

REVIEW VERTEBRAE, SPINAL NERVES, REFLEXES

1) VERTEBRAE - NORMAL SPINAL CURVATURES: Primary = Concave Anterior - (fetal curvature); preserved in adult Thorax, Sacrum

Secondary = Concave Posterior (develop in childhood) - Cervical (support head), Lumbar (support body)

ABNORMAL CURVATURES - all can cause pain from compression of spinal nerves

	Curvature	Location (Most common)	Cause
Kyphosis	Exaggerated Concave Anterior	Often in Thoracic Region (Hump back)	Osteoporosis, etc. - loss of bone in bodies of vertebrae
Scoliosis	Exaggerated Lateral	Thoracic, Lumbar most common	Hemivertebra (half of vertebral body does not form in development), etc.
Lordosis	Exaggerate Concave Posterior	Lumbar (normal in pregnancy)	Obesity, etc.

SUMMARY OF LIGAMENTS OF VERTEBRAE AND DISC HERNIATION

Ligament	Connects	Clinical
Anterior Longitudinal Ligament	Anterior side of bodies of vertebrae	Broad band; Prevents disc herniation anteriorly
Posterior Longitudinal Ligament	Posterior side of bodies of vertebrae (inside canal)	Narrow band; (intervertebral discs herniate in posterolateral direction, lateral to ligament)
Ligamenta Flava	Elastic layer connecting Laminae of vertebrae	Last layer penetrated by needle in Epidural anesthesia ; (Note: Dura is last in Lumbar Puncture spinal tap)
Interspinous and Supraspinous ligaments	Spines of vertebrae	Thickened in neck to form Ligamentum nuchae (extends from Ext. Occipital Protuberance to C7)

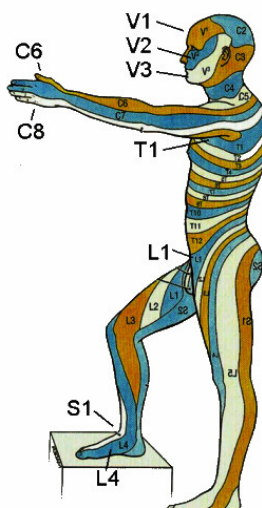
Note: **Herniation of Nucleus pulposus = 'Slipped Disc'** - Nucleus pulposus bulges out through Annulus fibrosus; usually in a **Posterolateral direction** (lateral to the Posterior Longitudinal Ligament); **Most common at levels L4-L5 or L5-S1**.

Note: **Cervical Intervertebral Disc Herniation** - Second most common region for disc herniation; **Lower cervical disc herniation** - Symptoms in **Upper Extremity**, if below C4 (**Brachial Plexus C5-C8, T1**)

SUMMARY OF SOME FEATURES OF VERTEBRAE ON CT, LANDMARKS AND SOME CLINICAL SIGNS

Vertebra	ID Features on CT	Clinical, Associated Structures on CT
Cervical (7)	Foramina Transversaria transmit Vertebral Artery (C1-C6) C1 = Atlas - no body C2 = Axis - dens C7 = Vertebra prominens (long palpable spine)	1) Damage to vertebral artery - brainstem symptoms 2) Upper cervical fracture (C1 or dens of C2) - Quadriplegia ; 3) Disc Herniation in Lower Cervical Vertebrae - symptoms in upper extremity (Brachial plexus)
Thoracic (12)	Ribs abut bodies (head of rib), transverse processes (tubercle of rib);	Landmark: Thoracic aorta anterolateral to bodies
Lumbar (5)	Large bodies; No surrounding bones	Landmarks: Erector spinae posterior; Psoas major lateral; IVC and Abdominal aorta anterior to bodies

2) GROSS ANATOMY OF SPINAL CORD AND SPINAL NERVES

Syndrome/ Procedure	Anatomy	Structures	Clinical, ID Features on CT
Spinal Nerve Compression	Convention: Cervical spinal nerves C1-C7 exit Above corresponding vertebrae; C8 and All other spinal nerves exit Below vertebrae	Dermatomes - area of distribution of single nerve root to skin; [V1 - Face (above eyes *) V2 - Face (below eyes*) V3- Face (below mouth)*] C5 - Shoulder C6 - Thumb C8 - Little finger T1 - Armpit T4 - Nipple T7 - Xiphoid T10 - Umbilicus L1 - Inguinal lig. L4 - Big toe S1 - Little toe [* Note: V - also Oral, Nasal Cav., Cranial Dura Mater - headache]	Symptoms of compression of nerve root - Paresthesia, pain, sensory loss, hyporeflexia, muscle weakness  Note: overlap of dermatomes in region of trunk: sensory loss in trunk only with Two Thoracic spinal roots
Lumbar Puncture	Inferior end of Spinal Cord = Conus medullaris	Conus medullaris at 1. In Newborn , vertebral level L3 2. In Adult , conus at vertebral level L1	Lumbar Puncture done below Conus Medullaris (region of Cauda Equina); Level: 1. Children - L4-L5 2. Adult - L3-L4 or L4-L5
Metastasis to Vertebral Column	Epidural Space (outside Dura) Dura is separated from inner side of vertebral canal; Note: in Skull, there is no epidural space	Internal Vertebral Venous plexus - inside vertebral canal in Epidural Space; drains to External Venous plexus (outside vertebrae) by Radicular and Intervertebral veins	Disease processes (ex. cancer) can spread to vertebrae and spinal cord via anastomoses of Vertebral venous plexus and intervertebral veins with Lumbar veins (ex. carcinoma of prostate can metastasize to vertebral column)

LAYERS PENETRATED IN EPIDURAL ANESTHESIA/LUMBAR PUNCTURE (superficial to deep)

1. Skin, 2. Superficial Fascia, (3. Supraspinous ligament, 4. Interspinous ligament)
5. **Ligamentum Flavum** (sudden yield, first 'pop') - now inside vertebral canal in Epidural space
6. Epidural Space - **STOP HERE FOR EPIDURAL ANESTHESIA**
7. **Dura Mater** (sudden yield, second 'pop')
- (8. Arachnoid - adherent to inner side of dura mater)
9. **Subarachnoid Space (Lumbar Cistern)** - **STOP HERE FOR LUMBAR PUNCTURE/SAMPLE CSF**

3) SPINAL REFLEXES AND DIAGNOSIS OF UPPER AND LOWER MOTOR NEURON LESIONS

REFLEX	STIMULUS/SENSE ORGAN(S) EXCITED	RESPONSE	CLINICAL/ABNORMAL RESPONSES
Stretch (Myotatic, Deep Tendon) Reflex	Rapid Stretch of muscle (test: tap on muscle tendon) Excites Muscle Spindle Primary (Ia) and Secondary (II) sensory neurons (NOT Golgi Tendon Organ)	Stretched muscle contracts rapidly (monosynaptic connection); also excite synergist and Inhibit antagonist Note: Gamma motor neurons can enhance stretch reflexes (Gamma dynamic motor neurons specifically enhance Ia sensitivity; tell patient to relax before test)	Hyporeflexia - decrease in stretch reflexes occurs in Lower Motoneuron Diseases, Muscle atrophy etc. Hyperreflexia - (increase) characteristic of Upper Motor Neuron lesions (ex. spinal cord injury, damage Corticospinal tract); note: Clonus = hyperreflexia with repetitive contractions to single stimulus
Autogenic Inhibition (Inverse Myotatic Reflex)	Large force on tendon excites Golgi Tendon Organ Ib (test: pull on muscle when resisted)	Muscle tension decreases; Also inhibit synergist muscles; excite antagonist muscles	Clasped Knife Reflex - occurs in Upper Motor Neuron lesions - forceful stretch of muscle is first resisted then collapses
Flexor Reflex	Sharp, painful stimulus, as in stepping on nail; Excites - Cutaneous and pain receptors	Limb is rapidly withdrawn from stimulus; protective reflex; also inhibit extensors of same limb and excite extensors of opposite limb (Crossed Extensor Reflex)	Babinski sign - toes extend (dorsiflex) to cutaneous stimulus of sole of foot (normally plantar flex); characteristic of Upper Motor Neuron lesion

Note: **Infant Stepping** - reflexes are used to check motor function in neonates; some infant reflexes probably represents activation of Central Pattern Generators (CNS interneurons that produce rhythmic movements, ex. walking)

LOWER AND UPPER MOTOR NEURON LESIONS

Lesion	Structure Affected	Symptoms	Examples
Lower Motor Neuron Lesion (Flaccid Paralysis)	Lower Motor Neurons = Alpha Motor neurons with axons that innervate skeletal muscles	Muscle is effectively denervated: 1) Decrease Stretch (Deep Tendon) Reflexes 2) Decreased Muscle Tone 3) Muscle atrophy; Fasciculations (twitches) precede atrophy 4) No Babinski sign	1) Compression of spinal nerve 2) Poliomyelitis - viral infections affecting motor neurons
Upper Motor Neuron Lesion (Spastic Paralysis)	Upper Motor Neurons = All descending neurons that affect Lower Motor Neurons (ex. Corticospinal Reticulospinal neurons)	Disrupt voluntary control and regulation of reflexes (remove inhibition): 1) Increase Stretch (Deep Tendon) Reflexes 2) Increased Muscle Tone 3) No Fasciculations 4) Babinski sign 5) Clasped Knife Reflex	1) Damage to Corticospinal (corticobulbar) tracts - can occur at all levels from cortex to spinal cord (brainstem)

Note: Some diseases produce both Upper and Lower Motor Neuron Symptoms - (ex. ALS Amyotrophic Lateral Sclerosis)

REVIEW: CLINICAL EMBRYOLOGY OF HEAD AND NECK

Clinical Condition	Normal development	Abnormal	Signs/ Symptoms	Treatment
Cleft Lip (cheiloschisis)	Fusion of medial nasal and maxillary processes forms upper lip	Failure of fusion of medial nasal and maxillary processes	Cleft at philtrum of upper lip	Surgical repair
Cleft Palate (palatoschisis)	Anterior - Fusion of medial nasal processes (Primary palate) and maxillary processes (Secondary Palate); Posterior - Secondary palate formed by Maxillary processes of two sides	Failure of fusion	Anterior - Cleft anterior to Incisive foramen; Posterior - Cleft posterior to Incisive foramen	Surgical repair
Malformation of nasolacrimal duct (dacryostenosis)	Duct forms as cord between maxillary and frontonasal processes that extends from lacrimal sac (at medial canthus of eye) to nasal cavity (inferior meatus)	Cord fails to canalize	Continuous flow of tears over lower lid onto face	Surgical repair
First Arch (Treacher Collins) Syndrome	First brachial arch forms skeletal elements: 1) malleus, incus 2) contributes to mandible (Meckel's cartilage)	Neural crest cells do not migrate into Arch 1	1) Mandibular hypoplasia 2) Conductive hearing loss 4) Facial malformation	Some surgical repair
Thyroglossal duct cysts	Thyroid forms as evagination at foramen cecum of tongue; tissue migrates ant. to Hyoid bone in midline of neck to location below Cricoid cartilage	Glandular tissue or cysts develop anywhere along path of migration	Mass in midline of neck	Surgical removal (remove tract to tongue)
Abnormal location/ Accidental Removal of parathyroid glands	Normally posterior to thyroid gland or embedded in it; develop from branchial pouches 3 and 4 Inferior parathyroid - pouch 3 Superior parathyroid - pouch 4	Can be located within thyroid gland or ectopic	Normally no symptoms; If accidentally remove parathyroid during thyroid removal, signs of calcium imbalance	Treat calcium imbalance pharmacologically, etc.

BRANCHIAL ARCHES AND DERIVATIVES

ARCH (NERVE)	SKELETAL	LIGAMENTS	MUSCLES
First (V)	1) Malleus 2) Incus	1) Ant. ligament of malleus 2) Spheno-mandibular ligament	1) Muscles of Mastication 2) Tensor tympani 3) Tensor palati 4) Mylohyoid 5) Ant. belly of Digastric
Second (VII)	1) Stapes 2) Styloid process 3) Hyoid bone - lesser horn, upper half of body	Stylohyoid ligament	1) Muscles of Facial Expression 2) Stapedius 3) Stylohyoid 4) Post. belly of Digastric
Third (IX)	Hyoid bone - greater horn, lower half of body	-----	Stylopharyngeus
Fourth (X)	Cartilages of Larynx	-----	1) All muscles of Larynx 2) All muscles of Pharynx (except Stylopharyngeus) 3) All muscles of Soft Palate (except Tensor palati)
Sixth (XI)	-----	-----	1) Sternocleidomastoid 2) Trapezius

STRUCTURES DERIVED FROM BRANCHIAL POUCHES, CLEFT AND MEMBRANE: BRANCHIAL 'CLEFT' CYSTS (FISTULI = channels from pharynx to skin)

POUCH	FORMS	CLINICAL
First	1) Auditory tube 2) Tympanic cavity	First Branchial 'Cleft' cyst - tract to external auditory meatus or auditory tube
Second	Lining (crypts) of palatine tonsils	Second Branchial 'Cleft' cyst - tract to tonsillar fossa (palatine tonsils) - MOST COMMON CYST
Third	1) Inferior parathyroid gland 2) Thymus	Third Branchial 'Cleft' cyst - tract to thyrohyoid membrane or piriform recess
Fourth	1) Superior parathyroid gland 2) C-cells of Thyroid	rare

Note: Pouch 3 structures migrate below (caudal) to Pouch 4 structures.

Note: Location of Cysts and Fistuli - in **lateral neck, anterior to Sternocleidomastoid muscle**

Note: **First Branchial Cleft forms External Auditory Meatus; First Branchial Membrane forms Tympanic Membrane**

CLINICAL ANATOMY OF HEAD AND NECK

Clinical	Anatomy	Cause	Sign/Symptom
Anterior Cranial Fossa - Cranial nerve I, Nasal Cavity			
Fracture of cribriform plate of ethmoid bone	Nasal septum continuous with crista galli of ethmoid bone; Olfactory nerve passes through cribriform plate of ethmoid bone	Blow to nose; fracture produces continuity between subarachnoid space and nasal cavity	Leakage of CSF from nose ('runny nose')
Middle Cranial Fossa - Cranial nerves II-VI Orbit, Eye Movements, Face			
Rapid loss of vision in one eye	Central artery of retina (branch of Ophthalmic artery from Int. Carotid) is normally an end artery with no functional anastomoses (except in cases of Chorioretinal anastomoses)	Occlusion of Central Artery of Retina	Sudden onset blindness in one eye (one eye only, artery visible through ophthalmoscope)
Slow loss of vision in one eye	Dura mater and subarachnoid continue over optic nerve; optic nerve function can be affected by CSF pressure	Communicating hydrocephalus (many causes)	Decreased visual function both eyes (diagnose as papilledema in ophthalmoscope); also other signs increased intracranial pressure (headache, etc.)
Abducens nerve palsy	Abducens nerve innervates only Lateral Rectus muscle (action: abduction of eye)	Damage Abducens nerve VI (causes ex. increased intracranial pressure, Cavernous sinus thrombosis)	Diplopia and Medial strabismus
Trochlear nerve palsy	Trochlear nerve innervates only Superior Oblique muscle (action: abduct, depress and medially rotate eye)	Damage Trochlear nerve (ex. trauma)	Inability to look down and out (difficulty walking down stairs); Head tilted toward side opposite lesion
Oculomotor nerve palsy	Oculomotor nerve innervates Superior, Medial and Inferior Rectus and Inferior Oblique; part of Levator palpebrae superioris; also provides parasympathetics to pupillary constrictor, ciliary muscles	Damage Oculomotor nerve (frequently idiopathic)	Lateral strabismus, dilated pupil, ptosis; also loss of accommodation (near vision) due to paralysis of ciliary muscles

Clinical	Anatomy	Cause	Sign/Symptom
Horner's Syndrome	Sympathetics in head innervate smooth muscle part of Levator Palpebrae Superioris; Pupillary dilator muscle; sweat glands of skin; Pathway: pre-ganglionic neurons arise at T1,2; ascend in chain; post-ganglionics in Sup. Cerv. Ganglion; distributed with arteries (ex. Ophthalmic A.)	Block conduction in Sympathetics to head (tumors, etc)	Ptosis (drooping eyelid from smooth muscle part of Levator Palpebrae Superioris); Constricted pupil (miosis due to paralyze Dilator pupillae); Anhydrosis of forehead (denervate sweat glands)
Cavernous sinus thrombosis	Branches of cranial nerves (III, IV, V1, V2, VI) and Internal carotid artery pass through wall of cavernous sinus; Cavernous sinus drains ophthalmic veins which anastomose with branches of Facial Vein; veins have no valves	ex. Infection in cav. sinus spread from infection of face (angle of nose or upper lip particularly dangerous)	Diplopia (blurred vision) due to disruption of eye movements; increased venous pressure produces engorgement in veins of retina (view in ophthalmoscope)
Epidural Hematoma	Middle Meningeal artery (branch of Maxillary artery that passes through foramen spinosum) supplies bone of calvarium	Blow to side of head (fracture skull in region of pterion)	Patient conscious after accident; loses consciousness within hours; coma, death (Note: hematoma is lens-shaped on CT)
Subdural Hematoma	Bridging veins link Superficial cerebral veins on surface of brain and Superior Sagittal sinus (also other venous sinuses)	Blow to head; in elderly can occur without distinct event	Slow onset of neurological symptoms, headache (often hours to days) (Note: hematoma is crescent-shaped on CT)
Communicating Hydrocephalus due to decreased CSF reabsorption (in elderly)	CSF produce in choroid plexus; reabsorbed from subarachnoid space at arachnoid villi into venous sinuses	Calcification of arachnoid villi (arachnoid granulations)	Headache, papilledema
Numbness of regions of face	V is major sensory nerve of face and head; Sensory neuron cell bodies are in Semilunar (Trigeminal) Ganglion ; V1 above lateral margin eyelids; V2 eyelids to upper lip; V3 below lateral margins of lips	Many; ex. Trigeminal Anesthesia	Numbness in specific region can be correlated with specific division of V
Pain in external auditory meatus following Facial paralysis	Skin of ear and external auditory meatus receive sensory innervation from V, VII, IX and X	Bell's palsy	Ear ache (following or accompanying Facial paralysis)

Clinical	Anatomy	Cause	Sign/Symptom
Weakness of muscles mastication	Muscles mastication innervated by V3; Lateral Pterygoid opens mouth; all other muscles Mastication close mouth	ex. Tumor at foramen ovale	When open mouth, jaw deviates toward paralyzed side
Posterior Cranial Fossa - Cranial Nerves VII-XII, face, ear, pharynx, tongue			
Facial paralysis (with effect on VIII)	CN VII and VIII exit post. cranial fossa via Internal auditory meatus; VIII ends in temporal bone; VII enters facial canal and gives off branches in temporal bone; 1) parasymp. to Lacrimal gland, mucous glands of nose, palate; 2) Nerve to Stapedius muscle; 3) Chorda tympani - taste to ant. 2/3 of tongue; parasymp. to Submandibular, Sublingual salivary glands	Acoustic neuroma	Loss or reduction of hearing in one ear; Full Facial nerve palsy (Bell's palsy) symptoms: 1) Facial paralysis and loss of Corneal reflex (V1 sensory, VII motor) 2) Loss of taste to ant. 2/3 of tongue 3) Decreased secretion tears and saliva 4) Hyperacusia
Facial paralysis (no effect on VIII)	Facial nerve exits skull via Stylomastoid foramen; only has motor branches after leaving skull	Parotid tumor	Facial paralysis ; Loss of corneal reflex but no loss of taste or decrease in tears or saliva; no hyperacusia
Loss of function of IX and X	IX is major sensory nerve to pharynx (oropharynx); X is motor to all muscles of pharynx except Stylopharyngeus; all muscles of palate (except Tensor palati)	Tumor at Jugular Foramen	Difficulty in swallowing; Absence of gag reflex ; (Gag reflex - IX sensory, X motor)
Hoarse voice after thyroid surgery	X is motor to all muscles of larynx; also sensory to larynx; Recurrent Laryngeal nerve passes posterior to Thyroid gland with Inf. Thyroid artery; motor to all laryngeal muscles except Cricothyroid	Damage Recurrent Laryngeal nerve during Thyroid surgery	Hoarse voice due to unilateral paralysis of all laryngeal muscles (except Cricothyroid)
Torticollis	XI innervates Sternocleidomastoid and Trapezius	Torticollis can be congenital or acquired	Contracture of Sternocleidomastoid - head is rotated with face directed to opposite side (Note: Trapezius - clinical test for XI - shrug shoulders)
Paralysis of muscles of tongue	XII is motor to all muscles of tongue (no sensory component)	XII hypoglossal nerve palsy	Atrophy of muscles of tongue on one side; protruded tongue deviates toward side of lesion due to Genioglossus) in Lower Motor Neuron Lesion

LOWER EXTREMITY CLINICAL/ANATOMICAL REVIEW

Clinical Condition	Anatomy	Cause	Symptom
Hip/Pelvis			
Femoral Hernia	Femoral ring is a weak point in abdomino-pelvic cavity; Lymphatic vessels course through Femoral ring to Femoral Canal in medial part of Femoral sheath (which surrounds Fem. Art, Vein, Lymph)	Increase in pressure in abdomen (lifting heavy object, cough, etc.) can force loop of bowel into Femoral Canal (out Saphenous opening)	Bulge in anterior thigh below Inguinal Ligament
Hip Pointer	Anterior Superior Iliac spine (origin of Sartorius, Tens. Fasc. Lata m.) is subcutaneous	Fall on hip causes contusion at spine	Bruise on hip
Pulled Groin	Adductor muscles of thigh take origin from pubis	Tear in Adductor muscles can occur in contact sports	Pain in groin (at or near pubis)
Hamstring Pull	Hamstring muscles of post. thigh have common origin at Ischial Tuberosity	Excessive contraction (often in running) produces tear or avulsion of hamstring muscles from Ischial tuberosity	Agonizing pain in posterior thigh if muscles are avulsed
Gluteal Gait	Gluteus Medius and Minimus act to support body weight when standing (essential when opposite leg is lifted in walking)	Damage to Superior Gluteal Nerve or polio	Gluteal Gait (Trendelenberg Sign): pelvis tilts to down toward non-paralyzed side when opposite (non-paralyzed) leg is lifted in walking
Collateral circulation at hip	Cruciate anastomosis links Inf. Gluteal artery (from Int. Iliac.) and Profunda Femoris, Med. and Lat. Fem. Circumflex	Damage to External Iliac or Femoral arteries (stab wounds, etc.)	Bleeding (can ligate between Internal Iliac and Profunda femoris)
Avascular necrosis of head of femur	Medial Femoral Circumflex artery supplies head of femur (also small supply from Obturator Artery)	Falls (common in elderly) can produce fracture of neck of femur (treatment is hip replacement)	Leg is rotated laterally (by action of Gluteus Maximus and short posterior rotator muscles)
Dislocate Hip (head of femur displaced superiorly)	Hip joint ligaments usually strong	Congenital - Upper lip of acetabulum can fail to form	Leg is rotated medially (by action of Gluteus Medius and Minimus)

KNEE			
Tear Anterior Cruciate Ligament (ACL)	Anterior Cruciate Ligament extends from Lateral Condyle of Femur to Ant. part of Intercondylar eminence of tibia; limits ant. movement of tibia	Rapidly rotate body when foot planted on ground	Anterior drawer test - pull tibia anteriorly
Terrible Triad	Medial Meniscus is firmly attached to Medial Collateral ligament	In sports, blow to lateral side of leg tears Medial Meniscus, Medial Coll. Lig, ACL	Pain and high mobility (ACL - positive Anterior Drawer test)
LEG, ANKLE and FOOT			
Foot drop	Common Peroneal nerve is subcutaneous when passing around head of fibula at knee	Blow to lateral leg at head of fibula or sustained pressure in wearing a leg cast	Inability to dorsiflex foot); cannot lift foot from ground in walking
Anterior Leg Syndrome	Fascia of anterior muscular compartment of leg is very tight	Exercise or fracture of tibia; compress of Deep Peroneal nerve in anterior compartment	Foot drop (inability to dorsiflex foot); cannot lift foot from ground in walking
Tarsal Tunnel Syndrome	Tendons and vessels pass under Flexor retinaculum on medial side of ankle (Tom, Dick and Harry: Tibialis posterior, Flexor Digitorum longus, Posterior Tibial Artery and Tibial Nerve, Flexor Hallucis longus)	Swelling of tendons under flexor retinaculum produces compression of Tibial Nerve	Numbness of sole of foot and toes, weakness in flexion of toes
Intermittent Claudication	Posterior tibial artery (from Popliteal artery) supplies posterior compartment of leg and most of foot	Atherosclerosis produces narrowing of artery, limiting blood supply to leg and foot	Painful cramps after exercise that subsides with rest
Ankle sprain	Ligaments on lateral side of ankle are weaker than medial side	Excessive Inversion produces stretch of Anterior Talofibular and Calcaneofibular ligaments	Pain on lateral side of ankle
Pott's Fracture	Deltoid ligament on medial side of ankle is strong	Excessive eversion of ankle fractures distal tibia (medial malleolus) and fibula	Pain in ankle
Fallen Arch (Pes planus)	Medial arch of foot held by Plantar Calcaneonavicular ligament	Loss or decrease in medial arch; can be developmental or related to use	Foot pain, particularly on medial side

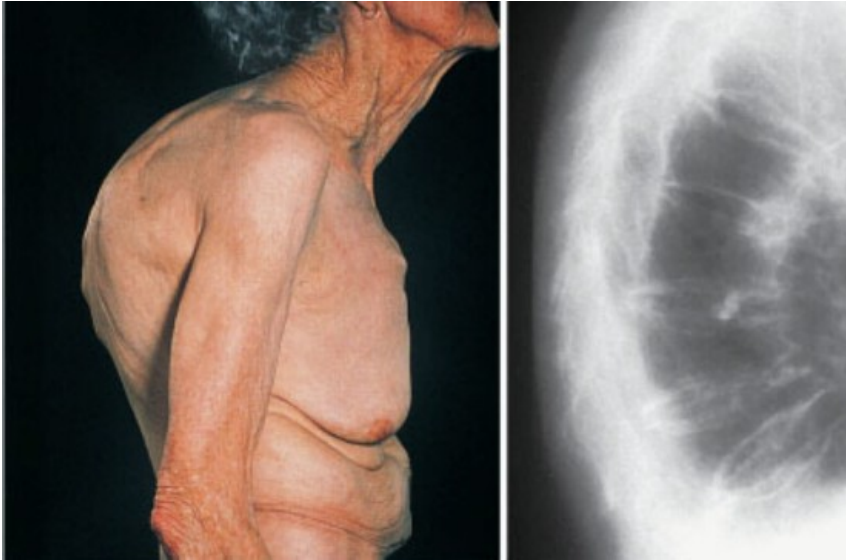
**NOTE: DERMATOMES - L1 INGUINAL REGION; L4 BIG TOE, S1 LITTLE TOE
 PATELLAR TENDON REFLEX - TEST L3-L4; ACHILLES TENDON REFLEX - TEST S1
 FEMORAL TRIANGLE - STRUCTURES LAT. TO MED. - NAVL (Femoral Nerve, Artery, Vein, Lymphatics)**

REVIEW QUESTIONS ON VERTEBRAE, SPINAL CORD, SPINAL NERVES



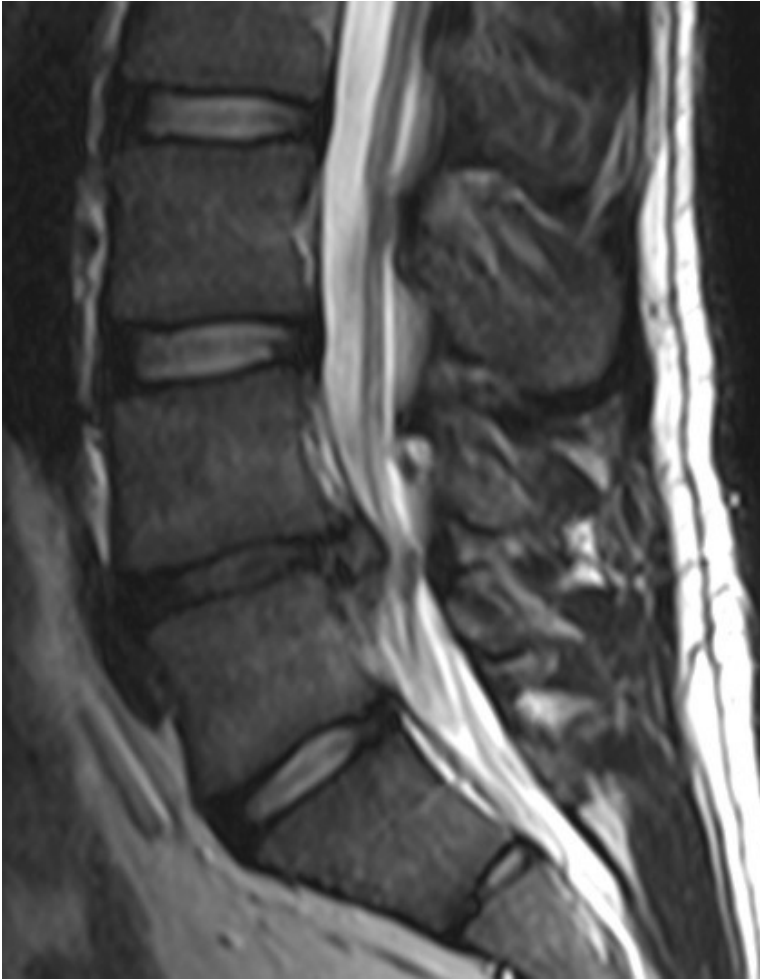
1- ____ A 28-year-old-women presented to the hospital emergency room with intense lower back spasms in the context of coughing during an upper respiratory infection. Review of her medical records showed that she had experienced progressive lower back problems for the preceding 6 years. She had gained 15 pounds during that period but was not morbidly obese. MRI scan of the vertebral column (image above) showed an exaggerated anterior-posterior curvature. Based upon this image, the radiologist would diagnose this as which of the following conditions?

- A. Scoliosis in vertebrae L3-S1
- B. Kyphosis in vertebrae T12-L3
- C. Increased lordosis in vertebrae L3-S1
- D. Increased lordosis in vertebrae T12-L1
- E. Scoliosis in vertebrae T12-L3



2.____ A 70 year old female with no health insurance was seen at a community based clinic. She complained of stooping of her posture (photo left above). She stated that the condition had been developing over a number of years. However, the deformity had increased to the point that she had difficulty holding her neck upright. She had also begun experiencing chronic back pain. The image (above right) is a lateral view xray of the thoracic spine. Which of the following would be a diagnosis of this condition?

- A. Congenital scoliosis
- B. Degenerative kyphosis associated with osteoporosis
- C. Post-traumatic fracture of bodies of thoracic vertebrae
- D. Scoliosis due to the presence of a hemivertebra
- E. Degenerative lordosis of thoracic vertebrae



3. ____ A 45 year old man was helping a friend move a piano when he experienced sudden lower back pain. Physical examination showed weakness in dorsiflexion of the foot. The MRI image of the lumbosacral spine (above) shows a structure pressing against the cauda equina. The herniated structure would be immediately adjacent to which of the following spinal ligaments?

- A. Anterior longitudinal ligament
- B. Ligamenta flava
- C. Interspinous ligament
- D. Posterior longitudinal ligament
- E. Supraspinous ligament



4. ___ A 2.2 kg girl was born at 34 weeks and showed severe respiratory distress. The neonate had a malformed thorax that limited normal respiration. The skeleton was imaged by CT and showed multiple abnormalities. 3D reconstruction (shown above) of the spine showed a distinct discontinuity in the vertebrae (arrow). Which of the following describes this discontinuity?

- A. Lordosis due to the presence of a 'hemivertebra'
- B. Scoliosis due to the presence of a 'hemivertebra'
- C. Congenital Kyphosis
- D. Exaggerated primary curvature
- E. Exaggerated secondary curvature in the lumbar region

5. ____ A 25-year-old rugby player injured his neck while tackling another player. He felt numbness over the region of the thumb on the palmar surface that persisted for several days.. Physical examination by his physician showed weakness in the biceps muscle. These symptoms could result a sign of herniation of an intervertebral disc located between vertebrae at which of the following levels?

- A. C3-C4
- B. C4-C5
- C. C5-C6
- D. C6-C7
- E. C7-T1

6. ____ A newborn baby born at 37 weeks is noted to be unwell, feeding poorly and is jittery, with a temperature of 38°C. A clinical diagnosis of early sepsis is made and a lumbar puncture to sample cerebrospinal fluid (CSF) is suggested on the ward round as a part of sepsis evaluation. To perform the procedure of lumbar puncture (spinal tap) safely in a newborn, the needle must be inserted between which of the following vertebrae?

- A. T12-L1
- B. L1-L2
- C. L2-L3
- D. L3-L4
- E. L4-L5

7. ____ A 24-year-old-patient is seen for a routine neurological exam. The patient is a medical student who has been studying intensely for Step 1 board (or Final) examinations. Testing of patellar tendon reflexes (deep tendon reflex) shows bilateral, mild hyperreflexia (scored 3). The physician suspects that this is not pathological but due to increased activation of Gamma motor neurons associated with nervousness and anxiety. Which of the following is an action of Gamma motor neurons that could produce the mild hyperreflexia?

- A. Increase sensitivity of Golgi tendon organs
- B. Increase sensitivity of Ia fibers in muscle spindles
- C. Directly produce contraction of all muscle cells
- D. Increase sensitivity of free nerve endings in muscles
- E. Produce relaxation of muscle cells in muscle spindles

8. ____ Both Lower motor neuron and Upper motor neuron lesions can cause muscle paralysis. Differential diagnosis is often complex and based upon a number of tests. Which of the following is a characteristic of Lower motor neuron lesions which does not occur in Upper motor neuron lesions?

- A. Hyperreflexia
- B. Fasciculations
- C. Decreased muscle tonus
- D. Clasped knife reflexes
- E. Babinski sign



9. ____ A patient who was treated for advanced carcinoma of the prostate begins to experience back pain. An MRI image of a lateral view of the vertebral column is shown above. Which of the following could serve as an anatomical pathway by which metastasis could have spread to the structures indicated by the arrow?

- A. External Iliac vein
- B. Renal vein
- C. Testicular vein
- D. Lumbar veins
- E. Deep Femoral vein

10. ____ A first year resident in OBGYN, who has been on call for 18 hours, is asked to administer an epidural anesthetic to a patient prior to delivery. As the needle is being inserted, the resident struggles to remember the anatomy of the vertebral column to know when to stop and administer the anesthetic. Which of the following is the last structure the needle should pass through in administering an epidural anesthetic?

- A. Anterior Longitudinal Ligament
- B. Posterior Longitudinal Ligament
- C. Supraspinous Ligament
- D. Ligamentum flavum
- E. Nuchal Ligament

11. ____ A patient experiences intermittent numbness of the big toe. The physician suspects that the cause may be due to osteophyte formation at an intervertebral foramen. At which of the following levels would foraminal encroachment by osteophyte formation produce numbness of the big toe?

- A. Intervertebral foramen at L1-L2
- B. Intervertebral foramen at L2-L3
- C. Intervertebral foramen at L3-L4
- D. Intervertebral foramen at L4-L5
- E. Intervertebral foramen at L5-S1

Key to Questions on Vertebrae, Spinal Cord, Spinal Nerves

1. C
2. B
3. D
4. B
5. C
6. E
7. B
8. B
9. D
10. D
11. D

HEAD AND NECK EMBRYOLOGY PRACTICE QUESTIONS



1. ____ A neonate is examined and found to have a large defect located at the philtrum of the upper lip (photo above). This condition arises because of failure of fusion of structures in embryonic development. Failure of fusion of which of the following structures would result in this condition?

- A. maxillary and mandibular processes
- B. maxillary and medial nasal processes
- C. maxillary and lateral nasal processes
- D. medial and lateral nasal processes
- E. frontonasal process with medial nasal process.



2._____ A young boy is brought to a physician working in a field hospital. The mother of the boy says he has difficulty swallowing and that food is expelled through the nasal cavity. Upon examination, the physician finds a large defect in the hard and soft palates (photo above) and suspects that the child developed with a Posterior Cleft palate. Which of the following is the anatomical landmark that would be used to differentiate Posterior and Anterior cleft palate?

- A. Greater palatine foramen.
- B. Infraorbital foramen
- C. Incisive foramen
- D. Mental foramen
- E. Mandibular foramen

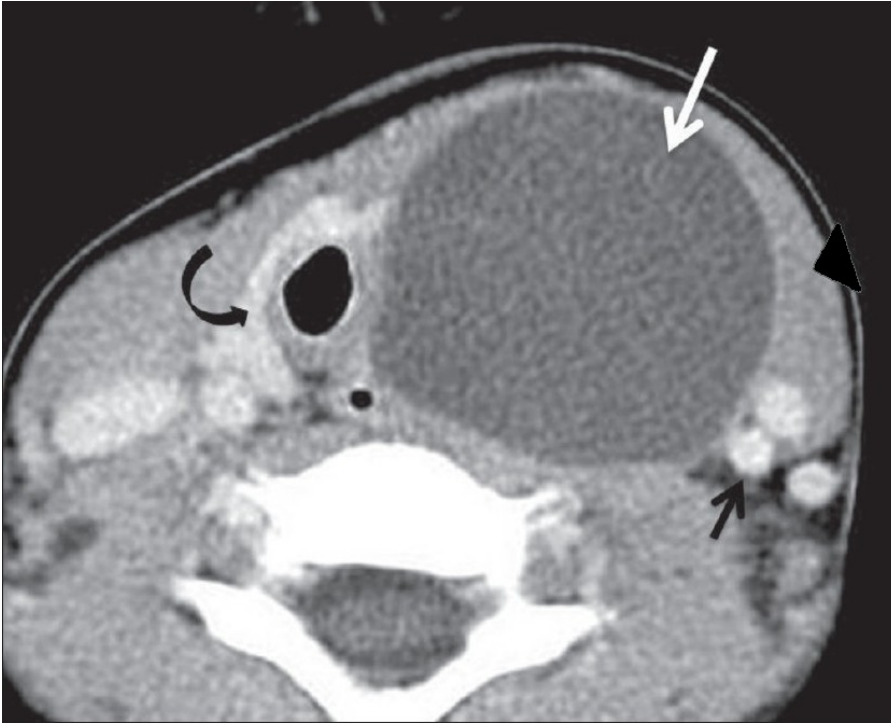


3. _____ An infant has a continuous secretion of tears from the left eye (photo above). MRI of the orbit appears normal and the lacrimal gland is not enlarged. The physician suspects that the condition is resulting from obstruction of the nasolacrimal duct due to failure of canalization of the duct in development. The obstruction prevents normal drainage of tears. The nasolacrimal duct normally drains to which of the following structures?

- A. Inferior meatus of the nasal cavity
- B. Superior meatus of the nasal cavity
- C. Bulla ethmoidalis of the nasal cavity
- D. Infraorbital foramen
- E. Maxillary sinus

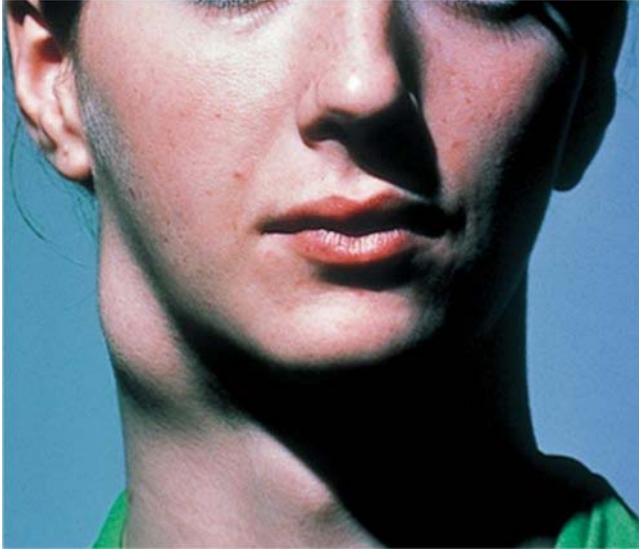
4. _____ During a routine auditory test, a child is found have a severe conduction deficit in one ear. High resolution CT scan of the tympanic cavity shows a complete agenesis of the stapes. This condition could result from failure of formation of the stapes from which of the following structures?

- A. First branchial arch
- B. Second branchial arch
- C. Third branchial arch
- D. Frontonasal process
- E. First branchial pouch



5. _____ A 4-year-old boy presents with an asymptomatic, left-sided neck swelling that had been present since birth. CT imaging (above) shows a mass (white arrow) in the anterior neck that had displaced the carotid vessels, the trachea and thyroid gland (black arrows). The mass was determined to be a cyst connected to a tract that extended to the anterior mediastinum. Superiorly the tract terminated in the piriform recess. Which of the following is likely to be the initial embryonic origin of the mass?

- A. First branchial pouch
- B. First branchial arch
- C. Second branchial pouch
- D. Second branchial arch
- E. Third branchial pouch



6. _____ A 24 year old woman develops a mass in her neck (see photo above). The mass is located immediately anterior to the sternocleidomastoid muscle. The physician suspects that this condition has result from a branchial cyst. During surgery, the mass is found to be connected to a tract that extends superiorly and medially. The tract is most likely to be connected to which of the following structures?

- A. Middle meatus of the nasal cavity
- B. Pharyngeal tonsil
- C. Tonsillar fossa (palatine tonsils)
- D. Lingual tonsil
- E. Mandibular fossa



7. _____ A young child develops a mass in the midline of the neck (photo above). The mass is located anterior to the hyoid bone, superior to the thyroid cartilage. Palpation of the salivary glands and thyroid gland show that they are normal in size. The child is scheduled for surgical removal of the mass. During surgery, the mass is found to be connected to a tract that courses superiorly. The tract is most likely to be connected to which of the following structures?

- A. foramen cecum of the tongue
- B. lingual tonsil
- C. sublingual papilla
- D. palatine tonsils
- E. submandibular duct



8. ____ A young child is brought to a pediatrician by his parents. The child (photo above) shows micrognathia (small mandible) and downward slanting eyes. Tests of auditory function indicate a hearing loss. The physician suspects that the child has Treacher-Collins syndrome, a congenital disorder associated with malformation of structures that develop in association with the first branchial arch. Which of the following structures normally develops with the first branchial arch and could have been malformed to cause the hearing loss?

- A. Auditory tube
- B. Cochlea
- C. Malleus and Incus
- D. Vestibulocochlear nerve
- E. Stapes

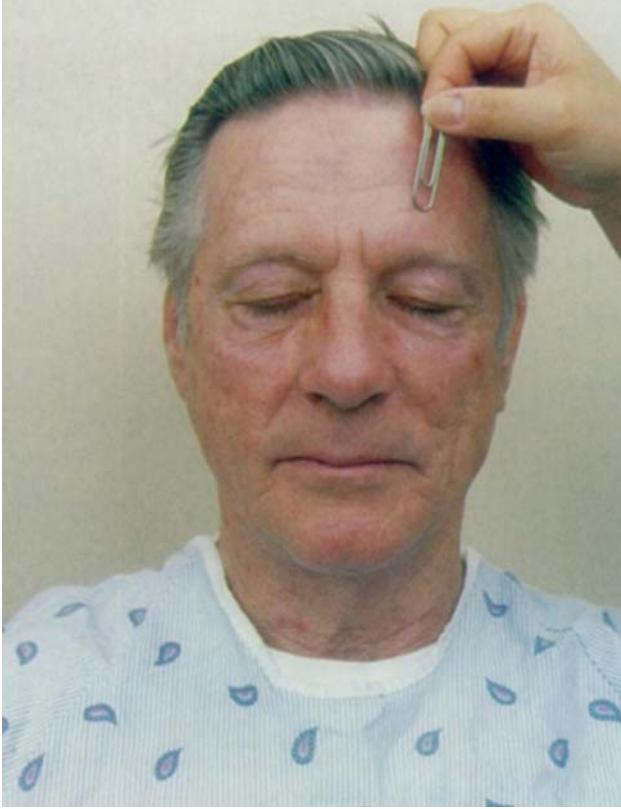
9. ____ Accidental removal of the parathyroid glands during thyroid surgery is the most frequent cause of hypoparathyroidism. The parathyroid glands are typically located on the posterior surface of the thyroid or within the substance of the gland but their location is variable. This variability is due to the multiple origin of the parathyroid glands from the

- A. First and second branchial pouches
- B. Second and third branchial pouches
- C. First and third branchial pouches
- D. Third and fourth branchial pouches
- E. Second and fourth branchial pouches

Head and Neck Embryology Question Key

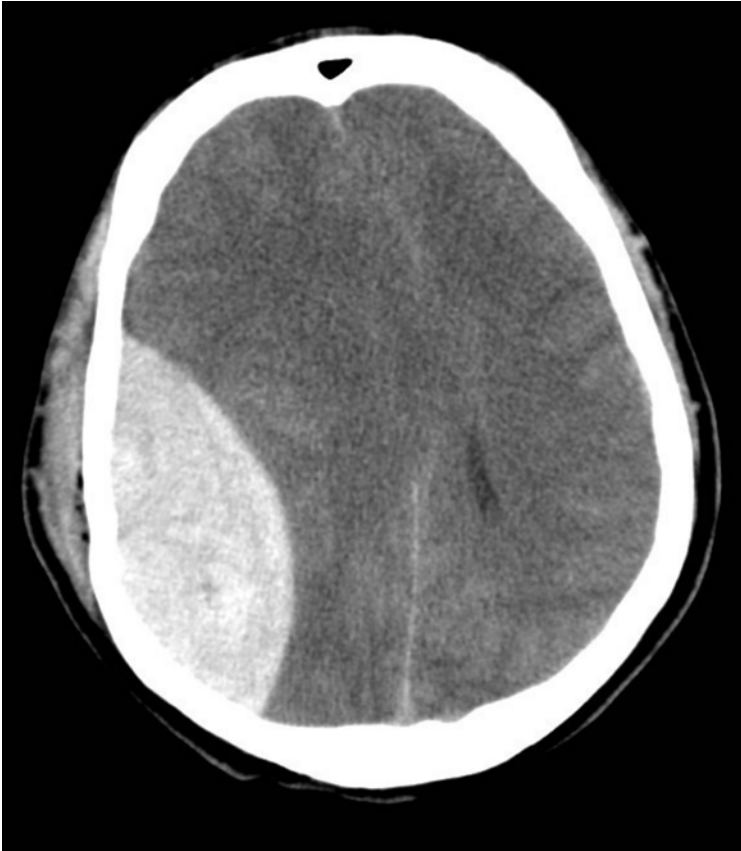
1. B
2. C
3. A
4. B
5. E
6. C
7. A
8. C
9. D

HEAD AND NECK ANATOMY PRACTICE QUESTIONS



1. ____ A patient complains that he has lost sensation on his face and that the skin of his face feels numb. The physician tests tactile acuity by touching the forehead (see photo above) and finds severe loss of sensation. Which of the following is the location of the sensory neuron cell bodies that innervate this area?

- A. Mesencephalic nucleus of V
- B. Semilunar (Trigeminal) ganglion
- C. Geniculate ganglion
- D. Ciliary ganglion
- E. Pterygopalatine ganglion



A person is in an automobile accident and gets struck on the side of the head. The patient refuses to be taken to the hospital and instead demands to simply go home and lie down for a while. Within hours, the person is rushed to the hospital after losing consciousness. The image above is a CT scan section at the level of the cranial cavity.

2. _____ The physician suspects that this is a hematoma that has resulted from tear of a vascular structure. Which of the following describes the type of hematoma and the vascular structure that was damaged?

- A. Subdural hematoma, ophthalmic artery
- B. Subdural hematoma, middle meningeal artery
- C. Epidural hematoma, ophthalmic artery
- D. Epidural hematoma, middle meningeal artery
- E. Epidural hematoma, deep temporal artery

3. _____ This artery is a branch of the

- A. Internal Carotid Artery
- B. Superficial Temporal Artery
- C. Occipital Artery
- D. Maxillary Artery
- E. Facial Artery



A patient sees a physician because the eyelid of her left eye is drooping and she is having double vision. Examination of the patient (photo above) shows ptosis of the left eyelid and deviation of the left eye when the patient is told to look straight ahead. Further examination demonstrates that pupil is dilated in the left eye.

4. _____ Which of the following nerves is likely to have been damaged?
- A. Trochlear
 - B. Abducens
 - C. Oculomotor
 - D. Facial
 - E. Ophthalmic division of the Trigeminal (V1).
5. _____ The ptosis is likely to be due to partial paralysis of which of the following muscles?
- A. Superior oblique
 - B. Levator Palpebrae Superioris
 - C. Frontalis
 - D. Superior Rectus
 - E. Orbicularis Oculi
6. _____ The pupil is dilated because the action of the dilator pupillae muscle is unopposed. Which of the following is the innervation of the dilator pupillae muscle?
- A. Sympathetic fibers
 - B. Facial nerve
 - C. Infraorbital nerve (V2)
 - D. Trochlear nerve
 - E. Optic nerve

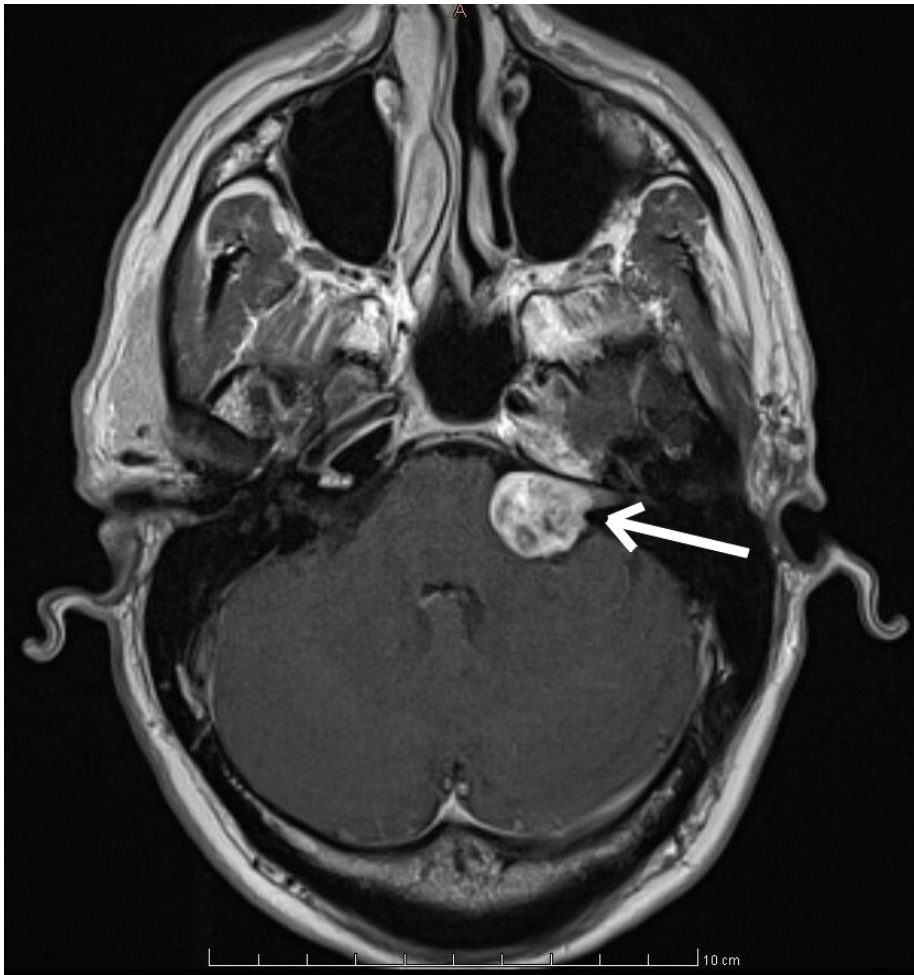
A teenager patient develops a pimple on the face lateral to the nose and scratches the sore. In time, the sore becomes infected but remains untreated. The patient then develops neurological symptoms and has the major complaint of 'blurred vision' which is diagnosed as Diplopia.

7. _____ The physician suspects that the infection has spread to a structure inside the cranial cavity. Which of the following is likely to be the structure and the route by which the infection has spread?

- A. Superior Sagittal sinus, 'bridging' veins
- B. Inferior Petrosal sinus, middle meningeal vein
- C. Cavernous sinus, ophthalmic veins
- D. Transverse sinus, mastoid veins
- E. Cavernous sinus, retromandibular veins

8. _____ The blurred vision is likely result from compromised function of which of the following?

- A. optic nerve (II)
- B. optic chiasm
- C. long ciliary nerves
- D. short ciliary nerves
- E. nerves to eye muscles (III, IV, VI)



9. _____ A 35-year-old male is referred to a neurologist because of hearing loss. The patient also states that he has begun experiencing episodes of facial weakness and drooping at the corner of the mouth. An MRI (imaged above) shows a mass in the posterior cranial fossa at the cerebellopontine angle. Further testing demonstrated that the patient had a number of other neurological and physical deficits. Which of the following would NOT be likely to be shown by this patient?

- A. decreased salivation
- B. facial paralysis
- C. loss of taste to the anterior 2/3 of the tongue
- D. decreased secretion of the lacrimal gland
- E. dilated pupil of the eye



10. ____ A 63-year-old aging rock musician fell off the stage during a concert tour and his head struck a large speaker in front of the stage. While he felt fine but bruised on the day of the fall, within the next week he developed a bad headache and was more verbally incoherent than usual. X rays taken at the hospital showed no fractures of the skull but there was evidence of papilledema. The image above is an MRI image from a series that was subsequently ordered. Damage to which of the following vessels is most likely to account for the symptoms?

- A. Internal Carotid Artery
- B. Internal Jugular Vein
- C. Vertebral Artery
- D. Superficial Temporal Artery
- E. 'Bridging' Vein or Venous Sinus

11. ____ A patient chronically suffers from excess production of mucous in the nasal cavity. He also complains that he often has tears in his eye. These symptoms could result from damage to the parasympathetic innervation of the mucous glands of the nose and the lacrimal gland. Damage to which of the following cranial nerves and associated ganglion could produce these symptoms?

- A. CN VII, Pterygopalatine ganglion
- B. CN IX, Otic ganglion
- C. CN III, Ciliary ganglion
- D. CN V, Semilunar ganglion
- E. CN VII, Submandibular ganglion

12. ____ Access to the circulatory system may be obtained in neonates by a needle placed into the skull at the Anterior fontanelle. Which of the following is the vascular structure that would be accessed in this procedure?

- A. Superior Sagittal sinus
- B. Inferior Sagittal sinus
- C. Sigmoid sinus
- D. Middle Meningeal vein.
- E. Cavernous sinus

13. ____ A patient complains that he has difficulty chewing and that part of his face feels numb. When asked to open his mouth, the jaw is observed to deviate toward the right. Damage to which of the following nerves could produced the jaw deviation?

- A. right Facial nerve
- B. left Trigeminal nerve
- C. right Trigeminal nerve
- D. left Facial nerve
- E. left Glossopharyngeal nerve



14. ____ A 64 year-old female is in the back seat of car that suddenly decelerates in an accident. She shows no acute injury but in the following days she begins having double vision. Examination of the patient shows that she is holding her head tilted (see photo above). Cranial nerve examination finds that she has difficulty moving her right eye downward, particularly from an adducted position. A head MRI is ordered to specifically image which the following cranial nerves?

- A. right cranial nerve III
- B. left cranial nerve IV
- C. right cranial nerve IV
- D. left cranial nerve III
- E. right cranial nerve VI

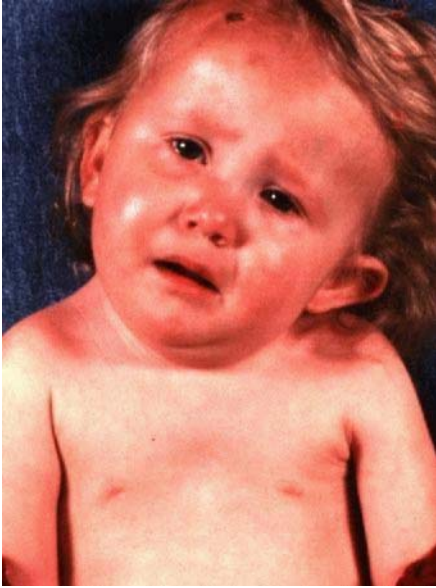
15. ____ A patient has difficulty in swallowing. Neurological tests show that the Vagus and Glossopharyngeal nerves are normal. Which other nerve that should be tested, as it also innervates a muscle of the soft palate and could produce the difficulty in swallowing?

- A. Transverse cervical nerve
- B. V (Trigeminal)
- C. XI (Accessory)
- D. VII (Facial)
- E. XII (Hypoglossal)



16. ____ A 19 year old suffers a violent blow to the nose during a fist fight. Over the following week, the person notices that a clear fluid persists in dripping from the nose, and goes to the local hospital emergency room. The physician orders a CT scan (image above) and finds a defect (arrow) in the floor of anterior cranial fossa. This defect is likely a fracture of which of the following bones?

- A. Maxillary bone
- B. Vomer
- C. Horizontal process of the frontal bone
- D. Greater wing of the sphenoid bone
- E. Cribriform plate of the ethmoid bone



17. _____ The parents of a small child notice that she appears to have a 'twisted' neck. When the child is brought to the pediatrician's office, the head is held so that the face is directed partially toward one shoulder (see photo above). The physician suspects that the child has a torticollis resulting from the contracture of a neck muscle. Contracture of which of the following muscles could cause this condition?

- A. Left Sternocleidomastoid muscle
- B. Right Sternocleidomastoid muscle
- C. Left Omohyoid muscle
- D. Left Sternothyroid muscle
- E. Left Digastric muscle



18. This is a photo a person posted on the web in which they are attempting to smile and raise their eyebrows. Which of the following would be an additional symptom shown by this person?

- A. Pain (ear ache) in person's right ear
- B. Sounds seem too loud in person's left ear
- C. Decreased taste sensation on right side
- D. Pupillary constriction in left eye
- E. Loss of sensation to skin of forehead on left side



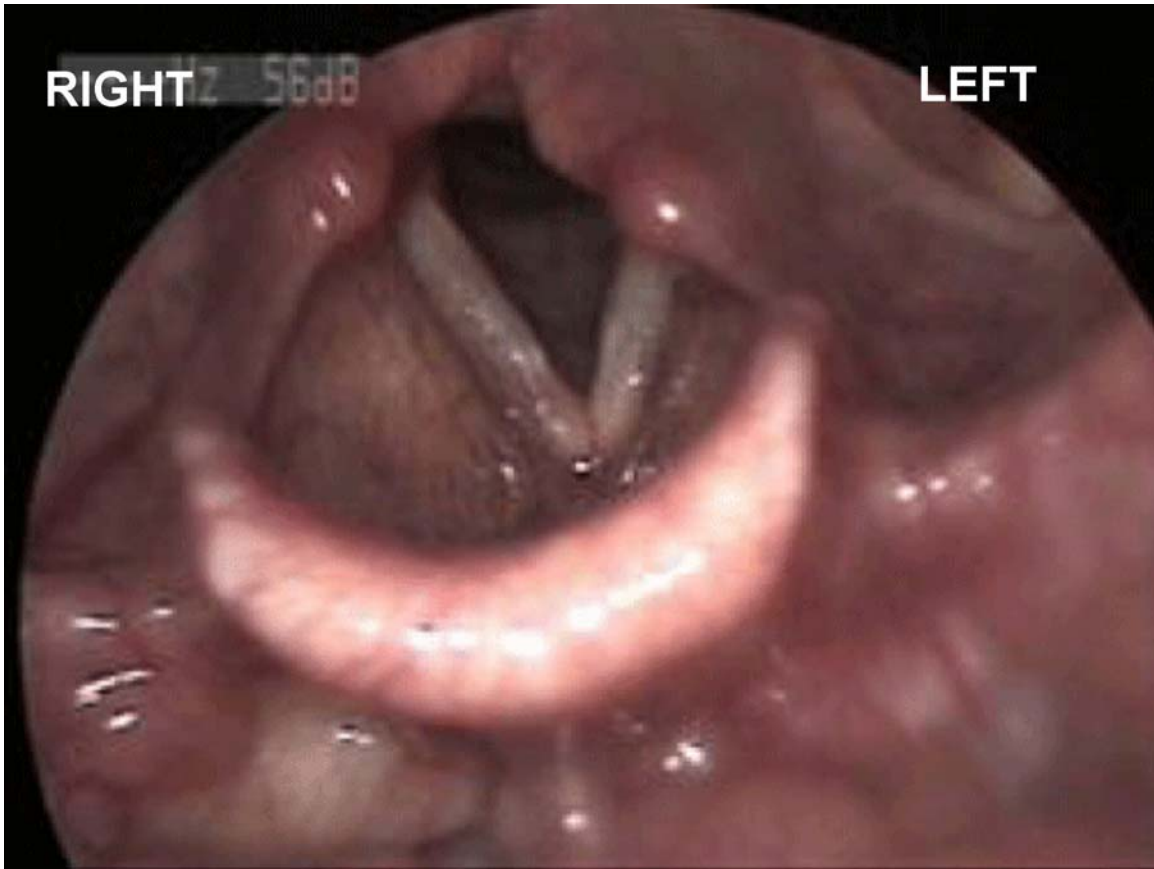
19. An 18-year-old female sees a physician because one of her eyes 'won't stay open' (photo above). Tests show that the patient's visual acuity and eye movements are normal. However, further tests show that pupil of the left eye is constricted (relative to right eye). These symptoms could be caused by a tumor at which of the following locations?

- A. at the Superior Orbital Fissure compressing the Oculomotor nerve.
- B. at the Internal Auditory meatus compressing the Facial nerve
- C. in the neck compressing the Sympathetic chain.
- D. at the Supraorbital foramen compressing the Supraorbital nerve.
- E. at the Inferior Orbital fissure compressing Infraorbital nerve.



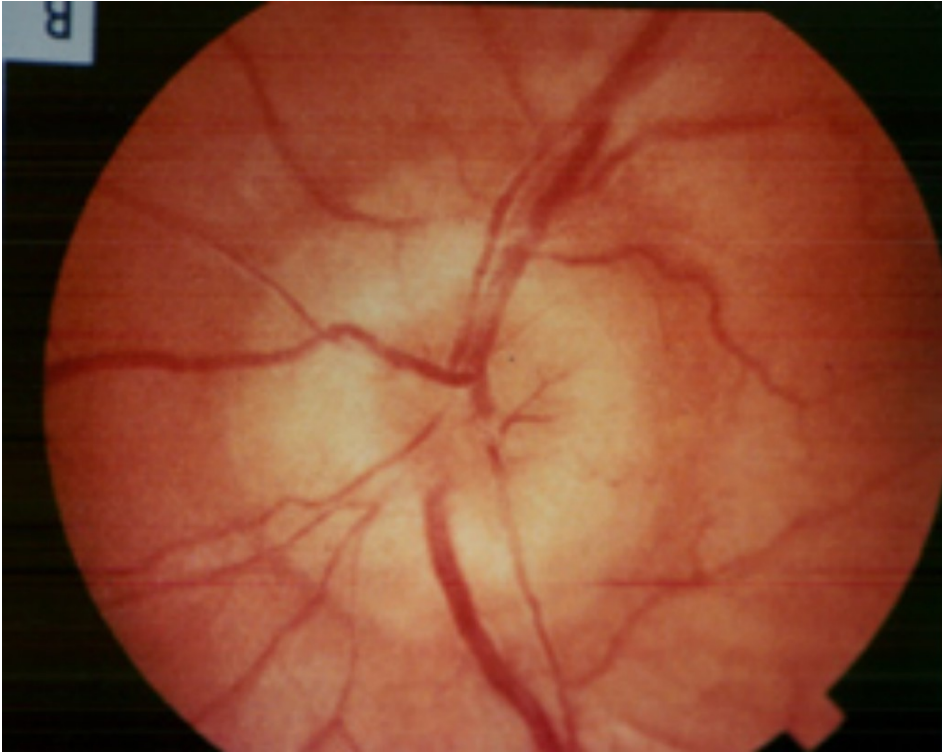
20. A patient complains that he is having difficulty speaking and that he is biting his tongue when chewing his food. The physician asks the patient to protrude his tongue (photo above). Other tests show that there is no loss of taste or touch sensation in the tongue. Damage to which of the following nerves could produce these symptoms?

- A. Right Lingual nerve
- B. Right Hypoglossal nerve
- C. Left Lingual nerve
- D. Left Hypoglossal nerve
- E. Left Glossopharyngeal nerve



21. A patient undergoes surgery for removal of thyroid nodules. The nodules are found to be noncancerous but post-operatively the patient has a 'hoarse' voice. Laryngoscopic examination (photo above) shows asymmetry in position of the vocal folds when the patient is told to breathe deeply. The physician suspects that this is due to damage of which of the following structures?

- A. Right Superior Laryngeal nerve
- B. Right Recurrent Laryngeal nerve
- C. Left Superior Laryngeal nerve
- D. Left Recurrent Laryngeal nerve
- E. Right Sympathetic chain



22. 49. An 85 year old woman complains of persistent headaches. Examination of the optic nerve with an ophthalmoscope (image above) shows bulging consistent with the occurrence of papilledema. The appearance is similar in both eyes. The physician suspects that this may be caused by increased intracranial pressure. Calcification of which of the following structures could cause this condition?

- A. choroid plexus
- B. pterygoid venous plexus
- C. denticulate ligaments
- D. emissary veins
- E. arachnoid villi

HEAD AND NECK SAMPLE QUESTIONS KEY

1. B
2. D
3. D
4. C
5. B
6. A
7. C
8. E
9. E
10. E
11. A
12. A
13. C
14. C
15. B
16. E
17. A
18. B
19. C
20. B
21. B
22. E

LOWER EXTREMITY PRACTICE QUESTIONS

1. ____ A skier went off a down hill course and caught one ski under a log. X ray after the accident showed that he had fractured the tibia. A cast was placed on the leg that went from the knee to the foot. When the cast was removed, the patient dragged his foot and was unable to lift it from the ground. This condition most likely resulted from pressure of the cast on which of the following nerves?

- A. Femoral
- B. Obturator
- C. Superficial peroneal
- D. Common peroneal
- E. Tibial

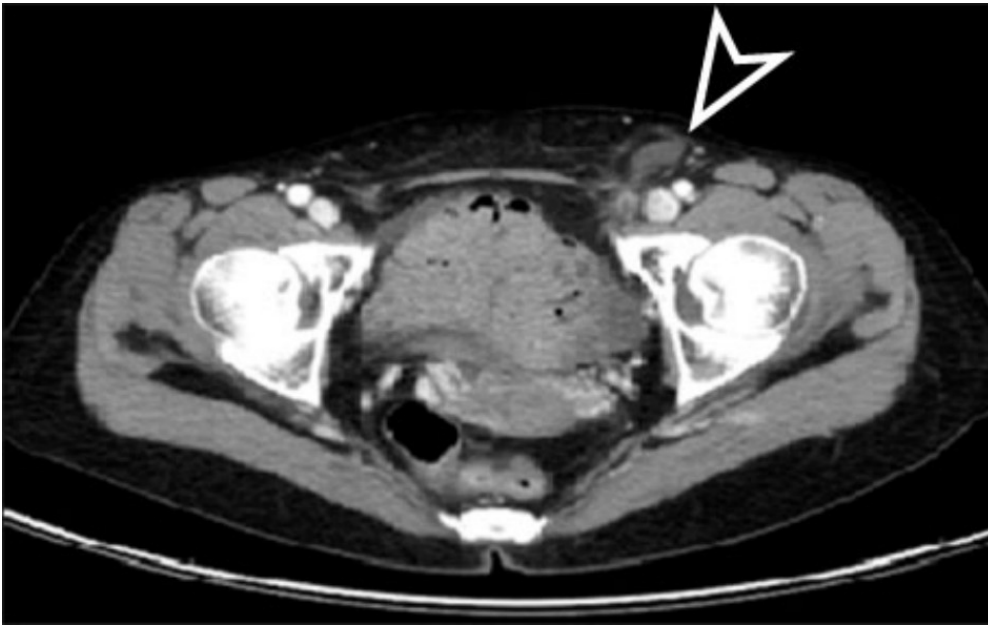


2. ____ A football player was tackled from the lateral side while attempting an end around run in a tie game. The foot on that leg was planted on the ground and the tackle was made by another player who weighed 312 pounds and was running at the rate of 3.5 miles per hour. MRI of the patient's knee (above) shows a tear in which of the following structures (note position of patella)?

- A. tibial collateral ligament
- B. fibular collateral ligament
- C. anterior cruciate ligament.
- D. posterior cruciate ligament.
- E. semitendinosus tendon

3. ____ A cross country runner was attempting to pass another runner in a race and stepped off the path. His foot landed on a small stump resulting in hyperinversion of the foot. Subsequent x-ray showed no fractures of the tarsal bones, distal tibia or fibula but the ankle was swollen and painful. Which of the following structures was (were) most likely to have been damaged?

- A. deltoid ligament.
- B. long plantar ligament.
- C. spring ligament.
- D. calcaneofibular and anterior talofibular ligaments.
- E. calcaneofibular and posterior talofibular ligaments.



4. ____ A 63 year old grandmother lifted her 7 year old grandson and felt a sharp pain in her left thigh. She was admitted to the emergency room and examination by palpation detected a bulge below the level of the inguinal ligament on the left side. MRI imaging was performed. A transverse section (image above) showed structures projecting from the anterior thigh on the left. The fascial layer that is immediately overlying the bulge is continuous with the

- A. fascia of the Internal Oblique muscle
- B. transversalis fascia
- C. Camper's fascia
- D. Rectus sheath
- E. Iliotibial tract



5. ____ A runner accelerated toward the finish line of a race and suddenly felt a pop on the back of his thigh. He then fell down in excruciating pain. Xray of the pelvis (image above) showed that a small piece of bone had been fractured and avulsed by muscle tendons. This piece of bone is part of which of the following structures?

- A. pubis
- B. ischial spine
- C. ischial tuberosity
- D. acetabulum
- E. ilium

6. ____ Following hip replacement surgery on the left side of the body, an adult patient complains that he has difficulty walking. He is also very unstable when standing if he lifts his right leg. When the patient is observed while walking in a physician's office, the pelvis sways considerably and tilts toward the right when the right leg is lifted. Which of the following nerves was likely to have been damaged in the hip surgery?

- A. Left Inferior Gluteal Nerve
- B. Right Inferior Gluteal Nerve
- C. Left Sciatic Nerve
- D. Left Superior Gluteal Nerve
- E. Right Superior Gluteal Nerve

7. ____ While on a hunting trip, a teenage patient falls and the hunting knife in his belt penetrates his upper thigh. After being rushed to an emergency room, inspection of the wound shows a deep cut 1.5 inches below the inguinal ligament that is bleeding profusely. The physician suspects that the femoral artery has been severed and ligates the Femoral artery immediately below the inguinal ligament. The lower limb is still able to receive a sufficient supply of arterial blood because of which of the following anastomoses.

- A. Inferior Gluteal artery with the Medial and Lateral Femoral Circumflex arteries.
- B. Internal Pudendal artery with the Medial and Lateral Femoral Circumflex arteries.
- C. Superficial Circumflex Iliac artery with the Inferior Gluteal artery.
- D. Inferior Epigastric artery with the Medial and Lateral Femoral Circumflex arteries.
- E. Inferior Epigastric artery with the Inferior Gluteal artery.



8. ____ A 76-year-old woman is walking down the stairs of her house and falls. She is in pain and has difficulty walking but she does not see a physician. After one week, the pain has become unbearable and she goes to the emergency room of her local hospital. An xray of the thigh (image above) shows a fracture in the neck of the femur and degenerative changes in the femoral head. The blood supply from which of the following arteries is likely to be compromised by the fracture and result in insufficient blood supply to the head of the femur?

- A. Lateral Femoral Circumflex artery
- B. Medial Femoral Circumflex artery
- C. Inferior Epigastric artery
- D. Inferior Gluteal artery
- E. Superficial External Pudendal artery



9. ____ A carpenter is working on a building site and a large beam falls on the lateral side of his foot. An xray image of the foot (above) shows fractures to the lateral bones of the foot. Healing of the fracture indicated by the arrow at right could be complicated because the tendon of leg muscle inserts at this point. Which of the following muscles inserts at the point indicated by the right arrow (Note: not in review sheet but this was a question on the last board exam)?

- A. Tibialis posterior
- B. Peroneus longus
- C. Tibialis anterior
- D. Peroneus brevis
- E. Extensor digiti minimi



10. ____ A patient complains that the medial side of the sole of his foot is painful when he stands or walks. The xray of his foot (above) shows a substantial decrease in the height of the medial arch. Weakness in which the following structures could produce this condition?

- A. Plantar calcaneonavicular ligament
- B. Long plantar ligament
- C. Anterior talofibular ligament
- D. Deltoid ligament
- E. Posterior talofibular ligament



11. ____ A young female is in a serious automobile accident that occurs as a head-on collision. She is taken to an emergency room and physical examination shows an asymmetry in the position of the greater trochanter of the femur. The trochanter on right is elevated relative to the left sides. The position of the leg and foot is also abnormal on the right side. Xray of the hip is taken (image above) and shows no fractures in the femur on either side. Which of the following describes the position of the leg and foot on the right side?

- A. foot and leg are rotated laterally
- B. foot and leg are rotated medially
- C. foot and leg are flexed
- D. foot and leg are extended
- E. foot is everted

LOWER EXTREMITY ANSWER KEY

1. D
2. C
3. D
4. B
5. C
6. D
7. A
8. B
9. D
10. A
11. B