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# **THYROID DISEASES**

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- **Thyroid disease** is a medical condition that affects the function of the thyroid gland.
  - The thyroid gland is located at the front of the neck and produces thyroid hormones that travel through the blood to help regulate many other organs, meaning that it is an endocrine organ.
  - These hormones normally act in the body to regulate energy use, infant development, and childhood development.
  - There are five general types of thyroid disease, each with their own symptoms. A person may have one or several different types at the same time.

- **The five groups are:**
  - 1) **Hypothyroidism** (low function) caused by not having enough thyroid hormones
  - 2) **Hyperthyroidism** (high function) caused by having too much thyroid hormones
  - 3) Structural abnormalities, most commonly a **goiter** (enlargement of the thyroid gland)
  - 4) **Tumors** which can be benign (not cancerous) or cancerous
  - 5) Abnormal thyroid function tests without any clinical symptoms (subclinical hypothyroidism or subclinical hyperthyroidism).
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## **Symptoms of hypothyroidism:**

- Tiredness
- Unexplained weight gain
- Slow movement
- Muscle cramps
- Slow heart rate (bradycardia)
- Sensitivity to cold temperatures
- Constipation
- Depressed mood
- Memory difficulty

#### 7.4.1.1 Causes of hypothyroidism

- 1) Less iodine intake in diet.
- 2) Hashimoto's thyroiditis (it is an autoimmune disorder which causes destruction of thyroid gland).
- 3) If previously patient is given treatment with radioactive iodine.
- 4) If the hypothalamus or anterior pituitary gland gets injured then it also leads to decrease in secretion of these hormones.
- 5) If thyroid gland is injured will also cause hypo-functioning of gland affecting the release.
- 6) Lack of functioning of thyroid gland at birth.
- 7) Previous thyroid injury.

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## **PATHOPHYSIOLOGY of HYPOTHYROIDISM**

- Thyroid hormone is required for the normal functioning of numerous tissues in the body.
- In healthy individuals, the thyroid gland predominantly secretes thyroxine ( $T_4$ ), which is converted into triiodothyronine ( $T_3$ ) in other organs by the selenium-dependent enzyme iodothyronine deiodinase.
- The thyroid gland is the only source of thyroid hormone in the body; the process requires iodine and the amino acid tyrosine.

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- Iodine in the bloodstream is taken up by the gland and incorporated into thyroglobulin molecules.
  - The process is controlled by the thyroid-stimulating hormone (TSH, thyrotropin), which is secreted by the pituitary.
  - Not enough iodine, or not enough TSH, can result in decreased production of thyroid hormones.

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## Symptoms of hyperthyroidism:

- Difficulty sleeping (insomnia)
  - Unexplained weight loss
  - Tremors
  - Fast heart rate (tachycardia) or palpitations
  - Sensitivity to hot temperatures, excess sweating
  - Diarrhea
  - Anxiety, irritability
  - **Note:** certain symptoms and physical changes can be seen in both hypothyroidism and hyperthyroidism —fatigue, fine/ thinning hair, menstrual cycle irregularities, muscle weakness/ aches (myalgia), and different forms of myxedema.
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#### 7.4.2.1 Causes

1. Grave's disease (overactive thyroid)
2. Toxic nodular goiter
3. Increased TSH secretion from pituitary gland
4. Increased TRH secretion from Hypothalamus
5. Excess doses of thyroid hormone (medication) or iodine (diet / medication)
6. Drug toxicity eg. amiodarone
7. Congenital hyperthyroidism
8. Thyroid carcinoma

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## **PATHOPHYSIOLOGY of HYPERTHYROIDISM**

- Autoimmune thyroid disease is a general category of disease that occurs due to the immune system targeting its own body. It is not fully understood why this occurs.
- In one of the most common types, Grave's Disease, the body produces antibodies against the TSH receptor on thyroid cells.
- This causes the receptor to activate even without TSH being present and causes the thyroid to produce and release excess thyroid hormone (hyperthyroidism).

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- Another common form of autoimmune thyroid disease is Hashimoto thyroiditis where the body produces antibodies against different normal components of the thyroid gland, most commonly thyroglobulin, thyroid peroxidase, and the TSH receptor.
  - These antibodies cause the immune system to attack the thyroid cells and cause inflammation (lymphocytic infiltration) and destruction (fibrosis) of the gland.

### 7.4.3.2 Symptoms

The degree of swelling and the severity of symptoms produced by the goiter depends on the individual. Most goiters produce no symptoms. When symptoms do occur, the following are most common:

1. Throat shows symptoms of tightness, cough, and hoarseness
2. Trouble in swallowing
3. Severe cases can cause difficulty in breathing, possibly with a high-pitch sound
4. Other symptoms may be present because of the underlying cause of the goiter, but they are not because of the goiter itself. For example, an over active thyroid can cause symptoms such as:
  - i. Nervousness
  - ii. Palpitations
  - iii. Hyperactivity
  - iv. Increased sweating
  - v. Heat hypersensitivity
  - vi. Fatigue
  - vii. Increased appetite
  - viii. Hair loss

- ix. Weight loss
- 5. In cases where goiter is a result of **hypothyroidism**, the underactive thyroid can cause symptoms such as:
  - i. Cold intolerance
  - ii. Constipation
  - iii. Forgetfulness
  - iv. Personality changes
  - v. Hair loss
  - vi. Weight gain

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## **PATHOPHYSIOLOGY of GOITER**

- Goiter is the general enlargement of the thyroid that can be associated with many thyroid diseases.
- The main reason this happens is because of increased signaling to the thyroid by way of TSH receptors to try to make it produce more thyroid hormone.
- This causes increased vascularity and increase in size (hypertrophy) of the gland.

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- In hypothyroid states or iodine deficiency, the body recognizes that it is not producing enough thyroid hormone and starts to produce more TSH to help stimulate the thyroid to produce more thyroid hormone.
  - This stimulation causes the gland to increase in size to increase production of thyroid hormone.
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