Incidental findings in Oncology Imaging

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Disclosure

• None
Outline

• Background
  • Definition
  • Current problem
  • Specifically in oncology imaging

• Vascular findings
  • Pulmonary Embolism

• Organ specific
  • Thyroid nodules
  • Pulmonary nodules
  • Adrenal nodules
  • Liver lesions
  • Adnexal lesions
Background

• Incidentaloma (Incidental = by coincidence; oma= tumour *Greek*)
  • Unexpected, asymptomatic abnormality that are discovered serendipitously while searching for other pathology or during screening examination¹.

• Incidental radiologic findings are common in clinical practice and research

1. Managing incidental findings on abdominal CT: white paper of the ACR incidental findings committee. Berland LL etal.
Background

• Reasons for the increase
  • Increase use of imaging from diagnosis to management
  • Dramatic rise in cross-sectional imaging is the key reason

Eg, Use of
  • cross sectional imaging (eg CT simulation) vs plain radiographs,
  • CT pulmonary angiogram vs VQ scan
  • Intravenous pyelogram vs CT urography
  • The list goes on.....

• Aging population
• Improve in the quality of imaging
VQ scan vs CTPA

Pahade J et Radiographics 2009
Intravenous urogram

CT urogram
‘Incidental’ lesions in oncology could be:

1. Metastases from the pre-existing primary
2. Second primary malignancy
3. Benign lesion

Multidisciplinary team approach

• Further management depends on patient’s comorbidity, performance status, life expectancy etc
• May impact on treatment planning eg Crohn’s disease and radiation
Specifically for oncology patients

Tests that are potentially problematic

• Screening examination
  • CT colonography
  • CT chest for lung screening

• Staging CT chest abdomen and pelvis eg. Prostate cancer

• Family history – hereditary screening program

• Research

• CT simulation for radiation planning

• PET-CT
What are the pros and cons?

   • Eg CTPA – incidental findings requiring follow up were nearly 3 x more common than emboli.¹
   • Incidental findings change incidence of disease eg Thyroid cancer double over 30 years²,³, 61% increase in RCC.
2. Increase patient’s anxiety
3. Dilemma for referring physicians
4. Radiologists are anxious about missing incidental findings
5. Lack of recommendations for management plan for radiologists for indeterminate findings
6. Detection of early stage synchronous cancer

³ Cronan JJ. Thyroid nodules: is it time to turn off the US machines? Radiology 2008;247:602-4.
Prostate cancer

• Retrospective evaluate 355 CT AP – patient prostate cancer 5 year period
• Incidental Findings (IF) are considered significant if therapeutic intervention, additional imaging or tissue sampling was advised.
• Rate of IF correlated to patient’s age and prostate cancer risk
• Result:
  • 779 IF in 292 patients
  • 20.6% were significant
  • Synchronous malignancy in 5.9% (RCC 1.97%; Lymphoma 1.13%) –
    • ALL N0M0 disease
    • Age >65
  • Significant vascular findings – 6 patients

1. Incidental Findings at initial imaging workup of patients with Prostate cancer: Clinical significance and Outcomes. Azadeh et al AJR Dec 2012 Volume 199 Number 6
Vascular findings

Pulmonary embolism
Pulmonary embolism

• Malignancy increase risks of thromboembolic disease
• Can be detected in CT Abdomen Pelvis (last few slices), CT Chest (PV phase)
• Central PE – Generally treat
• What about isolated subsegmental PE (ISPE)
CT AbdoPelvis
? Posterior basal
RLL PE

Dedicated CT PA study

Motion artefact
Non diagnostic

Isolated subsegmental PE
right posterobasal

No PE
TOO MUCH MEDICINE

When a test is too good: how CT pulmonary angiograms find pulmonary emboli that do not need to be found

Renda Soylemez Wiener assistant professor\textsuperscript{1,2}, Lisa M Schwartz professor\textsuperscript{3,4}, Steven Woloshin professor\textsuperscript{3,4}
Case 1: Melanoma-staging CT

26 May 2016

27 May 2016 CTPA study
June 2\textsuperscript{nd} 2016

Subsegmental PE resolved

Other history:
Recent craniotomy for brain mets
Lung nodule
Case 2: 92 man staging CT
Organ specific IF
Thyroid nodules

• Very common in adult population.

• Large autopsy study published in 1955 found that 50% of patients with no clinical history of thyroid disease had thyroid nodules.

• Incidental thyroid nodules (ITN)
  • 20-67% of ultrasound studies
  • 25% of contrast-enhanced chest CT scans
  • 16-18% of CT and MR of the neck
  • 1-2% FDG PET scans
What we know...

• Small thyroid cancer are indolent
• Incidentally detected thyroid cancer are more likely to be papillary cancer good prognosis even without treatment.
• Small thyroid cancers do not benefit from treatment
• Subclinical thyroid cancer common
  • 36% of 101 autopsies found occult papillary cancers
• Davis et al reported incidence of thyroid cancer tripled from 1975-2009 but mortality stable
Risk of cancer in Incidental thyroid nodules (ITN)

- ITN detected on US 1.6% to 12%\(^1\)
- ITN detected on CT and MRI range from 0-11%\(^2,3\)
- ITN detected on FDG-PET scan at 33-35%\(^4\)

Problems

• Patient’s anxiety
• Although FNABs carry minimally risk, cytology difficult to differentiate adenoma vs carcinoma
  • repeat bx,
  • unnecessary surgery (25-41% ITN proceed to surgery- 36-75% = benign)
  • Only 25% of patients suspicious for malignancy
Managing incidental thyroid nodules

ACR guidelines 3 tiered system

• Category 1- Any size with aggressive imaging features
• Category 2- <35 years old
• Category 3- 1.5cm and not meeting criteria 1 and 2

1. Managing Incidental Thyroid Nodules Detected on Imaging: White Paper of the ACR Incidental Thyroid Findings Committee
   Jenny K. Hoang, MBBSa, Jill E. Langer, MD b, William D. Middleton, MD c, Carol C. Wu, MD d, Lynwood W. Hammers, DO e, John J. Cronan, MD f, Franklin N. Tessler, MD, CM g, Edward G. Grant, MD h, Lincoln L. Berland, MD g
Incidental Thyroid Nodule Detected on \textsuperscript{18}FDG-PET and Other Nuclear Medicine Scans\textsuperscript{1}

- **Focal activity\textsuperscript{2}**
  - Limited life expectancy and comorbidities\textsuperscript{3}
    - No further evaluation
  - General population
    - Evaluate with thyroid ultrasound\textsuperscript{4}

- ITN on accompanying PET/CT or PET/MRI without metabolic activity
  - Refer to Recommendations for ITN on CT and MRI
Clinical input that will be helpful:

HISTORY

- Childhood radiation
- Endocrine syndromes
- Family history
Case 1

- 85 year old, history of diffuse large B cell lymphoma
- PET-CT workup show FDG avid right thyroid nodule
1.1cm right thyroid nodule
SUV max 5.0
Hurthle cell lesion of undetermined significance

- Overall malignancy rate of cytology of follicular lesion of undetermined significance range from 5-30%
- This patient is waiting for surgery
Case 2

• 60 female
• Jejunal GIST in the setting of neurofibromatosis
• Incidental thyroid nodule found in routine CT
Benign follicular nodule with cystic degeneration
Case 3

• 63 year old T3N2 M1 rectal cancer
• PET-CT FDG avid right thyroid nodule
1.5cm right thyroid nodule
SUV max 13.6
Papillary thyroid carcinoma
Lung nodules

- Lung nodules
- Fleichner’s criteria – follow up small lung nodules incidentally detected on CT
- Perifissural nodules
- Triangular intrapulmonary lymph nodes
56 female history of breast cancer
Fleichner’s criteria

Fewer than 1% of very small (<5mm) nodules in patients without a history of cancer will demonstrate malignant behaviours

- <5mm -> 12 mo FU found NO cancer
- 5-9mm → 6% malignant detected at 4-8 months FU scan
- 8mm nodules → 10-20% risk of malignancy
## Solid non calcified nodule (NCPN)

<table>
<thead>
<tr>
<th>Nodule size (mm)</th>
<th>Low risk</th>
<th>High risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;= 4</td>
<td>No follow up</td>
<td>F/U 12 moths If unchanged- no further FU</td>
</tr>
<tr>
<td>&gt;4-6</td>
<td>F/U 12 mo Unchanged-Stop</td>
<td>Initial FU CT at 6-12 mo then 18-24 mo if no change</td>
</tr>
<tr>
<td>&gt;6-8</td>
<td>Initial 6-12 mo then 18-24 mo</td>
<td>Initial FU 3-6 mo 9,12,24 mo if no change</td>
</tr>
<tr>
<td>&gt;8</td>
<td>3,9, 24 mo CE CT, PET CT=/- biopsy</td>
<td>Same as low risk patients</td>
</tr>
</tbody>
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History of extrapulmonary malignancy

- Cahan et al (1978) thoracotomy results
  - 800 with cancer over 35 years
  - 500 NSCLC (HN, bladder, breast, prostate)
  - 196 metastatic (melanoma, bone, soft tissue sarcomas and testicular cancer)

  - Non calcified pulmonary nodules $\geq 5\text{mm}$ found on CT chest
  - HN cancer patients more likely to have NSCLC

  - 151 patients – 42% with malignant nodules
  - 50% lung cancer, 44% metastatic, 3% second primary, 3% unknown primary
NCPN in patients with extrapulmonary cancer

• Shorter interval follow ups
• Low threshold for biopsy
• Clinical correlation especially history of smoking
• Lung cancer is not excluded by the findings of multiple nodules
Liver

• Jones et al\(^1\) (1992)-
  • 1454 consecutive patients
  • 17\% - \leq 1.5\text{cm} hepatic lesions found
  • 82\% of this patients known to have extrahepatic malignancy --51\% lesions benign, 26\% malignant, 23\% indeterminant
  • 5\% with 1 lesion
  • 19\% -2-4 lesions
  • 74\% >5 lesions
  • Multiple small lesions were more likely to represent malignant disease than were single small lesions

\(^1\)Jones EC, Chezmar JL, Nelson RC, et al. The frequency and significance of small (less than or equal to 15 mm) hepatic lesions detected by CT. AJR 1992; 158: 535-539.
• Schwartz et al
  • Small \( \leq 1.0 \text{cm} \) lesions found in 12.7% patients
    • 80.2% benign,
    • 11.6% malignant
    • 8.2% indeterminate

• Jang et al
  • 1133 colorectal and gastric patients; \( \leq 1.5 \text{cm} \) hypoattenuating lesions in 25.5% cases
    • 94% smooth, \(<20\text{HU} = \text{benign}\)

• Khalil et al
  • 941 breast cancer patients found 29.4% small liver lesions
  • 92.7% no change
What are the liver lesions?

- Metastases
- Hepatic cysts (14% autopsy series)
- Bile duct hamartomas (0.69-5.6%)
- Hemangioma (1-20%)
- Focal nodular hyperplasia (0.9%)
- Hepatic adenoma
- Nodular regenerative hyperplasia
- Transient hepatic attenuation difference
Case 1

- 65 man stage II thymoma resected in 2007 + radiation
- Routine Chest CT follow up 14 May 2015
In phase

Oppose phase
Pathology

• Benign, mild steatosis
Case 2

- 66 man hx of papillary thyroid carcinoma and tonsillar SCC with metastatic lymph node
- PET CT indeterminate liver lesion
Angiomyolipoma
Simple hepatic cysts
Adrenal mass

• Common
Pre op GE Junction tumour

Post op gastric pull up
Adnexal lesions

- 3448 CT scans reviewed 5% (168) has adnexal lesions, 72 had an extra-ovarian neoplasm
- In both pre and post menopausal woman, most adnexal lesions were benign even in the presence of known malignancy
- In pt with known non gyne malignancy, no primary ovarian neoplasms were discovered and 3% had metastases – all post menopausal
- No primary ovarian malignancy were discovered incidentally in the non oncological population
- 121 breast cancer underwent resection of adnexal masses, 61 had benign, 60 malignant
The adnexal incidentaloma: a practical approach to management
50 year female history of Breast Cancer
38 female abdo pain
• Krukenberg tumour
• Metastases
Clinical input

- Risk of malignancy index
- Ultrasound score x manopausal state x CA125
- Manopausal state
Conclusion

• Incidental findings are common due to the exponential usage of cross-sectional imaging
• In oncology patients the concerns are mets, second primary or benign
• Increase use of guidelines and recommendations to have a more uniform approach by Radiologists
• Multidisciplinary approach is key to management
  • Radiologists- best imaging modality
  • Clinicians (Med onc, Rad onc, GPO)- co-morbidities, performance status, life expectancies and patient’s expectations
  • Pathologists
Thank you

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