THYROID GLAND DISORDERS

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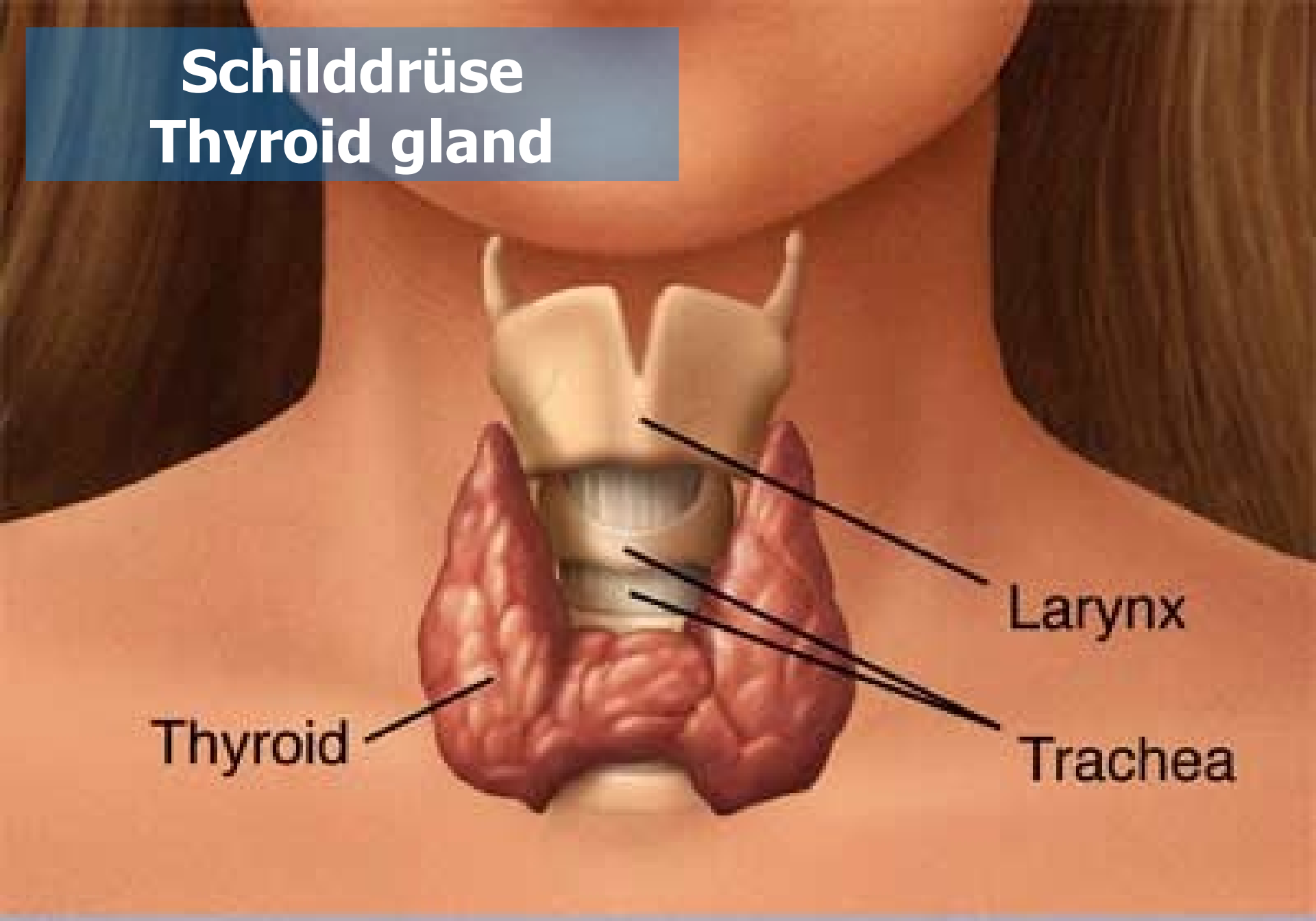
THYROID GLAND DISORDERS

- Anatomy - structure
- Physiology - function
- Thyroid gland examination
- Classification – in general
- Most common clinical diseases and it's symptoms, signs, diagnostics, treatment and prognosis

Schilddrüse
Thyroid gland

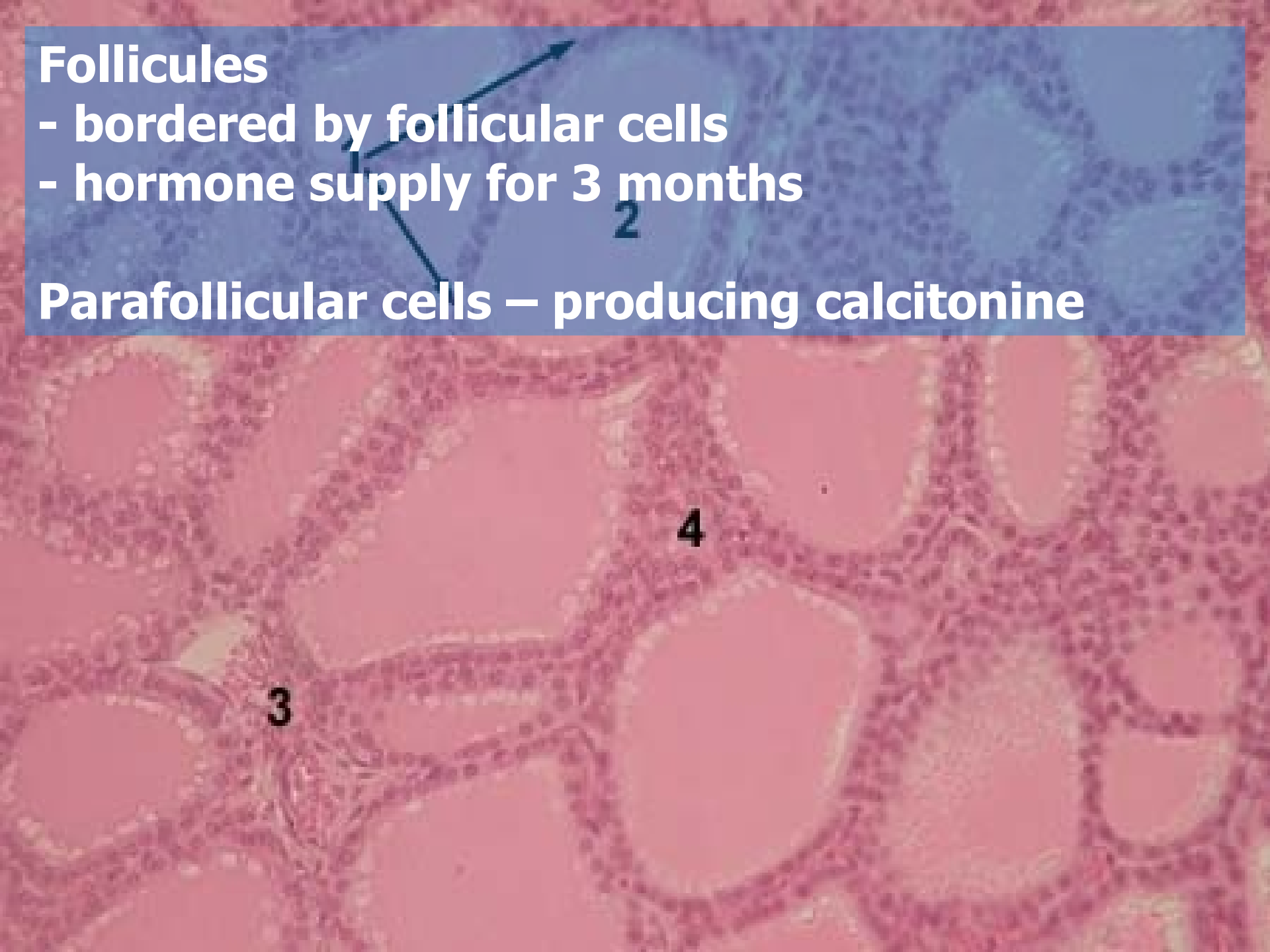


Anatomy + physiology

- 2 lobes, isthmus, (lobus pyramidalis)
- extrathyroidal remnants – in course of thyreoglossal ductus
- 2 cell types
  - follicular cells, in shapes of „honeycomb" with colloid in between
  - parafollicular cells
- thyroid capsule

Follicules
- bordered by follicular cells
- hormone supply for 3 months

Parafollicular cells – producing calcitonine

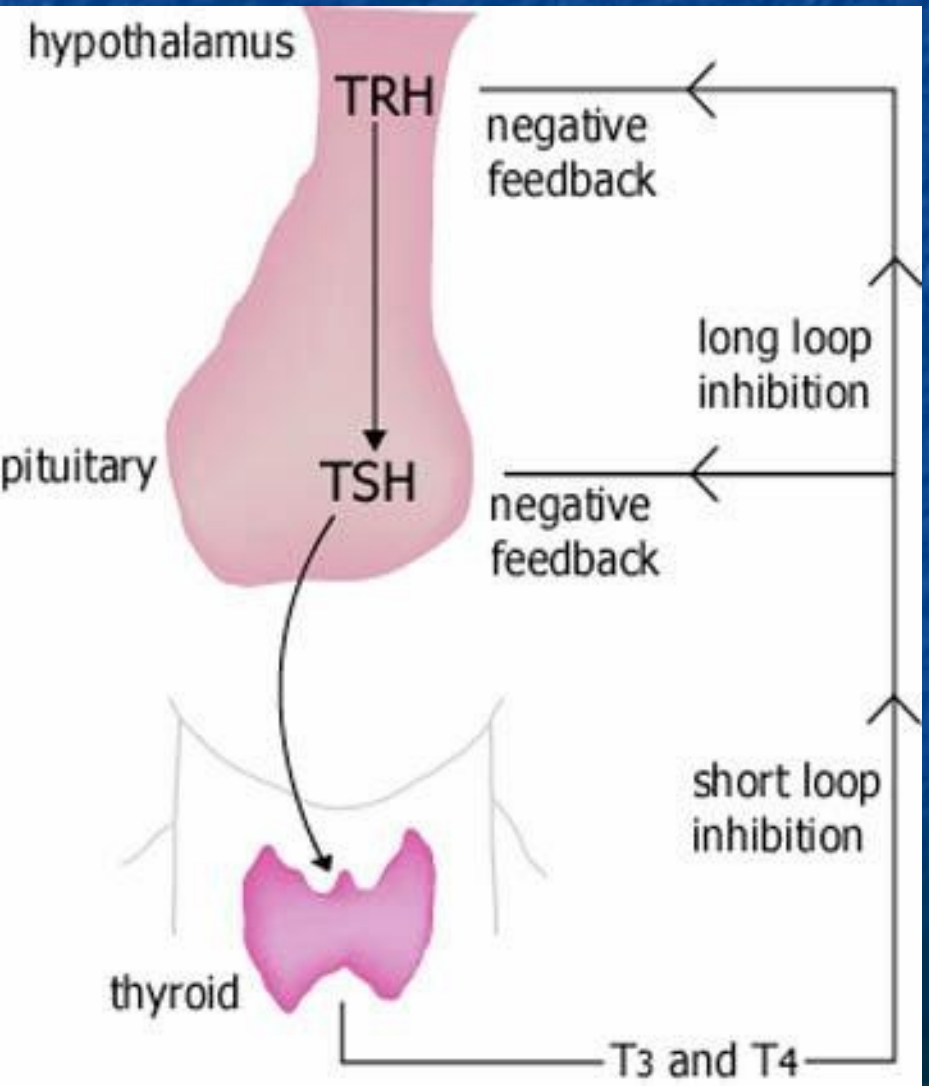


Peripheral thyroid hormones

T4 – 3, 3', 5, 5' – tetraiode – L – thyronine = thyroxine
- produced in thyroid gland
- inactive form
- half-life period ca 7-8 days

T3 – 3, 3', 5 – triiode – L – thyronine = triiodethyronine
- produced in thyroid gland in 10%
- 90% from T4 in peripheral tissues (deiodinase)
- active form
- half-life period ca 1-2 days

Physiology – thyroid gland control



negative feedback mechanismes as other pituitary – controlled glands

task – to sustain stable level of peripheral (thyroid) hormone

hypothalamic pituitary thyroid axis

Thyroid hormone effects

- Increase energy metabolism and oxygen consumption in tissues
- Increase body temperature
- Positive chronotropic effects – increase heart rate
- Increase nerve conduction velocity – augmented reflexes
- Increase red blood cells production

Thyroid hormone importance

- Energy metabolism, thermogenesis, mineral metabolism
- Bone marrow metabolism
- Lack of T hormones is atherogenic
- T hormones influence metabolism of all tissues
- Children – differentiation and growth of all tissues (congenital hypothyroidism – endemic cretinism)

Thyroid gland examination

- Medical history
  - family thyroid illnesses history, neck irradiation in the past, drugs with iodine (amiodarone, CT/RTG contrast)
- Physical examination
  - thyroid gland palpation (size, consistence, nodules)
  - skin examination (dry/wet, alopecia, fragile nails

Thyroid blood tests I.

- TSH
  - thyreotropine stimulation hormone
  - stimulate thyroid function and growth
  - normal values approx. 0,5 – 4,0 mIU/l
- fT4 (free thyroxine)
  - better than fT3 due to circadian variations
  - normal values approx. 10 – 22 pmol/l

Thyroid blood tests II.

- aTPO (thyroid peroxidase antibody, antimicrosomal antibody)
  - autoimunne thyroidits (80% sensitivity)
  - other thyroiditis
- aTG (thyreoglobulin antibody)
  - autoimunne thyroidits (less sensitivity)
  - thyroid malignity
  - other thyroiditis

Thyroid blood tests III.

- aTSH (TRAK) (TSH receptor antibody)
  - mostly stimulation antibodies (→ hyperthyroidism)
  - Graves-Basedow disease
- aNIS (natrium-iodine-symporter antibody)
  - new antibody
  - autoimunne thyroidits

Thyroid blood tests IV.

- thyreoglobuline
  - thyroid carcinoma marker
  - depends on thyroid mass (goiter / carcinoma)
- calcitonine
  - parafollicular thyroid cells
  - Ca metabolism (x PTH)
  - medullar thyroid carcinoma marker

Thyroid imaging

- ultrasonography (USG)
  - first choice imaging method
  - size, parenchym echogenity + texture
  - nodules, lymphatic nodes
  - thyroid vascularization (doppler a. thyroidea)

  - eye (orbital tissue) ultrasonography (endocrine orbitopathy)

Thyroid imaging

- RTG – thoracic outlet rtg (upper thorax apperture)
  - trachea deviation and constriction
- CT (computer tomography)
  - retrosternal (USG invisible) goiter
  - penetration into other tissues (oesophagus, cervical muscles)
  - carefully consider iodine contrast in hyperthyroidism or large goiter – risk of rapid thyroid function rise!!

Thyroid gland biopsy

- usg driven thin needle biopsy (FNAB – fine needle aspiration biopsy)
- nodules > 1 cm or suspect lymphonodes
  - for cytological examination
- acute thyroiditis (abscess cave)
  - for microbial cultivation
- rarely in diffuse goiter

THYROID DISORDERS I.
Thyroid function impairment

- hypothyroidism (subclinical)
  - **peripheral** – low (normal) fT4, high TSH
  - central – low fT4, low TSH
- hyperthyroidism (subclinical)
  - **peripheral** – high (normal) fT4, low TSH
  - central – high fT4, high/normal TSH
- hypothyroxinemia
  - normal TSH, low fT4

THYROID DISORDERS II. Thyroid structure impairment

- goiter (high thyroid volume)
  - approx. > 20ml, depends on age and sex
- thyroiditis
  - acute, subacute, chronic autoimmune (Hashimoto), Graves-Basedow (autoimunne) disease
- tumors
  - primary (benign / malign), secondary (metastasis)

Euthyroid goiter

- large thyroid with normal function
  - symptomatic, asymptomatic
  - USG examination – nodules?
- most often colloid-nodose goiter (caused by strumigens or idiopatic) or nodose hyperplastic goiter
- diffuse iodopenic goiter (endemic goiter) – nowadays decreasing occurence

Euthyroid goiter - treatment

- observation only (if asymptomatic and if nodules > 1cm are FNAB verified)
- iodine supplementation (diffuse jodopenic goiter)
- suppression therapy (low dose thyroxine), target TSH between 0,2-0,5 mIU/l)
- thyroidectomy
  - total thyroidectomy
  - lobectomy (if changes only in one lobe)

Hypothyroidism

- 4-6%, after six decade 15-20% (with subclinical hypothyroidism), women 8x more often
- peripheral – high TSH, low T4
  - subclinical hypothyroidism – normal fT4, no symptoms
- central hypothyroidism – pituitary surgical operations, tumors, etc.
  - low TSH, low fT4

Hypothyroidism - symptoms

- fatigue, somnolence, forgetfullness, depression, cold intolerance
- constipation, muscle weakness or pain
- hypomenorhea, infertility
- local symptom (neck pressure, strangulation) if goiter or autoimmunity is present

Hypothyroidism - signs

- dry skin („crocodile"), nails, alopecia
- swelling (very rare pretibial myxedem)
- anemia
- bradycardia, diastolic dysfunction, pericardial effussion
- lower twinkle frequency (Stellwage sign)
- goiter or thick palpation in thyroid region (if autoimmunity or goiter present)

Suspicion on hypothyroidism

- family history (autoimmune thyroiditis)
- other autoimmunity
  - pernicious anemia, celiac sprue, primary biliary cirrhosis, type 1 DM, vitiligo
- history of thyroidectomy and ablation using radioiodine
- history of neck irradiation
- drugs: lithium, interferone, amiodarone

Causes of hypothyroidism

- autoimmune processes – chronic autoimunne thyroiditis (Hashimoto)
- neck irradiation history (even 10 years)
- undergone inflammations of the thyroid gland (10 – 40%), or undergone thyroid surgery (even partial)
- iodine deficiency
- iatrogenic – amiodarone 6%, cytokines 10%

Hypothyroidism - treatment

- **T4 - tyroxine p.o.**
  - individual dose, approx. 1,6ug/kg/day
  - consecutive dose elevation to target, common opening dose 50-75ug/day
  - cardiac or older patients – opening dose 12,5 - 25ug/day with consecutive increase 12,5ug / 2 weeks
- in special causes – T4 and T3 combination (rare)
- TSH + fT4 tests in approx. 6 – 8 weeks at beginning, in approx 6-12 months after stabilisation

- if treatment is'nt effective – consider noncompliance, reduced absorption (celiac sprue, high fibre intake, medication – Fe)

Hyperthyroidism
(thyreotoxicosis)

- Graves-Basedow disease
- early phase of chronic autoimmune (Hashimoto) thyroiditis
- thyroid gland autonomy – toxic adenoma or polynodose toxic goiter
- drug-induced (amiodarone)
- central – hypersecretion of TSH (TSH adenoma) - extreme rare situation)

Graves-Basedow's (or Graves') disease

- stimulation antibodies against TSH receptor
- typical patient is young woman (8:1), but can revealed in any age
- etiology uncertain and combined – genetics, infection (Yersinia), iodine (lack or excess), stress
- often with endocrine orbitopathy (similar structures to TSH receptor are in orbital tissue and muscles)

Graves' disease - symptoms

- Often goiter – diffuse, soft, venous hum
- Cardiovascular symptomatology – palpitations, tachycardia, AF, weakness, dyspnea, edema
- Psyche – insomnia, nervousness, agitation, apathy in the elderly
- Metabolism – catabolism, weight loss, elevated body temperature
- Neuromuscular symptomatology – trembling, muscular hypotrophy
- Skin – warm, sweaty, mycoses, eczema, pruritus
- GIT – excellent appetite, diarrhea

Hyperthyroidism - treatment

- antithyroid drugs – thiamazol (Thyrozol), propylthiouracil (Propycil) – cave agranulocytosis
- betablockers, anxiolytic drugs, vitamins
- effect in 2 – 4 weeks – fT4 (fT3) decreasing or normalization, long-term TSH suppression (1-2 months).
- surgery – total thyroidectomia – drug intolerance, high dose antithyroid drugs in pregnancy, large or nodular goiter, relapse after treatment termination, impossibility of treatment termination
- radioiodine – similar indication as TTE

Endocrine ophthalmopathy (orbitopathy)

- Grave's opthalmopathy – staring appearance – proptosis, eyelid edema, extraocular muscle imbalance (→ diplopia), corneal complications, visual blurring, eyelid retraction, chemosis
- Diagnostics – orbital sonography (or MR), Hertel, physical examination
- Treatment – local eye gel or instillations, glucocorticoids (peroral or i.v. pulse treatment), cyclophosphamide, surgery (?), radioiodine (?), orbital radiotherapy, orbital decompression in acute phase with optical nerve compression

Endocrine ophthalmopathy (orbitopathy)

- autoimmune disease
- eye symptoms intensity is not dependent on thyroidal symptoms intensity
- rarely may occur in patients with hypothyroidism or no thyroid pathology
- 20 – 40% of Graves' disease patients have opthalmopathy
- Asymmetric lesion of both orbits, rarely unilateral, but ultrasonographic findings are in both orbits

Thyroiditis I.

- Acute thyroiditis
  - painful induration, skin redness, abscess formation, fever, lasts a few days
  - infection from neighbouring tissues
  - **TREATMENT:** Abscess evacuation (microbiologic cultivation), ATB, NSAIDs, cooling, corticosteroids in great neck swelling

- Subacute granulomatous thyroiditis (de Quervain)
  - viral etiology, lasts a few weeks
  - **TREATMENT:** corticosteroids

Thyroiditis II.

- Chronic lymphocytic thyroiditis (Hashimoto)
  - autoimmune illness, lasts for years
  - Risk factor of carcinoma, lymphoma (USG!)
  - progression to hypothyroidism (> ½)
  - TREATMENT: izohormonal treatment with low dose thyroxine, monitoring
- Chronic fibrous (Riedel's) thyroiditis
  - fibrosis of thyroid and surrounding tissues, hypothyroidism, tracheal compression
  - rare, often surgical treatment, TSH monitoring (often hypothyroidism)

Thyroid nodules and tumors

- ultrasonography
- if > 1cm, FNAB (in young people with solitary nodule in normal parenchym may be better to provide FNAB even in small nodule)
- growing nodule!
- scintigraphy in hyperthyroidism – to excluding independent adenoma causing hyperfunction
  - „hot", „warm" and „cold" nodules – all of this types could be malignant!

Thyroid nodules and tumors

- benign – adenoma
  - eufunctional, toxic adenoma
  - follicular adenoma vs. carcinoma (can be heavily distinguished by cytology – better to be radical)
- carcinoma
  - folliculary – osteolytic metastases, TGB
  - papillary – most common – local lymphocytic infiltration
  - anaplastic – most aggressive fast growth
  - medullary – parafollicular cells – produces calcitonin
    - MEN 2A a 2B
    - familiar variant (RET-protooncogen) – family examination
- primary lymphoma – rapid growth
- metastases of the lung, kidney and breast carcinoma, melanoblastoma, lymphoma, local metastases (GIT and respiratory tract)

Thyroid carcinoma

- FTCA a PTCA – total thyroidectomy and adjuvant radioiodine treatment
  - if we found „suspect" cytology, then total thyroidectomy (more than 30% undetectable micrometastases)
- MTCA – total thyroidectomy, searching for MEN or for familiar variant (cca 15%)
  - in case of genetic variant – preventive thyroidectomy
- ATCA – bad prognosis, older people, neck irradiation, tumor mass surgical resection, chemotherapy
- secondary tumors – depend to primary origin