Neuroscience Clerkship Teaching Vignettes

CEREBROVASCULAR DISEASE

Case 1: A 55-year-old right-handed man with diabetes and hypertension presented with weakness and numbness of his right hand, and numbness of the right side of his mouth that started abruptly 2 hours ago. His wife reported that he had seen the eye doctor yesterday complaining of spells of loss of vision in the left eye. Over the last week, he had three similar spells, each lasting thirty seconds, which he described as like a shade coming down over his eye.

Examination disclosed an alert man with blood pressure of 140/90 and a regular pulse of 78. He had mild difficulty with both naming and repetition. The right nasolabial fold was flat relative to the left, but all other cranial nerve functions were intact. Subjective numbness was noted over the right distal hand, with errors exhibited in tests for 2-point discrimination and graphesthesia. A mild right arm pronator drift and clumsiness of finger tapping in the right hand were observed. Reflexes were slightly less active in the right arm compared to the left, and tone was mildly diminished on the right. Toes were downgoing. Head CT was normal.

1. What is the most likely localization of the neurologic signs and symptoms?
2. In general, what symptoms give firm evidence of ischemia in the anterior circulation, what symptoms give evidence of ischemia in the posterior circulation, and what symptoms may be indeterminate?
3. What clinical factors help differentiate cortical vs. subcortical?
4. What blood vessel is likely involved in this case?
5. What is a transient ischemic attack (TIA)? What is the differential diagnosis of a TIA?
6. How should this patient be investigated and managed?
7. What are the risk factors for cerebrovascular disease?
8. Why is the CT normal despite the obvious clinical deficit?

Case 2: A 54-year-old hypertensive male suddenly slumped in his chair while reading. In the ER, he was found to be in a coma with gasping respirations. Pupils were pinpoint, but reactive to light. There were no horizontal eye movements to doll’s head maneuver or calorics. He had a flaccid quadriplegia. Extensor posturing occurred with sternal pressure. Bilateral Babinski responses were present.

1. Describe the probable location of the lesion in this patient.
2. What is the differential diagnosis in this patient?
3. Describe the common locations and clinical syndromes of hypertensive hemorrhages.

Case 3: A 33-year-old right-handed woman developed a sudden and severe frontal headache, vomited and collapsed. Past history was unremarkable. Examination revealed a blood pressure of 180/95, pulse of 56, respirations of 22, and a temperature of 101.5 deg. F. Neck flexion was resisted, and Kerning's and Brudzinski's signs were present. She thrashed about in response to pain, but did not follow commands. Cranial nerve and funduscopic exams were negative. No focal weakness was observed. She withdrew from pain on all four extremities. The left toe was upgoing to plantar stimulation.

1. What is the likely diagnosis?
2. What entities cause subarachnoid hemorrhages (SAH)?
3. Where are saccular (berry) aneurysms most commonly located?
4. What are common possible secondary complications of SAH?
5. What are the common treatment options of saccular aneurysms?
Case 4: A 65 year-old African-American man is admitted with new right sided weakness, present upon awakening in the morning. There was no prodrome. Prior medical history was notable for hypertension and diabetes. Blood pressure on admission was 225/115. Examination showed a moderately severe right hemiparesis (3/5) affecting the right lower face, arm and leg. Visual fields were normal. Language testing was normal. Sensory examination was intact for touch, pin, vibration and two point discrimination. Reflexes were depressed on the right with an upgoing right toe on plantar stimulation. Head CT was normal.

1. Where is the most likely localization for this neurologic deficit?
2. What is the most likely etiology? What is the underlying pathogenesis?
3. Describe some of the more common classic lacunar syndromes.
4. How should the blood pressure be managed acutely?
5. How should this man be evaluated and treated?

Extra Cases if Time Permits

Case 5: A 21-year-old right-handed man developed severe left neck pain followed by transient right hand weakness and difficulty getting his words out. The neurologic symptoms resolved over 10 minutes but the neck pain persisted. This occurred shortly after lifting a large barrel over his left shoulder while working on a construction site. There was no past medical history. Neurologic exam was normal other than a mild left ptosis and a slightly smaller pupil (3 mm) on the left compared to the right (4 mm). When the lights were turned off, the pupil asymmetry became much more marked.

1. What is the significance of the neurologic findings on examination?
2. Together with the history, what is the most likely diagnosis?
3. What other etiologies may cause strokes in the young?

Case 6: A 60-year-old woman presented to the emergency room with slurring of speech, vertigo, staggering gait, and difficulty in swallowing. Onset was sudden, with partial resolution thereafter. Her medical problems included adult-onset diabetes mellitus, hypertension and mild angina pectoris. There had been no prior neurological or cardiac history otherwise of significance. She regularly took a thiazide diuretic, lisinopril, sublingual nitroglycerine and an oral hypoglycemic.

Examination revealed an obese woman with a blood pressure of 190/110, and a pulse of 72 per minute with occasional irregularities. There were no bruits. Mental status was normal. Speech was dysarthric. Nystagmus, beating to the right, was present in primary position. Slight left sided ptosis and miosis were present. Pin sensation was impaired on the left side of the face. Facial strength was intact. The left soft palate did not elevate voluntarily or during a gag reflex. Facial sensation was decreased on the left face. Finger-to-nose intention tremor and impaired rapid alternating movements were present in the left upper extremity. Reflxes were symmetric. Muscle tone and strength were normal in the extremities. Gait was ataxic. Sensory examination revealed impairment to fine touch and pinprick on the right side of the body. Vibratory sensation was normal. CBC, serum electrolytes and urinalysis were within normal limits. The EKG showed unifocal PVC’s. Head CT was normal.

1. In this patient, where is the lesion most likely, and how do you explain the exam findings? What blood vessel supplies this area?
Neuroscience Clerkship Teaching Vignettes

CHANGE IN CONSCIOUSNESS/MENTAL STATE

Case 1: A 48-year-old alcoholic was found lying in the street in a coma. Identification was made from his wallet, after which a record search indicated several prior admissions for complications of ethanol abuse. On exam, his temperature was 100.5 deg. F., pulse was 88 and regular, blood pressure was 110/75, and respirations were 16 per minute. No recent trauma was evident. Finger stick showed a glucose of 150. Neck was supple. He did not respond to voice, but supraorbital pressure caused extension and pronation of the right arm and leg. There was withdrawal to firm pinch on the left, but not on the right side. The left pupil was 5 mm and sluggishly reactive, and the right 3 mm with normal response to light. No papilledema was seen. The left eye was deviated laterally at rest and did not fully adduct to doll's maneuver nor to ice water calorics. The tone in the right arm and leg was decreased with respect to the left. The right toe was upgoing to plantar stimulation.

1. To develop coma, what areas of the neuraxis must be involved?
2. What is the significance of the physical findings in this patient and their likely site of associated pathology?
3. What is the differential diagnosis in this case?
4. How should this man be managed?

Case 2: A 57-year-old woman was found in her bedroom, unresponsive by her husband on his return home from work. There was no history of significant underlying illness. On exam, temperature was 97 deg. F., pulse was 68, respirations were 8 and blood pressure was 90/70. The skin was cool and dry; there was no evidence of trauma and her neck was supple. Pupils were 2 mm each and reactive to light. Tone and reflexes were decreased. Toes were unreactive to plantar stimulation.

1. How is "structural" coma distinguished from "metabolic" coma?
2. What entities may cause a metabolic coma?
3. What studies should be initiated in this patient and how should she be managed?

Case 3: A 65-year-old man is brought to the clinic by family because he has taken to wandering in the street. For the past six months, he has appeared to be forgetful of names and places. He became listless and lost interest in his usual hobbies. Recently, the decline has accelerated. He has been seen talking to empty rooms and has referred several times to visits from his mother, who has been dead for years. On a few occasions, he has been incontinent of urine.

1. What is the difference between delirium and dementia?
2. What is the most common cause of dementia, and what is its typical clinical presentation?
3. What are the treatable causes of dementia?
4. How should this 65-year-old man be evaluated?
**Case 4:** A 65-year-old, right-handed man was brought to the emergency room because of sudden disturbance of speech. On examination, he spoke spontaneously and excessively, but conveyed little meaning. He substituted words when speaking (e.g., knife instead of fork, etc.) and at other times, used made-up words. He was unable to carry out anything other than simple instructions and had difficulty in correctly naming objects. He could not repeat simple phrases accurately. Reading was as impaired as verbal comprehension. He could write with his right hand; the letters were legible, but the words were incomprehensible.

1. Define "aphasia," "apraxia," and "agnosia."
2. What are paraphasias and neologisms?
3. Describe clinically Broca's aphasia, Wernicke’s aphasia and conduction aphasia. Describe the locations in the brain that result in these conditions? What type of aphasia did this man show?

Extra Case if Time Permits

**Case 5:** A 70-year-old hypertensive female suddenly developed an occipital headache, nausea, vomiting and vertigo. Her blood pressure was 230/130 mm Hg. Her pupils were small, but reactive. She had difficulty looking to the right. Rapid alternating movements were decreased in the right upper extremity and an extensor plantar response was noted in the left foot. She had truncal ataxia and could not walk unassisted. Within 3 hours, she developed bilateral plantar extensor responses and lapsed into a coma.

1. Describe the location, likely etiology, work-up and management of this case.
2. Discuss why it is imperative to diagnosis this problem accurately and quickly.
Neuroscience Clerkship Teaching Vignettes

EPILEPSY

Case 1: A 22-year-old woman with no previous medical problems suddenly cried out, fell to the ground, extended her legs, flexed her arms and then jerked rhythmically for 30 seconds. She bite her tongue and was incontinent of urine immediately after the seizure. She awoke slowly over a ten-minute period, and recalled nothing that had transpired during the time of the seizure. No aura was reported. Later that day, in the emergency room, her examination was normal.

1. Review the following different seizure types: focal with preserved awareness (formerly "simple partial"), focal with impaired awareness (formerly "complex partial"), generalized, and focal with secondary generalization. What type of seizure did this patient have?
2. How can you differentiate between seizure and syncope?
3. What are the common causes of seizures in different age groups?

Case 2: A 37-year-old known epileptic man is brought by family to the emergency room because he had been continuously convulsing for over half an hour.

1. What is status epilepticus?
2. How should this man be managed?
3. What are the common reasons for recurrent seizures in a patient with known epilepsy?

Case 3: During the last three months, a 22-year-old male college student had suffered several episodes where he would suddenly stop talking, turn his head to the right, raise his right hand in the air and make slow "pawing" movements. These spells lasted for about a minute, after which he was confused for several minutes. Most spells were preceded by "queasiness" and a strange metallic taste in his mouth. On the day of admission, he had a spell with a similar onset but which was followed by rhythmic jerking of the right upper extremity followed by a generalized jerking and a brief loss of consciousness. Afterwards, he was groggy, incontinent of urine, and had a mild right sided hemiparesis.

1. What is an automatism and what type of seizure is it seen in?
2. How would you characterize this patient’s seizure type?
3. What is Todd's paralysis?
4. What is the significance of a focal onset to a seizure as contrasted to a generalized onset?
5. How should this patient be evaluated and managed for new onset seizures?

Case 4: Kathleen, a 20 year old woman with no previous medical problems, presents to your outpatient clinic after having two events described as repetitive stereotypical movements of her mouth and hands. Her work-up including labs and imaging were normal. She does not have any risk factors for epilepsy. On neurological examination, she has no focal deficits. She is on an oral contraceptive pill (OCP) but may be stopping this soon as she would like to get pregnant.

1. What anti-epileptic medication would you start for this patient and why? What medication should you avoid in this patient? Discuss the side effects of these medications.
2. Are there any additional supplements you feel this patient should be instructed to take?
3. Kathleen would like to know if there are any interactions between the medication you prescribed her and the OCP. What would you tell her?
4. The patient has a follow-up visit one year later and tells you she is pregnant. What is important to monitor for this specific population?
Extra Cases if Time Permits

Case 5: A 40-year-old alcoholic was found on the street having two minutes of synchronous clonic jerking of his arms and legs. He was stuporous and brought to the emergency room by ambulance. Temperature was 101 F rectally; blood pressure was 180/100, respiration's 20 and pulse 90. His neck was supple. There was no evidence of external trauma. The liver was enlarged. Neurological examination was non-focal, but toes were bilaterally upgoing to plantar stimulation.

1. What are the time course and nature of typical alcohol withdrawal seizures?
2. What is the difference between delirium tremens (DTs) and withdrawal seizures?
3. What other entities must be considered in this 40-year-old alcoholic man?
4. How should this man be managed in the emergency room?

Case 6: Bryce, a 25-year-old medical student, smells something burning during anatomy lab, then falls down and loses consciousness. He wakes up an hour later; his body is sore and he has a painful laceration on the right side of his tongue. His friend tells him that his whole body shook and it “looked like a seizure.” The patient hadn’t slept well the past 2 nights because he was preparing for an anatomy examination. Bryce has never had a seizure before and has no other medical problems. Before medical school, he was a linebacker for the Ohio State University football team and suffered at least 3 concussions during play, one with loss of consciousness.

1. What tests would you order for this patient and why? Does it matter when these tests are done?
2. Bryce wants to know how likely it is that he will have another seizure – What would you tell him? Does the history of concussion increase his risk?
3. A one-hour sleep-deprived EEG shows a few right temporal epileptiform sharp waves. Would you start an antiepileptic drug? What if the EEG was normal?
4. Bryce lives close enough to campus to walk to school, but he owns a car and drives frequently. What would you advise regarding driving? As his physician, are you required to report to the DMV?

Case 7: Jorge, a 54-year-old Hispanic man with history of high blood pressure presents reporting paroxysmal episodes for the past 15 years. He gets a rising sensation in his stomach followed by blank staring lasting for one minute. During the episodes, his parents have noticed him moving his hands and lip smacking. Some of these progressed into generalized stiffness and jerking of his whole body. After these events, he is always confused and often incontinent of urine. He has been experiencing a few episodes of blank staring per week and whole body jerking approximately once per month despite taking levetiracetam 2,000 mg bid and oxcarbazepine 1,200 mg bid. He has no side effects from the medications. In the past, he had tried multiple anti-seizure medications, including phenytoin, lamotrigine, valproic acid, topiramate.

Questions:
1. What type of epilepsy (location) does this patient likely have? How do we know?
2. What is refractory epilepsy? Is this patient’s epilepsy considered refractory?
3. What are non-surgical treatment options for patients with refractory epilepsy?
4. If this patient requires epilepsy surgery, what additional pre-surgical evaluation may be required? What are the outcomes of epilepsy surgery?
Neuroscience Clerkship Teaching Vignettes

HEADACHE

Case 1: A 24-year-old female law student presented with a six-month history of intermittent headaches. The headaches were usually located in the left, but sometimes in the right, temporal or vertex areas. Pain was variously described as aching or throbbing. Sometimes, there was queasiness of the stomach, but no vomiting. The headaches could last hours or up to 1-2 days. Aspirin had been of no benefit. A sister had similar headaches. Among her many medical concerns was a fear of a brain tumor.

1. What are the major categories of headaches?
2. How is a migraine headache distinguished clinically from a tension type headache?
3. What is the likely diagnosis in this 24-year-old woman?
4. What is the difference between migraine with and without aura?
5. What medications might be useful in treatment of this case?
6. What are the "danger signs and symptoms" of a serious headache?
7. What ways do brain tumors typically present?

Case 2: A 42-year-old housewife, who had been in good health, complained of the worst headache of her life. Six hours before arrival in the emergency room, while stepping down from a bus carrying groceries, she developed the sudden onset of severe pain behind the eyes, accompanied by light-headedness and nausea. Visual changes and sensorimotor focal symptoms were absent, but the patient admitted feeling unwell since the onset of pain. All symptoms improved while waiting in the ER triage line.

1. What headaches may present suddenly?
2. What physical signs should be sought after diligently in this case?
3. What would be the management in the emergency room of this patient?

Case 3: A 76-year-old, right-handed man had a nagging headache worst on the left, which had continued to slowly worsen over the past three weeks. His jaw on the same side ached when he chewed. He also complained of muscle aches in his shoulders and a general "tired" feeling.

1. What is the differential diagnosis in this 76-year-old man?
2. What is the proper laboratory evaluation in this patient?
3. What is the appropriate therapy and evaluation for this patient?
4. Review the complications of this disorder if not recognized and treated.

Case 4: A 62-year-old, right-handed man suffered from intense shooting pains in his left cheek, each lasting for a second. He avoided touching certain parts of his face because of fear of setting off an attack, and had taken to chewing food on the right side of his mouth. Between attacks, he felt normal. His neurologic exam was normal.

1. What is the likely diagnosis in this 62-year-old man?
2. What investigations are indicated?
3. How should this man be managed?
Neuroscience Clerkship Teaching Vignettes

PEDIATRIC NEUROLOGY

Case 1: On a busy afternoon you see the following children in subsequent visits:

1) A 4-month old girl born at 34 weeks gestation without major complications. Her parents arrive with concerns that she has reduced tone and difficulty feeding. On exam she is alert and smiling, but drooling freely. She does have low resting tone and a head lag, but otherwise seems strong. Her reflexes are brisk and she has 6 beats of clonus at the ankles bilaterally.

2) A 12-year-old who comes for an update on his seizure medications. He had normal development until age 3 years, when he was thrown through a window during a car accident. Following 12 hours of coma, he emerged with a seizure disorder, learning difficulties in the mildly mentally retarded range, and spastic quadriplegia.

3) A 5-year-old arrives for advice regarding his school planning. He is a bright child who knows his alphabet and is already reading well. However, he is in a wheelchair because of significant athetosis and chorea, which prevent him from speaking clearly or using writing utensils. He was born full term, complicated by placental abruption requiring a blood transfusion and a four day Neonatal ICU stay.

1. Is it appropriate to use the diagnosis of cerebral palsy for any or all of these children?
2. Which ones and why/why not?
3. How is CP classified usually?
4. Are all children with CP mentally impaired?

Case 2: A 6 year old presents with a history of an increased activity level and a short attention span. His parents report that he is unable to sit quietly at school and has frequent temper tantrums when he does not get his way. At home he interrupts conversations, runs into the street without looking for cars, disappears in a store, does not sit still at the dinner table, and easily gets distracted by stimuli in the environment. His family states that these behaviors have been happening for several years.

1. What are typical clinical features of attention deficit-hyperactivity disorder?
2. What clinical features are most prominent at different ages?
3. What advice should be given to the family regarding management?
4. What is the differential diagnosis of a child with this presentation?
**Case 3:** You are asked to evaluate a three month old baby because he is floppy. He was the product of an uncomplicated pregnancy, labor and delivery. He was noted in the nursery to be quite floppy, and had a poor suck. His mother states that he has been in the hospital three times since birth with pneumonia. Over the last month he has had increasing difficulty with feeding. On examination, you find a very alert baby who has decreased spontaneous movements except of his hands and feet. He lies supine in the "frog-leg" position. His cranial nerve examination is normal. Motor exam reveals markedly reduced proximal muscle strength with a moderately weak hand grasp bilaterally. There are no deep tendon reflexes.

1. What is the ‘anatomic’ differential diagnosis of a floppy infant? (i.e., what locations from brain to muscle can cause hypotonia?).
2. What other ‘systemic’ problems should be considered?
3. Are all hypotonic infants weak?
4. What is the localizing value of the following findings?
   a. physical dysmorphic features
   b. seizures and/or drowsiness
   c. fasciculations of tongue and other muscles
   d. increasing weakness with effort
   e. hyperreflexia
   f. normal or hypoactive reflexes
   g. absent reflexes
5. What is your diagnosis of this baby? What tests would you do to confirm this diagnosis?
6. How would you counsel the parents?

**Case 4:** A 10 month old baby boy is brought to your office because of his “big head”. His mother states when he was born his head was “medium” sized, but his pediatrician is concerned that over the last four months his head has been growing too fast. His head circumference is now 52 cm, well above the 98th percentile. His examination is basically normal except for three hypopigmented birth marks on his chest.

1. What is the differential diagnosis of macrocephaly in infants?
2. What would you examine on the parents that might help you with your diagnosis?
3. What is the significance of the hypopigmented birth marks?
4. What tests/laboratory studies would you recommend for this child (if any)?
**Extra Cases if Time Permits**

**Case 5**: A two-year-old child previously well is seen in the ER with the chief complaint of "she is walking like she is drunk." Her mother states that she woke up this morning a little unsteady, but has gotten much worse as the day has progressed. She has been well, but her five-year-old sibling presently has chicken pox. On examination she is afebrile and vital signs are stable. She is somewhat irritable but will calm down when consoled by her mother. Her examination shows intact cranial nerves. Muscle strength and tone is normal. Deep tendon reflexes are 2+ and symmetrical. She had a broad-based ataxic gait. She has dysmetria on finger to nose testing.

1. What is the differential diagnosis of acute ataxia in childhood?
2. What is the significance of the chicken pox exposure in this child?
3. What if her examination revealed absence of deep tendon reflexes, how would this change your suspected diagnosis?
4. Would you admit this child? What studies/labs would you order?

**Case 6**: A Caucasian baby girl was born to a primigravida 17 year-old woman who had no prenatal care until the one month prior to delivery. The mother presented to the obstetrical service with a fever and foul smelling amniotic fluid, in active labor on the day of delivery. Fetal bradycardia was noted during intrapartum monitoring between 80 and 100 beats per minute. The child was delivered with an Apgar at one minute of four and at five minutes of eight with a birth weight of 1100 grams. Physical examination included an estimated maturity between 28 and 30 weeks gestation. Grunting and retractions were noted at one hour of life and the infant was intubated, requiring ventilatory assistance for six days. On day two of life, a sudden desaturation and mottled appearance of the skin was noted and a right pneumothorax was diagnosed. After placement of a chest tube, the child was noted to be acidotic with a pH of 7.15. Sodium bicarbonate was administered. A cranial ultrasound within 12 hours of the occurrence of the pneumothorax documented an intraventricular hemorrhage that filled the right ventricle without dilatation of the ventricular outline. Following extubation on day seven, the child's head circumference increased by 2 cm from birth and a repeat sonogram documented significant ventriculomegaly, with an echodensity in the right periventricular region extending from the frontal to the parietal/occipital areas. The infant remained hospitalized for one month. Upon discharge her neurologic examination revealed hypertonia in all limbs and a left hemiparesis.

1. What are some possible explanations for this infant's premature birth?
2. What is the significance of the maternal fever and foul smelling amniotic fluid?
3. Why do premature infants develop intraventricular hemorrhage? What is the significance of the echodensity in the right periventricular region on the repeat sonogram?
4. What is the mechanism for the increasing head size? What is your next step in dealing with the “ventriculomegaly”?
5. What is the neurologic sequela of extreme premature birth? Of intraventricular hemorrhage?
Neuroscience Clerkship Teaching Vignettes

MOTOR SYSTEM

Case 1: A 65-year-old man complained of weakness in the right arm. For three months, he had been dropping objects from his right hand. He was unsure of the exact time of onset of symptoms, but noted that they were "getting worse." He complained of no symptoms in the other limbs, no sensory abnormalities, no difficulty with gait, and no neck or head pain. On exam, the patient was mildly confused and speech was slow and slurred. There was flattening of the right nasolabial fold. Muscle bulk was normal. Passive movement of the right arm or leg met with resistance which would "give way." Strength was minimally diminished in the right intrinsic hand muscles, wrist dorsiflexors, triceps and deltoids. A right pronator drift was observed. Right finger movements were slow. The right iliopsoas, hamstrings and tibialis anterior were 4+/5 versus 5/5 on the left. The right leg circumducted during walking. Reflexes were hyperactive on the right. The right plantar response was extensor. Sensation was normal to touch, pin, cool and vibration. Two-point discrimination and graphesthesia were performed poorly on the right in comparison to the left.

1. Contrast the symptoms and signs of an upper motor neuron lesion vs. a lower motor neuron lesion?
2. Where would you localize the lesion in this case?
3. What is the differential diagnosis for this 65-year-old man?

Case 2: A 70-year-old, right-handed man complained of weakness in the right arm, and a six-month history of dropping objects from the right hand. On occasion, he would drag his right foot, and he once tripped going up stairs. The symptoms had been steadily progressive, so that he recently had become unable to open jars or doorknobs with his right hand. There were no left-sided symptoms except for cramps in the calf and thigh. Sensory symptoms, headache and back pain all were denied.

Examination showed decreased muscle bulk in the right forearm, with wasting of the interosseous muscles of the right hand. Strength was 4/5 in the upper limb, including the interossei, finger extensors, wrist dorsiflexors, triceps, deltoids and neck flexors. There was minimal weakness of the left arm. He could not walk on his heels or toes and he had a subtle right foot drop. Fasciculations were noted in the right deltoid, right pectoralis, right calf and left quadriceps. Reflexes were diffusely brisk. Sensory signs were lacking.

1. Does this man have evidence for a lower motor neuron or upper motor neuron lesion?
2. In what conditions are fasciculations and cramps seen?
3. What is the likely diagnosis in this 70-year-old man?
4. What investigations are indicated?
**Case 3:** A 65-year-old, right-handed man complained of weakness of the right arm. About six months earlier, he had noticed that he could not brush his hair or teeth as rapidly as he had in years past. His wife reported a general slowing down of his daily activities, such as dressing, eating and climbing stairs. Affect was flat. There was a general paucity of movement and facial expression. He blinked infrequently. Upgaze was limited. The remaining cranial nerve examination was within normal limits. Sensation was normal. An obvious tremor was seen at the metacarpophalangeal joints of the right hand when the patient was at rest. The tremor attenuated with movement. Tone was increased in the right arm, especially during contralateral movement. Tone in the left arm was normal. Leg tone was increased bilaterally. Gait was slow and shuffling. Turning was clumsy. Power was normal in all limbs. Reflexes were 1+ and symmetrical.

1. Define "tone." Contrast the differences between increased tone from a) upper motor neuron lesions, b) basal ganglia lesions, and c) frontal lobe lesions?
2. What are the general symptoms of basal ganglia disease?
3. What are the "frontal release signs" and their significance?
4. What is the differential diagnosis in this case?

**Case 4:** A 37-year-old, right-handed woman began to stumble yesterday. Today, she is completely unable to walk, and can barely sit without support. Her arm and face strength are normal. There is no sensation below the level of the umbilicus except to deep pain stimuli. She has no control of her bowel or bladder. Tone is flaccid, and knee and ankle jerks are absent.

1. Is there any evidence in this case of neuropathy, myelopathy, or hemisphere disease?
2. What is a "sensory level" and what is its significance?
3. Does flaccid areflexia in this setting rule out an upper motor neuron lesion?
4. What is the likely site of the lesion in this woman?
5. What is the differential diagnosis?

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**Extra Case if Time Permits**

**Case 5:** A 45-year-old, right-handed man complained of progressive difficulty with walking of six months' duration. He would occasionally fall, especially in the dark. He also noted that his right arm would shake when drinking Thunderbird wine. Mental status were normal. Speech was slightly dysarthric. Coarse nystagmus was evoked by eccentric gaze in any direction. Sensory exam was normal except for a mild stocking-pattern decrease in pin and vibration sensation. Tone was diminished in all four limbs. No rest tremor was seen, but there was a side-to-side intention tremor of both upper extremities. Tremor was noted on heel-to-shin testing bilaterally. Rapid alternating movements of the hands were impaired. Muscle strength was normal. Reflexes were present and normal other than absent ankle reflexes bilaterally. Gait was broad-based and unsteady. A Romberg sign was present.

1. What areas in the neuraxis are likely affected in this patient?
2. What symptoms and signs occur with damage to the cerebellar hemisphere and what symptoms and signs occur with damage to the cerebellar vermis?
3. What is the likely diagnosis in this man?
4. If this man had a family history of similar problems in a brother and father, what other diagnosis should be considered?
5. If this man had lung cancer, what other diagnoses should be considered?
Neuroscience Clerkship Teaching Vignettes

NEUROPATHY AND MYOPATHY

Case 1: A 22-year-old, right-handed man complained of fatigue. For the past three months, he had noted increasing difficulty when rising from chairs, climbing stairs and brushing his teeth. Symptoms were less pronounced in the morning and after periods of rest. More recently, he developed intermittent double vision. Sensory symptoms were absent. Exam demonstrated bilateral ptosis and the inability to fully squeeze the eyes shut. He was unable to whistle. Sensory exam was normal. There was mild fatigability of the shoulder and hip girdle muscles. Muscle bulk was normal. Reflexes and coordination were normal.

1. What is the likely diagnosis in this case?
2. What further studies might be performed?
3. After the diagnosis is secured, what therapies might be indicated?
4. What medicines or other conditions might exacerbate this patient’s symptoms?

Case 2: A 45-year-old, left-handed bartender developed tingling in his feet four days prior to admission. He had been well other than a mild upper respiratory tract infection two weeks earlier. By the next day, he was stumbling and complaining of tingling in the fingers as well. Subsequently, his weakness progressed so that he could not stand alone, and could not lift his arms over his head. On exam, temperature was 98.6 deg. F., pulse 115, blood pressure was 170/90, respirations were 24 and vital capacity was 2.2 liters. He had mild bifacial weakness, absent reflexes and weakness in all limbs, proximal and distal. Position, vibration, temperature and pin sensations were diminished in all four extremities.

1. At what site in the neuraxis is the disease located in this case?
2. What is the differential diagnosis in this 45-year-old man?
3. What laboratory studies should be obtained?
4. What management should be initiated?

Case 3: A 63-year-old, right-handed man comes to clinic after abruptly suffering the onset of left knee extension weakness, and numbness and pain over the left anterior thigh one week earlier. The condition has been stable since. He indicates that two weeks before he had awakened in bed with a right wrist drop and numbness over the back of his hand, accompanied by pain in the right upper arm. He was prescribed a cock-up splint from his internist. He has had a low-grade fever over the last month and has lost ten pounds of weight. Examination demonstrates weakness in the areas mentioned. Numbness is present over the left anterior thigh and medial calf, as well as over the dorsum of the right hand between the thumb and index finger. Reflexes are unobtainable in the left knee and right triceps.

1. What is the difference between a mononeuritis multiplex and a polyneuropathy?
2. What nerves are involved in this patient?
3. What is the differential diagnosis of this condition?
4. What laboratory investigations are indicated?
5. What treatments should be considered?
Case 4: A 42 year-old woman developed progressive weakness over the past three months. She noted increasing difficulty when rising from chairs, climbing stairs and combing her hair. She also developed mild difficulty with swallowing, especially solid food. There was no pain, no sensory symptoms and no rash. On examination, cranial nerve testing was normal. There was mild weakness of neck flexors. Moderate weakness of shoulder and hip girdle muscles was present. Muscle bulk was normal. Reflexes were normal. Sensory examination was normal to all modalities.

1. What is the pattern of weakness?
2. What is the differential diagnosis of this patient?
3. Would knowing the patient’s list of medicines be helpful? Why?
4. What laboratory testing would be useful?

Extra Case if Time Permits

Case 5: A 47-year-old, right-handed man had been suffering for six months from slowly progressive numbness of both feet. Recently, his fingertips had begun to become numb. He described an unpleasant burning sensation. Weakness was denied. On exam, cranial nerves were normal. Position and vibration sense was grossly diminished in the feet. Cool stimuli and pin were perceived, but there was a subjective stocking distribution of numbness to the mid-calf bilaterally. Reflexes were absent at the ankles and diminished elsewhere. Atrophy of the intrinsic foot muscles was present bilaterally. Strength was close to normal in the arms, but intrinsic hand strength was rated 4/5. He could not heel or toe walk.

1. Is there evidence for a neuropathy, radiculopathy or myelopathy in this case?
2. What are some of the more common causes of a slowly progressive neuropathy?
3. What investigations should be initiated?
Neuroscience Clerkship Teaching Vignettes

DISTURBANCES OF VISION, HEARING AND BALANCE

Case 1: A 63-year-old white male presented because he was unable to see objects to his left. This became manifest when he was sideswiped by a garbage truck in cross-traffic. On examination he had a left homonymous hemianopsia to confrontation, extending to the midline. Visual acuity was normal. He showed "extinction" of tactile stimuli applied simultaneously to his right and left hands (i.e., he only reported stimulation of the right hand). Otherwise, sensory and motor testing was normal. The remaining neurological exam was negative.

1. What is the course of fibers from retina to occipital lobe?
2. What is the significance of: a) Homonymous hemianopsia b) Heteronymous hemianopsia (such as bitemporal hemianopsia) c) Homonymous superior quadrantanopsia d) Homonymous inferior quadrantanopsia
3. Occlusion of which vessel(s) may give homonymous hemianopsia?
4. What is the significance of his extinction of simultaneously applied sensory stimuli?

Case 2: A 33-year-old right-handed woman slowly lost hearing in her left ear over a three-year period. There were no other reported symptoms. Exam confirmed decreased acuity to whisper on the left, with air conduction greater than bone conduction bilaterally, and Weber lateralizing to the right ear. There was gaze-evoked nystagmus on looking to the left. The left corneal reflex was diminished. A mild clumsiness and intention tremor were noted in the left hand.

1. What is the differential diagnosis of hearing loss in one ear?
2. What factors on exam or specialized testing might distinguish cochlear from retro-cochlear lesions?
3. What is the localizing significance of the left hand clumsiness and intention tremor?
4. What is the differential diagnosis in this woman?

Case 3: A 27-year-old woman developed progressive visual blurring in her left eye and clumsiness in her right hand over several days. Two years ago she had transient horizontal diplopia. She has had a two-year history of fatigue, heat intolerance and urinary urgency. On exam she has a relative afferent pupillary defect on the left, a subtle internuclear ophthalmoplegia (INO) on the right and cerebellar ataxia in the right hand.

1. Localize the lesions and the physiology underlying her afferent pupillary defect, INO, and ataxia.
2. Describe the differential diagnosis and the work-up.
3. Describe the common signs and symptoms of multiple sclerosis, its pathogenesis and treatment.
**Case 4:** A 55-year-old right-handed man awoke with severe nausea and vomiting. He had previously been well, apart from treated hypertension. When seen in the emergency room, he preferred to lie on his left side, and became quite ill when he rolled over. He denied other neurological symptoms. On examination, he had a horizontal-torsional nystagmus in primary position beating to the left (slow phases to the right). This nystagmus was accentuated when he looked to the left. He showed past-pointing to the right and tended to fall to this side when he stood. His hearing was mildly impaired bilaterally.

1. Localize the lesion in this man – is it due to a peripheral (vestibular) or central lesion?
2. What is the differential diagnosis of acute vertigo: at age 25? at age 65?
3. What other examinations and investigations could you obtain on this patient?
4. How would you manage his problem?
5. What is the differential diagnosis of posturally-induced vertigo?
6. What is the differential diagnosis of "dizziness"?

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**Extra Cases if Time Permits**

**Case 5:** A 26-year-old right-handed woman complained of headache and blurred vision for the past two weeks. There was no history of underlying disease or head trauma. She was very obese. Fundi showed bilateral papilledema. Her acuity was 20/20 in both eyes, with her glasses. Visual fields were full to confrontation except for enlargement of her blind spot. Examination was otherwise negative, except for difficulty in fully abducting either eye.

1. What is the definition of "papilledema" and what is its differential diagnosis?
2. What is the possible significance of her difficulty with eye abduction?
3. At the bedside, how does one test visual fields and size of blind spots?
4. How does papilledema differ from optic neuritis and ischemic optic neuropathy?
5. What is the differential diagnosis in this case?

**Case 6:** A 25-year-old RN suddenly notices that her left pupil is larger than her right pupil (5 vs. 3 mm). She makes inquiries of a third year clinical clerk, who is busy pondering a laxative order.

1. What is the pathway mediating the pupillary light reflex?
2. What is the "near reflex" and its neuroanatomical basis?
3. What is the differential diagnosis of anisocoria?
4. What is Horner's syndrome and what is it due to?
5. When does anisocoria indicate that emergency measures are required?
6. How can you determine that self administered atropine-like eye drops are the cause of anisocoria?