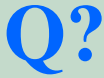


# Glossary

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# Neuroanatomy

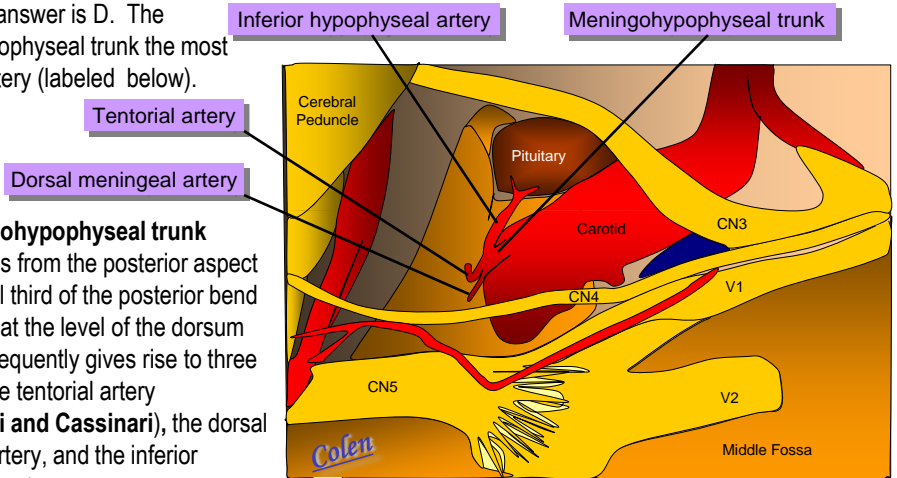
- Which of the following statements is INCORRECT regarding the anatomy of the cavernous carotid artery?
  - A. The inferior hypophyseal artery is most commonly a branch of the meningohypophyseal trunk.
  - B. The inferior hypophyseal artery passes medially to the posterior pituitary capsule.
  - C. Persistent trigeminal arteries can also originate from the posterior vertical segment of the cavernous ICA and pass posteriorly through the posterior wall of the sinus to join the basilar artery between the origin of the superior and anterior inferior cerebellar arteries.
  - D. The tentorial artery, or the artery of Bernasconi and Cassinari, is the most inconstant branch of the meningohypophyseal trunk.

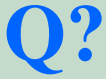


# A.

# Neuroanatomy

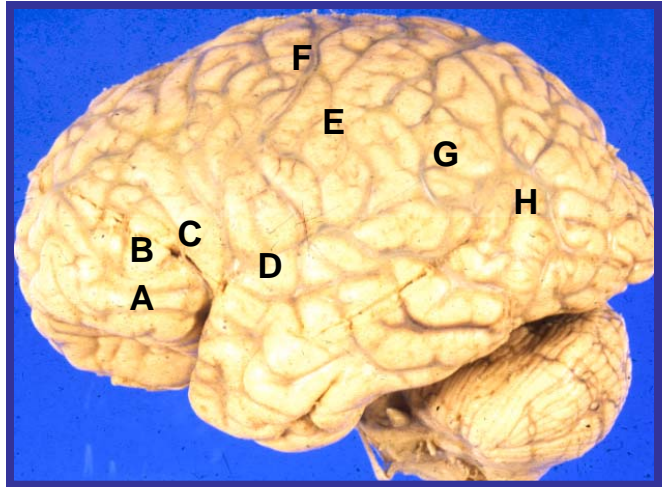
- The correct answer is D. The meningohypophyseal trunk the most **constant** artery (labeled below).
- The **meningohypophyseal trunk** usually arises from the posterior aspect of the central third of the posterior bend of the artery at the level of the dorsum sellae and frequently gives rise to three branches: the tentorial artery (**Bernasconi and Cassinari**), the dorsal meningeal artery, and the inferior hypophyseal artery.





# Neuroanatomy

- MATCH: Cortical neuroanatomy
1. Sylvian fissure
  2. Rolandic fissure
  3. Pars triangularis
  4. Pars opercularis
  5. Pars orbitalis
  6. Supramarginal gyrus
  7. Angular gyrus



Colen

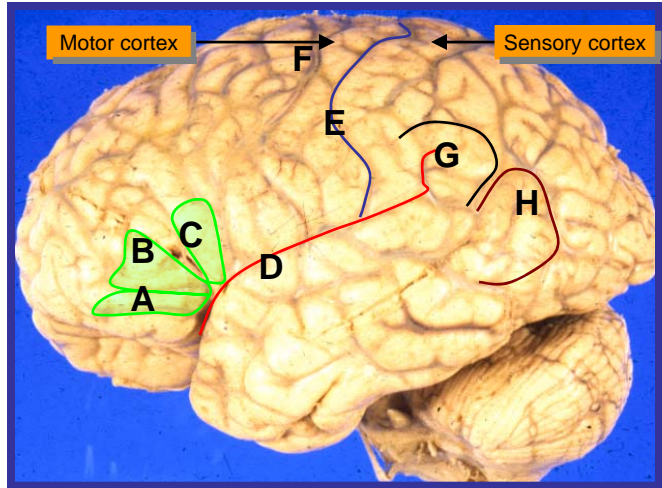


# A.

# Neuroanatomy

- Cortical neuroanatomy
  1. D, Sylvian fissure
  2. E, Rolandic fissure
  3. B, Pars triangularis
  4. C, Pars opercularis
  5. A, Pars orbitalis
  6. G, Supramarginal gyrus
  7. H, Angular gyrus
- F is the precentral sulcus.

*Colen*



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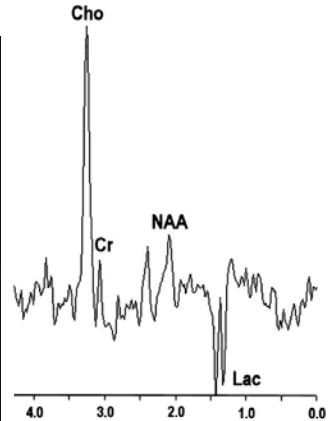
# Q?

# Neuroradiology

- What is the most likely diagnosis?
  - A. Low grade glioma
  - B. Pleiomorphic xantho-astrocytoma
  - C. High grade glioma
  - D. None of the above



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# A.

# Neuroradiology

**BOARD FAVORITE!**

- The correct answer is C, high grade glioma.
- **N-acetylaspartate (NAA)** is predominantly located in **neurons** and is thus decreased in all neoplasms that cause the neurons to be displaced or replaced with malignant cells. Findings of numerous studies have demonstrated **decreased NAA values in glial** neoplasms.
- **Choline (Cho)** peak contains contributions from glycerophosphocholine, phosphocholine, and phosphatidylcholine, components that are thought to **reflect cellular membrane density and turnover**. As in any process that leads to hypercellularity and increased membrane proliferation, the **Cho value is consistently elevated in gliomas**.
- **Lactate (Lac)** indicates that cellular respiration has shifted from the oxidative metabolism of carbohydrates to nonoxidative metabolism. Increased reliance on **anaerobic glycolysis** is found in highly malignant tumors.



# Q?

# Neuroradiology

- This MRI of the brain is most suggestive of:
  - A. Iron deposition
  - B. Macrocrania
  - C. Hypoxemia
  - D. Generalized atrophy
  - E. Butterfly glioma



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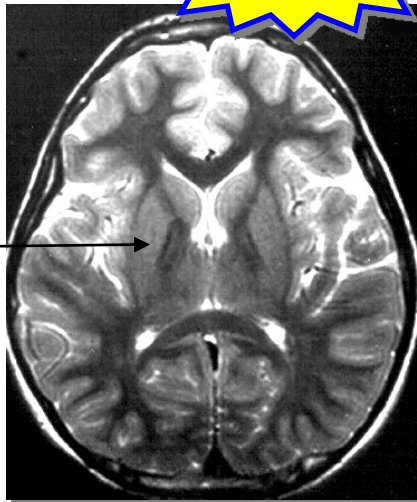
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# A.

# Neuroradiology

**BOARD FAVORITE!**

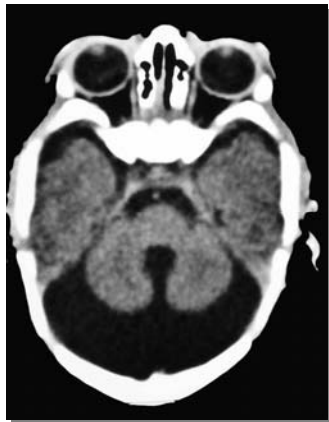
- The correct answer is A, iron deposition.
- **Hallervorden-Spatz syndrome**- Deposition of iron especially **globus pallidus** & retina
- Dystonia, rigidity and neurobehavioral changes
- MRI: Globus pallidus on T2-weighted images
- **"Eye-of-the-tiger"** sign
- **Central** region of **hyperintensity**
  - Primary tissue insult
  - Produces edema
- Surrounding hypointensity
  - Region high in iron
  - May be 2° process





# Neuroradiology

- An 8 month old infant is brought to your clinic because the parents feel that her milestones are delayed. Her head CT is shown on the right.
- Which of the following is the MOST accurate statement regarding this condition?
  - A. Jaundice is quite common.
  - B. After 1 year of age, these children rarely have new complications.
  - C. Incidence of mental retardation associated with this condition is 41-71%.
  - D. Hydrocephalus is rarely seen in patients greater than one year old.



# A.

# Neuroradiology

- The correct answer is C, Incidence of **mental retardation** associated with this condition is **41-71%**.
- This CT head shows **Dandy-Walker malformation (DWM)**- a malformation associating hypoplasia of the vermis, pseudocystic fourth ventricle, upward displacement of the tentorium, torcular and lateral sinuses and antero-posterior enlargement of the posterior fossa.
- Children **more than 1 year of age** commonly present with **developmental delay** and **symptoms of elevated intracranial pressure**.





# Neurobiology

- The metopic suture generally ossifies during the:
  - A. First year of life
  - B. Second year of life
  - C. Third year of life
  - D. Fourth year of life

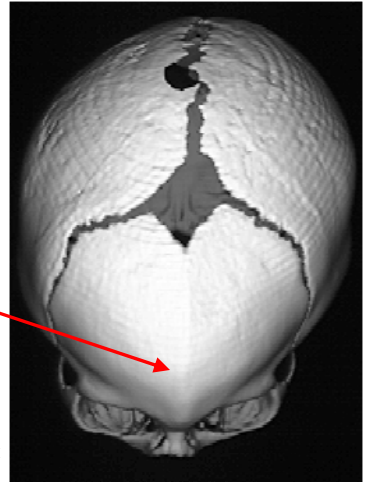


# A.

# Neurobiology

- The correct answer is B.
- The metopic suture will generally fuse in a child between 3 and 9 months of age. Ossification occurs after the closure during the second year of life.
- Closure of the metopic suture starts under normal circumstances at the end of the first year and may last until the end of the second year
- The premature arrest of growth of the **metopic suture synostosis** may present as a spectrum of manifestations including a **keel-shaped forehead**, **retruded orbital rims** and **hypotelorism**.

*Colen*



1. Collman, H., Forensen, N., Kraus, J. Consensus: Trigenocephaly. Child Nerv Syst. 1996; 12:664-668
2. H.L. Vu, J. Panchal, E.E. Parker, N.S. Levine, P. Francel. The timing of physiologic closure of the metopic suture: a review of 159 patients using reconstructed 3D CT scans of the craniofacial region. The Journal of Craniofacial Surgery. 2001; 12(6):527-32.
3. Yeomans Neurological Surgery 5th Ed. Editor Richard Winn, 2003. p. 3300-01



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# Neurobiology

- Choose the MOST accurate statement regarding the physiology of an action potential:
  - A. Voltage-gated potassium channels (also called delayed rectifier potassium channels) have a delayed response, such that potassium continues to flow out of the cell and initiate depolarization.
  - B. Hyperpolarization is caused by  $K^+$  influx into a cell.
  - C. Closing of voltage-gated potassium channels is both voltage- and time-dependent.
  - D. Depolarization is caused by  $Na^+$  efflux from a cell.

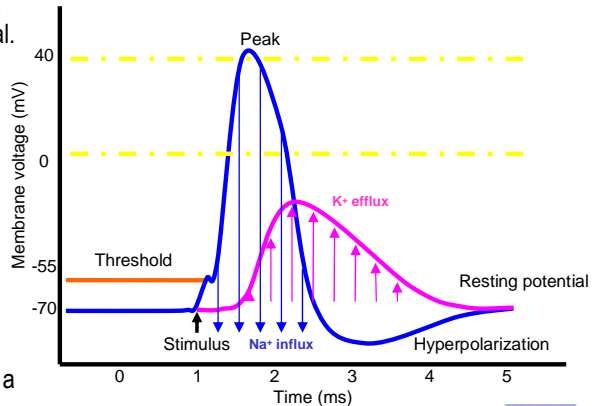


# A.

# Neurobiology

BOARD FAVORITE!

- The correct answer is C. Closing of voltage-gated **potassium channels** is both **voltage- and time-dependent**. As potassium exits the cell, the resulting membrane repolarization initiates the closing of voltage-gated potassium channels.
- These channels do not close immediately in response to a change in membrane potential. Rather, voltage-gated potassium channels (also called **delayed rectifier potassium channels**) have a delayed response, such that potassium continues to flow out of the cell even after the membrane has fully repolarized. Thus the membrane potential dips below the normal resting membrane potential of the cell for a brief moment; this dip of **hyperpolarization** is known as the undershoot.
- Hyperpolarization is caused by **K<sup>+</sup> efflux** from a cell.
- Depolarization is caused by **Na<sup>+</sup> influx** into a cell.



Colen





# Neurobiology

- During gastrulation the formation of the notochordal process begins from cells invaginating through:
  - A. The notochord
  - B. Hensen's node
  - C. The caudal eminence
  - D. The uncinat process



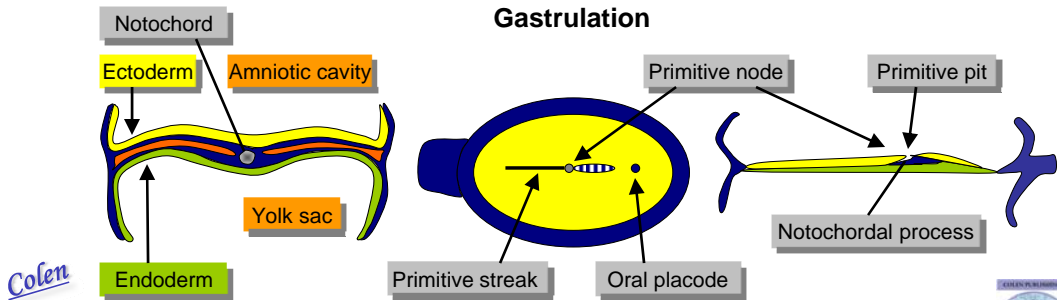
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# A.

# Neurobiology

**BOARD FAVORITE!**

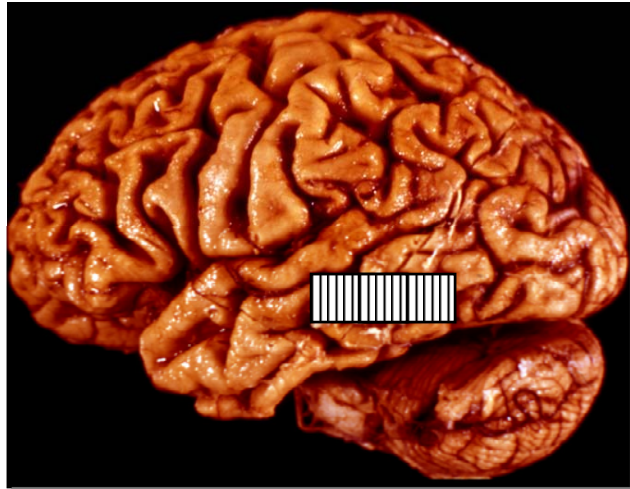
- The correct answer is B, Hensen's node.
- **Hensen's node (primitive node)** is the regional thickening of cells anterior of the primitive streak through which gastrulating cells migrate anteriorly to form tissues in the future head and neck. Hensen's node is also responsible for the secretion of cellular signals essential to gastrulation- including **fibroblast growth factors, sonic hedgehog, and retinoic acid**. Differential secretion of these factors by the node also causes development of the **right-left axis** in the embryo.



# Q?

# Neuropathology

- This gross brain specimen shows atrophy that is consistent with:
  - A. Multiple sclerosis
  - B. Pick's disease
  - C. Alzheimer's disease
  - D. Acute cerebral infarction



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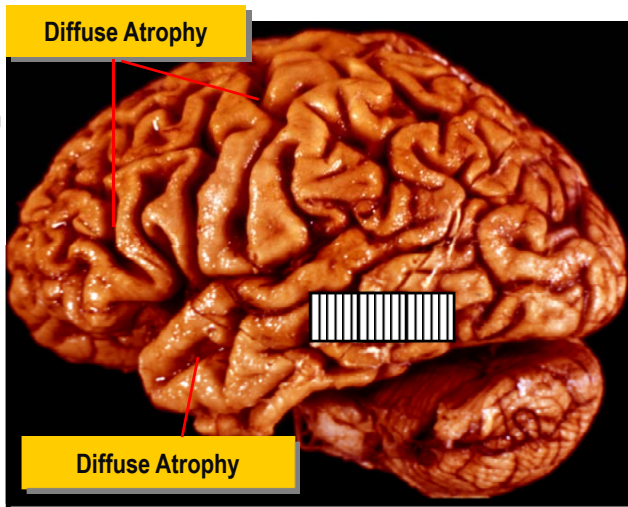
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# A.

# Neuropathology

- The correct answer is Alzheimer's disease.
- **Alzheimer's disease** is the most common dementing illness in adults, characterized by progressive dementia over several years. There is increased frequency with increasing age and in familial cases, usually earlier onset.
- Note the **diffuse brain atrophy of Alzheimer's disease**, unlike **Pick's disease** which has mostly **frontal lobe atrophy**.
- **Risk is increased in Down's syndrome (BOARD FAVORITE).**

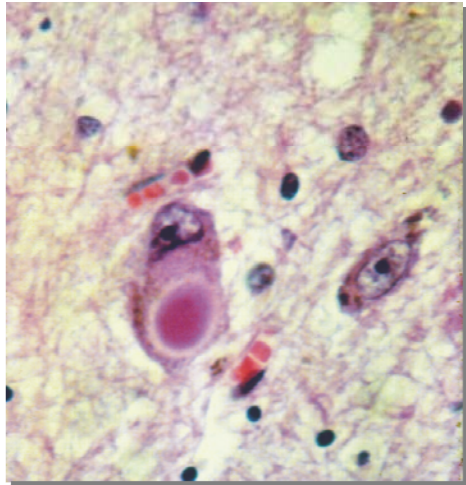
*Colen*



# Q?

# Neuropathology

- Which of the following is NOT a characteristic of the following inclusion body?
  - A. Intracytoplasmic
  - B.  $\alpha$ -synuclein immunoreactive
  - C. Tau-protein immunoreactive
  - D. Ubiquitin immunoreactive



*Colen*

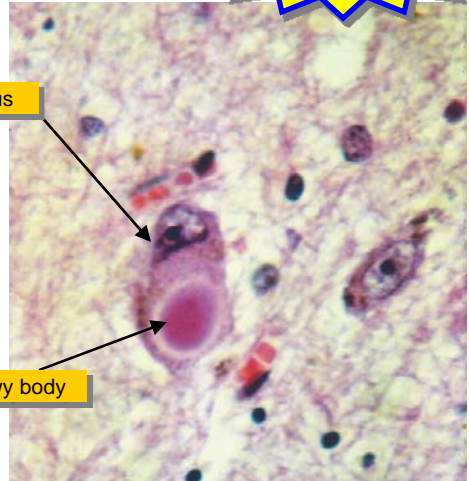


# A.

# Neuropathology

BOARD FAVORITE!

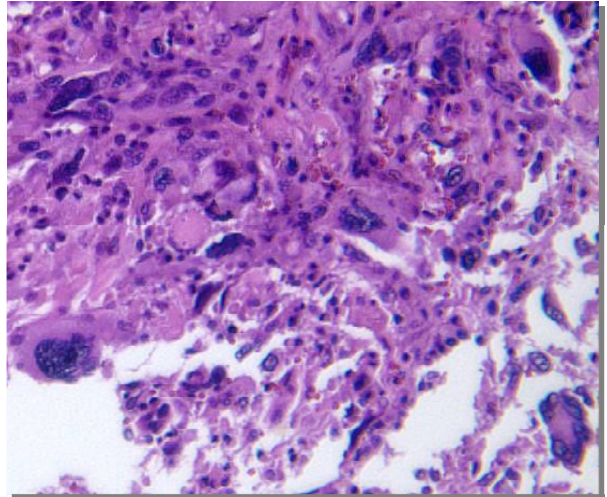
- The correct answer is C, tau-protein immunoreactive.
- **Lewy bodies** are intracytoplasmic inclusions, stain for **ubiquitin and  $\alpha$ -synuclein**, but NOT tau protein. Alpha-synuclein is normally soluble and predominantly a presynaptic neuronal protein of unknown function (possible function as a molecular chaperone in the formation of SNARE complexes), but can also be found in glial cells.
- **Neurofibrillary tangles** are immunoreactive for **tau-protein**.



# Q?

# Neuropathology

- This brain tumor specimen is consistent with:
  - A. Gemistocytic astrocytoma
  - B. Pituitary adenoma
  - C. Pilocytic astrocytoma
  - D. Giant cell glioblastoma
  - E. Oligodendroglioma



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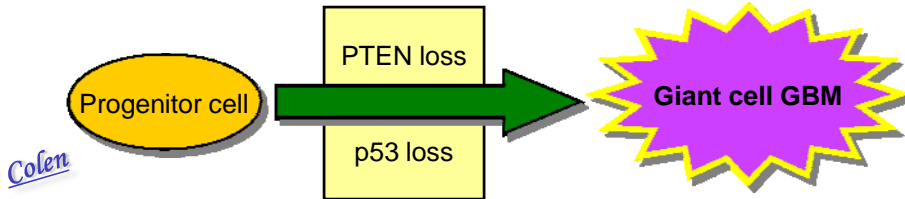
# A.

# Neuropathology

**BOARD FAVORITE!**

- The correct answer is D, giant cell glioblastoma (GBM).
- **Giant cell GBM** has numerous **multinucleated giant cells** plus the **4 - typical features of classic GBM: nuclear pleomorphism, endothelial hyperplasia, mitotic activity (MIB-1, Ki-67), and central necrosis** surrounded by viable tumor nuclei giving appearance of palisading which is called **pseudopalisading**. **Necrosis** is found in glioblastoma multiforme but **NOT anaplastic astrocytoma**.
- **Molecular Pathway to Giant cell GBM**

Arise de novo like primary GBM



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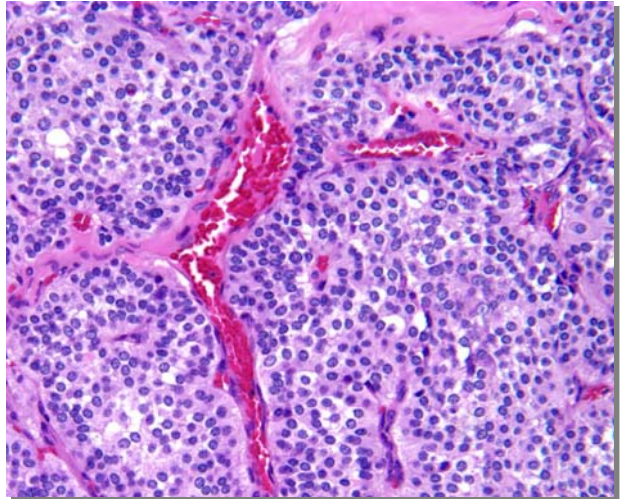


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# Neuropathology

- This brain tumor specimen is consistent with:
  - A. Gemistocytic astrocytoma
  - B. Paraganglioma
  - C. Craniopharyngioma
  - D. Epidermoid
  - E. Giant cell glioblastoma



# A.

# Neuropathology

**BOARD FAVORITE!**

- The correct answer is B, **paraganglioma**.
- **Paragangliomas (aka chemodectomas)** arise from the **glomus cells** (special chemoreceptors located along blood vessels that have a role in regulating blood pressure and blood flow) and are derived from the embryonic **neural crest**.
- **Secretory granules** may contain many neuropeptide hormones including adrenocorticotrophic hormone (ACTH), **serotonin**, **catecholamines**, and dopamine.
- Microscopy demonstrates **clusters “zellballen” of epithelioid** (chief) cells and are invested in a highly vascular capillary stroma. Histologic criteria does not predict their malignant potential. **Malignancy** is determined by the **presence of metastasis**.
- There are 4 tumor types:
  - **Carotid body-** arise from the **carotid bifurcation**
  - **Glomus jugulare-** arise from the **superior** vagal ganglion
  - **Glomus tympanicum-** arise from the **auricular** branch of the vagus nerve
  - **Glomus intravagale-** arise from the **inferior** vagal ganglion.





# Neurosurgery

- The 3 column theory classifies the burst fracture as:
  - A. Stable
  - B. Unstable
  - C. Affecting 1 column
  - D. Affecting 2 or more columns
  - E. B + D

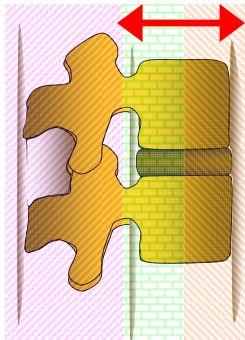


# A.

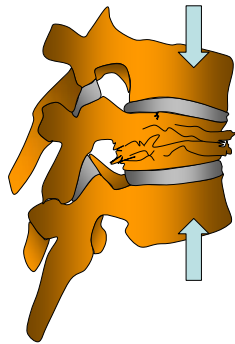
# Neurosurgery

- The correct answer is E.
- The image to the right presents a burst fracture and the three column theory classification.
- In the **burst fracture**, both the **anterior** and **middle** column are affected. This type of fracture is **considered as unstable**.

*Colen*



Three column theory



Burst Fracture



# Neurosurgery

- Which of the following is NOT characteristic of anterior interosseous syndrome?
  - A. Extension of the distal interphalangeal (DIP) joint of index finger.
  - B. Increased flexion of the metacarpal phalangeal (MCP) joint of thumb.
  - C. Weakness of forced supination of forearm with elbow flexed.
  - D. Sensory changes in the index finger.

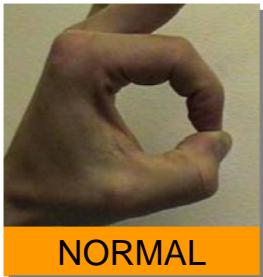


# A.

# Neurosurgery

**BOARD FAVORITE!**

- The correct answer is D, sensory changes in the index finger.
- There are **NO sensory changes** with anterior interosseous syndrome.
- Anterior Interosseous Syndrome (AIS) is a type of **median nerve entrapment syndrome** (anterior interosseous branch of the median nerve). Nerve fibers carried in this branch are purely motor and innervate the **flexor digitorum profundus 1 and 2, flexor pollicis longus, and pronator quadratus**. **Motor skills are affected** by this syndrome, such as the “**pinch sign**” (inability to form a circle with the index finger and thumb). Sensory perception is **not** affected.



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# Neurology

- Which of the following is NOT a common cause of Marcus-Gunn pupil:
  - A. Retinal detachment
  - B. Superior colliculus lesion
  - C. Optic nerve atrophy
  - D. Lateral geniculate nucleus



# A.

# Neurology

- The correct answer is B, superior cerebellar peduncle lesion.
- The **Marcus-Gunn pupil** is also known as the **pupillary escape reflex**, and is a relative **afferent pupillary defect**. The mechanism by which this phenomenon occurs is thought to be by a reduction in the number of fibers subserving the light reflex on the affected side.
- **Test by the swinging-flashlight test** -the patient's pupil dilates instead of constricting when the light swings from the unaffected (good) eye to the affected (bad) eye due to lack of light transmission. Both eyes constrict when the light shines in the unaffected (good) eye.
- A lesion of an optic tract may result in a slight suppression of the pupillary light reflex; lesions at the level of the **lateral geniculate nucleus**, or in the visual radiations result in a **contralateral homonymous hemianopsia** with no change in the pupillary light reflex.

# Q?

# Neurology

- 30 year-old female presents with a history of shunted pseudotumor cerebri, small ventricles, now complains of worsening headache. Fundoscopic exam is shown below. Which of the following statements is TRUE?

- A. It is best treated with Diamox.
- B. Likely has shunt failure and stiff ventricles.
- C. Likely has venous thrombosis.
- D. There is no cause for concern about this headache.



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# A.

# Neurology

- The correct answer is B, likely have shunt failure and stiff ventricles. A low index of suspicion should be present when evaluating a patient with shunted pseudotumor cerebri (PTC). Approximately 40% of shunts placed in children will fail in the 1st year and almost all children will require shunt revision at some point. In PTC shunt malfunction may result in blindness.
- PTC is encountered most frequently in young, overweight women between the ages of 20 and 45. Headache is the most common presenting complaint, occurring in more than 90 percent of cases. Dizziness, nausea, and vomiting may also be encountered, but typically there are no alterations of consciousness or higher cognitive function.
- It is defined clinically by four criteria: (1) elevated intracranial pressure as demonstrated by lumbar puncture; (2) normal cerebral anatomy, as demonstrated by neuroradiographic evaluation; (3) normal cerebrospinal fluid composition; and (4) signs and symptoms of increased intracranial pressure, including papilledema.





# Neurology

- Fibrillations may be seen on electromyography how soon after axon transection ?
  - A. Immediately
  - B. 2 to 8 days
  - C. 10 to 25 days
  - D. 20 to 35 days
  - E. 30 to 40 days



# A.

# Neurology

**BOARD FAVORITE!**

- The correct answer is C, 10 to 25 days.
- **Fibrillation potentials** are caused by injury to a **single** nerve fiber, are biphasic or **triphasic**, and last **1-5 milliseconds**. Fibrillations are seen on electromyography (EMG) **10 to 25 days** after axon death. They are associated with anterolateral sclerosis, poliomyelitis, some myopathies (polymyositis) or peripheral nerve injury (e.g. transection)
- Fibrillation potentials **are not seen thru the skin**, whereas fasciculation potentials are seen through the skin (quivering muscle).
- **Not seen** in neuromuscular junction defects (myasthenia gravis, Lambert-Eaton)
- **Fasciculations** are caused by the involuntary activity of a **group of fibers** (motor unit), are **polyphasic**, and last **5-15 milliseconds**. They are associated with anterolateral sclerosis, poliomyelitis or radiculopathy.





# Neurocritical Care

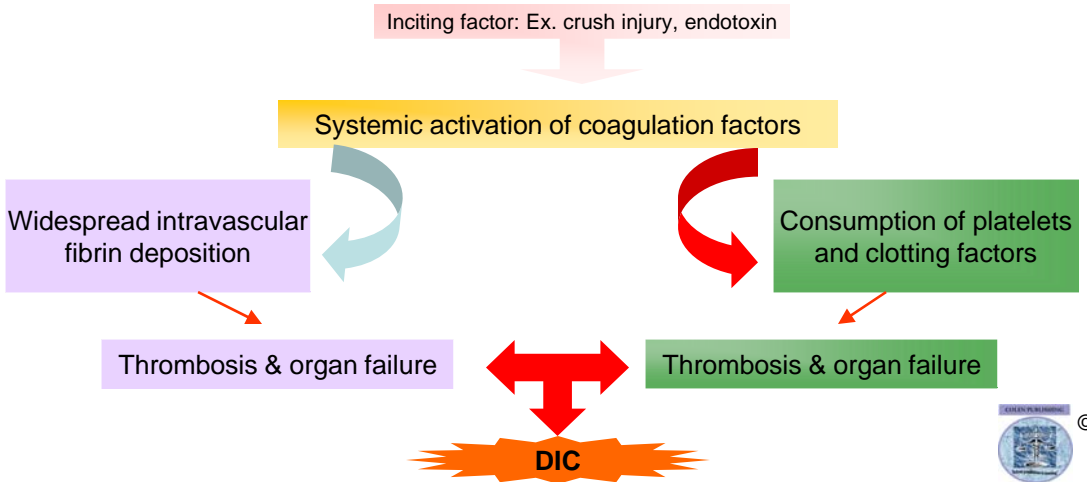
- What is the hallmark of disseminated intravascular coagulation (DIC) as a primary disorder?
  - A. Decreased fibrin-split products
  - B. Increased factor X
  - C. Low platelets
  - D. Decreased d-dimer



# A.

# Neuro-Critical Care

- The correct answer is C, low platelets. Coagulation factors are also decreased and fibrin-split products and d-dimers increase.





# Neurocritical Care

- Tardive dyskinesia is a side effect mostly seen with the use of which antipsychotic drug?
  - A. Olanzapine (Zyprexa)
  - B. Risperidone (Risperdal)
  - C. Haloperidol (Haldol)
  - D. Ziprasidone (Geodon)



# A.

# Neurocritical Care

**BOARD FAVORITE!**

- The correct answer is B, haloperidol.
- Tardive dyskinesia is mostly seen in older neuroleptic drugs, such as **Haldol** and the **typical** antipsychotics.
- Newer atypical antipsychotics such as olanzapine and risperidone appear to cause tardive dyskinesia somewhat less frequently.
- **Tardive dyskinesia** is due to hypersensitivity of the dopamine receptor. It occurs in 15-30% of patients receiving treatment with antipsychotic neuroleptic medications for 3 months or longer. It is characterized by the urge to perform repetitive, involuntary, purposeless movements. Features of the disorder may include grimacing, tongue protrusion, lip smacking, and rapid eye blinking. Rapid movements of the arms, legs, and trunk may also occur. Impaired movements of the fingers may appear as though the patient is playing an invisible guitar or piano.





# Neurocritical Care

- Which of the following medical treatment options for essential tremor is most effective?
  - A. Alcohol, primidone,  $\beta$ -blockers
  - B. Adrenergics, methadone, anticholinergics
  - C. Alcohol, naltrexone, antabuse
  - D. Alcohol, propranolol, naltrexone



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To view the answer to this question purchase  
your set here: