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Propedeutics in Endocrinology

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Propedeutics in Endocrinology

- **Endocrine organs:** hormone production
hormone secretion to the bloodstream
hormones usually effect on a distant organ or tissue (both endocrine and non-endocrine)
- **Malfunction:** hyperfunction
hypofunction
- **Pituitary gland:** regulated by the central nervous system through hypothalamus
 - Thyroid-stimulating hormone (TSH) - thyroid gland
 - Adrenocorticotrophic hormone (ACTH) - adrenal cortex
 - Luteinizing hormone (LH) and Follicle stimulating hormone (FSH) - gonads
 - Prolactin (PRL) - mammary gland
 - Growth hormone or somatotropin (STH)
- **Endocrine organs regulated by the hypothalamus-pituitary axis:**
 - Thyroid gland (thyroxin)
 - Adrenal cortex (cortisol, aldosterone)
 - Testes (testosterone), ovary (estrogen, progesterone)
- **Endocrine organs not regulated by the hypothalamus-pituitary axis:**
 - Parathyroid glands (parathormone PTH)
 - Pancreatic islets of Langerhans (insulin, glucagon)
 - Adrenal medulla (catecholamines – adrenaline, noradrenaline, dopamine)
 - Neurohypophysis (antidiuretic hormone ADH)

Thyroid gland

- **Palpation:** size (approximately), consistency, presence of nodules, adhering to the surrounding tissues, pain
- **Ultrasonography:** precise information about morphology of the gland (except for retrosternal goiter)
volume: men 22 ml (both lobes)
women 18 ml
- **Thyroid scintigraphy:** Tc or ^{131}I
diagnosis of nodules with autonomous production of hormones
diagnosis of retrosternal goiter
- **Laboratory tests:** Thyroid-stimulating hormone (TSH): 0,28-4,2 mU/l
Free Thyroxine (fT4): 12-21 pmol/l

primary hypothyroidism: \uparrow TSH \downarrow fT4

primary thyrotoxicosis: \downarrow TSH \uparrow fT4

secondary hypothyroidism (disorder of the pituitary gland: tumor, bleeding, post surgical): \downarrow TSH \downarrow fT4

secondary thyrotoxicosis (pituitary adenoma): \uparrow TSH \uparrow fT4

subclinical functional thyroid diseases: changes in the TSH level, normal fT4

- **Cytologic evaluation:** fine needle aspiration biopsy (FNAB)
rating through Bethesda classification

Parathyroid Gland

- Small glands producing parathormone (PTH)
- Essential in calcium metabolism
- Typical localization is on the back of thyroid lobes – 2 upper and 2 lower
- Total number varies (4-6)
- The localization variability is common – anywhere on the neck, in the upper mediastinum, or in thyroid gland (10 %)
- Primary hyperparathyroidism (adenoma or hyperplasia): \uparrow PTH and Ca, \downarrow P
- **Imaging methods:** ultrasonography
parathyroid MIBI scan (metoxyisobutylisonitril)
fluorocholeline PET/MR

Adrenal Cortex

- The adrenal glands are paired hormonally active glands situated at the upper poles of each kidney
- Each adrenal gland has two distinct parts, the outer adrenal cortex and the inner medulla, both of which produce different hormones
- **Imaging methods:** CT or MR scan
- **Adrenal cortex produces:** aldosterone (mineralocorticoid)
cortisol (glucocorticoid)
sex hormones

- Excessive secretion of aldosterone: primary hyperaldosteronism (PHA)
 - hypertension
 - hypokalemia
 - adrenal adenoma with PHA (Conn's syndrome)
- Excessive secretion of cortisol: Cushing's syndrome
 - hypokalemia
 - hypertension
 - diabetes mellitus
 - osteoporosis
 - depression
- Excessive secretion of androgens: congenital adrenal hyperplasia (CAH) or quite rare hormonally active adenoma
 - virilization (excessive hair growth, beard, male-pattern hair loss...)

Adrenal Medulla

- Production of catecholamines - adrenaline, noradrenaline, dopamine
- Adrenal medulla hyperfunction in a hormonally active tumor (pheochromocytoma)
 - typically manifests by hypertensive crisis with flush, sweating, vegetative symptomatology
 - exceptionally (up to 10 % of cases) extra-adrenal forms occur (paraganglioma)
- **Imaging methods:** CT or MR scans (first choice)
 - MIBG scan
 - a nuclear medicine imaging test with metaiodobenzylguanidine - suitable for non-adrenal and metastatic forms
- **Laboratory tests:** first choice method is plasma free metanephrines test (metanephrine, normetanephrine)
 - metanephrines are metabolites of catecholamines
 - plasma concentrations of catecholamines fluctuate widely as a result of stress and a variety of other stimuli)
- Pheochromocytoma may be a part of MEN type 2 syndrome (multiple endocrine neoplasia type 2)

Pituitary Gland

- A small gland situated in a small bone cavity (sella turcica) in the sphenoid bone at the bottom of the skull
- Produces hormones that either control the function of other endocrine glands in the body or have direct effect on body tissues
- **Imaging methods:** MR scan
- **Pituitary expansion (adenomas):** risk of compression of the optic nerves beyond crossing in the optic chiasm that can lead to impaired peripheral vision in the outer temporal halves of the visual field of each eye (bitemporal hemianopsia)
perimetry test may be performed (examination of visual field)
- Secretion of hormones produced in the pituitary gland is regulated by the central nervous system through hypothalamus
- The pituitary gland is composed of anterior lobe (adenohypophysis) a posterior lobe (neurohypophysis)
- **Hormones produced in adenohypophysis:**
 - Thyroid-stimulating hormone (TSH) - stimulation of the follicular cells in the thyroid gland
 - Adrenocorticotrophic hormone (ACTH) - stimulation of adrenal cortex
 - Luteinizing hormone (LH) and Follicle stimulating hormone (FSH) - regulate the function of the gonads
 - Prolactin (PRL) - associated with function of the mammary gland, excess in production causes hyperprolactinemia (prolactinoma) and galactorrhea
 - Growth hormone or somatotropin (STH) - excess of STH in adulthood leads to acromegaly, in childhood to gigantism
- **Hormones produced in neurohypophysis:**
 - neurohypophysis serves as a reservoir for hormones produced in the hypothalamus until secreted
 - antidiuretic hormone (ADH), oxytocin