The Spectrum of Management of Pulmonary Ground Glass Nodules

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- 236 surgically resected peripheral adenocarcinomas < 2cm
- 6 types based on tumor growth patterns.
  - 1. Lepidic = replacement growth pattern.
    - A. Localized bronchioloalveolar carcinoma
    - B. " with foci of alveolar collapse.
    - C. " active fibroblastic proliferation
  - 2. Helic = expansile growth pattern- poorer prognosis
Noguchi 236 peripheral adenocarcinomas <2cm

<table>
<thead>
<tr>
<th>Type</th>
<th>Count</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Type A</td>
<td>14</td>
<td>6%</td>
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<tr>
<td>Type B</td>
<td>14</td>
<td>6%</td>
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<tr>
<td>Type C</td>
<td>141</td>
<td>60%</td>
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Noguchi B with alveolar collapse

Takashima et al. AJR
Noguchi C  F= fibroblastic proliferation

Takashima et al. AJR
Characteristics and Features-GGN

1. Small, circumscribed, lesion that occupies a focal portion of the lung parenchyma.

2. Low attenuation lesion, mean attenuation typically between -400 and -600H. Mean should not exceed -200H. [Fat = -120H].

3. May contain a denser, [usually centrally-located], more solid component.

4. Usually invisible on chest xray, especially if < 1cm.

5. Ratio long axis/ short axis < 1.5. [spherical]

6. Slow growth. May show no growth or minimal growth in volume at 6-12 month follow-up.

7. Patient asymptomatic.
Characteristics and Features-GGN

- 10. GGN due to focal inflammation or bleeding usually disappears or markedly diminishes at 3-4 month FU
- 11. High likelihood that persistent GGN is malignant; even higher if patient has prior lung cancer.
GGN radiology pathology correlation

1. Pure Ground Glass - AAH or BAC

2. Mainly ground glass with small solid component - BAC Noguchi B or C.

3. Mainly solid with < 50% ground glass. Mainly adenocarcinoma with alveolar cell features.

4. Spiculation, pleural retraction, and prominent air-bronchogram not seen with AAH.

   A. GG part, slow growth, solid part, more rapid growth.

   B. Solid part due to alveolar collapse and fibrosis.

   C. The central scar is a desmoplastic reaction to the tumor formed during growth of the tumor.
Ground glass nodule anterior segment right upper lobe measuring 1.9 x 2.1 cm, demonstrating minimal growth. In our experience a lesion with these characteristics hold an 80% chance of being an alveolar cell carcinoma.

70M history of bladder cancer

9/04/07 7/15/09 7/14/2010

Surgery 7/19/10 1.5 cm BAC with negative nodes.

- 73 lesions, 48 with serial study.
- Progression from AAH to type A to Type B to type C.
- Progression brings larger size, less ground glass, more solid component, appearance of air bronchograms or cavities, spiculated borders, pleural tags.
BAC is non-invasive cancer
5/14/03 60M Ca esophagus resected 3/03
5/14/04 one year followup. Size unchanged. CT# - 630H
Follow-ups

1. 5/14/03
2. 5/14/04
3. 6/10/05  1.1 cm
4. 6/30/06  stable
5. 1/23/07   1.3 cm
6. 7/22/07   1.8 cm
7. 4.27.08   last pre-op
12/05/07

4 year 2 month follow-up
Surgery 6/17/08, 5 years after 1st scan

* 2cm lesion

* Well to moderately differentiated mixed type adenocarcinoma with features of BAC.

* All 15 lymph nodes negative for tumor.
Focal scar above, BAC below
2008 versus 2011
8/07

58F being followed
Prior LLL lobectomy for adenoca
CT # -500H. Patient asymptomatic. History of MI.
To address advances in oncology, molecular biology, pathology, radiology, and surgery of adenocarcinoma.

AAH- atypical adenomatous hyperplasia. A proliferation of mildly atypical type II pneumocytes and Clara cells lining alveolar walls and sometimes respiratory bronchioles. Usually 5 mm or less in diameter.

AIS- adenocarcinoma in situ- localized, <3cm, adenocarcinoma growth restricted to neoplastic cells along existing alveolar structures without stromal, vascular, or pleural invasion. There is as continuum of morphologic changes between AAH and AIS.

MIA- minimally invasive adenocarcinoma. <3cm. <5mm invasion in greatest dimension in any one focus.
Decision on the management of GGNs

OPERATE

1. Significant solid component
3. Not necessary to do a lobectomy.
4. Aerogenous spread
5. Superb outcome - no LN mets, no recurrences.
6. >2 cm

DON’T OPERATE

1. Pure Ground Glass.
2. Overdiagnosis Bias
3. Resecting non-invasive carcinoma.
4. 1/6 of lung carcinomas at autopsy not diagnosed during life and not contributing to death.
5. Patient asymptomatic.
6. <1 cm
Mean diameter 2004 = \[ \frac{2.93 + 2.27}{2} \] = 2.6

Mean diameter 2007 = \[ \frac{3.2 + 2.6}{2} \] = 2.9
“The patient is active and well. We continue to follow her lesion that has shown no significant change. She is 75 years old, lives alone and travels the world. She has no family to care for her. A thoracotomy with lung resection would potentially compromise her lifestyle and possibly end her willingness to continue in life. Therefore I have decided to follow this lesion until absolutely forced to do otherwise. We have several patients with biopsy proven BAC who refuse surgery and yet live full lives with no symptoms from their pulmonary process. “

Conclusions GGN

1. The majority of persistent GGN are BAC.
2. Mean attenuation <-200H and typically -400H to -600H.
3. Diff DX: focal fibrosis and organizing pneumonia.
4. Lesions grow slowly – gradually develop central denser areas due to alveolar collapse and fibrosis.
Conclusions-GGN

5. Limited surgery: segmentectomy or wedge resection currently acceptable.

6. Predilection for non-smoking Asian women and patients with prior lung ca.

7. 3 month > 6 month >12 month follow

8. Follow lesions <1cm, remove lesions >2cm.

9. Jury is out on whether surgery is: overtreatment for a non invasive lesion or a prudent measure for a potentially life-threatening neoplasm.