

General Neuroanatomy/Staining: an Introduction to Neuropathology for Neuropathologists

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Case-Based Questions (please see page 3 for answers)

1.	A 30-year-old man presents with pain and weakness in the distribution of the C6 nerve root. MRI demonstrates a peripheral nerve sheath tumor with the main differential being schwannoma vs. neurofibroma. The patient agrees with the neurosurgical recommendation to remove the tumor, and the subsequent specimen comes to pathology. H&E stain suggests that the tumor could be a neurofibroma, so you would like to try and demonstrate axons within the tumor. You happen to work in a very remote hospital that has a limited budget for pathology and no immediate access to immunohistochemistry. Which of the following stains on routine formalin-fixed, paraffin-embedded tissue could you order to demonstrate axons in the specimen?
a.	Bodian
b.	Cajal
c.	Cresyl violet
d.	Holzer
e.	Phosphotungstic acid-hematoxylin (PTAH)

2.	A 75-year-old man with a history of hypertension, diabetes, and hyperlipidemia presents to the emergency room with the sudden onset of right-sided hemiparesis (face = arm = leg), a right-sided hemianopia with sparing of a “beak-shaped” tongue of vision within the center of the hemianopia, and right-sided dystonia. All higher cortical function activities are intact without evidence of neglect or aphasia. MRI demonstrates an acute lacunar infarct affecting the posterior limb of the internal capsule, globus pallidus, and lateral geniculate nucleus in the left hemisphere. Which vascular territory was most likely affected?
a.	Anterior cerebral artery
b.	Anterior choroidal artery
c.	Middle cerebral artery
d.	Posterior cerebral artery
e.	Posterior choroidal artery

3.	A 45-year-old woman presents to the emergency room with the sudden onset of severe conjunctival congestion, ptosis, pulsatile proptosis, and painful ophthalmoplegia. MRI reveals a carotid-cavernous fistula. Which of the following cranial nerves is most commonly affected in this condition?
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	a.	III
	b.	IV
	c.	V
	d.	VI
	e.	VII

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Question 1 Correct answer and rationale: A) Bodian

Bodian is an axonal stain. Cajal stains for either neurons or glia require free-floating sections, not routine FFPE sections. Cresyl violet is a neuronal (“Nissl”) stain. Holzer and PTAH are glial stains.

Question 2 Correct answer and rationale: B) Anterior choroidal artery

The posterior limb of the internal capsule, globus pallidus, and lateral geniculate nucleus are supplied by the anterior choroidal artery. An infarct in these structures leads to the described symptoms, including weakness that is equal in the face, arm, and leg. Anterior cerebral infarcts affect the medial cortex with a weakness distribution of leg > face/arm. Middle cerebral infarcts affect the lateral cortex with a weakness distribution of face/arm > leg plus aphasia with dominant hemisphere infarcts and neglect with nondominant hemisphere infarcts. Posterior cerebral infarcts affect the occipital cortex with macular-sparing homonymous hemianopia and alexia without agraphia in the dominant hemisphere. There is no associated weakness. Isolated posterior choroidal artery infarcts are very uncommon and should only affect the thalamus and pineal region with no associated weakness.

Question 3 Correct answer and rationale: D) Cranial nerve VI

Cranial nerve VI (abducens nerve) is closest to the carotid artery within the cavernous sinus; therefore, a VIth nerve palsy is the most common cranial nerve abnormality in a patient with a carotid-cavernous fistula. Only the first and second divisions of cranial nerve V are within the cavernous sinus, and cranial nerve VII is not present at all.