Hypertension

Disorders of surgical importance

Disorders of surgical importance

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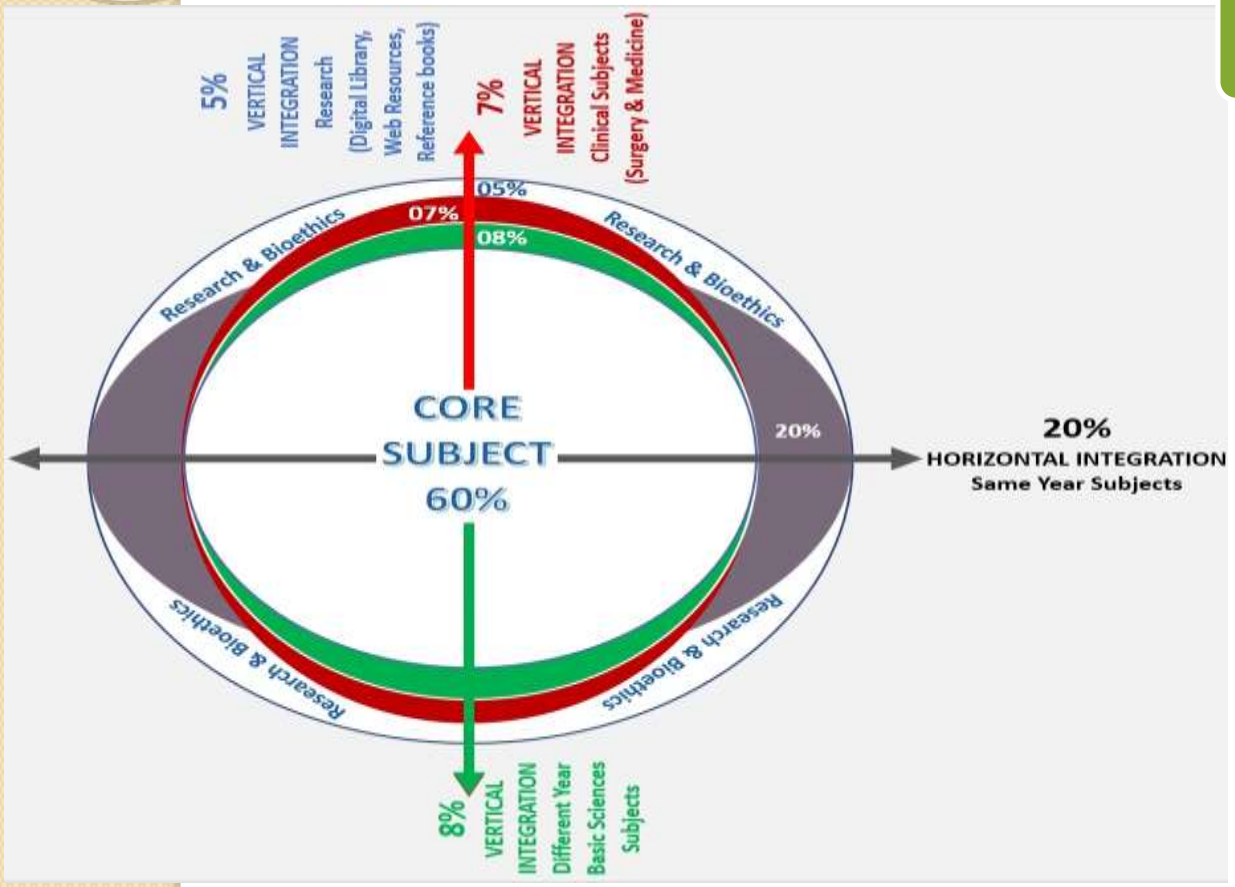
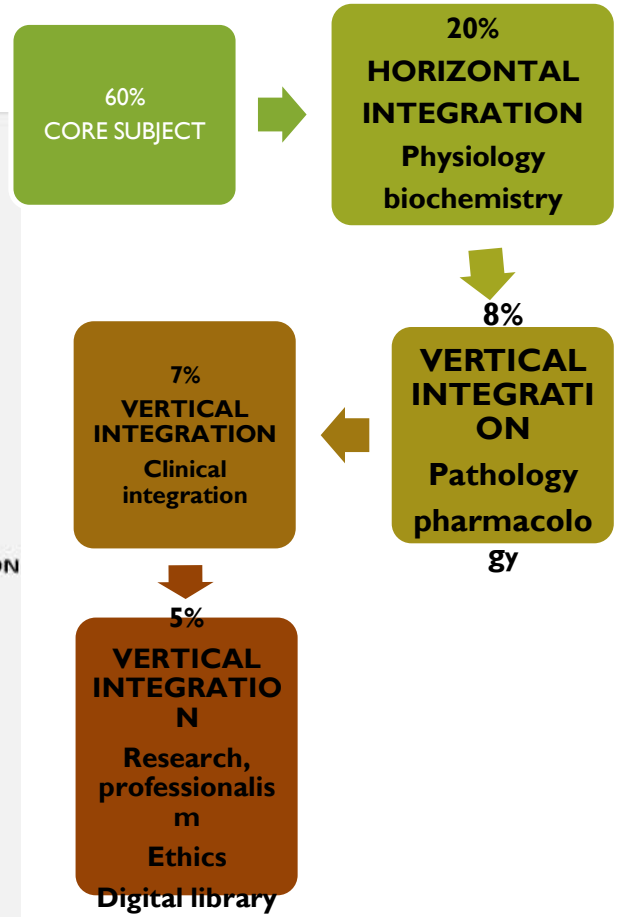
Mission Statement of RMU

- To impart evidence based research oriented medical education
- To provide best possible patient care
- To inculcate the values of mutual respect and ethical practice of medicine

Professor Umar Model of Integrated Lecture





Learning Outcomes

By the end the participants will be able to :

- Describe the applied anatomy and physiology of adrenal glands.
- Enumerate the different types of adrenal disorders.
- Describe adrenal disorders of surgical importance.

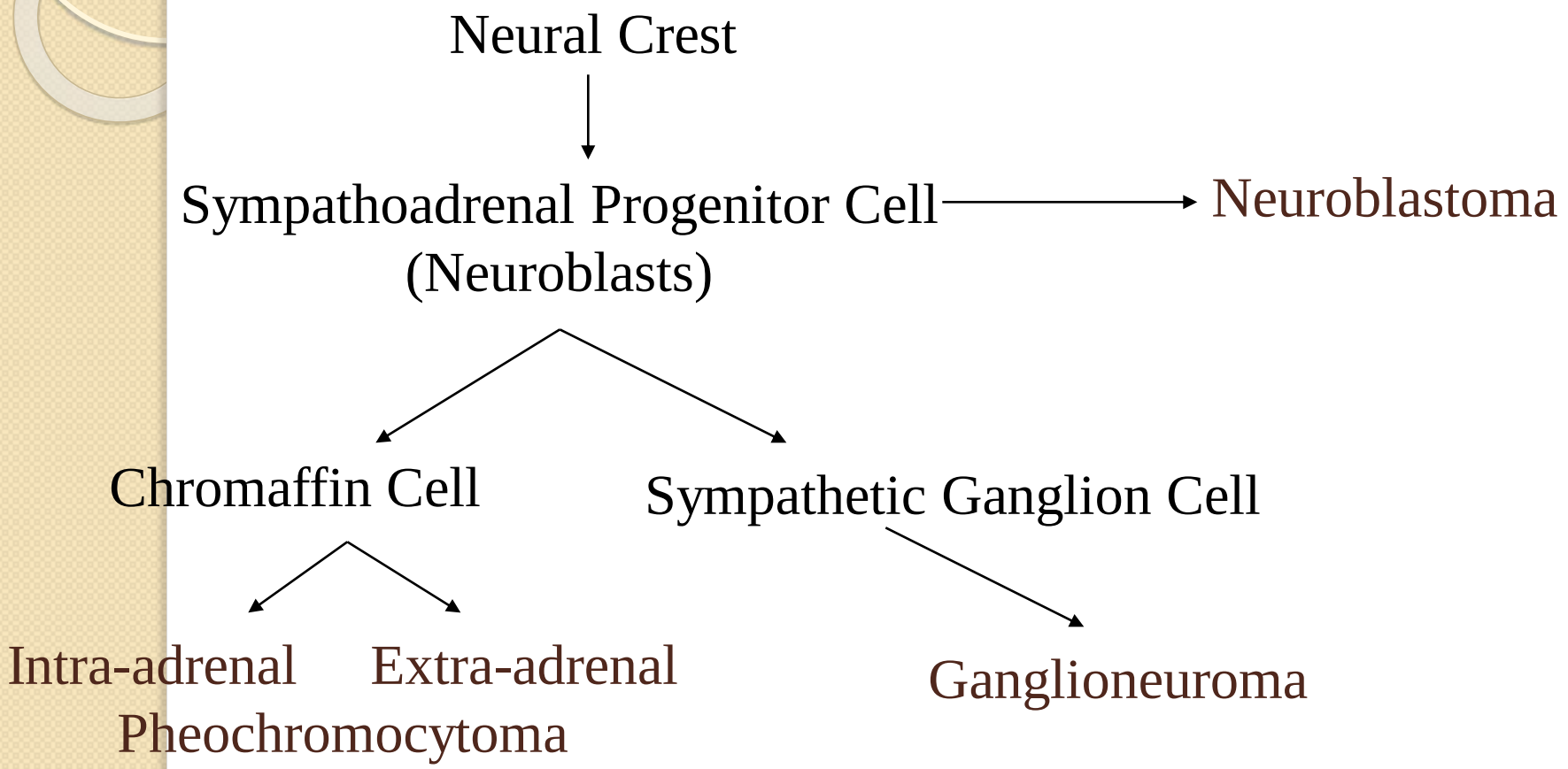
Screening

- Testing can be expensive and requires clinical suspicion and knowledge of limitations of different tests
- General principles:
  - New onset HTN if <30 or >50 years of age
  - HTN refractory to medical Rx (>3-4 meds)
  - Specific clinical/lab features typical for dz
    - i.e., hypokalemia, epigastric bruits, differential BP in arms, episodic HTN/flushing/palp, etc

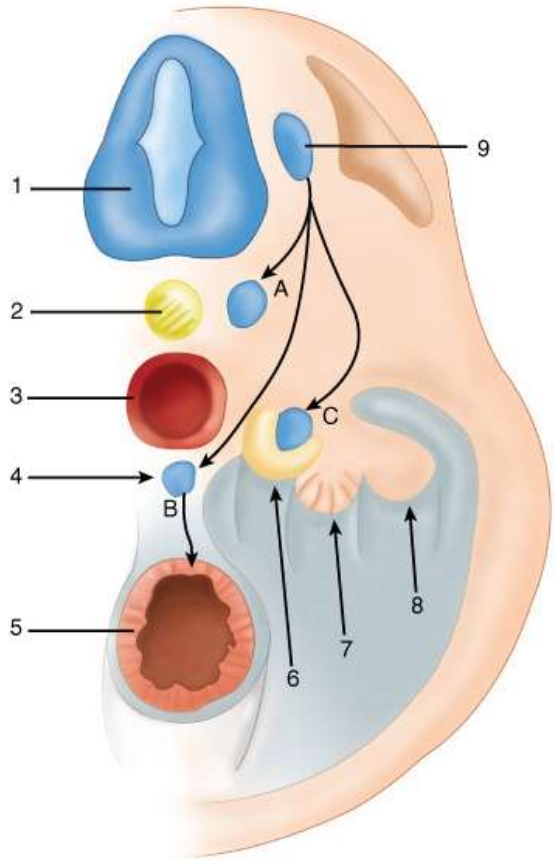
Causes of Secondary HTN

- Common
  - Intrinsic Renal Disease
  - Renovascular Dz
  - Mineralocorticoid excess/ aldosteronism
  - ? Sleep Breathing d/o
- Uncommon
  - Pheochromocytoma
  - Glucocorticoid excess/ Cushing's dz
  - Coarctation of Aorta
  - Hyper/hypothyroidism

Catecholamine Producing Tumors



1.Neural tube 2.chorda.3.aorta4.base of mesentry5.digestive tube.6 adrenal cortex7. undifferentiated gonad 8.mesonephros.9.Neural crest

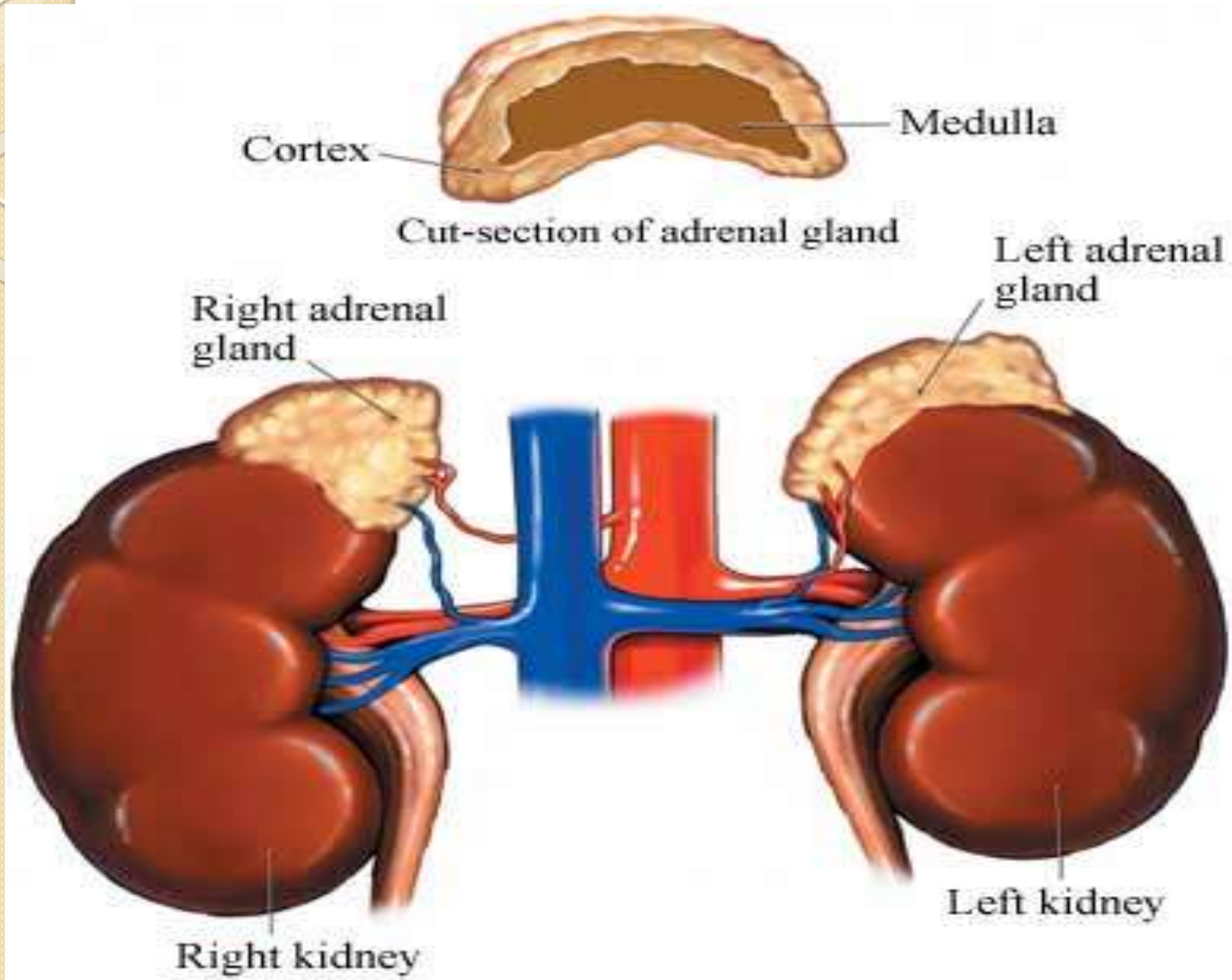


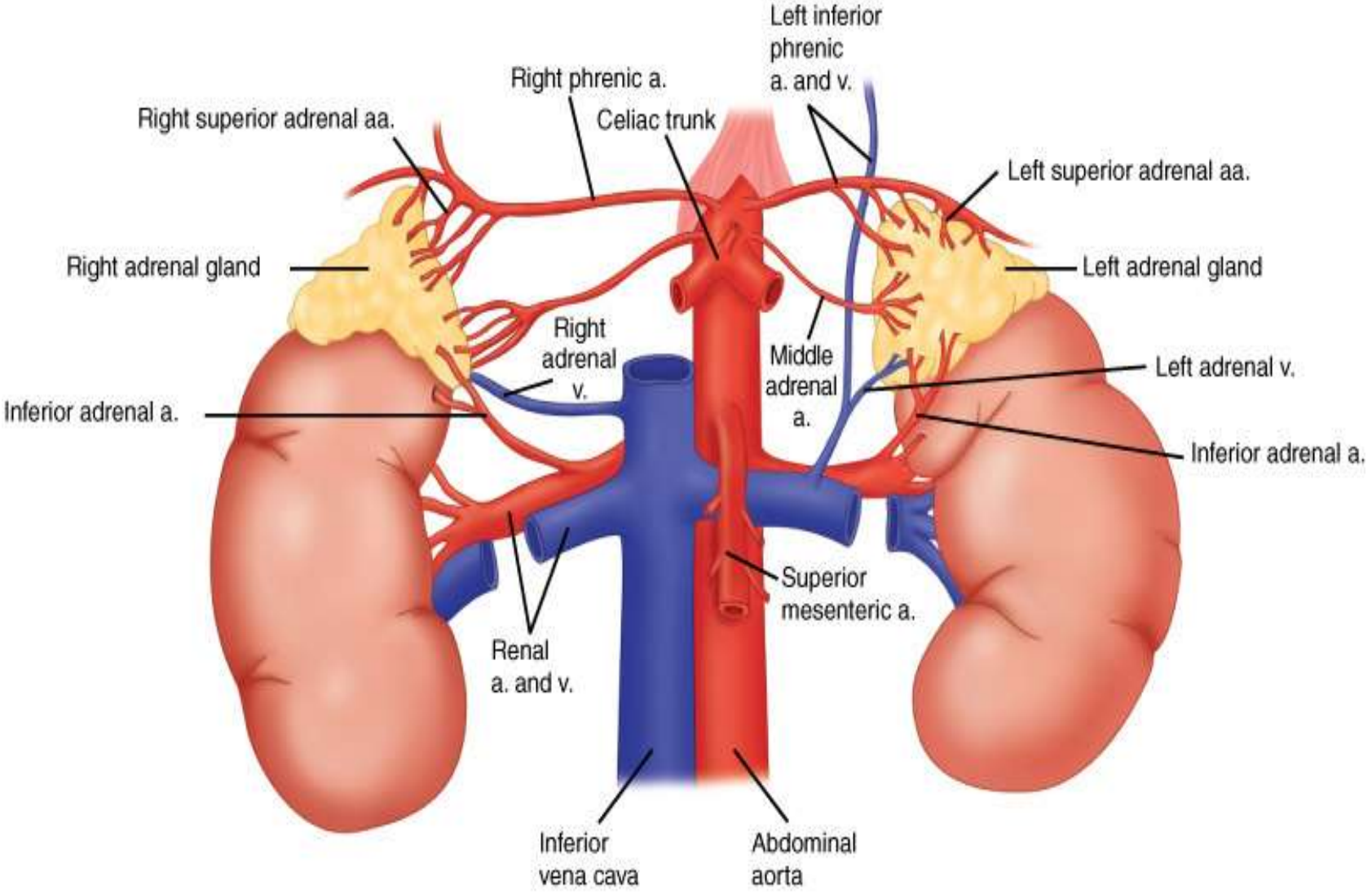
Anatomy

- Flattened yellowish
- Less than 10 gm
- Pyramidal and cresentic
- Rich blood supply

Historical background

- Eustachius : anatomic account of the adrenals in 1563.
- Anatomic division of the adrenals into the cortex and medulla was described much later, by Cuvier in 1805.
- Thomas Addison in 1855 features of adrenal insufficiency, which still bear his name.
- . Pheochromocytomas were first identified by Frankel in 1885, but were not named as such until 1912 by Pick, who noted the characteristic chromaffin reaction of the tumor cells
- . Adrenaline was identified as an agent from the adrenal medulla that elevated blood pressure in dogs and was subsequently named epinephrine in 1897.
- The first successful adrenalectomies for pheochromocytoma were performed by Roux in Switzerland, and Charles Mayo in the United States.


Medulla
Cortex
Cut-section of adrenal gland
Left adrenal gland
Right adrenal gland
Left kidney
Right kidney



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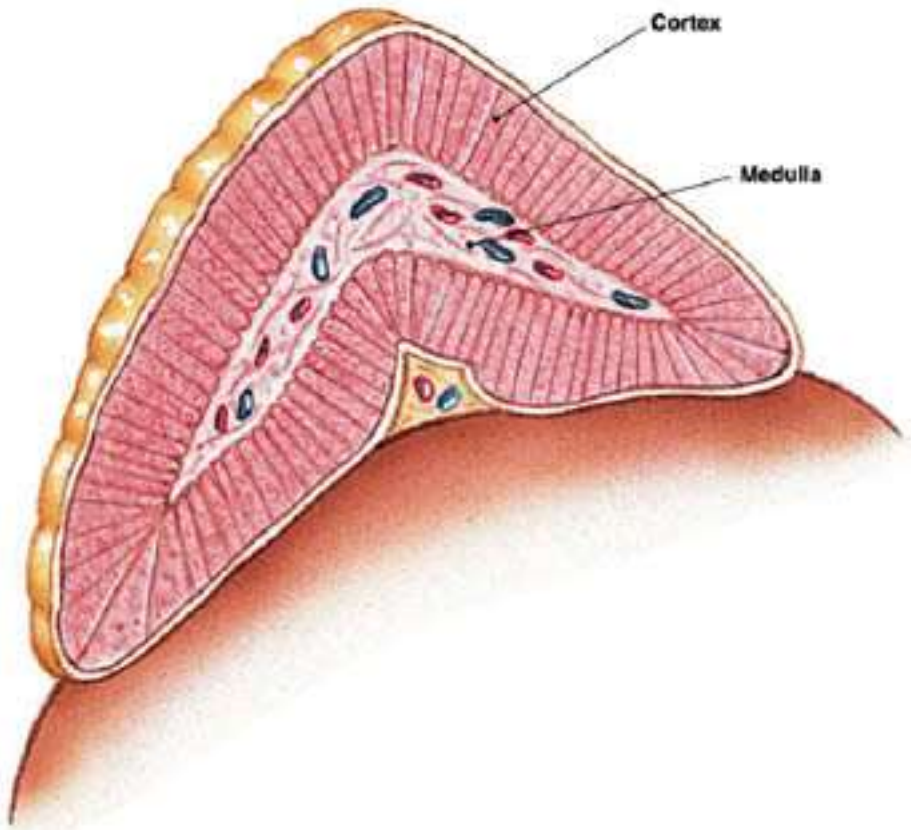
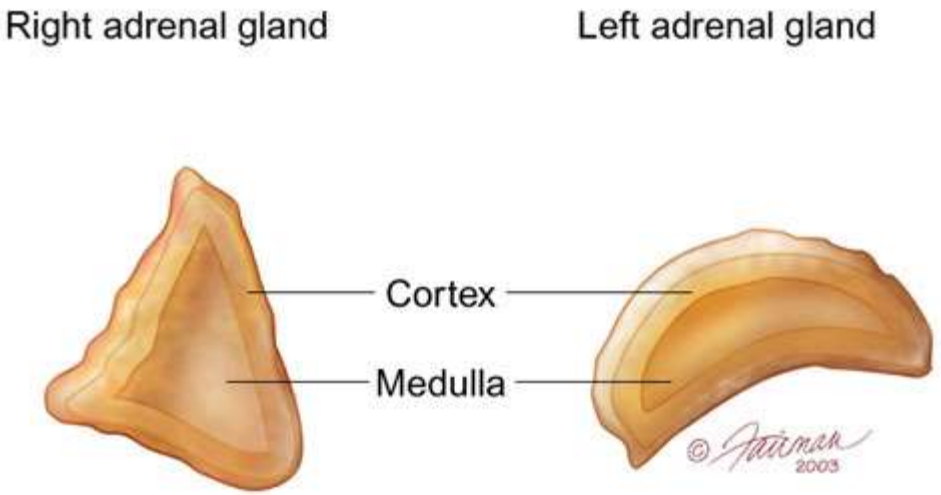
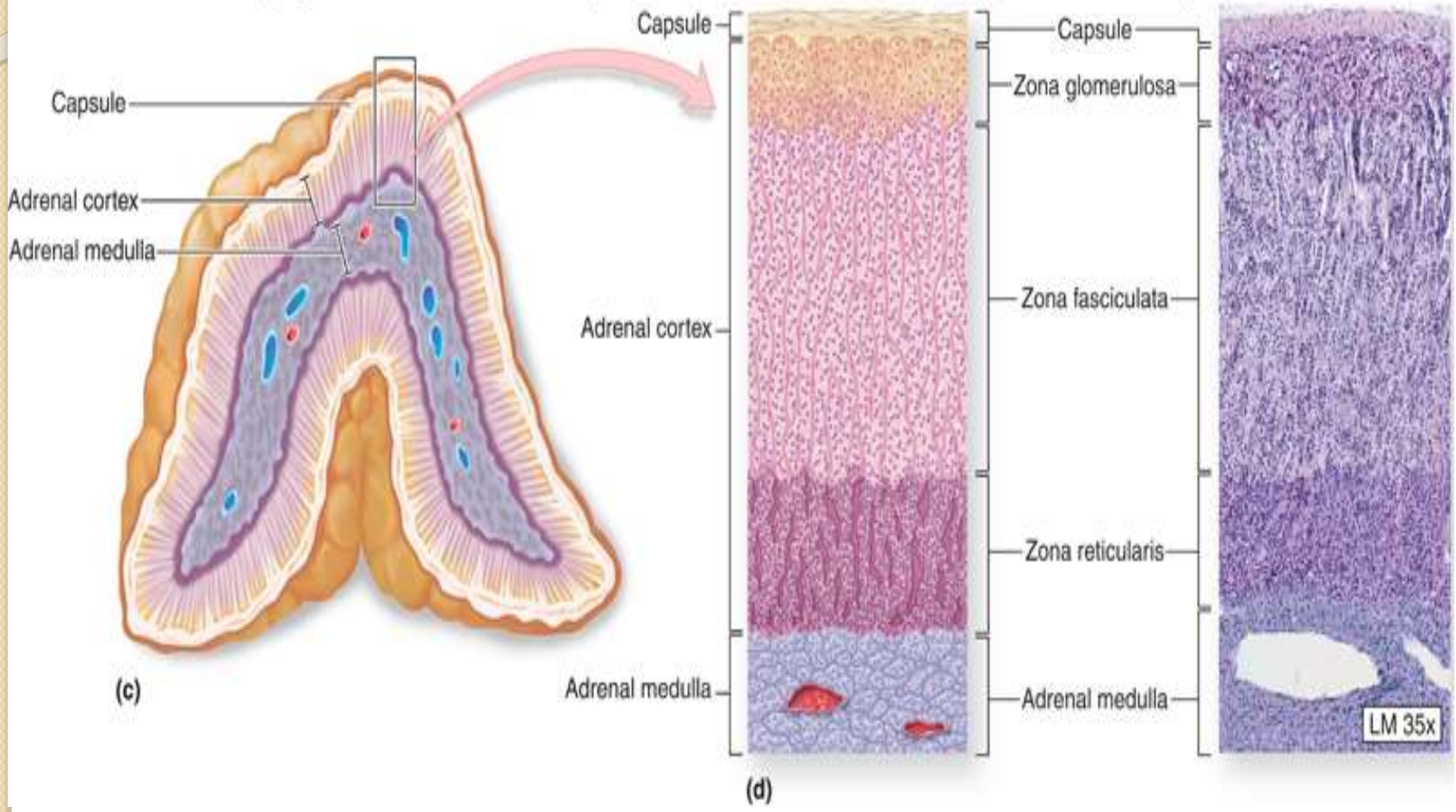
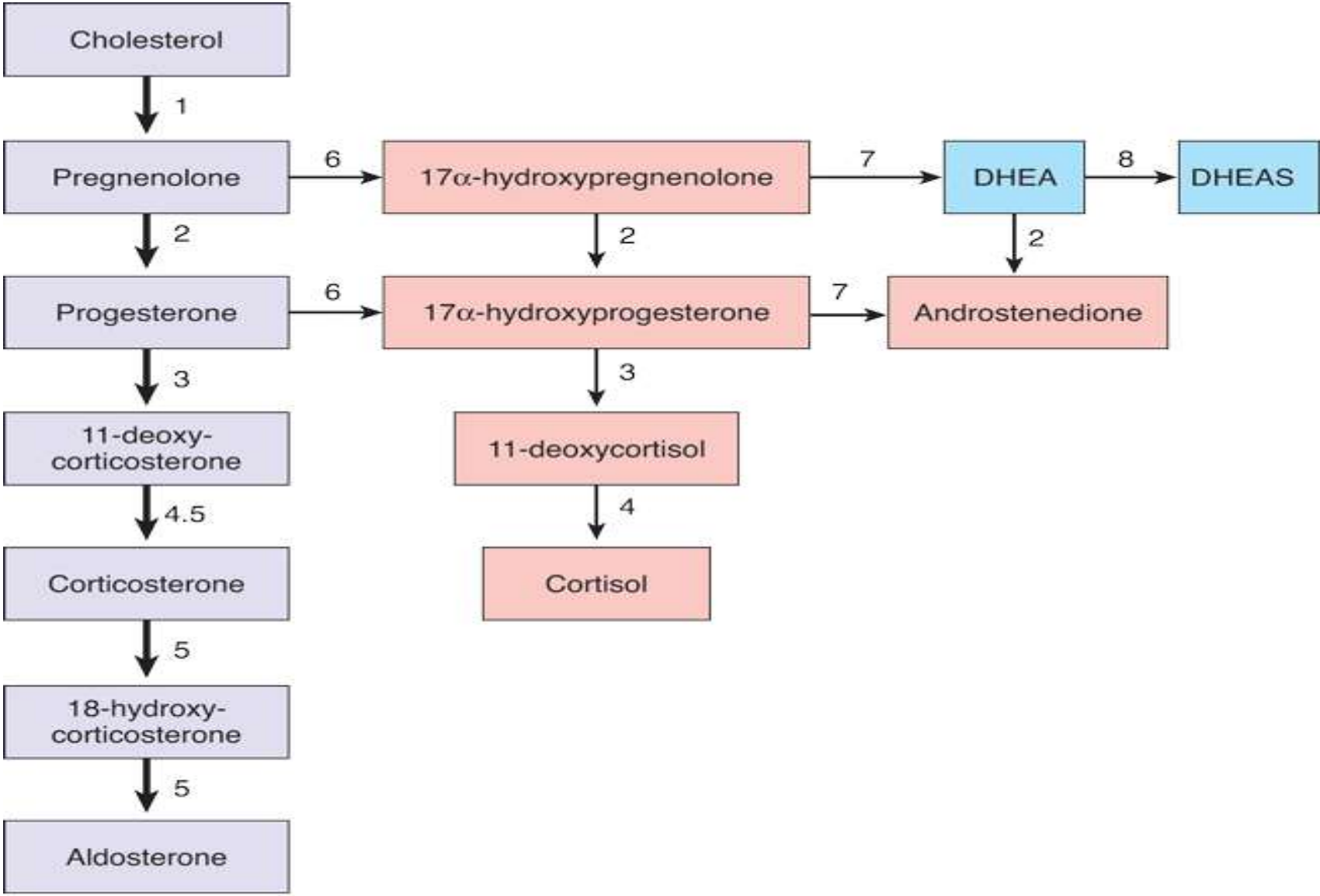

Cortex
Medulla


Right adrenal gland
Left adrenal gland
Cortex
Medulla
© Tortora 2003



Applied Physiology

- Essential for life
- Cortex secretes steroid hormones synthesized from cholesterol
- Zona glomerulosa produce mineralocorticoid aldosterone
- Zona fasciculata and reticularis synthesize glucocorticoids, androgens and oestrogens
- Adrenal medulla secretes catecholamines, adrenaline, noradrenaline and dopamine



Adrenal Cortex

Hypocorticism

i. Acute (Adrenal apoplexy of the newborn)
ii. Chronic (Addisons Disease)

Hypercorticism

i. Infantile
ii. Prepubertal
iii. Adult (Cushings Syndrome)
iv. Postmenopausal
v. Primary Aldosteronism

Adrenal Medulla

Tumours

i. Ganglioneuroma
ii. Neuroblastoma
iii. Phaeochromocytoma

Disorders of Surgical Importance

- Primary Aldosteronism
- Tumours of adrenal Medulla

Primary Aldosteronism primary hyperaldosteronism PHA

- Conn's Syndrome
- Surgically Correctable type of Hypertension
- (1-2%) of all

Primary Aldosteronism Pathology

- Hyperaldosteronism may be secondary to stimulation of the renin-angiotensin system from renal artery stenosis and to low-flow states such as congestive heart failure and cirrhosis
- Autonomous Excessive Aldosterone Secretion.
- 80% of patients with PHA have unilateral adrenocortical adenoma(Conn's syndrome).Remainder have bilateral hyperplasia

Primary Aldosteronism

- $[Na^{+}]$
- $[K^{++}]$

- $[Na^{+}]$

- $[K^{++}]$

Primary Aldosteronism

Clinical Features:

Characterized by hypertension and hypokalemia

1) Muscular Weakness

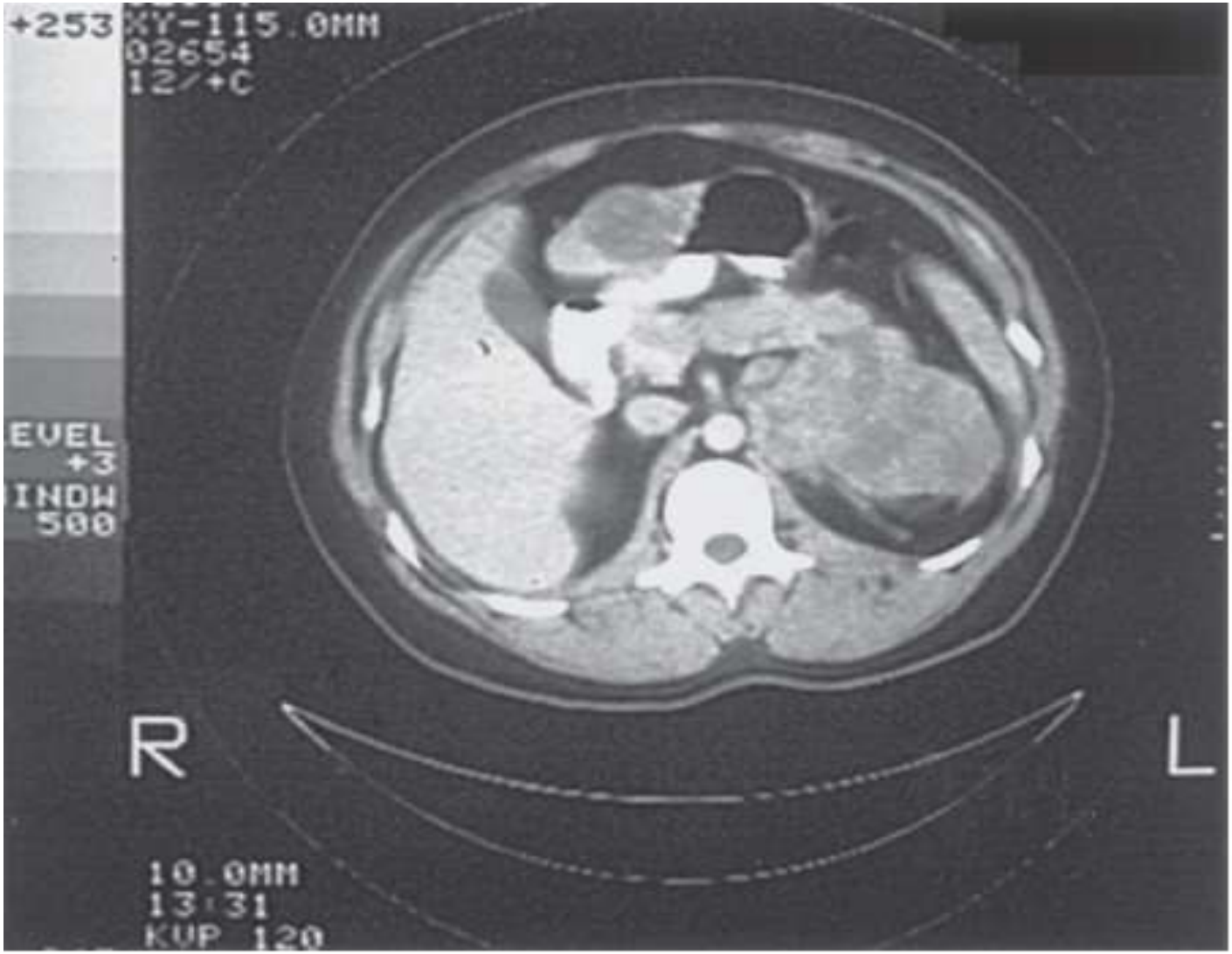
2) Polyuria
3) Polydypsia

4) Hypertension
5) Edema

Primary Aldosteronism

Investigations:

- S. potassium is low
- Elevated urinary potassium
- CT
- MRI



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Primary Aldosteronism

Treatment

- Medical
- Surgical
  - Unilateral Adrenalectomy

Neuroblastoma

- Neural Crest Cells

- Location

  ¾ abdomen

  ½ of them in adrenals

Neuroblastoma

Clinical Features:

- Age:

90% < 8yrs

- Abdominal Mass
  - Weight loss
  - Abdominal Pain
  - Distension

Neuroblastoma

- Metastasis:

50% of infants

Neuroblastoma

Investigations:

- Urine
- Abdominal Ultrasound
- CT Scan

Neuroblastoma

Treatment:

- Surgical Excision
- Neodjuvant Chemo/radiotherapy

Pheochromocytomas

Pheochromocytomas

Definition

Pheochromocytomas are neoplasms derived from the chromaffin cells of

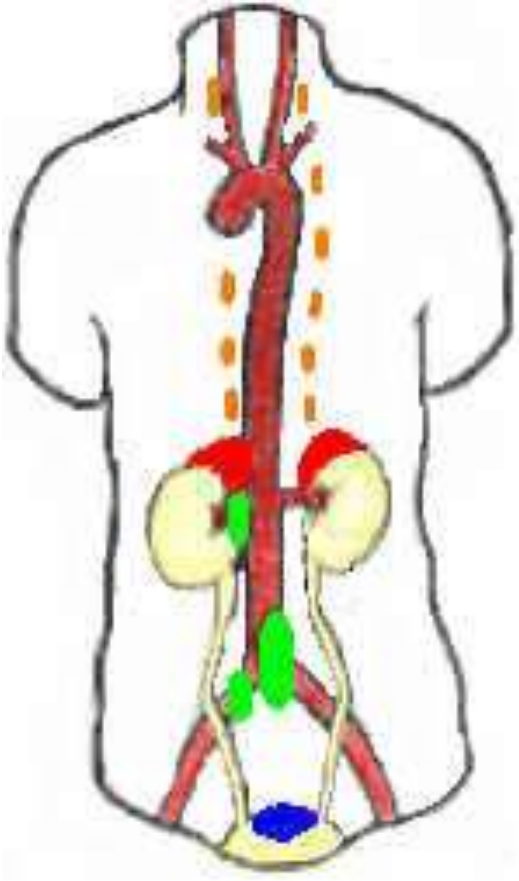
- adrenal medulla (90%)
- extra-adrenal paraganglia (10%)

- result in unregulated, episodic oversecretion of catecholamines

- Phaeochromocytoma, unilateral or bilateral occurs in association with following hereditary syndromes
  - Multiple endocrine neoplasia type 2(sipple's syndrome
  - Von Hippel-Lindau (VHL)
    - Renal cell carcinoma
    - CNS and retinal haemangioblastoma
  - Neurofibromatosisis type 1
  - Familial paraganglioma syndrome

Pheochromocytoma : location

- Virtually all (99%) arise within the abdomen



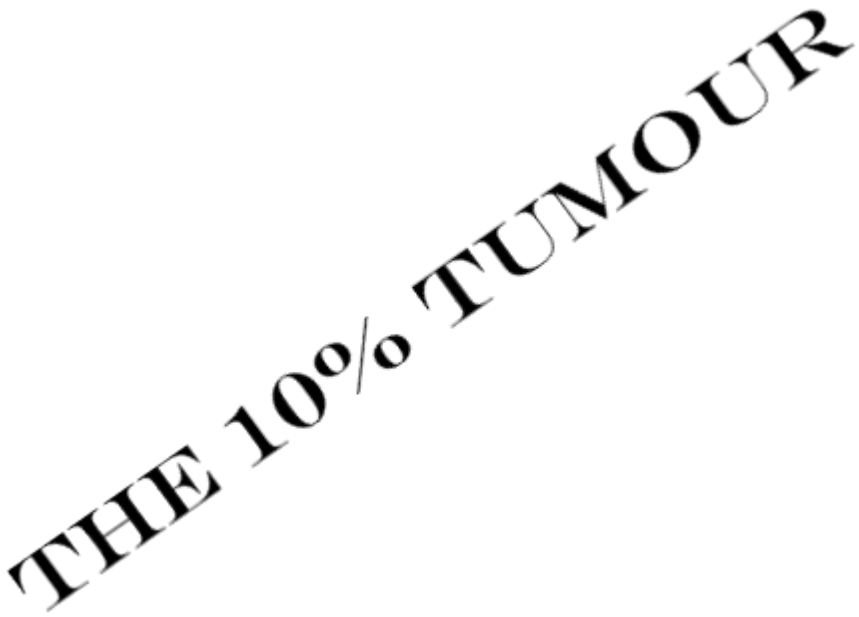
Adrenal medulla :90%

Extra-adrenal :10%

Pheochromocytomas

- Uncommon neoplasms
- 0.1% to 0.3% of all hypertensive patients
- Surgically correctable form of hypertension

Phaeochromocytoma



- extra-adrenal
- children
- familial
- bilateral
- malignant

10 %

Clinical Features

- Usually present before the age of 50 years

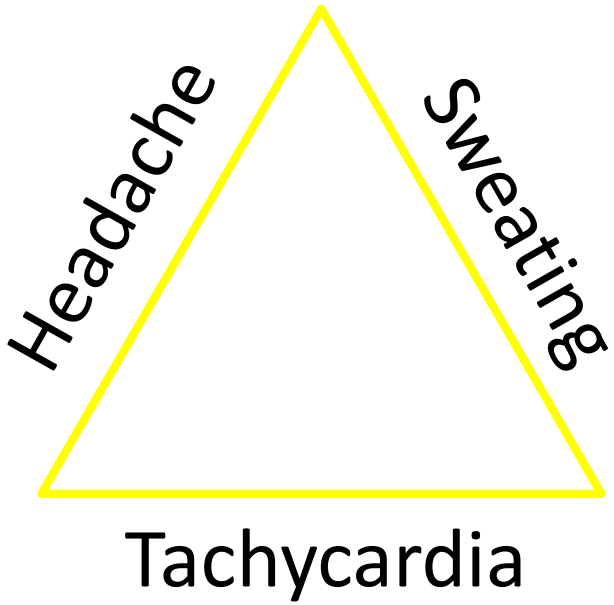
  Commonly 3rd to 5th decades

- Male = Female

- Manifests by effects of adrenaline and noradrenaline excess

Classical Presentation

- Paroxysms manifesting as a triad of:



Classical Presentation

- Additional symptoms during an attack :
  - Blood pressure may rise to 200/100 mmHg
    - Paroxysmal hypertension in 50% patients
  - Palpitations
  - Extreme anxiety
  - Tremors
  - Paresthesias
  - Chest or abdominal pain
  - Nausea, vomiting
  - Dyspnea

Other Presentations

- Persistent Hypertension
  - All young hypertensive patients should be screened for a catecholamine-secreting tumor
  - Surgically correctable

Catecholamine crises

- Sudden and severe increase in blood pressure
- Can lead to
  - Heart failure
  - Pulmonary edema
  - Arrhythmias
  - Intracranial hemorrhage

24 Hours Urinary Catecholamines

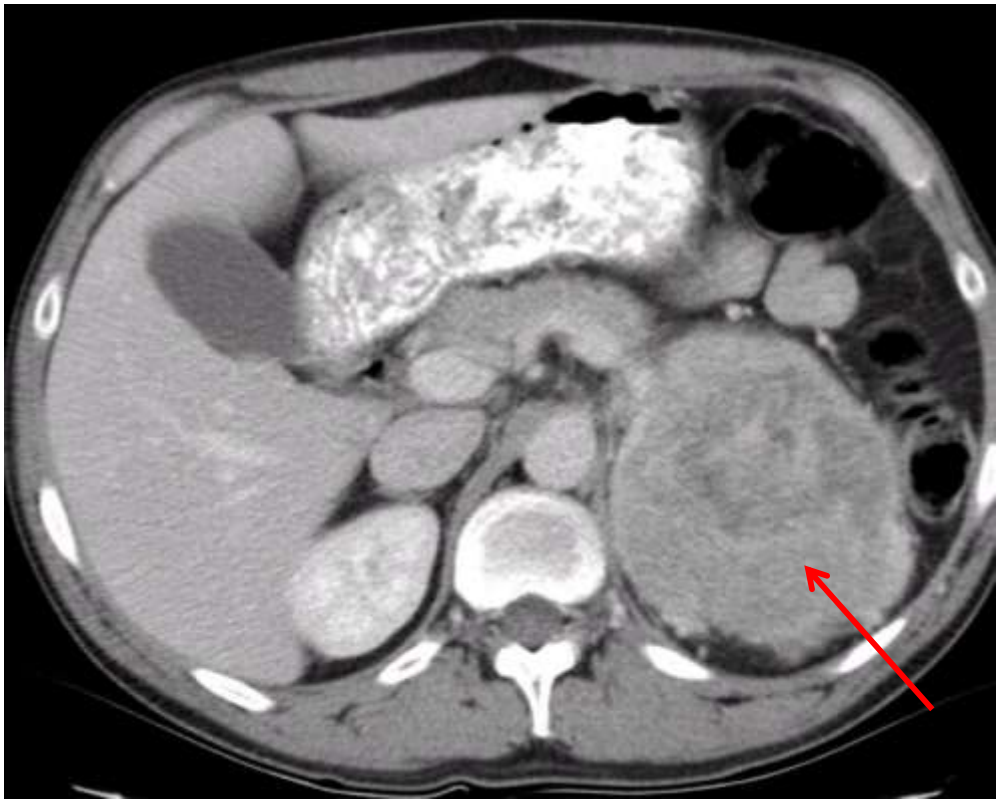
- 24 hours urine collection
- Analyzed for catecholamines and their metabolites:
  - Adrenaline and Noradrenaline
  - Metanephrines
  - Vanillylmandelic acid (VMA)

- Diagnostic values:

  > 2-3 fold elevation

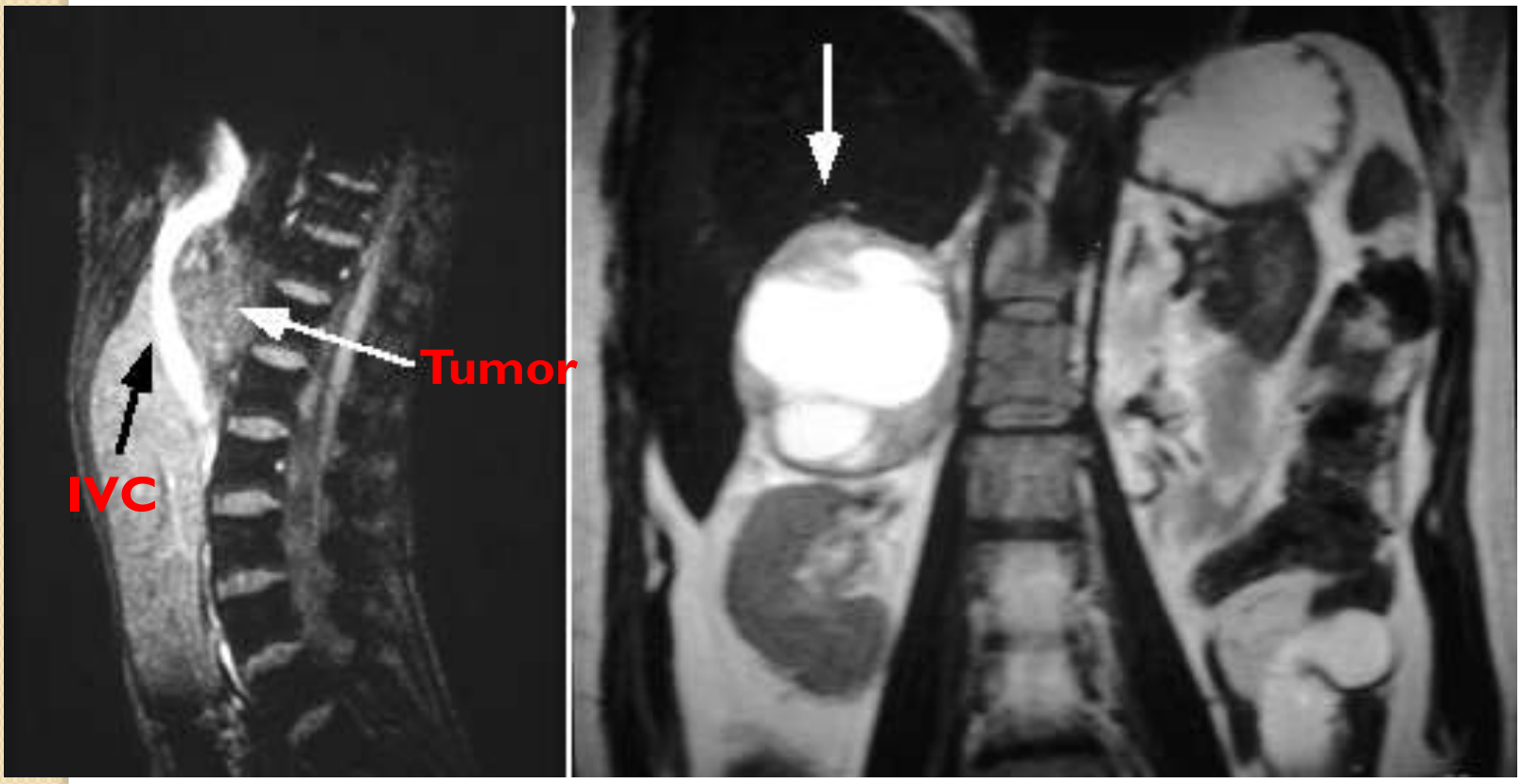
Localization: Imaging

- CT abdomen



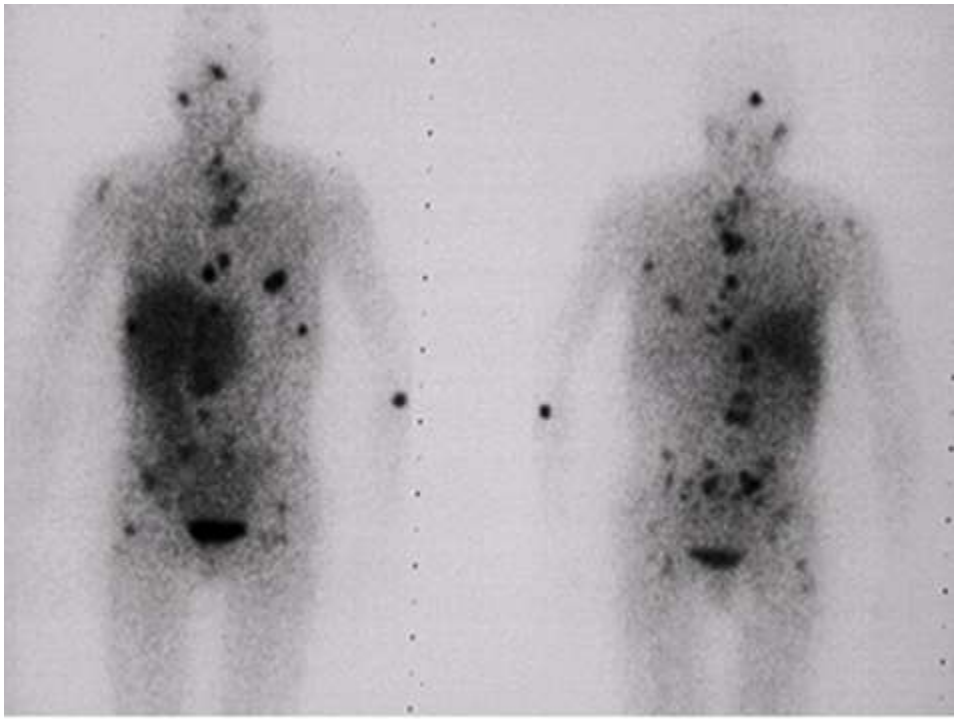
Localization: Imaging

- MRI
  - More sensitive for extra-adrenal pheochromocytoma



Localization: Imaging

- MIBG (^{131}I-meta-iodobenzylguanidine) Scintigraphy



Diffuse metastatic pheochromocytoma

Preoperative Preparation

- Surgery without preoperative preparation is dangerous
  - Risks:
    - Peroperative hypertensive crisis
    - Post excisional hypotension

- The patient should come to operation with
  - Blood pressure and pulse rate controlled
  - Adequate hydration

- Preoperative control of blood pressure
- α-adrenergic blocker
- B-blockers

Preoperative Preparation

- Volume expansion to avoid post-excision hypotension
  - Liberal oral salt and water
  - Intravenous hydration night before surgery

Measures to avoid cardiovascular instability during surgery

- Continuous monitoring
  - ECG
  - Arterial line
  - CVP line / Swan-Ganz catheter
- Avoid excessive tumor manipulation, which can result in catecholamine release

- Operative mortality prior to 1950 : 24 - 50 %

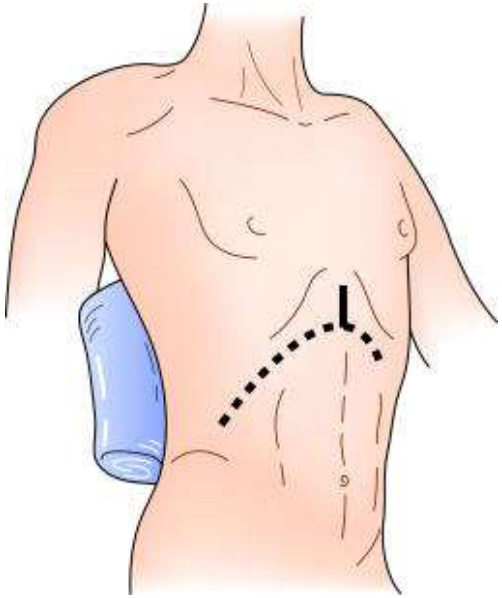
- Current operative mortality :
  0 - 2.7 %

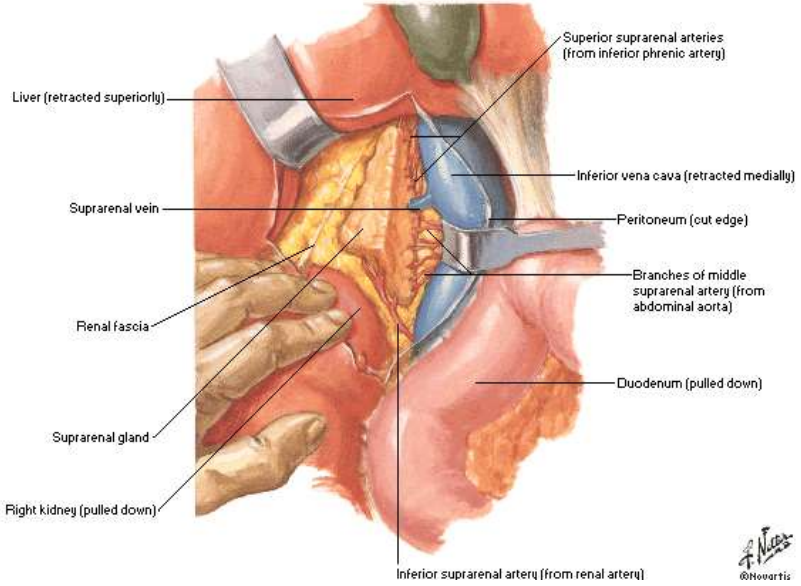
Operative Procedures

- Adrenalectomy
  - Open
  - Laparoscopic
- Excision of extra-adrenal paraganglioma

Operative Procedures

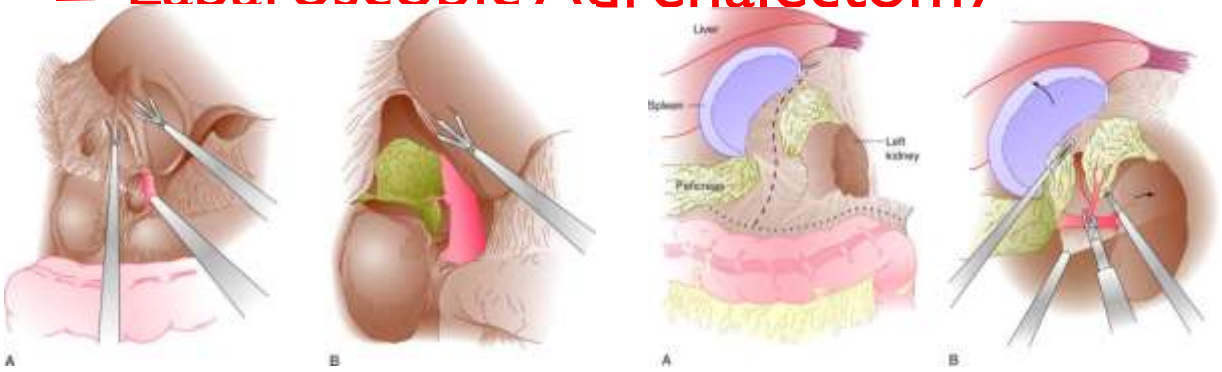
- Open Adrenalectomy

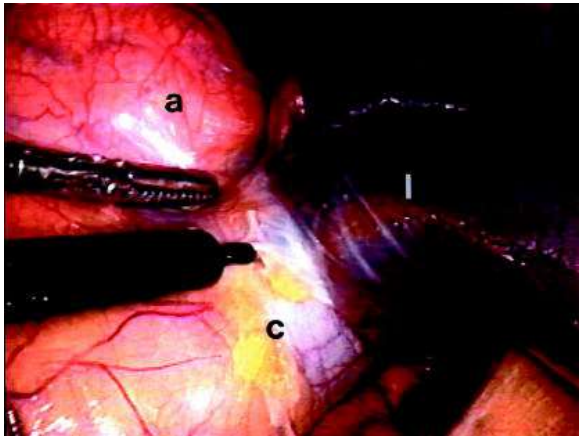


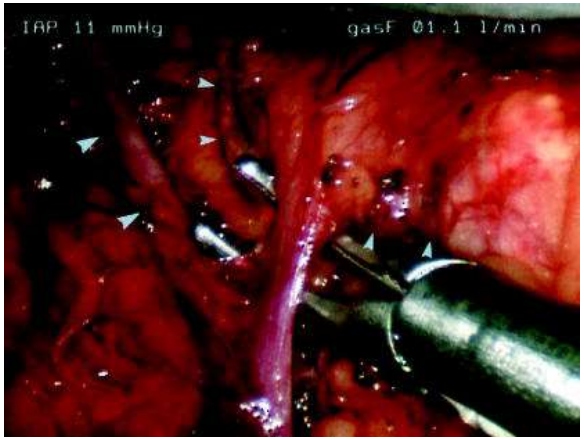


Operative Procedures

- Laparoscopic Adrenalectomy







Any Questions

Thanks