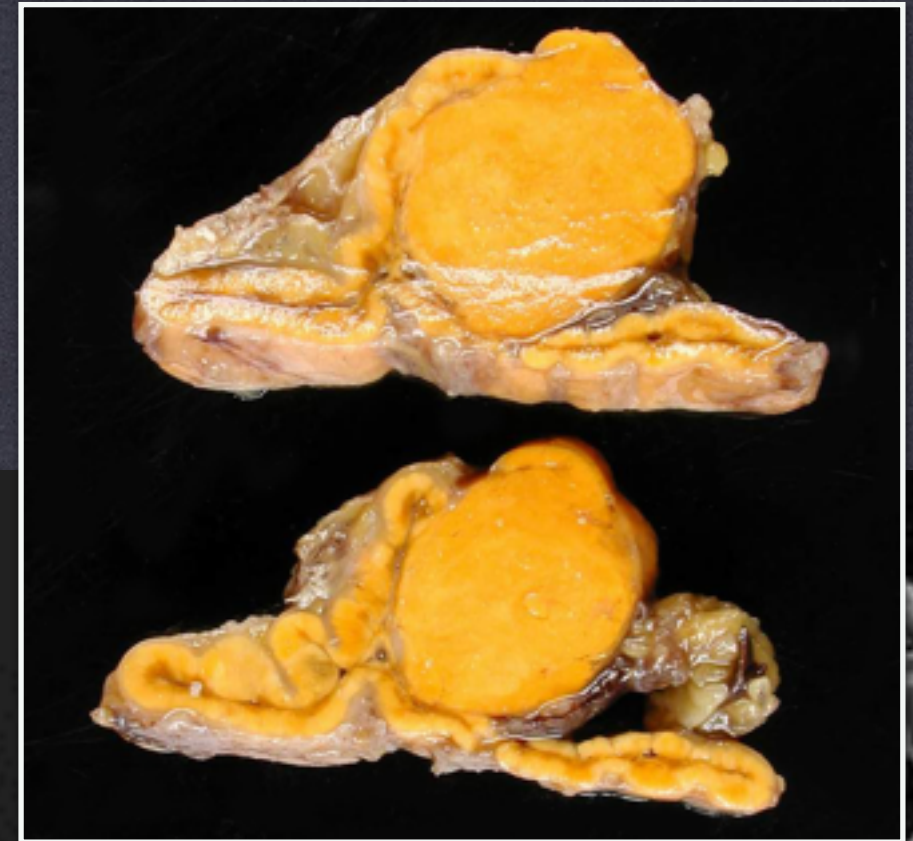




ADRENAL MASSES

QUAN-YANG DUH

MIKE TUFAGA

“Incidentaloma”

“Adrenal incidentalomas are tumours of the adrenal gland that are discovered incidentally when imaging studies are done for purpose other than searching for adrenal pathology.”

1-5% of abdominal imaging studies identify unanticipated adrenal tumor

Geelhoed GW, Drury EM. Surgery 92: 866-874, 1982

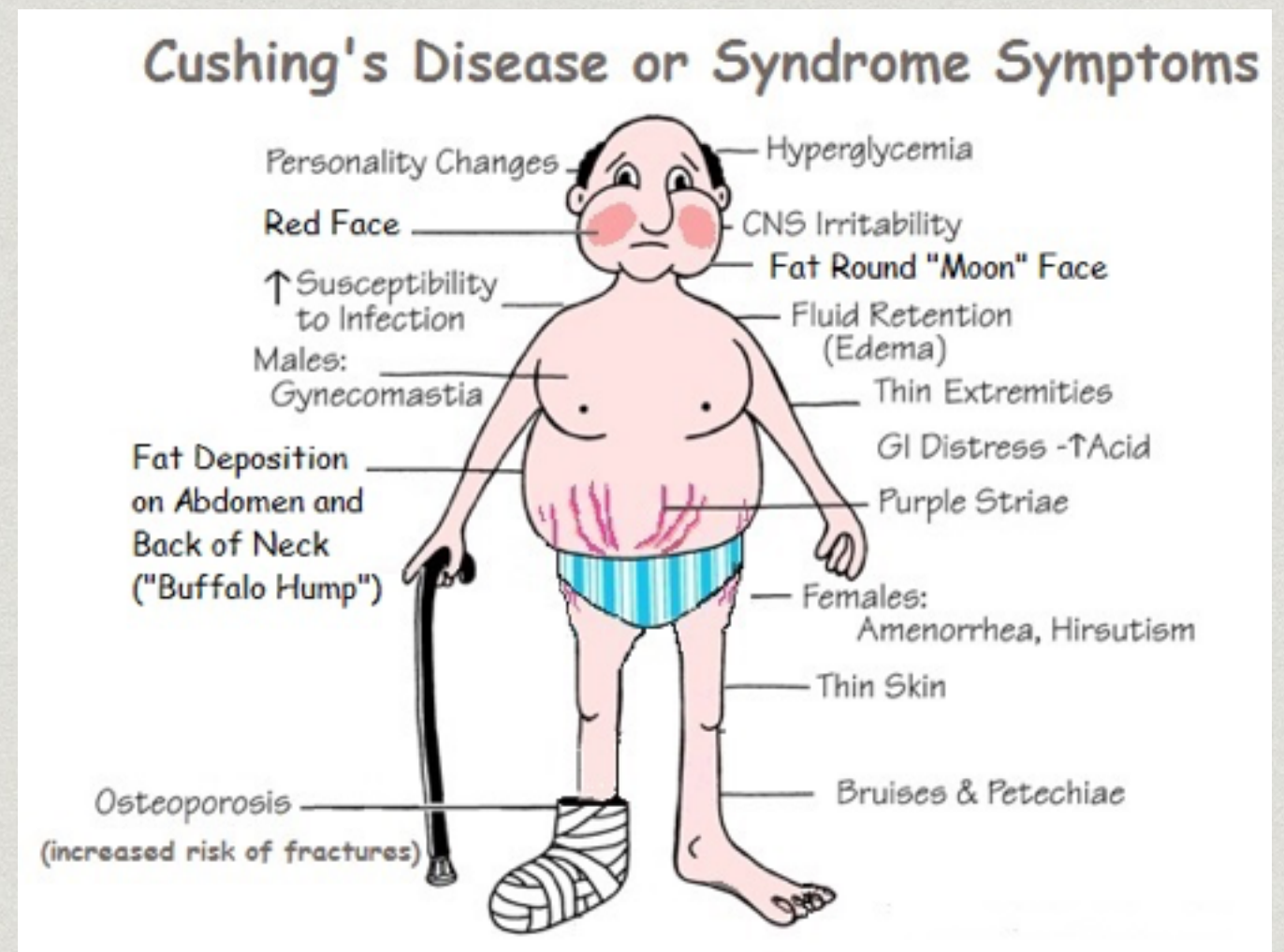
Duh QY. Br J Surg 89:1347, 2002

Surgical Approach to Adrenal Incidentalomas: Objectives

- Work up for incidental adrenal tumors
- Evaluating and treating functioning tumors
 - Pheochromocytoma
 - Hypercortisolism and hyperaldosteronism
- Evaluating and treating adrenal malignancy
 - metastasis
 - adrenocortical cancer
- Techniques and results of adrenalectomy

Cortisol Producing Adenoma (Zona Glomerulosa)

- ✱ History: Weight gain, fatigue, depression, sleep disturbances, menstrual irregularities, hypertension, glucose intolerance, and easy bruising.
- ✱ Physical: HTN, central obesity, suprclavicular fat accumulation, buffalo hump, facial plethora, purple striae, hirsutism, proximal muscle wasting/weakness.



Cushing's Syndrome: Laboratory Diagnosis

- Low-dose dexamethasone suppression
 - 1 mg dexamethasone PO at 11 PM
 - 8 AM plasma cortisol (nl < 5 mcg/dL vs 1.8)
- Mid-night salivary cortisol level
 - normal < 550 ng/dL
- 24 hr urine free cortisol
 - nl 5-50 mcg/24 hr
- Plasma ACTH
- “Subclinical Cushing's”
 - Dexamethasone not suppressible
 - Post resection Addisonian crisis

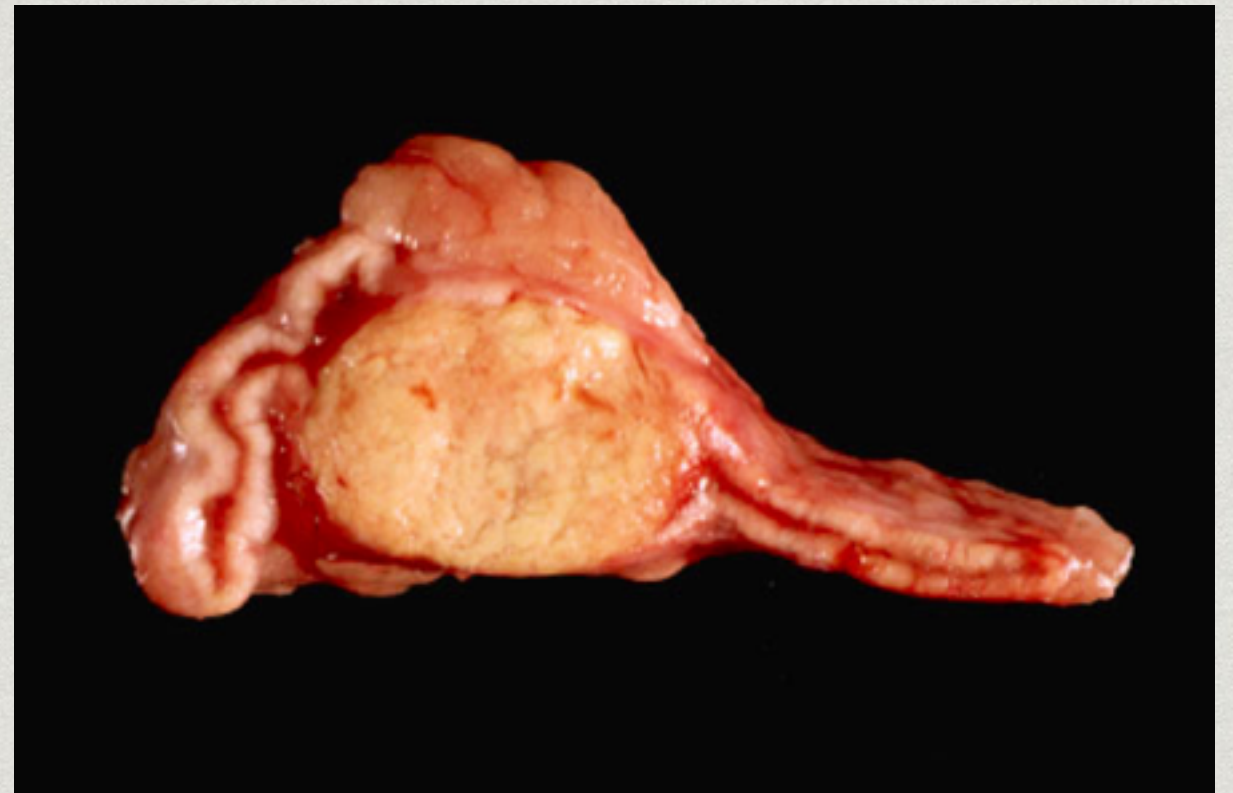


- ◆ Central obesity
- ◆ Moon facies
- ◆ Supraclavicular fat pad
- ◆ Purple Striae

Shen WT, et al: Arch Surg.141:771, 2006

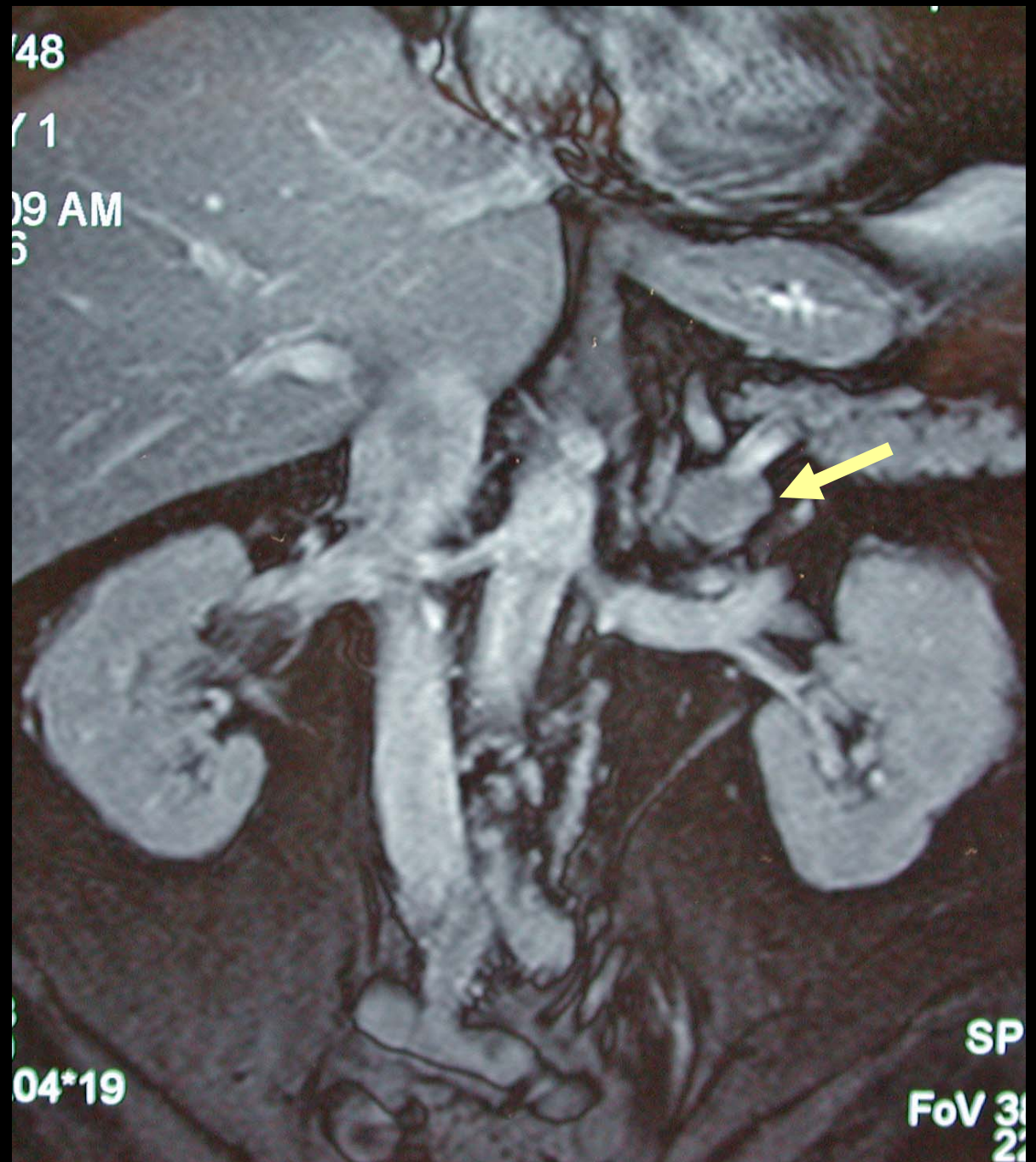
Aldosteronoma (Zona Fasciculata)

- * History: Nocturia, Polyuria, Muscle Cramps, Palpitations, Difficultly-controlled HTN (multiple drugs)
- * Physical: Hypertension.



Aldosteronoma: CT scan

- 1- 2 cm
- No contralateral abnl
- Adrenal protocol
 - Without and with contrast
 - Thin cut (2.5 mm or less)
- Low Hounsfield U
 - < 10 pre-contrast
- Early washout of contrast



Role of Adrenal Vein Sampling

- If relying on CT scan alone
 - 22% would have been excluded for adrenalectomy (bilateral normal or bilateral nodular)
 - 25% would have unnecessary or inappropriate (wrong side) adrenalectomy
- “**AVS is an essential diagnostic step** in most patients to distinguish between unilateral and bilateral adrenal aldosterone hypersecretion”

WF Young, et al. Surgery 136:1227, 2004

Founders JW, et al. JCEM 93:3266, 2008

A Clinical Prediction Score to Diagnose Unilateral Primary Aldosteronism

- 100% specific for APA if typical adenoma >0.8 cm and K < 3.5 or Cr Clr >100

TABLE 3. Clinical prediction score to predict lateralized AVS (higher score indicates higher probability of lateralized AVS)

Item	Points
Typical Conn's adenoma on imaging	3
Hypokalemia <3.5 mmol/liter	2
eGFR (MDRD) (ml/min/1.73 m ²)	
<80	0
80 to 100	1
≥100	2
Total score	(maximum 7)

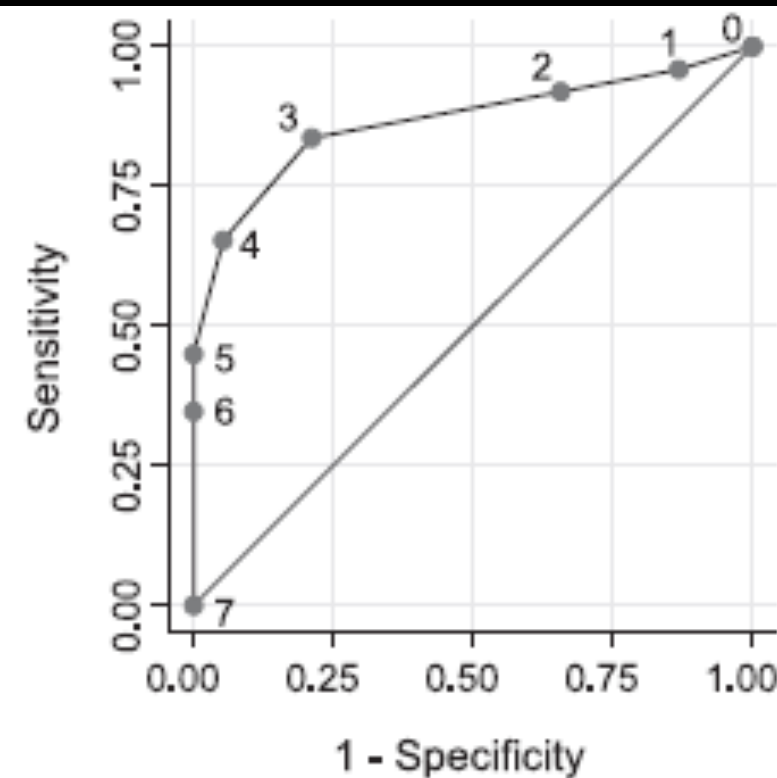
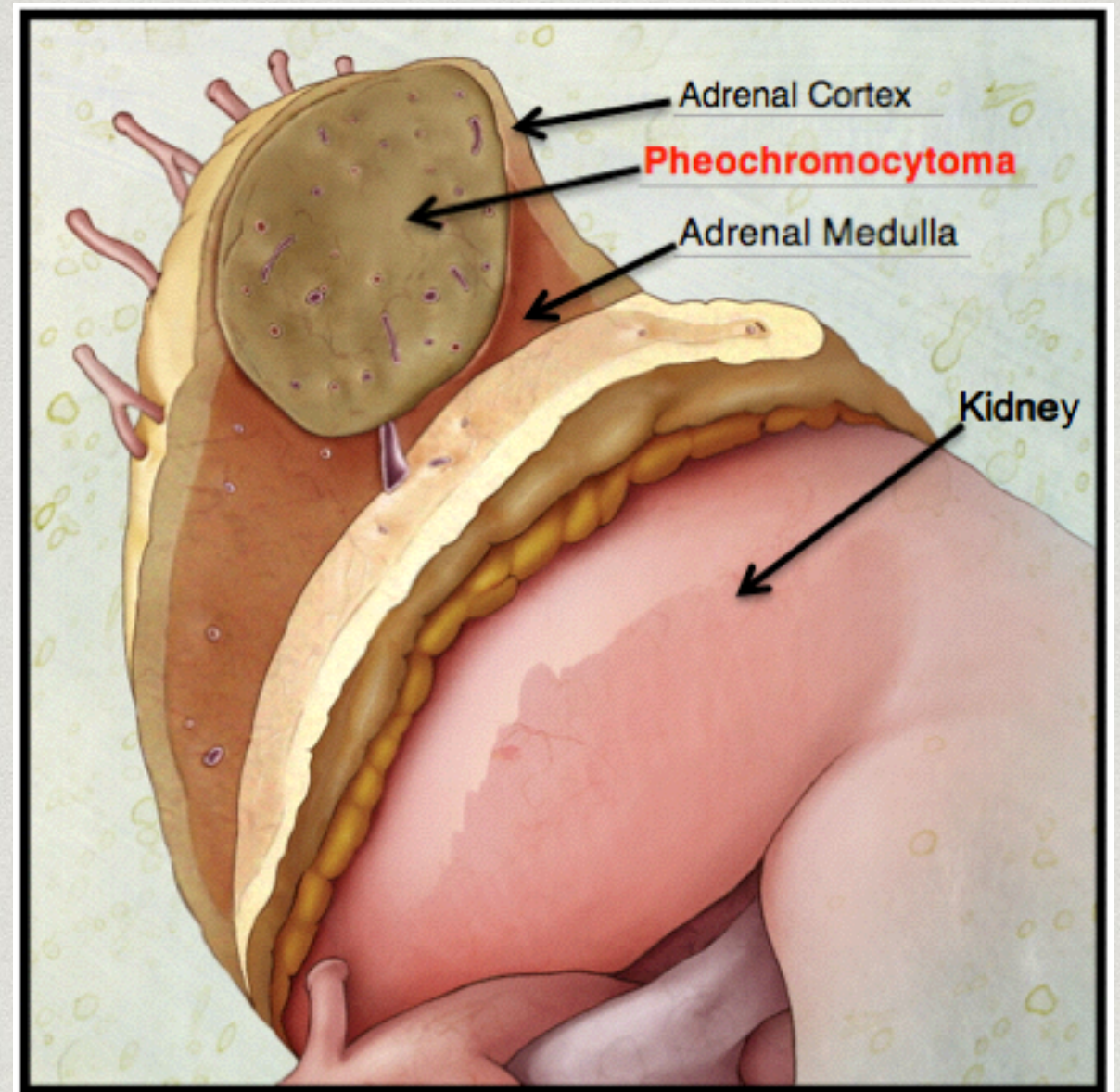


FIG. 2. ROC curve of the clinical prediction score.

Kupers EM, et al. J Clin Endocrinol Metab 97:3530-7, 2012

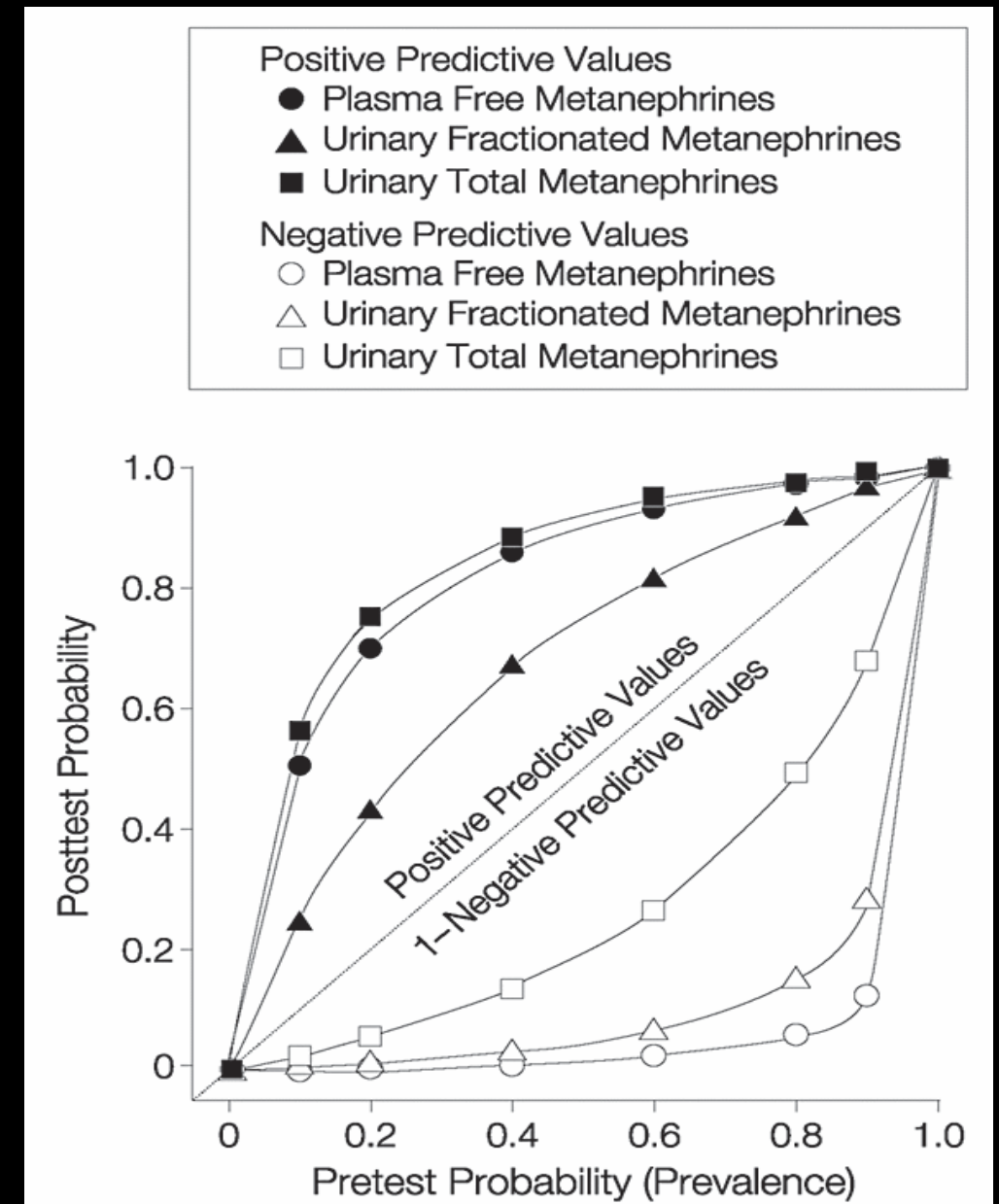
Pheochromocytoma (Adrenal Medulla)

- * History: Classic symptoms include headache, palpitations, and diaphoresis. May also report tremor, anxiety, or asymptomatic.
- * Physical: Hypertension, Orthostatic hypotension, pallor, possible retinopathy.



Biochemical Diagnosis of Pheochromocytoma: Which test is best?

- Plasma metanephrines
 - Best negative predictive value
 - More false positives
 - Screen familial disease
- Urinary metanephrines
 - Best positive predictive value
 - Fewer false positives
 - All other patients
- (CT/MRI characteristics)



Lenders et al: JAMA 287: 1427, 2002

Pheochromocytoma: Localizing Studies

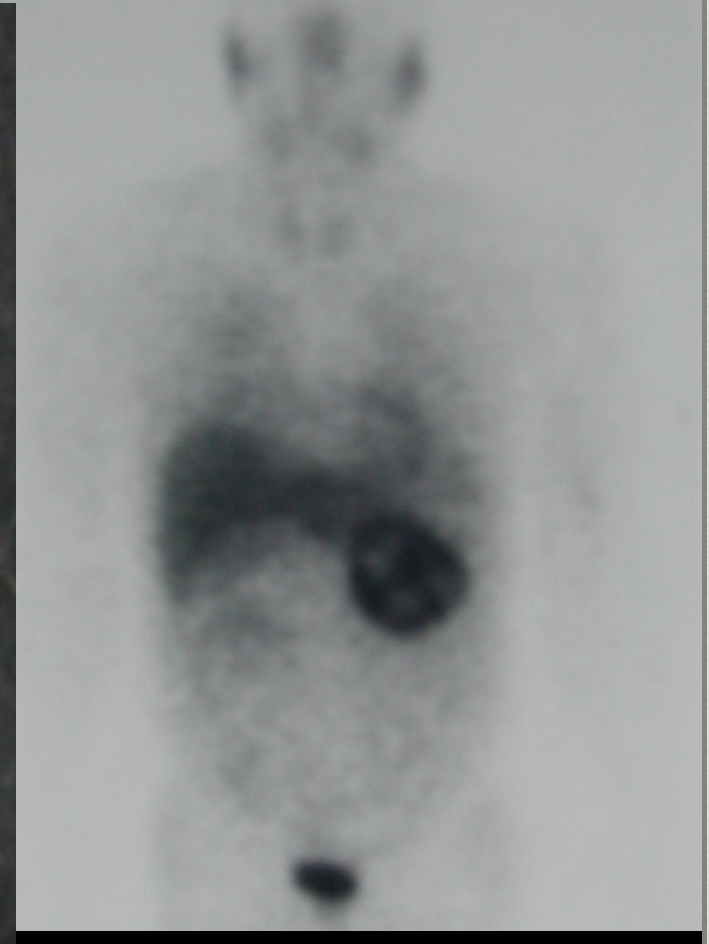
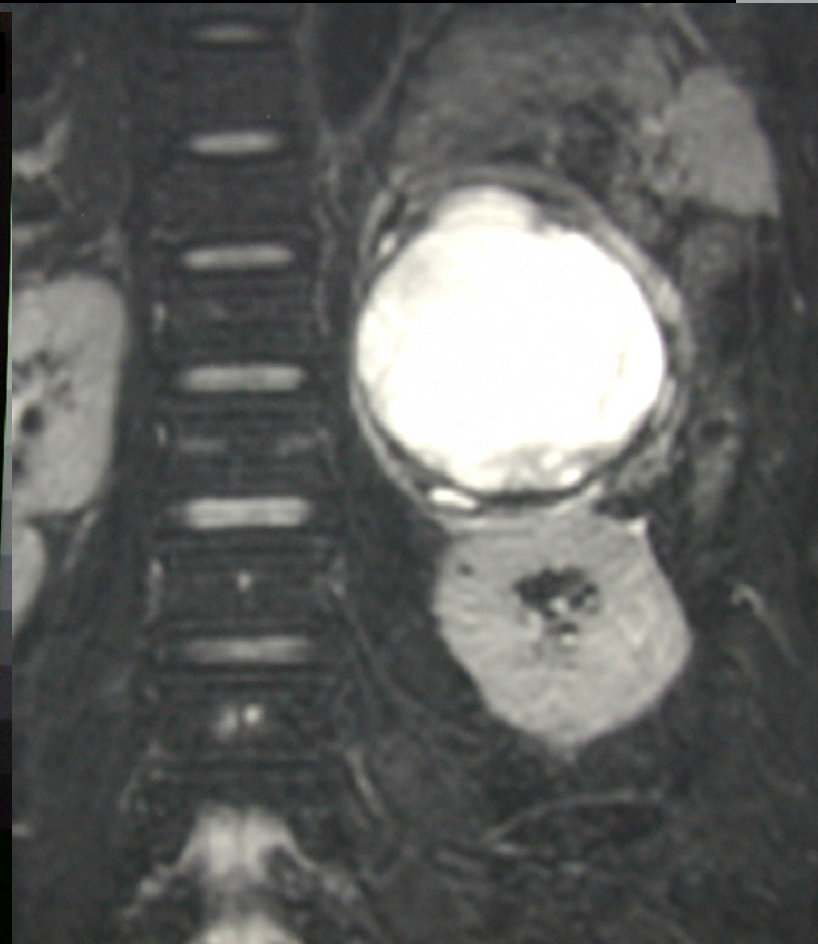
CT

MRI

MIBG



Best for surgical planning



Malignant or metastatic
Planning for I131 Tx

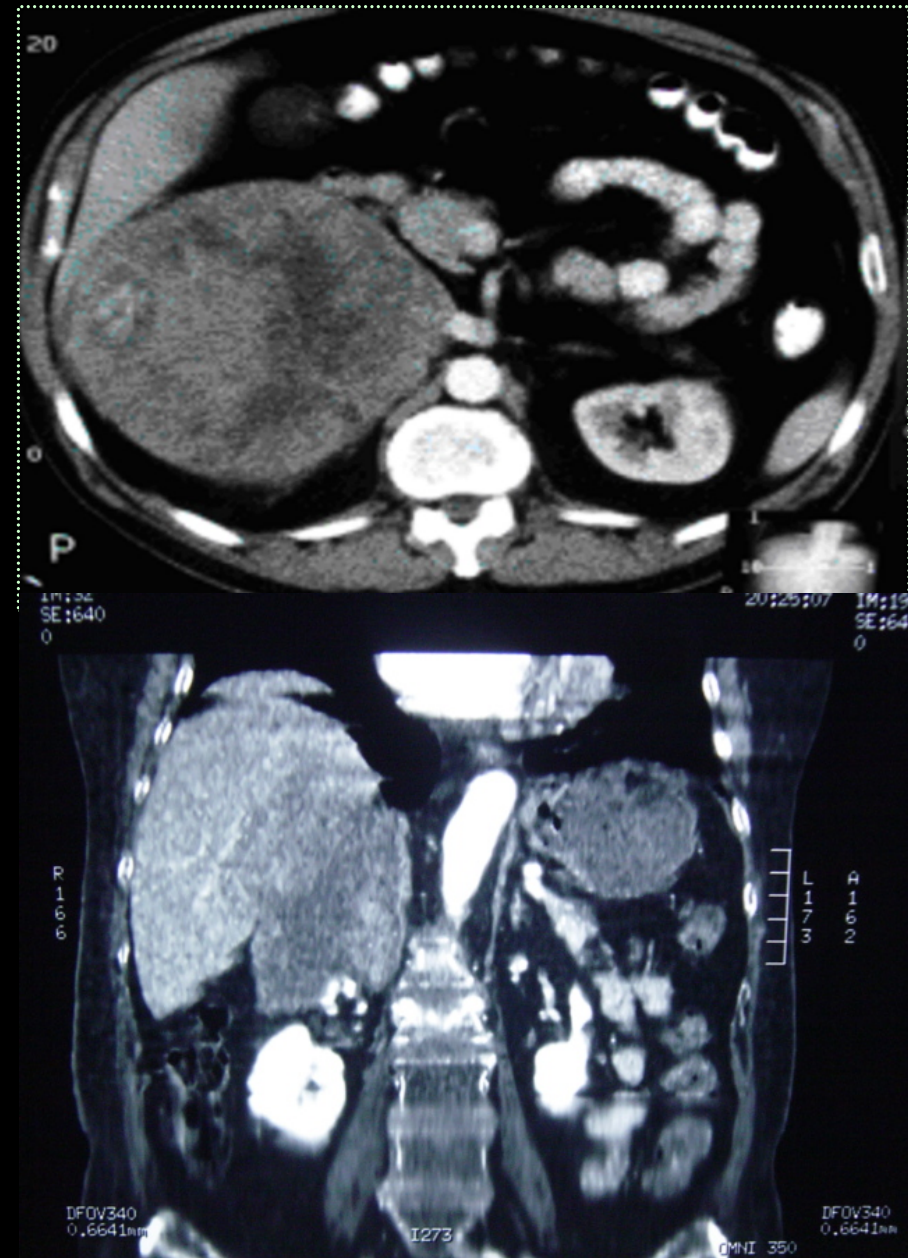
Adrenocortical Carcinoma (Adrenal Cortex)

- * Incidence: <2 cases/million/year.
- * 45% present with glucocorticoid excess alone; 25% present with glucocorticoid excess AND androgen excess.
- * >40% present with metastatic disease at the time of diagnosis and are not candidates for curative surgical resection.



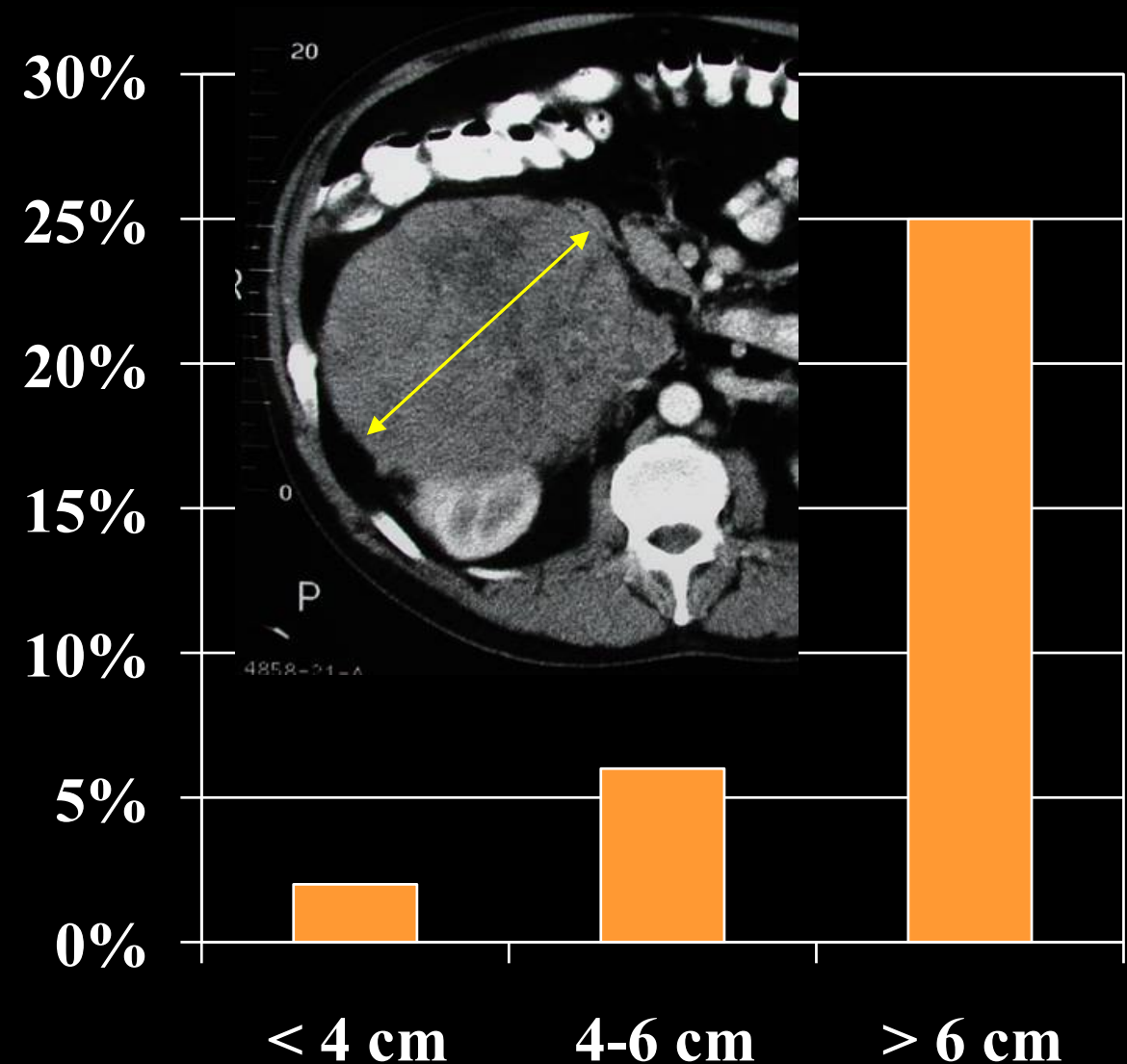
Adrenocortical Carcinoma: Imaging

- Central necrosis
- Irregularity
- HU > 20
- Invasion (liver, IVC)



Is size the best Predictor for the risk of Adrenal Cortical Cancer?

- CT findings
- Cortical adenoma
 - Homogeneous
 - Pre-contrast < 10 HU
 - Rapid wash-out
- Carcinoma, mets, pheochromocytoma
 - Heterogeneous
 - Pre-contrast > 20 HU
 - Slow wash-out



Adrenocortical Carcinoma

- * Overall survival rate is poor, with mean survival of 22-47 months
- * 5 year survival rate of Stage I/II after complete resection is 40-60%
- * Only 10% of Stage IV survive beyond 1 year
- * Despite complete resection, 85% will develop local or metastatic recurrence.
- * Adjuvant Mitotane has been shown to improve recurrence-free and overall survival rates after resection.
- * Adjuvant radiation is controversial, but has been suggested for those with positive margins and those with Stage III disease.

TABLE 4: TNM staging of adrenal gland tumors

Primary tumor (T)

Stomach

TX	Primary tumor cannot be assessed
T0	No evidence of primary tumor
T1	Tumor ≤ 5 cm in greatest dimension, no extra-adrenal invasion
T2	Tumor > 5 cm, no extra-adrenal invasion
T3	Tumor of any size with local invasion, but not invading adjacent organs*
T4	Tumor of any size with invasion of adjacent organs*

Regional lymph nodes (N)

NX	Regional lymph nodes cannot be assessed
N0	No regional lymph node metastasis
N1	Metastasis in regional lymph node(s)

Distant metastasis (M)

M0	No distant metastasis (no pathologic M0; use clinical M to complete stage group)
M1	Distant metastasis

Stage grouping

Stage I	T1	N0	M0
Stage II	T2	N0	M0
Stage III	T1	N1	M0
	T2	N1	M0
	T3	N0	M0
Stage IV	T3	N1	M0
	T4	N0	M0
	T4	N1	M0
	Any T	Any N	M1

* Adjacent organs include the kidney, diaphragm, great vessels, pancreas, spleen, and liver.

From Edge SP, Byrd DR, Compton CC, et al (eds): AJCC Cancer Staging Manual, 7th ed. New York, Springer, 2010.

Indications for Adrenalectomy

- Hypersecretion of hormones
- Local symptoms
- Cancers or potential cancers
- Uncertain diagnosis

All adrenalectomy can be performed by laparoscopy EXCEPT...

(Relative) Contraindications for Laparoscopic Adrenalectomy

- Large adrenal tumors
 - What is “large”? > 6-15 cm?
 - > 8 cm for right, > 10 cm for left
- Adrenocortical carcinomas
 - Not for obviously invasive cancers.
 - Start laparoscopic then convert as needed?
- Technical limitations
- Risks of inadequate/inappropriate resection (cancer)

Laparoscopic Adrenalectomy: Size Matters (UCSF, 1993-2011)

- 523 patients, 563 adrenalectomies
 - Aldo 180, pheo 123, Cushing 85, mets 44, others 91
- Smaller (< 3 cm) vs Larger ($\geq$ 3 cm) tumors
 - op time 2.29 hr vs 3.07 hr
 - EBL 44 ml vs 97 ml
 - Intraop complication 2% vs 10%
 - Postop complications 14% vs 24 %
 - Hospital stay 1.6 days vs 2.5 days

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