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Pocket Guide for Emergent Head CT Interpretation

1. Become familiar with normal neuroanatomy at **key levels** of the head.

A.

Figure 1 Posterior Fossa

B.

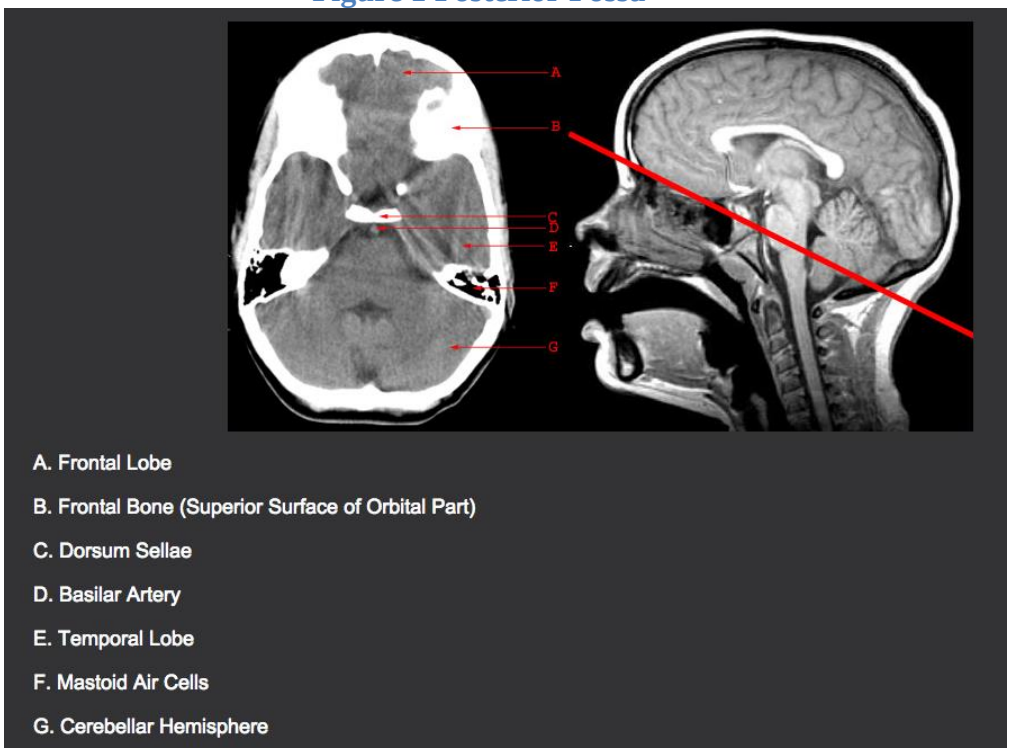


Figure 2 High Pons 1st Key Level

C.

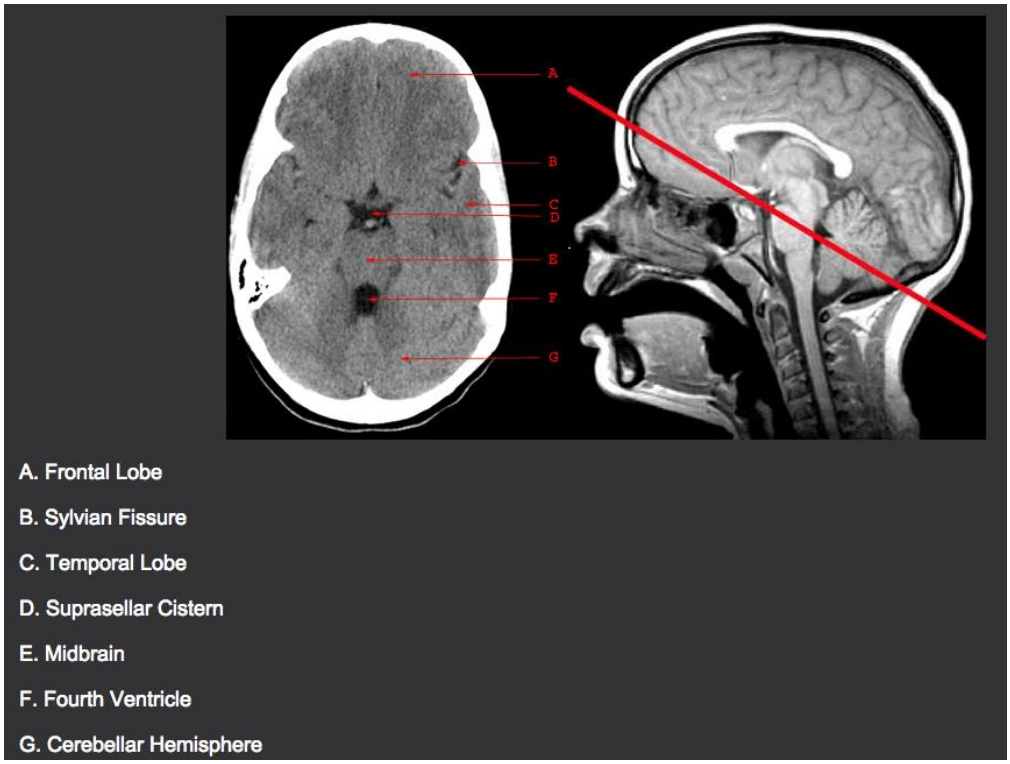


Figure 3 Cerebral Peduncles 2nd Key Level

D.

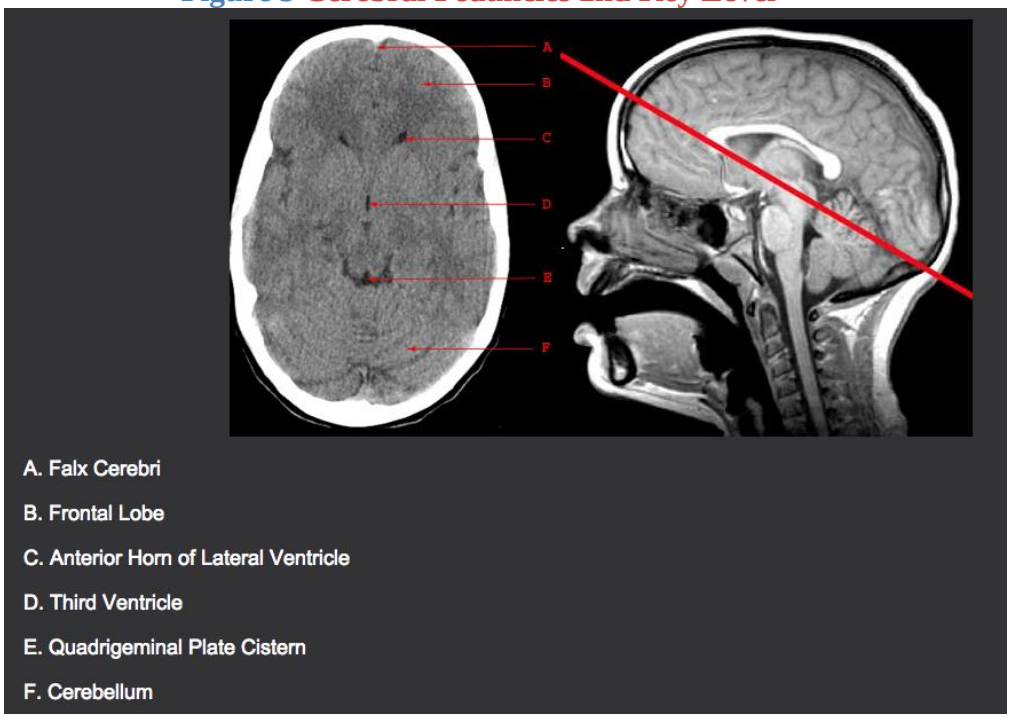


Figure 4 High Midbrain 3rd Key Level

E.

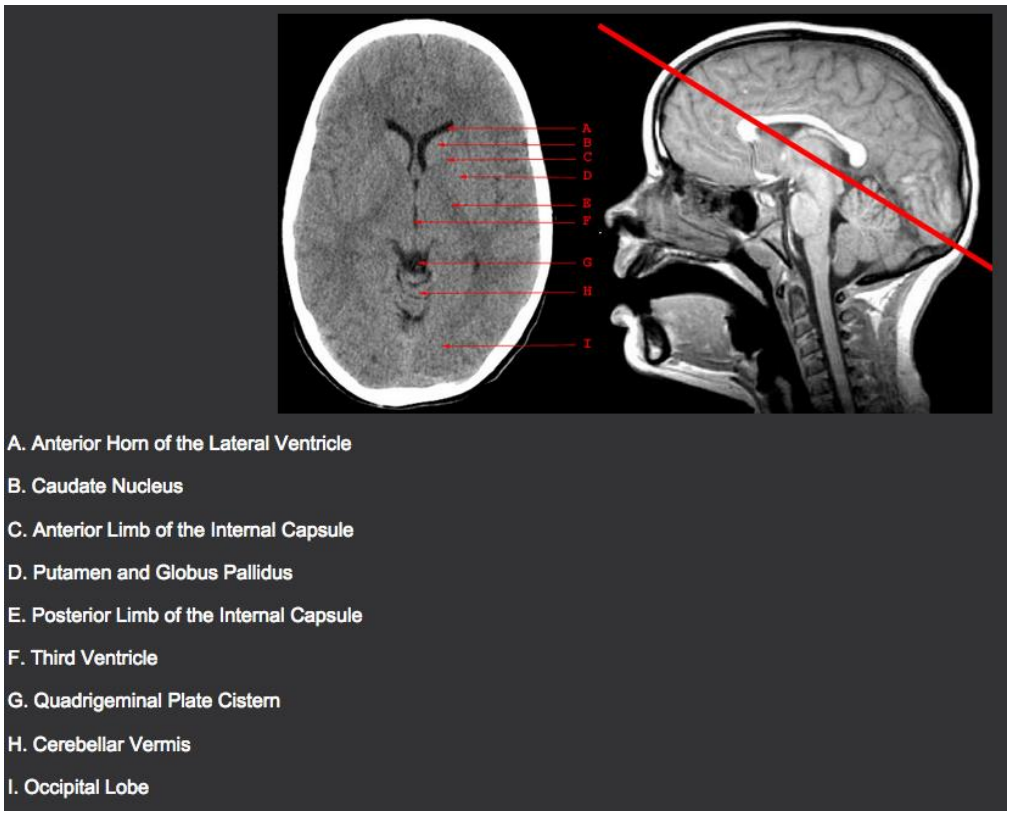


Figure 5 Basal Ganglia Region

F.

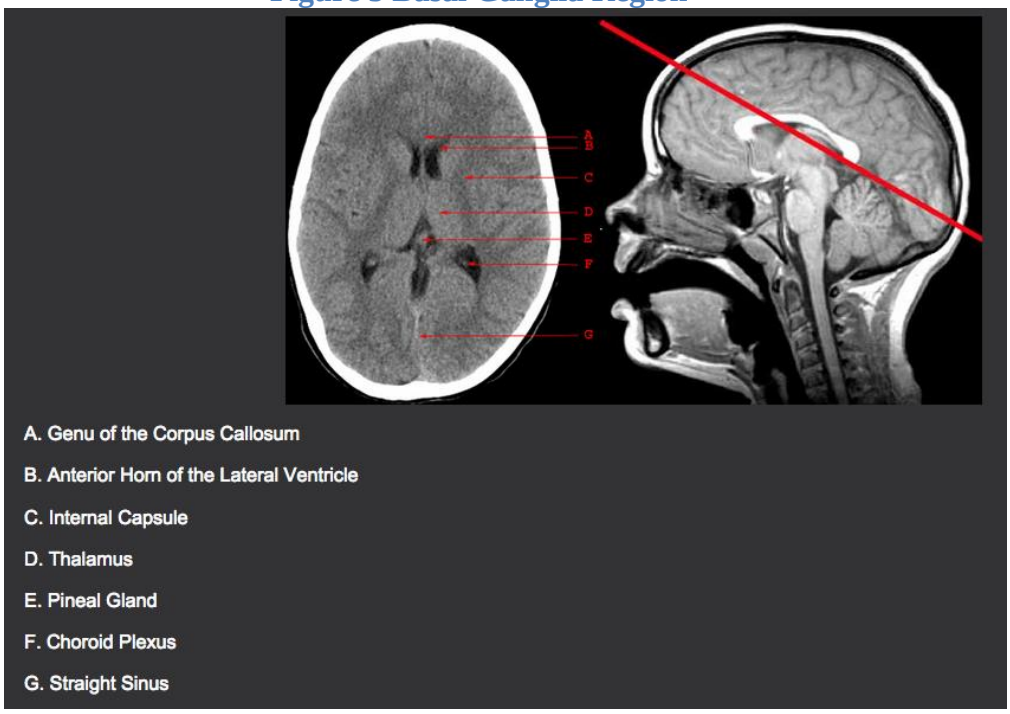


Figure 6 Upper Cortex

G.

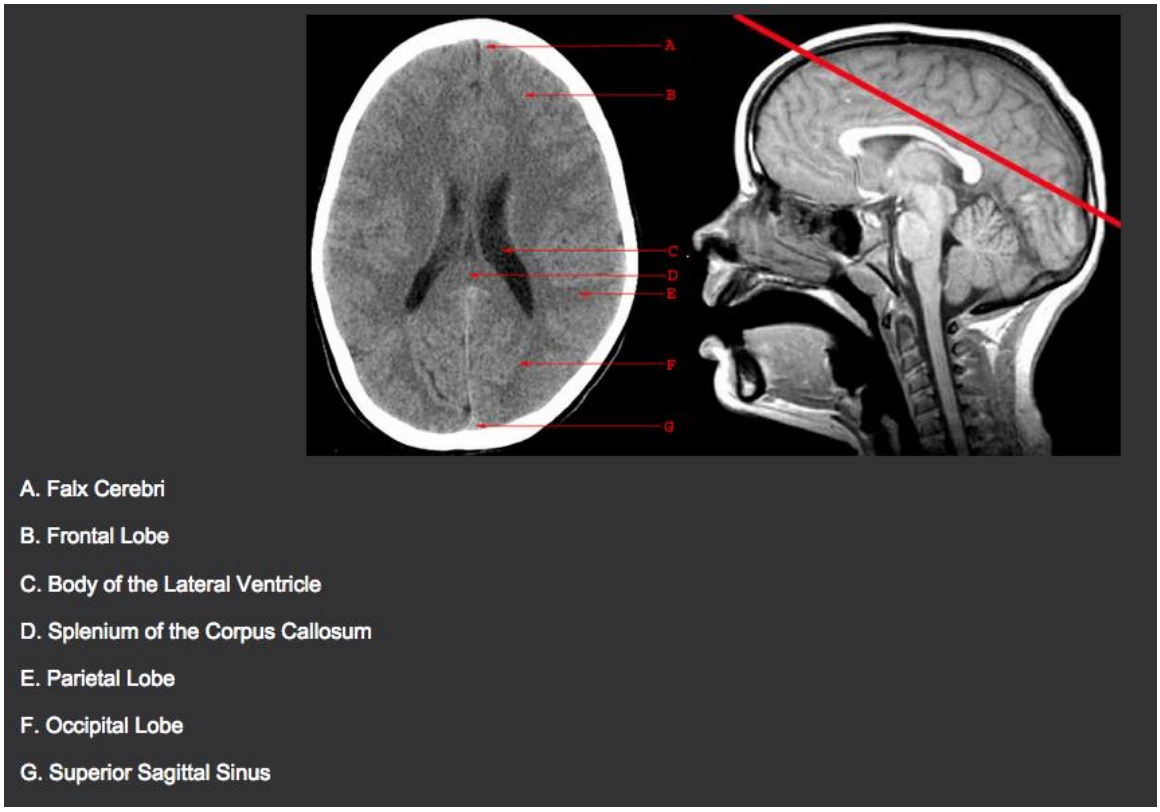


Figure 7 Upper Cortex

H.

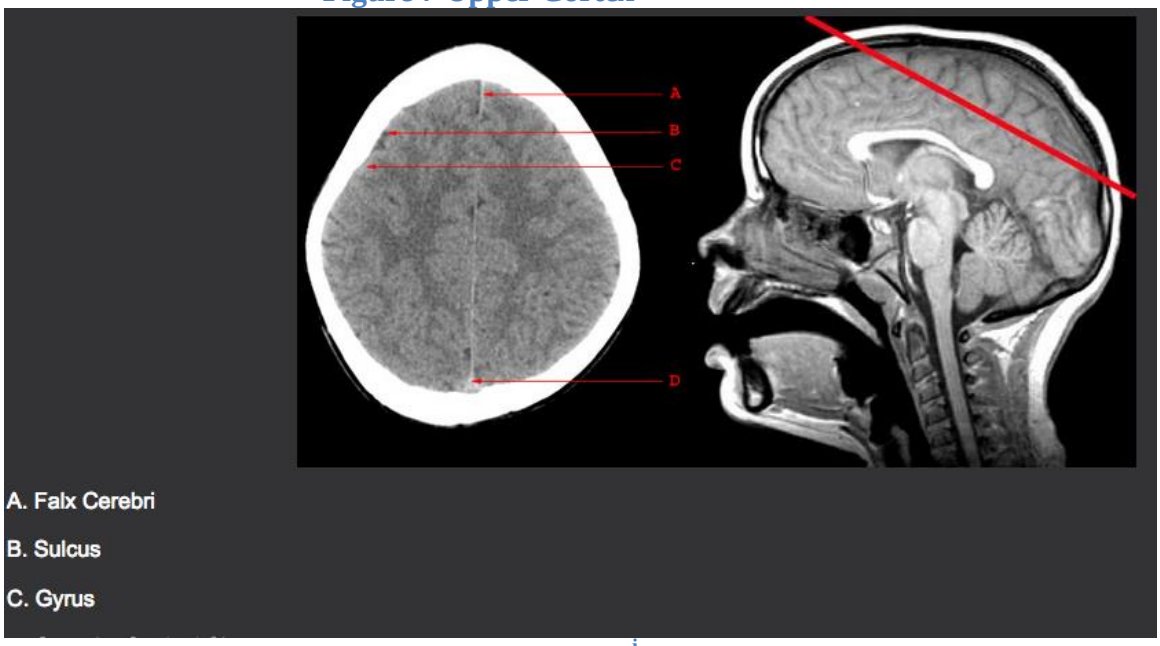


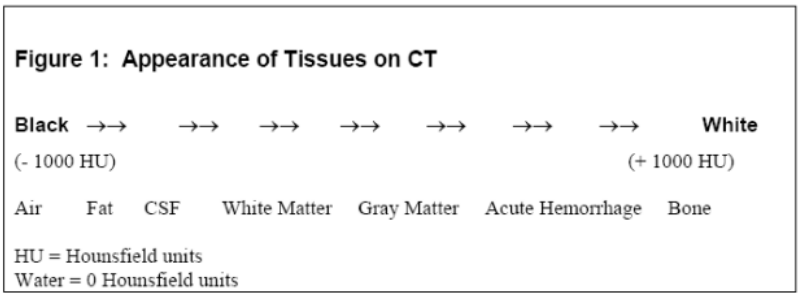
Figure 8 Upper Cortex[i]

CSF Facts

- *0.5-1cc/minute in adults*
- *Adult CSF volume is 150cc*

- *Adult CSF production is 500-700 cc/day, which means that CSF turns over 3-5 times/day.*[ii]

2. Use "**B**lood **C**an **B**e **V**ery **B**ad" to quickly scan for pathology.



B = Blood

"Acute hemorrhage appears hyperdense **(bright white)** on CT. This is due to the fact that the globin molecule is relatively dense and hence effectively absorbs x-ray beams. As the blood becomes older and the globin breaks down, it loses this hyperdense appearance, beginning at the periphery. The precise localization of the blood is as important as identifying its presence."[iii]

Blood will 1st become isodense with the brain (4 days to 2 weeks, depending on clot size), and finally darker than brain (>2-3 weeks).[ii]

C = Cisterns

Cerebrospinal fluid collections jacketing the brain; the following four key cisterns must be examined for blood, asymmetry, and effacement (representing increased intracranial pressure):

• **Circummesencephalic**—Cerebrospinal fluid ring around the midbrain; first to be effaced with increased intracranial pressure
• **Suprasellar (star-shaped)—**Location of the circle of Willis; frequent site of aneurysmal subarachnoid hemorrhage
• **Quadrigeminal**—**W**-shaped cistern at top of midbrain; effaced early by rostrocaudal herniation
• **Sylvian—**Between temporal and frontal lobes; site of traumatic and distal mid-cerebral aneurysm and subarachnoid hemorrhage

B = Brain

• **Symmetry**—Sulcal pattern (gyri) well differentiated in adults and symmetric side-to-side.
• **Gray-white differentiation**—Earliest sign of *areas of ischemia* is loss of gray-white differentiation *(can be seen as early as 2-3 hrs);* metastatic lesions often found at gray-white border
• **Shift**—Falx should be midline, with ventricles evenly spaced to the sides; can also have rostrocaudal shift, evidenced by loss of cisternal space; unilateral effacement of sulci signals increased pressure in one compartment; bilateral effacement signals global increased pressure
• **Hyper-/hypodensity**—Increased density with blood, calcification, intravenous contrast media; decreased density with air/gas (pneumocephalus), fat, ischemia, tumor

V = Ventricles

Pathologic processes cause dilation (hydrocephalus) or compression/shift; hydrocephalus usually first evident in dilation of the temporal horns (normally small and slit-like); examiner must take in the "whole picture" to determine if the ventricles are enlarged due to lack of brain tissue or increased cerebrospinal fluid pressure

B = Bone

Highest density on CT scan; diagnosis of skull fracture can be confusing due to the presence of sutures in the skull; compare other side of skull for symmetry (suture) versus asymmetry (fracture); basilar skull fractures commonly found in petrous ridge (look for blood in mastoid air cells)"[iii]

- [i] http://www.med-ed.virginia.edu/courses/rad/headct/index.html
- [ii] FERNE / EMRA 2009 Mid-Atlantic Emergency Medicine Medical Student Symposium*: ABCs of Head CT Interpretation*; Heather M. Prendergast MD, MPH. http://www.ferne.org/Lectures/emra_midatl_2009/pdf/ferne_emra_2009_midatl_medstud_ctinterp_prendergasthandout_122909.pdf
- [iii] How to Read a Head CT Scan. Andrew D. Perron. http://www.elsevierhealth.com.au/
- http://www.ncbi.nlm.nih.gov/pubmed/25260346