY MOUTH

Nothing by mouth until a swallow screen has been performed — no water, no food, and **no oral medication, including the aspirin**.

Aspiration pneumonia is a leading cause of death after stroke and is largely preventable. A bedside swallow screen takes minutes and can be done by trained nursing staff. Prescribing oral aspirin to a dysphagic patient with a dense hemiplegia is a common and consequential error.

3. Localising the Stroke

Syndrome	Features
Total anterior circulation	All three of: higher cortical dysfunction, homonymous hemianopia, and hemiparesis or hemisensory loss. This patient.
Partial anterior circulation	Two of the three, or isolated higher cortical dysfunction
Lacunar	Pure motor, pure sensory, sensorimotor, ataxic hemiparesis, or dysarthria with a clumsy hand — and no cortical signs and no visual field defect
Posterior circulation	Cranial nerve palsy with contralateral deficit, bilateral signs, cerebellar signs, conjugate gaze disturbance, or isolated homonymous hemianopia

THE STROKES THAT GET MISSED

Posterior circulation strokes present with **vertigo, vomiting, unsteadiness and nystagmus** — and are repeatedly misdiagnosed as labyrinthitis and sent home.

Warning features: inability to stand or walk unaided, new headache or neck pain, any other brainstem sign, and vascular risk factors. In acute vestibular syndrome, a structured bedside oculomotor examination distinguishes peripheral from central causes better than early imaging does — **computed tomography is insensitive in the posterior fossa.**

4. Investigations

- **Immediate non-contrast computed tomography of the head** — its first purpose is to exclude haemorrhage. Early ischaemic signs include loss of grey–white differentiation, loss of the insular ribbon, sulcal effacement, and the **hyperdense artery sign** of thrombus within the vessel.
- **Computed tomographic angiography** to identify a large vessel occlusion, which determines eligibility for thrombectomy. **Perfusion imaging** selects patients for treatment in the extended time window.
- Glucose, complete blood count, coagulation screen, urea and electrolytes, and an **electrocardiogram**, which here shows atrial fibrillation and identifies the mechanism.

- **Later, to determine aetiology and secondary prevention:** prolonged cardiac monitoring for paroxysmal atrial fibrillation, carotid imaging, echocardiography, lipids and glycated haemoglobin. **Magnetic resonance imaging with diffusion-weighted sequences** where the diagnosis is uncertain or the stroke is posterior.

- **In a young patient**, extend the workup: arterial dissection, patent foramen ovale, thrombophilia, vasculitis, and infective endocarditis.

5. Management

Reperfusion

- **Intravenous thrombolysis within 4.5 hours** of onset in the absence of contraindications. **Blood pressure must be below 185/110 mmHg before treatment** and controlled afterwards.

- **Mechanical thrombectomy for large vessel occlusion**, conventionally within 6 hours and extending to 24 hours in patients selected by perfusion imaging. This patient has a middle cerebral artery occlusion and should be referred for thrombectomy **at the same time** as thrombolysis is being given.

- **Do not delay transfer to a thrombectomy centre in order to complete a thrombolysis infusion.** The two run in parallel.

PERMISSIVE HYPERTENSION

Do not lower the blood pressure in acute ischaemic stroke unless it exceeds approximately 220/120 mmHg, thrombolysis is planned, or there is another indication such as aortic dissection or heart failure.

The ischaemic penumbra has lost autoregulation and depends on systemic pressure for perfusion. Lowering the pressure converts salvageable tissue into infarct. The instinct to treat a reading of 190/100 is strong, and it is wrong here.

Note that the opposite applies in **intracerebral haemorrhage**, where early blood pressure lowering is appropriate.

The first 48 hours

- **Stroke unit care** — the intervention that benefits the largest number of patients, more than any drug.

- **Aspirin 300 mg** — immediately if not thrombolysed, or after 24 hours and a repeat scan if thrombolysed. Given rectally or by nasogastric tube if swallowing is unsafe.

- Maintain normoglycaemia and normothermia; oxygen only if hypoxic; **intermittent pneumatic compression** rather than routine early heparin for venous thromboembolism prophylaxis; early mobilisation and pressure care.

- **Malignant middle cerebral artery syndrome** — deteriorating consciousness with massive infarction in the first 48 hours. **Decompressive hemicraniectomy** improves survival in selected younger patients and must be discussed early, before the patient deteriorates beyond eligibility.

Secondary prevention and rehabilitation

- **Anticoagulation for atrial fibrillation**, with timing determined by infarct size — larger infarcts are anticoagulated later because of haemorrhagic transformation risk.

- Antiplatelet therapy where the mechanism is not cardioembolic; **high-intensity statin**; blood pressure control started after the acute phase; diabetes and smoking.

- **Carotid endarterectomy within two weeks** for symptomatic severe stenosis — the benefit falls sharply with delay.
- **Multidisciplinary rehabilitation** — physiotherapy, occupational therapy, speech and language therapy; nutrition; screening for post-stroke depression; driving advice; and, for an aphasic patient, deliberate attention to how consent and communication are managed.

6. Teaching Points and Viva Questions

- Check the glucose before anything else. Hypoglycaemia mimics everything.
- Time last known well, recorded to the minute, drives every subsequent decision.
- Do not treat the blood pressure in ischaemic stroke — the penumbra depends on it.
- Swallow screen before the first tablet or sip.
- Vertigo with ataxia and vascular risk factors is a posterior circulation stroke until proved otherwise, and the computed tomogram will not reassure you.
- Thrombolysis and thrombectomy referral happen together, not one after the other.

Questions you should be able to answer:

- Classify this stroke syndrome and name the vessel.
- His blood pressure is 196/104. What do you do, and why?
- He was found on the floor at 07:00 having gone to bed at 23:00. What time do you use, and what are his options?
- The nurse asks whether she can give his morning tablets. What is your answer?
- When would you start anticoagulation for his atrial fibrillation?

Case 65 · Seizures and Status Epilepticus

CLINICAL VIGNETTE

A **23-year-old woman** with known epilepsy is brought in after a witnessed generalised convulsion at work lasting about two minutes. She had a second convulsion in the ambulance without regaining awareness. **As she is transferred to the trolley a third seizure begins, and it is still continuing six minutes later.**

Her colleague reports that she stopped her levetiracetam about two weeks ago. She had been sleeping badly and had a feverish illness last week.

On arrival: convulsing, cyanosed around the lips, oxygen saturation 88%. Temperature 37.8 °C. **Capillary glucose 6.4 mmol/L.**

THE DEFINITION THAT DETERMINES YOUR ACTION

A seizure lasting 5 minutes or more, or repeated seizures without recovery of consciousness in between, is status epilepticus and must be treated as such.

The older 30-minute definition is obsolete. Five minutes is the operational trigger, because most self-limiting seizures have stopped by two minutes and the longer a seizure runs the harder it becomes to terminate.

This patient is in status epilepticus. Treatment starts now.

1. Managing Status Epilepticus

Time	Action
0–5 minutes	Airway, high-flow oxygen, recovery position, suction. Capillary glucose. Intravenous access and bloods. Cardiac and oxygen saturation monitoring. Note the time the seizure began.
5–20 minutes — first line	A benzodiazepine: intravenous lorazepam, or intramuscular or buccal midazolam where there is no access. May be repeated once after 5–10 minutes. In alcohol dependence or malnutrition, give thiamine before or with any glucose.
20–40 minutes — second line	An intravenous antiseizure drug: levetiracetam, sodium valproate — avoided in girls and women of childbearing potential — or phenytoin, which requires cardiac monitoring, a controlled infusion rate, and must not be given in a dextrose-containing line.
40–60 minutes — refractory status	General anaesthesia with intubation and ventilation: midazolam, propofol or thiopental infusion, with continuous electroencephalographic monitoring in intensive care.
Throughout	Find and treat the cause. Consider eclampsia (magnesium sulfate), isoniazid toxicity (pyridoxine), meningitis, and correct sodium, calcium and magnesium.

THE COMMONEST ERROR

The commonest reason status epilepticus fails to respond to first-line treatment is that the benzodiazepine was under-dosed, or given only once.

Give the full weight-appropriate dose, and give the second dose if the first does not work. Reluctance — usually a fear of respiratory depression — leads to prolonged seizing, which causes far more harm than the drug.

- **Complications to anticipate:** hypoxia and aspiration, **rhabdomyolysis with acute kidney injury**, hyperthermia, arrhythmia, lactic acidosis, fractures and dislocations, and neuronal injury from prolonged seizure activity.

2. Once She Has Stopped — the History

Get the witness account. A seizure diagnosis made without one is unreliable, and the witness is usually available in the department for only a short time.

- **Before:** what she was doing, any warning or aura, posture, and triggers such as sleep deprivation, alcohol, missed medication or flashing lights.
- **During:** focal onset or generalised from the start, head or eye deviation, duration, colour change, **lateral tongue biting** — which is relatively specific — incontinence, and injury.
- **After:** duration of confusion, **focal weakness (Todd paresis)**, headache, muscle pain.
- **In a known epileptic, find the precipitant:** missed or stopped medication, a new interacting drug, infection, sleep deprivation, alcohol, or menstruation.

	Seizure	Syncope	Psychogenic non-epileptic attack
Onset	Sudden, may have aura	Lightheadedness, nausea, greying vision, sweating	Often gradual, situational
Duration	Usually 1–3 minutes	Seconds	Often prolonged, waxing and waning
Eyes	Open, may deviate	Open or closed	Closed and actively resisting opening
Movements	Rhythmic, synchronous, decreasing frequency	Brief irregular jerks may occur	Asynchronous, side-to-side head movement, pelvic thrusting
Recovery	Postictal confusion, often prolonged	Rapid and complete	Rapid; may weep; awareness often retained

3. Investigations

- **Glucose, sodium, calcium, magnesium**, complete blood count, liver and renal function, **creatine kinase**, and drug levels where relevant. Toxicology and a **pregnancy test**. Blood cultures if febrile.
- **A raised lactate is expected immediately after a generalised convulsion** and clears within an hour or two. It is a useful confirmatory finding and is regularly misread as evidence of sepsis or shock.
- **Computed tomography of the head** for a first seizure with a focal deficit, persistent alteration of consciousness, head injury, fever, anticoagulation, immunosuppression or known malignancy.
- **Lumbar puncture** where meningitis or encephalitis is suspected, with imaging first where indicated.
- **Electroencephalography** supports the diagnosis and classifies the epilepsy syndrome, but **a normal recording does not exclude epilepsy** — most patients are normal between seizures. **Magnetic resonance imaging** is the structural investigation of choice in focal epilepsy.

4. Longer-Term Management

- **Match the drug to the seizure type.** Focal epilepsy: lamotrigine, levetiracetam, carbamazepine. Generalised epilepsy: valproate, lamotrigine, levetiracetam. **Carbamazepine can worsen generalised epilepsies** — classification matters.

VALPROATE AND WOMEN OF CHILDBEARING POTENTIAL

Sodium valproate must not be used in girls or in women of childbearing potential unless no alternative exists and stringent pregnancy prevention conditions are met.

It carries a high risk of major congenital malformation and of neurodevelopmental disorders in exposed children. This is one of the clearest prescribing rules in modern neurology, and it applies from childhood onwards — not from the moment a woman announces she is planning pregnancy.

- **After a first unprovoked seizure, treatment is not automatic.** It depends on the risk of recurrence — an abnormal electroencephalogram, a structural lesion, a focal or nocturnal seizure — and on the patient's own priorities, including driving and occupation.

THE MOST IMPORTANT QUESTION OF THE ADMISSION

This patient stopped her medication two weeks ago. **Find out why, without judgement** — cost, side effects, feeling well, forgetting, stigma, or not understanding that treatment is long term. Each has a different remedy, and none is addressed by simply restarting the same prescription.

Non-adherence is the commonest precipitant of status epilepticus in a known epileptic. The consultation that explores it is more valuable than the one that adds a second drug.

- **Driving.** The patient must be advised not to drive and to inform the licensing authority. **Have the conversation and document it** — it is a legal obligation as well as a clinical one.
- **Safety advice:** showers rather than baths, never swim alone, caution with heights, unguarded machinery and cooking, and a rescue medication plan taught to the family.
- **Women:** folic acid; interactions between enzyme-inducing drugs and hormonal contraception in both directions; and preconception counselling well before pregnancy.
- **Discuss sudden unexpected death in epilepsy** honestly. The risk is reduced by good seizure control and by adherence, which is itself a reason to have the conversation.

5. Teaching Points and Viva Questions

- Five minutes defines status epilepticus. Start treating at five, not at thirty.
- Under-dosing the benzodiazepine is the commonest reason status persists.
- Thiamine before glucose in anyone malnourished or alcohol-dependent.
- A raised lactate after a convulsion is expected, not alarming.
- A normal electroencephalogram does not exclude epilepsy.
- Ask why she stopped the tablets, and document the driving conversation.

Questions you should be able to answer:

- At what point did this become status epilepticus, and what is your first drug?
- She is still fitting after two doses of lorazepam. What next, and in what order?
- Her creatine kinase is 8400. What is the complication and how do you manage it?

- How would you distinguish this from a psychogenic non-epileptic attack?
- She asks when she can drive again, and whether she can take valproate. Answer both.

Case 66 · Acute Neuromuscular Weakness

CLINICAL VIGNETTE

A **38-year-old man** describes five days of progressive weakness. It began as difficulty climbing stairs, then spread to his thighs, and today he cannot lift a cup. He has tingling in both feet and severe aching pain in his back and thighs. He had a diarrhoeal illness three weeks ago.

On examination: symmetrical flaccid weakness — 3/5 in the legs, 4/5 in the arms. **All deep tendon reflexes are absent.** There is mild distal sensory loss to pinprick. There is bilateral facial weakness. **There is no sensory level and no sphincter disturbance.** Pupils are normal.

Forced vital capacity 1.6 litres (predicted approximately 4.5). He can count only to 14 on a single breath. Blood pressure has fluctuated between 90/60 and 175/95 mmHg over two hours.

1. Localise First

Site	Pattern	Key discriminator
Spinal cord	Paraparesis or quadriparesis	Sensory level and sphincter disturbance. Must be excluded urgently — cord compression is treatable and time-critical
Anterior horn cell	Asymmetric, pure motor	Wasting and fasciculation, no sensory loss
Root or plexus	Dermatomal and myotomal	Radiating pain, single reflex lost
Peripheral nerve	Distal, ascending, symmetrical	Areflexia with sensory involvement — this patient
Neuromuscular junction	Ocular, bulbar, proximal	Fatigability, no sensory loss, reflexes preserved
Muscle	Symmetrical proximal	No sensory loss, reflexes preserved, raised creatine kinase

The absence of a sensory level and of sphincter disturbance, with global areflexia and a preceding diarrhoeal illness, places this in the peripheral nerves — Guillain–Barré syndrome. But if there had been any suspicion of a cord lesion, **magnetic resonance imaging of the spine comes before anything else**.

2. Focused History

- **Antecedent illness** — *Campylobacter* gastroenteritis is the classic trigger, along with cytomegalovirus, Epstein–Barr virus, *Mycoplasma*, and recent surgery or vaccination.
- **Tempo** — Guillain–Barré syndrome progresses over days to a maximum at up to four weeks. Weakness progressing over months is a different disease.
- **Pain** — severe back and limb pain is present in most patients, is often the first symptom, and is regularly under-treated because it is not expected.
- **Bulbar and respiratory symptoms:** difficulty swallowing, nasal speech, weak cough, breathlessness on lying flat.
- **Autonomic symptoms:** palpitations, fainting, constipation, urinary retention, sweating changes.

- **If the pattern suggests myasthenia instead:** fatigability worse towards the end of the day, ptosis, diplopia, and precipitating drugs — **aminoglycosides, macrolides, quinolones, beta blockers and magnesium**.

3. Physical Examination

- Pattern and grading of weakness; **reflexes and plantars**; a careful search for a **sensory level**; assessment of fatigability by sustained upgaze and repeated arm abduction where myasthenia is possible.
- **Bulbar function** — speech, swallow, cough strength — and **neck flexion strength**, which parallels diaphragmatic strength.

THE SINGLE MOST IMPORTANT POINT IN THIS CASE

Measure the forced vital capacity at the bedside, and repeat it every four hours. This is the observation on which the patient's life depends.

Do not rely on oxygen saturation or arterial blood gases. In neuromuscular respiratory failure they remain normal until the patient is close to arrest — hypoxaemia and hypercapnia are **late, pre-terminal** findings.

Indications for intensive care review and probable intubation: vital capacity below about 20 mL/kg (or under 1 litre in an adult), a fall of more than 30% from baseline, **paradoxical abdominal movement**, inability to count above about 15 in one breath, weak cough, or bulbar weakness with a risk of aspiration.

The decision to intubate is made **electively on the trend**, in daylight, with a senior anaesthetist — not as an emergency at three in the morning.

4. Investigations

- **Serial forced vital capacity**, as above, charted like an observation.
- **Lumbar puncture: albuminocytological dissociation** — a raised protein with a normal cell count. **It is frequently normal in the first week**, so an early normal result does not exclude the diagnosis. A raised cell count should prompt consideration of infection, including human immunodeficiency virus, and of malignant infiltration.
- **Nerve conduction studies and electromyography** — demyelinating features in Guillain–Barré syndrome; a **decremental response on repetitive nerve stimulation** in myasthenia gravis.
- **Anti-ganglioside antibodies**, including anti-GQ1b in the Miller Fisher variant of ophthalmoplegia, ataxia and areflexia; stool culture and serology for *Campylobacter*.
- **If myasthenia is suspected:** acetylcholine receptor and muscle-specific kinase antibodies, thyroid function, and **computed tomography of the chest for thymoma**.
- **Exclude the mimics:** potassium, magnesium, calcium and phosphate; creatine kinase; vitamin B12; human immunodeficiency virus; and consider botulism, tick paralysis, porphyria, vasculitic neuropathy, and heavy metal poisoning.
- **Magnetic resonance imaging of the spine wherever a cord lesion is conceivable.** Cord compression is the diagnosis you cannot afford to miss, and it is the one that most closely mimics an ascending paralysis.

5. Management

- **Admit to a monitored bed with four-hourly vital capacity and continuous cardiac monitoring.** Involve intensive care early, before deterioration.
- **Immunotherapy: intravenous immunoglobulin or plasma exchange.** They are of equivalent efficacy, and **they are not combined.** Intravenous immunoglobulin is more widely available and easier to give.

> WHAT NOT TO GIVE
>
> **Corticosteroids do not work in Guillain–Barré syndrome and are not used.**
>
> This is a genuine and examinable contrast with **chronic inflammatory demyelinating polyradiculoneuropathy**, which is steroid-responsive. The instinct to reach for prednisolone in an inflammatory neuropathy is understandable and, in the acute syndrome, wrong.

- **Autonomic instability is a leading cause of death.** Monitor the rhythm, avoid drugs that swing the blood pressure, be alert for bradyarrhythmias, ileus and urinary retention, and treat labile hypertension cautiously.
- **Treat the pain properly** — neuropathic agents together with simple analgesia. Patients are fully conscious throughout.
- **Venous thromboembolism prophylaxis** in every immobile patient; pressure area care; nutrition and swallow assessment; early physiotherapy.
- **Psychological support.** A patient who is progressively paralysed but entirely alert and aware is frightened, and communication becomes harder exactly as the fear increases. Explain what is happening and what will happen next, repeatedly.
- **Myasthenic crisis:** intravenous immunoglobulin or plasma exchange, treatment of the precipitant, withdrawal of the offending drug, and cautious corticosteroid introduction — **steroids can transiently worsen weakness at the start of treatment**.
- **Prognosis:** most patients with Guillain–Barré syndrome recover substantially, but recovery takes months, a significant minority require ventilation, and mortality is not negligible. Say this honestly to the family.

6. Teaching Points and Viva Questions

- Localise before you diagnose — and exclude cord compression first.
- The vital capacity is the observation. Saturations and gases reassure you right up until they do not.
- Areflexia with ascending symmetrical weakness after a diarrhoeal illness is Guillain–Barré syndrome until proved otherwise.
- A normal lumbar puncture in the first week excludes nothing.
- Steroids are ineffective in the acute syndrome, and immunoglobulin and plasma exchange are not combined.
- Autonomic instability, not weakness, is what kills these patients.

- Treat the pain, and keep talking to a patient who cannot answer.

Questions you should be able to answer:

- Which findings place the lesion in the peripheral nerves rather than the cord?
- His saturations are 98% on air. Does that reassure you? Justify your answer.
- The lumbar puncture on day 4 shows normal protein. What do you conclude?
- A colleague suggests high-dose methylprednisolone. How do you respond?
- His heart rate drops to 38 during suctioning. What is happening?

Case 67 · Peripheral Neuropathy

CLINICAL VIGNETTE

A **63-year-old man** describes two years of numbness that began in the toes and has crept up to mid-calf, with **burning pain worst at night**. He is unsteady walking to the bathroom in the dark but manages in daylight. He has developed two painless ulcers under the forefoot, and last month **burned the sole of his foot on a hot floor without feeling it**.

He has had type 2 diabetes for twelve years with a glycated haemoglobin of 9.1%, and drinks around 40 units of alcohol a week.

On examination: symmetrical loss of pinprick and temperature to mid-calf in a glove-and-stocking distribution, **absent ankle jerks**, reduced vibration and joint position sense to the knees, mild weakness of toe extension, and **high-arched feet with clawed toes, thick callus and a clean neuropathic ulcer** under the right first metatarsal head. Romberg test positive. No proximal weakness, no fasciculation.

Vitamin B12 low-normal with a raised methylmalonic acid.

1. Four Questions That Classify Any Neuropathy

Neuropathy has an intimidating list of causes and a very manageable structure. Answer these four questions and the list becomes short.

Question	What the answer means
1. Which fibres?	Large fibre — vibration, joint position, reflexes, and unsteadiness in the dark. Small fibre — burning pain, temperature loss and autonomic symptoms, with preserved reflexes and normal nerve conduction studies. Motor, sensory, autonomic, or mixed.
2. What distribution?	Symmetrical and distal — length-dependent polyneuropathy. Asymmetrical, multiple named nerves — mononeuritis multiplex, which means vasculitis or diabetes (Case 61). A single nerve — entrapment or compression. Proximal and distal with early loss of reflexes — a demyelinating polyradiculoneuropathy.
3. What tempo?	Days to weeks — Guillain–Barré syndrome, vasculitis, porphyria, toxins, critical illness. Months to years — diabetes, alcohol, hereditary disease, paraproteinaemia.
4. Axonal or demyelinating?	The nerve conduction studies answer this and it splits the causes. Axonal — diabetes, alcohol, B12 deficiency, uraemia, drugs, hereditary sensorimotor neuropathy, amyloid. Demyelinating — Guillain–Barré syndrome, chronic inflammatory demyelinating polyradiculoneuropathy, paraprotein-associated neuropathy, Charcot–Marie–Tooth type 1, leprosy, diphtheria.

2. The Causes

Group	Causes
Metabolic and nutritional	Diabetes — the commonest cause; alcohol; B12 deficiency; thiamine and vitamin E deficiency; vitamin B6 in excess as well as in deficiency; hypothyroidism; chronic kidney disease; liver disease
Drugs and toxins	Isoniazid, metronidazole, nitrofurantoin, amiodarone, phenytoin; chemotherapy — vincristine, platinum agents, taxanes, thalidomide, bortezomib; lead, arsenic, organophosphates
Infective	Leprosy — a leading infectious cause worldwide, with thickened palpable nerves and skin lesions; human immunodeficiency virus; hepatitis B and C; Lyme disease; diphtheria; brucellosis
Immune and inflammatory	Guillain–Barré syndrome (Case 66); chronic inflammatory demyelinating polyradiculoneuropathy — which is treatable; vasculitis; connective tissue disease; sarcoidosis; coeliac disease
Paraproteinaemic and neoplastic	Myeloma and monoclonal gammopathy; amyloidosis; POEMS syndrome; paraneoplastic neuropathy
Hereditary	Charcot–Marie–Tooth disease — look for pes cavus, hammer toes, distal wasting giving an inverted-champagne-bottle appearance, and affected relatives. Patients often have marked signs with surprisingly few symptoms, because the disease has been present all their life

Around a quarter remain idiopathic after full investigation, and it is legitimate to say so once the treatable causes have been excluded — but only then.

3. Focused History

- Onset, progression and distribution; which fibre types are involved; the character of any pain.
- **Function, which is what the patient actually cares about:** falls, unnoticed injuries and **burns**, difficulty with buttons and keys, tripping, and unsteadiness in the dark.
- **Autonomic symptoms:** postural dizziness, early satiety and vomiting, altered bowel habit, bladder and sexual dysfunction, sweating changes.
- **Alcohol quantified**; diet, vegan practice and **bariatric surgery**; every drug including chemotherapy and over-the-counter vitamins; occupational and toxin exposure.
- **Family history — and examine the parents' and siblings' feet if you can**, because hereditary neuropathy is often undiagnosed in the family.
- **Red flags demanding urgent investigation:** rapid progression, prominent or asymmetrical **motor** involvement, autonomic failure, weight loss, or systemic features.

4. Examination

- **Establish the pattern first**, then map the sensory level and test vibration, joint position, pinprick and temperature separately.
- Reflexes; power tested with attention to a **distal-to-proximal gradient**; gait and Romberg test; **pes cavus and clawing**.
- **Palpate for thickened nerves** — the ulnar nerve at the elbow, the greater auricular in the neck, the common peroneal at the fibular neck. **Thickened nerves mean leprosy or hereditary neuropathy**, and

take fifteen seconds to check.

- **Inspect the feet and the footwear**, as in Case 25 — this man has already ulcerated and burned himself.
- Postural blood pressure; and a search for the systemic causes above.

5. Investigations

THE FIRST-LINE SCREEN — CHEAP, AND IT FINDS MOST OF THE TREATABLE CAUSES

Glucose and glycated haemoglobin — and an oral glucose tolerance test if these are normal, because impaired glucose tolerance alone causes neuropathy · **vitamin B12, with methylmalonic acid or homocysteine if borderline** · folate · thyroid function · renal and liver function · complete blood count and erythrocyte sedimentation rate · **serum protein electrophoresis with immunofixation and serum free light chains** · human immunodeficiency virus and hepatitis serology.

A paraprotein is found in roughly one in ten otherwise idiopathic neuropathies, and it is the test most often left off the request form. It costs little and it changes the diagnosis from "idiopathic" to something with a name and, sometimes, a treatment.

- **Second line, guided by suspicion:** antinuclear and antineutrophil cytoplasmic antibodies, rheumatoid factor, coeliac serology, angiotensin-converting enzyme, copper and caeruloplasmin, vitamin E, heavy metals, anti-ganglioside antibodies, and genetic testing.
- **Nerve conduction studies and electromyography** to confirm, localise, and classify as axonal or demyelinating.
- **Normal nerve conduction studies in a patient with burning feet do not exclude neuropathy — they suggest small fibre disease**, which is confirmed by skin biopsy or quantitative sensory testing where available.
- **Nerve biopsy** occasionally — for suspected vasculitis, amyloidosis or leprosy. Imaging of the spine where a myelopathy or radiculopathy is possible.

6. Management

- **Treat the cause.** Glycaemic control slows progression; alcohol abstinence with thiamine replacement; B12 and thyroid replacement; withdrawal of the offending drug; treatment of the vasculitis, paraprotein or leprosy.

TREATING NEUROPATHIC PAIN HONESTLY

Set the expectation before you write the prescription: a 30 to 50 per cent reduction in pain is a good result, and abolition is not achievable.

Promising more guarantees that the patient will judge the treatment a failure and stop it.

Duloxetine, amitriptyline, gabapentin or pregabalin, started low and titrated, with topical capsaicin or lidocaine for localised pain. **Avoid opioids for chronic neuropathic pain** — they work poorly and cause harm.

THE MOST IMPORTANT PART OF THE PLAN

In a patient who has lost protective sensation, foot care is the intervention that prevents amputation — and it matters more than the analgesia.

Daily inspection including with a mirror; never barefoot; test bath water with the hand or a thermometer; professional nail and callus care; properly fitted footwear; and **same-week referral to a multidisciplinary foot service for any ulcer** (Case 25).

- Falls prevention, physiotherapy and occupational therapy, an ankle-foot orthosis for foot drop, and driving assessment.
- **Autonomic management:** compression stockings and fludrocortisone or midodrine for postural hypotension; prokinetics for gastroparesis.
- **Do not accept a chronic progressive demyelinating neuropathy as untreatable. Chronic inflammatory demyelinating polyradiculoneuropathy responds to corticosteroids, immunoglobulin or plasma exchange** — in contrast to Guillain–Barré syndrome, where steroids do not work (Case 66). It deserves referral rather than resignation.
- Genetic counselling in hereditary disease.

7. Teaching Points and Viva Questions

- Classify by fibres, distribution, tempo, and axonal versus demyelinating.
- The cheap first-line screen finds most of the treatable causes — and includes a paraprotein screen.
- Normal nerve conduction studies with burning feet means small fibre neuropathy, not a normal patient.
- Palpate for thickened nerves.
- Mononeuritis multiplex means vasculitis or diabetes.
- Promise 30 to 50 per cent pain relief, not abolition.
- Foot protection prevents amputation; chronic demyelinating neuropathy is treatable.

Questions you should be able to answer:

- Which four questions would you ask of any neuropathy, and what are the answers in this man?
- He has diabetes and drinks heavily. Why still send the full screen?
- A patient with burning feet has entirely normal nerve conduction studies. What do you conclude?
- What will you tell him about how much his pain will improve?
- A 45-year-old has a two-year progressive weakness with globally absent reflexes and demyelinating conduction studies. Why does this matter?

Case 68 · Myelopathy and Demyelinating Disease

CLINICAL VIGNETTE

A **34-year-old woman** describes five days of numbness that began in both feet and has ascended to the level of her umbilicus, with heaviness of both legs and **difficulty starting micturition with a feeling of incomplete emptying**.

Two years ago she had **painful loss of vision in the right eye** which recovered over several weeks. Last year she had a week of vertigo and double vision.

On examination: a **spastic paraparesis** with increased tone, pyramidal-pattern weakness, brisk reflexes and **extensor plantar responses**. There is a **sensory level at T10**. Abdominal reflexes are absent. There is a **right relative afferent pupillary defect with temporal pallor of the optic disc**. Vibration sense is reduced to the knees.

Magnetic resonance imaging: multiple T2 lesions in the periventricular white matter, corpus callosum and cervical cord, two of which enhance. **Cerebrospinal fluid: oligoclonal bands present, normal cell count.**

THE RULE BEFORE ANY DIAGNOSIS IS MADE

A sensory level, bilateral motor signs and sphincter disturbance define a myelopathy — and every myelopathy is cord compression until imaging says otherwise.

Image the WHOLE spine, urgently, not just the level you think is affected — compressive lesions are frequently multiple, and a scan of the wrong segment is worse than no scan because it falsely reassures.

Remember from the system opener that in the acute phase the legs may be flaccid and areflexic — spinal shock — so normal tone and absent reflexes do not exclude a cord lesion.

1. Compressive Myelopathy — the Emergency

- **Causes: metastatic malignancy — breast, lung, prostate, myeloma and lymphoma — which is the commonest cause in an adult**; **epidural abscess** (fever, back pain, immunosuppression, diabetes, intravenous drug use, recent spinal instrumentation); epidural haematoma (anticoagulation or a recent procedure); disc prolapse and vertebral fracture; and **tuberculous or brucellar spondylitis, which are important here and may present with a gibbus** (Cases 41 and 43).

- **Red flags:** progressive leg weakness, a sensory level, **urinary retention or new incontinence**, saddle anaesthesia, band-like pain around the trunk, back pain worse at night or on straining, fever, or a known malignancy.

WHAT HAPPENS IN THE NEXT HOUR

Urgent magnetic resonance imaging of the whole spine · high-dose dexamethasone if malignant compression is suspected · same-hour discussion with neurosurgery and oncology · then radiotherapy or surgical decompression.

Neurological function that is not recovered within hours is often not recovered at all. The difference between a patient who walks and one who does not is usually the speed of the first scan.

For an epidural abscess: blood cultures, antibiotics and urgent surgical drainage.

2. Non-Compressive Myelopathy

Group	Causes
Inflammatory and demyelinating	Multiple sclerosis · neuromyelitis optica spectrum disorder — aquaporin-4 antibody, with longitudinally extensive cord lesions and severe optic neuritis · MOG antibody disease · acute disseminated encephalomyelitis · sarcoidosis · lupus
Metabolic	Vitamin B12 deficiency — subacute combined degeneration (Case 50) · copper deficiency · nitrous oxide misuse
Infective	Human immunodeficiency virus · HTLV-1 · varicella zoster · syphilis · schistosomiasis · tuberculosis
Vascular	Spinal cord infarction — sudden onset, anterior spinal artery territory with dorsal column sparing · dural arteriovenous fistula
Degenerative and structural	Cervical spondylotic myelopathy — the commonest myelopathy in older adults: insidious, with clumsy hands, gait disturbance and brisk legs with a normal or reduced arm reflex at the level
Other	Intrinsic cord tumour · syringomyelia · radiation myelopathy

THE MIMIC THAT MUST BE EXCLUDED

Distinguishing neuromyelitis optica spectrum disorder from multiple sclerosis matters, because the treatments differ and several multiple sclerosis drugs make neuromyelitis optica worse.

Suspect it with: severe or bilateral optic neuritis with poor recovery · a **longitudinally extensive cord lesion spanning three or more vertebral segments** · intractable hiccups or vomiting from an area postrema lesion · relapses that leave severe deficits.

Send aquaporin-4 and MOG antibodies in every first presentation of demyelinating myelitis or optic neuritis.

3. Multiple Sclerosis

- **The diagnosis requires dissemination in space and in time** — lesions in more than one site, occurring on more than one occasion. This patient has optic neuritis, a brainstem episode and now a myelitis, with characteristic imaging and oligoclonal bands.
- **Phenotypes:** relapsing–remitting, secondary progressive, primary progressive; and the clinically isolated syndrome.
- **Typical presentations: optic neuritis** — painful monocular visual loss with a relative afferent pupillary defect, recovering over weeks and leaving optic atrophy; **transverse myelitis**; brainstem syndromes with **internuclear ophthalmoplegia**, vertigo or diplopia; sensory disturbance; **Lhermitte sign** — an electric sensation down the spine on neck flexion; **Uhthoff phenomenon** — symptoms worse in heat; and the features patients rate as most disabling: **fatigue, bladder dysfunction, spasticity and cognitive change**.

Investigations

- **Magnetic resonance imaging of the brain and the whole spine with contrast** — periventricular, juxtacortical, infratentorial and cord lesions, with enhancement indicating active inflammation.
- **Cerebrospinal fluid oligoclonal bands** with a normal or mildly raised cell count; visual evoked potentials.
- **Aquaporin-4 and MOG antibodies**, and **exclusion of the mimics: B12, human immunodeficiency virus, syphilis, antinuclear antibody, angiotensin-converting enzyme, thyroid function and the vasculitides.**

Management

- **Acute relapse: high-dose corticosteroid shortens the relapse but does not change the long-term course**, and is used only where the relapse is disabling. **Exclude infection first — urinary infection both mimics and precipitates relapse, and should be treated before any steroid is given.**
- **Disease-modifying therapy in relapsing disease, started early**, because disability accrues early and is not recovered later. Agents range from interferons and glatiramer through dimethyl fumarate and teriflunomide to natalizumab, fingolimod, ocrelizumab, alemtuzumab and cladribine, selected by disease activity and risk. **Screen before starting: JC virus serology, hepatitis B, tuberculosis, varicella status, and pregnancy planning.**

SYMPTOM MANAGEMENT IS WHERE QUALITY OF LIFE LIES

Ask about, and treat, the things the patient actually complains of — which are rarely the things on the imaging.

Fatigue · bladder dysfunction — measure a post-void residual before prescribing an anticholinergic, and teach intermittent self-catheterisation where retention is the problem · spasticity (baclofen, tizanidine, physiotherapy, botulinum toxin) · bowel care · neuropathic pain · **depression, which is common and under-treated** · sexual dysfunction · cognitive difficulty.

And two things with evidence behind them: exercise, and smoking cessation — smoking accelerates progression. Vitamin D replacement.

- **Pregnancy:** the relapse rate falls during pregnancy and rises in the puerperium; plan drug changes in advance rather than reacting to a positive test.
- Multidisciplinary care with a specialist nurse, physiotherapy, occupational therapy and continence services; and an honest conversation about prognosis, which is far more variable than patients expect.

4. Teaching Points and Viva Questions

- A sensory level plus sphincter disturbance means imaging the whole spine today.
- Flaccid areflexic legs early do not exclude a cord lesion.
- The commonest compressive cause in an adult is metastatic malignancy — and here, think tuberculous and brucellar spondylitis too.
- Send aquaporin-4 antibodies: neuromyelitis optica is treated differently and some multiple sclerosis drugs worsen it.
- Steroids shorten a relapse but do not change the course — and treat the urinary infection first.
- Start disease-modifying therapy early; disability accrues early.
- Measure the post-void residual before treating the bladder.

Questions you should be able to answer:

- What does the sensory level at T10 tell you, and what is your first investigation?
- Her legs are flaccid with absent reflexes on day one. Does that exclude a cord lesion?
- Which two antibodies must you send, and why does the answer matter?

- She has a relapse and is dysuric. What do you do before prescribing methylprednisolone?
- Give four symptoms you would ask about that will not appear on her scan.

Case 69 · Parkinson Disease and the Extrapyramidal Disorders

CLINICAL VIGNETTE

A **68-year-old man** is brought by his wife, who has noticed over eighteen months that he walks more slowly, his handwriting has become small, his voice is quieter and his face less expressive. He has a **tremor of the right hand when it is resting in his lap, which disappears when he reaches for a cup**. He struggles to turn over in bed. He is constipated.

On direct questioning: he **lost his sense of smell several years ago**, and for at least a decade he has **shouted and thrashed in his sleep as though acting out dreams**.

On examination: reduced facial expression and blink rate, quiet monotonous speech. **Asymmetrical resting tremor of the right hand at about 5 Hz**, cogwheel rigidity of the right arm, and **bradykinesia on finger tapping with progressive decrement in amplitude**. Reduced right arm swing, stooped posture, short shuffling steps and slow turning. **Eye movements are full, there have been no falls, and there is no postural drop in blood pressure.**

FIRST NAME THE SYNDROME, THEN FIND THE CAUSE

Parkinsonism = bradykinesia, plus at least one of resting tremor, rigidity, or postural instability.

That establishes the **syndrome**. The work then is to establish the **cause** — and there are four groups: idiopathic Parkinson disease, **drug-induced parkinsonism**, the atypical degenerative syndromes, and the structural and metabolic mimics.

1. The Causes

Cause	What identifies it
Idiopathic Parkinson disease	Asymmetrical onset, resting tremor, a good and sustained levodopa response, slow progression — and the prodromal non-motor features: loss of smell, rapid eye movement sleep behaviour disorder, constipation and depression, often present for years or decades beforehand, as in this man
Drug-induced parkinsonism	The commonest reversible cause, and it must be asked about first. Antipsychotics, and above all metoclopramide and prochlorperazine, plus sodium valproate, lithium and tetrabenazine. Typically symmetrical, and may take months to resolve after the drug is stopped
Progressive supranuclear palsy	Early falls, characteristically backwards, a vertical supranuclear gaze palsy, axial rigidity, and pseudobulbar features
Multiple system atrophy	Early and severe autonomic failure — postural hypotension, urinary retention or incontinence, erectile dysfunction — with parkinsonian or cerebellar features, and inspiratory stridor
Corticobasal degeneration	Marked asymmetry with apraxia, alien limb phenomenon, cortical sensory loss and dystonia
Dementia with Lewy bodies	Fluctuating cognition, visual hallucinations, dream enactment, and severe — sometimes fatal — neuroleptic sensitivity, with dementia appearing within a year of the motor features
Vascular parkinsonism	Lower-body predominant, vascular risk factors, stepwise course, poor levodopa response
Wilson disease	In anyone under 50 — with Kayser–Fleischer rings, liver disease and psychiatric features. Check caeruloplasmin and copper
Normal pressure hydrocephalus	Gait apraxia, urinary incontinence and cognitive decline, with ventriculomegaly

RED FLAGS AGAINST PARKINSON DISEASE

Symmetrical onset · falls within the first year · early autonomic failure · early dementia or visual hallucinations · vertical gaze palsy · pyramidal or cerebellar signs · inspiratory stridor · rapid progression · and a poor or absent response to levodopa.

Any of these should make you doubt idiopathic Parkinson disease and think of an atypical syndrome — which matters for prognosis, for the drugs that will and will not help, and for what the family is told.

2. The Tremor Differential

Tremor	Features
Parkinsonian	4–6 Hz, present at rest, asymmetrical, reduced by voluntary movement, re-emerges on sustained posture; accompanied by bradykinesia and rigidity
Essential	6–12 Hz, postural and kinetic rather than at rest, symmetrical, often involves the head and voice, family history, improved by alcohol, and no bradykinesia
Cerebellar (intention)	Worsens as the finger approaches the target, with other cerebellar signs
Enhanced physiological	Fine and postural — anxiety, thyrotoxicosis, caffeine, beta agonists, alcohol withdrawal
Dystonic and functional	Task- or position-specific; variable, distractible and entrainable in functional tremor

3. Focused History

- **Motor:** slowness, micrographia, quiet voice, loss of dexterity, difficulty turning in bed, freezing in doorways, falls.
- **The full drug history, and specifically the antiemetics** — a course of metoclopramide or prochlorperazine is the commonest thing to find, and it is reversible.

THE QUESTIONS THAT ARE NOT ASKED

The non-motor features are at least as disabling as the motor ones, and they are almost never volunteered.

Ask about: constipation · urinary urgency and nocturia · postural dizziness · drooling and dysphagia · **loss of smell** · **acting out dreams** · depression, anxiety and apathy · pain · fatigue · sleep disturbance · hallucinations · and cognitive change.

Two of these — anosmia and dream enactment — precede the motor features by years and are strong supporting evidence for the diagnosis.

- Family history; occupational and toxin exposure; and the impact on function, work, driving and — importantly — on the carer.

4. Examination

- **Observe before you touch:** facial expression, blink rate, posture, and tremor at rest with the hands in the lap.
- **Demonstrate bradykinesia properly** — finger tapping, hand opening and closing, and foot tapping, watching for **decrement in amplitude and speed**, which is what distinguishes bradykinesia from simple weakness or slowness.

- Rigidity, with and without contralateral activation to bring out cogwheeling.
- **Gait: initiation, stride length, arm swing, turning, festination and freezing** — plus the pull test for postural instability.
- **Eye movements, especially vertical saccades and pursuit**; **postural blood pressure**; cognitive screen; speech and swallowing; and **Kayser–Fleischer rings in a younger patient**.

5. Investigations

- **The diagnosis is clinical. No test confirms Parkinson disease**, and students expect one.
- **Structural imaging** where the picture is atypical, to exclude vascular disease, hydrocephalus or a structural lesion.
- **Dopamine transporter imaging distinguishes degenerative parkinsonism from essential tremor and from drug-induced parkinsonism — but it does not distinguish Parkinson disease from the atypical degenerative syndromes**, which is the distinction that usually matters clinically.
- **Caeruloplasmin, copper and liver function in anyone under 50**; thyroid function; vitamin B12.
- **The levodopa response is itself diagnostic information** — a clear and sustained response supports Parkinson disease, and a poor one argues for an atypical syndrome.

6. Management

- **Refer to a specialist before starting treatment where possible, and do not start antiparkinsonian drugs simply to see what happens in an unclear case.**

WHEN TO START LEVODOPA

Levodopa with a decarboxylase inhibitor is the most effective drug, and it is started when symptoms are troublesome — at the lowest effective dose.

There is no benefit in withholding it to "save it for later". That was an older practice based on a misunderstanding, and it cost patients years of unnecessary disability.

Discuss the long-term motor complications honestly: **wearing-off, dyskinesia and unpredictable on–off fluctuations**, managed by fractionating the dose, adding a COMT or MAO-B inhibitor or a dopamine agonist, and later apomorphine, intestinal levodopa gel or **deep brain stimulation** in selected patients.

THE SIDE EFFECT THAT MUST BE ASKED ABOUT BY NAME

Dopamine agonists cause impulse control disorders — pathological gambling, hypersexuality, compulsive shopping and binge eating — in a substantial minority.

Patients conceal them, and families discover them after serious financial or relationship damage. Warn the patient and, with consent, the family at the time of prescribing, and **ask about them directly at every review** rather than waiting to be told.

THREE HOSPITAL RULES THAT PREVENT REAL HARM

Never stop levodopa abruptly — it risks an akinetic crisis and a neuroleptic malignant-like syndrome.

Give the doses on time. Parkinson medication is exquisitely time-critical, and standard hospital drug rounds do not match a patient's regimen. Missed and late doses cause avoidable immobility, aspiration and falls. **If the patient is nil by mouth, use a nasogastric tube or a rotigotine patch — do not simply omit the drug.**

And avoid dopamine-blocking drugs: use **domperidone or ondansetron** rather than metoclopramide or prochlorperazine for nausea, and **quetiapine or clozapine** if an antipsychotic is unavoidable. **In dementia with Lewy bodies, neuroleptic sensitivity can be fatal.**

- **Non-motor management, which is where most of the quality of life is:** constipation, orthostatic hypotension, bladder symptoms, drooling, sleep disorder, **depression — common and under-treated**, pain, and cognitive impairment, for which **rivastigmine is used in Parkinson disease dementia**.
- **Multidisciplinary care: a Parkinson specialist nurse, physiotherapy for gait and falls, occupational therapy, speech and language therapy for voice and swallow**, and dietetics. **Exercise has genuine evidence for slowing functional decline.** Driving advice, carer support and advance care planning.
- **Atypical syndromes** are managed supportively, with particular attention to falls, swallowing and autonomic failure, and earlier involvement of palliative care.

7. Teaching Points and Viva Questions

- Parkinsonism is bradykinesia plus one. Then find the cause.
- Ask about every drug, and especially the antiemetics.
- Anosmia and dream enactment precede the tremor by years.
- Know the red flags that argue against Parkinson disease.
- The diagnosis is clinical, and dopamine transporter imaging does not separate the degenerative syndromes.
- Do not delay levodopa, and ask about impulse control at every visit.
- Never stop levodopa, never give metoclopramide, and give the doses on time.

Questions you should be able to answer:

- Which features here support idiopathic Parkinson disease rather than an atypical syndrome?
- What is the significance of his anosmia and his sleep behaviour?
- Give five red flags that would make you doubt the diagnosis.
- He is admitted with pneumonia and is nil by mouth. What must happen to his medication?
- His wife telephones to say he has gambled away their savings. What has happened?