1. A groundglass nodule measuring 2cm in diameter with a solid component measuring <5mm is unchanged on CT over a 3-month interval. Pathologically, this lesion is most likely to represent:
   a. Bronchioloalveolar carcinoma
   b. Atypical adenomatous hyperplasia
   c. Minimally invasive adenocarcinoma
   d. Invasive adenocarcinoma

Correct answer: C

Explanation:
As per the new pathology classification of adenocarcinomas of the lung (reference by Travis et al below) the term bronchioloalveolar cell carcinoma (BAC) has been eliminated and has been replaced with “carcinoma in situ”, a pre-invasive lesion, therefore A is incorrect. Atypical adenomatous hyperplasia (AAH), another pre-invasive lesion, appears as a pure groundglass nodule without a solid component, therefore B is incorrect. A groundglass nodule with a small solid component (≤5mm) is most likely due to “minimally invasive adenocarcinoma” (possibly carcinoma in situ). Thus the best answer is C. These lesions have an excellent prognosis with a 100% 5-year survival following resection. Subsolid nodules with larger solid components than this nodule are more likely to represent invasive adenocarcinomas, therefore D is incorrect.

References:

Codes:

2. Based upon these results of automated HRCT analysis, which of the following 4 patients with diffuse ILD is likely to have the poorest prognosis? (% = % volume of lung involved by that finding)
   a. 20% GGO, 4% honeycombing, 8% reticular; lower zone, peripheral predominant
   b. 18% nodules, 15% bronchovascular thickening; mid zone, central predominant
   c. 15% honeycombing, 5% GGO, 10% reticular; lower zone, peripheral predominant
   d. 15% cysts, 5% nodules, upper zone, uniform predominant

Correct answer: C

Explanation:
Patients with prominent honeycombing and absence of ground glass opacity, i.e. those with typical HRCT features of UIP, would be expected to have a poor prognosis, as is the case in patient C. On the other hand, the presence of ground glass opacity on HRCT in patients with ILD is associated with an increased likelihood of response to therapy and improved survival. Thus patient A would be expected to have a better prognosis. Patients with a predominant nodular pattern as in patient B are more likely to have a diagnosis other than an idiopathic ILD, such as sarcoid, and may respond well to therapy. Likewise, patient D does not have features suggesting an idiopathic ILD but rather findings suggesting...
Langerhans cell histiocytosis. Patients with the latter disorder have a good prognosis with stabilization following smoking cessation. **Thus the best answer is C.**

**References:**

**Modality:** C02E  
**Primary Content:** C02C  
**Anatomy:** C02C  
**Pathology:** C02K

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3. Which of the following HRCT features, when dominant, provides the highest accuracy in predicting the pathology in ILD?
   a. Cysts  
   b. Bronchovascular thickening  
   c. Ground glass opacity  
   d. Honeycombing  
   e. Traction bronchiectasis

**Correct answer:** D

**Explanation:**
The study by Sundaram et al cited below confirmed that honeycombing, when the predominant HRCT finding, predicted UIP at pathology with a high accuracy (92-97%), thus the correct answer is D. This is particularly advantageous since the HRCT diagnosis of UIP in the appropriate clinical setting can obviate the need for a diagnostic lung biopsy. Bronchovascular thickening and cysts also provided a high accuracy although less than that of honeycombing. Ground glass opacity has poor specificity (only 44-76% accuracy). Traction bronchiectasis can be seen in a number of fibrotic ILDs including NSIP, UIP and chronic hypersensitivity, and is therefore nonspecific.

**Reference:**

**Modality:** C02E  
**Primary Content:** C02C  
**Anatomy:** C02C  
**Pathology:** C02K

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4. Which of the following is the most sensitive imaging method for the detection of emphysema?
   a. Diffusion-weighted helium-3 MR  
   b. HRCT with inspiratory/expiratory scans  
   c. Radionuclide ventilation scan with washout  
   d. Xenon-enhanced dual-energy CT

**Reference:**
Correct answer: A

Explanation:
Apparent diffusion coefficient (ADC) measurements obtained from diffusion-weighted hyperpolarized helium-3 MR reflect alveolar size. The larger airspaces in emphysema can be detected by an increase in ADC (less restricted molecular diffusion) compared with normal lung. Diffusion-weighted MR thus can detect early microstructural changes of emphysema beyond the resolution of HRCT (therefore B is incorrect). The washout phase of radionuclide ventilation scans detect functional gas trapping with lower spatial resolution and sensitivity than other techniques (therefore C is incorrect). Xenon-enhanced dual-energy CT is the newest of these techniques, combining function with the spatial resolution of HRCT, but is not as sensitive as MRI (D is incorrect).

References:

5. In comparison to emphysema-predominant COPD, the airways-predominant phenotype is best characterized by which of the following features?
   a. Greater functional impairment
   b. Better response to inhaled corticosteroids
   c. Lower risk of exacerbations
   d. Greater extent of air trapping

Correct Answer: B

Explanation:
Airways-predominant COPD (as exemplified by a patient with chronic bronchitis) is characterized by a better response to anti-inflammatory agents and bronchodilators than emphysema-predominant COPD. The airways-predominant phenotype is associated with lesser functional impairment and a lesser extent of air trapping (therefore A and D are incorrect). The airways-predominant phenotype is also associated with more frequent exacerbations (therefore C is incorrect).

Reference:
6. In the National Lung Screening Trial (NLST) 27.3% of the CT scans on the initial screen were positive, i.e. showed a nodule ≥4mm or other findings potentially related to lung cancer. What percentage of these positive studies proved to be due to lung cancer?
   a. 4%
   b. 8%
   c. 14%
   d. 18%
   e. 22%

Correct answer: A

Explanation:
Approximately one quarter of the screening CT scans in NLST were positive due to the high prevalence of pulmonary nodules. Among these positive screening CT scans, however, only 4% proved to be due to lung cancer. Despite this apparently low detection of lung cancers, the NLST results demonstrated a 20% lung cancer mortality reduction among the CT-screened population (55-74 year old current or former 30-pack year smokers) compared with the chest radiograph control arm.

Reference:

Modality: C02E
Primary Content: C02C
Anatomy: C02C
Pathology: C02C

7. Which sonographic feature of thyroid nodules is the least specific for the diagnosis of papillary thyroid cancer?
   a. Micro-calcifications
   b. Infiltrating margins
   c. Lack of a halo
   d. Marked hypoechogenicity
   e. Taller than wide shape

Correct Answer: C

Explanation:
High specificity indicates that when a particular feature is present within a nodule the likelihood that the lesion is a cancer is high. Several recent papers have reviewed the sonographic features of papillary carcinomas and have found that lack of a halo has a specificity of 33 to 77%, with a mean of 43%, compared to mean specificities of 89% to 94% for microcalcifications, infiltrating margins, marked hypoechogenicity and taller than wide shape. (Therefore choices A, B, D and E are incorrect). While most papillary thyroid cancers are not encapsulated and therefore lack a halo or surrounding hypoechoic rim, most benign hyperplastic nodules, which account for over 65% of all thyroid nodules, also lack a halo, leading to decreased specificity of this sign.

References:

Modality: C05.G
Primary Content: C05.B
Which of the following statements is true according to the Society of Radiologists in Ultrasound guidelines for management of thyroid nodules detected at ultrasound?

a. Substantial growth of a nodule is an indication for biopsy.

b. Palpable thyroid nodules are more likely to be malignant than nodules of the same size discovered incidentally by ultrasound.

c. Nodule size is the most important criterion for prediction of malignancy

d. Microcarcinomas (smaller than 10 mm in size) always have an indolent course.

e. The guidelines apply both to patients with and without risk factors for thyroid cancer.

Correct answer: A

Explanation:
The SRU guidelines were developed for incidentally detected thyroid nodules seen on sonography in adult patients without known clinical risk factors for thyroid cancer. (Therefore choice E is incorrect). The American Thyroid Association has guidelines for nodules detected in patients with risk factors for thyroid cancer and for nodules detected by other modalities, such as PET. Several studies have shown that the risk of malignancy is independent of whether the nodule is palpable or non-palpable. (Therefore choice B is incorrect). The SRU guidelines stress both consideration of the clinical context of the incidentally discovery of a nodules as well as the importance of evaluation of the neck for lymphadenopathy suspect for metastatic thyroid carcinoma. If present, abnormal neck nodes should be sampled to document metastatic disease. Evaluation of the neck nodes is very important when nodules that have features suspect for a cancer are detected. Many thyroids harbor papillary microcarcinomas, defined as cancers less than 10 mm. Although most follow an indolent course, a microcarcinoma that presents with metastatic disease is considered a biologically aggressive tumor with significance equal to cancers larger than 1 cm. (therefore choice D is incorrect).

In the absence of aggressive behavior, such as invasion of adjacent of structures or the presence of metastatic disease, sonographic assessment of nodular features (such as features such as micro-calcifications, coarse or macro-calcifications, marked hypoechoogenicity, infiltrative margins and taller than wide shape) has emerged as the primary imaging means to evaluate the malignant potential of thyroid nodules. These features are more important than nodule size. (Therefore choice C is incorrect). Although benign nodules grow over time and some cancers may exhibit either no growth or very slow growth, FNA is indicated when a nodule exhibits substantial growth. (Therefore choice A is correct). This has been defined as at least a 50% volume increase, by the American Thyroid Association but was left as a subjective assessment by the SRU consensus statement.

References:


a. Multiple nodules are a sign of benign disease, and biopsy is not necessary.
b. If biopsy is performed, it is only necessary to biopsy the largest nodule
c. Sonographic features are superior to size for prediction of malignancy.
d. Patients with multiple nodules detected by sonography are at lower risk for thyroid cancer than patients with one palpable nodule.
e. Multiple nodules always cause the thyroid gland to enlarge.

Correct answer: C

Explanation:
Until the mid 1990s, it was widely believed that the risk of thyroid malignancy was higher in patients with a solitary palpable nodule compared to multinodular glands. More recently published series, which define gland nodularity by imaging or pathologic analysis, note that the risk of malignancy is independent of the number of nodules or whether the nodule is palpable. (therefore choice A is incorrect). The overall incidence of thyroid cancer in patients with nodules detected by sonography who undergo FNA is approximately 9 to 13% regardless of the number of nodules. (therefore choice D is incorrect). In patients with multiple nodules, the cancer rate per nodule decreases, but the rate of cancer per patient remains the same as that of patients with solitary nodules. Although cancer is most often present in the dominant or largest nodule, over one third of cancers present in a non-dominant nodule. (therefore choice B is incorrect). Thus, palpability, nodule size and multiplicity do not allow further triage of nodules into high or low risk status. Analysis of the sonographic features of thyroid nodules is the most effective non-invasive tool for estimating the risk of malignancy. (Therefore choice C is correct). The term goiter is applicable to patients with an enlarged thyroid gland. Many patients have multiple nodules without glandular enlargement and patients may have an enlarged thyroid gland without nodular disease, as in Graves disease or autoimmune thyroiditis. (therefore choice E is incorrect).

References:

Modality: C05.G
Primary Content: C05.C
Anatomy: C05.I
Pathology: C05.C

10. The ultrasound finding least typical of cervical lymph node metastasis from papillary thyroid cancer is?
a. Calcifications
b. Cystic change
c. Hyperechoic foci
d. Increased hypoechochogenicity
e. Peripheral vascularity

Correct Answer: D
Explanation:
Metastatic disease to cervical lymph nodes from papillary thyroid cancer may have a variety of appearances. The findings with the highest predictive value include cystic change and calcifications with near 100% specificity. (Therefore choices A and B are incorrect). Papillary thyroid cancer spreads by direct lymphatic spread to the cervical lymph nodes. The lymphatic drainage to lymph nodes is via the periphery of the node and therefore metastatic disease first involves the peripheral cortex and typically appears as hypoechoic foci. (therefore choice C is incorrect). These foci are often vacular and the increased vascular flow in the periphery of the node may be more apparent than the gray scale findings. (therefore choice E is incorrect). Hematogenously spread metastatic diseases typically first involves the central hilar portion of node. Increased hypoechogenicity of the cortex of a node is often seen in hematogeneous malignancies and reactive nodes and is not a typical feature of thyroid cancer metastases. (Therefore choice D is correct).

Reference:

Modality: C08.B
Primary Content: C08.C
Anatomy: C08.N
Pathology: C08.C