DEPARTMENT OF PHYSIOTHERAPY

COURSE NAME : BPT

COURSE FACULTY : EZHILARASU T

QUESTION BANK

UNIT I – Neuroanatomy & Neurophysiology

Puzzle 1: The Subtle Asymmetry

Dr. Elena Ruiz, a second-year neurology resident, is rounding in the stroke unit when she observes Mr. Thompson, a 65-year-old man post-ischemic stroke, attempting to walk with assistance. His left leg drags slightly during swing phase, and there's a noticeable circumduction to clear the foot. Elena recalls the blood supply to the brain: the anterior cerebral artery perfuses the medial frontal lobe and leg areas of the motor cortex. But is this purely cortical, or could it involve subcortical structures like the internal capsule, supplied by middle cerebral artery branches? She ponders the pyramidal tract's descent through the corona radiata. The patient's posture leans rightward, suggesting possible basal ganglia involvement from lenticulostriate arteries. In this busy ward, with limited time before the attending arrives, Elena must decide how to localize the lesion based on these observations without immediate imaging.

Possible hypotheses:

1. Lesion in the anterior cerebral artery territory affecting the leg motor area.
2. Middle cerebral artery involvement with capsular hemiparesis.
3. Subcortical lacunar infarct in the basal ganglia.
4. Spinal cord tract involvement mimicking upper motor neuron signs.

Structured reasoning: Weigh accuracy of neuroanatomical localization against efficiency in a time-constrained ward; consider safety by identifying red flags like worsening asymmetry; evaluate resource use, such as consulting radiology promptly; balance short-term mobility support with long-term rehabilitation outcomes; address ethical need for precise communication to the patient about uncertainty.

Puzzle 2: The Blurred Horizon

In a community clinic, intern Jake Harlan examines Ms. Patel, 42, complaining of double vision when looking left. Jake traces the visual pathway: from retina through optic nerve, chiasm, tract, to lateral geniculate and occipital cortex. But the issue seems extraocular—perhaps abducens nerve palsy, given the horizontal diplopia. He notes the nerve's long intracranial course, vulnerable to increased pressure or vascular issues. The brainstem blood supply via basilar artery branches could be implicated. Ms. Patel mentions recent headaches, raising concerns for cavernous sinus involvement. With no MRI available immediately, Jake must hypothesize the anatomical site while ensuring patient safety.

Possible next steps:

1. Perform detailed cranial nerve exam focusing on CN VI.
2. Assess for signs of raised intracranial pressure.
3. Refer for urgent neuroimaging.
4. Observe and reassess in 24 hours.

Structured reasoning: Prioritize accuracy in pathway localization over hasty assumptions; ensure efficiency by using bedside tests first; flag urgency if headaches suggest aneurysm; optimize resources like clinic tools; consider long-term vision impact vs. short-term symptom relief; ethically, inform patient of potential serious causes without alarm.

Puzzle 3: The Unsteady Base

During a rehabilitation session, junior clinician Sarah Kim assists Mr. Lopez, 58, with balance exercises. He sways when standing with eyes closed, hinting at cerebellar connections disrupted. Sarah recalls the cerebellum's afferent tracts from spinal cord via inferior peduncle and its output to extrapyramidal system for coordination. His wide-based gait suggests vermis involvement, possibly from posterior inferior cerebellar artery occlusion. But could it be vestibular, tied to CN VIII? In this outpatient setting, time is limited before the next patient.

Possible hypotheses:

1. Cerebellar vermis lesion from vascular insult.
2. Disruption in spinocerebellar tracts.
3. Extrapyramidal basal ganglia dysfunction.
4. Peripheral vestibular pathology.

Structured reasoning: Balance localization accuracy with clinical efficiency; assess safety in fall risk; urgency for stroke red flags; use rehab resources wisely; weigh short-term stability aids against long-term motor recovery; ethical consideration of patient autonomy in exercise continuation.

Puzzle 4: The Tingling Trail

Neurology student Mia Chen is shadowing in the ER when Ms. Garcia, 50, reports numbness ascending from feet. Mia thinks of spinal cord tracts: dorsal columns for position sense, spinothalamic for pain/temperature. The lumbar plexus might be involved if peripheral, but the pattern suggests cord level. Blood supply via anterior spinal artery could be compromised. With spinal segments relating to nerve roots, she localizes to thoracolumbar. Urgent, as bladder issues loom.

Possible next steps:

1. Map sensory levels with pinprick test.
2. Check for bowel/bladder dysfunction.
3. Order spinal MRI.
4. Initiate steroids empirically.

Structured reasoning: Accuracy in tract localization vs. broad differentials; efficiency in ER flow; urgency for cord compression; resource allocation like imaging slots; short-term symptom control vs. long-term deficit prevention; ethical transparency on risks.

Puzzle 5: The Rigid Stance

In a geriatric ward, intern Raj Patel notices Mrs. Wong, 72, with increased tone in her arms, resisting passive movement. He recalls neurophysiology of tone: basal ganglia modulation via extrapyramidal pathways. Could be rigidity from substantia nigra dopamine loss, or spasticity from pyramidal involvement. Posture is stooped, pain threshold altered. Time-constrained rounds.

Possible hypotheses:

1. Extrapyramidal rigidity from basal ganglia lesion.
2. Pyramidal spasticity due to cortical damage.
3. Cerebellar influence on tone.
4. Spinal reflex arc hyperactivity.

Structured reasoning: Weigh neurophysiologic accuracy against quick assessment; safety in mobility; no immediate urgency unless acute; use ward resources; long-term function vs. short-term comfort; ethical empathy in elderly care.

Puzzle 6: The Silent Signal

Junior clinician Alex Torres examines a comatose patient, Mr. Kim, 60, post-trauma. Brainstem reflexes: pupillary via CN II/III pathway, supplied by posterior cerebral artery. No gag reflex—CN IX/X. Spinal cord segments intact below. Localization critical in ICU.

Possible next steps:

1. Test brainstem reflexes comprehensively.
2. Assess for locked-in syndrome.
3. Request CT angiogram for vascular mapping.
4. Monitor EEG for cortical activity.

Structured reasoning: Localization accuracy paramount; efficiency in critical care; urgency for brainstem herniation; resource-intensive imaging; short-term life support vs. long-term prognosis; ethical family discussions.

Puzzle 7: The Wandering Eye

Student Lila Grant observes nystagmus in Ms. Reed, 35, during clinic. Cerebellar-vestibular connections via flocculonodular lobe. Blood supply: vertebral arteries. Gait ataxic. Community setting limits tools.

Possible hypotheses:

1. Cerebellar flocculus lesion.
2. Vestibular nerve dysfunction.

3. Brainstem reticular formation involvement.
4. Extrapyramidal modulation error.

Structured reasoning: Accurate pathway tracing; efficient bedside exam; urgency if vertigo severe; basic resources; balance outcomes; ethical reassurance.

Puzzle 8: The Weak Grip

In rehab, intern Theo Nash notes asymmetric weakness in Mr. Singh's hand. Brachial plexus anatomy: C5-T1 roots. Spinal cord tract: corticospinal. Pain suggests radiculopathy.

Possible next steps:

1. Test dermatomes and myotomes.
2. Evaluate for Horner syndrome.
3. MRI cervical spine.
4. EMG for nerve conduction.

Structured reasoning: Localization precision; time efficiency; safety in progression; resources; functional outcomes; ethics in pain management.

Puzzle 9: The Burning Path

Clinician Nora Hale sees Mr. Diaz with hemisensory loss. Spinothalamic tract decussation in cord. Vascular: middle cerebral artery thalamic branches.

Possible hypotheses:

1. Thalamic stroke.
2. Spinal hemisection.
3. Cortical sensory area lesion.
4. Peripheral neuropathy mimic.

Structured reasoning: Accuracy vs. differentials; efficiency; urgency stroke; resources; outcomes; ethical consent.

Puzzle 10: The Trembling Limb

Student Kai Liu observes rest tremor in Mrs. Evans. Extrapyramidal system: substantia nigra to striatum. Neurophysiology: dopamine deficit affecting movement initiation.

Possible next steps:

1. Assess for bradykinesia.
2. Check postural reflexes.
3. Brain MRI.
4. Dopamine challenge test.

Structured reasoning: Physiologic basis; clinic efficiency; no acute urgency; resources; long-term mobility; ethical support.

Answers for UNIT I

1. **Best hypothesis:** 2 – Efficiency and accuracy favor capsular involvement due to classic signs; urgency low but safety in fall prevention key.
2. **Best next step:** 3 – Urgency for imaging outweighs observation; ethical to rule out serious causes promptly.
3. **Best hypothesis:** 1 – Localization accuracy to vermis; resources minimal for exam.
4. **Best next step:** 3 – Urgency for compression; accuracy in imaging over empiric treatment.
5. **Best hypothesis:** 1 – Neurophysiologic match to rigidity; long-term outcomes considered.
6. **Best next step:** 1 – Efficiency in bedside testing first; ethical for prognosis.
7. **Best hypothesis:** 2 – Pathway accuracy; safety in vertigo management.
8. **Best next step:** 1 – Resource-efficient; accuracy in mapping.
9. **Best hypothesis:** 1 – Localization to thalamus; urgency high.
10. **Best next step:** 1 – Efficiency and safety in clinical signs assessment.