Small Group 1 - Master Answers

Case 1

1. Where is the lesion causing her diplopia?

Assuming there is no pathology in the left orbit (or lateral rectus muscle itself) restricting abduction of the left eye, this would most likely be related to a lesion of the left sixth cranial nerve, in its course outside the pons, or involving its fascicle within the pons. A discrete lesion of the left sixth nerve nucleus, or adjacent PPRF (paramedian pontine reticular formation) would cause an ipsilateral gaze palsy (paralysis of left eye abduction and right eye adduction) due to involvement of the MLF (median longitudinal fasciculus).

2. Where is the lesion causing her left facial weakness?

A lesion of the left seventh nerve: either its nucleus, its fascicle within the pons or its course outside the pons.

3. What region of the brain or brainstem could include the lesions of (1) and (2) above, plus harbor another nearby lesion causing the right hyper-reflexia?

A lesion of the left pons could affect the corticospinal tract leading to hyper-reflexia on the right (and commonly a right hemiparesis), plus involve the fascicles of the sixth and seventh cranial nerves.

4. What is the likeliest pathology occurring at this region?

An infarction, especially with the stroke risk factors of diabetes and hypertension. A hemorrhage would probably impair consciousness by compressing the reticular activating system within the pons. A tumor would not cause such a sudden onset of symptoms.
5. What diagnostic testing should be done?

_A CT scan could be done quickly if there was a high clinical suspicion of a hemorrhage. An MRI scan of the brain is preferable for its greater detail and resolution, although it takes more time._

6. What do you think happened to the patient?

_Her blood pressure and diabetes were prudently controlled in the hospital, and her vision and facial weakness gradually improved over the next several weeks. Most likely the infarct was due to thrombosis of a small artery or arteries arising from the basilar artery, and an antiplatelet drug, aspirin, was given to prevent future infarcts. More extensive atherosclerotic lesions in larger arteries, such as a severe basilar artery stenosis, were not detected with MR angiography._

__Case 2__

1. Where could a lesion in the central nervous system cause the weakness in her right lower limb with its associated signs?

_The hyper-reflexia at the right knee and right Babinski sign suggest that the right lower limb weakness is due to an upper motor neuron lesion, i.e., above or rostral to the lumbar spinal cord. Absent ankle reflexes are not abnormal by themselves in older patients._

2. Where could a lesion cause her sensory deficit to pinprick (pain) and temperature?

_There is a sensory level at about T4 or T5 on her left, corresponding to spinothalamic tract involvement at about this level on the right (contralateral) side._

3. Where could a lesion cause her deficit to proprioception?

_Involvement of the posterior (dorsal) columns (fasciculus gracilis) above or rostral to the lumbar spinal cord on the right (ipsilateral) side._
4. Could any single region of the central nervous system contain all of the lesions discussed in (1), (2) and (3)?

A hemicord (Brown-Sequard) lesion of the thoracic spinal cord at about T4 or T5 on the right side. The absence of sacral sparing suggests an extramedullary lesion.

5. What is the likeliest pathology occurring here?

The gradual onset of symptoms suggests a tumor here.

6. What diagnostic testing is indicated here? (Note that she has a pacemaker.)

Although an MRI scan of the thoracic spinal cord would be clearly the best, her pacemaker prohibits performance of this test. A conventional myelogram (injection of contrast dye into the lumbar subarachnoid space, with subsequent X-rays and CT scan) is the only alternative test.

7. What do you think happened to the patient?

She underwent successful surgical removal of the tumor (a meningioma) with improvement of her symptoms.

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**Case 3**

1. Where could a lesion cause his sensory deficit to pinprick (pain) and temperature?

A lesion in the spinothalamic tract, approximately affecting dermatomes C2 to T7.

2. Is sacral sparing present? If so, why?

Since sensation to pinprick and temperature is normal in the lower body, including the buttocks and perianal regions (sacral dermatomes), sacral sparing is present. A lesion within the central region of the spinal cord is suggested. The sensory deficit is caused by an extensive lesion in the gray matter, from C2 to T7, disrupting decussating spinothalamic fibers, or a central lesion spreading into the white matter, affecting the
innermost cervical and thoracic portions, but sparing the outermost lumbosacral portions of the spinothalamic tract.

3. Why is sensation to vibration and proprioception unaffected?

*The spinal cord lesion in the central gray region does not affect the posterior (dorsal) columns.*

4. Why are the biceps and brachioradialis reflexes absent or reduced, yet there is no clinical weakness present?

*Probably the sensory afferents for these muscle stretch reflexes are affected by the lesion in the central gray region of the spinal cord, yet, for the most part, the anterior horn cells are not affected.*

5. What is the likeliest pathology here?

*An intramedullary spinal cord lesion, probably a syringomyelia caused by trauma, extending from C2 down to about T7.*

6. What diagnostic testing would be most helpful to confirm your clinical diagnosis?

*An MRI scan of the cervical and thoracic spinal cord would best demonstrate pathology within the spinal cord itself.*

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**Case 4 (Unknown Case)**

1. Why does passive hip flexion of his extended right lower limb reproduce his pain?

*This maneuver puts greater stretch or traction on an inflamed or irritated lumbar or sacral nerve root.*
2. What possible lesions could cause his weakness and sensory impairment?

   *An L-5 radiculopathy or peroneal nerve lesion. Lesions located more rostrally in the spinal cord or brain are less likely to produce such discrete, focal deficits as these, and would not be associated with this type of pain.*

3. What do you think happened to this patient?

   *He was given bed rest, analgesics and anti-inflammatory medications for a few days, with minimal to no improvement. Because of his persistent leg weakness, an MRI scan of the lumbar spine was performed, showing diffuse arthritic changes in his spine, plus a centrally herniated disc at L-4, L-5. The patient declined surgery, preferring to keep working with physical therapy. He was lost to follow-up.*