American Association of Neuropathologists

Intraoperative Neuropathology

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Case-Based Questions (please see page 4 for answers)

1.	65-year-old patient with history of diabetes, renal failure, status post/transplant 2 years ago, who presented with new onset confusion, imbalance, and headaches. Brain MRI of the brain shows a 3 x 6 cm rim enhancing lesion in the inferior left frontal lobe, extending into the genu of the corpus callosum. Intraoperative consultation shows largely necrotic tissue with abundant macrophages and inflammatory cells. What of the following is the best option to communicate to the surgeon?	
	a.	Center of a high-grade glioma, send the rest for permanents
	b.	Demyelination cannot be excluded
	c.	Lesional tissue
	d.	Likely treated lymphoma, send for flow
	e.	Necrosis and inflammation. Additional tissue needed for diagnosis

2.	34-year-old female with irregular periods, headache and blurry vision found to have a suprasellar mass. Tissue is sent for intraoperative consultation. The tissue did not smear well and clumped at one edge of the slide. The small remaining tissue is frozen and shows small fragment of gliotic brain parenchyma, Rosenthal fibers and some keratin debris. What is the most likely diagnosis?	
	a.	Adenoma
	b.	Craniopharyngioma
	c.	Pilocytic Astrocytoma
	d.	Posterior pituitary tumor
	e.	Rathke's cleft cyst

3.	18-year-old patient who presented with progressive imbalance and tinnitus. Brain MRI shows a 3.5 x 2.2 cm cerbello-pontine angle tumor. The patient has a younger brother who is undergoing genetic testing for multiple tumors in the central nervous system. Tissue is sent for intraoperative consultation. The tissue is handled by a first-year resident who was able to smear the lesion but lost the tissue to sectioning by going too deep in the block. The tissue smeared well and show numerous cells with abundant cytoplasm that folds in themselves. Some tumor cells are single, and others are forming groups that wrap around. The nuclei are oval and monotonous. Focal

	intranuclear inclusions are noted. Focal psammomatous calcifications are present. Based on this description what is the most likely diagnosis?	
	a.	Choroid plexus tumor
	b.	Ependymal tumor
	c.	Meningioma
	d.	Pilocytic astrocytoma
	e.	Schwannoma

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Correct Answers and Rationales

Question 1 Correct Answer and Rationale: **e. Necrosis and inflammation. Additional tissue needed for diagnosis**

Rationale: The differential diagnosis of a rim enhancing lesion includes high grade glioma, lymphoma, infection, demyelination and metastasis. Given the patient's age and clinical history, all of them are possible. It is important to only report with one observes in the tissue provided for interpretation. The current findings do not narrow down the diagnosis, additional tissue is necessary. Further implications may include diagnosing a non-resectable lesion (e.g. demyelination or lymphoma), features that raise suspicion for infection and require further tissue allocation for microbiology studies, etc.

Question 2 Correct Answer and Rationale: **b. Craniopharyngioma**

Rationale: All the options are included in the differential diagnosis of a suprasellar mass at this age. The fact that the tissue did not smear well, suggest that the lesion is mesenchymal in nature or has abundant collagen or reticulin that holds it together. Of the above options craniopharyngioma and Rathke cleft cyst fulfils those features. The presence of keratin debris, especially if one can determine if it is wet or dry keratin favors a craniopharyngioma. Rosenthal fibers are not entirely specific, those just tell us that the lesion has been there for a long time and has produced compression and reaction to the surrounding parenchyma. One may ask the surgeon if the lesion was cysts and if the cystic fluid look like machinery oil. This is the characteristic description of craniopharyngioma. One can also request the surgeon to send the cystic fluid and review it for cholesterol crystals under the microscope.

Question 3 Correct Answer and Rationale: **c. Meningioma**

Rationale: All the options are included in the differential diagnosis of a cerebellopontine angle (CPA) tumor. The fact that the lesion smear well and produce significant cellularity excludes mesenchymal-type lesion like a schwannoma, which often do not smear, given that it is a collagen rich lesion. The abundant cytoplasm, that folds in itself, is typical of meningothelial lesions, that lacks a rigid cytoskeleton that lacks intermediate filament like keratin (carcinomas) or GFAP (gliomas). Intranuclear inclusions, psammomatous calcifications and whorls (cells wrapping around) are all characteristic features of meningioma. In fact, meningioma is often diagnosed in cytologic preparations, and might be easier that a frozen section with bad freezing artifact. Gliomas, like pilocytic astrocytomas (PA) which can arise on this location, often have very long thin delicate processes that interconnect cells. Ependymomas, can be difficult because they do not have long processes like PA, but they will not present with whorls, or abundant cytoplasm that folds in itself. Although ependymomas can have calcifications, those are not psammomotous type. Smear of choroid plexus tumors (CPT) will often show a papillary architecture with hobnail cells and cytoplasmic vacuoles. Psammomatous calcifications can be seen in CPT, but whorls are not characteristic. It is possible that the patient's brother has NF2 as those patients present with CNS tumors that include meningioma, schwannoma, ependymoma.

Remember the mnemotechnic for CPA tumors: SAME-C

Schwannoma

Arachnoid cysts, **A**neurisms

Meningiomas, **M**esenchymal tumors, **M**etastasis

Ependymomas, **E**pidermoid Cyst

Choroid plexus tumor.