Clinical Neuroscience
Rad-Path Conference

Monday, August 4, 2014

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Case 1

- 73 year old female presented with 3-4 weeks of dizziness & 1 episode of syncope 4-5 weeks ago.
- OSH CT scan: CP angle mass
- PMH: Hypertension
- PSH: Appendectomy
• Radiology: Left cerebellopontine angle mass compatible with vestibular schwannoma.

• Pathology: Schwannoma (WHO grade I)
Frozen section: Spindle cell neoplasm, consistent with schwannoma, later confirmed.
Schwannoma, WHO grade I

Ostrom, et al. Neuro Oncol 15 Suppl 2:ii1 2013
Case 2

- 63 year old male presents with unilateral hearing loss on the right & tinnitus.
- OSH MRI: CP angle mass.
- PMH: Emphysema
- PSH: Colonoscopy
• Radiology: Right internal auditory canal & cerebellopontine angle mass suspicious for schwannoma.

• Pathology: Meningioma
Frozen section: Spindle cell neoplasm, consistent with meningioma, later confirmed.
Meningioma, WHO grade I

Ostrom, et al. Neuro Oncol 15 Suppl 2:ii1 2013
Case 3

- 20 year old male who presented in 2009 with anger management issues that lead to cranial imaging. Intracranial falcine mass was resected: meningioma (WHO grade II). Patient presents with recent episode of anger.

- PMH: Meningioma

• Radiology: Mass in the post operative region (falcine) suggestive of recurrent meningioma.

• Pathology: Atypical meningioma (WHO grade II)
Frozen section: Spindle cell neoplasm, consistent with meningioma, later confirmed.
Box 10-1. WHO 2007 Classification Scheme for Meningiomas*

**Meningioma Variants That Are Mostly Benign (WHO Grade I)**
- Meningothelial
- Fibrous (fibroblastic)
- Transitional
- Psammomatous
- Angiomatous (vascular)
- Microcystic
- Secretory
- Lymphoplasmacyte-rich
- Metaplastic

**WHO Grade II Meningiomas**
- Atypical (any variant plus criteria)
- Clear cell
- Chordoid
- Brain invasive*

**WHO Grade III Meningiomas**
- Anaplastic (any variant plus criteria)
- Papillary
- Rhabdoid

*Based on similar recurrence and mortality rates to atypical meningiomas in general, brain-invasive meningiomas are now considered prognostically equivalent to WHO grade II, even when they appear otherwise benign on routine histology.

Box 10-2. WHO 2007 Grading Criteria for Meningioma*

**Benign Meningioma (WHO Grade I)**
- Any predominant histology other than clear cell, chordoid, papillary, or rhabdoid
- Lacks criteria of atypical and anaplastic meningioma

**Atypical Meningioma (WHO Grade II) (either of two major criteria)**
- Mitotic index ≥ 4 mitoses/10 hpf
- At least three of the following five parameters:
  - Sheeting architecture (two-dimensional sheets with loss of whorls and fascicles)
  - Small-cell formation (clusters of lymphocyte-like cells with high N/C ratio)
  - Hypercellularity
  - Macronucleoli
  - Spontaneous necrosis (i.e., not induced by embolization or radiation)

**Brain-Invasive Meningioma (WHO Grade II)**
- Tongue-like protrusions of meningioma into adjacent brain parenchyma
- Meningioma containing islands of entrapped GFAP-positive parenchyma

**Anaplastic (Malignant) Meningioma (WHO Grade III) (either of two criteria)**
- Mitotic index ≥ 20 mitoses/10 hpf
- Frank anaplasia (sarcoma-, carcinoma-, or melanoma-like histology)

GFAP, glial fibrillary acidic protein; hpf, high-power field; N/C, nuclear-to-cytoplasmic; WHO, World Health Organization.
Figure 10-1. Common locations for meningiomas. Common sites of tumor growth in relationship to adjacent skull, brain, and dural reflections (A-D). Illustrations created by MedPIC at Washington University School of Medicine with additional input from Dr. Michael Chicoine, Department of Neurosurgery.
FIG. 7. Meningioma: recurrence-free survival based on brain invasion, GTR subset.

FIG. 10. Meningioma: recurrence-free survival based on histologic grading.

**TABLE 5.** Five-year recurrence rates stratified by extent of resection and histologic grade

<table>
<thead>
<tr>
<th></th>
<th>GTR</th>
<th>STR</th>
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<tbody>
<tr>
<td>Classic</td>
<td>5% (95% CI: 3–8%)</td>
<td>31% (95% CI: 19–41%)</td>
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<tr>
<td>High grade</td>
<td></td>
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<tr>
<td>(atypical brain invasive)</td>
<td>40% (95% CI: 25–51%)</td>
<td>NA</td>
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<tr>
<td>NA, Not assessable due to small number of cases.</td>
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Case 4

• 27 year old male presents with a 2 year history of headaches and increasing hand, foot, nose, & lip size. No visual changes.

• PMH: Acromegaly, dental disease, & sleep apnea.

• PSH: None
• Radiology: Enhancing sellar/suprasellar mass most likely representing a pituitary macroadenoma.

• Pathology: Atypical pituitary adenoma.
Smear: Monomorphous neoplasm, consistent with pituitary adenoma, later confirmed.
Tumors of pituitary and sellar region

- Pituitary adenoma: 82%
- Atypical adenoma: 3.0%
- Pituitary carcinoma: 0.1%
- Craniopharyngioma: 3.2%
  - Adamantinomatous: 2.9%
  - Papillary: 0.3%
- Rathke’s cyst: 2.0%
- Meningioma: 1.0%
- Chordoma: 0.5%
- Metastasis: 0.6%
- Lymphocytic hypophysitis: 0.3%
- Other lesions: 4.1%

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Table 4: Comparison between mean Ki-67 LI and clinical variables

<table>
<thead>
<tr>
<th>Clinical Variable</th>
<th>Mean Ki-67 LI (% ± SEM)</th>
<th>2-tailed Mann-Whitney (P value)</th>
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<tbody>
<tr>
<td>Tumors with progression</td>
<td>1.45% ± 0.09%</td>
<td>.01</td>
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<tr>
<td>Tumors without progression</td>
<td>0.41% ± 0.01%</td>
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</tr>
<tr>
<td>Nonfunctioning tumors</td>
<td>1.09% ± 0.06%</td>
<td>.68 (NS)</td>
</tr>
<tr>
<td>Functioning tumors</td>
<td>0.58% ± 0.03%</td>
<td></td>
</tr>
<tr>
<td>Invasive tumors</td>
<td>1.66% ± 0.18%</td>
<td>.38 (NS)</td>
</tr>
<tr>
<td>Non invasive tumors</td>
<td>0.59% ± 0.01%</td>
<td></td>
</tr>
<tr>
<td>Tumors with suprasellar extension</td>
<td>1.05% ± 0.05%</td>
<td>.34 (NS)</td>
</tr>
<tr>
<td>Tumors without suprasellar extension</td>
<td>0.57% ± 0.03%</td>
<td></td>
</tr>
<tr>
<td>Macroadenomas (size ≥ 1 cm)</td>
<td>0.91% ± 0.03%</td>
<td>.68 (NS)</td>
</tr>
<tr>
<td>Microadenomas (size &lt;1 cm)</td>
<td>0.71% ± 0.09%</td>
<td></td>
</tr>
<tr>
<td>Male patients</td>
<td>1.18% ± 0.10%</td>
<td>.38 (NS)</td>
</tr>
<tr>
<td>Female patients</td>
<td>0.67% ± 0.02%</td>
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</tbody>
</table>

The only significant difference in the mean Ki-67 LI was in relation to progression.

Roger Gejman MD, Brooke Swearingen MD, E. Tessa Hedley-Whyte MD.
Role of Ki-67 proliferation index and p53 expression in predicting progression of pituitary adenomas. Human Pathology (2008) 39 758

Saeger W, Ludecke DK, Buchfelder M, Fahlbusch R, Quabbe H-J, and Petersenn S.
Pathohistological classification of pituitary tumors: 10 years of experience with the German Pituitary Tumor Registry. European Journal of Endocrinology (2007) 156 203–216
Case 5

• 3 year old male transferred from OSH complaining of 2 months of intermittent headaches & vomiting. CT showed a posterior fossa mass.

• PMH: None

• PSH: None
• Radiology: Large left cerebellar tumor with cystic & solid components favors astrocytoma. Mild 2nd & 3rd ventriculomegaly due to mass effect on 4th ventricle. Inferior displacement of cerebellar tonsil.

• Pathology: Pilocytic astrocytoma (WHO grade I).
Smear and Frozen: Glioma, later confirmed as pilocytic astrocytoma.
BRAF-KIAA1549 Fusion Predicts Better Clinical Outcome in Pediatric Low-Grade Astrocytoma.

Clin Cancer Res (2011) 17 4790

Hawkins C, et al.

David T.W. Jones, Sylvia Kocialkowski, Lu Liu, Danita M. Pearson, L. Magnus Bäcklund, Koichi Ichimura, and V. Peter Collins.