Common endocrine pathologies

Done by :

Manar Alfaleh

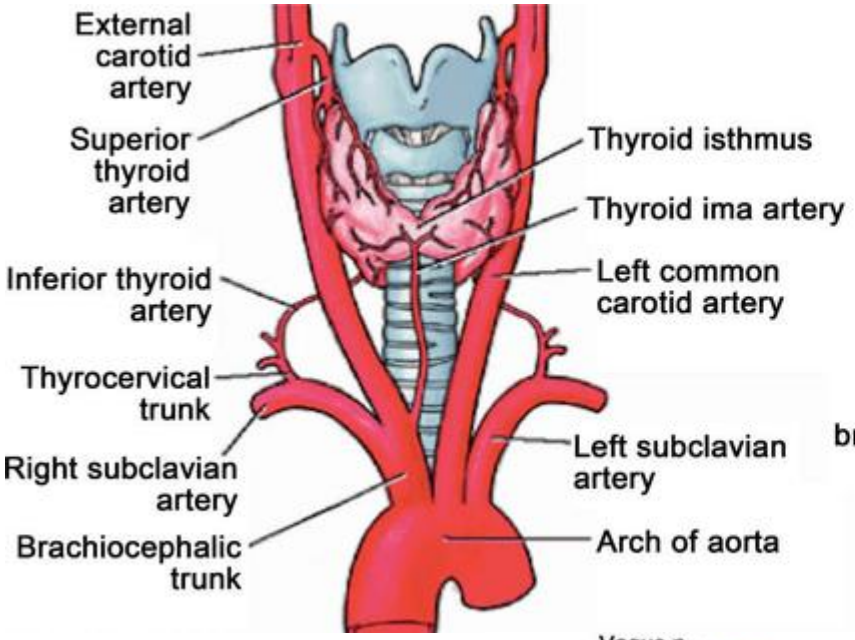
Tasneem Al-dwiry

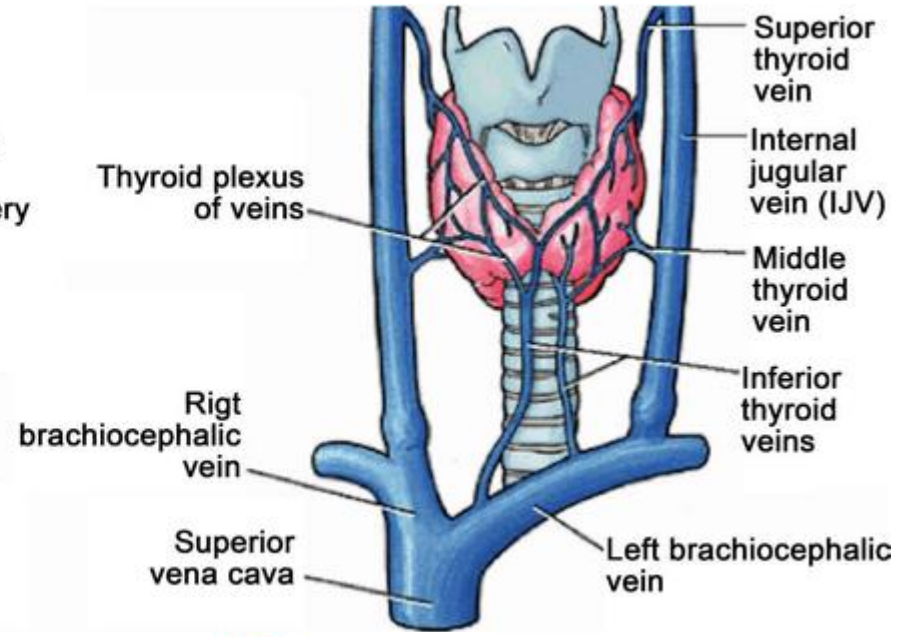
Alaa Jarrah

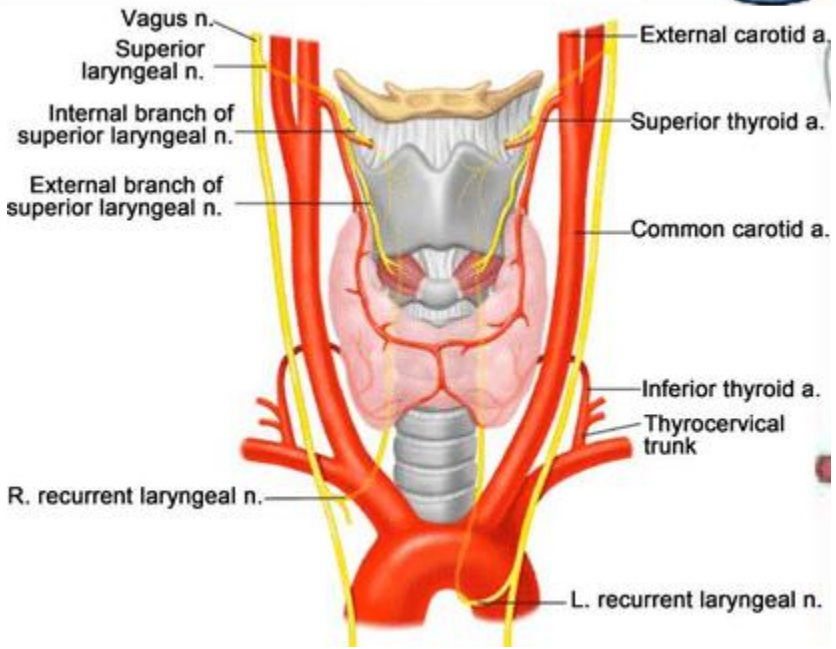
supervised by :

dr. moetaz qassaymeh

Thyroid GLAND Arterial And Venous Supply





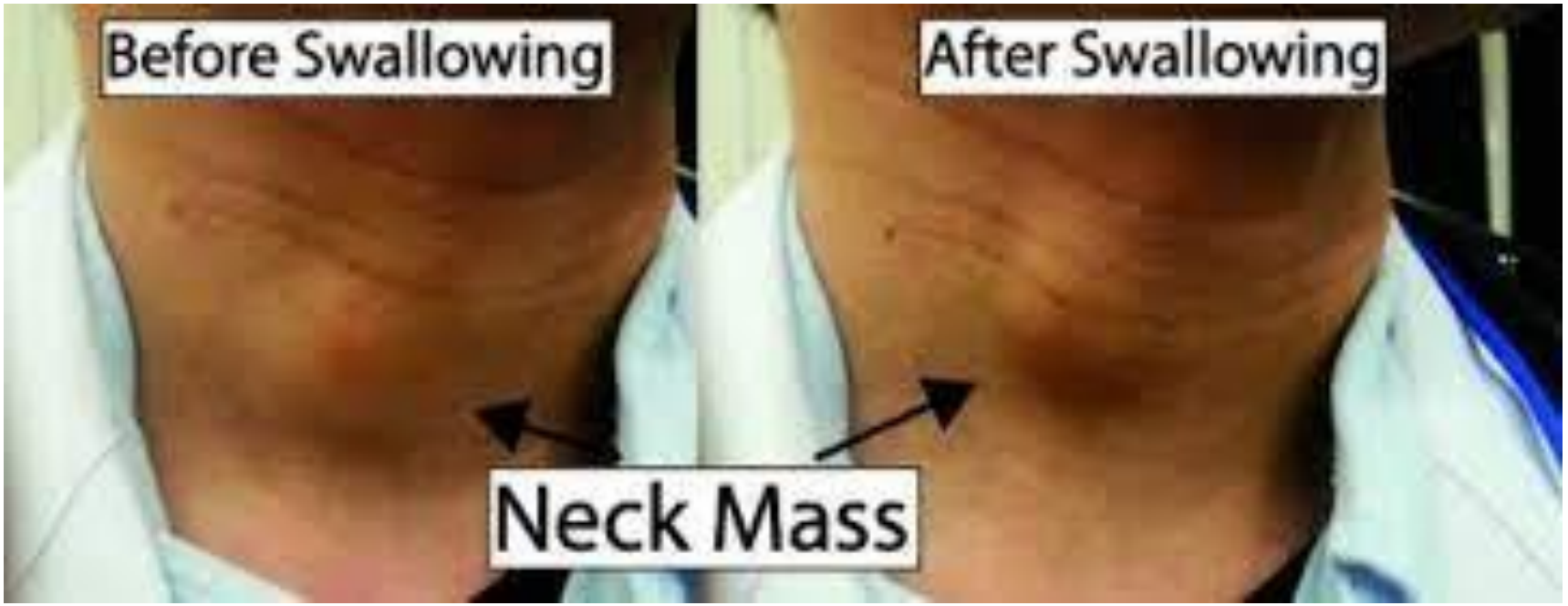


Thyroid nodular disease

- Thyroid nodule: a discrete intra thyroid lesion that is distinct radiographically from the surrounding thyroid parenchyma.

- Epidemiology: Thyroid nodule is common with 4% to 7% of all adults having palpable thyroid nodules and a higher prevalence (19% to 68%) on ultrasound (US),
- Thyroid nodule is more common among females

Thyroid nodule



-All structures within the **pretracheal fascia** move with deglutition (swallowing)

Risk factors increase likelihood of thyroid nodule to be malignant

History taking :

- the extremes of age.
- male gender .
- personal history of ionizing radiation exposure.
- a positive family history of thyroid malignancy.
- familial adenomatous polyposis (FAP).
- Rapid nodule growth, pain, compressive symptoms, or hoarseness .

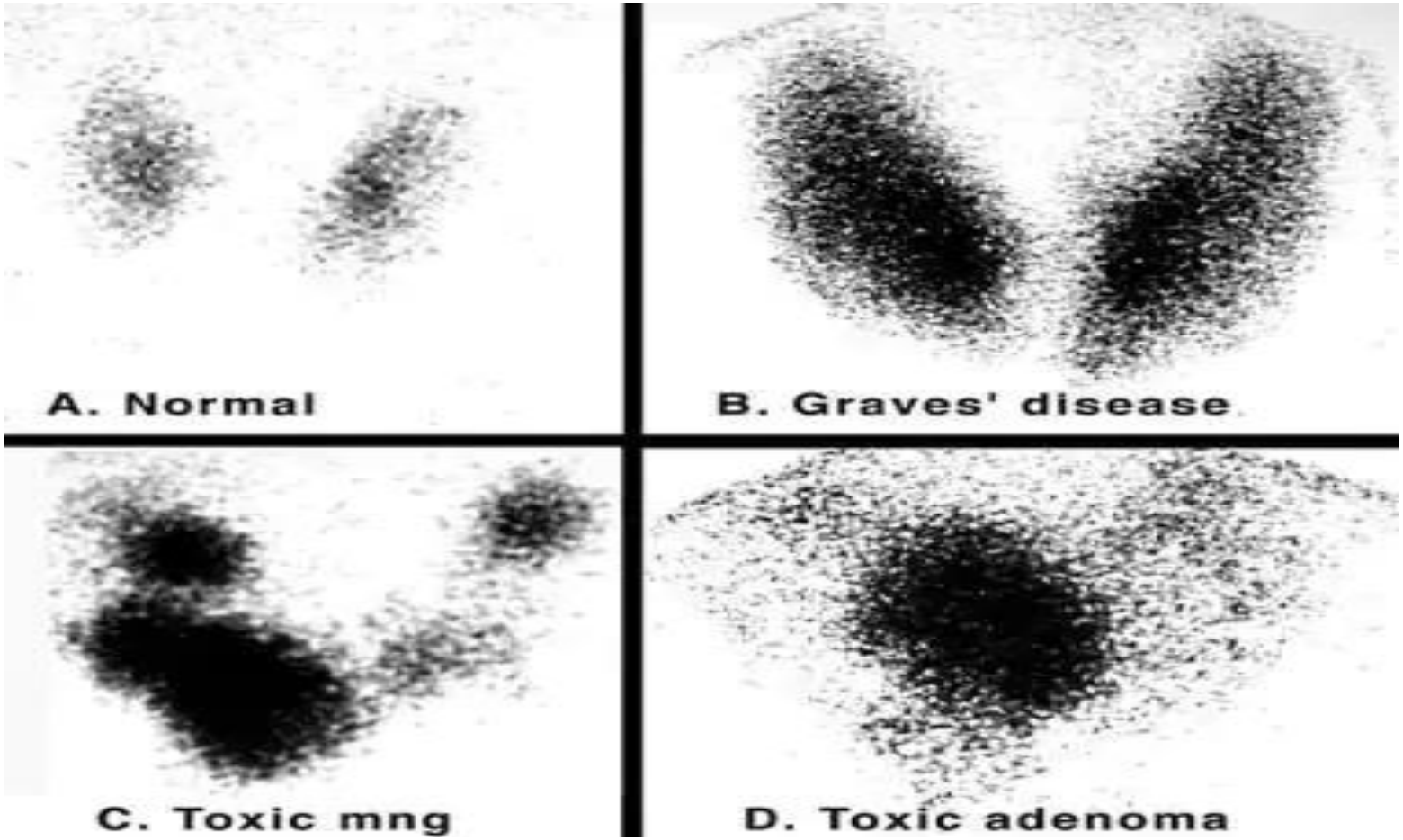
Physical signs :

- a solitary nodule with firm or irregular texture.
- fixation to surrounding structures.
- associated enlarged cervical lymph nodes .

Thyroid nodule

- The first step to evaluate thyroid nodule by assessing the functional status of thyroid gland ,
- Hyperthyroid patent (low TSH)require a thyroid scan to assess functional status of thyroid itself .
- Euothyroid and hypothyroid patients, we need an US and cytological analysis (FNAC).

thyroid scan for hyperthyroidism



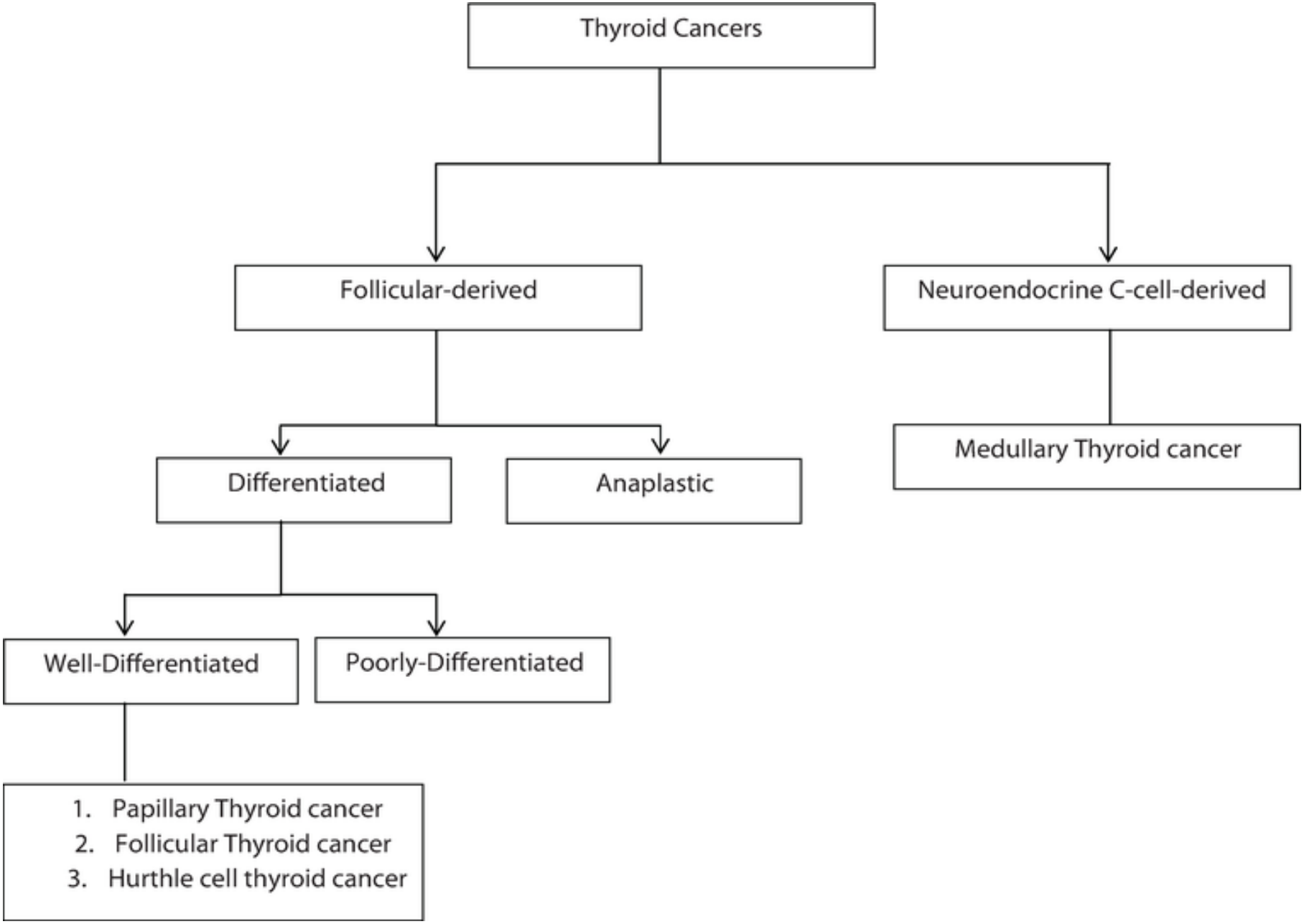
Bethesda Categorization of Thyroid Nodule Cytology:

Category	Meaning
I	Non-diagnostic or inadequate
II	Benign
III	Atypia/follicular lesion of undetermined significance
IV	Follicular neoplasm or suspicious for follicular neoplasm
V	Suspicious for malignancy
VI	Malignant

Source: Cibas et al.[11]

Bethesda Categorization of Thyroid Nodule Cytology:

Diagnostic category	Risk of malignancy (%)	Usual management
Nondiagnostic or unsatisfactory	1–4	Repeat FNA with ultrasound guidance
Benign	0–3	Clinical follow-up
Atypia of undetermined significance or follicular lesion of undetermined significance	5–15	Repeat FNA
Follicular neoplasm or suspicious for a follicular neoplasm	15–30	Surgical lobectomy
Suspicious for malignancy	60–75	Near-total thyroidectomy or surgical lobectomy
Malignant	97–99	Near-total


Thyroid Cancers
Follicular-derived
Neuroendocrine C-cell-derived
Differentiated
Anaplastic
Medullary Thyroid cancer
Well-Differentiated
Poorly-Differentiated
1. Papillary Thyroid cancer
2. Follicular Thyroid cancer
3. Hurthle cell thyroid cancer

Thyroid cancer

- Thyroid carcinomas are classified according to their cell of origin into those of follicular cell origin (95%) and those of parafollicular cell origin. The former include: papillary, follicular, Hürthle cell, insular, large cell and anaplastic carcinomas. The latter include medullary carcinomas. Thyroid carcinomas of follicular cell origin are in turn classified according to their degree of differentiation into well, poorly and undifferentiated lesions.

Thyroid cancer

- PTC is the most common but least aggressive carcinoma of the thyroid gland. It is more common in iodine sufficient areas of the world.
- Spread is typically lymphatic rather than hematogenous.
- Children are more likely to be node positive than adults.

Thyroid cancer

Features of malignant cells in PTC on FNA include:

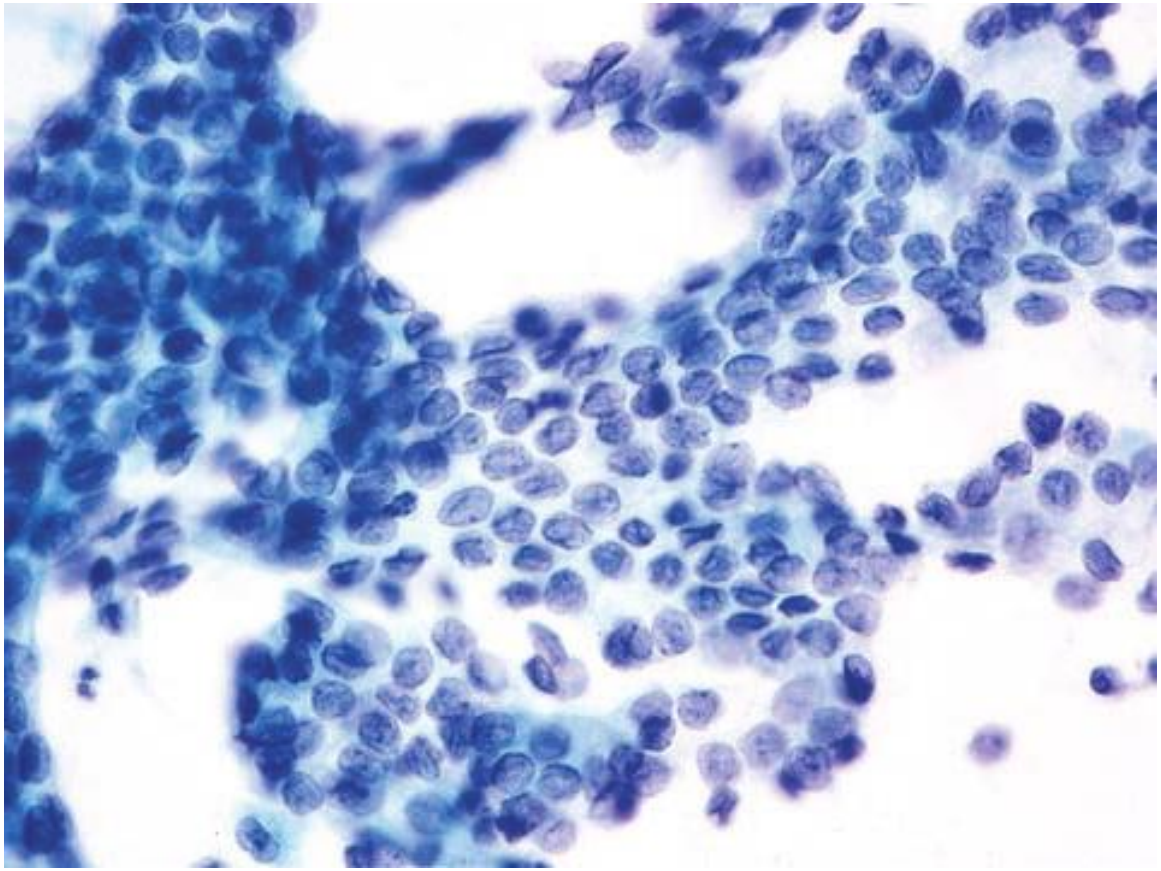
1. Optically clear nuclei The nuclei of malignant cells contain finely dispersed chromatin therefore, appear empty and are called "optically clear nuclei".

2. Nuclear crowding/overlap

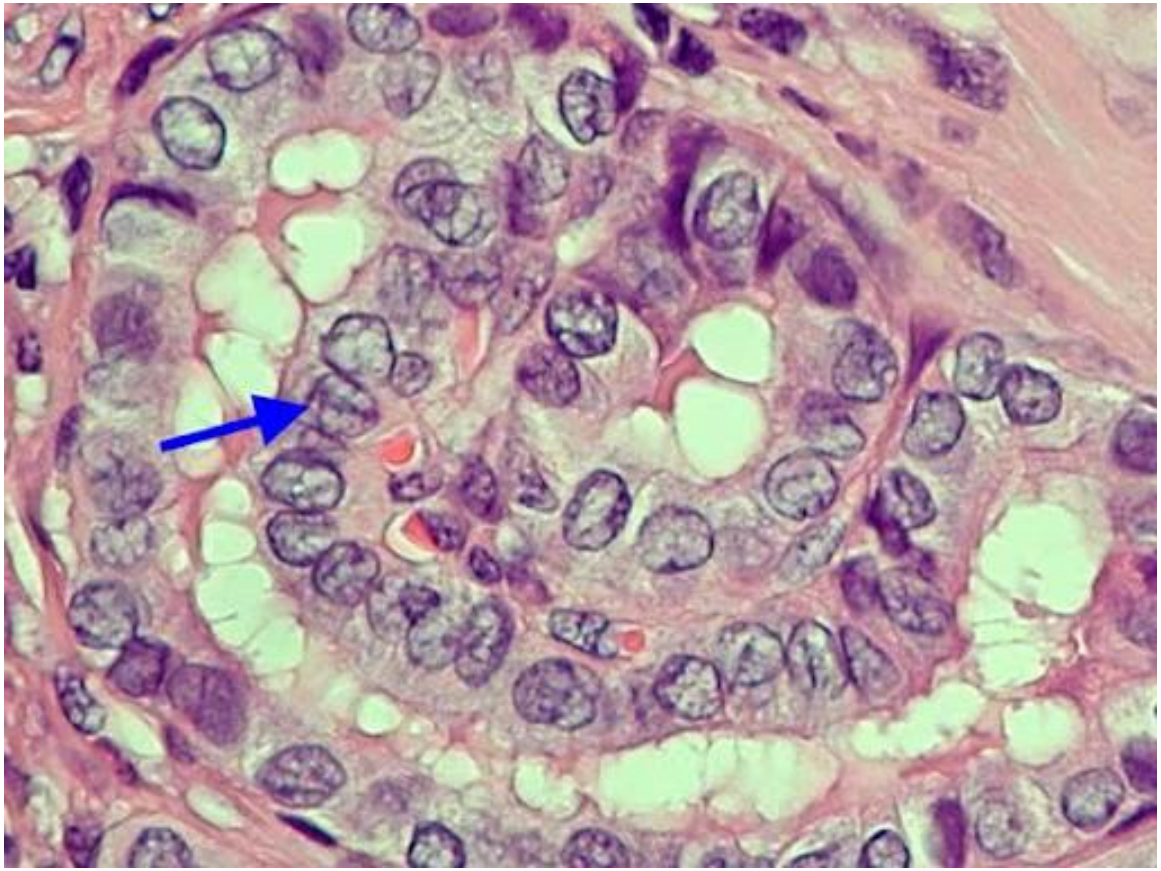
3. Intranuclear cytoplasmic inclusions. These are characteristic of PTC but may also be seen in medullary thyroid carcinoma.

4. Nuclear envelope irregularities/nuclear grooves. These represent in foldings of the nuclear envelope created by adherence of chromatin to the nuclear envelop.

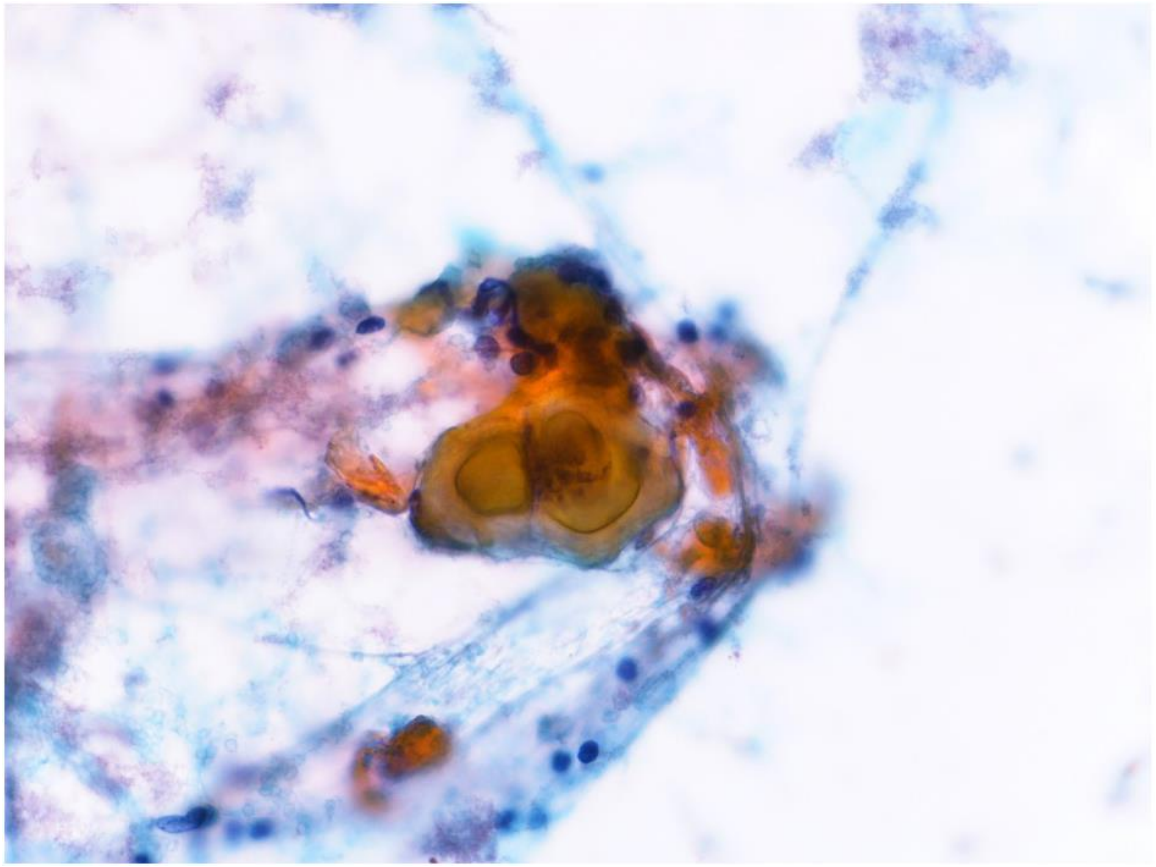
5. Psammoma bodies. Represent calcified clumps of malignant cells.



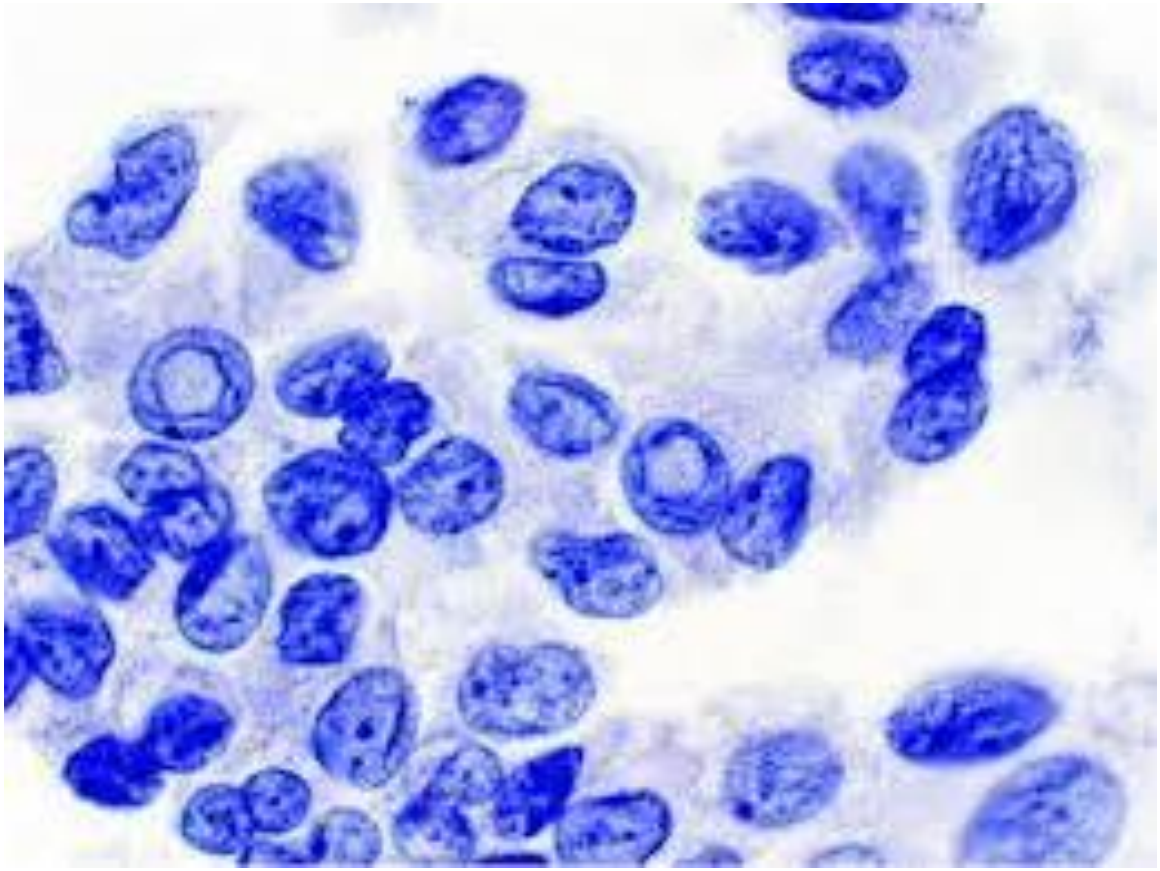
Nuclear crowding/overlap and Optically clear nuclei



Nuclear envelope irregularities/nuclear grooves.



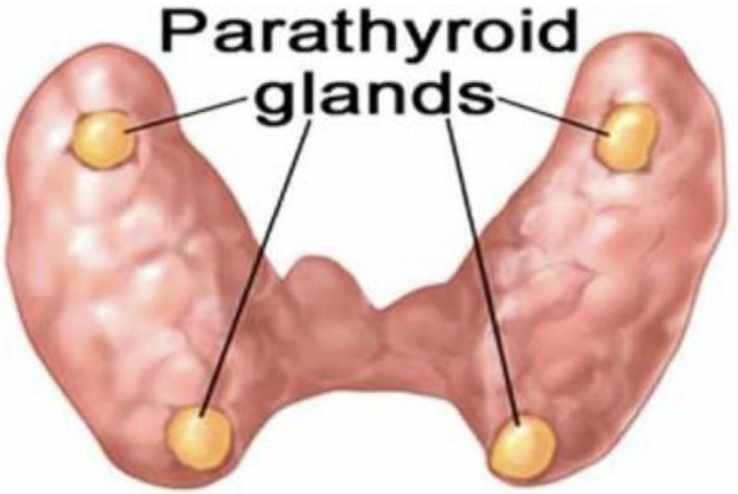
Psammoma bodies



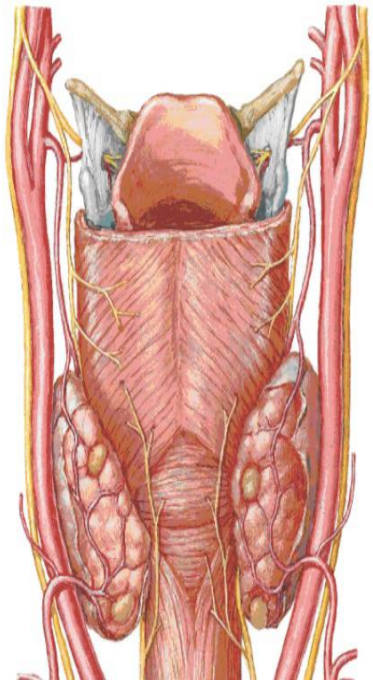
Intranuclear cytoplasmic inclusions

Parathyroid Gland

Parathyroid Glands



*Two pairs of small endocrine glands lying on the posterior border of thyroid gland within its capsule.

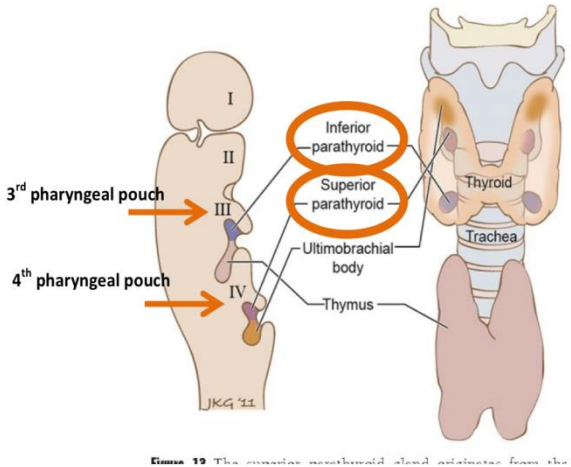


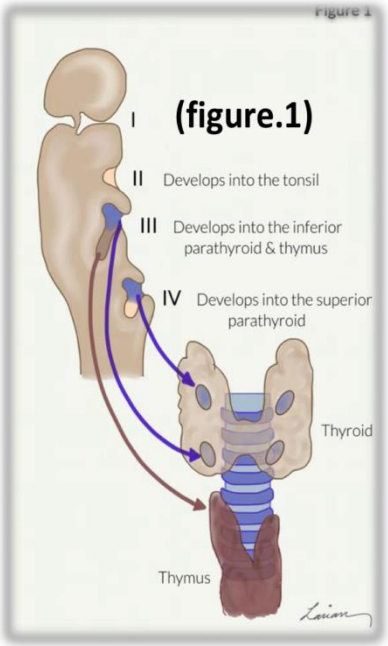
*Shape: is oval.

*Size:- 6 x 4 x 2 mm.

Embrology

- Superior parathyroid gland developed from 4th pharyngeal pouch
- Inferior parathyroid gland developed from 3th pharyngeal pouch

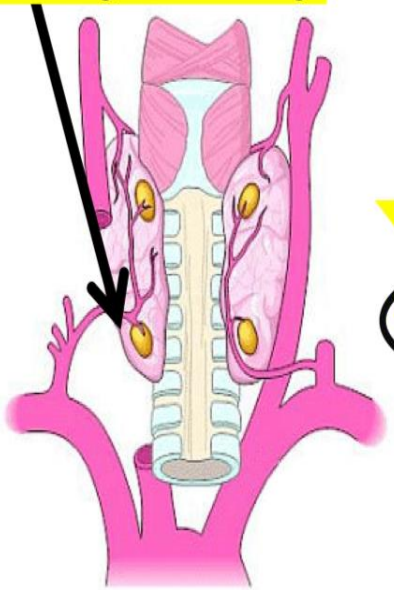


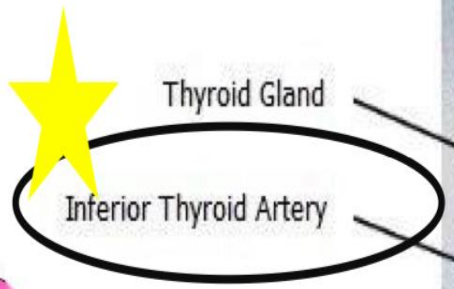


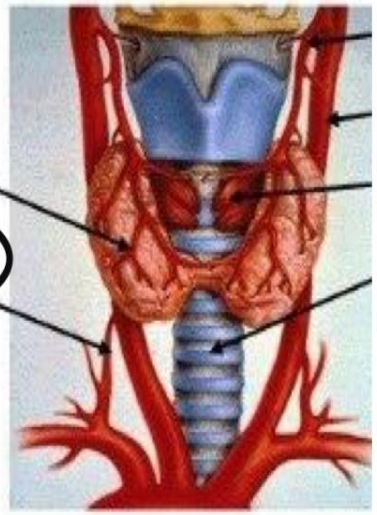
➢Blood supply of parathyroid gland is: Inferior thyroid artery.

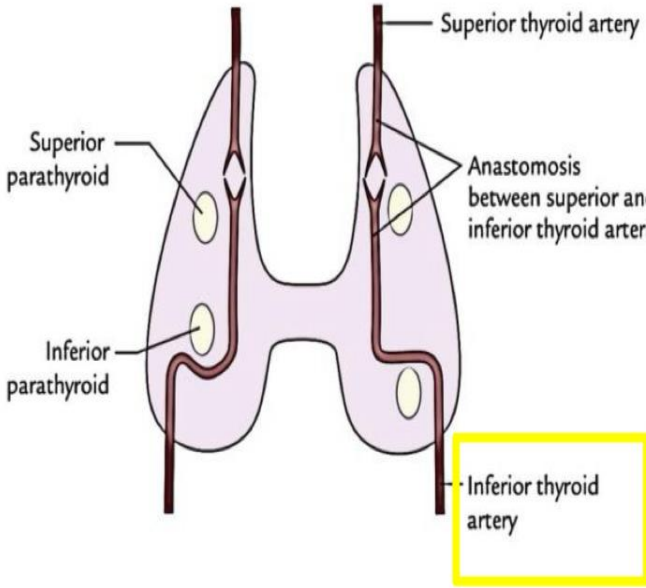
parathyroid glands receive their blood supply from branches of the **inferior thyroid** arteries,

Inferior thyroid artery.

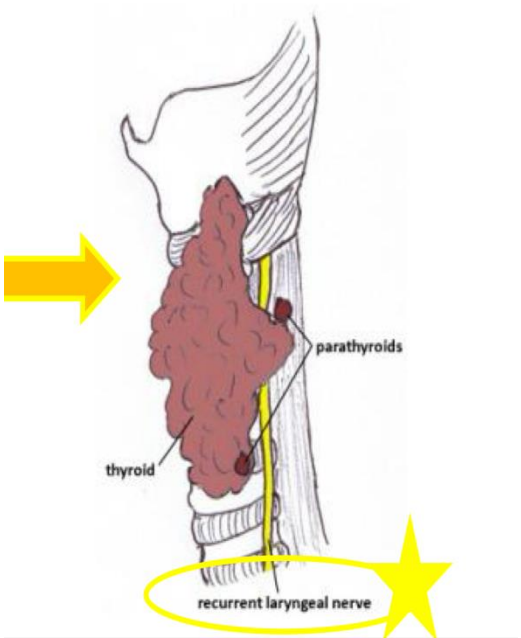








- Inferior parathyroid known as anterior gland;because it is ventral to the nerve.
- Superior parathyroid gland known as posterior gland;because it is posterior to recurrent laryngeal nerve.



Hyperparathyrodism

- It is hyper function of parathyroid gland which lead to increase circulation levels of parathyroid hormone.
- The cause of this elevation might be:
- 1)primary hyperparathyrodism
- 2)secondary hyperparathyrodism
- 3)tertiary hyperparathyrodism

Primary hyperparathyrodism

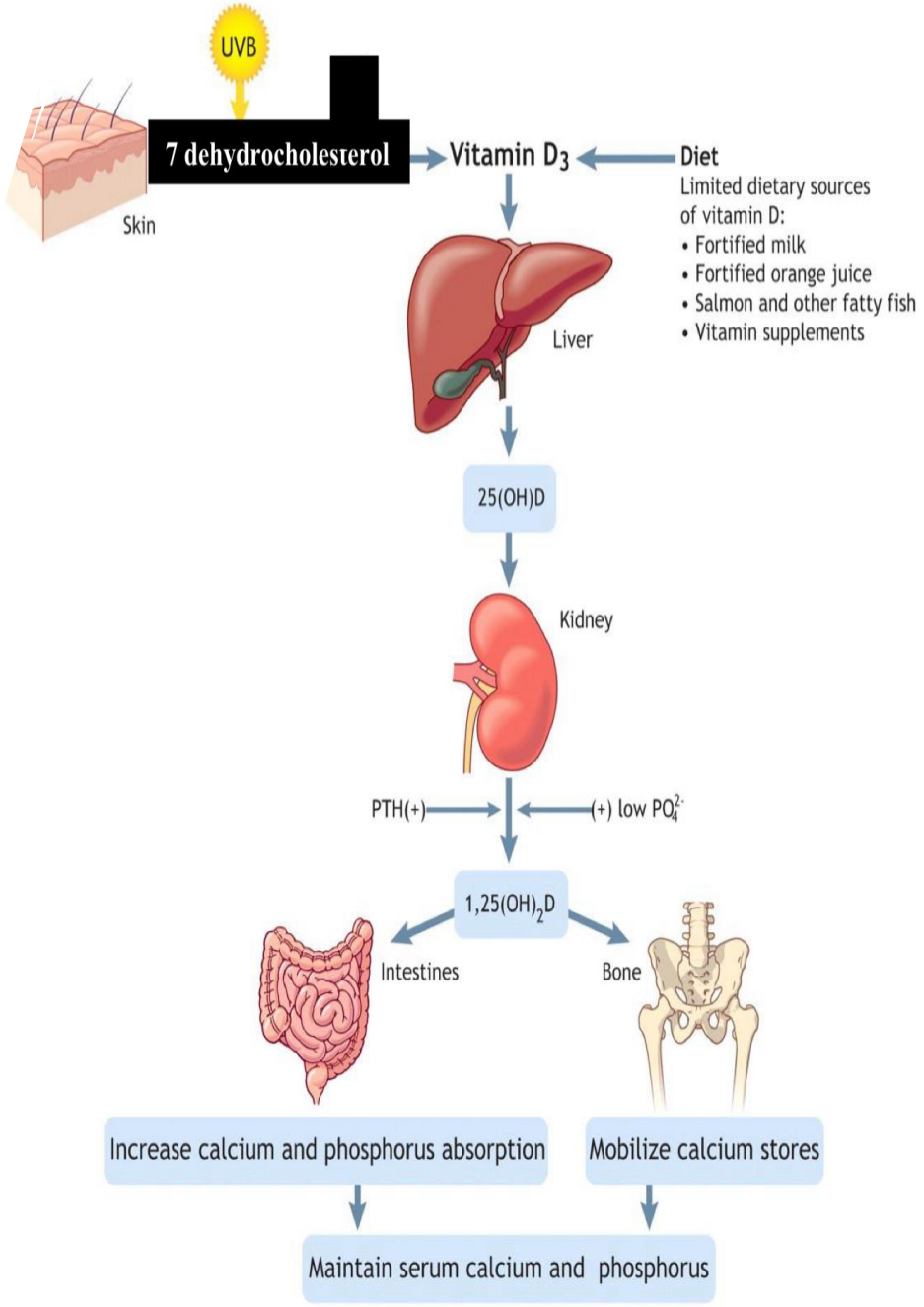
- The parathyroid glands itself become overactive and secrete excess amounts of parathyroid hormone.As a result, the blood calcium rises to a level that is higher than normal.

- It might be:
- adenoma (most common)
- Carcinoma
- MEN1 , MEN2
- Familial isolated hyperparathyrodism

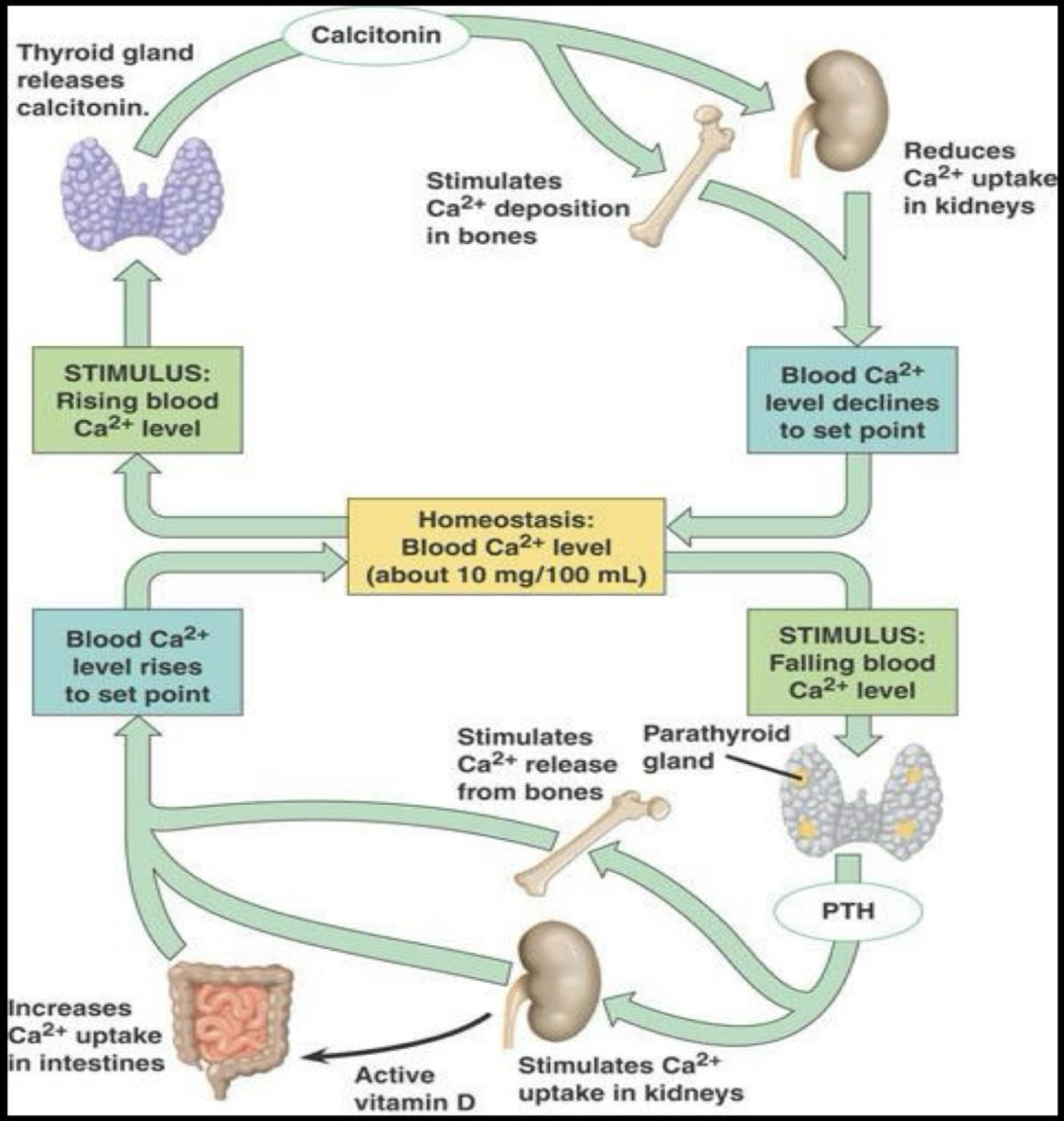
secondary hyperparathyrodism

- There is another cause rather than parathyroid gland
- Excessive secretion of PTH by parathyroid gland in response to hypocalcemia, with resultant hyperplasia of these glands.

Vit-D metabolism



Calcium Homeostasis



- Causes of secondary hyperparathyrodism:
- 1.chronic kidney disease (most common)
- 2.vit-D deficiency
- 3.hypomagnesemia
- 4.hyperphosphatemia
- 5.Increase deposition of ca (hungry bone syndrome)

Hypercalcemia / Hyperparathyroidism Signs

Mnemonic: "Bones, Stones, Groans, Moans"

knowmedge

Painful Bones	Painful bone condition (Classically osteitis fibrosa cystica)
Renal Stones	Kidney Stones (Can ultimately lead to Renal failure)
Abdominal Groans	GI symptoms: Nausea, Vomiting, Constipation, Indigestion
Psychiatric Moans	Effects on nervous system: lethargy, fatigue, memory loss, psychosis, depression

Clinical picture

	Primary Hyperparathyroidism	Secondary Hyperparathyroidism	Tertiary Hyperparathyroidism
Calcium	↑	↓/N	↑
PTH	↑	↑	↑↑
Phosphate	↓	↑/N	↑

Management

- Primary hyperparathyrodism-surgery (minimaly invasive parathyroidectomy+intraoperative determination PTH)

- Secondary hyperparathyrodism-mainly medical but there is indications for surgery

SECONDARY HYPERPARATHYROIDISM

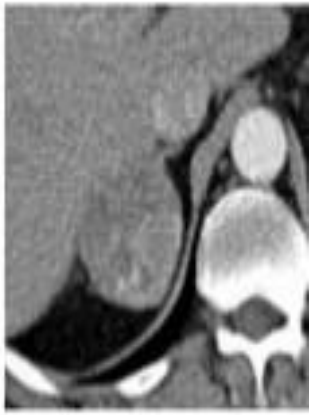
Indications for Surgery

- Failure of reliable maximal medical Rx.
- Development of significant symptoms: Musculo-skeletal, pruritis, calcinosis cutis, neuro-psych.
- Calcium x Phosphorus product above 70.
- Osteopenia, decreasing measured bone density, bone biopsy.
- Development of Tertiary Hyper-PTH

Adrenal Mass

Adrenal Mass

incidental adrenal mass is detected on cross-sectional imaging (rarely on ultrasound)



✓ No known neoplasm (CT is performed for other reasons e.g. vascular, trauma)

➔ **Incidentaloma**

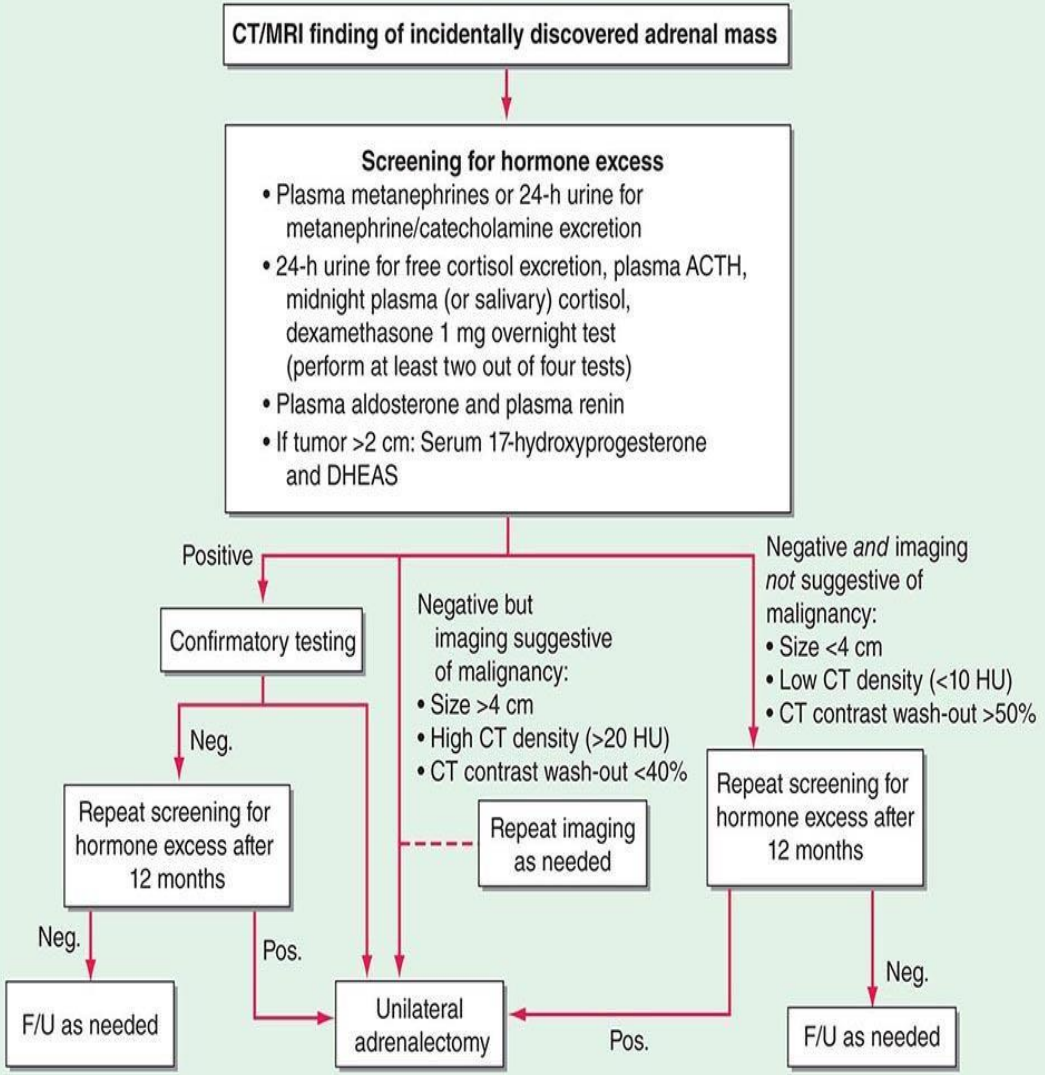
Imaging can not distinguish between functioning and nonfunctioning adrenal mass

- Incidentally discovered adrenal masses, commonly termed adrenal “incidentalomas,” are common, with a prevalence of at least 2% .The prevalence increases with age, with 1% of 40-year-olds and 7% of 70-year-olds harboring an adrenal mass.

- Most adrenal nodules are endocrine-inactive adrenocortical adenomas. However, larger series suggest that up to 25% of adrenal nodules are hormonally active, due to a cortisol- or aldosterone-producing adrenocortical adenoma or a pheochromocytoma associated with catecholamine excess. Adrenocortical carcinoma is rare but is the cause of an adrenal mass in 5% of patients. However, the most common cause of a malignant adrenal mass is metastasis originating from another solid tissue tumor

- Hormone secretion by an adrenal mass , with a gradual increase in clinical manifestations in parallel with hormone levels. Exclusion of catecholamine excess from a pheochromocytoma arising from the adrenal medulla is a mandatory part of the diagnostic workup. Furthermore, autonomous cortisol and aldosterone secretion resulting in Cushing's syndrome or primary aldosteronism, respectively, require exclusion. Overproduction of adrenal androgen precursors, DHEA and its sulfate, is rare and most frequently seen in the context of adrenocortical carcinoma, as are increased levels of steroid precursors such as 17-hydroxyprogesterone.

Algorithm for the Management of the Patient with an Incidentally Discovered Adrenal Mass



Pheochromocytoma rare, catecholamine-secreting tumor derived from chromaffin cells characterized by sudden onset episodic HTN , headache , sweating, palpitation & Tremor.

It may be apart of MEN syndrome (MEN2a , MEN2b).

Initial test is free metanephrines in plasma and if it is positive we do confirmatory test (24 hours urine metanephrines collection

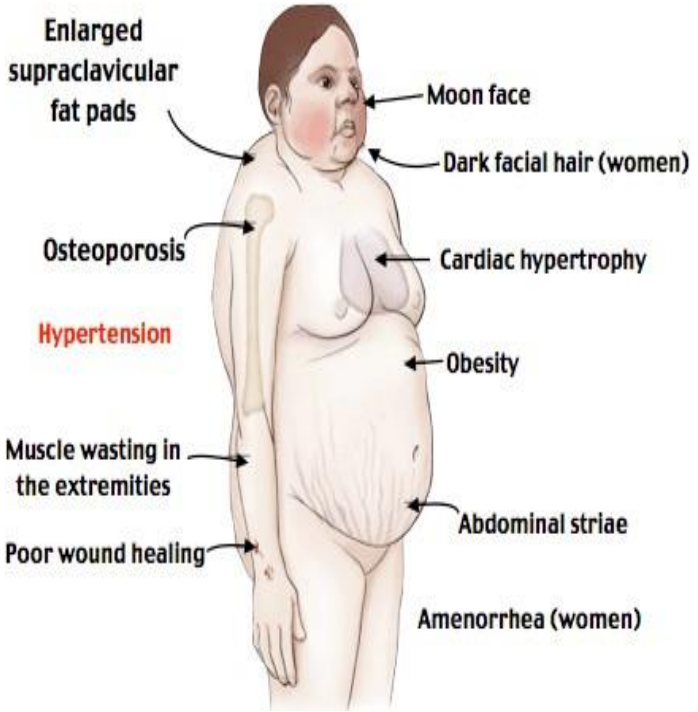
Management : If mass is more than 4 cm it need surgery
We must control Bp by alpha blocker or phentolamine

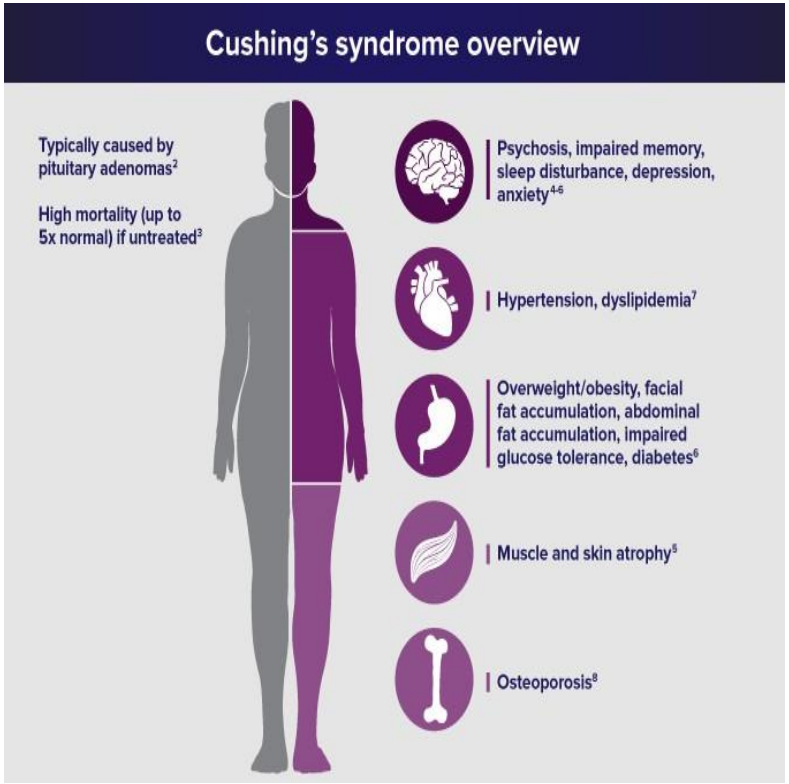
Fine-needle aspiration (FNA) or CT-guided biopsy of an adrenal mass is almost never indicated. FNA of a pheochromocytoma can cause a life-threatening hypertensive crisis. FNA of an adrenocortical carcinoma violates the tumor capsule and can cause needle track metastasis. FNA should only be considered in a patient with a history of nonadrenal malignancy and a newly detected adrenal mass, after careful exclusion of pheochromocytoma, and if the outcome will influence therapeutic management. It is important to recognize that in 25% of patients with a previous history of nonadrenal malignancy, a newly detected mass on CT is not a metastasis.

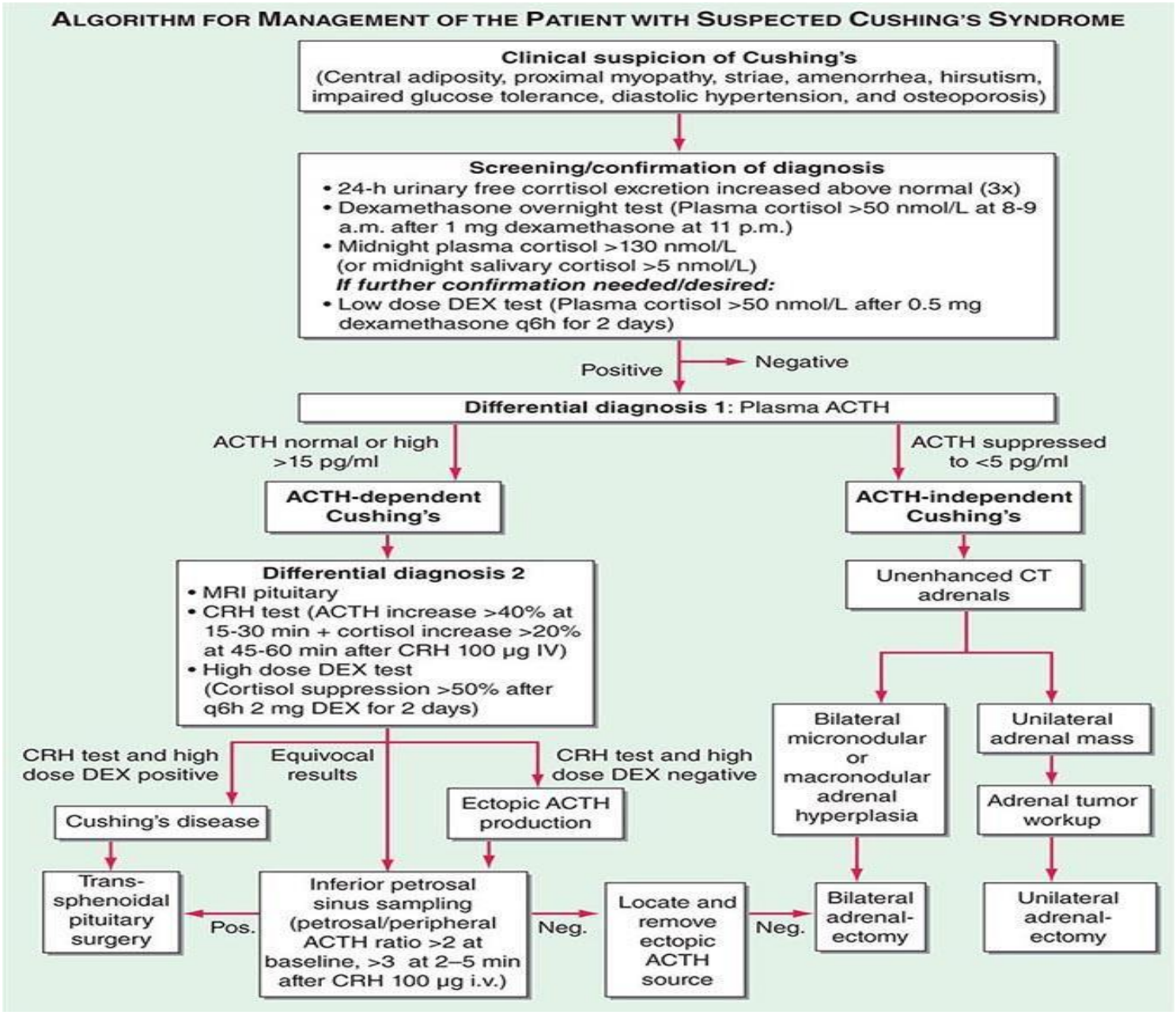
Cushing's syndrome

Due to **excess cortisol-like medication** (prednisone) or **tumor** that produces or results in production of **excessive cortisol**

[Cases due to a pituitary adenoma = Cushing's disease]






ALGORITHM FOR MANAGEMENT OF THE PATIENT WITH SUSPECTED CUSHING'S SYNDROME
Clinical suspicion of Cushing's
(Central adiposity, proximal myopathy, striae, amenorrhea, hirsutism, impaired glucose tolerance, diastolic hypertension, and osteoporosis)
Screening/confirmation of diagnosis
• 24-h urinary free corrtisol excretion increased above normal (3x)
• Dexamethasone overnight test (Plasma cortisol >50 nmol/L at 8-9 a.m. after 1 mg dexamethasone at 11 p.m.)
• Midnight plasma cortisol >130 nmol/L (or midnight salivary cortisol >5 nmol/L)
If further confirmation needed/desired:
• Low dose DEX test (Plasma cortisol >50 nmol/L after 0.5 mg dexamethasone q6h for 2 days)
Positive
Negative
Differential diagnosis 1: Plasma ACTH
ACTH normal or high >15 pg/ml
ACTH suppressed to <5 pg/ml
ACTH-dependent Cushing's
ACTH-independent Cushing's
Differential diagnosis 2
• MRI pituitary
• CRH test (ACTH increase >40% at 15-30 min + cortisol increase >20% at 45-60 min after CRH 100 µg IV)
• High dose DEX test (Cortisol suppression >50% after q6h 2 mg DEX for 2 days)
Unenhanced CT adrenals
CRH test and high dose DEX positive
Equivocal results
CRH test and high dose DEX negative
Bilateral micronodular or macronodular adrenal hyperplasia
Unilateral adrenal mass
Cushing's disease
Ectopic ACTH production
Adrenal tumor workup
Trans-sphenoidal pituitary surgery
Pos.
Inferior petrosal sinus sampling (petrosal/peripheral ACTH ratio >2 at baseline, >3 at 2–5 min after CRH 100 µg i.v.)
Neg.
Locate and remove ectopic ACTH source
Neg.
Bilateral adrenal-ectomy
Unilateral adrenal-ectomy

CONN'S SYNDROME

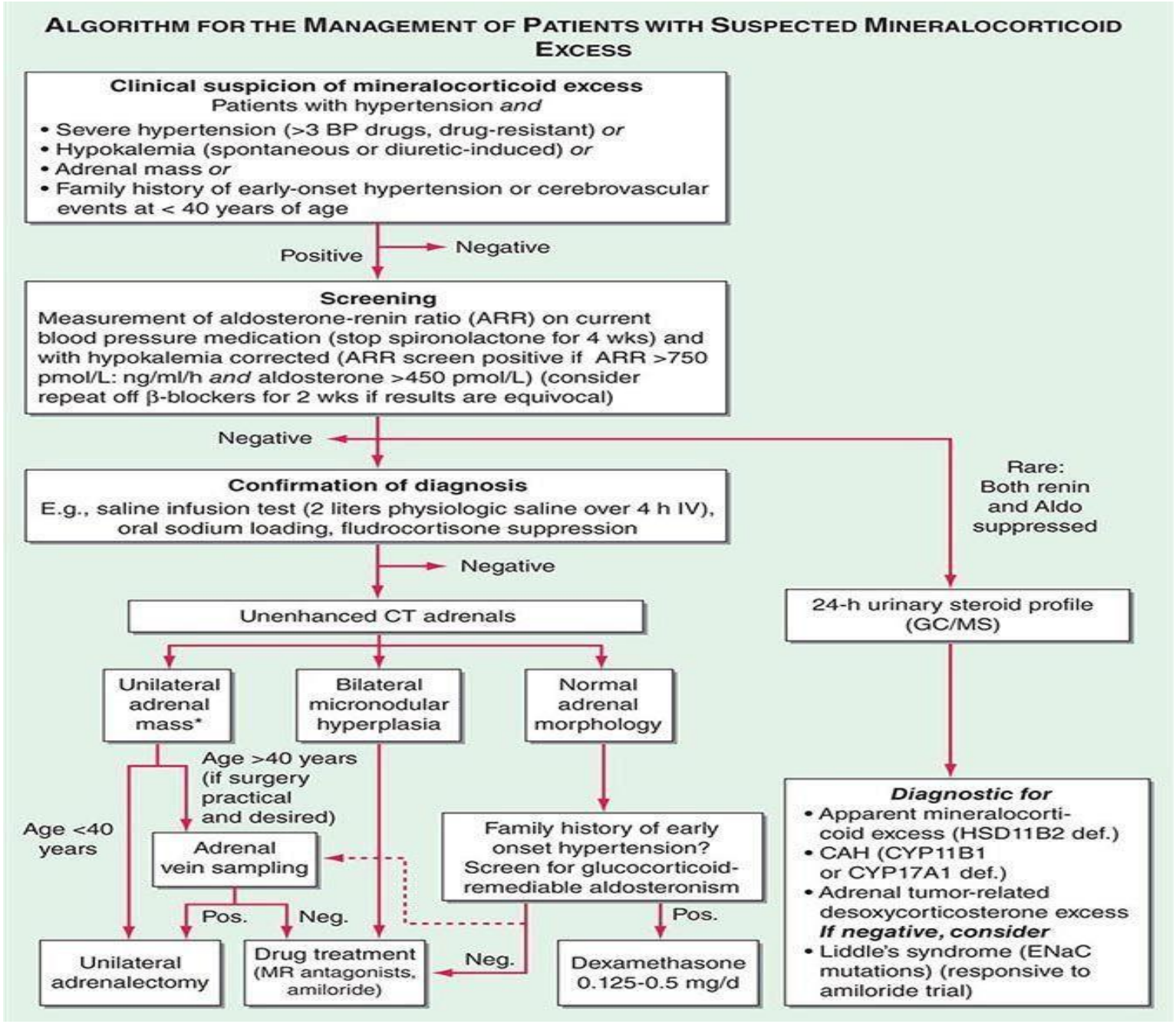
THE MOST COMMON CAUSE OF MINERALOCORTICOID EXCESS IS PRIMARY ALDOSTERONISM,

REFLECTING EXCESS PRODUCTION OF ALDOSTERONE BY THE ADRENAL ZONA GLOMERULOSA. BILATERAL MICRONODULAR HYPERPLASIA IS SOMEWHAT MORE COMMON THAN UNILATERAL ADRENAL ADENOMAS.

CONN'S SYNDROME

- **Clinical Manifestations** Excess activation of the mineralocorticoid receptor leads to potassium depletion and increased sodium retention, with the latter causing an expansion of extracellular and plasma volume.

- The clinical hallmark of mineralocorticoid excess is hypokalemic hypertension; serum sodium tends to be normal due to the concurrent fluid retention, which in some cases can lead to peripheral edema. Hypokalemia can be exacerbated by thiazide drug treatment, which leads to increased delivery of sodium to the distal renal tubule. Severe hypokalemia can be associated with muscle weakness, overt proximal myopathy, or even hypokalemic paralysis. Severe alkalosis contributes to muscle cramps and, in severe cases, can cause tetany.


ALGORITHM FOR THE MANAGEMENT OF PATIENTS WITH SUSPECTED MINERALOCORTICOID EXCESS
Clinical suspicion of mineralocorticoid excess
Patients with hypertension and
• Severe hypertension (>3 BP drugs, drug-resistant) or
• Hypokalemia (spontaneous or diuretic-induced) or
• Adrenal mass or
• Family history of early-onset hypertension or cerebrovascular events at < 40 years of age
Positive
Negative
Screening
Measurement of aldosterone-renin ratio (ARR) on current blood pressure medication (stop spironolactone for 4 wks) and with hypokalemia corrected (ARR screen positive if ARR >750 pmol/L: ng/ml/h and aldosterone >450 pmol/L) (consider repeat off β-blockers for 2 wks if results are equivocal)
Negative
Rare: Both renin and Aldo suppressed
Confirmation of diagnosis
E.g., saline infusion test (2 liters physiologic saline over 4 h IV), oral sodium loading, fludrocortisone suppression
Negative
Unenhanced CT adrenals
24-h urinary steroid profile (GC/MS)
Unilateral adrenal mass*
Bilateral micronodular hyperplasia
Normal adrenal morphology
Age >40 years (if surgery practical and desired)
Age <40 years
Adrenal vein sampling
Family history of early onset hypertension? Screen for glucocorticoid-remediable aldosteronism
Diagnostic for
• Apparent mineralocorticoid excess (HSD11B2 def.)
• CAH (CYP11B1 or CYP17A1 def.)
• Adrenal tumor-related desoxycorticosterone excess
If negative, consider
• Liddle's syndrome (ENaC mutations) (responsive to amiloride trial)
Pos.
Neg.
Pos.
Unilateral adrenalectomy
Drug treatment (MR antagonists, amiloride)
Neg.
Dexamethasone 0.125-0.5 mg/d

Thank you