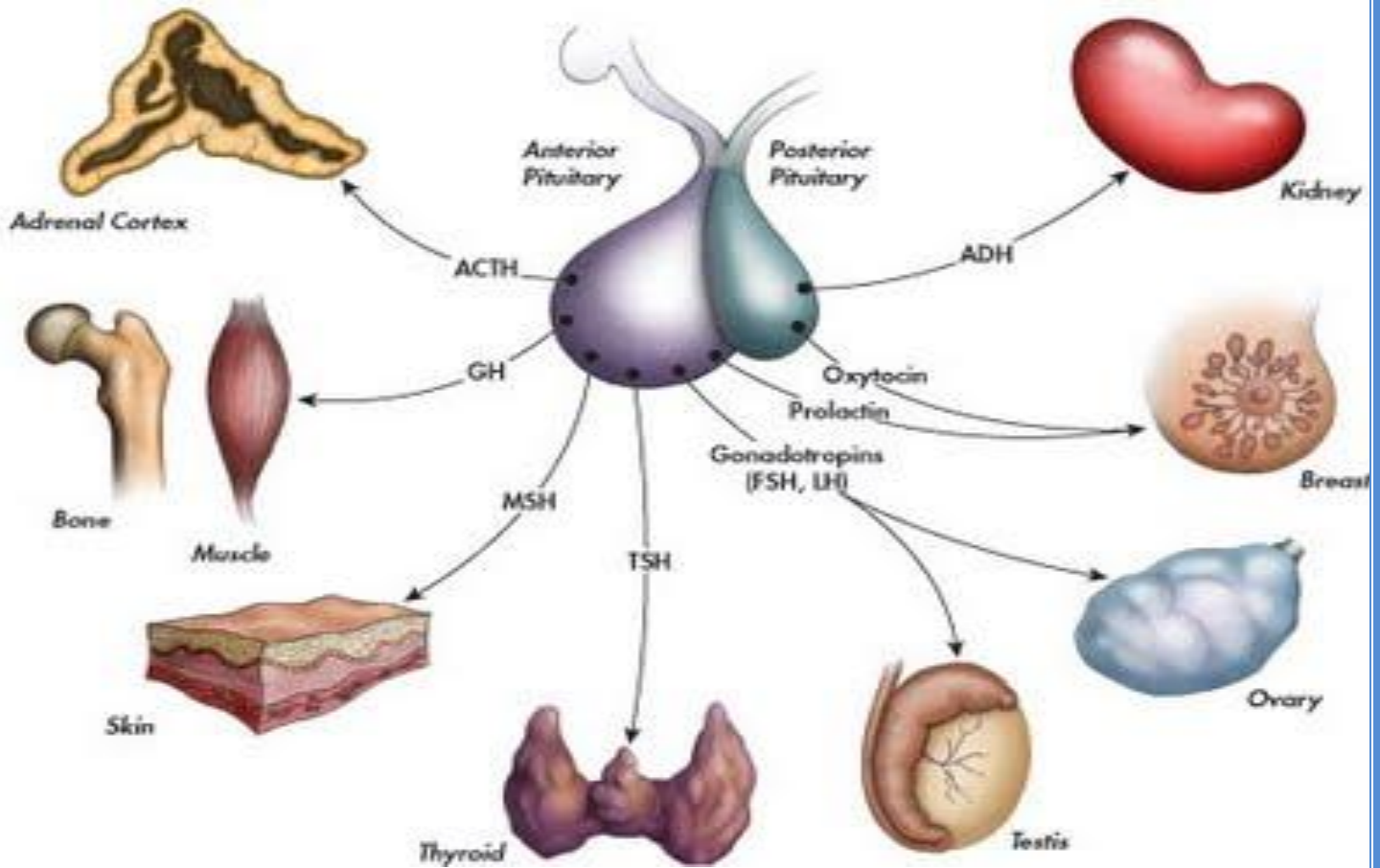


7th Lecture

Hypo & Hyperthyroidism



PHYSIOLOGY TEAM – 430

Physiology Team Leaders:

Al-Waleed Al-Johar

Layan Akkielah

This Lecture is done by:

Faisal Al-Thunayan

Hanan Al-Amer

Organized by : Al-Waleed Al-Johar

Hyperthyroidism

- **Activity of gland:**

- A. 5 - 10 times increase in secretion
- B. 2 - 3 times increase in size

Women : men ratio (8:1)

- **Causes:**

1. **Graves' disease:**

- An autoimmune disorder.
- Increased circulating level of thyroid- stimulating Immunoglobulins (TSI).
- 95%.
- 4 – 8 times more common in women than men.

2. **Thyroid gland tumor:**

- 95% is benign.
- History of head and neck irradiation and family history.

3. **Exogenous T3 and T4**

- Maybe by mistake by taking drugs that increase T4 and T3
- Rarely cause

4. **Excess TSH secretion:**

- Diseases of the hypothalamus (TRH).
- Diseases of the pituitary (TSH).

- **Diagnosis:**

- **Based on the Signs and Symptoms:**

1. **Goiter in 95%** (increase in thyroid gland size)

2. **Skin:**

- Smooth, warm and moist.
- Heat intolerance. (Abnormal sensitivity to a hot environment)
- Night sweating.

3. **Musculoskeletal:**

- Muscle atrophy (thyroxine catabolic (breakdown) protein which leads to Muscle atrophy).

4. **Neurological:**

- Tremor.
- Enhanced reflexes.
- Irritability.

5. Cardiovascular:

- Increase heart rate.
- Increase stroke volume.
- Arrhythmias.
- Hypertension.

6. G.I tract:

- Weight loss.
- Diarrhea.

7. Renal function:

- ↑ Glomerular filtration rate.

8. Exophthalmos:

(The cause is unknown but it is because of swelling of tissue)

- Anxious staring expression.
- Protrusion of eye balls.

9. Others:

- Menstrual cycle disturbance.



➤ Based on the Investigations:

- Serum measurement of T3, T4 and TSH

	T3, T4	TSH
Primary Hyperthyroidism	High	Low
Secondary Hyperthyroidism	High	High

• Treatment:

1- Medical therapy:

- E.g. Propylthiouracil (Antithyroid agent)
- Usually for 12-18 months course
- With 3-4 monthly monitoring

2- Surgery:

- Subtotal thyroidectomy
- Indication for surgery:
 - A. Relapse after medical treatment
 - B. Drug intolerance
 - C. Cosmetic.(Surgery that modifies or improves the appearance of a physical feature)
 - D. Suspected malignancy

Hypothyroidism

- **Causes:**

More in woman (30- 60 years)

1. **Inherited abnormalities of thyroid hormone synthesis :**

- Peroxidase defect
- Iodide trapping defect
- Thyroglobulin defect

2. **Endemic Colloid Goiter:**

- Table Salt (iodized salt) reduced the incidence
- ✓ \downarrow Iodide \rightarrow \downarrow Hormone formation \rightarrow \uparrow TSH \rightarrow \uparrow Thyroglobulin \rightarrow \uparrow Size (10-times)

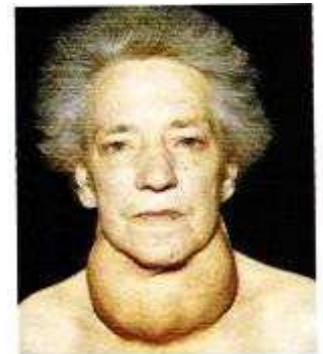
3. **Idiopathic Nontoxic Colloid Goiter:**

- There is no iodine deficiency.
- It has the symptoms of mild Thyroiditis
- ✓ Inflammation \rightarrow \uparrow Cell damage \rightarrow \downarrow Hormone secretion \rightarrow \uparrow TSH \rightarrow \uparrow Activity of normal cells \rightarrow \uparrow Size

4. **Gland destruction (surgery)**

5. **Pituitary diseases or tumor**

6. **Hypothalamus diseases or tumor**



- **Diagnosis**

- **Based on the Signs and Symptoms**

1. **Skin:**

- Dry Skin
- Cold Intolerance. (Abnormal sensitivity to a cold environment)

2. **Musculoskeletal:**

- \uparrow Muscle Bulk
- \downarrow In Skeletal Growth
- Muscle Sluggishness

3. **Neurological:**

- Slow Movement
- Impaired Memory
- Decrease Mental Capacity

4. Cardiovascular:

- ↓Heart rate
- ↓Stroke volume

5. G.I tract:

- Constipation
- Increase Weight

6. Renal function:

- ↓ Glomerular filtration rate

7. Myxoedema:

- An edematous appearance throughout the body

8. Others:

- Loss of libido.(Loss of sexual desire)
- Menstrual cycle disturbance

➤ Based on the Investigations

	T3, T4	TSH
Primary Hypothyroidism	Low	High
Secondary Hypothyroidism	Low	Low

• Treatment:

- L-Thyroxine (Is a synthetic form of thyroid hormone)
- Starting dose is 25-50 µg
- Increase to 200 µg
- At 2-4 weeks period
- The first response seen is the weight loss

Cretinism

- Extreme hypothyroidism during infancy and childhood (failure of growth)

- **Causes:**

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

- **Symptoms:**

- 1- Infant is normal at birth but abnormality appears within weeks
- 2- Protruding tongue
- 3- Dwarf with short limbs
- 4- Mental retardation
- 5- Often umbilical hernia
- 6- Teeth



- **Treatment:**

- Changes are irreversible unless treatment is given early.

Summary

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

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