RadPath Conference

December 2009

Ellen Giampoli, M.D.

Aharon Wolf, M.D.
Case 1

• 59 year old female with shoulder pain
Patient had history of previously diagnosed plasma cell myeloma. FNA of proximal humerus and acromion was done.
# Suggested Panels for the Classification of Various Tumors

<table>
<thead>
<tr>
<th>Tumor Type</th>
<th>Common Immunomarkers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carcinomas (Epithelial Tumors)</td>
<td>Pankeratin, CK 7 and CK 20, TTF-1, Napsin-A, CDX-2, CalR, CK 5/6, CEA, EMA, B72.3</td>
</tr>
<tr>
<td>Lymphomas</td>
<td>CD45, CD 3, CD 20, CD 30, CD 15, Kappa, Lambda, CD138 (plasma cell)</td>
</tr>
<tr>
<td>Sarcomas (Mesenchymal Tumors)</td>
<td>S-100, Myogenin, MSA, SMA, Vimentin, CD 99, CD 31, CD 34, C-kit</td>
</tr>
<tr>
<td>Melanoma</td>
<td>S-100, HMB-45, Melan-A, Cytokeratin (-)</td>
</tr>
<tr>
<td>Neural/NE</td>
<td>Chromogranin, Synaptophysin, CD 56, GFAP</td>
</tr>
</tbody>
</table>
Bone, acromion, right, CT-guided FNA:
Diff-Quik stain, 20x
Bone, acromion, right, CT-guided FNA: Diff-Quik stain, 40x
Bone, acromion, right, CT-guided FNA: Papanicolaou stain, 40x
Bone, acromion, right, CT-guided FNA: Cell block, H & E stain, 20x
Bone, acromion, right, CT-guided FNA: Cell block, CD 138 immunostain, 20x
Bone, acromion, right, CT-guided FNA:
Cell block, cytokeratin immunostain, 20x
Bone, acromion, right, CT-guided fine needle aspiration:

Cellular evidence of Plasma Cell Myeloma

Comment: Immunostain for CD 138 is positive. A stain for broad spectrum cytokeratin is negative.
Bone, right, proximal humerus, core needle biopsy

- Involved by previously diagnosed plasma cell myeloma
- Plasma cells comprise approximately 33% of cellularity
- Immunophenotype: CD 138, Kappa
- 3 mm of bone marrow sampled

The finding of clonal plasma cells in the context of multiple bone lesions is consistent with multiple myeloma.
Bone, right proximal humerus, biopsy: H & E stain, 60x
Bone, right proximal humerus, biopsy:
Immunostain CD 138, 20x
Bone, right proximal humerus, biopsy: Immunostain Lambda, 20x
Plasma Cell Myeloma (localized lesion)

- Malignant monoclonal proliferation of plasma cells
- Most common primary tumor of bone
- Patients are often decade younger than MM, often male
- Grossly, myeloma appears as soft, friable red mass; underlying bone is eroded and fragile
- Present with single lesion (myeloma) patients eventually develop lesions elsewhere (multiple myeloma-55% within ten years - FNA samples are identical)
Plasma Cell Myeloma (localized lesion)

- CD 138 Immunostain + in normal and neoplastic plasma cells - in other lymphoproliferative disorders
- Suggested 30% bone marrow volume comprised of plasma cells - diagnosis of plasma cell myeloma is likely
- Localized disease treated with resection or radiation
- Advanced disease incurable treated with chemotherapy and radiation - prolong survival
- Bone marrow transplant is option for younger patients
Plasma Cell Myeloma
(localized lesion)

• Molecular cytogenetic studies

poor prognosis  
- \( t(4;14)(p16;q32) \)
- \( t(14;16)(q32;q23) \)
- \(-17p13\)

intermediate prognosis  
- \((-13q14)\)

good prognosis  
all others
Case 2

• 68 year old male
Patient had history of adenocarcinoma of the esophagus and esophagectomy. FNA of left lung was done.
Lung, left, CT-guided FNA: Diff-Quik stain, 20x
Lung, left, CT-guided FNA: Diff-Quik stain, 40x
Lung, left, CT-guided FNA: Papanicolaou stain, 20x
Lung, left, CT-guided FNA: Papanicolaou stain, 40x
Lung, left, CT-guided FNA: Cell Block, H & E stain, 20x
Lung, left, CT-guided FNA: Cell block, H & E stain, 40x
Lung, left, CT-guided fine needle aspiration:

Malignant tumor cells present derived from adenocarcinoma. The tumor is morphologically similar to the patient's previous esophageal primary tumor.
Distal esophagus and proximal stomach, esophagogastrrectomy:

Adenocarcinoma, moderately differentiated.
Tumor site: Tumor present at the GE junction
Tumor size: 4.3 cm (gross)
Angiolympathic invasion: present
GE junction mucosa shows high grade dysplasia, Barrett’s esophagus

Metastatic adenocarcinoma present in 4/46 lymph nodes with extranodal extension.

Gastrointestinal stromal tumor of stomach, posterior wall, biopsy - 0.9 cm in size.
Distal esophagus and proximal stomach, esophagogastrectomy: H & E stain, 20x
Esophagogastric lymph node: H & E stain, 10x
Metastatic Adenocarcinoma to Lung

- Metastatic carcinoma – prior clinical history is extremely important
- Compare surgical pathology with cytopathology specimen
- Most patients present with advanced-stage disease. Small resectable tumors under 2 cm (65% to 80% - five year survival)
Metastatic Esophageal Adenocarcinoma

- Patient’s with Barrett’s esophagus – relative risk of adenocarcinoma 30-120 fold in comparison with patient’s without
- Smoking factor – risk related to quantity and duration
- Abdominal obesity – risk factor, especially in men
- 75% of adenocarcinomas of esophagus located in distal esophagus, consequence of development from GERD and Barrett’s
- Time of diagnosis ~50% of patient’s have distant metastatic disease
Case 3

- 67 year old male
Adrenal Masses: Characterization

• Adrenal masses of 10 HU or less were correctly characterized as lipid-rich adenomas, in 96% of 166 adrenal masses.

• The sensitivity and specificity for characterizing an adrenal mass as an adenoma versus a nonadenoma were 98% (124 of 127 masses) and 92% (36 of 39 masses), respectively.

CT guided FNA of the adrenal was done.
Adrenal gland, left, CT-guided
FNA: Diff-Quik stain, 40x
Adrenal gland, left, CT-guided FNA: Diff-Quik stain, 40x
Adrenal gland, left, CT-guided FNA: Papanicolaou stain, 20x
Adrenal gland, left, CT-guided FNA: Papanicolaou stain, 40x
Adrenal gland, left, Cell Block: Immunostain TTF-1, 20x
Adrenal gland, left, Cell Block: Immunostain Cytokeratin 20, 20x
Adrenal gland, left, CT-guided fine needle aspiration:

Malignant tumor cells present derived from adenocarcinoma consistent with pulmonary origin.

Comment: Immunohistochemical stains are positive for TTF-1 and cytokeratin 7 and negative for cytokeratin 20 and Melan-A. These staining results support a pulmonary origin.
Metastatic Lung Adenocarcinoma to Adrenal Gland

- Adrenal glands per unit weight are the most frequent organ involved by metastatic tumors
- Rank fourth in frequency following lung, liver and bone for mets
- Mets found in autopsy 9-27% pts – breast most common primary
- Immunostains TTF-1 and Napsin A
Case 4

• 24 year old female with knee pain
CT guided FNA and needle core biopsy of the right tibia was done.
Bone, tibia, right, CT-guided FNA: Diff-Quik stain, 40x
Bone, tibia, right, CT-guided FNA: Papanicolaou stain, 20x
Bone, tibia, right, CT-guided FNA: Papanicolaou stain, 40x
Bone, tibia, right, CT-guided fine needle aspiration:

Malignant lymphoma, diffuse large B-cell type
Bone, right tibia, needle core biopsy:

Diffuse large B cell lymphoma

Immunophenotype:
  Positive: CD19, CD20, PAX5, CD10, BCL6, Kappa
  Negative: BCL2, MUM1, CD30

Neoplastic cell Ki-67 proliferation rate ~70%
Bone, right tibia, core needle biopsy: H & E stain, 20x
Bone, right tibia, core needle biopsy: H & E stain, 40x
Bone, right tibia, core needle biopsy: Immunostain CD 10, 40x
Bone, right tibia, core needle biopsy: Immunostain CD 20, 40x
Bone, right tibia, core needle biopsy: Immunostain Ki-67, 40x
Diffuse Large B cell Lymphoma

• Comprise 1/3 of all non-Hodgkin’s lymphomas
• Occur in all age groups
• Male to female ratio – 1.2:1
• Positive for B-lineage marker CD20
Diffuse Large B cell Lymphoma

- Malignant lymphoma of bone - large destructive lytic mass - erodes cortex and often forms a soft tissue component
- Most common primary lymphoma of bone is large B cell lymphoma
- Immunohistochemically tumor cells express LCA and B cell markers
- Treatment includes both radiation and chemotherapy
- Primary lymphoma of bone 75% 10-year survival, less with systemic disease
Case 5

• 64 year old female with abdominal CT findings. PET done.
The Significance of Incidental PET Uptake in the Thyroid Gland

• Incidental FDG-PET uptake in the thyroid gland is associated with a 27.8% risk for well-differentiated thyroid carcinoma; however, there seems to be no correlation between intensity of FDG uptake and the risk for a malignant process.

US guided FNA of the thyroid was done.
<table>
<thead>
<tr>
<th>US Feature</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solitary nodule</td>
<td></td>
</tr>
<tr>
<td>Microcalcifications</td>
<td>Strongly consider US-guided FNA if $\geq 1$ cm</td>
</tr>
<tr>
<td>Solid (or almost entirely solid) or coarse calcifications</td>
<td>Strongly consider US-guided FNA if $\geq 1.5$ cm</td>
</tr>
<tr>
<td>Mixed solid and cystic or almost entirely cystic with solid mural component</td>
<td>Consider US-guided FNA if $\geq 2$ cm</td>
</tr>
<tr>
<td>None of the above but substantial growth since prior US examination</td>
<td>Consider US-guided FNA</td>
</tr>
<tr>
<td>Almost entirely cystic and none of the above and no substantial growth (or no prior US)</td>
<td>US-guided FNA probably unnecessary</td>
</tr>
<tr>
<td>Multiple nodules</td>
<td>Consider US-guided FNA of one or more nodules, with selection prioritized on basis of criteria (in order listed) for solitary nodule*</td>
</tr>
</tbody>
</table>

**Management of Thyroid Nodules Detected at US: Society of Radiologists in Ultrasound Consensus Conference Statement**

*Radiology December 2005 237:794-800*
Thyroid, isthmus, ultrasound-guided FNA: Diff-Quik stain, 20x
Thyroid, isthmus, ultrasound-guided FNA: Diff-Quik stain, 40x
Thyroid, isthmus, ultrasound-guided FNA: Papanicolaou stain, 20x
Thyroid, isthmus, ultrasound-guided FNA: Immunostain calcitonin, 20x
Thyroid, isthmus, ultrasound-guided fine needle aspiration:

Malignant tumor cells present derived from medullary thyroid carcinoma.

Comment: Immunohistochemical stain performed on alcohol-fixed slide shows the cells of interest mark strongly with calcitonin.
Medullary Carcinoma of Thyroid

- Derived from C cells and comprises 5-10% malignant tumors thyroid
- Association with MEN (Multiple endocrine neoplasia) syndromes
- Varied morphologic patterns
- Clinically presents as a firm painless nodule
- Common in females and males
- Age depends on MEN, familial, or sporadic
Medullary Carcinoma of Thyroid

- Amyloid identified in up to 80% tumors – Congo Red
- Common site for mets – cervical lymph nodes and contralateral lobe
- Distant metastasis – lung, bone, liver and adrenals
- Gold standard for diagnosis – Immunostain Calcitonin.
- Prognostic factors – sporadic or familial tumor, age of patient, tumor size and stage
The End