

# Management of Incidentalomas on MRI spine

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## Incidentaloma

- Something unexpected on imaging, often prompting further work up
- Common incidentalomas in spine imaging include
  - Thyroid
  - Renal lesions
  - Abdominal aortic aneurysm
  - Others – ovary, lung nodules, adrenal, etc...
    - Not included in this talk.

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## Thyroid



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### Background of the ITN

- Incidental thyroid nodule (ITN) is one of MC incidental findings on H&N imaging
- Defined as “nodule not previously detected or suspected clinically but detected on an imaging study
- ITN → increased cost and risk to patient if Bx
- High variability in management by radiologists
- Majority are benign!

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### Background

- Nodules very common
  - 1955 autopsy study 50% with nodules, most multiple
- Seen on 16-18% of neck/C spine CT and MRI
- Malignancy rate of these incidentally detected nodules ranges from 0-11%

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### Understanding FNA

- Safe procedure but not infrequently is inconclusive, leading to repeat Bx or surgery
- 25-41% that have FNA go to surgery (and for those that don't many get follow up US)
- 36-75% of these that go to surgery are benign
- → reason to prevent unnecessary FNA if possible

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### Furthermore

- MC incidentally discovered thyroid CA is papillary CA
- Small papillary CA (the kind likely to be seen but not felt) has excellent prognosis even without Tx
  - Untreated papillary microcarcinoma 100% survival at 10 yrs in one study

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### Imaging

- CT and MRI – “no reliable features to diff malignant from benign”
- Things to consider when managing nodules
  - Size
    - Thyroid cancers <2 cm generally have an indolent course, with a 99.9% 10-year survival rate
      - failure to diagnose these cancers is unlikely to affect morbidity and mortality
  - Age and comorbidities
    - Higher rate of malignancy if under 35

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### Reference

- Am College of Radiology white paper *J Am Coll Radiol* 2015;12:143-150 sets forth recommendations for management of ITN
- Goals of this paper include:
  - Distinguish ITN that needs US versus those that do not
  - Reduce likelihood of unnecessary FNA in ITN
- Exceptions – patients with increased risk thyroid Ca (MEN); symptomatic patients; peds

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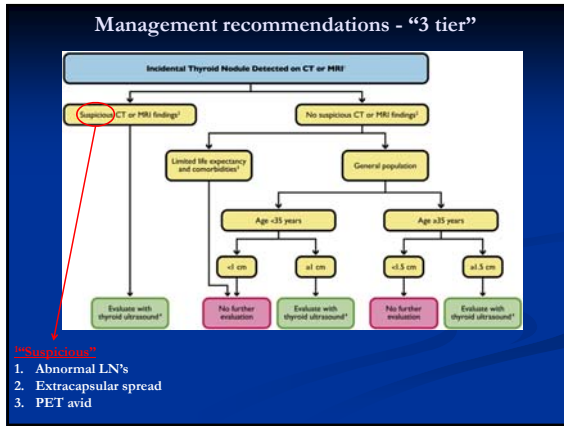
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### Additionally

- For patients with multiple nodules the flow chart should be applied to the largest nodule
- Patients with diffusely heterogeneous, enlarged thyroid should have US (age and comorbidity dependent)

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### Results

- Estimated to reduce unnecessary Bx by up to 35% in one academic institution
- Another study decreased US follow up of ITN on CT by 46%
- Another study → false negative rate 13% but only missed 1.2% malignancies
  - most that were missed were small papillary CA's

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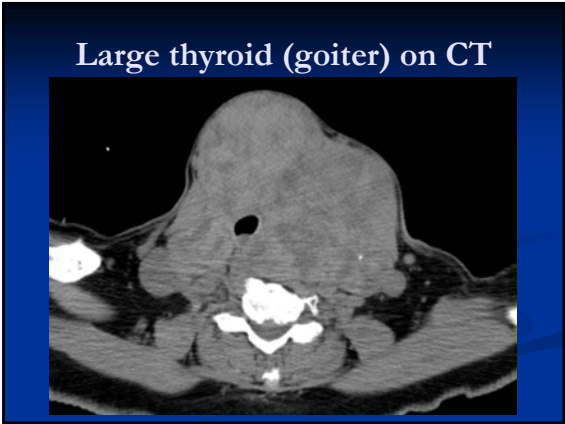
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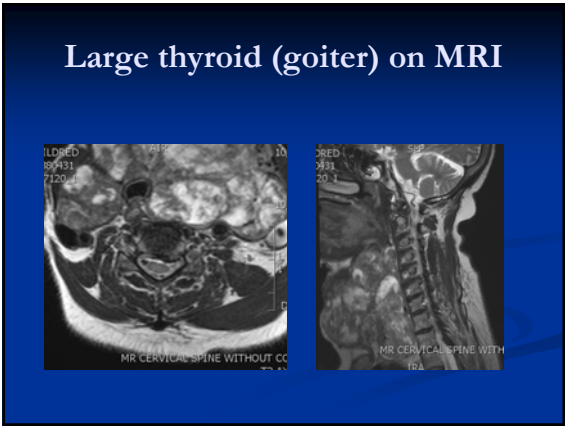
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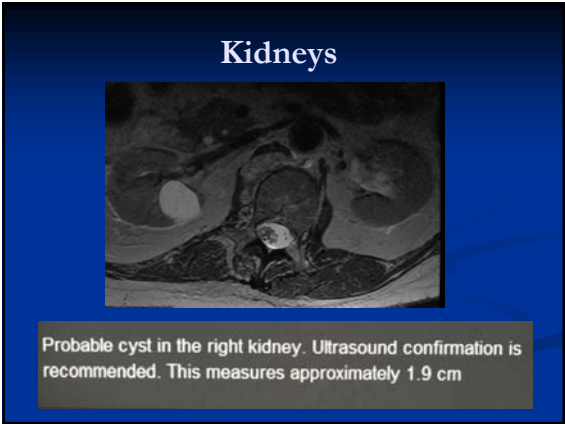
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## Renal lesions

- Renal lesions increased frequency with age (so does back pain) → as a result, frequently see renal lesions
- Management of renal lesions on *dedicated* imaging is well established
- Many, however, are incidentally/incompletely found on other studies (i.e. spine)
- Increasing evidence shows indolent behavior of smaller lesions, prompting more conservative management

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## Considerations

- One of three patterns for incidental renal lesions
  - mass completely characterized and can make suggestions on management confidently based on imaging
  - it is not completely imaged and further diagnostic workup necessary
  - it is not completely imaged but enough is seen to reliably determine management
- Usually the latter two in spine imaging

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## MC lesion is a simple cyst

- Bosniak classification – used to characterize cystic renal lesions
- Simple cyst is a Bosniak class I lesion
  - 40% patients incidentally have a simple cyst on CT
- Imaging of simple cyst includes
  - MRI – follows fluid on all sequences
    - Use CSF as reference (bright T2, dark T1)
  - CT
    - <20 HU non-contrast and <10 HU change after contrast given
  - US
    - Thin wall, anechoic, increased through transmission

Management of the Incidental Renal Mass on CT: A White Paper of the ACR Incidental Findings Committee. Shan R, Harris, MDs, Stuart G, Silverman, MDs, Neech, M, Hradman, et al. J Am Coll Radiol 2016;15:264-273. G. M. Israel and M. A. Reznick, "How safe is evaluating renal masses," *Radiology*, vol. 256, no. 2, pp. 441-450, 2005.

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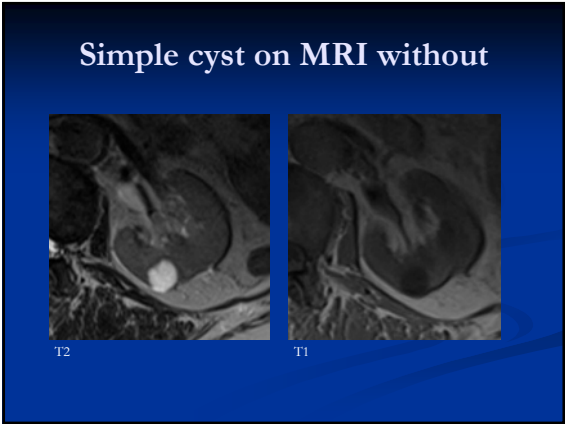
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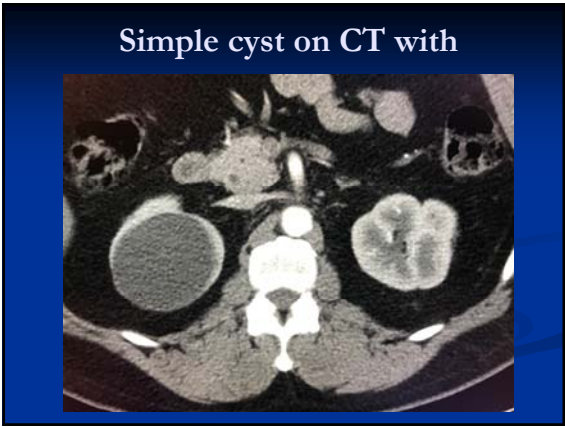
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### Benign, but not simple cyst

- Bosniak II lesions
- Include
  - Cyst with “few” thin septations or fine calcification
  - Proteinaceous or hemorrhagic cysts
    - >70 HU before contrast on CT 99% benign

A. Jansen, A. N. Rahbari, P. G. Menck, and G. M. Frisch. "Can high-attenuation renal cysts be differentiated from small cell carcinoma in unenhanced CT?" *Radiology* vol. 243 no. 2 pp. 442-450, 2007.

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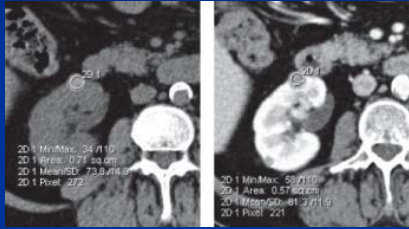
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## Hemorrhagic cyst on CT (II)



Imaging and Management of Incidental Renal Lesions. Mazzoni, et al. BioMed Research International, Volume 2017

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## Hemorrhagic cyst on MR (II)



Imaging and Management of Incidental Renal Lesions. Mazzoni, et al. BioMed Research International, Volume 2017

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## Indeterminate and high risk cystic lesions

- Low and medium risk lesions are classified as Bosniak IIF and III lesions
- Bosniak IIF
  - "multiple" septations. No nodules but septa thicker, enhance. Thicker calcs
  - Less than 3 cm and between 20-70 HU
  - Follow up CT or MRI at 6 months and then for 5 years
- Bosniak III
  - Thicker septa, more prominent enhancement
  - Basically, lesions that aren't definitely tumor but are suspicious and often require Bx or resection
  - IIF vs III often challenging, requiring multiple imaging modalities
- Bosniak IV – cystic lesions that are clearly malignant and require surgical intervention

Imaging and Management of Incidental Renal Lesions. Mazzoni, et al. BioMed Research International, Volume 2017

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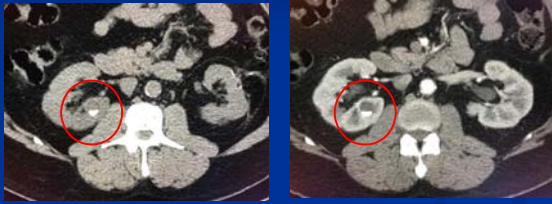
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## Indeterminate (IIF)



Non con CT

Con CT

Cyst with layering calcium. No enhancement after contrast.

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## Solid masses

- Benign
  - Angiomyolipoma - contains fat. Can confidently diagnose if enough images
  - Oncocytoma - often hard to differentiate from tumor
- Malignant
  - RCC most common by far. Also, lymphoma or mets
  - MC RCC is clear cell (75%) followed by papillary (15%)
  - RCC – T2 hyperintense, variable T1, enhances

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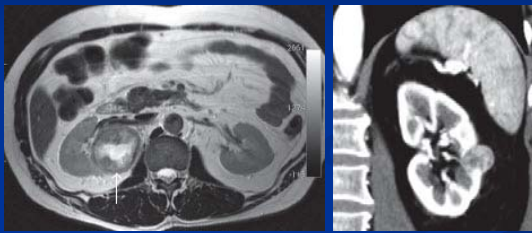
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## Renal cell carcinoma



T2 MRI

CT with

Imaging and Management of Incidental Renal Lesions. Mazzanti, et al. BioMed Research International. Volume 2017

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### Reasons for conservative management

- Most incidental lesions are benign, whether cystic or solid (AML, for example)
  - 44% solid lesions under 1 cm benign; 30% under 2 cm benign in one study
- Even if RCC, many are slow growing, if at all
- Treatment is costly and potentially morbid
  - Risk from treatment itself and risk from chronic renal dz after
- RCC relatively low risk of mortality compared to other common health factors (HTN, DM, etc...)
- Many renal masses now followed (particularly under 3cm)
  - Absence of growth very little, if any, incidence of metastasis

Incompletely Characterized Incidental Renal Masses: Emerging Data Support Conservative Management. Silverman, et al. *Radiology* 2015

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### Some helpful features

- Size
  - Solid mass 1 cm or less - 40% benign
- Density on CT
  - -10 to +20 HU is simple cyst; >70 HU on *non-con* is hemorrhagic; <-10 is AML
- Simple = good; Complex = ?? or bad
- Rapid growth = bad

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### ACR recommendations 2017

- Consensus suggestions on management of renal lesions
- Helpful guidelines but mainly address management of *completely* imaged lesions (incidental renal lesions on MRI spine often *incomplete*)

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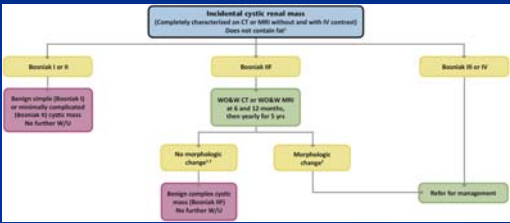
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## Cystic renal lesion → Bosniak



Management of the Incidental Renal Mass on CT: A White Paper of the ACR Incidental Findings Committee. Brent R. Hertz, MD, Stuart G. Silverman, MD, Nicole M. Heidman, et al. J Am Coll Radiol 2016;15:264-272

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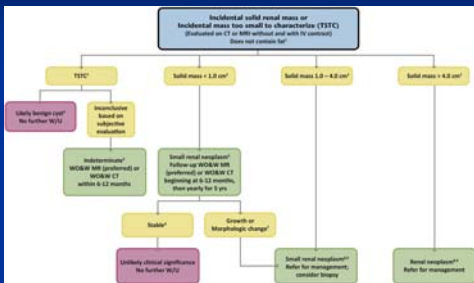
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## Solid renal mass



Management of the Incidental Renal Mass on CT: A White Paper of the ACR Incidental Findings Committee. Brent R. Hertz, MD, Stuart G. Silverman, MD, Nicole M. Heidman, et al. J Am Coll Radiol 2016;15:264-272

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## Management guidelines

- Definite cyst can be ignored
- Definite benign lesion (hemorrhagic cyst) can be ignored
- Indeterminate lesions further workup
  - Some authors advocate a few septa can be ignored\*
  - If further workup – use of CT, US, MRI patient dependent
- Question of incomplete imaged (only see part of it)
  - ?????

Imaging features, follow-up and management of incidentally detected renal lesions. Houlton, et al. Clinical Radiology 66 (2011)

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# Aorta and AAA

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- ## AAA
- AAA rupture 10<sup>th</sup> most common cause of death in western world
  - AAA defined as infrarenal aorta greater than or equal to 3 cm in diameter
  - Mortality repair for rupture 46% vs 4-6% for elective repair
  - Increased frequency rupture over 5 cm and this is often benchmark for Tx
  - Aorta often clearly in FOV for MRI lumbar

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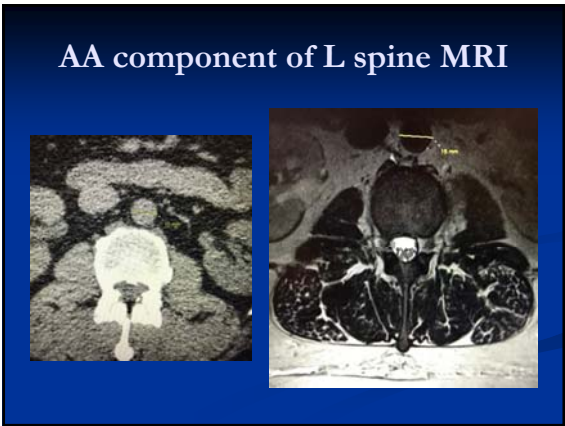
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Also see in sagittal plane



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Look for incidental AAA!



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AAA on CT - treated



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### AAA on CT - ruptured



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### Follow-up recommendations

<u>Size</u>	<u>Follow up</u>
2.5-2.9 cm	5 yrs
3.0-3.4 cm	3 yrs
3.5-3.9 cm	2 yrs
4.0-4.4 cm	1 yr
4.5-4.9 cm	6 mo. or surgery
5.0-5.5 cm	3-6 mo. or surgery

Managing Incidental Findings on Abdominal and Pelvic CT and MRI Part 2: White Paper of the ACR Incidental Findings Committee II on Vascular Findings Faisal Khoro, MD, Glenn Krinsky, MD, Michael Mccarr, MD, I. Kent Yee, MD, Lincoln L. Berlin, MD. J Am Coll Radiol 2013;10:789-794.

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### Recommendations

- Previous recommendations made for incidental vascular findings (AAA)
- If AA is adequately imaged (usually is) and you feel confident measurements are accurate, can consider follow up based on recommendations without further imaging
  - i.e. can recommend from the spine MRI
- If incomplete, or feel that the cranial or caudal extent is further, may need further imaging in short term

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## References

- Thyroid - *J Am Coll Radiol* 2015;12(4):350
- Incompletely Characterized Incidental Renal Masses: Emerging Data Support Conservative Management. Silverman, et al. *Radiology* 2015
- G. M. Israel and M. A. Bontak, "How I do it: evaluating renal masses," *Radiology*, vol. 236, no. 2, pp. 441–450, 2015.
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- Managing Incidental Findings on Abdominal and Pelvic CT and MRI, Part 2: White Paper of the ACR Incidental Findings Committee II on Vascular Findings Fasil Khosa, MDs, Glenn Krinsky, MDs, Michael Macari, MD, F. Kent Yucel, MD, Lincoln L. Ireland, MD. *J Am Coll Radiol* 2013;10:789-794.

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