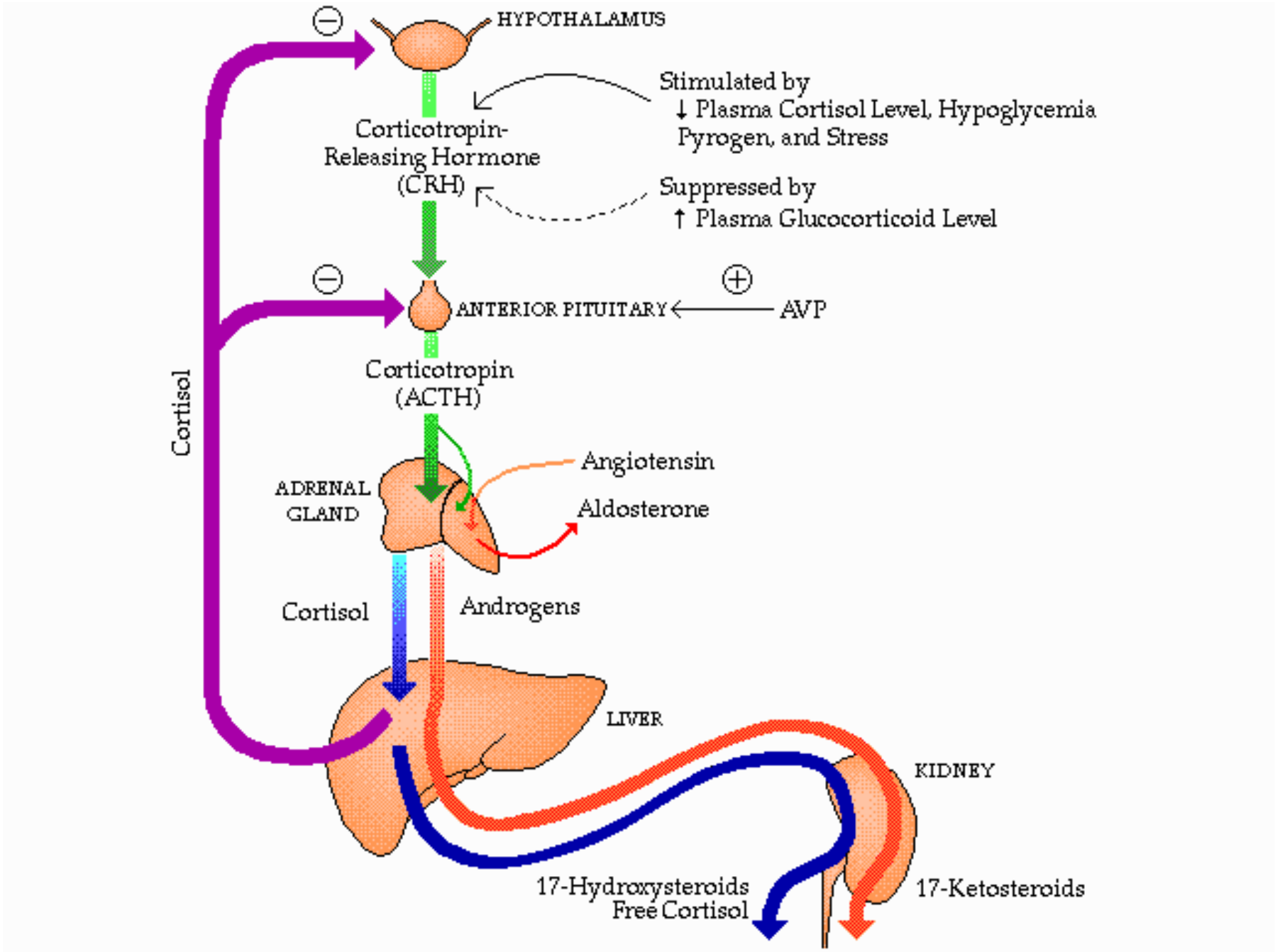
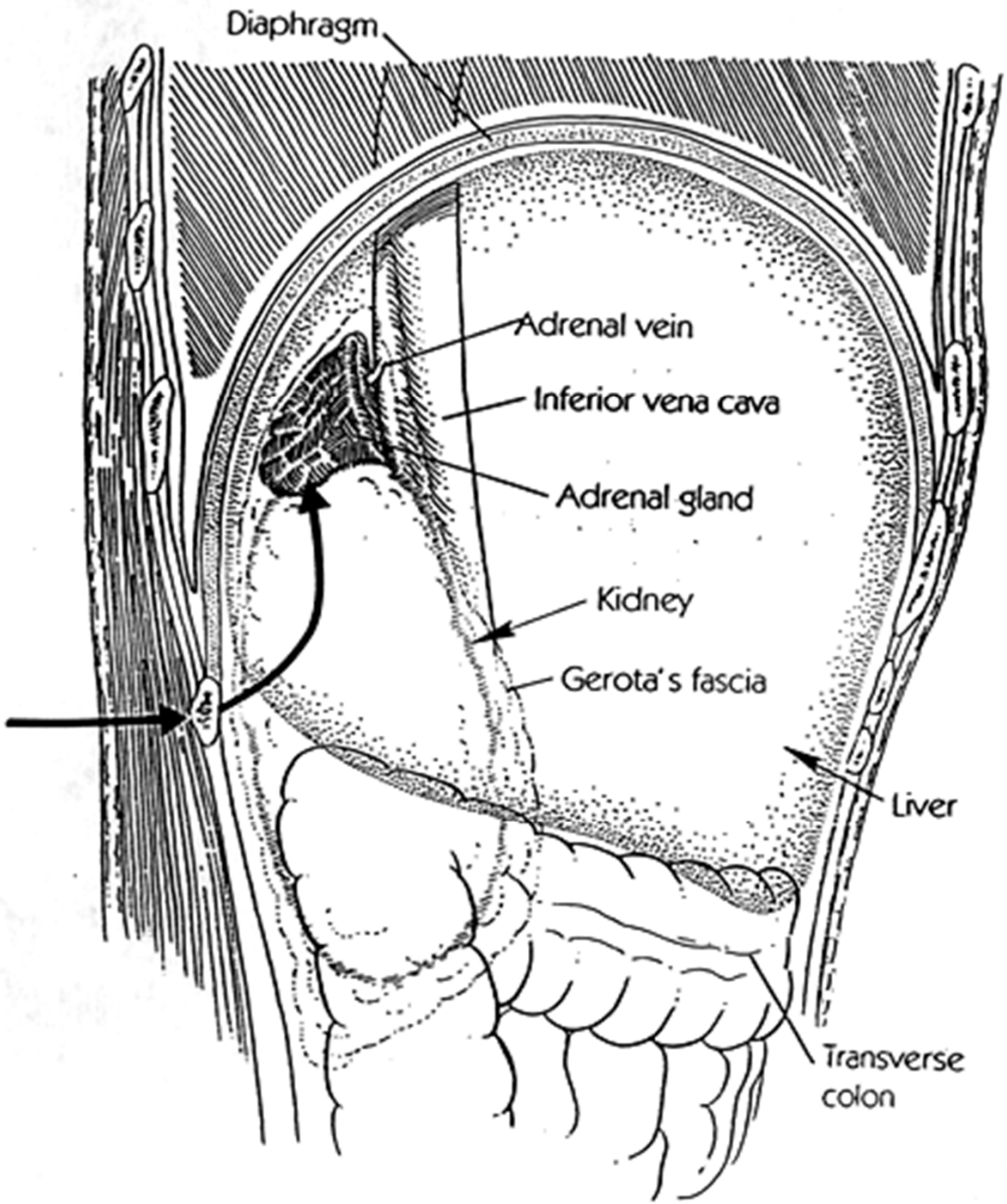
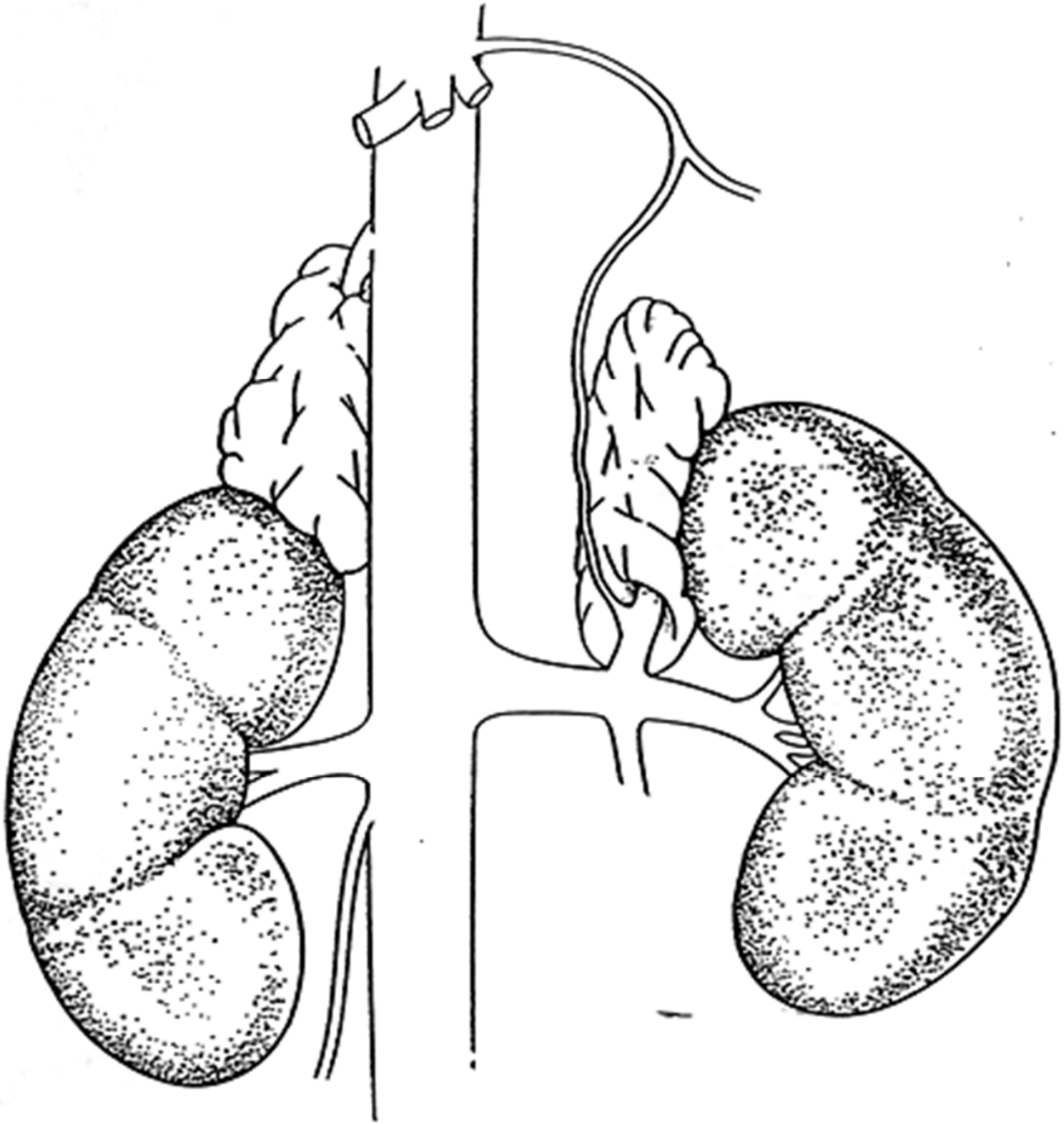
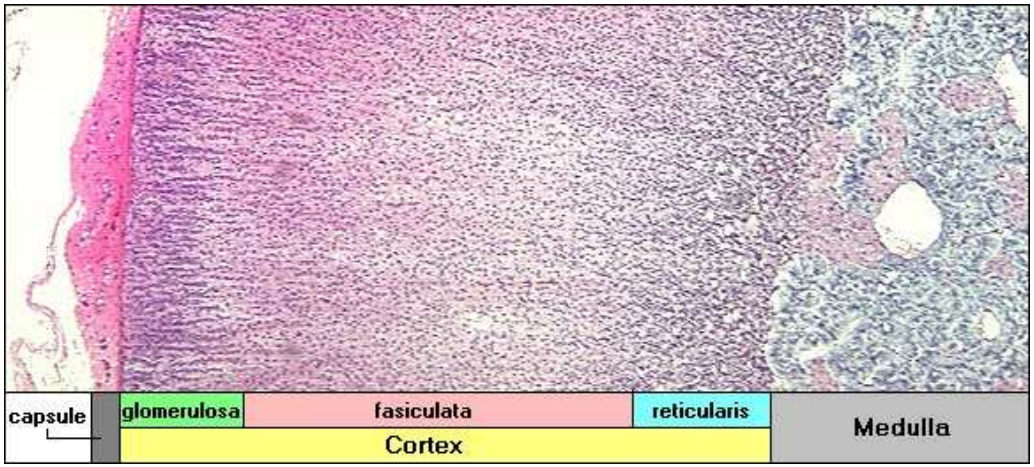
Adrenal Glands


HYPOTHALAMUS
Stimulated by
↓ Plasma Cortisol Level, Hypoglycemia
Pyrogen, and Stress
Corticotropin-
Releasing Hormone
(CRH)
Suppressed by
↑ Plasma Glucocorticoid Level
ANTERIOR PITUITARY
AVP
Cortisol
Corticotropin
(ACTH)
ADRENAL
GLAND
Angiotensin
Aldosterone
Cortisol
Androgens
LIVER
KIDNEY
17-Hydroxysteroids
Free Cortisol
17-Ketosteroids


Diaphragm
Adrenal vein
Inferior vena cava
Adrenal gland
Kidney
Gerota's fascia
Liver
Transverse colon



HYSTOLOGY



- **Cortex**
  - **Zona glomerulosa**
    - mineralocorticoids (aldosterone)
  - **Zona fasiculata**
    - glucocorticoids (cortisol)
  - **Zona reticularis**
    - sex steroids (androgens)
- **Medulla**
  - catecholamines (epinephrine and norepinephrine)

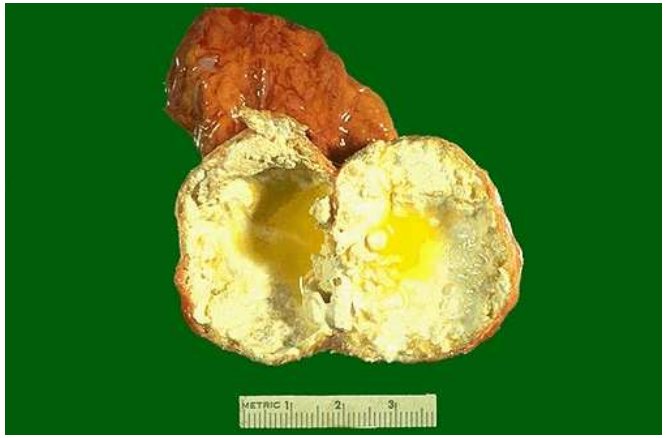
Disease of adrenal glands

Disease of adrenal cortex:

- Cushing sindrome
- Hyperaldosteronism
- Adrenogenital syndroms
- Adrenal insufisiensy

Disease of adrenal medulla:

Pheochromocitoma



Insidental adrenal mass:

- Functioning tumors
- Nonhypersecretory tumors

Adrenocortical carcinoma

Adrenal metastases

Nonfunctioning adenomas

Cushing’s Syndrome

- **Iatrogenic**
  - Steroid therapy (most common cause)
- **Central Cause**
  - Pituitary adenoma
- **Adrenal Cause**
  - Adrenal Adenoma
  - Adrenal Hyperplasia
  - Adrenal Malignancy (15%)
- **Ectopic Source**
  - Malignancy (Small Cell Carcinoma of the lung: 15%)

Cushing’s Syndrome

ACTH Dependent (80%)

Pituitary Tumors (60%)
Lung Cancers (5%)

ACTH Independent (20%)

Benign Adrenal Tumors (adenoma) (25%)
Malignant Adrenal Tumors (adrenal cell carcinoma) (10%)

Hyperaldosteronism

- Primary Hyperaldosteronism (Conn's Disease)
  - Solitary adrenal adenomas (80-90%) –
  - Bilateral adrenal hyperplasia (10-20%) –
    - Idiopathic hyperaldosteronism
    - Accounts for 50% of cases at some referral centers
  - Adrenal Carcinoma (rare) –
  - Unilateral Adrenal Hyperplasia (very rare) –

Hyperaldosteronism

Secondary Hyperaldosteronism •

Hypertensive States –

- Primary Reninism (rare renin producing tumor) •
- Secondary reninism due to decreased renal perfusion •

Edematous States –

- Cirrhosis •
- Nephrotic Syndrome •

Pheochromocitoma

- Catecholamine secreting tumor of the adrenal gland
- **Epidemiology**
- Peak ages: 30-60 years
- Equal male and female predominance

Diagnosis

- Six "H's"
  - Hypertension
  - Headache - throbbing (90%)
  - Hyperhidrosis or excessive sweating (69%)
  - Heart consciousness or Palpitations (73%)
  - Hypermetabolism
  - Hyperglycemia
- Rule of 10
  - Familial (10%)
  - Malignant (10%)
  - Multiple or Bilateral (10%)
  - Extra-adrenal (10%)
  - Childhood onset (10%)
  - Recurrence after Surgery (10%)

Adrenocortical Carcinoma

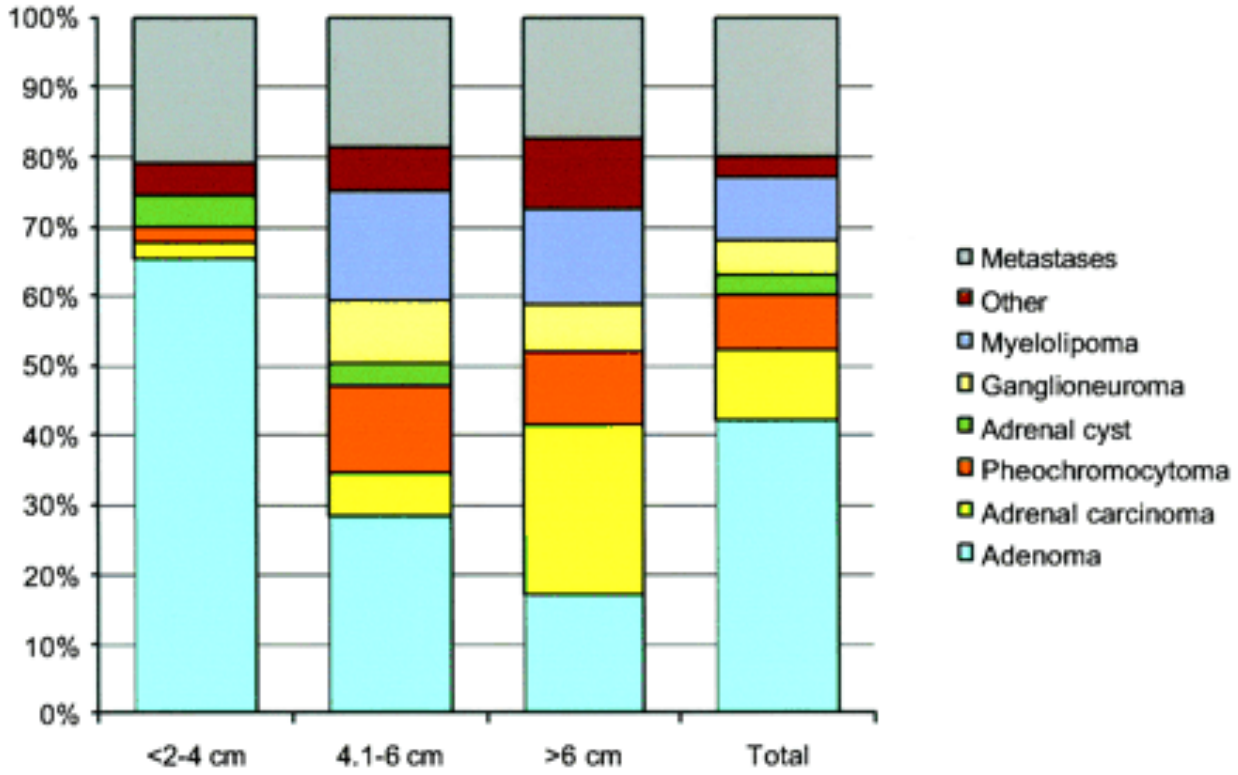
Classification of Adrenal Carcinoma

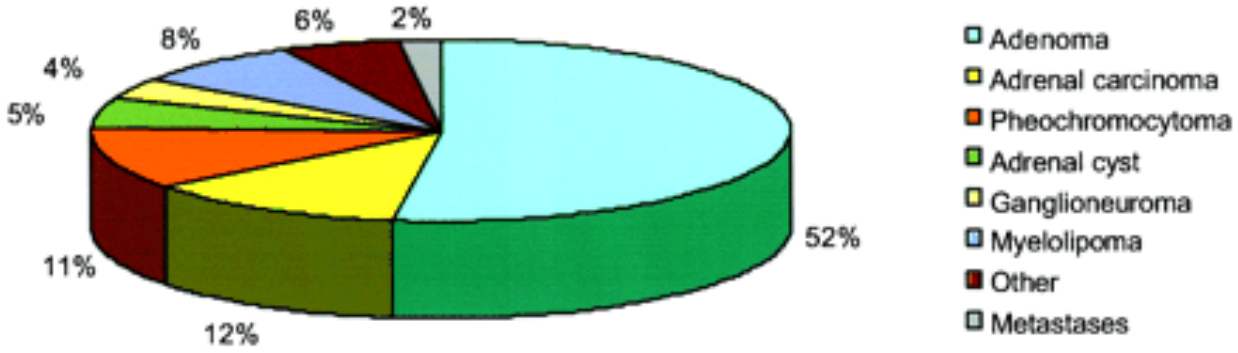
Functional ▪

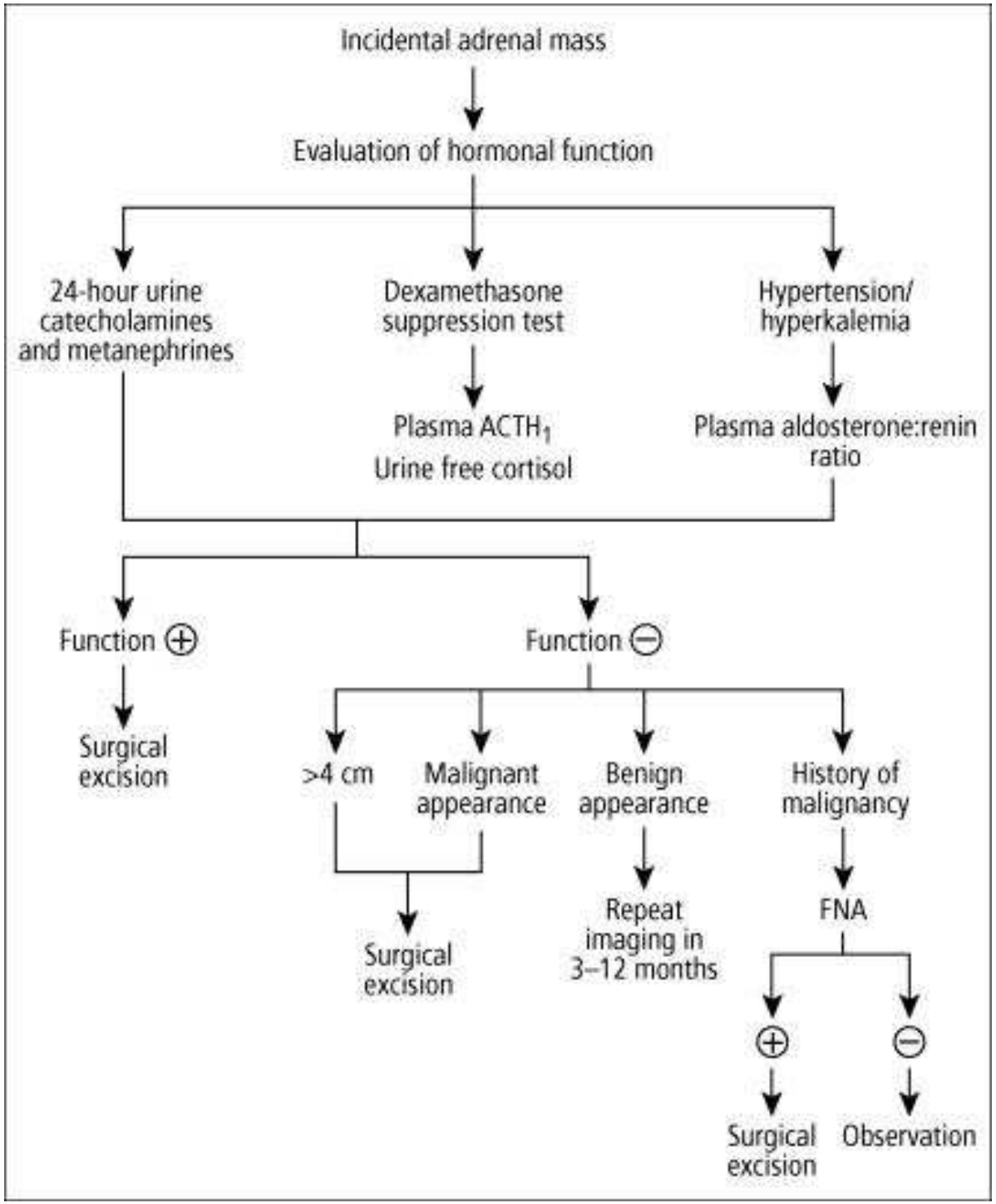
- Cushing's syndrome
- Virilization in females
- Feminizing syndrome in males
- Hyperaldosteronism
- Mixed combinations of above

Nonfunctional ▪

Incidental Adrenal Mass






Incidental adrenal mass
Evaluation of hormonal function
24-hour urine catecholamines and metanephrines
Dexamethasone suppression test
Hypertension/ hyperkalemia
Plasma ACTH1
Urine free cortisol
Plasma aldosterone:renin ratio
Function ⊕
Function ⊖
Surgical excision
>4 cm
Malignant appearance
Benign appearance
History of malignancy
Surgical excision
Repeat imaging in 3–12 months
FNA
⊕
⊖
Surgical excision
Observation