NEUROLOGY CASE 3

Chief Complaint: A 50-year-old right-handed man presents to urgent care for several days of difficulty walking.

History of Present Illness:
One week prior to presentation, the patient believes he fell and hit his head. He thinks he tripped over his cat, but he had been drinking and states that his memory is "a little fuzzy" about the event. He woke on the floor with a bruise on his forehead, but he is not sure how long he was unconscious or if it happened before or after the fall. He felt normal after he woke up except for a moderate headache and increase in his baseline neck pain. He was alone at the time.

The next day he woke with numbness and tingling in his right thumb and index finger and a "shooting" pain in the right arm which has worsened each day since. The day after these symptoms started, he began to have difficulty lifting objects with his right arm despite being able to grip them well with his hand. This has progressed to where he had to switch to his left hand to be able to continue drinking beer.

Three days ago, he began to have difficulty standing and walking. He feels like he is having trouble controlling both legs and that they did not want to hold him up. This progressed to where he fell repeatedly. Yesterday he could not stand and stayed in bed all the rest of that day and today, during which time he was unable to eat or drink anything. Today he accidentally urinated in his bed, and he did not know that he had done so until his hand touched the urine.

At this point, he crawled to the phone and called 9-1-1. This took him several tries because both hands were so shaky that he kept hitting the wrong numbers.

Past Medical History: He has not seen a doctor in many years. At age 20, he suffered a neck injury from an accident, the only sequela of which was chronic neck pain.

Medications: None

Allergies: No known drug allergies.

Social History: He does not work and receives disability funds for neck injury. He smokes two packs of cigarettes daily, drinks one case of beer daily and denies recreational drug use other than occasionally smoking marijuana. His use of alcohol has steadily increased over the years, and he wakes up in the morning feeling "jittery" and needing a drink. His driver's license was revoked last year after his third citation for driving under the influence of alcohol.

Family History: Negative.

Review of Systems: Chronic neck pain, otherwise negative.

General Physical Examination: The vital signs are normal except for tachycardia of 120 beats per minute which is regular. His general examination is normal except that he is sweating copiously, he

appears to be uncomfortable, he guards his neck from passive movements, and his rectal tone is diminished.

Mental Status: He is alert and oriented to person, place, and time with normal attention, language, and memory. There is normal psychomotor activity except for fidgeting which he states is due to pain. Affect appears moderately anxious, but he states his mood is "fine". Thought process, content, insight and judgement appear normal.

Cranial Nerves: Visual fields and acuity are normal. Pupils are equal, round and reactive to light and accommodation. The optic discs appear normal. Eye movements are normal and without nystagmus. Facial sensation is normal. Contraction of the muscles of mastication is normal. The face is symmetric at rest and with movement. Hearing is normal. The palate elevates symmetrically. Shoulder shrug and head rotation are limited by pain. The tongue has normal bulk and movement.

Motor: Bulk is normal throughout, and there are no fasciculations or pronator drift. Tone is normal in the arms but symmetrically increased in the legs with faster passive joint movement causing more resistance. Strength (right/left) is 5/5 in the tested proximal and distal muscles of both arms except for elbow flexion which is 2/5. There is symmetric weakness of both legs which is 2/2 for hip flexion, 4/4 for hip extension, 2/2 for knee flexion, 4/4 for knee extension, 2/2 for foot dorsiflexion, and 4/4 for foot plantar flexion. There is a symmetric tremor of both hands with rest and movement, but most noticeable with posture, and has a fast frequency and low amplitude.

Somatosensation: Mildly diminished to pin and temperature, symmetrically, inferior to a horizontal line encircling the upper chest. Touch, vibration, position sense, Stereognosis and graphesthesia are normal throughout.

Coordination: Finger-to-nose and rapid alternating movement testing are normal; heel-to-shin testing could not be done due to leg weakness.

Reflexes (right/left): Brachioradialis 0/2, biceps 0/2, patellar 3/3, Achilles 3/3. The plantar responses are extensor bilaterally.

Gait: He is unable to stand.

Subsequent Course:
Based on your clinical evaluation, you diagnosed a right sixth cervical radiculopathy followed by cervical myelopathy at the same level. You recognized that the deficits of myelopathy may occur below the level of pathology if the tracts are partially affected. You felt this was likely caused by subacute progressive compression by a herniated intervertebral disc from new trauma superimposed on chronic post-traumatic cervical spondylosis. This was confirmed with magnetic resonance imaging of his cervical spine which you had ordered stat. You also diagnosed alcohol dependence and withdrawal for which you prescribed thiamine to prevent neural degeneration from possible deficiency, and benzodiazepines as needed for control of his withdrawal symptoms and to lower the risk of seizures and autonomic instability. You recognized that he was at high risk for further spinal cord injury due to his progressive course and referred him for emergency surgery to relieve the compression, which occurred that day without complications. He subsequently improved with inpatient rehabilitation and was later discharged to home with mild residual neurological deficits and continued outpatient rehabilitation and treatment for alcohol dependence.

Key Concepts:
Understand how to locate dysfunction of the nervous system based on symptoms and signs, and how to combine this with the syndrome time course and risk factors to determine the causal pathophysiology and diagnosis.

Learning Objectives:
1. Describe and distinguish between the anatomy and clinical features of radiculopathy versus mononeuropathy.
2. Describe and distinguish between the anatomy and clinical features of myelopathy versus cerebral or peripheral nervous system dysfunction.
3. Appreciate the significance of a sensory level.
4. Appreciate the significance of sphincter dysfunction with neck or back pain.
5. List common causes of radiculopathy and myelopathy.
6. Describe the anatomy, symptoms and signs of spondylosis with or without compression of neural structures.
7. List the potential consequences of chronic heavy alcohol consumption.

GUIDE TO NEUROLOGY CASE ONE

Diagnosis:
1. Right sixth cervical radiculopathy followed by cervical myelopathy at the same level, both caused by compression from a herniated intervertebral disc from new trauma superimposed on chronic post-traumatic cervical spondylosis.
2. Alcohol dependence and withdrawal.

Part One

Chief Complaint:
Difficulty walking may be caused by many abnormalities of the musculoskeletal system, the corticospinal tracts, the cerebellum, the proprioceptive systems, or the vestibular system.

History of Present Illness:
It is unclear if he tripped and hit his head which then caused his loss of consciousness from concussion, or he could have lost consciousness first which then caused his fall. An unexplained episode of loss of consciousness could have many causes, but the most common are syncope or seizure. A binge of alcohol consumption could also cause amnesia with or without loss of consciousness.

While it is possible to have neurological deficits of one limb from central nervous system dysfunction, it is more commonly seen with peripheral nervous system dysfunction. This can involve a spinal nerve root, plexus, or one or more peripheral nerves. Pain and tingling, in addition to motor or sensory deficits, also suggest peripheral nervous system pathology. The thumb and index finger are part of the medial nerve distribution, but they are also in the dermatome of the sixth cervical spinal nerve root. Median nerve compression in the carpal tunnel may cause pain of the hand, which sometimes slowly radiates up the forearm, but lancinating pain in the arm is more consistent with radicular pain from compression of a spinal nerve root. His difficulty lifting objects is from weakness of the biceps brachii, brachialis, or brachioradialis, which are all elbow flexors innervated by the sixth cervical spinal nerve root. All of these symptoms suggest compression of the sixth cervical spinal nerve root. Radiculopathy is most commonly caused by compression from degenerating spinal elements (spondylosis), particularly

herniated intervertebral discs, which in this case is progressing in a subacute timeframe over several days but could also occur suddenly or more gradually.

Bilateral leg weakness suggests spinal cord dysfunction (myelopathy) as does sphincter dysfunction and particularly incontinence that is not sensed. Bilateral hand tremor could have several causes but, in this case, he is starting to withdrawal from alcohol because he is dependent and unable to drink due to immobility.

Past Medical History:
Prior spine trauma increases the risk of developing painful spondylosis, with or without compression of neural structures.

Social History:
This amount of drinking suggests alcohol dependence.

Part Two

General Physical Examination:

Sinus tachycardia and diaphoresis have many causes but, in this case, they are from alcohol withdrawal. His uncomfortable appearance could be from pain from radiculopathy and cervical spondylosis or from alcohol withdrawal. Diminished rectal tone is usually from dysfunction of the spinal cord or cauda equina.

Mental Status:
Fidgeting and an anxious affect have many causes, but in this case they are from alcohol withdrawal.

Motor:
He has weakness of both legs (paraparesis) with spasticity and other upper motor neuron signs secondary to spondylotic myelopathy. The herniated intervertebral disc that initially compressed the right sixth cervical spinal nerve root is now also compressing his spinal cord and causing dysfunction of the upper motor neuron axons to the legs. With further compression, the upper motor neuron axons to the arms could become involved as well, but they are not yet. There is a pattern to upper motor neuron weakness, where in the legs, the flexors and foot dorsiflexors are usually more affected than the flexors and hand pronators. The hemiparetic gait is a useful way to remember this.

The tremor of alcohol withdrawal appears similar to the enhanced physiological tremor seen with anxiety or stimulant use and is likely the same thing caused by increased sympathetic tone. This tremor involves both hands symmetrically with a fast frequency and small amplitude and is most prominent with posture such as holding both arms out straight.

Somatosensation:
Diminished pain and temperature sensation with sparing of the other modalities suggests spinal cord dysfunction, where these axons ascend separately from the other modalities. A horizontal line on the neck or trunk below which sensation is abnormal is termed a sensory level and strongly suggests spinal cord dysfunction at or above that level. With external compression of the spinal cord, the clinical deficits may initially involve myotomes and dermatomes that are lower than the location of the

compression if only the outer portions of the tracts are affected. With progressive external spinal cord compression, the clinical level will ascend to meet the pathological level.

Reflexes:

The diminished right Brachioradialis and biceps reflexes, which are lower motor neuron signs, suggest right sixth cervical spinal nerve root dysfunction while the symmetric hyper-reflexia and extensor plantar responses of the legs suggest myelopathy, as these are upper motor neuron signs.

Part Three

Subsequent Course:

Each of his findings in isolation could have a long differential diagnosis, but his pattern of symptoms and signs fits with right sixth cervical radiculopathy followed by cervical myelopathy. The cause of his radiculopathy and myelopathy is likely subacute progressive compression by a herniated intervertebral disc. This would be the most common cause of both and is also suggested by his new trauma superimposed on chronic post-traumatic cervical spondylosis. Once alcohol dependence and withdrawal have been diagnosed, thiamine should be administered immediately to prevent neural degeneration as the likelihood of deficiency is high, and benzodiazepines should be prescribed as needed for control of withdrawal symptoms and to lower the risk of seizures and autonomic instability. Rapidly progressing compressive myelopathy is an emergency requiring immediate imaging and surgery to relieve the compression as there is a limited time window to prevent further loss of spinal cord function. It is sometimes possible to salvage some lost function.