Adrenal Incidentaloma

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Case Presentation

- **CC:** right chest wall mass

- **HPI:** This is a 62 y/o male who presented to his PMD with a c/o a right chest wall mass. As part of work-up the patient underwent a CT scan of the chest which revealed an incidental right adrenal mass. He was subsequently referred to the surgical service for further work-up and management.
• PMHx: HTN, DM

• PSHx: drainage of right chest wall abscess

• Allergies: NKDA

• Meds: captopril, amlodipine, metformin, januvia

• SHx: non-contributory
• **Vitals:** Temp 98.4° F  BP 165/86  HR 56  RR 16  O2 sat 100%

• **Physical Exam:**
  
  General: AAOx3  
  HEENT: NCAT, EOMI, right neck mass  
  Chest: CTA bilaterally  
  CVS: S1S2, rrr  
  Abdomen: soft, +BS, NT, ND  
  Back: left back mass, soft, mobile  
  Extr: right shoulder mass, no edema or calf tenderness  
  Rectal: good tone, no gross blood
• Labs:

CBC: 6.63 / 13.3 / 40.1 / 298
Chem: 138 / 4.2 / 102 / 25 / 15 / 0.85 / 103
Coags: 9.8 / 26.0 / 0.9

VMA 24H urine 5.6 mg ( < / = 6.0 )
VMA urine 2.5 mg ( 1.1 – 4.1 )
Metanephrines 134 µg ( 90-315 )
Normetanephrine 403 µg ( 122-676 )
Cortisol 24H urine 191.2 µg ( 28.5 – 213.7 )
Renin activity 0.32 ng/ml/hr ( 0.25 – 5.82 )
Aldosterone 3.0 ng/dl ( < / = 28 )
• Radiologic Studies:

CT Abd/Pelvis: complex right adrenal cyst measuring approximately 7.4 x 5.1 x 7cm
• Radiologic Studies: CT scan of Abd/Pelvis

Contrast: CONTRAST
Gantry: 0°
FoV: 394 mm
Time: ms
Slice: 5 mm
Pos: 124.9
FFS

• colonoscopy on 8/2010 normal

• pre-op for a laparoscopic adrenalectomy

• post-op course was uneventful. The patient tolerated the procedure well and was discharged home on POD #2.

• pathology: benign cystic lesion
Adrenal incidentaloma (AI): are clinically silent masses, measuring greater than 1cm in diameter, discovered incidentally at the time of imaging procedures performed for unrelated reasons.

Prevalence of unsuspected adrenal masses detected on CT ranges from 1-5%

The incidence has also increased with advancing age where 6.9% are discovered in individuals older than 70
Differential Diagnosis:

- Nonfunctioning adenoma: 60%
- Pheochromocytoma: 10%
- Cortisol producing adenoma: 5%
- Aldosteronomas: 5%
- Adrenocortical carcinoma: 5%
- Adrenal cyst: 5%
- Ganglioneuroma: 9%
- Myelolipoma: 1%
Approach to work-up and management of Adrenal Incidentaloma

- Is it functional or non-functional?
- Is it malignant or does the patient have a history of malignancy?
- Does size matter?
Is it functional or non-functional?

- Non-functional Cortical Adenomas

  - account for 60% or more of adrenal incidentalomas

  - characterized radiographically by their homogeneity and low attenuation (HU) on CT

  - most are < 4cm in size but may be up to 6cm in diameter

  - adrenalectomy is indicated for those larger than 4cm or with imaging characteristics that are atypical for an adenoma.
Is it functional or non-functional?

- Functional (hormonally active) Adrenal Incidentaloma: include pheochromocytoma, cortisol producing adenoma, aldosteronoma

- Pheochromocytoma
  - account for approx. 5% of all incidentalomas
  - clinically silent except for the presence of HTN
  - spells of palpitations, tremor, HA, diaphoresis, anxiety are usually absent
Is it functional or non-functional?

- **Pheochromocytoma**

  - diagnostic evaluation
    - plasma-fractionated metanephrines
    - 24H urine measurements of catecholamines and metanephrines

  - prior to surgical intervention
    - alpha-receptor blockade
    - beta blockade reserved for persistent tachycardia after alpha blockade.
Is it functional or non-functional?

• Cortisol producing Adenoma

- approx. 5-20% of patients have abnormalities in cortisol secretion without signs of Cushing’s syndrome: Subclinical Cushing’s Syndrome (SCS)

- progression to Cushing’s syndrome can range from 1.5 to 12.5 % in 1 year

- tend to have a higher incidence of HTN (76%), diabetes (30%) and obesity (52%)
Is it functional or non-functional?

- Cortisol producing Adenoma

  - low-dose dexamethasone suppression test:
    - 1-3mg dexamethasone at 11pm; measure cortisol level at 8 am
    - Normal individuals should suppress to <3µg/dl.
    - Failure to do so warrant’s further evaluation with either plasma ACTH levels or a 24H urine-free cortisol level
Is it functional or non-functional?

- Cortisol producing Adenoma

  - adrenalectomy is recommended: improvements with weight loss, blood pressure and blood glucose control

  - post-operative supplemental glucocorticoids should be given to prevent adrenal insufficiency

  - may take approx. 12 months for the pituitary-adrenal axis to recover normal function
Is it functional or non-functional?

- Aldosteronoma
  - should be screened for in any patient with HTN or hypokalemia
  - diagnosis: ratio of aldosterone to renin of $>20$ with a plasma aldosterone of 15ng/dl is suggestive of an aldosteronoma
  - 24H urine measurement of aldosterone with saline loading can be performed; aldosterone level of $>12$ng/dl is confirmatory
Is it malignant or does the patient have a history of malignancy?

- **Adrenocortical Carcinoma**
  
  - rare tumors with incidence of 1 in 1-1.5 million population
  
  - at presentation mean tumor size is large, approx. 90% are larger than 6cm
  
  - approx. 50% of adrenal cancers are hypersecretory
  
  - probability of an AI being a primary adrenal cancer increases with increasing size of the lesion
Is it malignant or does the patient have a history of malignancy?

- **Adrenocortical Carcinoma**
  
  - assessment for risk
  - size
  - radiographic characteristics: heterogeneous with areas of necrosis, hemorrhage or calcification. May also have irregular borders of local invasiveness or regional lymphadenopathy

- open adrenalectomy
Is it malignant or does the patient have a history of malignancy?

• Adrenal Metastases

- cancers that MC metastasize to the adrenal gland: renal, lung, melanoma, breast and lymphoma

- most mets are > 3cm in diameter and have imaging characteristics suspicious for malignancy

- adrenalectomy is appropriate for solitary mets
Is it malignant or does the patient have a history of malignancy?

- **Adrenal Metastases**
  - PET maybe helpful to exclude extra-adrenal metastatic disease
  - FNA bx: only in those patients where tissue diagnosis will alter therapy; not warranted if lesion is amenable to resection; r/o pheochromocytoma prior to bx
Does size matter?

- Yes, important variable in determining the malignant potential of the adrenal lesion
- Recommended threshold for adrenalectomy for an AI based on size is 4cm

Radiologic Assessment

- CT scan
  - Useful for lesion size, homogeneity, invasiveness and attenuation
  - Adenomas: smooth, homogenous, well-circumscribed lesions with a low attenuation due to abundant intracellular lipid content, < 10 HU
Radiologic Assessment

- carcinomas: irregular borders, heterogeneous, areas of necrosis, hemorrhage or calcifications with high attenuation, > 18 HU

• MRI

- chemical shift imaging: uses the differential lipid vs. water content of adrenal masses

- opposed-phase sequences the signal from protons in fat is subtracted from those in water, therefore benign lesions will have a low signal compared to malignant lesions
• Algorithm for Management of AI

Management of Adrenal Incidentaloma

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Adrenal incidentaloma (≥1 cm)

Assessment of biochemical function*

Plasma fractionated metanephrines
Single dose dexamethasone test
Upright PAC:PRA**

Functioning mass
Laparoscopic adrenalectomy

Nonfunctioning mass
Assessment of radiographic features (CT/MRI)

Large size (≥4-5 cm), atypical imaging appearance*
Adrenalectomy

Benign appearance (≤4-5 cm)
Repeat CT or MRI at 3 and 12 months
Functional reassessment at 12 and 24 months

Suspected isolated adrenal metastasis
Surgical candidate

Hypersecretory or enlarging
Adrenalectomy

Consider FNA biopsy
Management of Adrenal Incidentaloma

- **Surgical Approach**
  - Laparoscopic (lateral trans-abdominal, lateral, retroperitoneal)
  - Open (anterior, posterior, thoracoabdominal)

- Laparoscopic approach:
  - Procedure of choice for adrenal tumors
  - Better outcome compared to open approach (decreased length of stay and post-op pain, fewer complications, faster recovery)
  - Contraindications: locally invasive tumor, regional LN mets, large AC cancer
Management of Adrenal Incidentaloma

- Laparoscopic Trans-Abdominal Approach – patient positioning

![Diagram of patient positioning for laparoscopic trans-abdominal approach](image)

- Diagram showing patient positioning with labels for various surgical tools and ports.

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Laparoscopic Technique (Trans-abdominal approach)

- Step 1: Exposing the adrenal gland - Incise the lateral attachments to allow medial rotation of either the spleen/pancreas or liver and dissect peritoneum free

- Step 2: Dissection of adrenal gland - Starting with the most cephalad attachments to the diaphragm and moving toward the renal hilum
  - Identify the adrenal vein

- Step 3: Mobilizing free the adrenal gland from the renal hilum - Be careful not to ligate a superior pole vessel to the kidney because this may cause postoperative hypertension

- Step 4: Completing the adrenalectomy - Cut through the fat between the kidney and adrenal gland using the LigaSure, harmonic scalpel, or cautery.
Laparoscopic Trans-Abdominal Approach

Step 1. Exposing the adrenal gland
Step 2. Counter clockwise dissection of adrenal gland
Step 3. Mobilizing free the adrenal gland from the renal hilum
Step 4. Completing the adrenalectomy

A. Right Adrenalectomy
B. Left Adrenalectomy

Cameron 9th Ed pg 589
Evaluating and Managing Adrenal Incidentalomas

Hamrahian, AH et al., Cleveland Clinic Journal of Medicine.

2006; vol 73, pgs 561-568

• case based approach to evaluating and managing AI
• Approach – Is it malignant? Is it functional?
• Work-up – History and Physical, Imaging and Hormonal studies
• Threshold for surgical intervention after completion of hormonal and imaging studies: 6cm

• If mass <6cm and nonfunctional – repeat imaging in 6-12 months
  - no change yearly evaluation for hormonal secretion
  - change ≥ 1cm surgical intervention
• Conclusions:

- The incidence of AI have increased with the use of high-resolution imaging studies as well as with age.

- The general approach for the work-up and management of AI is based on 3 pertinent questions:
  Is it functional or non-functional?
  Is it malignant or does the patient have a history of malignancy?
  Does size matter?

- Laparoscopic approach is surgical management of choice.