Incidental Radiology Findings

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Incidental findings in imaging diagnostic tests: a systematic review

- Review Article
- British Journal of Radiology (2010) 83, 276-289
- B Lumbreras, PhD, L Donat, MSC and I Hernández-Aguado, PhD

Conclusions:

- Overall, the mean frequency of incidental findings was 23.6% (95% confidence interval (CI) 15.8–31.3%).
- The frequency of incidental findings was higher in studies involving CT technology (mean 31.1%, 95% CI 20.1–41.9%), in patients with an unspecific initial diagnosis (mean 30.5, 95% CI 0–81.6).
Issue 1: Selecting the Right Test

- Radiology is complex and rapidly changing.
- Practice parameters based on an explicit, detailed, objective analysis of specific problems may aid physicians in the selection of tests.
- Consulting the radiologist can also help choose which tests to order.
- Point of ordering guidelines and reminders may be helpful in the future.

Example: Lung Cancer Screening

- Do you screen for lung cancer?
- If so, what do you use?
CXR and Lung Cancer

Chest X-Rays Can Detect Early Lung Cancer But Also Can Produce Many False-Positive Results

Issue 2: Communication between Radiologist and Clinician:

• nearly impossible to provide a comprehensive word picture of every abnormality. Subtleties of appearance that are of differential diagnostic importance are difficult to capture in words.
• The significance of some lesions may depend on further knowledge of the patient history.
• Communication is important.
• Numerous studies have verified that more accurate interpretations are possible if pertinent clinical information is provided.
Radiology Language

- Radiologists often use their own semiquantitative words to convey probability.
- Phrases like conceivably, worrisome for, consistent with, suggestive of, and cannot exclude are used to varying degrees at different institutions.
- Not only do clinicians interpret the same phrase differently but different radiologists use the same phrase differently.

Bayes’ Theorem

Under the Bayesian interpretation of probability, probability, or uncertainty, measures confidence that something is true.

BIRADS CATEGORIES:

<table>
<thead>
<tr>
<th>Final Assessment Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 = Need Additional Imaging Evaluation or Prior Mammograms For Comparison</td>
</tr>
<tr>
<td>1 = Negative There is nothing to comment on</td>
</tr>
<tr>
<td>2 = Benign Finding</td>
</tr>
<tr>
<td>3 = Probably Benign Finding (&lt;2% malignant) Initial Short-Interval Follow-Up Suggested</td>
</tr>
<tr>
<td>4 = Suspicious Abnormality (2 - 95% malignant) Biopsy Should Be Considered</td>
</tr>
<tr>
<td>5 = Highly Suggestive of Malignancy (&gt;95% malignant) Appropriate Action Should Be Taken</td>
</tr>
<tr>
<td>6 = Known Biopsy – Proven Malignancy</td>
</tr>
</tbody>
</table>
The Problem with Probabilities

- In order to use Bayes’ theorem, the disease prevalence in similar patients (pretest probability) and the test result must be mathematically combined.
- Unfortunately, estimating disease prevalence and quantifying the test result in a way that can be used in Bayes’ theorem require considerable guesswork.
- Medicine is not a science.
- Guesswork and intuition will always be needed because we cannot do all (or even most) of the scientific experiments that would be required for unambiguous answers.
- Clinical judgment and the use of Bayes’ theorem both require intuition.
- The major difference is that Bayes’ theorem requires physicians to be explicit about their intuition.
- When we are guessing, we should explicitly state that we are guessing.

Overview of Incidental Findings:
Incidental Findings on Brain MRI in the General Population

n engl j med 357;18
Nov 1, 2007

<table>
<thead>
<tr>
<th>Finding</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asymptomatic brain infarct</td>
<td>49 (1.6)</td>
</tr>
<tr>
<td>Lacunar infarct</td>
<td>112 (3.6)</td>
</tr>
<tr>
<td>Cortical infarct</td>
<td>49 (1.6)</td>
</tr>
<tr>
<td>Pituitary tumors, benign</td>
<td>11 (1.6)</td>
</tr>
<tr>
<td>Meningioma</td>
<td>8 (0.1)</td>
</tr>
<tr>
<td>Ventricular schwanoma</td>
<td>4 (0.1)</td>
</tr>
<tr>
<td>Intracranial Sinusitis</td>
<td>4 (0.1)</td>
</tr>
<tr>
<td>Intracranial schwannomas</td>
<td>4 (0.1)</td>
</tr>
<tr>
<td>Pituitary schwanoma</td>
<td>4 (0.1)</td>
</tr>
<tr>
<td>Venous tumors, meningioma</td>
<td>4 (0.1)</td>
</tr>
<tr>
<td>Other Tumors</td>
<td></td>
</tr>
<tr>
<td>Acoustic Neuroma</td>
<td>11 (1.6)</td>
</tr>
<tr>
<td>Atypical angioma</td>
<td>7 (0.1)</td>
</tr>
<tr>
<td>Meningioma</td>
<td>3 (0.1)</td>
</tr>
<tr>
<td>Subcortical herniation</td>
<td>3 (0.1)</td>
</tr>
<tr>
<td>Acquired cysts</td>
<td>40 (1.3)</td>
</tr>
<tr>
<td>Type I Cerebral Malaria</td>
<td>18 (0.5)</td>
</tr>
<tr>
<td>Meningeval herniation</td>
<td>9 (0.3)</td>
</tr>
<tr>
<td>Lateral cysts in acute stroke</td>
<td>2 (0.1)</td>
</tr>
<tr>
<td>Filumen Hernias</td>
<td>1 (0.0)</td>
</tr>
</tbody>
</table>

**White Matter Microangiopathic Changes**

![White Matter Microangiopathic Changes](image)
Significance of epidural fat on MRI
Thyroid Nodules:

• Thyroid nodules are a common clinical problem. Epidemiologic studies have shown the prevalence of palpable thyroid nodules to be approximately 5% in women and 1% in men living in iodine-sufficient parts of the world.
• In contrast, high-resolution ultrasound (US) can detect thyroid nodules in 19–67% of randomly selected individuals with higher frequencies in women and the elderly.
Revised American Thyroid Association Management Guidelines for Patients with Thyroid Nodules and Differentiated Thyroid Cancer

THYROID
Volume 19, Number 11, 2009

RECOMMENDATION 1

• Measure serum TSH in the initial evaluation of a patient with a thyroid nodule.
• If the serum TSH is subnormal, a radionuclide thyroid scan should be performed using either technetium 99mTc pertechnetate or 123I.
• Recommendation rating: A
RECOMMENDATION 2

• Thyroid sonography should be performed in all patients with known or suspected thyroid nodules.
• Recommendation rating: A

Thyroid US can answer the following questions:
• Is there truly a nodule that corresponds to the palpable abnormality?
• How large is the nodule?
• Does the nodule have benign or suspicious features?
• Is suspicious cervical lymphadenopathy present?
• Is the nodule greater than 50% cystic? Is the nodule located posteriorly in the thyroid gland?
• These last two features might decrease the accuracy of FNA biopsy performed with palpation.
• Also, there may be other thyroid nodules present that require biopsy based on their size and appearance.

RECOMMENDATION 12

• (a) In the presence of two or more thyroid nodules >1 cm, those with a suspicious sonographic appearance should be aspirated preferentially.
• Recommendation rating: B
• (b) If none of the nodules has a suspicious sonographic appearance and multiple sonographically similar coalescent nodules with no intervening normal parenchyma are present, the likelihood of malignancy is low and it is reasonable to aspirate the largest nodules only and observe the others with serial US examinations.
• Recommendation rating: C
Suspicious features:

- microcalcifications;
- hypoechoic;
- increased nodular vascularity;
- infiltrative margins;
- taller than wide on transverse view.

RECOMMENDATION 13

- A low or low-normal serum TSH concentration may suggest the presence of autonomous nodule(s).
- A technetium 99mTc pertechnetate or 123I scan should be performed and directly compared to the US images to determine functionality of each nodule >1–1.5 cm.
- FNA should then be considered only for those isofunctioning or nonfunctioning nodules, among which those with suspicious sonographic features should be aspirated preferentially.
- Recommendation rating: B

Follow up

- Thyroid nodules diagnosed as benign require follow-up because of a low, but not negligible, false-negative rate of up to 5% with FNA, which may be even higher with nodules >4 cm.
- Nodule growth is not in and of itself pathognomonic of malignancy, but growth is an indication for repeat biopsy.
- One reasonable definition of growth is a 20% increase in nodule diameter with a minimum increase in two or more dimensions of at least 2mm.
RECOMMENDATION 14

• (a) It is recommended that all benign thyroid nodules be followed with serial US examinations 6–18 months after the initial FNA. If nodule size is stable (i.e., no more than a 50% change in volume or <20% increase in at least two nodule dimensions in solid nodules or in the solid portion of mixed cystic–solid nodules), the interval before the next follow-up clinical examination or US may be longer, e.g., every 3–5 years.

• Recommendation rating: C

• (b) If there is evidence for nodule growth either by palpation or sonographically (more than a 50% change in volume or a 20% increase in at least two nodule dimensions with a minimal increase of 2mm in solid nodules or in the solid portion of mixed cystic–solid nodules), the FNA should be repeated, preferably with US guidance.

• Recommendation rating: B
High-risk history:

- History of thyroid cancer in one or more first-degree relatives;
- History of external beam radiation as a child; exposure to ionizing radiation in childhood or adolescence;
- Prior hemithyroidectomy with discovery of thyroid cancer;
- 18FDG avidity on PET scanning;
- MEN2a FMTC-associated RET protooncogene mutation;
- Calcitonin > 100 pg/mL;
- MEN, multiple endocrine neoplasia;
- Familial medullary thyroid cancer.

Table 1: Imaging criteria adapted from SGO Consensus Guidelines for FNA of thyroid nodules (rec.1)

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Module size (mm)</th>
<th>FNA?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid or nearly solid</td>
<td>&gt; 1 cm</td>
<td>Strongly consider FNA</td>
</tr>
<tr>
<td>Well-delineated solid</td>
<td>&gt; 1.5 cm</td>
<td>Strongly consider FNA</td>
</tr>
<tr>
<td>Abnormal echogenic (echo dense) with solid or mixed component</td>
<td>&gt; 2 cm</td>
<td>Consider FNA</td>
</tr>
<tr>
<td>Benign-appearing lymph nodes</td>
<td>Consider FNA</td>
<td></td>
</tr>
<tr>
<td>Presence of abnormal lymph nodal uptake</td>
<td>Should prompt fine-needle aspiration and/or traditional FNA due to the finding of lymph node involvement on post-FNA ultrasound imaging</td>
<td></td>
</tr>
<tr>
<td>handgun or oval shape with calcification on ultrasound</td>
<td>FNA likely unnecessary</td>
<td></td>
</tr>
</tbody>
</table>

MEN, multiple endocrine neoplasia; FMTC, familial medullary thyroid cancer.

12/01/2012
Solitary Lung Nodule

- diagnostic and therapeutic problem.
- range from a few millimeters up to 4 cm or more in size.
- larger than 2.5 cm and contain no calcium, it is highly probable that they are carcinomas.
- certain steps should be taken to ascertain the nature of the lesion.
- if the lesion was not present on films made within the preceding 1 or 2 years in a patient (particularly a smoker) older than 40 years of age, malignant tumor is the first consideration.
- if the nodule has undergone no increase in size for at least 2 years, it should be observed at intervals for several more years.
- CT should be used in the examination of patients with solitary pulmonary nodules to determine the presence or absence of calcification.
- When calcification is present the lesion is most likely benign, unless the calcification is focal and eccentric, which may indicate a calcified granuloma engulfed by tumor.
Lung Nodule Calcification

A or B?

Malignancy A or B?

[Images of lung nodules and calcifications]
Calcification and malignancy:

- A calculated likelihood ratio for malignancy with a benign pattern of calcification approaches zero.
- But only approximately 13% of malignant nodules have a non-benign pattern of calcification.

Nodule Features:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Risk of cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Diameter of nodule (mm)</td>
<td>&lt;1.5</td>
</tr>
<tr>
<td>Age (yrs)</td>
<td>&lt;45</td>
</tr>
<tr>
<td>Smoking status</td>
<td>Never smoked</td>
</tr>
<tr>
<td>Smoking-cessation status</td>
<td>Quit ≥7 years ago or never smoked</td>
</tr>
<tr>
<td>Characteristics of nodule margins</td>
<td>Smooth</td>
</tr>
</tbody>
</table>

Fleishner Society Criteria:

<table>
<thead>
<tr>
<th>Nodule Size (mm)</th>
<th>Low-Risk Patient</th>
<th>High-Risk Patient</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤4</td>
<td>No follow-up needed</td>
<td>Follow-up CT at 12 mos; if unchanged, no further follow-up/Initial follow-up CT at 6-12 mos then at 18-24 mos if no change/Initial follow-up CT at 36 mos then at 9-12 and 24 mos if no change/ Same as for low-risk patient</td>
</tr>
<tr>
<td>&gt;4-6</td>
<td>Follow-up CT at 12 mos; if unchanged, no further follow-up/Initial follow-up CT at 6-12 mos then at 18-24 mos if no change/Initial follow-up CT at 36 mos then at 9-12 and 24 mos if no change/ Same as for low-risk patient</td>
<td></td>
</tr>
<tr>
<td>&gt;6-8</td>
<td>Follow-up CT at 12 mos; if unchanged, no further follow-up/Initial follow-up CT at 6-12 mos then at 18-24 mos if no change/Initial follow-up CT at 36 mos then at 9-12 and 24 mos if no change/ Same as for low-risk patient</td>
<td></td>
</tr>
<tr>
<td>≥8</td>
<td>Follow-up CT at 12 mos; if unchanged, no further follow-up/Initial follow-up CT at 6-12 mos then at 18-24 mos if no change/Initial follow-up CT at 36 mos then at 9-12 and 24 mos if no change/ Same as for low-risk patient</td>
<td></td>
</tr>
</tbody>
</table>

PET Scans

- Ontario provides PET scans for patients with a solitary pulmonary nodule and potentially resectable non-small cell lung cancer

POSITRON EMISSION TOMOGRAPHY (PET)

- PET is a coalition of physics, chemistry, physiology and medicine
- Measures physiologic parameters non-invasively

COMPONENTS OF PET EXAM:

<table>
<thead>
<tr>
<th>Table 1 Components of a PET Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Radiopharmaceutical production</td>
</tr>
<tr>
<td>- Manufacture radiopharmaceuticals</td>
</tr>
<tr>
<td>- Link radiopharmaceuticals to</td>
</tr>
<tr>
<td>- Add cyclotron and chemical synthesis</td>
</tr>
<tr>
<td>- Imaging</td>
</tr>
<tr>
<td>- Administer radiopharmaceuticals</td>
</tr>
<tr>
<td>- Measure biodistribution of tracer</td>
</tr>
<tr>
<td>- Generate images of radioactivity</td>
</tr>
<tr>
<td>- Modeling</td>
</tr>
<tr>
<td>- Calculate physiologic parameters</td>
</tr>
<tr>
<td>- Medicine</td>
</tr>
<tr>
<td>- Interpret results in terms of the health of the patient</td>
</tr>
</tbody>
</table>
PET PRINCIPLES:

- PET imaging differs from conventional radionuclide imaging because it uses radionuclides that decay with positron emission.
- A positron has the same mass as an electron but has a positive charge.
- PET imaging consists of detection of these photons in coincidence.

18F-FDG is a structural analog of 2-deoxyglucose
- Enriched in tissues with high glucose consumption: inflammatory cells, tumour cells
A cyclotron is a machine used to accelerate charged particles to high energies. The first cyclotron was built by Ernest Orlando Lawrence and his graduate student, M. Stanley Livingston, at the University of California, Berkeley, in the early 1930's.

Cyclotron

Physiological Localization

\[ \text{Normal Glucose} \]

- Glu-1
- Fructose-6-phosphate
- Glucose-6-phosphate

\[ \text{Tumor Cell} \]

- FDG
- Glu-1
- Fructose-6-phosphate
- Glucose-6-phosphate

\[ ^{18} \text{F} \text{FDG} = \text{Glucose-6-phosphate}^{18} \text{F} \text{Phosphate} \]
Time line for Production and Use of FDG:
Coronary artery calcifications: significance of incidental detection on CT scans.


- A scoring system was devised for the assessment of coronary artery calcifications apparent on computed tomographic (CT) scans, with width and length used to assess severity.

- The degree of calcification was compared with the presence of stenoses of 70% or greater at cardiac catheterization in 46 patients who underwent both studies.

- Although many significantly stenosed vessels showed no calcification, heavy calcifications had a high positive predictive value for significant disease.

- In a separate branch of the study, the perioperative cardiac morbidity and mortality were compared in 30 age- and sex-matched pairs of patients undergoing thoracotomy who did and did not have coronary calcifications on CT scans obtained before surgery.

- Patients with calcifications had a higher frequency of cardiac complications, including arrhythmias, ischemia, hypotension, myocardial infarction, and death.
What is the normal calibre of the CBD after cholecystectomy?

- The difference between patients without cholecystolithiasis (6.2 ± 2.3 mm) and patients after cholecystectomy (8.7 ± 2.9 mm) was statistically significant (P < 0.0001).
- Cholecystolithiasis (6.0 ± 1.6 mm) proves not to be an additional factor for CBD widening in comparison with patients without stone disease.
- The CBD is larger in older people.
- An upper limit of 10 mm seems reasonable for patients with and without cholecystolithiasis.
- A significant increase in CBD width after cholecystectomy was found and measurements up to 14 mm may occur.
- Measurements have to be correlated with clinical and laboratory findings.

European Radiology
Volume 8, Number 8, 1998, 1413-1415
TSTC (too small to characterize lesions)

- We cannot diagnose them with certainty as:
  - cysts: water-density, sharp demarcation
  - hemangiomas: slowly progressive peripheral nodular enhancement of arterial density
  - malignant lesions: inhomogeneous, irregular demarcation, peripheral enhancement less than arterial density

- For this type of lesions which, due to their small size and atypical imaging features, cannot be confidently categorized, the term TSTC (too small to characterize) lesions has been coined.

Incidental hypervascular lesions

- Incidental hypervascular lesions are also very common findings in liver imaging. It is important to differentiate between 'touch' and 'don't touch' lesions. Benign 'don't touch' hypervascular tumors include hemangioma, FNH and small adenomas.
- 'Touch' lesions include large adenomas (more than 5 cm) and malignant tumors like Hepatocellular carcinoma (HCC), Fibrolamellar carcinoma (FLHCC) and metastases.
- These enhancing, solid lesions should be differentiated from vascular lesions, like hepatic aneurysm, aortoporal shunt or pseudoaneurysm.
Typical hemangioma:
- Enhancement in arterial phase is almost isodense to the aorta.
- As contrast diffuses toward the center of the lesion, the level of enhancement lowers slowly.
- On the left a typical hemangioma.
- In the late phase is still hyperdense compared to the vascular spaces.

Enhancement in ‘capillary blush’
- ‘Capillary blush’ due to an abundant capillary network which characterizes FNH, adenoma, HCC and hypervascular metastases.
- As capillaries are surrounded by tissue the overall enhancement will be less dense compared to the enhancement of the vascular spaces in hemangioma.
- Hence, in capillary blush, the enhancement occurs slightly later compared to the aorta and is less dense than the aorta.

Focal Nodular hyperplasia:
- Non-neoplastic, hyperplastic response to a congenital vascular malformation.
- At late arterial phase, FNH typically presents with a bright homogeneous enhancement, but less intense than the aorta with a hypodense central scar.
- Smaller (< 3cm) FNH, often lack a central scar.
- The radiating hypodense fibrous bands or septa, arising from the scar, are not infrequent and quite characteristic.
- At portal phase, FNH is often iso-attenuating to the normal liver and may be difficult to delineate.
- Delayed phase often shows hyperattenuation of the central scar and septa due to late opacification of the fibrotic components.
- No calcifications, inhomogeneity or capsule should be seen in FNH.
Hepatic adenomas:
- are uncommon benign epithelial liver tumors that develop in an otherwise normal appearing liver.
- They are seen predominantly in young women (20 to 44 years-old), are frequently located in the right hepatic lobe, and are typically solitary (70 to 80 percent), although multiple adenomas have been described in patients with prolonged contraceptive use, glycogen storage diseases (GSD), and hepatic adenomatosis.
- Adenomas range in size from 1 to 30 cm.
- Symptoms, such as abdominal pain, are more likely with larger lesions.

Hypervascular lesions, somewhat less dense than we would expect in FNH.
- Both lesions demonstrate a halo of a capsule, which should not be apparent in FNH.
- Unlike in FNH, the enhancement is inhomogeneous and in the portovenous and equilibrium phase the lesions are not isodense to the liver.

Hepatocellular carcinoma (HCC):
- 'Every hypervascular lesion in a cirrhotic liver is HCC until proven otherwise.'
- On the left we see a cirrhotic liver with irregular margins (arrows), suggesting that the hypervascular lesion is a HCC.
- The inhomogeneous enhancement and the partial capsule are helpful for the diagnosis HCC, but even if these features were not present, our diagnosis still would be HCC.
Hypervascular metastases
- A hypervascular primary tumor like endocrine tumors (thyroid, carcinoid), renal cell tumors and some breast carcinomas.
- Often coexisting hypo- and hypervascular metastases.
- Larger lesions are often inhomogeneous due to central necrosis.
Features of a cyst on Ultrasound:

![Image of ultrasound]

Features of a cyst on CT:

![Image of CT scan]

<table>
<thead>
<tr>
<th>Substance</th>
<th>Hounsfield units (HU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air</td>
<td>-1,000</td>
</tr>
<tr>
<td>Fat</td>
<td>-50</td>
</tr>
<tr>
<td>Water</td>
<td>0</td>
</tr>
<tr>
<td>Soft tissue</td>
<td>+40</td>
</tr>
<tr>
<td>Calculus</td>
<td>+100 to +400</td>
</tr>
<tr>
<td>Bone</td>
<td>+1,000</td>
</tr>
</tbody>
</table>

Hounsfield units are units of x-ray attenuation used in computed tomographic scanning. Each pixel is assigned a value on a scale from -1,000 to +1,000.
**Bosniak renal cyst classification**

- **Bosniak 1**
  - simple cyst, anechoic, imperceptible wall, rounded
  - work up: nil
  - % malignant: ~ 0

- **Bosniak 2**
  - minimally complex, single thin (< 1mm) septations, thin Ca++; non-enhancing high-attenuation renal lesions of less than 3 cm are also included in this category; these lesions are generally well marginated.
  - work up: nil
  - % malignant: ~ 0

---

**Table 3: Bosniak's Classification of Cystic Renal Masses**

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Simple benign cysts. These lesions are round or oval in shape, are unilocular with the uniform density of water, have no perceptible wall and exhibit no enhancement on radiographs taken after the administration of contrast medium.</td>
</tr>
<tr>
<td>II</td>
<td>Probable benign simple cystic lesions that are minimally complicated. These lesions include septated cysts, minimally calcified cysts, infected cysts and high-density cysts.</td>
</tr>
<tr>
<td>III</td>
<td>More complicated cystic lesions. These lesions exhibit some findings seen in malignant, such as thick, irregular calcifications, irregular borders, multilocular form, thickened or enhancing septa, uniform wall thickening or small hemorrhaging nodules.</td>
</tr>
<tr>
<td>IV</td>
<td>Clear-cut malignant cyst masses. The appearance of these lesions results from necrosis and liquefaction of a solid tumor or a tumor growing in the wall. These lesions are heterogeneous, with a shaggy appearance, thickened walls or enhancing nodules.</td>
</tr>
</tbody>
</table>

**Bosniak renal cyst classification**

- **Bosniak 2F**
  - minimally complex but requiring follow up, thin septation, thick Ca++, hyperdense.
  - for a hyperdense cyst on CT to be 2F needs to meet the following criteria:
    - > 3 cm diameter, mostly intrarenal (less than 25% of wall visible), no enhancement
    - work up: needs ultrasound / CT follow up
  - % malignant: ~ 5%

- **Bosniak 3**
  - indeterminate, thick or multiple septations, mural nodule, hyperdense on CT (see 2F)
  - treatment / work up: partial nephrectomy or RF ablation in elderly / poor surgical risk
  - % malignant: ~ 50%

- **Bosniak 4**
  - clearly malignant, solid mass with cystic spaces surgery
  - treatment: partial / total nephrectomy
  - % malignant: ~100%

**Bosniak II F**

- Require follow up CT yearly for 5 years to establish stability.
Guidelines on the management of renal cyst disease


• There are no randomized controlled trials with regards to follow-up or management of cystic renal masses, as such, the recommendations are primarily expert opinion.

• At this time, category I and II renal cysts, do not require further imaging or follow-up.

• Patients in Category III, because of the approximate 5% malignant risk, do require periodic imaging. (There is no consensus or evidence based internal determined for follow-up imaging.) Combination of ultrasound and MRI should be considered as follow-up for Bosniak III and reduces the lifetime radiation dose (once the lesion has been characterized by triphasic CT scan) in patients younger than 50 years.

• For Category III (50% malignant risk) and category IV (75% to 90% malignant risk), surgical excision is recommended (Level 3 evidence, Grade B recommendation).

• Although MRI may add further information, it should be used as an adjunct to CT scans in difficult cases (Level 4 evidence, Grade C recommendation).
TABLE 4
Differential Diagnosis of Incidental Adrenal Masses

<table>
<thead>
<tr>
<th>Mass</th>
<th>Number (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adenoma</td>
<td>107 (51)</td>
</tr>
<tr>
<td>Metastatic cancer</td>
<td>64 (31)</td>
</tr>
<tr>
<td>Adrenal cancer</td>
<td>9 (4)</td>
</tr>
<tr>
<td>Cyst</td>
<td>9 (4)</td>
</tr>
<tr>
<td>Pheochromocytoma</td>
<td>9 (4)</td>
</tr>
<tr>
<td>Hyperplasia</td>
<td>4 (2)</td>
</tr>
<tr>
<td>Lipoma</td>
<td>3 (2)</td>
</tr>
<tr>
<td>Myelolipoma</td>
<td>3 (2)</td>
</tr>
</tbody>
</table>


Adrenal mass detected incidentally on CT scan or ultrasound examination

- What is the size (greatest diameter) of the lesion?
  - < 3 cm
    - Yes: Radiographic surveillance at 3 months, and then every 6 months for 2 years
  - Yes: Referral based on symptoms or laboratory test results
  - No: MRI and additional endocrine evaluation
  - > 6 cm: Surgical referral
  - > 3 to ≤ 6 cm

Algorithm for managing an incidental adrenal mass.
TABLE 5
Evaluation of Adrenal Masses

<table>
<thead>
<tr>
<th>Cause</th>
<th>Signs or symptoms</th>
<th>Screening test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cushing's syndrome</td>
<td>Hypertension, moon-shaped face, buffalo hump, strabismus, proximal muscle weakness, truncal obesity, thin skin, easy bruising</td>
<td>24-hour urinary free cortisol measurement or desmopressine suppression test</td>
</tr>
<tr>
<td>Pheochromocytoma</td>
<td>Hypertension, headache, diaphoresis, palpitations</td>
<td>24-hour urinary metanephrine, vanilyl mandelic acid or catecholamine measurement</td>
</tr>
<tr>
<td>Hyperaldosteron</td>
<td>Hypertension, hypokalemia, hypernatremia</td>
<td>Serum potassium level</td>
</tr>
</tbody>
</table>

http://www.radiologyassistant.nl/en/421aee7c6596c
### Basics

- In patients less than 30 years, a narrow zone of transition indicates benignancy.
- Mets and myeloma need to be included in the differential diagnosis of a well-defined bone lesion in a patient over 40 years.
- Infection and eosinophilic granuloma can mimic a malignant tumor with cortical destruction and aggressive periosteal reaction.
- Malignant bone tumors do not cause benign periosteal reaction.
Any Incidental lesions I have not covered that you want to ask about?

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