MRI findings highly suggestive of pleomorphic adenoma: a validation study

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**Objectives**

To validate an MRI algorithm characteristic of pleomorphic adenoma.

**Background**

Previous studies have only shown modest ability for MRI to predict benign or malignant histology, with sensitivities and specificities ranging from 40-67% and 81-89%, respectively (Christe et al., 2011. Fassnacht et al., 2013).

Pleomorphic adenoma (PA), the most common parotid tumor, has a characteristic appearance on MRI that has been well described: well circumscribed border, homogenous T2 hyperintensity, lobulated contour, and solid contrast enhancement (Ikeda et al., 1996, Heaton et al., 2013).

**Methods**

- Literature search: MRI features of pleomorphic adenoma
- Proposed radiologic algorithm and criteria
- Search and cross-referenced parotid specimens for MRI images (2001-2012)
- Test sensitivity, specificity, and accuracy of proposed clinical decision rule

**Results**

- MRI scoring algorithm: “High probability criteria for pleomorphic adenoma”

<table>
<thead>
<tr>
<th>PA Criteria</th>
<th>T2 signal</th>
<th>Margins</th>
<th>Enhance pattern</th>
<th>Contour</th>
<th>Rim</th>
</tr>
</thead>
<tbody>
<tr>
<td>Favorable</td>
<td>1 = bright</td>
<td>1 = sharp</td>
<td>1 = heterogeneous nodular</td>
<td>1 = lobulated</td>
<td>1 = T2 dark rim</td>
</tr>
<tr>
<td>Neutral</td>
<td>2 = interim</td>
<td>2 = interim</td>
<td>2 = none</td>
<td>2 = not lobulated</td>
<td>2 = no dark rim</td>
</tr>
<tr>
<td>Unfavorable</td>
<td>3 = dark</td>
<td>3 = grossly infiltrative</td>
<td>4 = thick peripheral with necrosis</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Meet all 5 “high probability” criteria
N = 19

<table>
<thead>
<tr>
<th>MRI</th>
<th>FNAB</th>
<th>MRI + FNAB</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pleomorphic adenoma</td>
<td>carcinoma ex-pleomorphic adenoma</td>
<td>mucoepidermoid carcinoma</td>
</tr>
<tr>
<td>specificity</td>
<td>91.6%</td>
<td>92.8%</td>
</tr>
<tr>
<td>sensitivity</td>
<td>40.4%</td>
<td>76.2%</td>
</tr>
</tbody>
</table>

**Discussion & Conclusion**

- Inability to reliably distinguish benign from malignant parotid masses is a known limitation of MRI. However, the most common primary parotid tumor, pleomorphic adenoma, often has a characteristic MRI appearance.
- Our results suggest that by using certain “high probability” criteria, a subset of parotid tumors can be diagnosed as pleomorphic adenoma with high confidence. This may allow the physician to bypass FNA in a meaningful proportion of cases.
- Even so, only 40% of the pleomorphic adenoma cases fulfilled all 5 proposed criteria and a significant number of PA cases in fact had features that overlapped considerably with other tumors. As such, the “high probability” criteria should be applied with prudence as they are likely representative for only a subset of PA tumors.