Physiology Team

ENDOCRINE BLOCK

LECTURE 7

Diseases of the thyroid gland

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OBJECTIVES

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Not Given :\

MIND MAP

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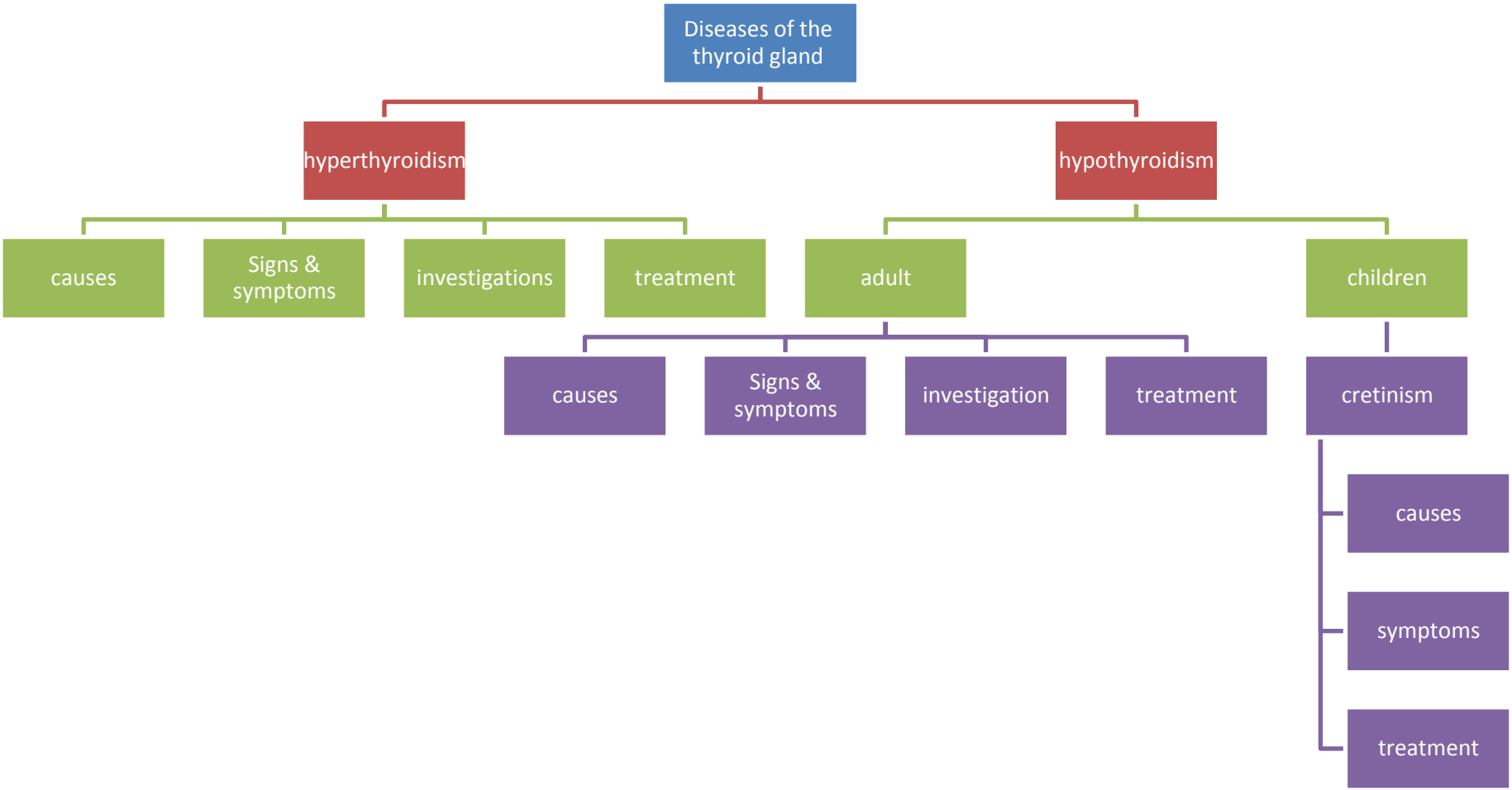

Hyperthyroidism

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- Over activity of the thyroid gland.
- Women : men ratio = (8:1). Females more than males

- **activity of gland:** **A.** 5- 10 times increase in secretion
  B. 2-3 times increase in size. (Goiter)

Causes	Notes
1- Graves' disease:	• an **autoimmune disorder.** • increased circulating level of thyroid- stimulating immunoglobulins (TSI). Stimulate thyroid gland to secret more hormones • 95% of hyperthyroidism is caused by Grave's • 4 – 8 times more common in women than men.
2- Thyroid gland tumor	•95% is benign. 5% is malignant. •history of head and neck irradiation and family history. For example; if a female had breast cancer and exposed to radiation, there is a chance that she will develop hyperthyroidism
3- Exogenous T3 and T4	rarely cause. Some females take high doses of thyroxin to get energy or to lose weight
4- Excess TSH secretion	•diseases of the hypothalamus (TRH) •diseases of the pituitary (TSH).

Hyperthyroidism

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Symptoms	
Goiter in 95%	• enlargement of thyroid gland
skin	• smooth, warm and moist. Hand sweat and hot • heat intolerance, night sweating like TB.
musculoskeletal	• Muscle atrophy because the hormone are catabolic
neurological	• tremor • enhanced reflexes (hyper-reflexia) • irritability. Patient is angry & aggressive
cardiovascular	• increase **sleeping** heart rate. (tachycardia and palpitation) • increase stroke volume • arrhythmias • Hypertension
GI tract	• weight loss and increase in appetite! • diarrhea
renal function	• increase glomerular filtration rate
Exophthalmos	• anxious staring expression. • protrusion of eye balls.
menstrual cycle disturbance.	

Hyperthyroidism

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Investigations	Primary hyperthyroidism	Secondary hyperthyroidism
Serum T3, T4 measurement.	**high T3, T4 and low TSH**	high T3, T4 and high TSH.

Treatment	
1- Medical therapy	• e.g. propylthiourcal • usually for 12-18 months course. • with 3-4 monthly monitoring
2- Surgery	• **subtotal thyroidectomy** we keep a small lobe of thyroid to protect parathyroid • **indication for surgery:** A- Relapse after medical treatment B- Drug intolerance. C- Cosmetic D- Suspected malignancy.

Hypothyroidism

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- Under activity of the thyroid gland
- more in woman (30- 60 years).

Causes of hypothyroidism

Inherited abnormalities of thyroid hormone synthesis	abnormalities in any step of the synthesis will lead to hypothyroidism such as following: • peroxidase defect. • Iodide trapping defect. • thyroglobulin defect.
Endemic Colloid Goiter	before table salt. ↓ iodide → ↓ hormone formation → ↑ TSH → ↑Thyroglobulin→ ↑ size of thyroid gland (> 10 times)
Idiopathic Nontoxic Colloid Goiter	• I intake is normal. • thyroiditis? **"inflammation of thyroid"** Inflammation → ↑ cell damage → ↓ hormone secretion → ↑ TSH → ↑ of activity of normal cells → ↑ size
Gland destruction (surgery)	
Pituitary diseases or tumor	
Hypothalamus diseases or tumor	

Hypothyroidism

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Diagnosis of hypothyroidism

1- Skin	- Dry skin. - Cold intolerance.
2- Musculoskeletal	- ↑Muscle bulk. - ↓ In skeletal growth. - Muscle sluggishness "lead to slow motion" - Slow relaxation after contraction.
3- Neurological	- Slow movement. - Impaired memory. - Decrease mental capacity.
4- Cardiovascular	- ↓Blood volume. - ↓Heart rate - ↓Stroke volume.
5- G.I tract	- Constipation - Increase weight.
6- Renal function	- Decrease glomerular filtration rate.
7- Myxeodema	- An edematous appearance through out body.
8- others	- Loss of libido. - Menstrual cycle disturbance.

- **Goiter can be associated with either hypothyroidism or hyperthyroidism**

Investigations

Primary hypothyroidism	Secondary hypothyroidism
Low serum T3, T4 and high TSH	Low T3, T4 and low TSH.

Treatment

L- thyroxine "start with low dose then gradually increase it"

- Starting dose is 25-50 µg.
- Increase to 200 µg.
- At 2-4 weeks period.

The first response seen is the weight loss.

Myxedema

Cretinism

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- **Extreme hypothyroidism during infancy and childhood leading to(failure of growth).**

Causes:

1. Congenital lake of thyroid gland (congenital cretinism).
2. Genetic deficiency leading to failure to produce hormone.
3. Iodine lake in the diet (endemic cretinism).

Symptoms:

Infant is normal at birth but abnormality appears within weeks.

1. Protruding tongue.
2. **Dwarf with short limbs.**
3. **Mental retardation**.
4. Often umbilical hernia.
5. teeth.

Treatment:

Changes are irreversible unless treatment is given early.

SUMMARY

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	hyperthyroidism	hypothyroidism
Causes	- **Graves' disease** - Thyroid gland tumor - Exogenous T3 and T4 - Excess TSH secretion	- Inherited abnormalities of thyroid hormone synthesis - Endemic Colloid Goiter - Idiopathic Nontoxic Colloid Goiter - Gland destruction (surgery). - Pituitary or Hypothalamus diseases /tumor.
Symptoms	- warm and moist skin - heat intolerance - weight loss - ↑heart rate - Exophthalmos - Muscle atrophy	- Dry skin - **Cold intolerance.** - **Increase weight** - **↓Heart rate** - **Myxeodema** - **Slow movement**.and **Impaired memory**
Investigation	- **Primary hyperthyroidism:** ↑T3,T4 & ↓TSH - **Secondary hyperthyroidism:** ↑ T3, T4 & ↑TSH.	**Primary hypothyroidism:** - ↓T3, T4 & ↑TSH **Secondary hypothyroidism:** - ↓T3, T4 & ↓ **TSH.**
Treatment	1. Medical therapy: propylthiourcal 2. Surgery:**subtotal thyroidectomy**	- **L- thyroxine**

■ Slides ■ Important ■ Females' Notes ■ Explanation ■ Males' Notes

Table 9-9 Pathophysiology of Thyroid Hormones

	Hyperthyroidism	Hypothyroidism
Symptoms	Increased basal metabolic rate Weight loss Negative nitrogen balance Increased heat production Sweating Increased cardiac output Dyspnea (shortness of breath) Tremor, muscle weakness Exophthalmos Goiter	Decreased basal metabolic rate Weight gain Positive nitrogen balance Decreased heat production Cold sensitivity Decreased cardiac output Hypoventilation Lethargy, mental slowness Drooping eyelids Myxedema Growth retardation Mental retardation (perinatal) Goiter
Causes	Graves' disease (increased thyroid-stimulating immunoglobulins) Thyroid neoplasm Excess TSH secretion Exogenous T_3 or T_4 (factitious)	Thyroiditis (autoimmune or Hashimoto's thyroiditis) Surgery for hyperthyroidism I^- deficiency Congenital (cretinism) Decreased TRH or TSH
TSH Levels	Decreased (feedback inhibition of T_3 on the anterior lobe) Increased (if defect is in anterior pituitary)	Increased (by negative feedback if primary defect is in thyroid gland) Decreased (if defect is in hypothalamus or anterior pituitary)
Treatment	Propylthiouracil (inhibits peroxidase enzyme and thyroid hormone synthesis) Thyroidectomy $^{131}I^-$ (destroys thyroid) β-Adrenergic blocking agents (adjunct therapy)	Thyroid hormone replacement therapy

QUESTIONS

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1. A 30-year-old female came to see her doctor because she always feels hot and sweats at night. Her T3 and T4 are high and TSH is low. What is your diagnosis :

A) Hypothyroidism
B) Primary hyperthyroidism
C) Secondary hyperthyroidism

2. What important sign you expect to see in a patient with hyperthyroidism:

A) Heat intolerance
B) Exophthalmos
C) Impaired memory
D) Myxoedema

3.One of the causes of hypothyroidism is

A. Graves' disease
B. Exogenous T3 and T4
C. Endemic Colloid Goiter
D. Excess TSH secretion

A 30-year-old female came to see her doctor because she always feels cold and her weight increased in past few months . Her T3 and T4 are low and TSH is low. Diagnosis is :

A. Primary hyperthyroidism
B. Secondary hyperthyroidism
C. Primary hypothyroidism
D. Secondary hypothyroidism

Cretinism symptoms is all except :

A. Heat intolerance
B. Protruding tongue.
C. Dwarf with short limbs.
D. Mental retardation.

1	B
2	B
3	C
4	D
5	A

THE END

Physiology Team

If there are any Problems or Suggestions,
Feel free to contact us:

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THANK YOU

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