

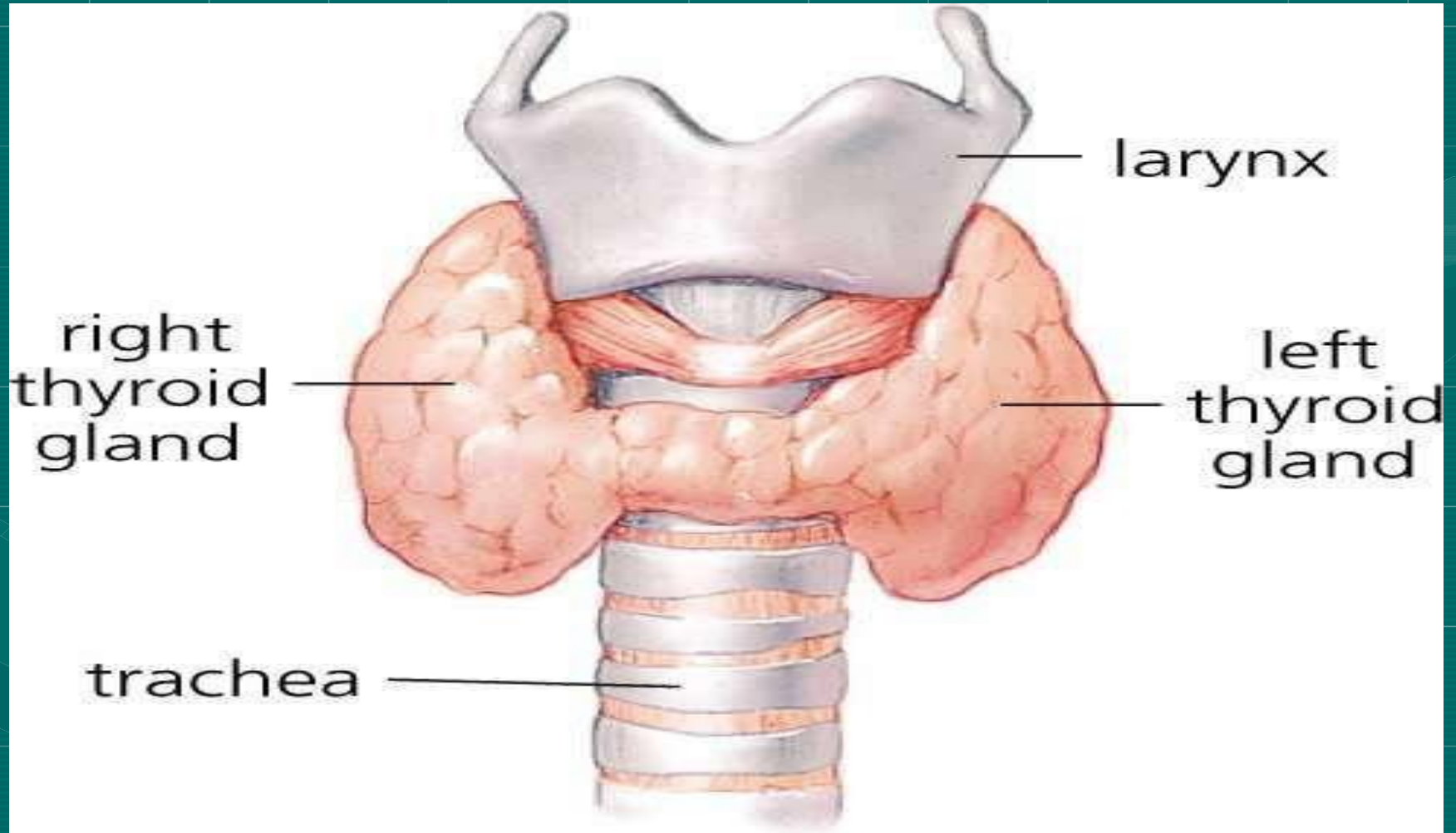
THYROID STORM

DR AJAZ QADIR (SR GEN. MEDICINE)

Anatomy of the thyroid gland

- The thyroid is one of the largest endocrine gland in the body
- The thyroid gland is located in the front of the neck, below the larynx (voice box). The small, two-inch gland consists of two lobes, one on each side of the windpipe, connected by tissue called the isthmus.
- The thyroid tissue is made up of two types of cells: follicular cells and parafollicular cells. Most of the thyroid tissue consists of the follicular cells, which secrete iodine-containing hormones called thyroxine (T4) and triiodothyronine (T3). The parafollicular cells secrete the hormone calcitonin. The thyroid needs iodine to produce the hormones.

Anatomy of thyroid gland

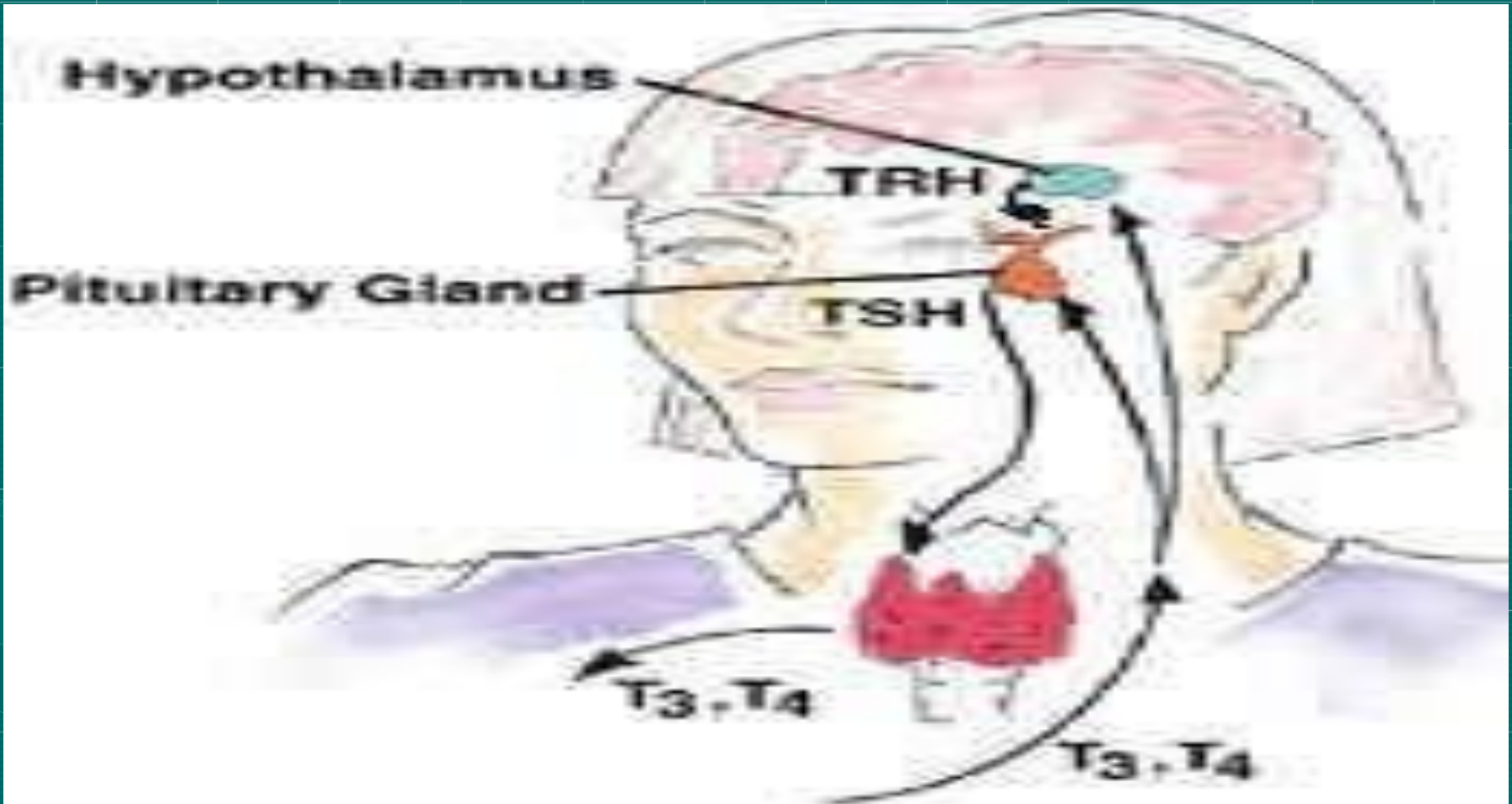


Carlyn Iverson

Functions & Physiology of the thyroid gland

- The thyroid plays an important role in **regulating the body's metabolism and calcium balance**. The T4 and T3 hormones stimulate every tissue in the body to **produce proteins and increase the amount of oxygen used by cells**. The harder the cells work, the harder the organs work. The calcitonin hormone works together with the parathyroid hormone to regulate calcium levels in the body.
- Levels of hormones secreted by the thyroid are **controlled by the pituitary gland's** thyroid-stimulating hormone, which in turn is **controlled by the hypothalamus**.

Physiology of thyroid hormones



Thyroid disease

Definition

- Hyperthyroidism
 - Overproduction of hormone from the thyroid gland
- Thyrotoxicosis
 - Any cause of **excessive thyroid hormone** concentration
- Graves' disease
 - **Autoimmune disease** and a metabolic imbalance resulting from **overproduction of thyroid hormones**
- Euthyroidism
 - Normal functioning of the thyroid gland , normal serum levels of thyroid hormone

Thyroid storm or Thyroid crisis

Definition

- Exacerbation of hyperthyroidism
- Acute, life-threatening, hypermetabolic state
- Thyroid storm may be the initial presentation of thyrotoxicosis
- Less than 10% of hospitalized thyrotoxicosis
- Mortality: 20-30%

Etiology

- Graves' disease (most common)
- Solitary toxic adenoma or toxic multinodular goiter
- Rare cause
 - hypersecretory thyroid carcinoma
 - thyrotropin-secreting pituitary adenoma
 - struma ovarii/teratoma
 - human chorionic gonadotropin-secreting hydatidiform mole.
- Other causes
 - interferon alpha
 - interleukin-2-induced thyrotoxicosis

Precipitating event

- Systemic insults
 - **Surgery**, trauma, myocardial infarction, pulmonary thromboembolism, DKA, **severe infection**
- Discontinuation of antithyroid drugs
- Excessive iodine (eg, radiocontrast dyes, amiodarone)
- Radioiodine therapy
- Pseudoephedrine and salicylate use

Thyroid Storm - diagnosis

- A score of 45 or more is highly suggestive of thyroid storm; a score of 25 to 44 supports the diagnosis; and a score below 25 makes thyroid storm unlikely.

Thermoregulatory dysfunction		Cardiovascular dysfunction	
Temperature		Tachycardia	
99-99.9	5	99-109	5
100-100.9 <i>37.2 – 37.7°C</i>	10	110-119	10
101-101.9	15	120-129	15
102-102.9	20	130-139	20
103-103.9	25	≥140	25
≥104.0 <i>40°C</i>	30	Congestive heart failure	
Central nervous system effects		Mild	5
Mild	10	Pedal edema	
Agitation		Moderate	10
Moderate	20	Bibasilar rales	
Delirium		Severe	15
Psychosis		Pulmonary edema	
Extreme lethargy		Atrial fibrillation	10
Severe	30	Precipitant history	
Seizure		Negative	0
Coma		Positive	10
Gastrointestinal-hepatic dysfunction			
Moderate	10		
Diarrhea			
Nausea/vomiting			
Abdominal pain			
Severe	20		
Unexplained jaundice			

Clinical presentation

Table 2
Signs and symptoms of thyrotoxicosis

Organ system	Symptoms	Signs
Neuropsychiatric/Neuromuscular	Emotional lability Anxiety Confusion Coma	Muscle wasting Hyperreflexia Fine tremor Periodic paralysis
Gastrointestinal	Hyperdefecation Diarrhea	
Reproductive	Oligomenorrhea Decreased libido	Gynecomastia Spider angiomas
Thyroid gland	Neck fullness Tenderness	Diffuse enlargement Bruit
Cardiorespiratory	Palpitations Dyspnea Chest pain	Atrial fibrillation Sinus tachycardia Hyperdynamic precordium Congestive heart failure
Dermatologic	Hair loss	Pretibial myxedema Warm, moist skin Palmar erythema
Ophthalmologic	Diplopia Eye irritation	Exophthalmos Ophthalmoplegia Conjunctival injection

Symptoms of Thyroid Storm

- Increased body temperature
- Tachycardia (rapid heart rate)
- Nausea/vomiting
- Frequent loose bowel movements
- Heart palpitations
- Heart failure
- Pulmonary edema
- Confusion

LAB

▽ ↑ free T4 and free T3

▽ ↓ TSH

- Hyperglycemia, elevated alkaline phosphatase, leukocytosis, Mild hypercalcemia, and elevated liver enzymes
- Cortisol ↑ (normal level → adrenal insufficiency)

Storm Treatments

Treatments directed at thyroid gland and hormones

- Inhibition of new hormone synthesis with **Thioamide drugs such as PTU and methimazole**
- Inhibition of hormone release with **Iodine & potassium iodide (Lugol's solution) & Lithium carbonate**

Storm Treatments

Treatments directed at preventing hormone's affects on the body

- Polythiouracil (PTU)
- Corticosteroids
- Beta blockers (most importantly Propanolol)
- Amiodarone
- Plasmapheresis

Storm Treatments

Treatments directed at maintaining homeostasis

- Hyperthermia: acetaminophen, cooling blankets
- Fluid and electrolyte testing/replacement
- Glucose
- Vasopressors
- Digoxin & diuretics if appropriate

Treatment Summary

Overall Goal: Reduce circulation thyroid levels and control symptom

- **Beta blockers:** decreases adrenergic hyperactivity (sympathetic outflow)
- **PTU (large amounts):** prevents synthesis of the hormone
- **Glucocorticoids:** inhibit hormone production and decrease peripheral conversion from T4 to T3.
- **Sodium iodide solution (Lugol's solution):** High levels of iodide will initially suppress release of thyroid hormone
- **Treat cardiac symptoms, fever and hypertension**

THANK YOU