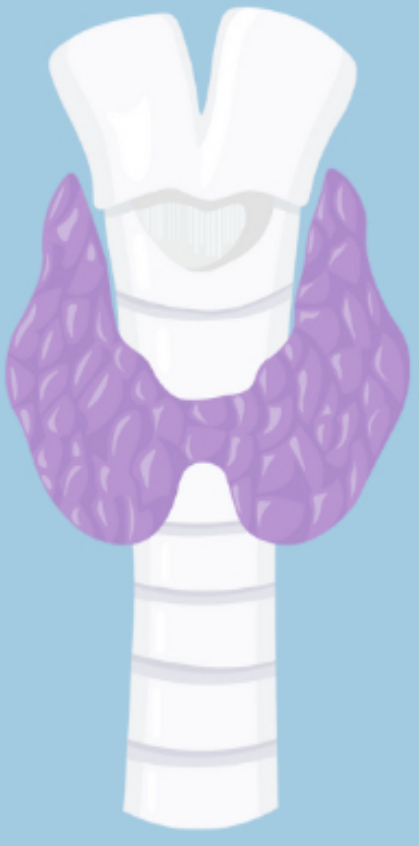
SUMMARY

Surgery

Endocrine



By :
Malak abu zubaid

Parathyroid

Anatomy

*Four glands behind the thyroid (6mm ,3mm,2mm) but the number of glands vary 4-6.
Normal function can be achieved with at least 2glands

*usually embedded between the posterior border of the thyroid gland and its fibrous capsule.

*most of the blood driven from inferior thyroid artery and also 20% of the upper glands are supplied by branches from superior thyroid

- The relationship of the glands with RLN (recurrent laryngeal nerve) superior glands are dorsal to RLN at level of cricoid cartilage but inferior glands are ventral to the nerve.
- Drain ipsilaterally by superior , middle and inferior thyroid veins.

Histology

Chief cells and oxyphil cells are found in the adipose (fat) tissue of the parathyroid gland. Both types of cells produce parathyroid hormone, and as a person gets older, the number of oxyphil cells increases

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Parathyroid glands regulate calcium levels in the body by the brathyroid hormone

Normal calcium levels in the blood (8.5-10.2) mg/dl

Forms of calcium in the plasma ?
*free ionised 50% (active)
*protein bound40%(albumin80%/ globulin)
*complexed with small anions

The lab result of calcium level in the plasma is for total calcium in all forms so we should calculate the " corrected calcium" to decide is the read normal or not as we care abt the biologically active calcium.

Take care of the units (ca and albumin).

$$Ca_{Corr} = Ca\left(\frac{mg}{dL}\right) + 0.8 * \left[4.0 - Albumin\left(\frac{g}{dL}\right)\right]$$

Hypercalcemia

Increased blood calcium concentration above the normal limit
Causes of hypercalcemia ?

*Hyperparathyroidism(primary and tertiary)
*malignancy related
*endocrine diseases (hyperthyroidism,addisonian crisis , pheochromocytoma).
*granulomatous diseases (TB, sarcoidosis).
* iatrogenic(excessive intake of vit D or calcium , Rx with lithium , thiazide diuretics).
* renal failure (3* hyperparathyroidism & aluminum intoxication).
*familial hypocalcuric Hypercalcemia (milk alkali syndrome)

PTH

Synthesised firstly as a precursor hormone and then undergoes multiple cleavage

Preproparathyroid → proparathyroid → 84 amino acid PTH
The half life of PTH is (2-4) mins and it is metabolised in the liver into active(N-terminal)and inactive(C-terminal) components.

PTH-calcium regulation:
Parathyroids have calcium sensing receptors (CASR) senses fluctuations in the concentration of extracellular calcium/ increased PTH secretion increases serum calcium by:

1- Increasing bone resorption
2- Enhancing renal calcium reabsorption
3- Increasing renal 1@ hydroxylase activity → increase 1,25-dihydroxy vitamin D.
- → Vit D promotes calcium absorption in the gut
- → All of these have -ve feedback effect on vit D concentration

Hyperparathyroidism

Primary Hyperparathyroidism: increased parathyroid cells proliferation and PTH secretion independent of calcium levels.

Clinical classical manifestations of Hyperparathyroidism:

Kidney stones calcium phosphate and oxalate.
painful bones osteopenia , osteoporosis and osteitis fibrosa cystica.
abdominal groans peptic ulcer disease, pancreatitis and constipation.
psychic moans psychiatric manifestations such as florid psychosis , obtubdation , coma depression, anxiety and fatigue
fatigue overtones
Polyurea and polydepsia

Osteitis fibrosa cystica (OFC): a rare skeletal disorder seen in advanced hyperparathyroidism characterized by replacement of calcified bone with fibrous tissue (the title have been mentioned in the slides and the doctor talked abt this in details).

Biochemical features of prim HPT

Serum tests	Alteration
Calcium	Increased (20% people normal Ca^{++})
Intact PTH	Increased(>0.5mg/L)
Phosphate	↓
P Chloride	↑
CL:PO4	↑ (>33)
Alkaline phosphatase	N or ↑(in the presence of bone disease)
Acid-base status	Mild hyperchloremic metabolic acidosis
Ca-:creatinine clearance ratio	>0.02(vs<0.01 in BFHH)
Urine Test: 24h urinary Ca	N or ↑ (>250mg/24h)

Indications of surgical management of Hyperparathyroidism :

1-Symptomatic: nephrolithiasis, ofc , neuromuscular symptoms

2-even if symptoms don't exist surgery is indicated in these cases :serum calcium >11.5 mg/dl , reduced cortical bone density , patient age <50 , markedly reduced cancellous bone density and decreased creatinine clearance.

*** Pre operative localisation:**

1-Imaging (high-resolution ultrasound ,CT, MRI and sestamibi)
Sestamibi? for localising adenoma in primary HPT the material used in this type of imaging is concentrated in mitochondria-rich tissue so it is useful in parathyroid localisation bcz of the delayed radionuclide washout from hyper cellular parathyroid tissue when compared to the thyroid tissue. The material is cleared from all glands except the affected parathyroid.
*SPECT is used with sestamibi for ectopic parathyroid adenoma

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Intraoperative parathyroid testing:
To determine adequacy of parathyroid resection so when PTH falls by 50% or more in 10 mins after parathyroid removal the test is positive and the operation is terminated.
Surgery :
The traditional method ? bilateral neck exploration
With preoperative imaging techniques ? minimally invasive focused surgery toward adenoma are used (removing the diseased gland without comparing other parathyroids).

Diseases of parathyroid gland

1- Hyperparathyroidism (**primary**:adenoma / hyperplasia /carcinoma, **secondary**, **tertiary**)
2- Hypoparathyroidism

Primary hyperparathyroidism
Parathyroid carcinoma

Carcinoma represents 1% of primary hyperparathyroidism. Gross features of the malignant tumor that appear intraoperatively : large , gray-white / gray-brown , adherent to or invasive into surrounding tissues.

Ttt: bilateral neck exploration with en bloc excision of the tumor and the ipsilateral thyroid lobe/ modefied radical neck dissection in the presence of lymph node mets.

أكثر من ملاحظة مكتوبين بالسلايدز بالعربي كتبت توضيح لهم حتى نفهمهم عشان في شغلات مش مفهومة >>

If on exploration, hyperplasia found, can remove and reimplant, or subtotal parathyroidectomy
leaving approx 50 mg of tissue (as reimplantation has 5% failure rate).

يعني بعد العملية إذا اكتشفنا انه الي شلناه كان عبارة عن hyperplasia و ليس carcinoma بنقدر نرجع نعمل زراعة

Bilateral upper cervical thymectomy also performed with hyperplasia because of supernumerary glands occur in 20% of
Patients

يعني لما نكون شاكين carcinoma كمان بنعمل upper cervical thymectomy بنشيل ال thymus عشان ممكن يكون في parathyroids زيادة بنسميهم supernumerary glands ممكن يكونوا هناك بال thymus

.

with autotransplantation, 12 to 14 pieces inserted into belly of brachioradialis muscle.

brachioradialis هو ال parathyroid reimplantation احسن مكان لل muscle.

Sternotomy may be needed to find a missing gland, generally not at initial operation, and after localizing studies performed,thyroidectomy may be also performed.
أحيانا بنضطر نفتح ال sternum عشان ندور على missing parathyroid gland
Intra-op PTH measuring helpful as well during sternotomy to make sure got the gland

Secondary hyperparathyroidism
Occurs in cases of chronic renal failure (decreased calcium reabsorption / deficiency in vit-D), decreased calcium intake , decreased calcium absorption.
Treatment (ttt)؟

1-treat medically in normal cases
2-surgical treatment in cases that indicates surgery we talked about these cases previously.(pruritus , calcium-phosphate product >=70 , calcium greater than 11mg/dl , calciphylaxis , soft tissue calcification,etc)

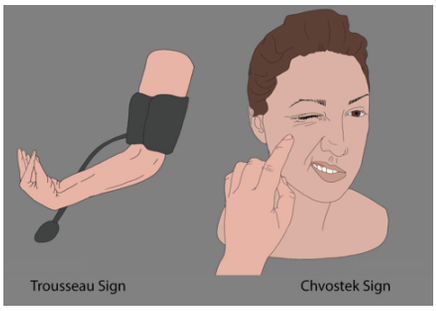
Tertiary hyperparathyroidism
Occurs in cases of long standing renal failure / renal transplant

Autonomous parathyroid gland function with problems similar to primary hyperparathyroidism.

Ttt : surgery

Post op complications of parathyroidectomy :

1-hypocalcemia (trousseau's sign & chvostek's)
2-vocal cord paralysis after RLN injury
3-Bone hunger syndrome



*additional pic

Hypoparathyroidism
Deficient secretion of PTH

Biochemical manifestations ? hypocalcemia / diminished or absent circulating iPTH

Also clinical symptoms of neuromuscular hyperactivity.

Causes of Hypoparathyroidism:
1- surgical Hypoparathyroidism (the commonest): due to removal of parathyroid glands or due to interruption of blood supply of the glands.
2- Idiopathic Hypoparathyroidism: MEDAC (autosomal recessive mode of transmission) , juvenile familial endocrinopathy , Hypoparathyroidism-addisons disease- mucocutaneous candidiasis (HAM) syndrome.

3- Functional Hypoparathyroidism: in cases of chronic hypomagesaemia (magnesium is necessary for PTH release from the glands and also for peripheral action of PTH.

Clinical features of Hypoparathyroidism >>

A-neuromuscular
Serum calcium decrease rate —> major determinant for neuromuscular complications development.
Low calcium levels —> decrease threshold of excitation —> repetitive response to a single stimuli and rarely continuous activity.

B-posterior lenticular cataract
C- cardiac manifestations: prolonged QT interval in ECG , hypotension , resistance to digitalis and refractory heart failure with cardiomegally.

Treatment of Hypoparathyroidism:
*Combination of oral calcium with pharmacological doses of vit D or its analogues
* phosphate restriction diet +/- aluminium hydroxide.(lower phosphate levels)

How to treat hypocalcaemic tetany ? calcium should be given parentally till adequate serum calcium levels is obtained then give combination of vita and oral calcium.